HARMONY OF LIGHT AND SHADOW: KEY ASPECTS OF LIGHTING IN PORTRAIT PHOTOGRAPHY

Ruslana Buryk
Student, School of Communications, Media, Arts, and Design,
Centennial College, Toronto, Canada
e-mail: ruslana.buryk@ukr.net, orcid.org/0009-0005-6518-4538

Maryna Bratitsel
Candidate of Cultural Studies, Lecturer at the Department of Hotel, Restaurant and Tourism Business, Kyiv National University of Culture and Arts, Ukraine
e-mail: frog2014137@gmail.com, orcid.org/0000-0001-9206-3479

Summary

The article analyzes the role of lighting in portrait photography, emphasizing how the harmony between light and shadow can affect the emotional depth and visual appeal of an image. Photography, presented as an art and science of light, requires not only professional skills, but also the talent and skill of the photographer. The skill of a photographer lies not only in technical execution, but also in the ability to convey life and emotions through the image, revealing the true character of a person. Thus, a portrait photographer should be able to capture the soul and inner world of the model, which is a sign of his or her true skill. The article pays special attention to lighting under artificial lighting. It further discusses such aspects as distance between the subject and the light source, directionality of light, the size of light source and the distance to the subject, as well as the importance of shape of reflector. The different types of lighting in portrait photography are also discussed: back, side, front, diffused, and hard light, each of which affects the final image. The study includes analysis of current trends and innovative lighting techniques in portrait photography. It emphasizes the importance of the photographer's ability to use different light sources to create images that reflect uniqueness and personality of the model. This study aims to expand the theoretical knowledge and practical skills of photographers, striving to improve the quality and expressiveness of portrait images.

Key words: portrait photographer, artificial lighting, aperture, light rays, light experiment, illuminator reflector, natural details.

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1. Introduction

It is hard to imagine modern society without photography, which has become an integral part of our lives. Photographic portraits, including portraits of people, are everywhere – on advertising posters, in photo exhibitions, magazines, and even in our passports. Most of us have our own photo collections, with portraits of ourselves and our loved ones taking up a significant share. Photographic portraits are widely used in advertising, forensics, science, and journalism, and have become an integral part of our everyday lives. This is one of the reasons why the profession of photography, especially portraiture, is so popular. Photography is not only an art but also a science of light. This is especially true in portrait photography, where right lighting plays

a key role in creating an image *(Douglas, 2011)*. In this article, we look at how the harmony between light and shadow can affect the emotional depth and visual appeal of a portrait, and analyze different techniques and approaches to lighting in portrait photography.

Photographic portraiture is a complex form of photographic art, but it has gained great popularity in our society, especially in the form of staged portraits. Masters in this field are valued for their ability to highlight advantages and minimize disadvantages in the images, meeting the needs of clients. Today, a simple camera can create an excellent portrait of a child, man, or woman. However, using expensive equipment does not guarantee success, and image editing programs cannot always correct imperfections or create a natural look. Photographic portraits are widely used in science, forensics, advertising, and glossy publications. This emphasizes that the profession of photography and the skill of lighting involves numerous complexities and important nuances *(Fried, Shechtman, Goldman, & Finkelstein, 2016)*. It is important not only to capture a person's appearance, but also to convey a part of their soul, the sparkle in their eyes, and their sense of life through the photograph. The main task of a portrait photographer is to feel and capture a person's character, to find a way to adequately embody it in the picture. The ideal result is when physical and psychological images are harmoniously combined. The photographer's ability to convey model's inner world through the lens is his or her true merit.

The relevance of the study lies in the growing interest in portrait photography among both professional and amateur photographers. In today's world, where images are of great importance in social media, advertising, journalism, and personal creativity, the ability to work with light and shadow is an integral part of creating impressive portraits. Knowing and understanding the basics of lighting helps photographers express their ideas, emotions, and characters of models, emphasizing their uniqueness and individuality *(Makedon and Ilchenko, 2021)*. Therefore, this study not only expands theoretical knowledge in the field of photography, but also has practical applications for those who seek to improve the quality and expressiveness of their portrait images.

The purpose of the study is to review and analyze the main aspects of light and shadow harmonization in portrait photography. We aim to identify how different lighting techniques affect the aesthetic and emotional aspects of a portrait, and how this can change the perception of the model's image. This research aims to combine theoretical knowledge and practical experience to develop a comprehensive approach to creating high-quality portraits using different lighting techniques.

