Psychological Reactions to Post-Processing in Photography

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Abstract

A photograph can have a profound impact on a wide range of emotions for the person viewing it. Using Suler’s *Qualitative Research Methodology for Photographic Psychology – QRM-PP* (Suler, 2013), the present study researched the psychological reactions to edited changes within a photo using post-processing techniques. Ten participants volunteered to take part in a photo interview in which they observed a photo along with 20 variations of that photo. Post-processing effects included changes in color, tonal changes, changes in texture, sharpness and blur, distortions, and cropping. The participants’ emotional response, interpretation, and subjective associations to the photos were observed and recorded. Results indicated broad differences in the psychological reactions to these photos based on variations in the perceived meanings and subjective associations to the photos, as well as common trends within many photos for several participants, including emotional reactions to color manipulation.
For years photography has served many purposes and has been the instrument for various tasks. A photograph can preserve a memory, tell a story, store information; it has become an art form of expression and communication. What once had to be put on canvas can now be captured with the press of a button thanks to the development of technology. This technology continues to grow, with the advent of digital photography opening the door to new and innovative techniques and contributions from participants ranging from skilled professionals to eager amateurs. With the use of computer software such as Photoshop, image editing – also known as “post-processing” - has now been simplified so that virtually anyone can touch-up and change the appearance of their photos without access to the advanced photography equipment and resources that were needed less than 20 years ago.

With this simplified access to image editing, people are now finding it possible to take ordinary photographs of varying subject matter and transform them into something that completely changes the way they view that photo. Research suggests that our perception of a picture is influenced by a variety of subtle factors, such as its composition, range of tones, colors, and the empty space seen in the photo (Frida, 2001). If visual perception is so heavily impacted by the many intricate and sometimes hidden details found in a photograph, it follows then that the altering of a picture through image editing would create a change in the reaction one has of that picture. For example, by adding a blur effect to a photo, or giving an object a glow, one could regulate which part of the picture people focus on.

It is evident that pictures are capable of eliciting emotional reactions, ranging from pleasant to unpleasant feelings, all dependent upon the image being seen and how this visual perception stimulates one’s affect (Lang, Bradley, & Cuthbert, 1997). Using image editing to add effects to pictures could also bring about emotions that perhaps the original photo could not.

A
color picture of a certain location could be turned into a grayscale image and evoke a feeling of nostalgia for something in our past, as black and white photos are typically associated with older generations and times before color photography existed. On the same token, an old black and white picture could be given color to alter the perceived meaning or feelings associated with that photo, differing from ones gotten by viewing the original photo. There are a variety of image editing techniques that can either drastically or subtly change the way one perceives a photo, and as a result change the emotional reaction one has when viewing the photo.

Using Suler’s (2013) *Qualitative Research Methodology for Photographic Psychology* (QRM-PP), the purpose of this project was to examine the ways in which image editing impacts visual perception of a photograph and how this brings about or changes different psychological reactions to the picture. My research focused on the following questions:

- What are the basic types of edited changes that can be made in a photograph?
- What types of edited changes in a photograph do people tend to notice?
- What types of edited changes do people tend not to notice?
- How do different types of changes in a photograph affect a person’s psychological reaction to the photo, including changes in one’s emotional response, interpretation of the photo, and subjective associations to the photo?
- How does the type of photograph (portraits, landscapes, nature, macro, etc.) affect people’s reactions to edited changes?
- How do these effects differ when the image editing is subtle versus obvious?
- What are the individual differences in how people react to edited changes in a photo?
Online Field Research

Field research was conducted primarily using the online photo-sharing community Flickr. On this website users are able to upload and share pictures of all kinds to be viewed by other members as well as guests. These photos can be commented on and discussed, with many different groups within the community being devoted to such discussions about specific or general concepts and types of pictures. For the purpose of this study, such groups that were observed were ones dedicated to the post-processing of photographs, as well as photos by individuals that demonstrated post-processing. This environment was observed each day for a month to view the new photos individuals had uploaded and the discussions that stemmed from them. In observing these different groups that were for post-processed images and people dedicated to photo editing, particular attention was put on the types of photos being uploaded and which post-processing effects were added to them.

Conversations about these photos typically revolved around the choice of post-processing effect in relation to the specific photo that was manipulated. Oftentimes encouragement was given for the photographer’s decision to edit a photo a certain way or for creating a feeling for the observer that impacted them deeply. In some cases there was criticism or disagreement for the way a photo was post-processed, and in a few heated discussions, the integrity of post-processing itself and its impact on photography and art was brought into question.

Creating Images using Post-Processing Techniques

When creating images, photos were primarily taken from my own personal collection in order to avoid manipulating pictures without the author’s permission. Pictures taken from the internet were used however while experimenting with different processing techniques. Photos were chosen based on the perceived variability in which they could be manipulated. For
example, pictures of landscapes were used when applying color manipulation in order to give an “alien” feel to the photo. When experimenting with different methods of cropping, pictures involving people were used to alter the meaning of the photo. Other photos had textures and effects added to them, along with brightness, saturation, and contrast manipulation. During the process I examined my own thoughts, feelings, and memories when processing the photos from my collection. For example, when editing a photo of a Christmas tree, the manipulation of the light and shadows had an effect on my own feelings and memories of Christmas, such as increasing the warmth and glow of it in order to create a more joyous feeling, or adding a grayscale effect to provoke a more nostalgic tone. This helped in determining which effects would best suit which type of photo in order to evoke the strongest reaction or particular feeling when viewing the photo.

