Aperture, Shutter Speed and ISO

Before you start your journey to becoming a Rockstar Concert Photographer, you need to master the basics of photography. In this lecture I´ll explain the 3 parameters aperture, shutter speed and ISO in that way that you don´t have to fear them anymore.

Aperture

The **aperture** is the **opening**, or “hole“ located **inside the lens** and allows you to decide **how much light** hits the digital sensor of your camera. This hole is formed by a series of overlapping metal blades (the diaphragm) and can be adjusted with your camera to make the opening larger or smaller. The larger the opening, the more light is allowed in to hit the sensor (large aperture). The smaller the opening, the less light can enter (small aperture). The same principle is behind the way the iris works in your eyes.

Apertures are also denoted **by f-numbers**. The **smaller the f/number, the larger the opening** in the lens (large aperture). In the beginning, this nomenclature can lead to some confusion and it took me a while to figure out how f/numbers work. Technically speaking, the f/numbers are ratios and are determined by dividing the diameter of the lens opening by the focal length of the lens. As I want to explain this to you in a way that doesn’t require you to have a Ph.D. in physics to understand, I´ll leave you with this explanation and rather focus on the practical aspects of how to use these f/numbers to our advantage.

F/numbers, like 1.4, 2, 2.8, 4 and 5.6, denote the widest openings (depending on your lens) which will admit the greatest amount of light. F/numbers such as 8, 11, 16 and 22 reflect the smallest openings which lets in less light. When you set your lens to the smallest aperture <u>number</u>, you are shooting “wide open“. If you choose larger aperture <u>numbers</u> you are „stopping the lens down“.

When you increase the f/number by a full stop (or one-stop increment) e.g from f/2 to f/2.8, the lens lets in half as much light as it did before. This means that f/4 allows half as much light as f/2.8 and f/5.6 allows half as much light as f/4. On the other hand, f/8 lets in twice as much light as f/11 and f/11 lets in twice as much light as f/16.

Why would you want to change the opening in your lens? Well, you might

think that it's just about controlling the flow of light hitting the camera sensor. It sounds obvious that when shooting on a sunny day in bright sunlight you should make the hole (the aperture) in your lens smaller, whereas when you are shooting a **concert in low light conditions,** you should set the **aperture as wide open** as possible to let enough light in to hit the camera sensor.

But the aperture has an even more important function, namely to control **Depth of Field (DoF)**.

Simply speaking, Depth of Field is the area of sharpness within a picture. I'm sure you've already noticed this in magazines or photography books by professional photographers. Some photos contain models where only the eyes of the person are in focus whereas the background is blurry. When focusing your lens on a certain point, everything in the image on the same plane is in focus as well. Everything in front and behind this point (focal plane) is not in focus. So, the depth of field determines the area that's in focus. The aesthetic quality of the blur produced in the out-of-focus areas of an image is referred as BOKEH (Japanese for blur, pronounced "bo", as in bone and "ke" as in Kenneth). Here you can see a portrait of William DuVall of Alice in Chains. Only his eyes are in focus whereas the background is out of focus.

What influences Depth of Field:

- *Aperture.* This, for me, is by far the most important factor in determining DoF. A small f/number (large aperture) not only lets in more light, but also decreases the Depth of Field. This will result in a very shallow focus area in your picture and an out of focus foreground/background. **The wider the aperture (the smaller the f/number) the smaller the DoF.** Portrait photographers often use an aperture of f/1.4 or f/2.8 to achieve this effect.
- *Subject distance.* The distance between you and the subject also determines the DoF. The closer you are to your subject, the shallower the depth of field. It makes a huge difference if the artist on stage is two meters away or if he leans over to you and sings into your camera.
- *Focal length*. The third component that influences DoF is the focal length of your lens. The longer the focal length e.g. 200mm, the shallower the DoF. The shorter the focal length e.g. 35mm, the deeper the DoF.

Summary of Aperture for concert photographers:

Get the "fastest lens" within your budget. With "fast" lenses I'm referring to lenses with a small aperture number such as f1.4, f1.8 or f2.8. I shoot 95% of my concert shoots without exception with lenses with small f/numbers. Most of the time, you have to deal with ultra low-light situations during concerts. So, the only way to get a decent exposure is to let as much light into your camera as possible. This you can achieve by setting your lens to the smallest f/number (large aperture). Additionally, your photos will have a shallow Depth of Field which helps blur out distracting stage elements behind the subject you're shooting. For example, if you focus on the eyes of your model using an aperture of f1.8, the ears will be out of focus. That's why it's important when using small aperture numbers to always focus on the eyes of the musicians on stage!

