

Informed Consent to Participate in Research

Principal Investigator: Yoshi Ohno

Study Title: Visual perception of color quality of light sources

Part 6: Experiments for new color definition, color perception depending on light level, and spectral effect on brightness

Study Site(s): NIST Gaithersburg, Bldg. 220, Room B307

Introduction

You are being asked to take part in a research study. Research studies include only people who choose to take part. This document is called an informed consent form. Please read this information carefully and take your time making your decision. Ask the researcher or study staff to discuss this consent form with you, please ask him/her to explain any words or information you do not clearly understand. The nature of the study, risks, inconveniences, discomforts, and other important information about the study are listed below.

The person who is in charge of this research study is Dr. Yoshi Ohno. This person is called the Principal Investigator. However, other research staff may be involved and can act on behalf of the person in charge.

Purpose of the study

The purpose of this study is to find out visual perception of color quality of light sources for general lighting and to improve the current standards for lighting products on color quality. The ranges of white light and the scores of color rendering (often called "color accuracy") specified in the current standards do not correlate well with what people actually prefer. One aspect of the study is related to color saturation of objects the light source can render depending on its spectrum. These perception characteristics depend on light level, and spectrum of light. The current color definitions are old and new improved definitions are proposed. This study investigates the perception of color quality for lighting as well as proposed new color definitions directly related to color specifications in lighting, which may lead to new international standards for solid state lighting.

Why are you being asked to take part?

You are being asked to participate in this research because we need data of human visual perception. There are individual variations in visual responses and we need to obtain meaningful average results from data of a number of subjects for each color quality parameter we investigate. If you are an employee or associate of NIST, you should have a permission from your supervisor for your participation.

Study Procedures:

If you take part in this study, we will ask you to participate in the experiment described below.

General procedures:

- After we answer any questions you may have, and if you consent to participate, we will first conduct a color-deficiency test of your vision. You will be asked to read numbers in many colored dots. This will take only one minute. If you don't pass this test, you are not eligible to participate, and we will withdraw you from participating in the experiments without any penalty.
- You will be asked to complete a demographic questionnaire, for your gender, age, and race/ethnicity. Your demographic information is kept confidential. Your demographic data will be connected to your experimental data using an assigned number, but the number will not be linked to your name or to this form. If you choose not to provide your demographic information we will withdraw you from participating in the experiments without any penalty.
- The experiments will take a total of approximately one (1) hour.
- You are welcome to request taking short breaks any time if necessary.
- The experiments will take place at our lab located at Bldg. 220, Room B307. If there exists a risk for Covid-19 transmission, instructions will be given remotely, for which you will be asked to watch an instruction video.
- There will be no recording of audio or video. For each pair of lights shown to you, the investigator will ask questions like, which sample on the right side matches the sample on the left side, and you answer verbally. The investigator will record your answer on a spreadsheet on a laboratory computer. The data on the computer will not include your name, all data are anonymous and only connected to your demographic data by an assigned number.
- After the experiment, you are welcome to ask any additional general questions about lighting or the color of light bulbs. The investigator will be happy to answer any additional general questions on lighting.

Experiment procedures

- you will sit in front of the double booth and very close to it so that each of your eyes see only one side of the booth.
- The right side of the booth is set to a high light level (4000 lx), and the left side is set to a low level (~1000 lx). These are very different light levels, but after you are adapted, you will feel these are about the same brightness.
- You will be adapted to the illumination for five (5) minutes, during which time, the operator will give you instructions, and let you practice the experiment.
- When you are ready, a reference color sample (gray, red, green, yellow, or blue) is presented on the left side (1000 lx) and a set of 20 color samples of the same color with slight color shifts is presented on the right side (4000 lx), and you will choose which sample on the left side appear closest color to the sample on the right side.
- This experiment will be done for five different colors – gray, red, green, yellow, and blue. Experiment on each color takes about two minutes. We will run five colors two times for different booth settings, and there will be a 15 to 30 minute break between the two sessions and the experiment will take about one (1) hour or less total.

Total Number of Participants

About 25 individuals are expected to take part in this part of the study.

Voluntary Participation / Withdrawal

You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study.

Benefits

There are no direct benefits to you by participating in this research, except for gaining the satisfaction of contributing to this scientific pursuit and learning more about vision science and lighting, which includes:

- Gaining the experience of what a vision science experiment is like at the state-of-the-art facility at NIST. You will experience our Spectrally Tunable Lighting Facility (<https://www.youtube.com/watch?v=TjZwECokbwE>) which is a world-famous facility.
- Getting acquainted with NIST researchers studying light and lighting, and asking any questions on LED light bulbs or lighting and color in general.

Risks or Discomfort

This research is considered to be minimal risk. That means that the risks associated with this study are the same as what you face every day. There are no known additional risks to those who take part in this study.

Compensation

You will receive no payment or other compensation for taking part in this study.

If you are a NIST employee or a NIST associate, your participation time will be regarded as a part of your work, thus you should have a permission from your supervisor to participate in this study.

The findings from this research may result in the future development of products that are of commercial value. There are no plans to provide you with financial compensation or for you to share in any profits if this should occur.

Costs

It will not cost you anything to take part in the study.

Privacy and Confidentiality

We will keep your study records private and confidential. This form with your signature will not be linked to any of the demographic information or the experimental results, and your name will never be recorded with any experimental data. Even the investigators will not be able to identify which data and results belong to which participant. The demographic data will be linked with the data and results using an assigned number. Your name will not be linked to this number. All records of email communications with you for scheduling purposes will be kept confidential and will not be disclosed to anyone to the extent permitted by law. No emails will be linked to your assigned number, experimental data, or demographic information.

Certain people may need to see the study records, which includes the consent form, demographic information and experimental data. Anyone who looks at your records must keep them confidential. These individuals include:

- The research team, including the Principal Investigator and all other research staff.
- Certain government people who need to know more about the study, and individuals who provide oversight to ensure that we are doing the study in the right way.
- Any agency of the federal, state, or local government that regulates this research, such as the Office for Human Research Protection (OHRP).

Your identity will be protected to the extent permitted by law, including the Freedom of Information Act. We may publish what we learn from this study. If we do, we will never include your name. We will not publish anything that would let people know you participated in the study.

You can get the answers to your questions, concerns, or complaints

If you have any questions, concerns or complaints about this study, or experience an unanticipated problem, or research-related injury call Yoshi Ohno at NIST extension 2321 or 301-975-2321.

If you have questions about your rights as a participant in this study, or have complaints, concerns or issues you want to discuss with someone outside the research team, contact the Human Subjects Protection Office at (301) 975-5445, or HSPO@nist.gov.

You will receive a copy of this signed consent form.

Consent to Take Part in this Research Study

I freely give my consent to take part in this study. I understand that by signing this form I am agreeing to take part in research. I have received a copy of this form to take with me.

Signature of Person Taking Part in Study

Date

Printed Name of Person Taking Part in Study

Statement of Person Obtaining Informed Consent

I have carefully explained to the person taking part in the study what he or she can expect from their participation. I confirm that this research subject speaks the language that was used to explain this research and is receiving an informed consent form in their primary language. This research subject has provided legally effective informed consent.

Signature of Person obtaining Informed Consent

Date

Printed Name of Person Obtaining Informed Consent