**Creating the Photo Interview Set**

In creating the interview set, a single photo was used in order to keep the subject matter at a constant throughout the interview. This photo depicts a beach scene with a girl lying on the sand with a hat covering her face, and a woman standing by the water looking out at the ocean. Two small, barren trees are also present in the scene, and the weather is sunny with clear skies. When choosing the photo, it was required that it meet the criteria of having a variety of color, multiple things which could be cropped out of it, and possessing some complexity and detail. This allowed for a greater range of effects and manipulations to be added to the photo. Along with the original photo, twenty variations of the photo were included, each with a different post-processing effect. The effects used and their descriptions are as follows:

- **Red Monotone**: a hue adjustment that changed the color of the photo to red
- **Blue Monotone**: a hue adjustment that changed the color of the photo to blue
- **Green Monotone**: a hue adjustment that changed the color of the photo green
- **High Contrast**: increased contrast to the highest level to make lighter colors much brighter and darker colors much more so
- **High Color Saturation**: increased saturation to the highest level to make colors of the photo much more vibrant and deep
- **Alien Color**: randomized the frequency and intensity of the red, blue, and green colors of the photo to create a rainbow-like spectrum of colors throughout the image
- **Sepia**: a sepia effect to change the color of the photo to a brown/yellow tone
- **Black & White**: desaturated the photo to produce a grayscale image
- **Low Key**: adjusted the color curve of the black & white photo to create a much darker grayscale image
- **High Key**: adjusted the color curve of the black & white photo to create a much brighter grayscale image
- **Higher Key**: adjusted the color curve of the black & white photo even higher to create a very bright, washed out grayscale image
- **Enhanced Sharpness**: increased the sharpness of the photo
- **Blurry**: distorted the photo using a blur effect to make the image appear blurred and fuzzy
- **Texture**: added a cloth-like texture to the photo
- **Girl Crop**: a crop of the photo to include only a rectangular image of the girl lying on the sand
- **Woman Crop**: a crop of the photo to include only a rectangular image of the woman, the trees, and the ocean
- **Trees Crop**: a crop of the photo to include the girl, the woman, the trees, and a smaller portion of the sand, water, and sky
- **Tight Crop**: a crop of the photo to include only an image of the girl and the women, and a minimal view of the sand, water, and sky

- **Scope**: a zoomed in view of just the woman looking out at the water, surrounded by a round black vignette to give the appearance of looking at her through a scope

- **Whirl**: used a filter that distorts the photo by creating a whirl at the center which pulls the rest of the photo into a spiral

**Conducting the Photo Interviews**

For the interviews 10 subjects volunteered to participate, 6 females and 4 males ranging from ages 20 to 60. Education status includes high school graduates and college graduates, ranging from bachelor to doctorate degrees. Occupation and lifestyle status includes parents, homemakers, chemists, receptionists, college professors, and current college students. None of the participants had any advanced or professional experience with photography or post-processing.

Each participant was given an informed consent and explained to them the basic process of the interview as well as the purpose of the study. Information for each interview was recorded using written notes as well an iPhone voice memo for audio recording.

1. **Silent Viewing**: In this stage the participant was shown a slide show of the images, with the original photo appearing first and the variations appearing in a randomized order after. Each image was shown for 5 seconds with a fade transition. Participants were told what they would be viewing and instructed to simply focus their attention on the slide show.

2. **Free Association**: Participants were first shown the original photo and asked to respond to the following:

   - Describe to me what you see
- What feelings does this photo create for you?
- What idea or story is the photo expressing?

After recording their response they were then informed that they would again be viewing the different variations of the photo. Participants spent a few minutes silently viewing the post-processed photo and then were asked how the visual effect:

- Is different from the original and the other variations
- Changes your reaction to the photo
- Changes the feeling of the photo
- Changes the ideas or story the photo is expressing

This was done for each of the 20 variations. For the first 3 photos participants were also asked if anything else came to mind, and to spend more time viewing the photo if they needed.

3. **Spontaneous Recall:** This stage consisted of both verbal and visual recall techniques. For verbal recall, subjects were asked of the pictures they had just viewed which one or two stood out in their mind the most, and why. When they had given their response they were then instructed to close their eyes and imagine the photo in their mind. They were then asked to describe what they saw, thought, and felt while imagining the picture.

4. **Unstructured Inquiry:** In this stage participants viewed each photo again in the same order as they had previously. While viewing the photo, a summary of what they said during the free association stage was read to them. They were then encouraged to elaborate or speak more of specific things which they had stated. I also relayed to them my own thoughts, feelings, and interpretations of each picture in order to encourage them and stimulate dialogue. A conversation was able to open up about each photo and ideas and feelings were able to surface or be recalled that were not mentioned previously by the participant.
5. Overview: In this stage, all of the images were displayed together, side by side in the same order in which they were viewed. Subjects were asked for their reactions and thoughts about seeing the images displayed together. Once they had completed their response, they were thanked for participating and asked if they had any

Types of post-processing techniques

With the rapid expansion of technology comes a plethora of unique and creative ways that a simple photo can be manipulated beyond recognition, or be delicately touched up to improve its quality or features. Not all post-processing was always done using a computer, however. Editing of photographs can be traced back to before digital and virtual technologies were even available. Line, form, color, and texture have all been manipulated using various methods while working with photograph film and negatives. Exposing a negative to sunlight or microwaves would alter the image radically, removing subject matter and replacing it with an abstract image. Infrared light could also be used to make certain colors appear lighter and others appear darker. It can also completely remove or inject a certain color. Even in the early 20\textsuperscript{th} century individuals combined photographs, creating composite images which gave new meaning to what the photo was expressing (Elliot, n.d.). Today, a composite image can easily be created by combining two or more photos in an image editing program and adjusting the transparency and layering of the photos.

