Illumination research as part of a visual assessment of visually impaired individuals

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Abstract. In this paper we describe a method for the preliminary assessment of the illumination needs of partially sighted individuals. The method is based on determining the smallest readable lettersize under different levels of illumination. Half of the partially sighted in our population had a performance that was dependent upon the level of illumination. At the same time, most of those for whom no improvement in performance was found, did express a preference for a certain level of illumination. Therefore, there remain discrepancies between the objectively determined optimal level and the preference for a certain level. We conclude that the current method is a useful but insufficient method of determining the illumination needs of partially sighted individuals.

Introduction

Assessment of the visual capacities of visually impaired persons increases the knowledge about their visual perception. The information about their remaining visual capacities obtained in this manner, together with information about psychological and social factors, can be used to provide an individually suited rehabilitation treatment. Visual assessment, in our project,* comprises the measurement of visual acuity, contrast sensitivity, intraocular glare, visual fields (perimetry), binocular vision, dark-adaptation and colour vision. These measurements are all carried out using standard procedures and standardised techniques. However, for most techniques the determinations need to be carried out using somewhat extended

* The research project 'Low vision rehabilitation' is a cooperative study between the Department of Ophthalmology of the University of Groningen and Visio's Regional Institute North in Haren (a regional institute for the visually impaired and blind). Similar projects are being carried out at Visio's regional institutes in Amsterdam and Rotterdam. The aim of the projects is to establish visual assessment centres for visually impaired people at the regional institutes (some more information on these projects can be found in: Kooijman, Cornelissen, De Jong and Looijestijn [3]).
ranges as compared to those on commercially available equipment (e.g. for visual acuity and contrast sensitivity measurement). In addition to the information provided by these measurements, we are also interested in the effect of illumination on visual performance. Adjusted illumination is regarded as an additional useful aid for the visually impaired. The currently accepted position is that the required level of illumination should be determined individually in order to obtain optimal visual performance. Furthermore, it should include complete assessment for each individual of the best light for each type of task to be performed [1, 2]. However, such a direct assessment is costly in time for both the investigator and the visually impaired person. A better approach therefore might be to first determine whether someone is likely to gain by adapted illumination. An indication of such improvement could then trigger further, more detailed investigations. The requirements for such a procedure are: it should provide good insight into improvement in visual performance due to changes in the illumination, and it should be relatively quick. In this paper we describe the results we have obtained with such a method for the preliminary assessment of the illumination needs of the visually impaired individual.

**Materials and method**

The aim of the assessment procedure is to determine whether someone’s visual performance improves when we either increase or decrease the level of illumination. Under three levels of illumination, a low (100 lux), a middle (500 lux), and a high (2000 lux) level, the smallest readable lettersize is determined using a reading chart (Fig. 1). By design this procedure fulfills one of the requirements, as this determination is relatively quick.

For reasons of simplicity we refer to this measure as 'reading acuity' in the remainder of the paper. However, we used no standard reading distance. For each individual, we determined whether reading acuity showed an improvement (i.e. a decrease in readable lettersize) at one level of illumination as compared to the other levels. The level at which reading acuity was highest is then regarded as the optimal level. If reading acuity was as high under the middle level as under one of the other levels, the middle level was recorded as the optimal level. Illumination was provided by fluorescent tubes (2 × Philips TLD15W33). The level of illumination was changed by varying the height of the fluorescent tube above the reading chart and was determined using a lux-meter (Metrawatt M × 4). For normal subjects, using this procedure and reading chart, no difference in reading acuity was found (as they could all read the smallest letter size even under the lowest level of illumination). In addition to determining best reading acuity, we asked our patients to express their personal preference as to what they regarded as the best level of illumination.