# User Responses to Energy Efficient Light Sources in Home Environments

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## Introduction

There is a well-known preference for the use of the incandescent light source in domestic homes. The warm and comfortable light from the incandescent is by that a visual preference according to light sources. The more energy efficient light sources available on the market are produced towards efficacy and are not in the same way as the incandescent suitable for human visual comfort. There is a need in domestic homes to create an environment that gives recreation, relaxation, and visual comfort as a calm contrast to a stressful weekday. From a health promotion perspective the light sources that are for sale on the market have an important role in psychological and physiological support of people all over the world. The incandescent light source emits nm within the long wavelength part of the spectrum in a high extent. Long wavelengths in electromagnetic radiation are highly represented in the natural light in early morning and the late afternoon. Long wave radiation gives good support for relaxation. Will LED light sources be accepted in domestic environments and replace the incandescent or are there obstacles for the transition that already can be seen? Visual preferences that guide the consumer when buying light sources to domestic environments have a strong connection to the amount of energy used for lighting purposes on a national and yearly basis, as well as globally and are by that of great importance.

## Background

The predominant information about light sources is technical and not in a high extent related to human visual and physiological impact. There is a need of an increase in the knowledge about the interaction between man and artificial light sources and about the psychologically, physiologically and ergonomically direct impact from nanometers. In 'The impact of modern science on lighting quality' (CIE 2010, 122-123) Liljefors invite to adapt modern science in vision and the interaction between man and light as a foundation for the evaluation of the human impact from electromagnetic radiation emitted from light sources. In 'Light response properties of intrinsically photosensitive retinal ganglion cells in non image-forming vision' Yasuko. K et.al (2009) picture the distinctive light response properties of iPRGCs that is the physiological system behind the direct human physiological impact from light sources.

## Aim and problem formulation

The aim of the study is to collect data about users' opinions about the light emitted from energy efficient light sources according to gender and geographical origin, including there visual preferences according to the level of light on the work space and level of complementary ambient light, the color of the light and the subject´s use of light sources at

home and their ability to judge the light emitted from light sources in the luminaries in Test Room 1 and 2. In this article the part of the study that concerns the subject´s opinions about the quality of the light emitted from the luminaries in Test Room 1 and 2 and the subject´s ability to identify the type of light source in the luminaries in the test rooms is interpreted.

## Method

The test subjects were recruited by e-mail (due to convenience) which was sent to all students at the School of Engineering. From the group that expressed an interest in participating, 100 people were selected based on a desire to obtain as even a distribution in age and geographical origins as possible. 87 people from 23 countries completed all stages of the study. The group consisted of 43 men and 44 women. The average age was 31 years.

### Formation of subgroups

The average values for the entire group's experiences were arrived at as a first step. The group was then divided into three subgroups: Scandinavians, Central Europeans and non-Europeans. Finally, the group was divided into men and women. The average values for the entire group of test subjects were compared with those of the subgroups. The average values obtained from each subgroup were subsequently compared with those of the other subgroups.

### Material

Freely formulated responses were assessed and were interpreted according to written guidelines for assessing positive and negative weighting. Each positive or negative light descriptive word was assigned one point. Data on the test persons' experiences of light were collected through a combination of semantic scales and questionnaires with freely formulated responses. In the latter case, the number of positive and negative descriptive words was counted.

### Design of the test rooms

All tests were conducted in six rooms. In two of these rooms, light colour, glare and individual preferences for lighting levels were evaluated with regards to levels of light on work surfaces and levels of ambient light. The other four rooms were labelled Test Rooms 1a and 1b and Test Rooms 2a and 2b. These four rooms will in this text be referred to as Test room 1 and Test room 2b. They were completely identical as far as the furniture was concerned, however Room 1a and 1b was designed with the same luminaries as Test room 2a and b, but was equipped with different light sources. The luminaries in Test Room 1a and 1b were fitted with LEDs, halogen bulbs and low energy efficient light bulbs, while Test Rooms 2a and 2b were fitted solely with LEDs.

Picture 1. Test Room 1.

Picture 2. Test Room 1.

Picture 3. Test Room 2.