In his book Photographic Psychology: Image and Psyche, Suler (2013) also discusses at length the various effects that can be post-processed in an image. These techniques can be classified according to the following basic categories:

Sharpening: Sharpening is an effect that is very heavily focused upon in current photography. Every day camera technology is being improved to increase image quality, with
larger and larger numbers depicting enhanced resolution, pixels, zoom, and so on. The push for “high definition” has now become the norm when viewing images and videos. But the detail a camera might not be able to capture can certainly be brought out when editing an image digitally. By increasing the sharpness of a photo, the image’s details and qualities are being brought out that may have otherwise gone unnoticed.

*Blur:* The same concept could also go in the opposite direction using post-processing. Instead of sharpening an image, one may give it a softer, blurred effect which does not enhance different aspects of an image but instead clouds the image slightly in order to allow the eye to do less work, not having to absorb the increased amounts of detail. The blur effect has even more uses, which can be identified by the term “bokeh”. When using bokeh, a blur effect is added to the photo in a certain way that brings attention to a particular part of an image, or removes the focus from another part. Using bokeh can greatly enhance the part of the photo which is being focused on (Suler, 2013a).

*Color changes:* As mentioned above, color is an extremely integral part of an image, and the amount of manipulation that can be done to it with image editing software is as vast as the color spectrum itself. Dr. Richard Zakia goes into detail in his book *Perception and Imaging* about the three dimensions or attributes of color: hue, saturation, and brightness (Zakia, 2007). By adjusting just one of those attributes, the color of an image can be drastically changed. When one begins to adjust any combination of the three at various levels, the scope to which an image’s color can be manipulated becomes exponential. With precise selection and layering, specific colors in an image can be altered while others remain the same. Every shade and tone of color can be changed in a way unique to that color or section that is being edited. Out of this comes a truly infinite number of ways in which an image’s color can be presented.
Color can not only be manipulated in a photo, but drained as well. The classic grayscale photo, or black and white, was all that was available before technology for color photography was invented. But even with the dominant color images in art and media today, a specialty is still dedicated to the removing of this color and creating the iconic black and white photos that people admire. Any photo can easily be desaturated using post-processing and have its color removed, creating a grayscale or black and white photo. To take this kind of photo even farther, there is an effect in photography known as chiaroscuro. Such an image is typically, but not always, in black and white, however heavy emphasis is put on the light and dark aspects of the photo. In post-processing this effect is achieved by observation of the image’s histogram and manipulation of the levels and curves of its shadows and tones (Suler, 2013b).

*Tonal Changes:* Along with color manipulation, the tones of a photo can also be changed to create variations in an image’s light and dark qualities. A photo can be made high key, which has a very bright look to it because of the increase in light and removal of much of the darker tones of an image. In the opposite direction is the low key photo, which has much of its light toned down to create a very dark image that relies on a shadow effect. The contrast of a photo can also be manipulated to create high and low contrast photos. The high contrast photo is one where the distinction between the light and dark parts of the photo is greatly enhanced, whereas in a low contrast photo, the distinction is gone and instead possesses a grayish effect all across the image.

*Cropping:* The shape of a photo or of the images in the photo is another aspect that sees a lot of manipulation in post-processing. While you are able to frame a shot while you are taking it, in many cases the photo can be framed and cropped just by using an image editing program (Suler, 2013c). Cropping the photo can change the shape or parameters of the photo, or it can cut
out certain parts of the image to ultimately change the point of what the photo is expressing. Another way of changing the shape of a photo and its effects on the viewer is through a process called vignetting. In this post-processing technique there is “a reduction of an image's clarity at the periphery compared to the center of the image” (Suler, 2013j).

**Distortions:** The distorting of a photo was mentioned above when photographers would purposely expose the negatives to harmful chemicals or electromagnetic waves like sunlight or radio waves. By doing this photographers could alter the photo by destroying and deleting its content and giving it an abstract appearance. The same is easily done with image editing software, such as was done to the “whirl” photo using an effect which caused the photo to spiral and distort the image being presented. Really any effect that impairs the clarity of what is being viewed can be considered a distortion. Some effects can add to that experience while others distort it, like with the whirl effect. In Flickr, distortion was popular when editing photos in order to achieve an abstract look, such as an added texture or light and shadow manipulation. Artificial effects like glowing phenomenon or auras were also common in order to give the photo a mystical feeling.

**Changing Texture:** Texture has always been a staple part of not just photography but of art in general. Every image has to be put onto something, whether it’s a computer screen, a piece of paper, a canvas, or a side of a building. Part of what makes a piece of art unique is the texture in which it is presented. Even in a photo, the image has a texture quality to it, whether it’s just a wall in the background or the focus of the photo. Everything has a texture, and so a photograph will convey that texture along with the image being presented. Textures can be added to a photo using image editing programs, either using textures found online or in nature, such as ones found in walls or fabrics. Almost every surface has a texture that can be transferred to an image either
naturally by incorporating it into the frame of your shot while taking the photo, or through post-processing (Suler, 2013i).

