Institute for Photopsychology

Research 2 (Short Report)

Preprint

Artificial Intelligence and Photography: A Psychological Analysis

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1 Introduction

The present exploratory study focuses on aspects of perception and evaluation of Artificial Intelligence in the field of photography.

Since AI-generated photorealistic images have gained attention in the media, discussions about the challenges of AI in relation to photography have been taking place on various levels. For example, the German Photo Council published a position paper on AI image generators in 2023, emphasizing the need to distinguish AI-generated images from conventional photographs. They should not be labeled as photographs, even though their photorealistic representation may create such an impression. "Because qualitative boundaries disappear, clear differentiation between photographs on the one hand and generated images on the other is crucial for their classification and perception, strengthening the media literacy of observers." A majority shares this view (Feigl, 2023). However, this topic is highly polarizing, and a quarter of professional photographers, in particular, hold a different opinion.

The discussion on Artificial Intelligence in the context of photography is essential as its impacts today are extremely diverse and far-reaching. Besides the obvious positive and negative consequences, there are also those whose evaluation is not yet clear.

An example of the diverse application of Artificial Intelligence is its use in smartphones to enhance photo quality, both through automated processes and intentional filter applications. A study by Bakhshi, Shamma, Kennedy & Gilbert (2015) investigated the use of graphic filters in smartphones. Photos edited with such filters had a higher likelihood of being viewed and commented on in social networks, with filters optimizing warmth, exposure, and contrast having the strongest impact. However, it is also known that AI can covertly replace parts of a photo with artificially generated, photorealistic elements (Fulterer, 2023).

In the realm of image editing, AI-supported software has been aiding in post-processing digital photographs for years. These advancements are evolving rapidly, providing continually expanding possibilities to influence photography quickly and easily. With AI software, individuals can be altered in various ways in photos, aged or rejuvenated. Historical black-and-white photographs can be colorized at the click of a button, and photos can be transformed into paintings in the style of well-known artists.

Finally, the aforementioned AI-generated photorealistic images, created based on extensive training material, need to be mentioned. Ienca (2023) provides an overview of the existing literature on manipulation using AI. In a 2017 study, Nightingale, Wade, and Watson demonstrated with two experiments that individuals find it challenging to distinguish between original and manipulated photos. Given the current capabilities of AI image generators, this issue is likely to be significantly intensified.

Generated photorealistic images are also raising concerns that trust in photos may erode, impacting the credibility of photographs (Feigl, 2023). Overall, interest in such images and in using AI image generators personally is weak, partly because individuals generally do not perceive a high personal benefit from it.

AI also has impacts on art. Professional photographers, in particular, tend to believe that generated photorealistic images will establish themselves in the art world (Feigl, 2023). Chatterjee (2022) argues that AI will become a significant tool for artists in the future. Furthermore, AI can be used as an instrument to analyze differences between artworks and art genres (Hung, Nakatsu, Tosa & Kusumi, 2022; Cetinic & She, 2022).

Gülacti & Kahraman (2021) conducted a literature review to assess the impacts of Artificial Intelligence on artistic photography and painting, including aspects related to reality, creativity, and authorship. From their perspective, Artificial Intelligence is increasingly changing how art is conceived and defined. "At the current state of the art in the age of post-truth, creativity, fiction, and authorship do not seem to be qualities unique only an artist as artists have been using deep neural networks to create innovatively,

exhibit what they have created in the most famous galleries and sell their work at renowned auction houses for great amounts of money across the world" (p. 264).

Developments in Artificial Intelligence will continue to progress, and it is expected that attitudes and behaviors in this context will also change. Therefore, continuous research is necessary to capture these developments over time.

In the context of this study, the focus is on differentiating between genuine photographs, manipulated photos, and generated photorealistic AI images, as well as evaluating them. Chapter 2 describes the research concept, while Chapter 3 presents the results. The key findings of the study are discussed in Chapter 4. Chapter 5 provides a summary of the work.

I would like to express my sincere thanks to everyone who provided valuable insights into shaping the survey prior to the quantitative study. Many thanks also to all who participated in the survey. Finally, I would like to extend my heartfelt thanks to all those who actively supported the interpretation of the results and the completion of this report.

2 Conducting the Study

2.1 Background of the Study

The Institute for Photopsychology was established in late 2022 as a private research initiative. The goals of the institute include:

- *Informing about existing findings in photopsychology and interpreting them for practical applications.*
- *Making additional psychological insights usable for photography.*
- *Generating new insights for photopsychology through empirical research.*

The present investigation represents the second exploratory study conducted within the framework of the institute. The aim was to further delve into the insights gained in the first study regarding the role of Artificial Intelligence in photography.

2.2 Research Questions

In contrast to the broadly themed first study conducted by the Institute, where various aspects of photography and photographing were considered, this survey is a short questionnaire with a focus on the topic of AI and photography.

The target audience for the empirical investigation once again included professional photographers, hobbyists, and individuals who engage in photography without considering it a hobby.

Due to the lack of empirical-psychological studies on AI in photography, the present study also takes on the character of an exploratory study. The following topic areas within the context of AI in photography were considered:

1. *Nomenclature of genuine photos and photorealistic AI images*
2. *Differentiation between genuine and altered photos and photorealistic AI images*
3. *Evaluation of photorealistic AI images*
4. *Desires for labeling photorealistic AI images*
5. *Evaluation of altered photos*

2.3 Development of the Research Design

2.3.1 Preliminary Remarks on the Study

For this present exploratory study, interviews and questionnaires were employed as data collection instruments. Semi-structured interviews were conducted initially with various experts to gather insights for the content design of the questionnaire. The questionnaire takes center stage in this study, as it provides an efficient means to collect extensive data from a large number of participants.

2.3.2 Research Design

For pragmatic reasons, an online survey tool from an external provider was once again utilized for conducting the survey.

The expert interviews were conducted in July and August 2023. The field period for the online survey was from August 11 to October 6, 2023. The survey could be completed on a computer, tablet, or smartphone.

2.4 Development of Data Collection Instruments

Currently, there are no empirical studies on the questions considered in this study. Therefore, a reconstruction of the research instrument was necessary.

For most attitude and motivation questions, a five-point Likert scale was employed.

fully disagree	somewhat disagree	neither	somewhat agree	fully agree

For this rating scale, subjective equidistance and thus interval scale level are assumed.

Außerdem wurden folgende Ratingskalen verwendet:

1 not meaningfull at all	2	3	4	5 very meaningfull

1 not suitable at all	2	3	4	5 very suitable

1 completely unproblematic	2	3	4	5 very problematic

For a behavioral question, the following scale was utilized:

never	rarely	occasionally	frequently	very frequently

Due to the difficulty respondents face in distinguishing between "very rarely" and "rarely," only a four-point scale was used here (for those who selected at least "rarely"): "rarely," "occasionally," "frequently," and "very frequently." Subjective equidistance is also assumed for this scale. The frequency of "never" was reported separately.

In one case, a scale was formed from individual items. Cronbach's Alpha was used as a measure of internal consistency.

Scale: Distinguishing Photorealistic AI Images

To capture the desire for clear linguistic differentiation and distinction between authentic photographs and generated AI images that resemble real photographs, four items were used:

- It is important to have a clear labeling requirement for AI-generated images that look like real photographs to avoid confusion.
- There is a need for linguistic differentiation to distinguish between AI-generated images that look like real photographs and authentic photographs.

- Only photographs that have technically originated as photographs (film or sensor) may be referred to as photographs.
- The term "photo" should fundamentally not be used in connection with AI-generated photorealistic images.

A scale for distinguishing photorealistic AI images was formed from these four items. The internal consistency is sufficiently high: α = .75 (Cronbach's Alpha). The mean is M = 4.29, and the standard deviation is s = 0.79.

Please note: The questionnaire was presented to participants only in the German language as part of the study.

2.5 Sample

2.5.1 Sample Recruitment

Initially, all individuals who registered for further surveys on the institute's website were contacted. Additionally, information about the survey, including the questionnaire link, was shared in newsletters of some overarching photography associations. Furthermore, the invitation to participate in the survey was posted on social networks (e.g., Instagram) and distributed within personal networks.

2.5.2 Composition of the Sample

For data analysis, 146 complete datasets were available. After reviewing response tendencies, no datasets needed to be removed.

The individual sample sizes are as follows:

- N=60 Professional Photographers
- N=71 Hobbyist/Amateur Photographers
- N=15 Comparison Group (Neither)

Unfortunately, the sample size of the comparison group is too small for a separate analysis. Therefore, it had to be omitted from consideration within the study. For further analyses, 131 datasets were used.

2.5.3 Classification of the Sample

It is assumed that the sample is not representative. Consequently, clear generalizations of the survey results to the entire population are not possible. However, with N=71 hobbyist/amateur photographers and N=60 professional photographers, the sample size is sufficiently large and can be considered useful.

3 Results of the study

3.1 Preliminary Remarks on Data Analysis

The following statistical procedures were employed for analyzing differences:

- Independent samples t-test
- One-way analysis of variance (ANOVA) for examining differences
- Pearson correlation for investigating relationships

The statistical assumptions of each method were checked and appropriately considered. Subjective equidistance was assumed for rating scales.

