

Colour Communication.

Understanding and expressing colour to your lab to achieve the best results.

I by no means claim to be an expert on colour or even on communication, as my technicians will tell you. However, in my years of restoring teeth in many places for different people and also attending seminars and presentations, I have picked up the odd bit of useful information here and there. These bits of information are not groundbreaking they are not reinventing the wheel, I'm not creating a new system that will end all remakes, but every little helps right?

Communicating shades to your laboratory in an efficient and effective manner will save you time and money and will build your reputation up as a clinician that can successfully restore anything from single centrals to full smiles. The measurement of success in this case being that of your

patients but also communicating shades professionally will impress your peers, which is always nice.

What is colour?

You need a small amount of understanding of what colour is to express this to your lab. Colour or the perception of colour is dependent on three things, the light source, the object and the observer.

The light source is something that we can control in our environment. Light comes in a unit of measurement, which is usually in temperature this unit is called Kelvin. Daylight or bright daylight has a colour temperature, which is said to be 6504 Kelvin; it could also be in a classification of D65. This comes from the International Commission of Illumination.

Light in surgeries or the light source used to observe in the oral environment should be in a measurement range of 5500 to 6500 Kelvin. There are several lighting systems on the market, which will provide you with the correct light temperature and fig 1, shows some of them.



Figure 1

So that's the light source identified what we need to move onto next is what effects light perception? The environment you take shades in is very important as to how your eyes perceive the light that is entering them, brightly coloured walls, chairs, uniforms, clothing, bibs, and lipstick (which is usually on female patients) are all things that will affect the way your eyes perceive the light. The list is endless and makes for a pretty stark surgery. If these design restrictions are not for you, I would recommend having a shade taking room or area away from these contributing factors. Also if you are a male over 30 and the majority of your shades you pick are D3 then you either only have one shade tab or like most males of a certain age your colour perception is not as good as others around you. There are studies that say that gender or age does not make a difference to your shade

taking, Donahue et al 1991 and also Curd et al 2006, but a recent study by Helen Haddad et al have shown in their study this is not the case. Out of a total of 614 test subjects from 15 universities in 9 countries aged between 18 and 47, which comprised of 305 women and 309 men, the people in the study were 319 students of dentistry and 295 dentists/dental technicians. In order to rule out colour vision deficiencies,

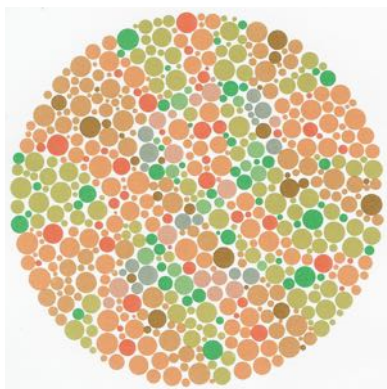


Figure 2

Ishihara tests as seen in figure 2 were carried out. After sufficient training in shade matching, the participants were required to sit a final test as a basis for the evaluation. This consisted of a total of 15 exercises, in each of which the three dimensions of colour were to be correctly determined. The sum of all deviations between the selected and the correct shade sample were determined. The lower the score,

the more precise was the shade determination. The result was that the female test subjects generally achieved a much higher success rate than the men. So as you can see males are at a disadvantage. If your assistant is a female ask her to take shades or at least confirm the shade you have picked.

This leaves the object as the last component in colour perception, what the object is made of, what it's surface texture is and how opaque the object is will all alter your perception. Reflected energy is the light that our brain perceives as to be the colour of the object.

Communication.

To communicate colour we use three main terms, these are **Value**, **Hue** and **Chroma**. The diagram in figure 3 shows a Munsell colour system. Value or lightness is a dimension that enables us to see the differentiation between light and darkness of the colour and in colour cones is represented by a vertical black to white axis. Hue is a dimension that enables differentiation between 'colour families' green, red, blue and yellow, these are placed in a circle with families

which are opposite in colour and oppose each other.

Chroma is a quality that enables differentiation between pale and strong and is represented as the distance from achromatic value centre axis, the further from the centre axis the stronger the chroma.

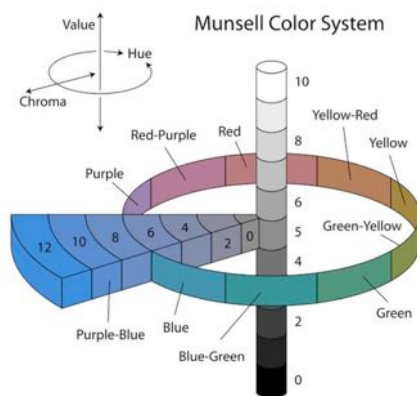


Figure 3

When describing shades to your lab always remember to use these terms **Value**, **Hue** and **Chroma** this way you and your lab will be able to discuss the shade of the teeth and know exactly what each other is referring to. I learnt on a course once that if you achieve very accurate shape, form and texture in a restoration and the value is correct then you are 95% of the way to making the restoration acceptable to the patient. So the chroma and hue is only fine-tuning. You will make mistakes but training and practice will lessen these.