**Edited changes that people notice**

When talking about post-processing and edited changes within a picture it is important to take note of which changes work in a more noticeable and overt manner in order to make sure that the manipulation can be distinguished. Such recognition may not always be the desire of photographer but it is hard to deny that there are some post-processing techniques which are more frequently noticed than others. When a person views a photo they are focusing their attention on that image. The attention that is given to a photo often depends on the emotional cues being presented within the image being viewed, which in turn activates various responses from the individual. Much of this attention and response is evolutionary, displayed by all animals as they react to scenes in the wild which activate instinctual responses such as fear, aggression, and sexual desire, based on the sensory information that their attention is being focused on (Lang, Bradley, & Cuthbert, 1997).

The third stage of the photo interviews helps to shed light on which images were more distinct than others, and perhaps portrays an accurate description of what effects people tend to notice more. In this stage participants were asked to name one or two photos that stood out in their mind the most. Half of the ten participants listed the “alien color” photo as one that stood out to them the most, with one participant listing the “green monotone” photo as standing out. By this information it is shown that a photo in which the color was drastically altered is remembered for having cued an emotional response strong enough within the observer to be brought up during spontaneous recall. Another popular response for spontaneous recall was the “higher key” and “low key” photos, both receiving mentions by two participants each. A detailed description
of the emotional responses and interpretations of each post-processing effect will be expanded upon in later sections of the paper.

These two effects also contain one of the dimensions of color, brightness, which perhaps suggests shadows and lighting to be a strong cue for attention and emotional response. The “whirl” photo was also listed during spontaneous recall by three of the participants. This is arguably the most distorted of all the photos, which possibly shows how extreme distortion can be a top motivator for heightened focus and emotions. More spontaneous recalls include the “scope”, “woman crop”, and “girl crop” photos, all being recalled by one participant each. These three photos all limit and change the view of the photo and what the observer is looking at, which could be related to a perceived alteration of the meaning of the photo compared to the original. These altered meanings resonated with the participants who recalled these crops, such as one participant who pointed out that the crop of the woman represented to her “thinking about the past, and the reflections of aging”. By cropping the photo to only show one person instead of them together, the photo no longer represented two separate individuals but instead, for this participant, a view of the same person at different points in her life. The cropped photos also stood out during the final stage of the interview when all of the photos were viewed side by side. The obvious removal of certain parts of the image was noticeable when compared to other photos that retained their integrity.

**Edited changes that people don’t notice**

During the photo interviews, the first question asked in the free association stage when looking at the variations was to describe how the photo was different from the original and other variations. Examining the responses to these questions is very helpful in determining which edited changes people may not tend to notice when looking at a photo. The photo that most
commonly elicited no discernable difference in appearance was the “enhanced sharpness” photo, with six participants reporting no change when viewing it. This response helps to show that sharpness, while dependent on the image being sharpened, is also very reliant on the level of which it is enhanced. The increase for this photo was not extreme, and if it was it may have elicited stronger responses, however it was enhanced to a realistic level like seen in high definition quality images mentioned previously. This could also suggest that the perceivable difference between a sharpened image and an unsharpened one is very subjective and dependent on many factors such as quality of eyesight and previous exposure to sharpened images.

Although the sharpened images may not have been noticed consciously, it is possible that the change was noticed unconsciously. Two of the participants who did not report an observable difference in the photo did report a change in feeling that was different than what they had felt when viewing the original. One noted that the photo gave off a “colder, windy feeling”, while the other described the photo as seeming “Spring-like”. Neither of these descriptions were given when asked about the original, however, consciously the image appeared to be the same as the original. This suggests an effect’s impact on subliminal perception, or what we notice unconsciously, and our emotional reaction to that unconscious change.

When observing the many groups and photos posted on Flickr, it appeared that in many instances a self-portrait was uploaded with various effects that either enhanced or focused attention onto a specific aspect of the photo, usually in an appealing way. Typically these photos were given effects that would enhance the beauty or appeal of the person. This is something that is seen all throughout popular culture such as in television, movies, and magazines, particularly when displaying a woman figure. Technology is used to airbrush and edit the features of a person, giving them a more appealing skin tone, body weight, and clearer skin. The means to do
so are easily accessible with image editing programs, so it is not surprising that in online photo sharing communities, even amateurs can upload pictures of themselves with similar quality using these same techniques.

One such technique, called texture synthesis, was studied at Stanford University by Homan Igehy and Lucas Pereira (1997). The process involves taking a sample of an adjacent image, such as a grassy field, and synthesizing that sample on a different section of the image, such as where a grazing animal is. By doing this, the animal is no longer in the image and the photo appears to have always been just a picture of a grassy field. The tool to do this in modern editing programs is typically called cloning, and it allows for the same technique to be done to any photo. Much like cropping, it can drastically alter the meaning of a photo, however the effects are incredibly subtle and practically impossible to detect if done professionally. This can be applied to almost any photo, such as a landscape image to remove an unwanted object, or on a portrait to create clearer skin and flawless body physique. This kind of change was not a post-processing technique that was focused on in this study.