In this study, differences and relationships are considered significant at a probability of error (p) < 0.05 (two-tailed testing), indicated by an asterisk (e.g., F = 4.56*). To complement statistical significance with practical significance, effect size was calculated. Cohen's d was used for t-tests, where a small effect is present at 0.20, a medium effect at 0.50, and a large effect at 0.80 (Bortz & Döring, 2016). Eta squared was used for one-way ANOVAs, with a small effect at 0.01, a medium effect at 0.06, and a large effect at 0.14 (Bortz & Döring, 2016). Bivariate correlation coefficient r was used for correlations, with a small effect at 0.10, a medium effect at 0.30, and a large effect at 0.50.

If results were not significant, corresponding test values were not presented.

For the results, differences were tested concerning the following variables:

- Professional vs. Amateur: P = Professional photographers (N = 60), A = Hobbyist/amateur photographers (N = 71) → Independent samples t-test
- Gender: GM = Male (N = 90), GF = Female (N = 40) → Independent samples t-test
- Age: <=49 years (N = 32), 50-59 years (N = 50), >=60 (N = 49) → One-way analysis of variance with multiple group comparisons

Only significant differences are listed, and medium and large effects are bolded. Where deemed appropriate, additional correlations were calculated using the Spearman correlation coefficient.

3.2 Survey Results

3.2.1 Demographics

In the sample, 54.2% are amateurs, and 45.8% are professionals.

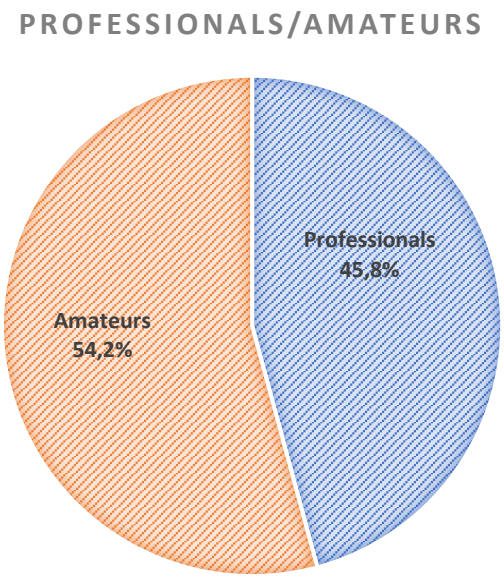

Figure 1: Professional vs. Amateur

The most represented age group in the sample is 50-59 years (38.2%), followed by 60-69 years and 40-49 years. Participants in the age range of 30-39 account for 9.2%, while those above 60 years constitute 6.9%. Participants aged 20-29 make up 3.8%, and no participant is below 20 years old.

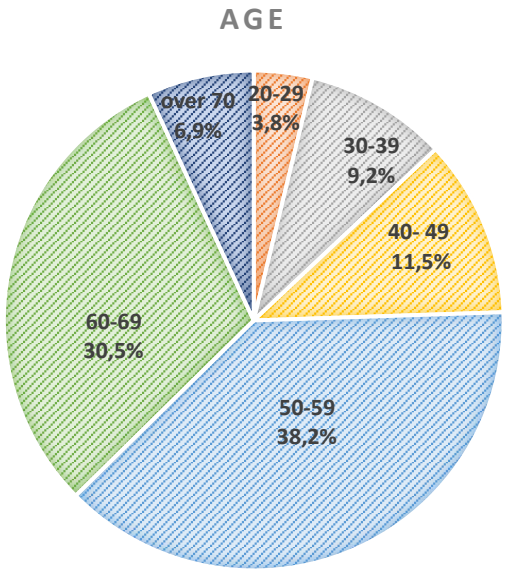

Figure 2: Age

In the context of the study, age groups were categorized as follows for age comparisons: under 49 years (24.4%), 50-59 years (38.2%), and over 60 years (37.4%).

The majority is male (68.7%), 30.5% are female, and 0.8% identify as non-binary or gender-diverse.

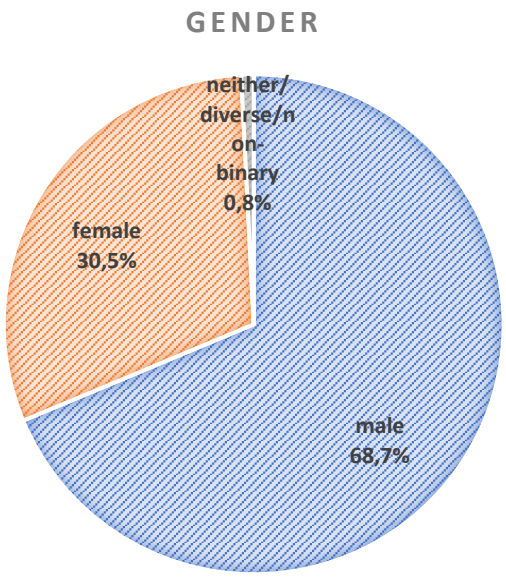

Figure 3: Gender

3.2.2 Results

The terms "photo" or "photography" refer to an image captured with a camera or photographic process. In contrast, the term "image" is more general and encompasses various types of visual representations, including photographic images. Only 20.6% of professionals and amateurs exclusively use the specific terms "photo/photography." For others, it is a combination of "photo/photography" and "image." Typically, "photo/photography" is used most frequently in combination with "image" occasionally. Approximately an equal percentage, 30.5%, use the terms interchangeably. Very few predominantly or exclusively use the term "image."

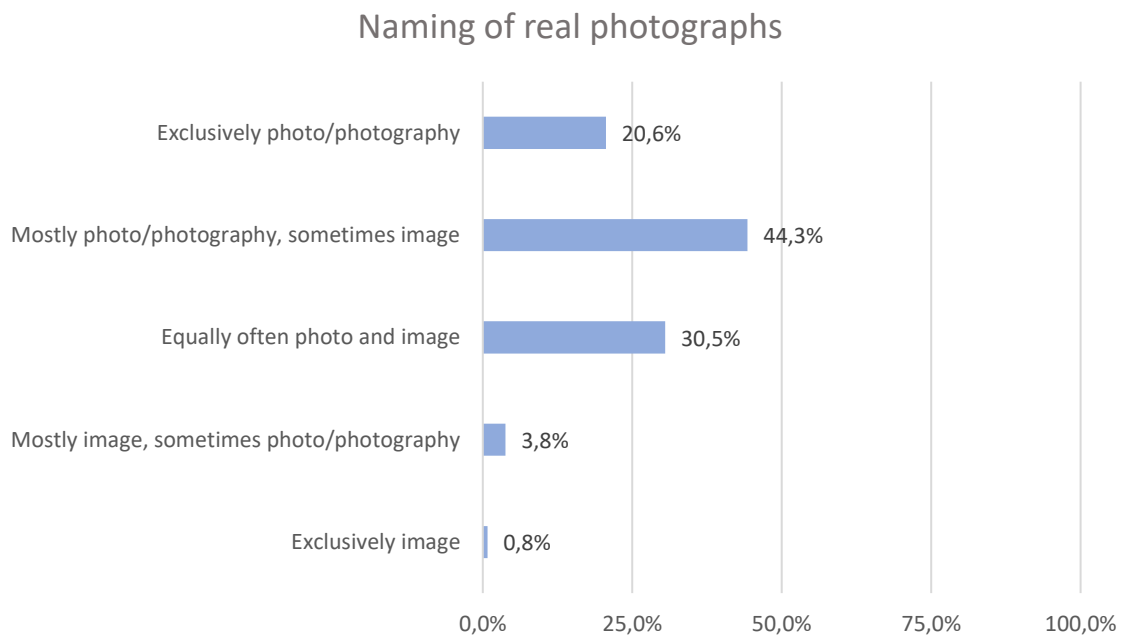

Figure 4: Naming of real photographs

A fundamental distinction between 1. authentic/real photos, 2. manipulated/altered photos, and 3. generated photorealistic AI images receives widespread agreement. 65.6% find this very sensible, and an additional 21.4% find it somewhat sensible. Only a combined 8.4% consider it somewhat or not at all sensible. The mean is 4.41 (S = 1.01).

To examine the association of the term "photo/photography" with photorealistic AI images, participants were asked to imagine the following: "Imagine a scenario where a photo displayed in an exhibition or published in a magazine is later revealed to have been generated by AI after a few weeks."

For 61.4%, it would still be clear, and for 21.4%, it would rather not be considered a photo anymore. Only 10% somewhat or fully disagree that it would cease to be a photo. The mean is 4.32 (S = 1.03). On average, men find it clearer that such an AI-generated image would no longer be considered photography in perception (M = 4.43, S = 0.95) compared to women (M = 4.10, S = 1.17): t(128) = 1.72*, Cohen's d = 0.33 (small effect), GM+/GF*.

