



## **PWDAS-46**

### **COLORIMETRIC TRAINING BOOK**

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The most important characteristics of human colour vision are colour identification and colour discrimination. Subjects with colour deficiency are impaired on both of these capacities when compared to subjects with normal colour vision. Subjects with normal colour vision can discriminate up to a few million hues / chromatic shades whereas subjects with colour deficiency cannot discriminate more than a few hundred of them. Our correction glasses help to substantially improve colour discrimination in colour deficiency. This improvement shows up in subjective colour experience as well: our subjects reported that on starting to wear the glasses, the world became more colourful. However, subjects with corrected colour deficiency need to memorize the new chromatic shades discriminated, and also to learn their names. In addition, the correction glasses modify those colour experiences with which the subjects had been familiar before the correction started. Thus subjects with corrected color deficiency need to familiarize themselves with a new world of colour. In people with normal colour vision, colour discrimination and naming are acquired in infancy and childhood, whereas only part of this learning process can take place in subjects with colour deficiency. Our Colorimetric Training Book helps subjects with corrected colour deficiency to improve their colour identification. and colour naming.

The first part of the Colorimetric Training Book is the basic level Training Book. Its aim is to help subjects with colour deficiency to recognize and name 25 colours that are of key importance in everyday life.

The basic level Training Book asks the reader questions about the colors presented. In our view, learning to perceive colours is like learning about more abstract subjects in that it is enhanced by focusing attention, active thinking and doing exercises. The correct answers to the questions and exercises can be found at the end of the book.

We think the 25 colors of highest practical importance are the three additive basic colours (red, green and blue), the three subtractive basic colours (cyan, magenta and yellow) and brown, orange, lilac and gray. These colours are shown in the book at three levels of lightness: light, medium and dark.

The first chapter presents each of the 25 colours accompanied with their names. Following this the same colours are shown again in random order, without naming, and the subject's task is to name them. Each page contains a single colour sample on white background; angular subtension of the samples exceeds  $10^\circ$ . At this first stage of learning our aim is to prevent simultaneous colour comparisons from affecting recognition. Following this we present pairs of colors that are often confused by subjects with colour deficiency (e.g., lilac vs. cyan; dark brown vs. dark green). In this section the colour samples appear in  $10^\circ$  viewing fields. In the third section we present a number of different colours simultaneously, where individual colour patches subtend  $2^\circ$ . Our aim here is to familiarize subjects with different shades of the colors presented in larger viewing fields in the first two sections.

The last chapter asks for psychological and esthetic assessment of the colors, for example, subjects are asked to choose the colors that they find beautiful versus displeasing, or calming versus exciting. Our goal with these questions is to keep the subject's attentional

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focus on the colors and to see if the esthetic and psychological assessments of the corrected color deficient differs from that of colour normals.

Using the Training Book we did experiments with uncorrected and corrected colour deficient subjects; a colour-normal control group was also examined. Our subjects were university students between 20-24 years of age.

Subjects with both corrected and uncorrected colour deficiency showed gradual improvement after repeating the exercises a few times. Subjects with corrected colour deficiency solved the tasks with significantly fewer errors than uncorrected subjects.