**Psychological reactions to edited changes**

**Sharpening and blurring**

It has been pointed out that the many kinds of post-processing techniques each comes with its own distinct effect on one’s emotional response, interpretation of the photo, and/or subjective associations to the photo. Now it is important to explore the psychological reactions that people have to the various forms of edited changes. It has been mentioned briefly that sharpness in a photo had created for one participant a “colder” and “windy” feeling, and another mentioned “Spring-like”, perhaps unconsciously noting the enhanced detail, particularly in the
tree branches and the sand. One participant who did notice the change in sharpness described the photo as “brighter” and that the “trees look more alive”. In examining my own thoughts about the sharpness, the indentations in the sand seemed to become much more focused, imparting a sort of grainy texture to the photo. The push in technology for clearer and sharper pictures and videos suggests this desire for purer imagery. Suler (2013f) points out the popular uses of the word “sharp” that reinforces this notion that it is an admired quality, such as when someone is told they have a sharp mind or eye, or is a sharp dresser. An image also be too sharpened, to the point that it creates an aggressive or penetrating feeling, relatable to other meanings we attach to the word “sharp”, such as a sharp wit, tongue, or remark.

Blur can also create ambiguity, which was the effect taken on by the blur used in the photo interview. Seven of the participants pointed out a confusing “uncertainty” when looking at the blurry photo. One participant noted that the ambiguity made the photo “less about the people” and instead focused on the colors of the photo. Three of the participants reported a distressed feeling from the photo and their inability to clearly see it, saying it is “unsettling”, “nauseating”, and “not fun to look at”. These assessments are interesting when thinking of the possible effects of ambiguity and uncertainty, reinforcing those instinctive “fears of the unknown”.

Although bokeh manipulation was not used in the interview set, it is related to the blur effects which were used in the photo interviews. The technique of bokeh is often used in conjunction with enhanced clarity to compliment the aesthetic qualities of a clear and crisp image. Bokeh works in many different ways to effect one’s psychological response to a photo, often depending on the details of the bokeh used. The bokeh itself can also give off a feeling or sensation that can either support or contradict the tone of the subject of the photo. For example, a
bright bokeh can create a feeling of sunlight or fire, which would complement a photo of the outdoors. Bokeh can also be either subtle or distracting, both accompanied by a different feeling. A soft, unobtrusive blur can feel soothing or pleasing. On the other hand, a loud bokeh can prevent their from being focus on just one aspect of the image and instead cause a busier image that forces the eye to constantly shift around and take in the various parts of the photo. Using bokeh is also very effective at creating a sense of movement. The direction of the blur can make an image look like it is coming toward the viewer, or moving away (Suler, 2013a). A photo with images that appear to be moving can create a very different interpretation than one standing still.

**Color changes**

Moving on to color, it is important to study the different effects that various colors can have on a person’s emotional state, and such research is well documented. Jamie Hyodo (2011) researched the effects of color on mood and experimented with color manipulation, specifically the effects of cool colors like blue versus the effects of warm colors such as red. Hyodo found evidence to support the hypothesis that cool colors were more pleasing than warm colors like and that warm colors were more arousing than cool colors. However, it is noted that the color blue itself was not found to be more pleasing than red specifically, and that such effects may depend on the associations of individual colors rather than the general categories of warm and cool colors. Suler (2013g) talks about color in relation to self-actualization, or the drive to reach one’s potential, and how vivid colors can depict the emotions that self-actualizing people have, such as excitement and joy for living.

In other research, Zakia (2007) discusses the interpreted meanings that are associated with various colors:
Black: Glossy black suggests formal wear and class, whereas dull black suggests mourning and death.

Blue: Propriety, truth, masculinity, business-like, timeless, inner peace.

Brown: Earth, security, comfort.

Gold: Wealth, generosity, expensive, upper class.

Green: Environment, health, self-esteem, fertility.

Yellow: Happiness, success, intellect, sunlight, warmth.

Orange: Assertiveness, endurance, pride.

Red: Passion, vitality, creativity, warmth.

Silver: Intuition, dreams.

White: Purity, honesty, cleanliness.

In the photo interview there were several photos with a different color manipulation, and the emotional response to each one varied. Four participants said about the “red monotone” photo that it was “not relaxing”, while two participants both pointed out the feeling of “heat” and the photo seeming to be of a different world. The description of “anger” was also used by two participants. In many interpretations of the color red it seems to suggest that there is anger or passion, an intensity that brings out phrases like “red hot”, but it is interesting to observe this color when placed in a photo such as this. Seven participants described the original photo as being “peaceful” or “relaxing”, but when viewed with a red monotone, this relaxation gets replaced with aroused feelings that are not as calm as the colors in the original photo.

For the “blue monotone” photo, three participants noted feelings such as “calm”, while the description of “cool”, “cold”, or “icy” was mentioned by four participants. Three participants also reported a perceived change in the time of day when looking at the blue monotone. These
descriptions seem to support the evidence for blue being a cool color and bringing about feelings of inner peace and calmness. When looking at the “green monotone” photo, there was a reoccurring theme of descriptions such as “polluted”, “poisonous”, and “sick” by five of the participants. One participant called the photo “cheerful”, while another pointed out that the green made it appear to them as though the photo was being “taken in night vision”. The relation of green and health is interesting, and by the reactions would appear to be in a negative manner. The interpretation of night vision is also a unique perception made that brought attention to the photographer and the possibility of “spying” on the subjects of the photo.