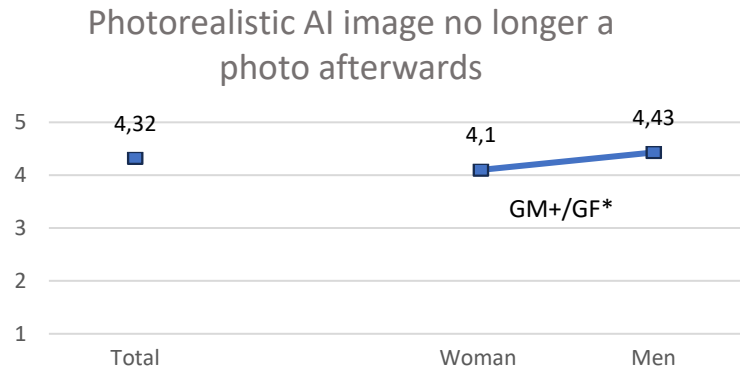

Figure 5: Photorealistic AI image no longer a photo afterwards

Conversely, 59.5% would clearly and 26% would rather not use the term photography for such images. 12% do not see it that way. The mean is 1.68 (SD = 1.02). In this case, a value of 5 indicates the maximum agreement to continue using the term photography. The clear majority of professionals and amateurs would not do so.

There is a significant negative correlation between the two statements: The more likely one is to no longer perceive a photorealistic AI image as photography afterward, the more likely one is also not to use the term photography (**r = -0.64***, large effect).

The scale *differentiation of photorealistic AI images*, consisting of four items, expresses the desire for clear linguistic differentiation and distinction between authentic photographs and generated AI images that look like real photographs. The mean is 4.29 (SD = 0.79), indicating a strong desire for this differentiation and distinction.

Only 7.6% fully agree and 29.8% somewhat agree with the statement *"AI-generated images that look like real photographs arouse my interest in learning more about their creation."* The mean is 2.91 (SD = 1.22), falling into the "neither agree nor disagree" range. The less interest there is, the more one wishes for linguistic differentiation and distinction between real photographs and photorealistic AI images (r = -0.22*, small effect).

There is a more pronounced general sense of distrust towards photorealistic AI images. Two-thirds of respondents somewhat or completely agree with the statement. The mean is 3.79 (SD = 1.20), falling into the "agree" range. The higher the level of distrust, the more one wishes for linguistic differentiation between real photographs and photorealistic AI images (r = 0.42*, medium effect).

For AI images that look like real photos, the term "AI image" is considered the most suitable, followed by "photorealistic AI image" and "AI-generated photo." The terms "Promptography" and "artificially created photorealism" are viewed as less suitable.

For professionals (M = 4.60, SD = 0.76), the term "AI image" is even more suitable than for amateurs (M = 4.28, SD = 0.97): t(121) = -2.10*, Cohen's d = 0.36 (small effect), Professional+/Amateur*.

For professionals (M = 2.87, SD = 1.61), the term "Promptography" is also less unsuitable than for amateurs (M = 2.25, SD = 1.45): t(129) = 2.23*, Cohen's d = -0.40 (small effect), Professional+/Amateur*.

The age group between 50 and 59 (M = 3.68, SD = 1.19) finds the term "AI-generated photo" more suitable than the age group over 60 (M = 2.96, SD = 1.46): F(2, 128) = 4.45*, effect size (η^2) 0.07 (small effect), 60+/50-59*.

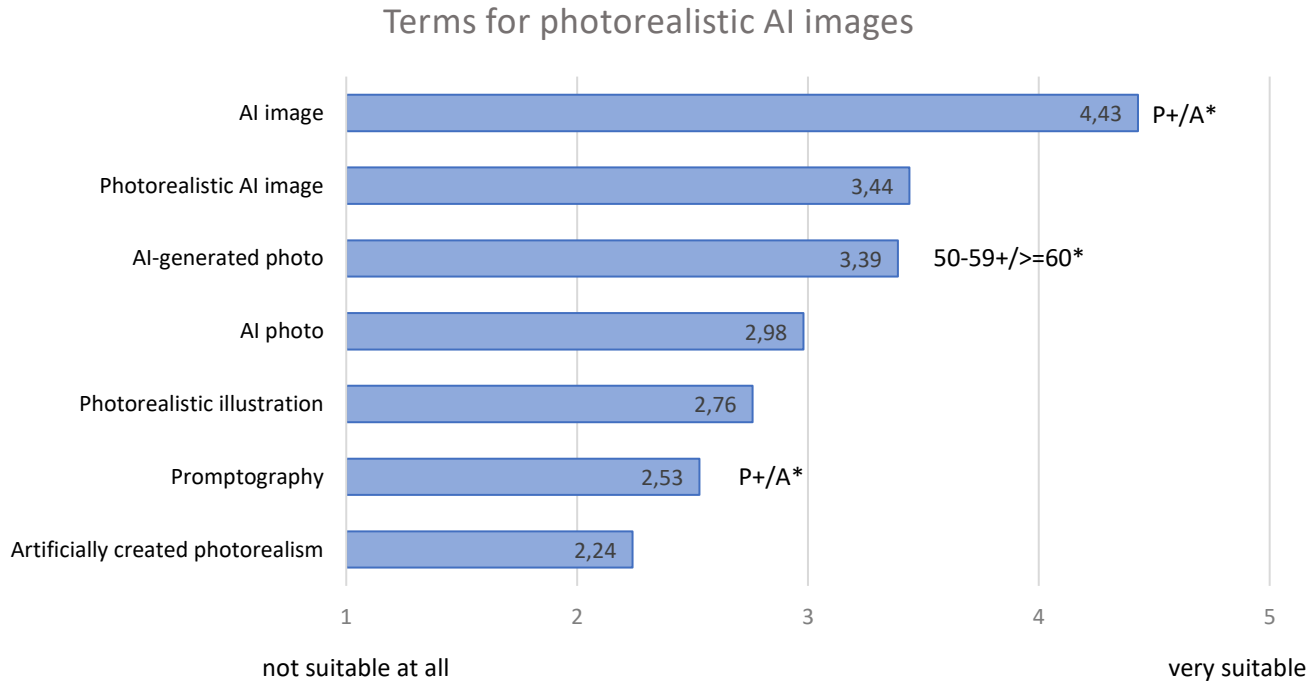

Figure 6: Terms for photorealistic AI images

In the next step, participants were asked which of the terms they would prefer to use in their everyday language. The clear majority opted for the term "AI image," followed at a considerable distance by "AI-generated photo," "Promptography," and "AI photo."

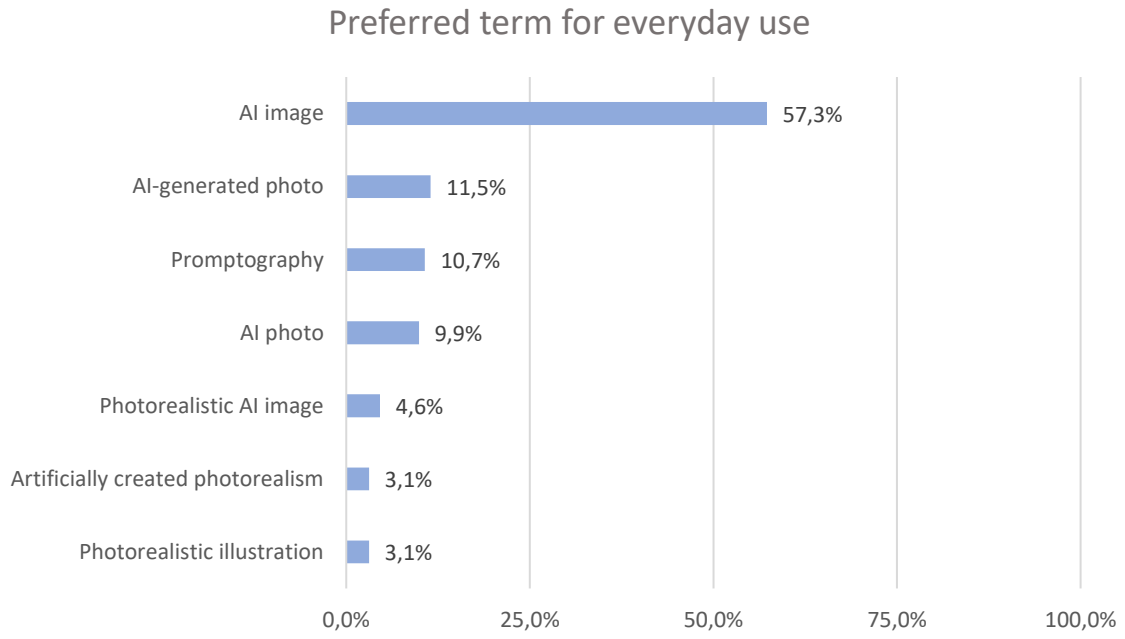

Figure 7: Preferred term for everyday use

The clear preference for the term "AI image" is evident among both professionals and amateurs. Among amateurs, "AI-generated photo" takes second place, followed by "AI photo." Among professionals, "Promptography" takes second place, followed by "AI photo." Women prefer "Promptography" more than men.