Research objectives: 1) to study the basic principles of lighting, their influence on image formation, as well as the analysis of different types of light and shadows; 2) to conduct practical experiments with different light settings to determine their impact on portrait photography; 3) to study the impact of lighting on the emotional expression of portraits by analyzing how changes in lighting can affect the transmission of emotions and character of the model in the photo; 4) based on the obtained data, to formulate practical recommendations for photographers on the use of lighting to achieve the best results in portrait photography; 5) analysis of current trends in portrait photography: research of modern approaches and techniques in portrait photography, with an emphasis on innovative lighting methods.

2. Features of shooting under artificial light

There are certain nuances when shooting with artificial light. The distance between the subject and the light source is extremely important, and usually does not exceed a few meters. Any change in this distance directly affects the level of illumination of the object. This

illumination changes according to the square of the distance: for example, doubling the distance between the light source and the subject will result in a fourfold decrease in illumination. This pattern should always be taken into account when taking photos.

In addition, an important characteristic of light is its directionality. This aspect directly depends on both the size of the light source and the distance to the subject *(Mitsukova, Onykiyenko, 2020)*. The following rule can be formulated: if the size of the light source is approximately equal to or close to the distance from it to the subject, the lighting will be soft and uniform; if the size of the light source is much smaller than the distance to the subject, such lighting will be directional (Table 1).

Table 1

Size of the light source and distance from the source to the subject (Hameed, 2023)

The nature of lighting	The ratio of the size of the light source and the distance from the source to the subject
Soft light-toned lighting without pronounced shadows	1:1
Soft lighting with subtle blurred shadows	From 1:1 to 1:3
Soft lighting with smooth transitions from light to shadows	From 1:3 to 1:6
Sufficiently contrasty lighting with fuzzy shadow contours	From 1:6 to 1:10
Contrast lighting with clear shadow boundaries	1:10

First of all, based on the data provided, it becomes possible to determine the required size of reflectors for lighting lamps to create the desired type of lighting. For example, to achieve a soft and diffused light that does not create harsh shadows on the face, you need to use reflectors which size is approximately equal to the distance from the lamp to the subject.

That is why professional photo studios and film sets use lighting fixtures with large radiating surfaces, often exceeding 1-2 meters in size, to create soft and diffused light. Conventional LED soffits provide such lighting only at a short distance of 30-70 cm; at a longer distance, the light becomes more focused and harsh. This is especially noticeable in the case of flash lamps, where reflectors are small – from 5 to 10 cm *(Jane, Fried, & Agrawala, 2019)*.

The directionality of light flux depends to a large extent on the characteristics of the reflector surface that reflects the light. The smoother and more mirrored this surface is, the less light it scatters, which leads to a greater directivity of the light flux. The shape of the reflector is also important: deeper reflectors create a narrower beam of light. This effect is usually not so noticeable when using conventional incandescent bulbs, but when shooting with short-focus lenses and using a flash directly from the camera, the narrow light beam can lead to uneven lighting: the center of the image may be normally exposed and the edges underexposed.

However, soft and diffuse lighting has a drawback: illumination of the subject is reduced several times compared to direct light, which is caused by both light losses due to reflection (up to 50%) and the distance from the light source to the subject. Because of this, more powerful light sources must be used to create this type of lighting.

Instead of using a screen, wall, or ceiling as a reflector, you can use a special umbrella covered with a white, thick fabric. Thick satin silk or other similar fabric is best suited for this purpose. Such umbrella is held open on a tripod with a clamp. The light source is placed near the umbrella handle. When the umbrella is folded, it takes up little space, and can be quickly placed in the right place during the shooting process.

Creating a directional light beam is a much easier task. I order to do this, one can put a cylindrical tube made of thick paper or thin cardboard, the diameter of which corresponds to the diameter of the illuminator reflector, on the photo illuminator. The length of this tube is determined by the desired degree of directionality of the light rays, which is usually 50–60 cm. The inner surface of the tube should be covered with black paper to prevent light scattering *(Lebedyeva, 2022)*. One can also use the illuminating part of a photomagnifier as a source of directional light.

3. Light sources in portraiture and their features

Light sources can be classified according to their direction and location relative to the subject and the photographer (back, side, front) and the state of the light source (diffused, directional, combined).