Reading on the subject and training on websites will lessen your mistakes and figures 4 and 5 show a favourite book of mine and a website on colour communication.

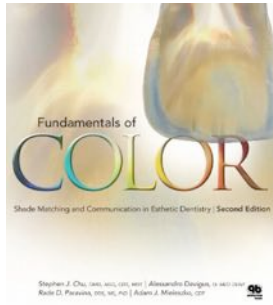


Figure 4

Society for Color and Appearance in Dentistry



Figure 5

On the website you can do a training exercise in shade recognition and earn yourself a diploma! Let's run through the Vita 3D shade guide it comes in two guises the classic Toothguide 3D Master figure 6 and the 3D Linear guide figure 7. The classic 3D Toothguide has 26 shades split into 5 value sub groups the value range is labeled as group 1 through to 5, 1 being the lightest and 5 the darkest. Within the value groups all the tabs moving downwards from the top increase in chroma (saturation). Within the value groups 2, 3 and 4

there is a choice of 2 further sub-groups, which are either side of the main group, and these are a red hue group labeled R and a yellow hue group labeled L.



Figure 6



Figure 7

The 3D linear guide has the same shade tabs as the 3D Toothguide but is split into separate smaller shade guides with a master value guide labeled 0 to 5 as the first shade guide to use.



Once the value has been chosen you then move onto choosing both the chroma and hue together within the chosen value.



It's a more logical process and will save you looking at all 26 shade tabs at once which will confuse and freeze your brain and eyes very quickly, the eye tires within 7 seconds, if you haven't made a decision on the value and subsequently the chroma and hue quickly then look away at a neutral space and come back to it.

On the website you use the Vita 3D Linear guide, click on which value group you believe the sample to be in then move onto the chroma master guide of that value group.

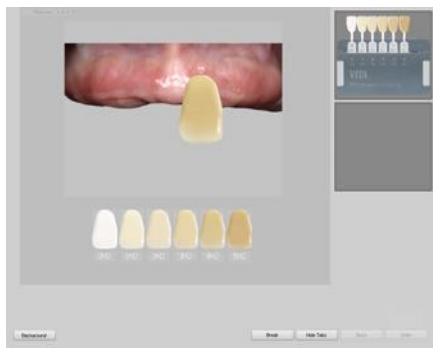


Figure 8

In this case we believe that the sample shade is in the value group 4 and so we then need to choose a chroma and a hue for the sample shade.



Figure 9

Congratulations if you picked the correct shade **4** (*value*) **L** (*hue*) **2.5** (*chroma*).



Figure 10

As you can see in the shade sample there is little or no incisal, when choosing shades as a general rule of thumb split the tooth into three parts, the cervical, the main body and the incisal third. When choosing a shade from a shade guide focus on these areas separately use the shade tabs to

choose the main body of the tooth the incisal third is better described as to what effect or structures it has within it and the cervical is usually a stronger chroma than the main body. Lets run through what the minimum amount of information you need to send to your lab to stand a chance of achieving success in a single tooth restoration. Figure 11 is the most useful picture you can send to your lab

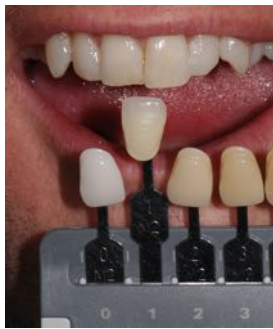


Figure 11

It gives the technician a dentine shade to use and also it will show the amount and value of translucency in the incisal third. The next picture I would send is that of the internal structures in a tooth and you do this by taking a picture with a lower exposure value in figure 12 it shows five different exposure levels of the same tooth in the lower exposure pictures you will notice how the internal structures start to come alive.



Figure 12

Go to your lab and learn the terms and porcelains your technician uses this way you can describe the effects and internal structures in the most accurate way. Send as much information in the form of pictures and notes as you can. Custom shade taking by your lab is still the best option but gaining knowledge of colour and shade taking can only help with communication.



This single central restored with Lithium disilicate (IPS e.max) is one of the most difficult to get right and I'm still not completely happy with the result the value is correct the hue is slightly off on the cervical third and because I was concentrating so hard on masking the underlying darkness but keeping some translucency I didn't concentrate enough on form, the distal is curved when it should be straight but the patient loved it compared to what they had previously had.





In conclusion

Get to understand the terminology for expressing colour and although in this article the shade guide used is a Vita 3D there is nothing wrong with using other shade guides as they are all used as a guide and comparison for dentine shades that your technician can then use to compare his restoration with. Send as much information to the lab as you can, it can never be too much. Good luck.

Refences

Vita info 3.09

Fundamentals of Color – Stephen Chu

Society for Color and Appearance in Dentistry