Table 1: Preferred everyday term (group comparisons)

	Ama-teurs	Profes-sionals	men	women	<= 49	50-59	>= 60
AI image	54,9%	60,0%	55,6%	62,5%	56,3%	60,0%	55,1%
AI generated photo	15,5%	6,7%	13,3%	5,0%	12,5%	18,0%	4,1%
Promptography	7,0%	15,0%	7,8%	17,5%	12,5%	10,0%	10,2%
AI photo	11,3%	8,3%	10,0%	10,0%	12,5%	2,0%	16,3%
Fotorealistic AI Image	5,6%	3,3%	5,6%	2,5%	0%	8,0%	4,1%
Artificially created photoreal-ism	2,8%	3,3%	3,3%	2,5%	3,1%	0%	6,1%
Photorealistic illustration	2,8%	3,3%	4,4%	0%%	3,1%	2,0%	4,1%

In an open-ended question, the following terms were mentioned and considered suitable:

- 5x AI-generated image
- Graphic from raw data
- Generated image
- Generoto
- Bildwerk (Image work)

- AI Photo
- Verbally generated representation
- Photo AI

Professionals and amateurs alike find photorealistic AI images to be most problematic in the fields of documentary/reportage photography and journalism/press photography. They are considered somewhat problematic in sports, street, and people/portrait photography. These images are perceived as less problematic in advertising photography and artistic photography.

The age group over 60 years (M = 4.47, s = 0.92) finds photorealistic AI images in the realm of people/portrait photography significantly more problematic than the age group between 50 and 59 (M = 3.70, s = 1.34): F(2, 128) = 7.35*, effect size (η^2) 0.09 (medium effect), **>=60+/50-59*.**

The age group between 50 and 59 (M = 1.52, s = 0.74) finds photorealistic AI images in the domain of artistic photography even less problematic than the age group over 60 years (M = 2.31, s = 1.29): F(2, 128) = 7.93*, effect size (η^2) 0.11 (medium effect), **>=60+/50-59*.**

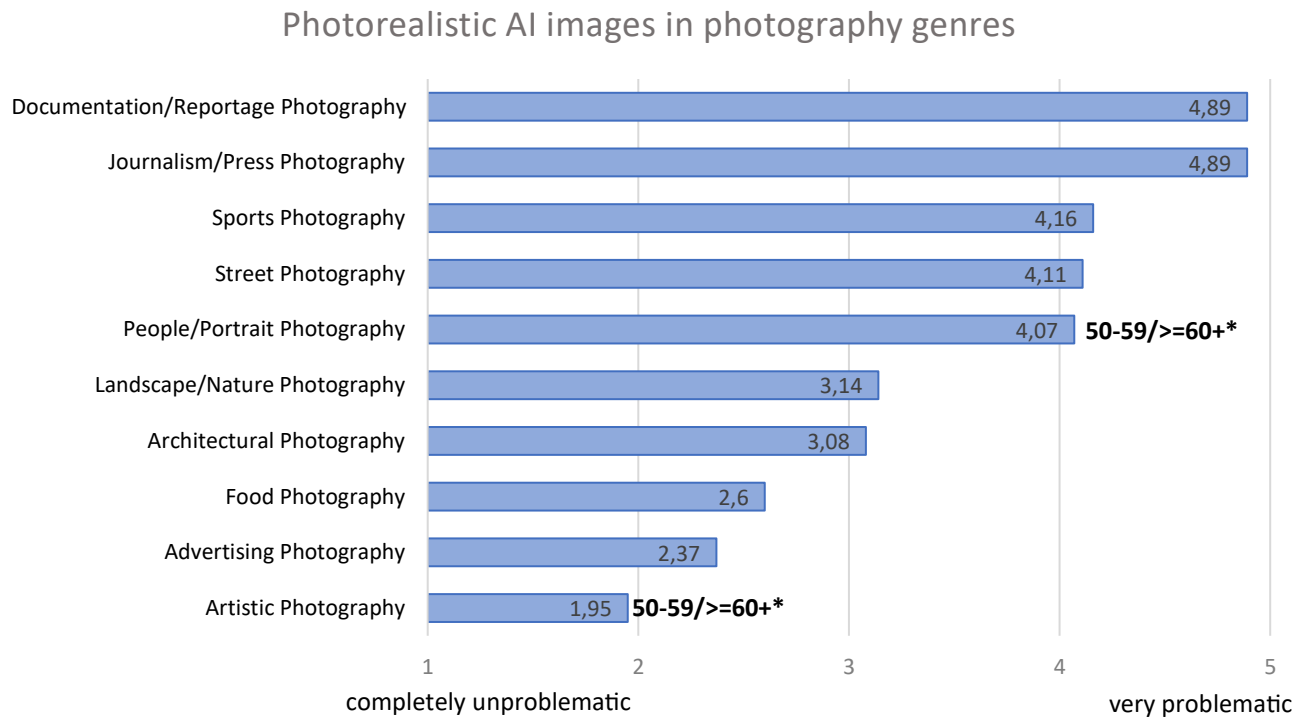

Figure 8: Photorealistic AI images in photography genres

The majority of both professionals and amateurs express a desire for mandatory labeling of photorealistic AI images in the fields of documentation/reportage photography and journalism/press photography. A significant majority also wishes for mandatory labeling in the areas of people/portrait photography, sports, and street photography. However, only about half of the respondents express a desire for mandatory labeling in the fields of advertising photography, artistic photography, and food photography.

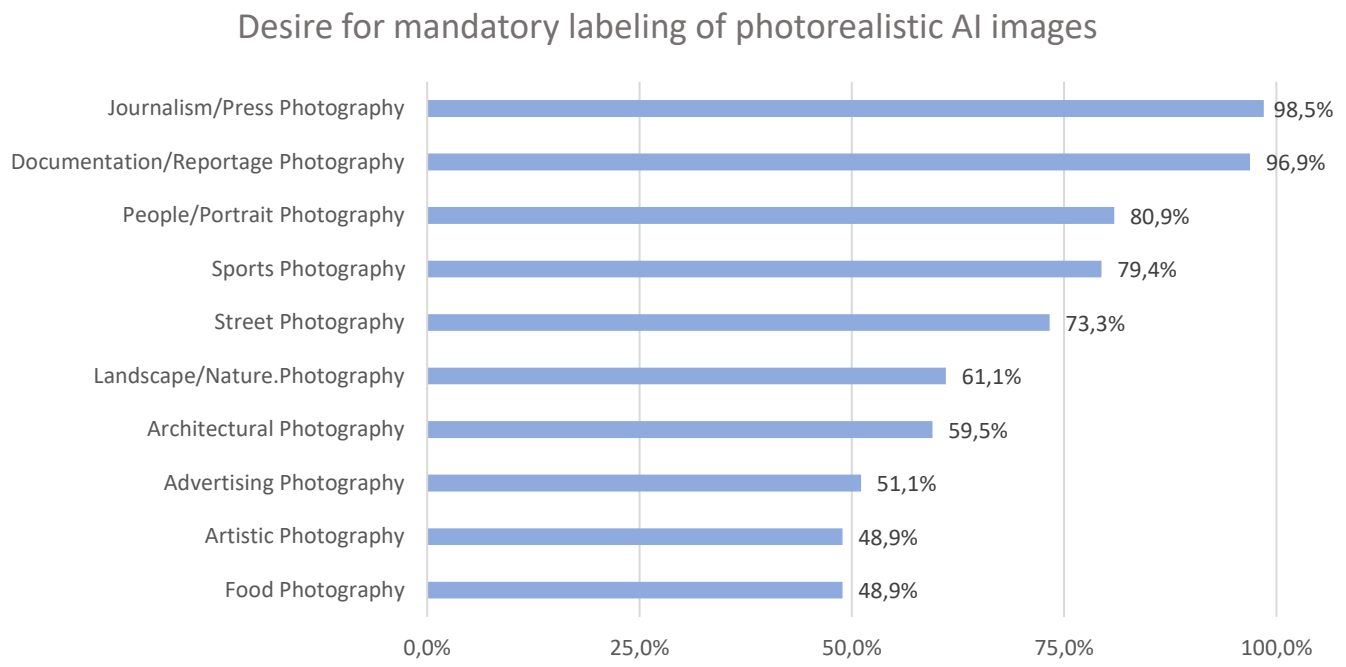

Figure 9: Desire for mandatory labeling of photorealistic AI images

In all groups, almost all respondents express a desire for mandatory labeling in the fields of documentation/reportage photography and journalism/press photography. In all other areas, more professionals than amateurs wish for mandatory labeling. Except for artistic photography, more women than men also express a desire for mandatory labeling in each respective category.

Table 2: Desire for mandatory labeling of photorealistic AI images (group comparison)

	Amateurs	Professionals	men	women	<= 49	50-59	>= 60
Journalism/Press Photography	98,6%	98,3%	98,9%	97,5%	100%	98,0%	98,0%
Documentation/Reportage Photography	97,2%	96,7%	96,7%	97,5%	96,9%	96,0%	98,0%
People/Portrait Photography	80,3%	81,7%	76,7%	90,0%	87,5%	72,0%	85,7%
Sports Photography	74,6%	85,0%	76,7%	85,0%	81,3%	78,0%	79,6%
Street Photography	70,4%	76,7%	71,1%	77,5%	71,9%	74,0%	73,5%
Landscape/Nature Photography	56,3%	66,7%	57,8%	67,5%	65,6%	60,0%	59,2%
Architectural Photography	54,9%	65,0%	56,7%	65,0%	59,4%	58,0%	61,2%
Advertising Photography	47,9%	55,0%	45,6%	62,5%	71,9%	44,0%	44,9%
Artistic Photography	42,3%	56,7%	48,9%	47,5%	56,3%	44,0%	49,0%
Food Photography	43,7%	55,0%	44,4%	57,5%	59,4%	46,0%	44,9%

For many, it is important to know whether an artistic image that resembles a real photograph is AI-generated or not. 44.3% fully agree, and 23.7% somewhat agree with this statement. 14.5% somewhat disagree, and 5.3% fully disagree. The mean is 3.87 (s = 1.27) in the "somewhat agree" range.