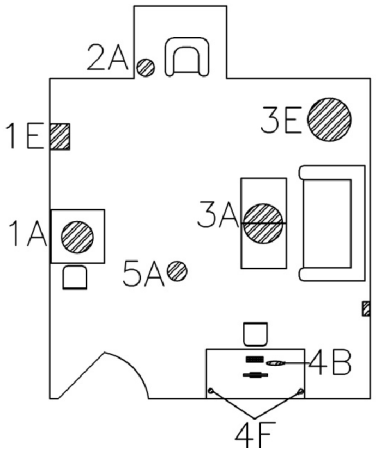
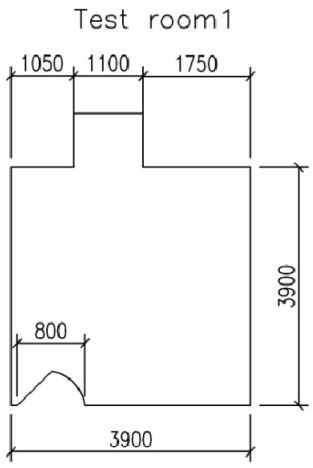



Figure 1. Coded floor plan.

Table 1. Lighting conditions in Test Room 1 and 2.

| **Test Room 1** | | **Test Room 2** | |
|---|---|---|---|
| 1A | Pendant luminaire. Compact fluorescent 11W E27, 2700K | 1A | Pendant luminaire LED 8W E27 |
| 1E | Wall luminaire.<br>Compact fluorescent 2x7W, E27, 2700K | 1E | Wall luminaire LED 2x4W E27 |
| 2A | Reading luminaire. Compakt fluorescent 7W, E14, 2700K | 2A | Reading luminaire LED 1,6W E14 Warm white |
| 3A | Pendant luminaire Compact fluorescent 8W, E27, 2700K | 3A | Pendant luminaire LED 2W E27 Warm white |
| 3E | Floor luminaire,<br>LED, 1,6W, E27, Warm white | 3E | Floor luminaire, LED 1,6W, E27, Warm white |
| 3I | Wall luminarie Halogen 42W 230V, E27 | 3I | Wall luminaire LED 1,6W E27 Warm white |
| 4B | Reading luminaire Halogen 35W, 12V, GY 6.35 | 4B | Reading luminaire LED 9W 18V 800 mA Warm white |
| 4F | Ceiling luminaire Compact fluorescent 7W, GX53 | 4F | Ceiling luminaire LED 3W, 700 mA |
| 5A | Ceiling luminaire Compact fluorescent 7W, E27, 825 | 5A | Ceiling luminaire LED 2W, E27, Warm white |



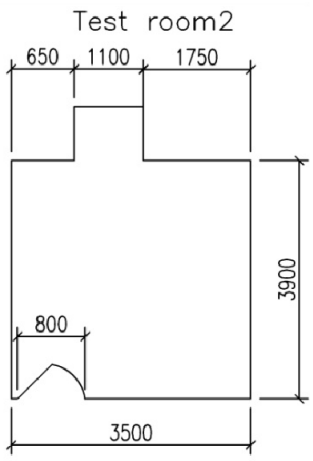




Figure 2. Floor plan 1.

Figure 3. Floor plan 2.

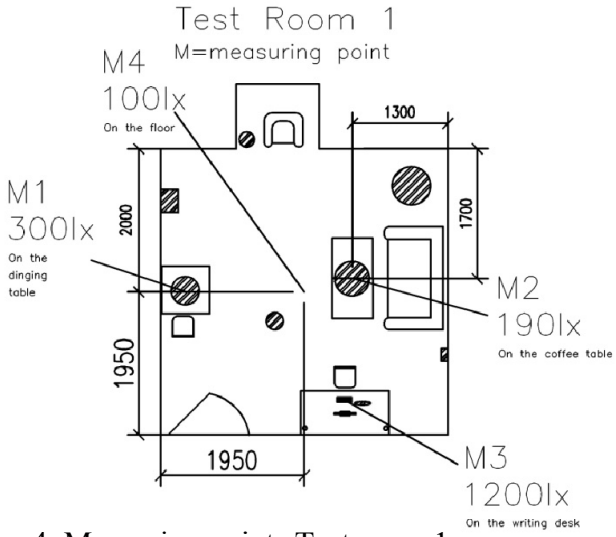



Figure 4. Measuring points Test room 1.