Backlighting. This type of lighting occurs when the subject is located between the light source and the photographer, for example, when the model is facing the photographer but with her back to the sun. To create the backlight effect, you need to use directional light in the frame, since it is impossible to achieve the desired effect with diffused light (Fig. 1).

Fig. 1. Example of a portrait using backlighting

Such type of lighting makes it easy to create contour images. Using this type of light in special atmospheres, such as fog or dust in the air, can create striking effects in the frame. This type of lighting is very attractive in terms of its ability to create images with a special mood, which can be tender, romantic, or fun, allowing to play with glare and reflections *(Hirsch, 2017)*.

Side light. Side lighting means that the light falls on the object from the side. This type of lighting provides excellent contrast, creates long shadows, and gives the image a sense of depth. Side lighting is often used to create dramatic effects in architecture photography and portraits (Figure 2).

Frontal lighting. This is a type of lighting where the light source is placed directly in front of the subject and, at the same time, directly behind the photographer. When working with frontal light, one needs to be especially careful, because it creates almost no shadows (especially when the sun is above your head), the shots can be somewhat flat and shallow) (Fig. 3).

Diffuse light. This type of lighting is often found in cloudy weather conditions or at dusk. Diffused light is usually the most convenient to work with because it does not require complicated exposure settings – measurements can be taken at almost any illuminated point. It provides uniform illumination of the object, creates soft shadows, and helps to preserve detail in shadow areas (Fig. 4) *(Horevalov, Zykun, 2020)*.

Fig. 2. An example of a portrait using side lighting

Fig. 3. An example of a portrait using frontal lighting

Fig. 4. An example of a portrait using diffused lighting

As a disadvantage of diffused light, many people point out that sometimes the object may not look three-dimensional due to the low contrast level in the image, especially in landscapes. However, it is important to keep in mind that it all depends on the purpose of the shot and the atmosphere you want to recreate. Diffused light is ideal for creating images that are not overly dramatic, but have a lot of detail.

When shooting outdoors, it is harder to control diffused light than indoors. When taking pictures near a window, one can work with both frontal and soft side lighting. Although this type of lighting is less suitable for backlighting, it can also be used to create soft images with vaguely defined contours *(Lu, & Liu, & Bai, 2022)*.

Hard light. Hard sunlight is the lighting that occurs when the sun is at or near its zenith. This means that the light source is located directly above the object or slightly to the side of the top (Figure 5).

Fig. 5. An example of a portrait using hard lighting

This type of natural light can be difficult to work with. It is harsh, creates sharp shadows in which details can completely disappear, and often there is a problem with exposure measurement: black "dips" in shadow areas are possible. Also, this light often causes overexposure. However, this has its advantages. First, the same hard shadows can sometimes add extra volume to the frame, dividing it into visual layers. Secondly, these shadows can achieve very interesting effects: for example, if you place the subject at the same level as the background, you can get a distinctly "flat" and graphic shot, as if drawn with a pencil on paper. Such lighting is well suited for creating stylish and contrasting fashion portraits *(Doble, 2013)*.

Light at dawn or sunset. This type of lighting is a favorite of many photographers. It can be observed about an hour after sunrise and an hour before sunset. At this time, the sun is low above the horizon, the light has a warm orange-golden color, and the shades in the photos are bright and saturated. The shadows in this lighting are long and soft, they fall more beautifully than during the midday hours (Fig. 6).

This type of lighting allows you to create portraits that look bright, warm, and three-dimensional. Sometimes it can be difficult to measure exposure due to possible overexposure. Thus, when shooting in natural light, it is important to remember that the direction of light depends on the position of the sun.

Fig. 6. An example of a portrait using light at dawn

Diffuse light. Stray light often creates "flat lighting," which can be unattractive for a shot because it muffles glare and creates indistinct shadows. If you place the light source behind your back, you can get a very brightly lit subject. It is important to choose the right shooting angle relative to the light source. By experimenting with changing the angle between the subject and the light source during shooting, you can achieve desired results. Ideal natural light is achieved when it is positioned behind the subject at a certain angle, creating a striking effect on the image. In most cases, this requires the use of reflectors or light reflectors.

Transillumination. This lighting method can also be effective. In this case, light passes through translucent objects, creating a unique effect *(Karmazina, 2020)*. This is especially effective with portraits such as those surrounded by blond hair or leaves that become almost transparent when exposed to light (Fig. 7).