Shutter Speed

Shutter speed is the second component in achieving a correct exposure. When you press the shutter on your camera, a device called the "shutter" inside your camera opens and allows light to pass from the lens into your camera body to hit the camera sensor. The time the shutter stays open, allowing light to hit the sensor, is called the shutter speed.
This means that the shutter speed controls the effect of motion in your photo, amongst other things. **Fast shutter speeds freeze the action**. You can see here a photo of Apocalyptica, where I used a fast shutter speed to freeze the action. **Slower shutter speeds** allow the **action to be recorded as a blur**.
The various shutter speeds are indicated as whole numbers such as 60, 125 or 250 in your viewfinder or on your camera display. However, these numbers are actually a fraction of a second: 1/60, 1/125, 1/250. Most newer cameras have the ability to set the shutter speed between very slow e.g. 30 seconds to ultra-fast, e.g. 1/8000 seconds. Shutter speeds over one second e.g. 2 sec, are marked with quotation marks after the number, such as 2".
If you go from a shutter speed of 1/125 seconds to 1/250 seconds, the shutter stays open for half the time. 1/125 seconds is twice as long as 1/250 seconds, so half the light will hit the camera sensor. This might sound

complicated, but once you've thought this through, it´s simple. The higher the 1/x time is, the faster the shutter speed. 1/250 seconds is faster than 1/125 seconds. 1/500 seconds is faster than 1/250 seconds.

Summary of shutter speed for concert photographers:
In **concert photography**, I shoot 99% of the time with a **fast shutter speed** of around **1/200 of a second** to make sure I get sharp images of the artist. Sometimes I set a slower shutter speed to blur parts of the image. One great example is to blur the drumsticks of a drummer. The drummer usually sits relatively still, but his hands and drumsticks are moving fast, so you can capture a sharp image of the person with blurred drumsticks which gives the feeling of motion and action. The same applies to a guitarist whose strumming hand is moving fast.

As a **rule of thumb**: 1/focal length of the lens is the slowest shutter speed you should use when hand-holding your camera because of camera shake (50mm -> 1/50sec, 200mm -> 1/250sec, and so on). If the subjects are moving and rocking (and band members usually are), you'll need even faster speeds. So remember, you'll get blurry photos because of your camera shaking, or because the subject is moving too fast, but in both cases, your shutter speed is too long or slow to freeze the action

ISO

Today, we´ll talk about the third factor of the exposure triangle: **ISO**!
Another important setting on your camera is the ISO value. **ISO refers to the sensitivity of your sensor** (in analogue times, the sensitivity of the film was measured in ISO). The higher the ISO setting e.g 800, the less light is needed to achieve the correct exposure. However, **the higher the ISO value, the warmer the camera sensor gets and the more noise (or grain, as it was known in analogue times)** you will encounter in your photos. There are ways to reduce the noise during post-production, but the aim is to keep the ISO as low as possible. Typical in concert photography are ISO setting of 800, 1600, 3200 and 6400 (depending on the stage lighting and venue. This concert picture is from Zola Jesus and there was

almost no light on stage. Therefore I had to use a high ISO setting of 6400 to get a decent exposure. You can see the grain especially at both sides of the light beam. However grain doesn´t have to be a bad thing and the effect of grain is working great when converting your photos into black and white.

Aperture, Shutter Speed and ISO are interconnected. Ok, let´s have a look at this holy trinity and how Aperture, Shutter Speed and ISO work together.

If you change one variable, you'll have to adjust the others as well to get a photo with the right exposure.
Say you set the aperture to f1.8 and the ISO to 1600 and the camera sets a shutter speed of 1/40 sec. This shutter speed might be too slow, resulting in a blurred photo. You can't reduce the aperture number since it's limited (for instance, on a 50mm lens) to f1.8. However, you can crank your ISO up to, let's say, 3200 (from ISO 1600 to 3200 is +1 stop), therefore your shutter speed will be one stop faster at 1/80sec (from 1/40 sec -> 1/50 ->1/60 -> 1/80 = +1 stop). I want you to get a feeling for these numbers.
We now have an aperture of f1.8, ISO 3200 and a shutter speed of 1/80 sec. Are you still with me? If there's action on-stage and the musicians are moving fast, you need a faster shutter speed. Guess what? We'll have to crank the ISO up to 6400. Remember, the higher the ISO, the more noise you'll get in the resulting photo. If we use ISO 6400, we get a shutter speed of 1/160 sec, which will probably get the job done, but you'll get more noise in the final image.
Another way of looking at it, is that you'll get exactly the same exposure in the following examples:
1. Aperture: f1.8, 1/250, ISO 200
Will get the same exposure as:
2. Aperture: f2.5, 1/125, ISO 200
Will get the same exposure as:
3. Aperture: f2.5, 1/250, ISO 400
Will get the same exposure as:
4. Aperture: f1.8, 1/500, ISO 400
Etc. etc.
However, the photo will have a slightly different look.

1. Very shallow depth of field (blurry foreground and background) because of the wide open aperture.
2. Slightly less shallow depth of field (slightly smaller aperture), but possibly more blur of moving objects in the shot (slower shutter speed).
3. Same depth of field as 2, but possibly sharper moving elements (faster shutter speed), but slightly more noise in the photo (higher ISO).
4. Back to the original shallow depth of field, quite fast moving objects or elements will be frozen sharp (higher shutter speed), but again the same amount of noise as in example 3 (higher ISO).

It´s always a compromise between getting sharp images and having noise in the picture.