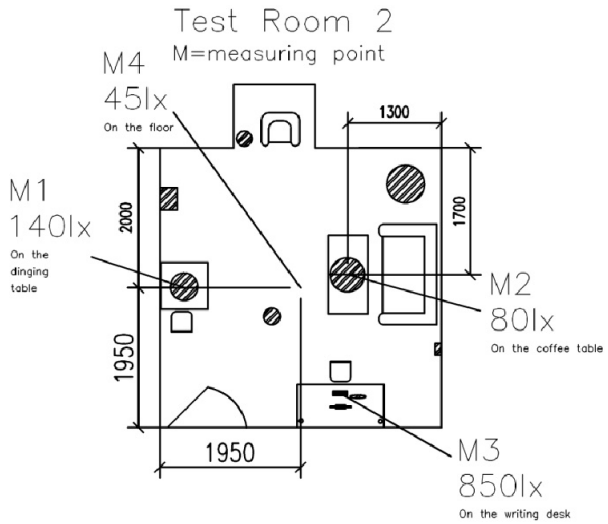



Figure 5. Measuring points Test room 2.

Table 2. Measuring points Test room 1 and 2.

| **Lux** | | | | |
|---|---|---|---|---|
| Measuring point 1 Dining table | Test Room 1 | 300 | Test Room 2 | 140 |
| Measuring point 2 Coffee table | Test Room 1 | 190 | Test Room 2 | 80 |
| Measuring point 3 Writing desk | Test Room 1 | 1200 | Test Room 2 | 850 |
| Measuring point 4 Middle of the floor | Test Room 1 | 100 | Test Room 2 | 45 |

## Procedure

The following is the procedure for conducting the study for the test subjects who began in Test Room 1. The allotted time was 50 minutes. The test subjects arrived and were each given a folder. They then carried out a test of visual comfort, after which they recorded the light sources they had at home on a questionnaire. They then received oral information about how the trial was to be conducted. An MP3 player in the room gave the test subjects information about the study's activity plan. Evaluation of the fixtures was carried out. Test subjects evaluated whether the light they were seeing in the room matched the light to which they were accustomed at home. They were then asked to state the way in which they were similar, and to describe the differences if the light did not correspond with the type they had at home. The test subjects were then asked to record their feelings of alertness, fatigue and wellbeing using a scale from 1-5 (a little – a lot). The trial was concluded after approximately 50 minutes.

The following is the procedure for conducting the study for the test subjects who began in Test Room 2. The allotted time was 50 minutes. The test subjects arrived and were each given a folder. They then conducted a study of lighting quality by describing the light in boxes 1-5 in their own words. They were asked to evaluate the quality of the light by assigning a score on a scale of 1-10, where 1=low and 10=high. The study of visual variation in the light on the wall included the test subjects being asked to look at the light source on the wall for one minute and then describe, in their own words, whether they felt that the light had changed during the time they had been observing it. They were asked to describe how the light had changed. The test subjects then carried out a glare test. A box with five different filters was placed on the floor. The test subject stood in a marked square, looking at the light in the box. The test subjects were asked to describe their experience of looking at the five alternatively lit surfaces on a scale of 1-10, with 1=uncomfortable and 10=comfortable. The test subjects received oral information about how the trial was to be conducted. An MP3 player in the room provided test subjects with information about the study's activity plan. Evaluation of the fixtures was carried out. Test subjects evaluated whether the light they were seeing in the room matched the light to which they were accustomed at home. They were then asked to state the way in which they were similar, and to describe the differences if the light did not correspond with the type they had at home. The test subjects were then asked to describe their feelings of alertness, fatigue and well-being on a scale from 1-5 (a little – a lot). The trial was concluded after approximately 50 minutes. The test subjects then continued to the next room, either Room 1 or 2, depending on where they had commenced the study.

## Methods for data analysis

Data was evaluated by counting positive or negative words used for subject's opinion of the light emitted from the luminaries in Test Room 1 or 2. Data was compared between the

subgroups. Data from the questionnaire used for collecting data about the subject's evaluation of the light sources in the luminaries in Test Room 1 and 2 was compared between the subgroups.