Fig. 7. An example of a portrait using transillumination

Window light is a light source that can transmit a significant amount of light that can be easily controlled. Using such lighting helps to achieve the right balance between light and dark areas in a photo.

When taking photos, it is important to maximize the use of natural light. Many professional photographers use artificial light sources even when shooting outdoors. This emphasizes the fact that lighting is one of the key elements in photography. For portrait photography, it is recommended to choose the brightest places, but it is important to remember that the light should be soft and diffused. Another important aspect is to avoid taking portraits outside at

noon. The southern sun standing high in the sky, especially in a city with little greenery and shade, can create too much contrast. Such lighting with its rough light and shadow pattern can easily ruin the image of even the most beautiful model. If you have the opportunity to work with a model outdoors in the early morning or late afternoon, you should definitely take advantage of it. During such time of the day, the lighting becomes especially soft and inviting, creating a charming chiaroscuro pattern on the face. It is not for nothing that the hours of sunrise and sunset are called the "golden hour" in photography *(Kotliar, and Zaspa, 2021)*.

When taking a portrait indoors, such as in a room, place the model as close to a natural light source as possible, such as a window. You can also use additional lighting from artificial sources. However, much depends on the budget and availability of lighting equipment. Do not forget about weather protection. When shooting outdoors, there is always a risk of unexpected weather changes, such as sudden rain. You should consider shelter, such as cafes, shops, bridges, or underpasses. However, in nature, bad weather can sometimes become not an obstacle but an auxiliary element in creating a unique portrait, where rain is one of the key elements. Much depends on the photographer's creativity and imagination.

4. Features of artificial lighting when shooting a portrait

The light source that forms the main light and shadow pattern on the face of the person being photographed is called the "drawing" light source. It is always located in the anterior hemisphere relative to the face, meaning that the person can see it without turning their head. The main property of the light from this source is the way it distributes light and shadow areas on the face.

Of course, even if several lighting devices are used in portrait photography, there is always only one "drawing" light source. Its use significantly changes the nature of the lighting, and turning on or off other light sources with the active "drawing" source does not affect the overall nature of the lighting *(Vershovs'kyj, 2010)*.

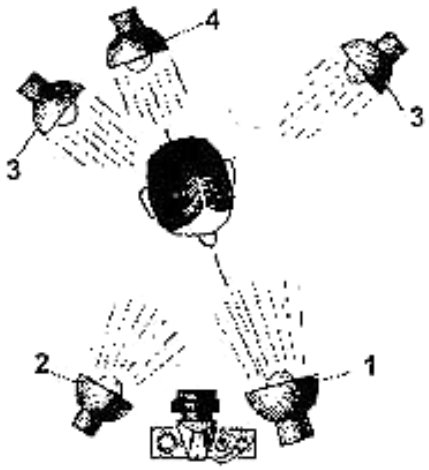

Fig. 8. Specific technical features of artificial lighting during portrait shooting (1 – drawing light, 2 – filling light, 3 – modeling light, 4 – backlight) (Zhang, 2018)

Lighting from the front and side and slightly from above is considered the most familiar to our perception, and also best emphasizes the three-dimensional shape of the face. Therefore, the "drawing" light source is usually located at or above the face of the portrait subject, in front of it along the line of symmetry or within 60 to 70 degrees to the right or left of this line. It is this placement of the light source that provides the effect of front, top, and side lighting.

Even within the above parameters, there are many options for placing lighting fixtures in space. The positioning of this lighting device in the horizontal plane depends on the shape and volume of the face. The more the nose protrudes and the deeper the eyes are located, the closer to the line of symmetry of the face the drawing light source should be located. Of course, a lot depends on the angle: the most noticeable relationship between the shape of the face and the position of the light source is observed in full-face photography, and the least in profile photography (Zhang, et al. 2021).

Despite the creative nature of the process of creating a light and shadow pattern on the face, there are proven techniques for the optimal location of the drawing light source. For example, if the illuminator is located along the line of symmetry of the face, its height is determined by the length of the shadow under the nose – it should not exceed half the distance from the nose to the upper lip, as well as by the illumination of the eye sockets – it is desirable that the upper eyelids are illuminated. When the light source is positioned anteriorly and laterally, its height and position are usually adjusted so that the shadow from the nose crosses the cheek that is further away from the light source, leaving a light spot on its upper part. Portraits where the nose shadow crosses the lip line and the eyes are in shadow do not look very aesthetically pleasing. However, this distribution of chiaroscuro can be used to achieve certain artistic effects *(Ozimek, Lainas, Bierhoff, et al., 2023)*.