**High Contrast**

When observing the “high contrast” photo, participants were quick to point out the increase in brightness in the lighter parts of the photo and the opposite for the darker parts. Two participants mentioned a split between night and day and light and dark that occurs in the photo. The right side displays whiteness in the sky and water while the left shows a shift into a deep blue from the enhanced contrast. One participant noted that this contrast between light and dark brought out a “separation between old and young”, referring to the two people in the photo. Two participants felt the photo was “unpleasant” and “disturbing”, while another associated the increased light with the sun and from that got a sense of “warmth” and “happiness”. To go in the opposite direction, a low contrast photo could have been used, but one was not included in the interview set.

**High Color Saturation**

The “high color saturation” photo in my view was a very complimentary and appealing effect because of the already bright colors of the original photo, which the increased saturation helped to liven and enhance the tropical feeling of the photo. Four participants also noted the increased
brightness, describing it as “exotic” and the “most natural color”, however, three of the participants did not report any noticeable change in perception or feeling of the photo. Two participants reported that the increased saturation created a “happier” and “cheerier” feeling, with many echoing their thoughts on the original picture as relaxing and calming.

**Alien Color**

The “alien color” photo was the most commonly reported picture during spontaneous recall, with seven of the participants giving very similar responses such as “psychedelic”, “60’s/70’s”, “tie dye”, “far out”, and “acid trip”. Most of these descriptions referred back to another time period, mentioning bands like Pink Floyd, posters from the 60’s or 70’s, and was particularly powerful for the participants who recalled living back during those times. Such participants thought of the photo fondly as “pleasant”. Two participants found the photo to be “unpleasant” and “not calming”, while another thought it was “artsy and creative”. Suler (2013h) discusses surreal photography in relation to intensified and unusual color, describing the ability of these unnatural colors and hues to create a reality not based on objectivity and rules but instead on the subjectivity in which we each personally view the world.

The “black & white” photo and the “sepia” photo shared many similar but varied reactions by the participants. Two participants pointed out a feeling of the past while viewing the black and white, using words like “vintage” and “from a newspaper”. While viewing the sepia effect, six participants gave related responses, giving descriptions such as “vintage”, “antique”, and “nostalgic”. Both photos also received a response about an “impending storm”, each from a different participant, as well as a feeling of “death”. Participants also described the black and white effect as “dreary” and “drained of color”. It is interesting to see the similarities between the two photos in terms of being items from the past or representing something from history, but the
distinct feelings that the sepia versus black and white produces. The black and white effect is a very popular choice on Flickr as well, with many comments describing the “authenticity” and even “somber” feeling of the photo.

High and Low Key

The manipulation of tones by creating high key and low key effects is very powerful in altering the mood of a photo and subsequently the mood of the person viewing the image. This change can turn a regular picture of a beach that might give off feelings of relaxation and peacefulness, as the original photo did, into one that “conveys a more surreal feeling of drama, mystery, and power in the play of light and dark” (Suler, 2013b). In the photo interviews, participants looked at three different photos that had undergone this effect. Seven of the participants, when viewing the “low key” photo, described the scene as “night”, noting the darker image and the impression of it being late at night, with the moon off to the side providing what light there is. For one participant, this perception of night created a calm feeling because of positive attitudes and experiences they associated with being on the beach at night. Three participants reported negative emotion such as “panic”, “concern”, and “ominous”, while three other participants described the image as being the “end of the day” and feeling “exhausted” and “tired”.

The “high key” photo went in the opposite direction as the “low key” photo and introduced a brighter version of the black and white effect which received some interesting comments. One participant equated the increased brightness with the sun, which produced a sense of happiness for them. Three participants thought of it as “quiet” and “dreary”. Three other participants described the photo as having “no warmth” and being “stark” and uninviting. One of these descriptions noted that the effect created the illusion that the sea was not actually water,
and instead was an extension of the sand. This made it appear as if it was a desert, and feelings of “loneliness and isolation” came out of this interpretation.

By increasing the brightness and light of the image even further, the “higher key” photo was created. This photo created a wide range of interpretations and emotions. Participants described the photo using words like “dead”, “foggy”, and “washed out”, while reporting feelings such as “ambiguous” and “blasé”. One participant took the visual description of being bright and very light to get to the impression of the photo representing “enlightenment” or that “aha moment”. Another participant saw the photo as a charcoal drawing, which resonated within him because of his passion for drawing when he was a child. Another interesting description by a participant is that the lightness of the photo makes it appear as if it is a dream. When giving my own impression of the photo, I pointed out how it made me think of the flash of white light right as a nuclear weapon explodes. This can create a sense of horror or fear, but there is also a sense of beauty in the capturing of such a fleeting moment on camera, the final peacefulness before destruction.

**Cropping**

Cropping becomes an effective and fascinating post-processing technique for its ability to drastically alter what the photo is, its’ perceived meaning, and the emotions that come with this new meaning. How these meanings and reactions can change vary with each form of crop. One can have a sense of solidity when looking at a square crop, or uneasiness when looking at one without that same symmetry. What crop out or include in the frame also greatly changes the way a photo is viewed. If a frame contains an object which supports the subject of the photo, then the meaning or message will be reinforced to the view, versus if this supplementary image was cropped out. Even empty space around the subject can serve to change the feeling of the photo,
giving it openness and freedom, as opposed to if the crop is very tight, creating a restrictive and claustrophobic feeling (Suler, 2013c).