The acceptability of not labeling AI-generated photorealistic images in art differs significantly between professionals and amateurs. 39.7% either fully or somewhat agree, while 45.8% somewhat or fully disagree. The mean is 2.86 (s = 1.45).

For women (M = 2.43, s = 1.43), it is less acceptable not to label AI-generated photorealistic images in art compared to men (M = 3.07, s = 1.42): t(128) = 2.37*, Cohen's d = 0.45 (small effect), GM+/GF*.

For the age group 50-59 (M = 3.28, s = 1.43), it is more acceptable not to label AI-generated images in art compared to the age group over 60 years (M = 2.51, s = 1.37): F(2, 128) = 3.80*, effect size (η^2) 0.06 (medium effect), **>=60/50-59+***.

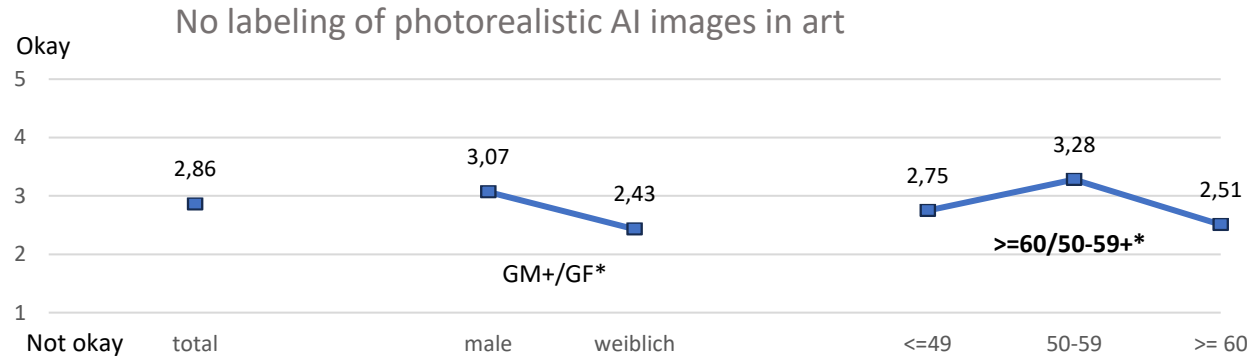

Figure 10: No labeling of photorealistic AI images in art

Both statements correlate with each other. The more important it is for an individual to know whether a photo is AI-generated or not, the more likely they are to endorse the view that it is not acceptable in art to leave photo-realistic AI images unmarked (**r = -0.42***, moderate effect).

Manipulation/alteration of authentic photos

Only 13% of professionals and amateurs never alter image content using image editing software. 38.9% do this rarely, 28.2% occasionally, and 19.8% frequently or very frequently. The mean for those who use image editing software at least rarely is 1.87 (SD = 0.96) in the occasional range.

In the next step, participants were asked about the extent to which editing a photo using image editing software such as Photoshop influences the perception and labeling of a photo. It was specified that it pertains to the alteration of image content, such as adding or removing elements, and not editing features like color contrasts, gradation curves, etc.

For 26%, any alteration leads to the photo no longer being considered authentic. For 35.1%, up to 10% of the photo can be altered, while 13% are open to 20% alterations, and for 9.9% of respondents, up to 30% of the photo can be changed and still be perceived as genuine and authentic. For 10.7%, even a completely altered photo is still considered genuine and authentic.

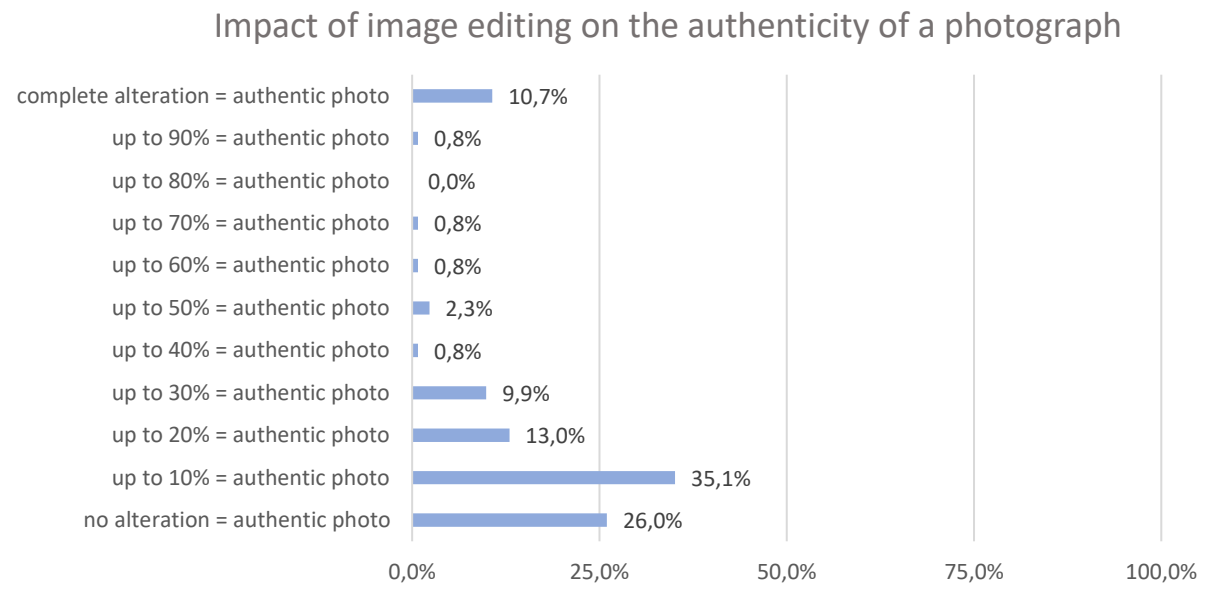

Figure 11: Impact of image editing on the authenticity of a photograph

The correction of red eyes in flashed individuals does not significantly compromise the authenticity of a photo for the vast majority. 73.3% fully agree with the statement, and 19.8% somewhat agree. The mean is 4.59 (0.86).

Regarding the statement "As long as the central message of the image is preserved, it's still a genuine photo for me even if parts of it were altered using AI image editing software," 22.9% fully agree, 50.4% somewhat agree, 10.7% somewhat disagree, and 8.4% fully disagree. The mean is 3.69 (s = 1.04), indicating a lower level of agreement.

Amateurs (M = 3.89, s = 0.76) are more inclined to agree with the statement compared to professionals (M = 3.45, s = 1.31): t(112) = -2.14*, Cohen's d = 0.37 (small effect), P/A+*.

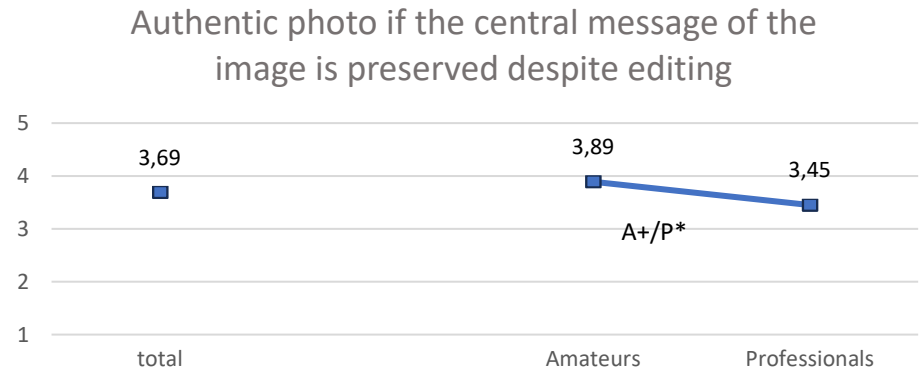

Figure 12: Authentic photo if the central message of the image is preserved despite editing

The more one agrees with the statement, the less likely one perceives a limitation of authenticity in correcting red eyes (**r = 0.31***, moderate effect).

In the next step, participants were asked which they prefer: a positive catalog listing adjustments that do not restrict the authenticity/genuineness of a photo (e.g., adjusting color contrast, red-eye correction), essentially a list of allowed modifications, or a negative catalog listing interventions that lead to a photo

no longer being considered authentic/genuine (e.g., fundamentally altering colors, removing or adding image areas). Alternatively, participants were asked if both are necessary, or if neither is necessary.

