# LIGHT FALL-OFF

## Rory Laubscher lays out one of the most important lighting principles

If you've been following my articles it should come as no surprise that I'm a huge fan of off-camera flash. Speedlights have dramatically improved my understanding of light and lighting. In this article I will be delving into the idea of light fall-off: a principle that has immense practical implications for photographers.

Imagine a dark room. In this room a spotlight is shining on a wall one metre away. What would happen if we moved that light another metre away from the wall (i.e. doubled the distance) — obviously the light would not be as bright, but by how much will its intensity have dropped? As we've doubled the distance you may be thinking that the light intensity would be halved. However, you'd be wrong. It would actually be reduced to one quarter of what it was.

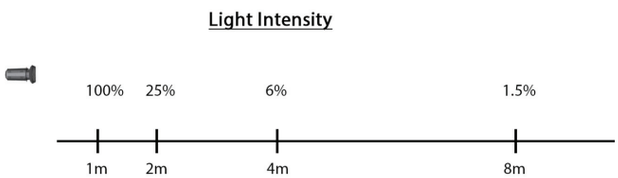
This relationship between light intensity and the distance between light and subject is governed by the inverse square law.

### The inverse square law

"The intensity of light radiating from a point source is inversely proportional to the square of the distance from the source."

Simply put, if we double the distance we reduce light intensity to a quarter of what it was (distance = 2, inverse = 1/2, squared = 1/2 x 1/2 = 1/4).

By the same formula, if we triple the distance we reduce light intensity to a ninth of what it was. The diagram below illustrates how light intensity changes with increased distance from the light source.




Light to Subject distance

Let's use the light intensity at one metre as our starting point (we'll call it 100 per cent to make this easier).

If we double the distance from the light (1m to 2m), we reduce the light intensity to 25 per cent of what it was at 1m.

If we double the distance again (2m to 4m) we lose another 75 per cent of our light (25 per cent to 6.25 per cent).

Once again we double the distance from the light (4m to 8m) and once again we lose 75 per cent of our light intensity (6.25 per cent to 1.5 per cent).

What I want you to see here is that, in the first metre, we've lost 75 per cent of our light intensity, but in the next 6m we lose only 23.5 per cent of the intensity we had at one metre from the light.

The key point: light falls off *rapidly* closer to the source.

In the image at the bottom of the page, a light meter has been used to mark out f-stops along the wall. Each jump to the right represents a one-stop difference (i.e. a halving of light intensity).

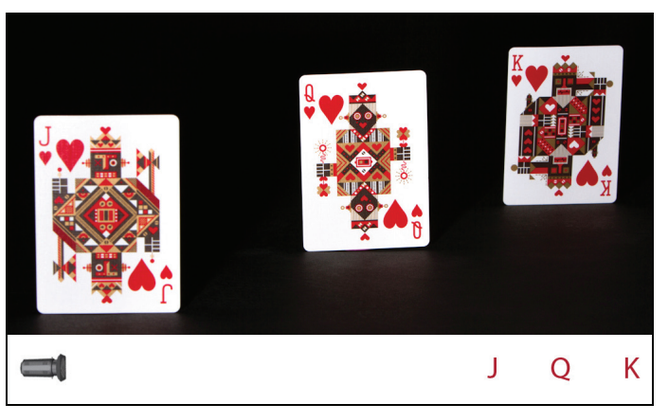
Note that as we get further from the light, the distance representing a one-stop loss gets progressively bigger.

### A few practical implications

How do you maintain an even spread of light when shooting groups?

If your light is too close to your subjects you may end up with a marked difference in exposure between the front and back of your group.

The way to correct this is to move your light far enough away from your group so that there is negligible fall-off between the people in the front and those in the back. Obviously this will require some adjustment to be made to maintain the same exposure (more flash power/higher ISO/wider aperture).


### Initial set-up

This image was shot against a white wall. Because there is a relatively large distance between the mannequin and the wall, the light has fallen off dramatically by the time it hits the wall. Consequently, the wall looks black.

So what happens if we move closer to the back wall?

### Closer to back wall

We've allowed more light to hit the wall. Granted, not enough to show that the wall is actually white, but enough to dramatically change the look of the background.

Let's move closer to the side wall.

### Closer to side wall

Notice that the right side of the mannequin's face has lightened up.

Essentially we've used the side wall as a reflector. Light has to travel from the flash to the side wall and reflect back on the model. In this case, that distance is *much* shorter than our previous example and consequently less light is lost before it hits our model again.

Now let's move away from the far wall again, but keep the same distance from the side wall.

### Away from far wall

Again our background has gone dark because of the distance, but as we're still close to the side wall it's still acting as a reflector.

This principle is important to remember when using circular reflectors — you can vary the amount of fill light by simply adjusting the reflector's distance from your subject.

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In my next article I will be talking about the practical aspects of using flash for action photography, in particular the use of high-speed/focal-plane sync and the numerous problems that need to be successfully navigated to produce a good image.

Understanding light fall-off and the fact that small flashes are often extremely ineffective at distance is key to my next piece.

Until next time — happy flashing!

Rory Laubscher runs workshops on flash photography at his Firefly Photography studio in Auckland. If you are keen to improve your photography through a better understanding of flash head to www.fireflyphotography.co.nz for details.