When taking portraits, relative position of the camera and the main light source is important. If they are located on the same side of the symmetry line of the photographed person's head, the part of the face looking at the camera will be more illuminated. In this case, as with all types of front lighting, the volume and shape of the face in the photo may appear less defined and flattened. If the camera and the main light source are on opposite sides of the head symmetry line, the part of the face facing the camera will be in shadow, and the three-dimensional shape of the face will be better reproduced in the photo.

Thus, we conclude that one needs at least one lighting device – a source of background lighting – when taking portrait photos. This device can be of any type, depending on the creative task facing the photographer. Illumination of the background compared to the illumination of the face can vary widely. For example, to get a completely white background without details, its illumination should be 0.5 to 1.5 stops higher than the illumination of the lightest part of the face. If the background illumination is 2 stops higher than the face illumination, the face may blend into the background. On the contrary, if the background illumination is 1-2 stops lower than the face illumination, the white background in the image will look gray *(Khynevych, Sklyarenko, Slityuk, 2022)*.

Using only a pure white or completely black background in portraiture is only one way to organize the background. Often, uneven lighting of a light background helps to better highlight the human figure against this background. For example, if the more illuminated side of a portrait face is more visible, it is desirable to project it onto the less illuminated part of the background. This not only creates a greater volume of the image, but also forms a rhythmic pattern of alternating light and dark areas.

A detailed light and shadow pattern of the background is usually undesirable, as it can distract attention from the main object of the image – the face of the portrait subject. In addition, light or dark areas of the background can create unexpected and strange patterns, merging with

the image of a person. Therefore, considerable attention should be paid to the organization of the background during portrait photography. It is worth remembering that a dark object against a light background is visually perceived as smaller than it actually is, and vice versa, a light object against a dark background appears larger *(Andhika Putra Herwanto, 2020)*. For example, a person wearing light clothes against a dark background will look larger and more massive. Likewise, a face with large, expressive features looks better against a dark, neutral background, giving a calmer impression.

When photographing delicate female faces, especially those of blondes, it is advantageous to use a light background. In such cases, the overall tone of the picture, as well as the lighting and color of the clothes, should be light, without deep dark shades and shadows. Light and bright lighting is best. When setting up lighting devices, it is important that the light covers all parts of the face and figure as much as possible, while being as diffused as possible. Therefore, in such shooting conditions, you should either bring the main light source as close as possible to the camera lens, intensively highlighting the resulting shadows with diffused supplementary light, or use screens or umbrellas as illuminators that effectively diffuse light and are proportional to the distance from them to the model.

In order to get interesting effects, try placing the light source behind the model or behind an object in the frame (for example, behind a tree leaf), minimize the background, and adjust the exposure to match the illumination of the model's face. Play with angles to affect the distribution of glare in the frame. Although sometimes glare can be an undesirable side effect, reducing the contrast of the image, as in the case of backlighting. Thus, we can conclude that natural light is better at conveying a certain mood, so it is important to be able to use all its capabilities and adjust the time and style of shooting depending on the original idea and the tasks at hand.

5. Conclusions

Summarizing research, we can highlight the main aspects and features of shooting under artificial light. Important factors are the distance between the object and the light source and the directionality of the light. Changing the distance between the light source and the subject directly affects the level of illumination, changing in proportion to the square of the distance. It is also important to understand how the size of the light source affects the nature of the lighting – soft light is achieved when the size of the light source is approximately equal to the distance to the subject.

It is also important to be careful when organizing background for portraiture. Using only a white or black background is only one option. Uneven lighting of a light background can emphasize the model's figure, and using different levels of background illumination can achieve different visual effects. When shooting with artificial light, special attention should be paid to the "drawing" light source, which forms the main light and shadow pattern on the face. Its location and height should be carefully considered to achieve the desired result.

The peculiarities of portrait photography are to take into account specifics of the subject, such as delicate female faces or blondes, and to use a light background to achieve a light tone of the image. The conclusion of the study emphasizes the importance of the photographer's ability to adapt to different lighting conditions and use a variety of light sources to achieve a spectacular result in portrait photography. It is important to take into account not only the technical aspects of lighting, but also the aesthetic side of shooting, when focusing on specific tasks and ideas.

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