## Results

**P1**=Comfortable, soft, cozy, nice, warm, relaxing, peaceful **P2**=Well functioning level of light, bright enough **P3**=Well functioning spread of the light **N1**=Uncomfortable, unpleasant, disturbing **N2**=Not well functioning level of light. Too high, too low, bad light **N3**=Not well functioning spread of the light

| **Test Room 1** | Positive | | | Negative | | |
|---|---|---|---|---|---|---|
| **Pendant kitchen luminary** | P1 | P2 | P3 | N1 | N2 | N3 |
| Entire group (87) | 88 | 31 | 3 | 51 | 33 | 4 |
| Scandinavians (38) | 39 | 12 | 2 | 31 | 11 | 1 |
| Europeans (22) | 25 | 8 | 0 | 11 | 14 | 2 |
| Non- Europeans (27) | 24 | 11 | 1 | 9 | 8 | 1 |
| All Men (43) | 42 | 17 | 2 | 21 | 13 | 3 |
| All Women (44) | 46 | 14 | 1 | 30 | 20 | 1 |
| **Large wall luminary** | | | | | | |
| Entire group (87) | 122 | 22 | 1 | 22 | 21 | 3 |
| Scandinavians (38) | 69 | 6 | 0 | 12 | 6 | 0 |
| Europeans (22) | 30 | 9 | 1 | 8 | 6 | 1 |
| Non- Europeans (27) | 23 | 7 | 0 | 2 | 9 | 2 |
| All Men (43) | 56 | 12 | 1 | 8 | 10 | 1 |
| All Women (44) | 66 | 10 | 0 | 14 | 11 | 2 |
| **Reading luminary** | | | | | | |
| Entire group (87) | 46 | 15 | 2 | 60 | 62 | 4 |
| Scandinavians (38) | 36 | 9 | 0 | 24 | 25 | 0 |
| Europeans (22) | 4 | 3 | 1 | 17 | 19 | 2 |
| Non- Europeans (27) | 6 | 3 | 1 | 19 | 18 | 2 |
| All Men (43) | 22 | 7 | 1 | 22 | 31 | 2 |

**P1**=Comfortable, soft, cozy, nice, warm, relaxing, peaceful **P2**=Well functioning level of light, bright enough **P3**=Well functioning spread of the light **N1**=Uncomfortable unpleasant, disturbing **N2**=Not well functioning level of light. Too high, too low, bad light **N3**=Not well functioning spread of the light

| **Test Room 2** | Positive | | | Negative | | |
|---|---|---|---|---|---|---|
| **Pendant kitchen luminary** | P1 | P2 | P3 | N1 | N2 | N3 |
| Entire group (87) | **55** | **25** | **3** | **83** | **41** | **2** |
| Scandinavians (38) | **33** | **10** | **2** | **44** | **15** | **1** |
| Europeans (22) | **7** | **6** | **0** | **28** | **13** | **1** |
| Non- Europeans (27) | **15** | **9** | **1** | **11** | **13** | **0** |
| All Men (43) | **26** | **13** | **1** | **30** | **20** | **0** |
| All Women (44) | **29** | **12** | **2** | **53** | **21** | **2** |
| **Large wall luminary** | | | | | | |
| Entire group (87) | **92** | **7** | **2** | **45** | **36** | **7** |
| Scandinavians (38) | **47** | **2** | **1** | **28** | **12** | **3** |
| Europeans (22) | **24** | **2** | **0** | **13** | **16** | **2** |
| Non- Europeans (27) | **21** | **3** | **1** | **4** | **8** | **2** |
| All Men (43) | **37** | **3** | **2** | **15** | **20** | **4** |
| All Women (44) | **55** | **4** | **0** | **30** | **16** | **3** |
| **Reading luminary** | | | | | | |
| Entire group (87) | **54** | **16** | **4** | **65** | **52** | **6** |
| Scandinavians (38) | **33** | **4** | **2** | **39** | **24** | **4** |
| Europeans (22) | **13** | **4** | **0** | **20** | **15** | **0** |
| Non- Europeans (27) | **8** | **8** | **2** | **6** | **13** | **2** |
| All Men (43) | **23** | **8** | **3** | **22** | **24** | **5** |