During the photo interview participants observed four different crops of the photo. For the “trees crop” photo, there were mixed reactions, including four participants who thought it was not that different than the original photo, and as such did not stir up any change in emotion. Two participants noticed the enhanced focus on the people in the photo, and three reported the photo as “relaxed” and “peaceful”. One participant commented that the closer view made the girl appear “beat up” or “dead”. Cropped even closer, the “tight crop” photo provoked a variety of interpretations and thoughts about what the photo could mean and the feelings it displayed. Two participants had feelings of relaxation and “tranquility” when viewing the picture, however, three participants pointed out an apparent rift between the two individuals in the photo, describing it as an “issue not spending time together”, that they seemed “aloof”, and that there might have been some kind of “argument while on vacation”. Two participants talked about the tightness of the crop, calling the photo “claustrophobic” and “isolated and lonely”.

The other two crops each focused on one of the individuals in the photo, leaving the other one out of the frame. It is interesting to note the changes in interpretation and emotion when viewing the photo with only one of the people in it instead of both, altering the possible story that the original was conveying. While viewing the “girl crop” photo there was a wide range of responses. One participant noted the lack of surroundings and compared it to the other photos, saying that the photo was “cut off” and that “half of the story is missing”, while another also pointed out the “isolation” and a feeling of “shyness”. Four participants had positive feelings when viewing the photo, saying how it appeared the girl was napping and that it was “relaxing”. 
The focus on the girl created a feeling of curiosity for one participant, wondering what she was doing and why she had a hat over her head. Another participant interestingly noticed that the crop was the “shape of a coffin”, and that there was a “sense of death” from the photo, perhaps reinforced by the fact that the girl is lying motionless. The “woman crop” photo also received differing interpretations, with three participants describing it as “peaceful”, and one saying the photo did not give off a “strong desire to go to the beach”. One participant described the photo as “impersonal and plain”, while two pointed out a feeling of “isolation” and “wanting to be alone”. Four participants also perceived the woman as “thinking” and “pensive”.

The “scope” photo was another personal favorite, not only because of the black, round vignette around the woman, but also because of the zoomed in effect that made the photo appear as if it was being viewing through a scope of some kind. Suler (2013j) echoes this sentiment when he describes dark vignetting and the sensation it creates of “looking in” or “looking out”, as well as the ability of it to create the sensation that the mind is “intoxicated, fading, or traumatized”. Five participants reported that the woman appeared to be “thinking”, “contemplating”, and “reflecting”. Two participants noted the perception of looking through a telescope, with one also mentioning the idea of a “peeping tom”. These responses are interesting because they not only focus in on the woman being looked at but also the photographer and the person doing the observing, perhaps in an inappropriate or spying manner.

**Distortions**

The “whirl” photo is interesting because of the extreme amount of distorting and moving around that is happening with the actual image itself, and none of it in a coherent way. Four participants also described the photo as “distorted”, while two participants reported a feeling of fear because of it. One participant pointed out that the twirl could be interpreted as a “ying and
yang”, and that it is a vacation bringing the people together, much like the actual effect distorts and pulls the images together. Two participants reported seeing a wave and two also described the image as “abstract”. I agree with the description of abstract, and the idea of the once calm ocean being transformed into a monstrous tidal wave because of the spiral effect. It can easily add a feeling of panic or fear, perhaps even confusion because of the heavy distortion and scrambling of the image.

**Texture changes**

When viewing a texture, one cannot help but begin to feel that surface in their mind, and with this sensation comes the memories and emotions that go along with it. “The texture of hair, skin, lips, a teddy bear, a baby blanket, bubbles, a faint prick of a pin, sandpaper. Just my mentioning these things probably creates within you a distinct sensation, memory, or feeling” (Suler, 2013). Indeed, everything we experience has some form of texture and when that texture is reawakened in our mind just by viewing it in a photo, so too do the emotions and thoughts that were associated with it spring forth. For the “texture” photo, a cloth or canvas-like texture was added to the image. In describing the appearance of the photo, participants used words like “painting”, “fuzzy”, and “pixelated”, pointing out the resemblance to different things like a “puzzle”, a “painting on a concrete wall”, and an “old picture”. Two participants thought the photo felt “vintage” and like looking at a “memory”. Another participant thought the appearance of a painting made the setting seem happy and cheerful yet “ironic because the women are facing away and lonely”. This specific texture does give off the appearance of being on a page in a book, or on a piece of canvas, creating a sense of art and storytelling.
The subject of the photograph

Not only is the type of edited change important when recording psychological reactions, but the subject of photograph as well. For example, a certain effect may incite a different response depending if the photo is a landscape versus a portrait. Each of these different types of photos and their features conveys an understanding specific to the visual experience being had by the observer. A landscape photo containing objects of nature may be viewed under an aspect of loneliness, however, it is not that the landscape is actually lonely, rather the objects contain these metaphorical expressions of loneliness and we believe that the landscape is suggesting this understanding of it (Friday, 2001). The same psychological effect is apparent within other photos as well, such as portraits. “Because personal snapshots permanently record important daily moments (and the associated emotions unconsciously embedded within them), they can serve as natural bridges for accessing exploring, and communicating about feelings and memories (including deeply-buried or long-forgotten ones), along with any psychotherapeutic issues these bring to light” (Morgovsky 2007).

Each edited change within a photo can have a different effect depending on the type of photo that is being manipulated. In a portrait, texture can enhance or alter how we view the subject’s personality characteristics and how we interpret that person (Suler, 2013i). Sharpening is also effective in portraits. In a sharpened image with cool and dark tones, the personality of the subject can become “stern and analytical”, whereas in a soft image with warm colors and a glow, the person appears more “friendly and gentle” (Suler, 2013f). The many types of bokeh can also have an effect depending on the kind of photograph. A bokeh which blurs the background of a portrait will enhance the subject being focused on, while still incorporating the elements of the
background. Reactions to this photo could be different if the background was left out completely (Suler, 2013a).