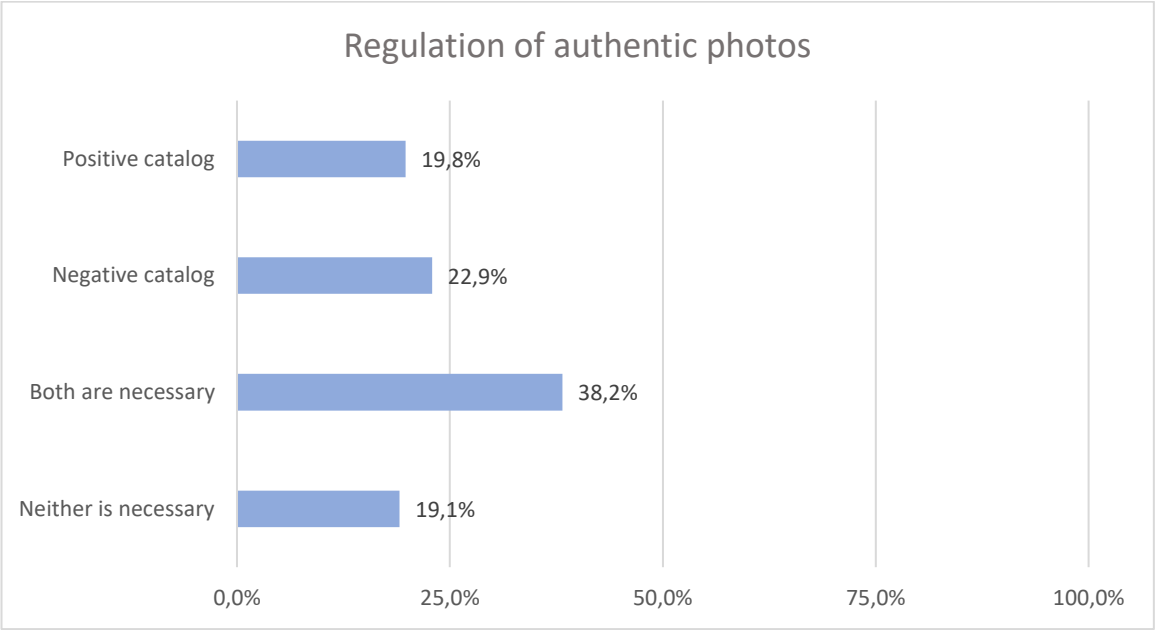

Figure 13: Regulation of authentic photos

With 38.2%, a combination of a positive and a negative catalog is the most desired, followed by only a negative catalog (22.9%) and only a positive catalog (19.8%). 19.1% do not consider a positive and negative catalog to be necessary.

In all subgroups, the majority desires either a positive or negative catalog or a combination of both. Amateurs and the age group over 60 prefer the combination of both catalogs most prominently. Only in the age group up to 49 years is the negative catalog slightly more frequently preferred over the combination of both.

Table 3: Regulation of authentic photos (group comparisons)

	Amateurs	Professionals	men	women	<= 49	50-59	>= 60
Positive catalog	21,1%	18,3%	21,1%	17,5%	12,5%	20,0%	24,5%
Negative catalog	15,5%	31,7%	21,1%	27,5%	34,4%	26,0%	12,2%
Both are necessary	42,3%	33,3%	38,9%	35,0%	31,3%	38,0%	42,9%
Neither is necessary	21,1%	16,7%	18,9%	20,0%	21,9%	16,0%	20,4%

4 Discussion

Linguistically, it is correct to refer to a photo or a photograph as such or to use the overarching term "image." Only one-fifth of the surveyed professionals and amateurs exclusively use the precise and specific term "photo" or "photography." The majority of respondents, however, utilize both terms. It would be interesting to determine whether the choice between the terms "image" and "photo" follows a specific pattern, perhaps depending on the situation or type of photography. However, there is also the possibility that the use of these terms occurs randomly.

Post-image processing likely exists since the early days of photography. In analog photography, it required a considerable amount of time but was possible. In the era of digital photography, image post-processing is now effortlessly and extremely time-efficient with specialized software. These programs increasingly leverage artificial intelligence to enable more profound modifications of the image content. Additionally, there are now AI software applications that can generate photorealistic AI images based on extensive training data through text-based inputs. In this context, a conceptual distinction between photographs and AI-generated photorealistic images seems necessary. Therefore, there is a broad consensus among surveyed professionals and amateurs regarding the fundamental differentiation between 1. authentic/real photos, 2. manipulated/modified photos, and 3. generated photorealistic AI images.

AI-generated photorealistic images

A central issue with AI-generated photorealistic images is that they are hardly distinguishable from real, authentic photos or are very difficult to differentiate. This can lead to images being mistakenly considered and labeled as real, authentic photos over extended periods, even though they are actually AI-generated. If this were to be revealed later on, the perception of a broad majority would change, and the AI image would no longer be perceived as a photo. The term "photography" would also no longer be used by a majority. This underscores the desire for clear linguistic differentiation but also expresses significant skepticism and rejection toward such images.

The desire for clear distinction and linguistic differentiation between real, authentic photos and AI-generated photorealistic images is explicitly evident. This is clearly desired by most professionals and amateurs and may partly be attributed to the existing distrust toward AI images felt by many of the surveyed individuals.

If a precise linguistic distinction between real, authentic photographs and generated photorealistic AI images is sought, the question arises about suitable terms for the latter. From a predefined selection of seven terms, the general term "AI image" was considered the most fitting, followed by "photorealistic AI image" and "AI-generated photo." In everyday language, a significant majority also prefers the term "AI image." However, terms such as "photorealistic illustration" and "artificially created photorealism" are seen as less suitable for describing photorealistic AI images and are rejected for everyday use. This rejection may be attributed to the perceived length and complexity of these terms.

The term "AI photo" is perceived, on average, as neither particularly suitable nor unsuitable. Only a few would use this term in everyday language. Linguistically, "AI photo" is more precise than "AI image" since the latter can also encompass other visual representations like paintings. The preference for the term "AI image" might stem from the desire for a clear distinction, reserving the term "photo" exclusively for real photographs. It is noteworthy that professionals prefer terms without the word "photo" even more than amateurs. This preference could be linked to the high professional identity of professionals and their association with the term "photographer" (cf. Feigl, 2023).

The term "Promptography" is considered less suitable by many, and only a few would use this term in everyday language. This perception might be due to "Promptography" being perceived as too artificial

and cumbersome. The fact that professionals consider the term less unsuitable than amateurs and would be more likely to use it in daily life could be because it is more familiar to this group.

It is assumed that the previously mentioned challenge, where photorealistic AI images are hardly distinguishable from real photos, has varying effects in different photographic contexts. For almost all surveyed professionals and amateurs, the areas of documentary/reportage photography and journalism/press photography are considered the most problematic. This clarity is not surprising. In documentary and reportage photography, authenticity is crucial as it involves accurately and unadulteratedly capturing events and stories. If AI-generated images are perceived as real photos in these contexts, they could compromise the credibility and integrity of documented events or stories. In journalism and press photography, truth-finding is of the utmost importance. Journalists and photographers must ensure that their images accurately reflect reality as they contribute to conveying information and news. With AI-generated images in this field, people can be deliberately manipulated, and the credibility of the media can be significantly damaged.

Sports, street, and people/portrait photography are considered somewhat problematic. The sports category may seem surprising at first glance, but here too, authenticity and precision are required to maintain credibility.

Photorealistic AI images are seen as less problematic in the fields of advertising photography and artistic photography. In advertising photography, this might be because authenticity, in the conventional sense, is not the primary focus; rather, the goal is to present something aesthetically and effectively. In artistic photography, the emphasis is on creative self-expression and the freedom of the photographer. The use of AI could be viewed as a legitimate extension of creative possibilities.

The perceived issue of photorealistic AI images aligns with a clear desire for a mandatory labeling of such images in various photographic applications. This need is most pronounced in the areas of documentary/reportage photography and journalism/press photography. But even in areas considered less problematic, such as advertising photography and artistic photography, half of the respondents advocate for mandatory labeling. This underscores the high sensitivity to this issue and the clear desire for transparency and authenticity in photography.

Another indication of this sensitivity in artistic photography is that over two-thirds of surveyed professionals and amateurs place great importance on being able to recognize or know whether an artwork is a real, authentic artistic photo or a generated artistic AI image. The impact of this knowledge on the perception of the artwork could be a worthwhile topic for further research.

Manipulation/alteration of authentic photos

Only a minority of surveyed professionals and amateurs indicated never using specialized software to edit photos. This could be attributed to various reasons. Some individuals may have exclusively dedicated themselves to analog photography, remaining entirely within the analog process without scanning their images or utilizing digital editing tools. Additionally, for this group of individuals, the emphasis on the authenticity and genuineness of photos might be so significant that they reject any form of image manipulation.

Interestingly, about a quarter of respondents mentioned that any alteration of the image content, except for basic edits like color contrasts and gradation curves, would lead them to no longer consider a photo as authentic. On the other hand, for a third of the respondents, a photo is still considered authentic as long as no more than 10% of the image content is altered. This suggests that the type of edits made plays a crucial role. As long as the central message of the image is preserved, the authenticity of the photo is not compromised for the majority. The professionals might be less inclined to agree than the amateurs, possibly because they set stricter standards, perhaps due to higher expectations

regarding the authenticity of photos or because of their ability to create photos from the outset that require less post-processing.