| **P1**=Comfortable, soft, cozy, nice, warm, relaxing, peaceful **P2**=Well functioning level of light, bright enough **P3**=Well functioning spread of the light **N1**=Uncomfortable, unpleasant, disturbing **N2**=Not well functioning level of light. Too high, too low, bad light **N3**=Not well functioning spread of the light | | | | | | |
|---|---|---|---|---|---|---|
| All Women (44) | 24 | 8 | 1 | 38 | 31 | 2 |
| **Floor luminary** | | | | | | |
| Entire group (87) | 108 | 20 | 6 | 56 | 29 | 2 |
| Scandinavians (38) | 48 | 5 | 3 | 35 | 13 | 0 |
| Europeans (22) | 28 | 8 | 2 | 14 | 8 | 1 |
| Non- Europeans (27) | 32 | 7 | 1 | 7 | 8 | 1 |
| All Men (43) | 55 | 8 | 4 | 14 | 21 | 2 |
| All Women (44) | 53 | 12 | 2 | 42 | 8 | 0 |
| **Pendant luminary** | | | | | | |
| Entire group (87) | 116 | 30 | 8 | 24 | 22 | 2 |
| Scandinavians (38) | 60 | 9 | 4 | 15 | 11 | 1 |
| Europeans (22) | 33 | 11 | 2 | 5 | 5 | 1 |
| Non- Europeans (27) | 23 | 10 | 2 | 4 | 6 | 0 |
| All Men (43) | 53 | 10 | 1 | 11 | 11 | 2 |
| All Women (44) | 63 | 20 | 7 | 13 | 11 | 0 |
| **Small wall luminary** | | | | | | |
| Entire group (87) | 97 | 18 | 4 | 31 | 21 | 7 |
| Scandinavians (38) | 53 | 4 | 1 | 15 | 8 | 4 |
| Europeans (22) | 24 | 6 | 2 | 9 | 4 | 2 |
| Non- Europeans (27) | 20 | 8 | 1 | 7 | 9 | 1 |
| All Men (43) | 43 | 9 | 3 | 16 | 12 | 2 |
| All Women (44) | 54 | 9 | 1 | 15 | 9 | 5 |
| **Desk luminary** | | | | | | |
| Entire group (87) | 79 | 43 | 9 | 38 | 25 | 2 |
| Scandinavians (38) | 46 | 17 | 3 | 19 | 12 | 1 |
| Europeans (22) | 17 | 12 | 3 | 10 | 6 | 0 |

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|---|---|---|---|---|---|---|
| All Women (44) | **31** | **8** | **1** | **43** | **28** | **1** |
| **Floor luminary** | | | | | | |
| Entire group (87) | **128** | **14** | **4** | **30** | **29** | **3** |
| Scandinavians (38) | **63** | **5** | **3** | **19** | **9** | **1** |
| Europeans (22) | **35** | **4** | **0** | **7** | **12** | **1** |
| Non- Europeans (27) | **30** | **5** | **1** | **4** | **8** | **1** |
| All Men (43) | **50** | **8** | **3** | **14** | **15** | **2** |
| All Women (44) | **78** | **6** | **1** | **16** | **14** | **1** |
| **Pendant luminary** | | | | | | |
| Entire group (87) | **103** | **20** | **2** | **31** | **38** | **2** |
| Scandinavians (38) | **52** | **11** | **1** | **16** | **13** | **0** |
| Europeans (22) | **23** | **1** | **1** | **11** | **15** | **2** |
| Non- Europeans (27) | **28** | **8** | **0** | **4** | **10** | **0** |
| All Men (43) | **45** | **11** | **0** | **15** | **20** | **0** |
| All Women (44) | **58** | **9** | **2** | **16** | **18** | **2** |
| **Small wall luminary** | | | | | | |
| Entire group (87) | **79** | **11** | **3** | **34** | **40** | **5** |
| Scandinavians (38) | **38** | **4** | **3** | **21** | **13** | **2** |
| Europeans (22) | **27** | **1** | **0** | **10** | **12** | **1** |
| Non- Europeans (27) | **14** | **6** | **0** | **3** | **15** | **2** |
| All Men (43) | **30** | **6** | **1** | **13** | **22** | **2** |
| All Women (44) | **49** | **5** | **2** | **21** | **18** | **3** |
| **Desk luminary** | | | | | | |
| Entire group (87) | **109** | **42** | **5** | **31** | **22** | **5** |
| Scandinavians (38) | **64** | **14** | **2** | **16** | **8** | **0** |
| Europeans (22) | **30** | **10** | **0** | **9** | **6** | **3** |

