AUTHORS

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Commercial Relationships Disclosure (Abstract): Lorie St-Amour: Commercial Relationship: Code N (No Commercial Relationship) | William Seiple: Commercial Relationship: Code N (No Commercial Relationship) | Jonathan Jarry : No Answer. | Walter Wittich: Commercial Relationship: Code N (No Commercial Relationship)Study Group:

ABSTRACT

TITLE: Test re-test reliability of luminance and color temperature preferences in normally sighted and low vision patients using the LuxIQABSTRACT BODY:Purpose:

Optimal lighting is an essential component of low vision rehabilitation. The LuxIQ assessment tool provides a new opportunity for systematic evaluation of lighting needs; however, to date, this tool has not been evaluated for its ability to provide consistent and repeatable data. The goal of this study was to compare test and re-test data for luminance and color temperature preferences under controlled ambient lighting conditions as well as clinically realistic illumination conditions.

Methods: Luminance intensity (Lux) and color temperature (Kelvin) preferences were assessed using the LuxIQ in 15 men and 15 women (ages 7 to 96) with low vision (VA 20/25 to 20/2400) and 19 normally sighted participants (ages 21 to 57). The low vision data were collected under uncontrolled conditions, e.g., in the clients' homes, whereas the control data were obtained at 625 Lux ambient illumination. Participants were asked to adjust the intensity to the level they would find most comfortable while reading, whereby color temperature was fixed at a level of 6500 K. They then had to adjust the color temperature to their preferred level as well. Finally, they had to re-verify the intensity level. The entire procedure was repeated 30 minutes later.

Results: Using Bland-Altman plots, the 95% limits of agreement (LoA) of inter-test difference scores were calculated. For luminance intensity, the LoAs were -1305 to 1122 Lux and -1572 to 1251 Lux, for normally sighted and low vision patients, respectively. For colour temperature, the LoAs were -640 to 504 Kelvin and -1097 to 1238 Kelvin, for normally sighted and low vision patients, respectively. The mean difference scores ranged from -160 to 70. Conclusions: The range of differences between repeated measurements of luminance intensity was between 2500 and 3000 Lux, depending on the administration conditions and the clientele. For color temperature, this range was smaller for normally sighted individuals (572 Kelvin) than that for persons with low vision (1167 Kelvin). These data hint at the importance of controlling ambient illumination during administration of the LuxIQ. The next steps are to evaluate which size of measurement

difference is clinically relevant to the functional abilities of low vision patients. (No Image Selected)

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.: Optimal lighting is an essential component of low vision rehabilitation. A new assessment tool, the LuxIQ, is claimed to be capable of systematic evaluation of lighting needs. Because of its size, convenience, and scope, it could easily replace the multiple lamps and bulbs a low vision rehabilitation specialist has to bring to a client's home for a lighting assessment. However, no one has evaluated the consistency and repeatability of its results. We compared the preferred luminance and light color chosen by a cohort of individuals with low vision (and normally sighted controls) on the LuxIQ before and after a thirty-minute period, to evaluate if these values would be consistent over time. In terms of luminance intensity, we found a difference of 2500 to 3000 lux; for light color, we found a much smaller range for normally sighted individuals (572 Kelvin) than for persons with low vision (1167 Kelvin). Whether these differences are clinically relevant remains to be evaluated.

DETAILS

TRAVEL GRANTS and AWARDS APPLICATIONS: ARVO Members-in-Training Outstanding Poster Award

Test re-test reliability of luminance and color temperature preferences in normally sighted and low vision patients using the LuxIQ

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No commercial relationship to disclose for any of the authors

INTRODUCTION

- The effect of optimal lighting on reading in individuals with low vision has been discussed repeatedly[1-4]. However, the systematic evaluation of lighting needs remains problematic[5].
- The LuxIQ is a device designed to facilitate the evaluation of lighting needs, but to date its validity and reliability have never been assessed independently.
- The goal of this study was to compare test and re-test data for luminance and color temperature preferences using the LuxIQ in order to evaluate its ability to provide consistent and repeatable data.

METHODOLOGY

- Luminance intensity (lux) and color temperature (Kelvin) preferences were assessed twice in 21 men and 30 women (ages 8 to 100) with low vision (VA 20/25 to 20/600) and 24 normally sighted participants (ages 20 to 71), each set of measurement separated by 30 minutes.
- Data from low vision participants were collected in their homes (ambient lighting not controlled), while data from normally sighted participants were gathered under controlled lab conditions, with ambient lighting fixed at 625 lux, while reading an MNRead paragraph at a print size chosen by the participant based on comfort.

CONCLUSION

- The range between measurements was smaller within the normally sighted group under lab-controlled conditions (optimal scenario), whereas this range increased with visually impaired individuals in their home. This difference, however, was not statistically significant.
- Next steps are to test whether ambient lighting influences the repeatability of the LuxIQ and evaluate which size of measurement difference is clinically relevant to the functional abilities of low vision patients.

ANALYSIS

Bland-Altman bubble plots show the luminance or color temperature difference scores as a function of mean luminance or color temperature. Bubble size represents the frequency of the data points in case of overlap. Means are illustrated by black lines, while the dotted lines represent two standard deviations above and below the mean. Green lines represent trend lines for correlations among the data within each Bland-Altman plot, examining possible bias in the data.

Neither luminance nor temperature difference scores differed statistically between normally sighted and visually impaired participants, $F(1,73) = .16$ and $.44$, respectively, p = ns. Levene's test for homogeneity of variance indicated that the distributions of the data on luminance and temperature difference scores did not differ significantly, $F(1,73) = .01$ and $.29$, respectively, p = ns. Pearson's correlation coefficients among the mean and difference scores are all close to zero (0.01, 0.01, 0.02, and 0.00), indicating an absence of systematic bias within these data sets.

Data points displayed a more noticeable scatter along the X axis (mean value) for visually impaired participants compared to normally sighted ones. Measured values of luminance and color temperature appear more likely to be the same (larger bubbles) for normally sighted individuals.

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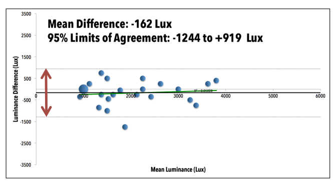
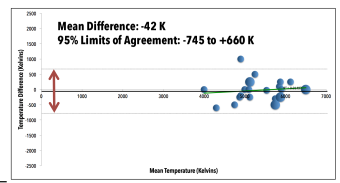
4. Bowers, A. R., Meek, C., & Stewart, N. (2001). Illumination and reading performance in age-related macular degeneration. Clinical and Experimental Optometry, 84(3), 139-147.
5. Perlmutter, M. S., Bhorade, A., Gordon, M., Hollingsworth, H., Engsberg, J. E., & Baum, M. C. (2013). Home lighting assessment for clients with low vision. The American Journal of Occupational Therapy, 67(6), 674.

LUMINANCE

COLOR TEMPERATURE

NORMALLY SIGHTED





VISUALLY IMPAIRED