Almost universally accepted is that correcting red-eye does not compromise the authenticity of a photo. In fact, it could be argued that the absence of such correction might impact the authenticity of the photo, as red eyes do not occur in reality. Essentially, only a camera flaw is being corrected.

Given these points, it is not surprising that a significant number of surveyed professionals and amateurs demand clarity on what types of edits could limit the authenticity or genuineness of a photo. 80% advocate either for a positive catalog (listing interventions that do not compromise the authenticity/genuineness of a photo, e.g., adjusting color contrasts, red-eye correction), a negative catalog (listing interventions that lead a photo to no longer be considered authentic/genuine, e.g., fundamental color changes, the removal or addition of image areas), or even both. This could be partly attributed to the numerous and easily accessible editing options in modern software programs, which may lead to some uncertainty and foster the need for guidance and clear rules.

5 Summary

This study explores aspects of perception and evaluation of Artificial Intelligence in the field of photography, specifically focusing on how real photographs can be distinguished from manipulated photos and generated photorealistic AI images, as well as how these images are assessed. Currently, there are no empirical findings on this topic.

The exploratory study was conducted in the German-speaking region and considered both professional and amateur photographers.

The results indicate a widespread desire for clear linguistic differentiation between authentic photographs and photorealistic images generated with the help of AI image generators. The term "AI image" is clearly preferred for naming such images.

Generated photorealistic AI images are perceived as particularly problematic in the field of documentary/reportage photography and journalism/press photography. Accordingly, there is a high demand for an obligation to label such images accordingly. Such labeling requirements are desired even in photography areas considered unproblematic, highlighting the high sensitivity to this issue and the desire for transparency and authenticity in photography.

In the realm of artistic photography, while a majority opposes mandatory labeling, it is evident that a majority still wants to know whether an artistic photorealistic image is a real photograph or not.

A large majority of surveyed professionals and amateurs edit photos using image editing software. There are varying opinions on how this affects the authenticity and genuineness of a photo. A majority seeks guidance in the form of a positive and/or negative catalog, listing what forms of photo editing are allowed and what are not. This clear desire for rules indicates a high level of uncertainty regarding photo editing in the context of authenticity and genuineness.

Advancements in Artificial Intelligence will continue, and it is expected that attitudes and behaviors in this context will evolve. Therefore, continuous research is necessary to capture these developments over time. The present results serve as a starting point for this exploration.

6 Literature

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7 Appendix

7.1 Result tables

Professional/Amateur (N=131)

Profes-sional	Amateur
45,8%	54,2%

Age (N=131)

10-19	20-29	30-39	40-49	50-59	60-69	60 an older
0%	3,8%	9,2%	11,5%	38,2%	30,5%	6,9%

Gender (N=131)

male	femal	non-binär, other
68,7%	30,5%	0,8%

Identification of genuine photographs (N=131)

I exclusively use the term "photo" or "photography" to name photographs.	20,6%
I mostly use the terms "photo" or "photography" to name photographs, but sometimes also use "image."	44,3%
I equally use the terms "photo" and "image" to name photographs.	30,5%
I mostly use the term "image" to name photographs, but sometimes also use "photo" or "photography."	3,8%
I exclusively use the term "image" to name photographs.	0,8%

Linguistic differentiation between photos and AI-generated images (N=131)

	1 Not at all mean-ingfull	2	3	4	5 Very mean-ingful	M	SD
Please indicate how meaningful you find it to differentiate between 1. authentic/genuine photos, 2. manipulated/ed-ited photos, and 3. generated photorealistic AI images.	3,1%	5,3%	4,6%	21,4%	65,6%	4,41	1,01

Perception of AI-generated images that resemble photographs (N=131) "Imagine a scenario where a photo displayed in an exhibition or published in a magazine is later revealed to have been generated by AI after a few weeks."

	fully disagree	somewhat disagree	neither	somewhat agree	fully agree	M	SD
In my perception, it would no longer be considered a photograph.	1,5%	8,4%	7,6%	21,4%	61,1%	4,32	1,03
I would still use the term photography to describe it.	59,5%	26,0%	2,3%	11,5%	0,8%	1,68	1,02

Scale for distinguishing photorealistic AI-generated images (N=131)

	fully disagree	somewhat disagree	neither	somewhat agree	fully agree	M	SD
It is important to have clear labeling requirements for AI-generated images that resemble real photographs to avoid confusion.	2,3%	3,1%	8,4%	16,0%	70,2%	4,49	0,94
There is a need for linguistic differentiation to distinguish between AI-generated images that look like real photographs and genuine photographs.	1,5%	3,8%	3,1%	28,2%	63,4%	4,48	0,85
Only images technically produced as photographs (film or sensor) should be referred to as photography.	4,6%	7,6%	7,6%	26,7%	53,4%	4,17	1,14
The term "photo" should not be used in connection with AI-generated photorealistic images in general.	4,6%	9,9%	13,7%	22,1%	49,6%	4,02	1,21

A scale for distinguishing photorealistic AI-generated images was formed from the four items. The internal consistency is sufficiently high: $\alpha = 0.75$. The mean is $M = 4.29$, and the standard deviation is $s = 0.79$.

Questions about Photorealistic AI Images (N=131)

	fully disagree	somewhat disagree	neither	somewhat agree	fully agree	M	SD
AI-generated images that look like real photographs arouse my interest to learn more about their creation.	16,8%	20,6%	25,2%	29,8%	7,6%	2,91	1,22
AI-generated images that resemble real photographs evoke a sense of distrust in me.	4,6%	13,7%	15,3%	31,3%	35,1%	3,79	1,20

Terms for AI-generated images that look like photos (N=131)

	fully dis-agree	some-what disagree	neither	some-what agree	fully agree	M	SD
Photorealistic Illustration	26,0%	20,6%	20,6%	16,8%	16,0%	2,76	1,42
AI image	2,3%	2,3%	6,9%	27,5%	61,1%	4,43	0,89
AI-generated photo	10,7%	16,8%	20,6%	26,7%	25,2%	3,39	1,32
Photorealistic AI image	18,3%	13,7%	7,6%	26,0%	34,4%	3,44	1,52
AI photo	28,2%	15,3%	13,0%	16,8%	26,7%	2,98	1,59
Promptography	37,4%	21,4%	11,5%	9,9%	19,8%	2,53	1,55
Artificially created photorealism	38,9%	25,2%	16,8%	10,7%	8,4%	2,24	1,30

_____

Preferred everyday term (N=131)

Photorealistic Illustration	3,1%
AI image	57,3%
AI-generated photo	11,5%
Photorealistic AI image	4,6%
AI photo	9,9%
Promptography	10,7%
Artificially created photorealism	3,1%

_____

Photorealistic AI images in photography genres (N=131)

	1 com-pletely un-prob-lem-atic	2	3	4	5 very prob-lem-atic	M	SD
Landscape/Nature Photography	14,5%	15,3%	26,7%	29,0%	14,5%	3,14	1,26
People/Portrait Photography	3,1%	10,7%	10,7%	27,5%	48,1%	4,07	1,14
Architectural Photography	10,7%	19,8%	33,6%	22,1%	13,7%	3,08	1,18

Street Photography	5,3%	6,1%	13,7%	22,1%	52,7%	4,11	1,18
Food Photography	25,2%	21,4%	31,3%	12,2%	9,9%	2,60	1,26
Journalism/Press Photography	1,5%	0%	0,8%	3,1%	94,7%	4,89	0,54
Documentation/Reportage Photography	0,8%	0%	2,3%	3,1%	93,9%	4,89	0,48
Artistic Photography	44,3%	29,8%	18,3%	2,3%	5,3%	1,95	1,10
Sports Photography	3,1%	4,6%	16,0%	26,0%	50,4%	4,16	1,05
Advertising Photography	33,6%	24,4%	20,6%	14,5%	6,9%	2,37	1,27

Desire for mandatory labeling of photorealistic AI images (N=131)

Landscape/Nature Photography	61,1%
People/Portrait Photography	80,9%
Architectural Photography	59,5%
Street Photography	73,3%
Food Photography	48,9%
Journalism/Press Photography	98,5%
Documentation/Reportage Photography	96,9%
Artistic Photography	48,9%
Sports Photography	79,4%
Advertising Photography	51,1%

Labeling photorealistic AI images in art (N=131)

	fully dis-agree	some-what disagree	neither	some-what agree	fully agree	M	SD
It is important for me to know whether an artistic image that looks like a real photograph is AI-generated or not.	5,3%	14,5%	12,2%	23,7%	44,3%	3,87	1,27
In art, it is acceptable not to label photorealistic AI images as such.	24,4%	21,4%	14,5%	22,9%	16,8%	2,86	1,45

Usage of image editing software such as Photoshop (N=131)

	never	rarely	occa-sionally	fre-quently	very fre-quently	M	SD
How often do you alter image content in your photos using image editing software such as Photoshop?	13,0%	38,9%	28,2%	12,2%	7,6%	2,87	0,96

Impact of image editing on the authenticity of a photograph (N=131)

Once a photo has been even minimally altered using image editing software, it is no longer an authentic, genuine photograph.	26,0%
If up to 10% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.	35,1%
If up to 20% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.	13,0%
If up to30% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.	9,9%
If up to 40% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.	0,8%
If up to 50% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.	2,3%
If up to 60% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.	0,8%
If up to 70% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.	0,8%
If up to 80% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.	0%
If up to 90% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.	0,8%
Even if a genuine photo has been completely altered using image editing software, it is still an authentic, genuine photograph for me.	10,7%

Questions about photorealistic AI images (N=131)

	fully dis-agree	some-what disagree	neither	some-what agree	fully agree	M	SD
As long as the central message of the image is preserved, it's still a genuine photo for me even if parts of the photo have been altered using AI image editing software.	8,4%	10,7%	7,6%	50,4%	22,9%	3,69	1,18
Altering the red eyes of individuals photographed with a flash does not compromise the authenticity of a photo.	2,3%	3,1%	1,5%	19,8%	73,3%	4,59	0,86

Regulation of authentic photos (N=131)

Positive catalog	19,8%
Negativ catalog	22,9%

Both are necessary	38,2%
Neither is necessary	19,1%

7.2 Questionnaire

Please note: The questionnaire was presented to participants only in the German language as part of the study.