| **P1**=Comfortable, soft, cozy, nice, warm, relaxing, peaceful **P2**=Well functioning level of light, bright enough **P3**=Well functioning spread of the light **N1**=Uncomfortable, unpleasant, disturbing **N2**=Not well functioning level of light. Too high, too low, bad light **N3**=Not well functioning spread of the light | | | | | | |
|---|---|---|---|---|---|---|
| Non- Europeans (27) | 16 | 14 | 3 | 9 | 7 | 1 |
| All Men (43) | 33 | 17 | 5 | 18 | 14 | 1 |
| All Women (44) | 46 | 26 | 4 | 20 | 11 | 1 |
| **Two ceiling luminary** | | | | | | |
| Entire group (87) | 62 | 18 | 12 | 42 | 27 | 6 |
| Scandinavians (38) | 38 | 5 | 7 | 20 | 10 | 3 |
| Europeans (22) | 11 | 7 | 2 | 12 | 10 | 1 |
| Non- Europeans (27) | 13 | 6 | 3 | 10 | 7 | 2 |
| All Men (43) | 28 | 11 | 8 | 18 | 12 | 2 |
| All Women (44) | 34 | 7 | 4 | 24 | 15 | 4 |
| **Ceiling luminary** | | | | | | |
| Entire group (87) | 76 | 18 | 4 | 38 | 27 | 5 |
| Scandinavians (38) | 39 | 8 | 3 | 23 | 12 | 2 |
| Europeans (22) | 16 | 1 | 1 | 13 | 10 | 1 |
| Non- Europeans (27) | 21 | 9 | 0 | 2 | 5 | 2 |
| All Men (43) | 33 | 11 | 1 | 18 | 16 | 1 |
| All Women (44) | 43 | 7 | 3 | 20 | 11 | 4 |

| **P1**=Comfortable, soft, cozy, nice, warm, relaxing, peaceful **P2**=Well functioning level of light, bright enough **P3**=Well functioning spread of the light **N1**=Uncomfortable unpleasant, disturbing **N2**=Not well functioning level of light. Too high, too low, bad light **N3**=Not well functioning spread of the light | | | | | | |
|---|---|---|---|---|---|---|
| Non- Europeans (27) | **15** | **18** | **3** | **6** | **8** | **2** |
| All Men (43) | **47** | **16** | **4** | **15** | **9** | **3** |
| All Women (44) | **62** | **26** | **1** | **16** | **13** | **2** |
| **Two ceiling luminary** | | | | | | |
| Entire group (87) | **50** | **12** | **6** | **41** | **40** | **6** |
| Scandinavians (38) | **23** | **4** | **4** | **26** | **19** | **4** |
| Europeans (22) | **15** | **6** | **0** | **9** | **9** | **2** |
| Non- Europeans (27) | **12** | **2** | **2** | **6** | **12** | **0** |
| All Men (43) | **20** | **5** | **5** | **20** | **21** | **3** |
| All Women (44) | **30** | **7** | **1** | **21** | **19** | **3** |
| **Ceiling luminary** | | | | | | |
| Entire group (87) | **42** | **4** | **0** | **54** | **57** | **4** |
| Scandinavians (38) | **22** | **0** | **0** | **35** | **22** | **2** |
| Europeans (22) | **14** | **2** | **0** | **14** | **13** | **1** |
| Non- Europeans (27) | **6** | **2** | **0** | **5** | **22** | **1** |
| All Men (43) | **20** | **3** | **0** | **24** | **24** | **2** |
| All Women (44) | **22** | **1** | **0** | **30** | **33** | **2** |

| **Test rom** | **Number of subjects that evaluate the light sour-ces in the luminaries correct. The lowest and the highest value.** | **Number of subjects that evaluates low-energy light bulbs and Led as incandescent. The lowest and the highest value.** | **Number of subject that evaluates incandescent as LED or low- energy light bulbs.** |
|---|---|---|---|
| Entire group | | | |
| 1 | 25-53/87 | 5-37/87 | 37-40/87 |
| 2 | 5-34/87 | 16-35/87 | |