A dyad shot, or shot of two people, also has unique effects when post-processed. Effects such as color, sharpness, lighting, and cropping, can determine which of the two people the eye observes first, as well as how we view them. High contrast makes the dyad edgy, whereas more subdued colors creates a gentler vibe. A high key dyad will have a lighter mood than a the somber feeling of a low key one (Suler, 2013d). While observing Flickr, there was a trend for landscape photos to involve post-processing effects which manipulated color, sometimes enhancing all or some of the colors in an image, or draining the image of color completely. Textures and distorting effects were also added to create abstract landscapes. The openness of landscapes seemed to allow for more creative manipulation which in turn led to many images that became less realistic and more abstract.

**Subtle versus obvious post-processing**

We have discussed the idea of subliminal perception when looking at the kinds of edited changes that people do not tend to notice, and the effects those changes may have even if they are not perceived consciously. As mentioned with the effects of sharpness, participants unconsciously may have noticed the effect when they reported no detailed change in visual appearance yet a change in the way the photo felt, such as “cold”, “windy”, and “Spring-like”. The same examples were found when recording participants’ responses to the different cropped photos. In the “tight crop” photo it was often described as “claustrophobic”, and there was an emphasis on the separation between the two individuals in the photo because of the limited content in the image which forced the focus to be on the people. Compare this to reactions to the “trees crop” photo, which contained much more space than the “tight crop” photo and only a
small amount less than the original. In observation of this photo, four participants did not even notice a change in the picture compared to the original. This photo also placed emphasis on the woman and girl for two participants, however, instead of invoking negative feelings about their separation, three participants reported feeling “relaxed” and “peaceful” while viewing it. The subtle difference in amount of background in the photo possibly changed these attitudes about the relationship of the two individuals in the image.

**Individual differences**

It has been demonstrated both in research and the photo interviews of this study that specific effects do not always elicit the same specific reactions from every individual that views it. It is clear that the subjective associations people have of both the content of the photo and the edited changes are unique and not universal. Some of these are culture specific as well. For example, in Western culture, the color black symbolizes mourning, while in Asian counties that color is white, and in Mexico blue (Zakia, 2007). Bickley-Green (1992) provides similar sentiments, stating how the basic internal visual experiences are common within all people, but that different cultures and environments reward and reinforce certain interpretations of those visual patterns. This idea is even a part of one of the techniques of Photo Therapy called “Photo-Projectives”, which Judy Weiser (1993) describes as being “based on the phenomenological fact that the meaning of any photo is primarily created by its viewer during their process of perceiving it”.

These individual differences and their projected attitudes and meanings were found in the photo interviews as well, with participants each reporting different emotions based on how they interpreted and felt about the photo. The participant who enjoyed going to the beach described feelings of “envy” and “wanting to be there” when they saw the original photo, however when
viewing such effects like the “woman crop” photo, different aspects of it turned them off from the idea of being there. The same was demonstrated by the “low key” photo and participants’ feelings about the beach at night. For the participant who enjoyed being on the beach at night, positive feelings like “romantic” were reported, whereas the participant who did not have favorable attitudes about night time at the beach described feeling “scared” and “afraid” when reacting to the photo. This data supports the theory that what we see is influenced and projected onto the world by our psychological states (Friday, 2001).

**Conclusions**

This study has provided great insight on the psychological reactions people have when viewing edited changes in photos that have undergone post-processing. The observations made when viewing changes in color seem to support much of the research on the effects of color on mood, such as cool colors being more pleasing and warm colors being arousing. Participant reports also reinforced the associated meanings of colors according to Western culture, such as blue being related to peace, green with health, and red with passion. Memories from participants’ own lives and subjective attitudes also showed to play a major part in their reactions to certain photos. Those alive during the “psychedelic” decades of the 60’s and 70’s, or had a strong interest in the culture of this time period, found the “alien color” photo to be very memorable and pleasing, while those who were detached from this aspect described the photo as “unpleasant”, or simply admired it for its artistic and creative qualities. The black & white and sepia effects had in many instances the traditional reaction of “vintage” and “authenticity”. The effects of cropping and its impact on the perceived meanings and interpretations of photos was another very interesting aspect of post-processing to investigate. From participants’ descriptions we see the various stories that a photo can convey depending on how that photo is being presented. A close
crop forced the two people in the photo together and created a sense of tension between them, but when the crop removed one individual from the frame, the story changed completely, and even more so depending on which individual was being shown.

The photo interviews explored many different post-processing effects and many different psychological reactions, but there is room for improvement. As technology expands so too will the need for further research on the growing number of ways one can edit a photo. A larger demographic and number of subjects would also benefit the study, as well as a diversity in culture and environment to see how this effects the meanings people associate with different edited changes. Further research could also incorporate a multitude of photos with various images and subject matter to combine with the numerous edited changes that can be made. Because the original photo was viewed before the cropped variations, which immediately causes participants to recognize that something is missing, and thus alters their psychological reaction, future studies might vary which cropped photos the participants view, or if they view the uncropped photo at all.
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http://truecenterpublishing.com/photopsy/QRM-PhotoPsy.pdf


http://users.rider.edu/~suler/photopsy/index.htm


APPENDIX: The Post-Processed Photos