Welcome to another, this time very brief, empirical survey in the field of photo psychology. We are delighted that you are participating in our survey!

In this exploratory study, we are focusing on the handling of AI-generated images that resemble real photographs. All information provided by you will be treated strictly confidentially and used solely for research purposes. Your data will not be disclosed to third parties, and your identity will remain anonymous throughout the entire study. The evaluation and presentation of results will be fully anonymized.

Your participation in the study is voluntary, and you have the option to withdraw from or not answer the study at any time. If you have questions about the study or need further information, feel free to contact us at info@foto-psychologie.de.

Participation takes approximately 5-10 minutes. You can complete the survey on a computer, tablet, or smartphone, with the fastest option being on a computer. The research results will be publicly accessible on the Institute for Photo Psychology's website: www.foto-psychologie.de.

We appreciate your participation in this study and your valuable contributions to research in the field of photo psychology. Please read all questions carefully and express your personal opinion. There are no right or wrong answers in this context; we are solely interested in your personal opinion!

Your age

Please check the applicable option:

☐ 10-19 ☐ 20-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60-69 ☐ 70 years and older

Your gender

☐ male ☐ female ☐ divers ☐ neither/nor

Professional/Amateur photography

Please indicate what applies to you:

☐ I am a professional photographer

☐ I am an amateur photographer

☐ neither/nor

What terms do you use to label genuine photographs (both your own and those taken by others)?

- I exclusively use the term "photo" or "photography" to label photographs.

- I mostly use the term "photo" or "photography" to label photographs, but sometimes also use "image."
- I equally use the terms "photo" and "image" to label photographs.
- I mostly use the term "image" to label photographs, but sometimes also use "photo" or "photography."
- I exclusively use the term "image" to label photographs.

Differentiation between photos and AI-generated images

Please indicate how meaningful you find it to generally distinguish between 1. authentic/genuine photos, 2. manipulated/altered photos, and 3. generated photorealistic AI images. Please answer the question on a scale from 1 "not meaningful at all" to 5 "very meaningful." You can also choose the steps in between.

1 not meaningfull at all	2	3	4	5 very meaningfull
☐	☐	☐	☐	☐

Classification of photographs

What do you prefer: a positive catalog listing adjustments that do not restrict the authenticity/genuineness of a photo (e.g., adjusting color contrast, red-eye correction), essentially a list of allowed modifications, or a negative catalog listing interventions that lead to a photo no longer being considered authentic/genuine (e.g., fundamentally altering colors, removing or adding image areas)? Or do you think both are necessary, or neither?

Positivkatalog

- Positive catalog
- Negative catalog
- Both are necessary
- Neither is necessary

Perception of AI-generated images that resemble photographs

"Imagine a scenario where a photo displayed in an exhibition or published in a magazine is later revealed to have been generated by AI after a few weeks."

	fully disagree	somewhat disagree	neither	somewhat agree	fully agree
In my perception, it would no longer be considered a photograph.	☐	☐	☐	☐	☐
I would still use the term photography to describe it.	☐	☐	☐	☐	☐

How fitting do you find the following terms for images that look like real photos but were created with the help of AI

	1 not suitable at all	2	3	4	5 very suitable
Photorealistic Illustration	☐	☐	☐	☐	☐
AI image	☐	☐	☐	☐	☐
AI-generated photo	☐	☐	☐	☐	☐
Photorealistic AI image	☐	☐	☐	☐	☐
AI photo	☐	☐	☐	☐	☐
Promptography	☐	☐	☐	☐	☐
Artificially created photorealism	☐	☐	☐	☐	☐

Which of these terms would you prefer to use in everyday life? You can choose only one term

Photorealistic Illustration	☐
AI image	☐
AI-generated photo	☐
Photorealistic AI image	☐
AI photo	☐
Promptography	☐
Artificially created photorealism	☐

Do you have a designation that, in your opinion, would be even more fitting but did not appear on the list?

Yes/No

If yes: Which _____

AI-generated images in various areas of photography

Please indicate how problematic or unproblematic you find AI-generated images that look like real photos in the following areas. Please answer the question on a scale from 1 "completely unproblematic" to 5 "very problematic." You can also choose the steps in between.

	1 completetely unproblematic	2	3	4	5 very problematic
Landscape/Nature Photography	☐	☐	☐	☐	☐
People/Portrait Photography	☐	☐	☐	☐	☐
Architectural Photography	☐	☐	☐	☐	☐
Street Photography	☐	☐	☐	☐	☐
Food Photography	☐	☐	☐	☐	☐

Journalism/Press Photography	☐	☐	☐	☐	☐
Documentation/Reportage Photography	☐	☐	☐	☐	☐
Artistic Photography	☐	☐	☐	☐	☐
Sports Photography	☐	☐	☐	☐	☐
Advertising Photography	☐	☐	☐	☐	☐

In which areas do you wish for a labeling requirement for AI-generated images that look like real photos?

You can choose one, several, or all areas. If you do not wish for labeling in any area, then do not select any.

Landscape/Nature Photography	☐
People/Portrait Photography	☐
Architectural Photography	☐
Street Photography	☐
Food Photography	☐
Journalism/Press Photography	☐
Documentation/Reportage Photography	☐
Artistic Photography	☐
Sports Photography	☐
Advertising Photography	☐

Usage of image editing software such as Photoshop

It concerns the alteration of image content, such as adding or removing elements. It does not refer to edits like color contrast, gradient curves, etc.

	never	rarely	occasionally	frequently	very frequently
How often do you alter image content in your photos using image editing software such as Photoshop?	☐	☐	☐	☐	☐

Please indicate to what extent the editing of a photo using image editing software like Photoshop influences your perception and labeling of the photo. It concerns the alteration of image content, such as adding or removing elements. It does not refer to edits like color contrast, gradient curves, etc.

- Once a photo has been even minimally altered using image editing software, it is no longer an authentic, genuine photograph.
- If up to 10% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.

- If up to 20% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.
- If up to30% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.
- If up to 40% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.
- If up to 50% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.
- If up to 60% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.
- If up to 70% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.
- If up to 80% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.
- If up to 90% of a genuine photo has been altered using image editing software, it is still an authentic, genuine photograph for me.
- Even if a genuine photo has been completely altered using image editing software, it is still an authentic, genuine photograph for me.

Questions about AI-generated images that look like real photographs

	fully disagree	somewhat disagree	neither	somewhat agree	fully agree
There is a need for linguistic differentiation to distinguish between AI-generated images that look like real photographs and genuine photographs.	☐	☐	☐	☐	☐
AI-generated images that look like real photographs arouse my interest to learn more about their creation.	☐	☐	☐	☐	☐
It is important for me to know whether an artistic image that looks like a real photograph is AI-generated or not.	☐	☐	☐	☐	☐
AI-generated images that resemble real photographs evoke a sense of distrust in me.	☐	☐	☐	☐	☐
It is important to have clear labeling requirements for AI-generated images that resemble real photographs to avoid confusion.	☐	☐	☐	☐	☐
Only images technically produced as photographs (film or sensor) should be referred to as photography.	☐	☐	☐	☐	☐
In art, it is acceptable not to label photorealistic AI images as such.	☐	☐	☐	☐	☐

The term "photo" should not be used in connection with AI-generated photorealistic images in general.	☐	☐	☐	☐	☐

Questions about photos that have been edited with image editing software

	fully disagree	somewhat disagree	neither	somewhat agree	fully agree
As long as the central message of the image is preserved, it's still a genuine photo for me even if parts of the photo have been altered using AI image editing software.	☐	☐	☐	☐	☐
Altering the red eyes of individuals photographed with a flash does not compromise the authenticity of a photo.	☐	☐	☐	☐	☐

You're done!

Thank you very much for participating in this empirical survey in the field of photo psychology. Your responses are highly valuable and will contribute to a deeper understanding of the connections between photography and psychological processes. The results of this study will be published on the website www.foto-psychologie.de and discussed in the associated podcast "FotoPsychoLogisch." You can find the podcast on the website and wherever podcasts are available. Once again, thank you for your participation!

7.3 List of figures

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