| Test rom | Number of subjects that evaluate the light sources in the luminaries correct. The lowest and the highest value. | Number of subjects that evaluates low-energy light bulbs and Led as incandescent. The lowest and the highest value. | Number of subject that evaluates incandescent as LED or low- energy light bulbs. |
|---|---|---|---|
| Scandinavians | | | |
| 1 | 9-24/38 | 9-20/38 | 12-19/38 |
| 2 | 4-17/38 | 6-15/38 | |
| Europeans | | | |
| 1 | 5-14/22 | 2-15/22 | 7-10/22 |
| 2 | 1-8/22 | 2-11/22 | |
| Non- Europeans | | | |
| 1 | 5-16/27 | 8-11/27 | 11-18/27 |
| 2 | 1-9/27 | 5-12/27 | |
| All men | | | |
| 1 | 11-28/43 | 8-20/43 | 15/22/43 |
| 2 | 3-21/43 | 4-18/43 | |
| All women | | | |
| 1 | 8-26/44 | 9-23/44 | 15/25/44 |
| 2 | 1-13/44 | 8-19/44 | |

## Discussions of results

The results in this study are originated from the way the material in the luminaries modulated the light from the light sources. The ambition was to make the transition from applications equipped with different energy efficient light sources to the same applications solely equipped with LED and measure the experience.

## Discussion of methods

The choice of research method is guided by the ambition to place as a priority the user's visual preferences. User responses can be used as a foundation for the development of lighting technique. In this study the subjects that have words for the experience of the light emitted from the luminaries in the test rooms is well represented. The subjects that have difficulty in putting words on their experiences are not represented to the same extent. If the level of visual

awareness and the ability to put words on the experience was used as a method for selection of the test subjects the quality of data in the study could probably be higher. The study is based on artificial light only. The evaluation of the light emitted from artificial light sources will be different if the light is compared to daylight be different. In this case the study is done with the ambition to collect data about visual preferences connected specifically to artificial light and to the chosen types of light sources. It is important to have in mind in lighting studies that the visual experience of the light emitted from the light sources is relative and depends on the references in the eyesight.

## Conclusion

The study reveals that visual comfort is an obstacle for the transition from the use of incandescent to the more energy efficient light sources in domestic environments. When the freely formulated answers and the words used for evaluation of the quality of the light emitted from energy efficient light sources in Test Room 1 and 2 were counted, the most frequently used words for positive response with just a few exceptions was concerning visual comfort. Visual support from the light was mentioned with less words and light distribution was mentioned with just a few words. The words used for the experience of visual comfort were comfortable, soft, cozy, nice, warm, relaxing, and peaceful. For the experience of positive visual support from the light the subject´s used most frequently the words, well- functioning level of light, bright enough and good enough. The words used for the positive experience of light distribution were well -functioning light distribution. The negative evaluation of the light emitted from the luminaries in Test Room 1 and 2 was mentioned in the same order as the positive. The most frequently used negative words concerned lack of visual comfort (uncomfortable, unpleasant, disturbing**)**. Then lack of visual support was mentioned (not well functioning level of light, too bright, too dark). With the least words the light distribution was mentioned **(**not well -functioning light distribution). With just a few exceptions both positive and negative evaluations followed the same pattern, visual comfort most frequently mentioned, visual support mentioned in some extent and light distribution rarely mentioned. When the results of the evaluation of the light emitted from the light sources and luminaries in Test Room1 and 2 is analyzed the subject´s point out the light in Test room 1 equipped with Led, Halogen and low energy light bulbs as having a higher level of quality than the light from the luminaries in Test room 2, only equipped with LED. This indicates that the subjects wish for quality in light is not met in the same extent in Test room 2. A possible explanation for the positive response among the subjects in Test room 1 is that halogen brings a certain amount of warmth, clear colors and visual variation to the room that is appreciated by the subjects.

The subject's knowledge about the basic characteristics in the light emitted from energy efficient light sources is low in the study. The number of subjects that evaluate LED as halogen and halogen as LED shows the subject´s difficulties in judging the light source´ s but also the potential in the development in LED and the design of the luminary. The practical consequences of the study is that the users need of visual comfort and need for support for visual work tasks is pointed out by the subject´s use of words. LED is by the subject´s evaluated as in the applications in Test room 2, less comfortable, cozy, nice, warm, relaxing and peaceful and as giving less support for work tasks than the same luminaires equipped with a combination of LED, Halogen, low energy light sources. There is a challenge for Lighting Technicians to develop the LED replacement light sources in the direction towards general visual preferences. If not succeeded the light source can be an obstacle for the fast transition towards an increase in the use of energy efficient lighting sources.

This study is a first step towards a mapping of user responses to LED in domestic environments.

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