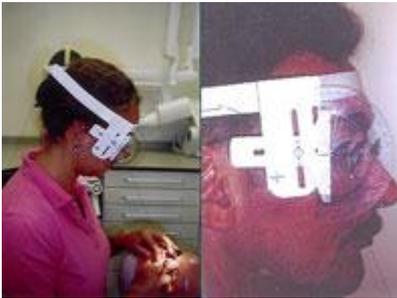


A group of dental students and a group of office employees were measured and compared. This study showed that an incorporated prism yielded the best effect and it appeared that there was a big difference between these two groups. A cervical spine flexion of > 25 degrees was measured for all dental students.



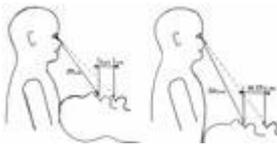
In the research into head flexion and eye rotation, a group of 12 practising dentists was measured. Measurement took place when they were looking at three different treatment areas, with and without spectacles with prisms.

The effect of the eye rotation when they looked at these three treatment areas was also examined for a standardised operating posture with neck flexion of 15 or 30 degrees respectively.

On the basis of questionnaires, a picture was formed of possible eye-related problems. All this data led to a determination of the refraction correction on the basis of a measured operating distance.



Before and during the use of special spectacles, participants were asked to list their perceived physical discomforts.



All this data led to four design alternatives from which, on the basis of the set requirements, a choice was made in favour of alternative three.

The total refraction is achieved by adding up the inclination of spectacles and the prism refraction. Its effect results in an intuitive image shift, where a larger viewing distance enlarges this image shift. In fact, the image does not move forward, but the viewing angle changes due to prismatic refraction.



Study results

The standardised operating posture displayed exceeded the set limit of 30 degrees of eye rotation both at 15 and at a 25 degree flexion of the cervical spine.

The eye rotation exceeds the 30 degree limit for the three treatment areas.

The problem - either more flexion of the head or further rotation of the eye.

The perceived physical discomfort improved so that five out of six dentists with neck complaints showed a considerable reduction in pain within ten days of use.

(However, this must be interpreted with due caution. Not all registrations were complete and there were some user problems with the prism spectacles, which may have influenced their effectiveness).

Conclusion

In this study, a significant reduction in eye rotation was found in three treatment areas and a reduction in neck flexion in two out of three treatment areas, due to the use of prisms.

It was concluded that a further study was required to improve the points of user experience indicated.

User Study "For Your Eyes Only"

Many dentists develop physical complaints during their careers, for instance back, shoulder and neck complaints. A research, among Dutch dentists, showed that 89% of the group observed bend their cervical spines forward far beyond the healthy limit of 25° for static working postures.

A previous study into the effect of spectacles with prisms (Wouters 2004) found that, when subjects looked at the elements studied in the standardised working posture, the eye rotation (at a cervical spine flexion of 15° and 25°) deviates significantly from 30°, i.e. is far higher. At each of the elements, the eye rotation is significantly less at a 15° flexion compared to 25°. It follows that working in a standardised upright seated posture is impossible if the starting point is a maximum eye rotation of 30° at a cervical spine flexion of 15° and 25° respectively on the three treatment positions studied. When the prism spectacles are worn with each of the elements, the eyeball depression is significantly lower at a 15° flexion compared to a 25° flexion. When the prism spectacles were used, a significantly lower flexion of the cervical spine was displayed with visibility on the treatment areas of the 3.5 and 1.1.

Problem definition

The questions for this study were: whether the use of special spectacles can improve the position of the cervical spine (reduced flexion of the cervical spine) and whether use of these spectacles has any effect on the eye rotation when spectacles are used with an inclination and a prism?

There was also the question as to the effect of the use of these spectacles on complaints in the neck area and whether any effect can be measured on the function (functional restrictions) of neck, shoulders and the thoracic spine?

In addition, research has taken place into user experience.

The first part of this study

In the first parts of the study, the viewing distance and horizontal working distance on three treatment positions in the mouth were measured with 15 subjects; 13 practising dentists, 1 practising dentist/lecturer and 1 practising orthodontist.

Optometric research was conducted and, after calculation of the image jump, the measurement data from the first study about the viewing distance and horizontal working distance enabled to calculate a spectacle prescription including the correct working distance, refraction correction and, if necessary, a near vision correction.

Next a physiotherapist/manual therapist examined and recorded the functionality of cervical spine and shoulders in accordance with a fixed protocol, both during the first visit to the subjects and after four weeks' use of the spectacles with prisms.

Before commencement of the study, the subjects completed an extensive questionnaire, on the basis of which a selection took place according to fitness for the study by excluding a number of inclusion factors. The subjects were selected after application. They responded to a notice in the NT magazine (Dutch magazine for dentists). All subjects had complaints in the neck region.

After four weeks' use of the spectacles with prisms, a new questionnaire was submitted to them. The two lists were compared. The second list also contained questions on user experience in addition to questions on optometrics and complaints.

The second part of this study

In the second part of the study, the flexion of the cervical spine was electronically measured, as was the downward eye rotation at three treatment positions in the mouth with a specially developed instrument. The starting point was the preferred posture of the subjects in their own practices at their own units. The same measurement was repeated in a standardised working posture. In all measurements, the viewing distance and the horizontal working distance were also recorded.

For this group of 15 subjects, spectacles with corrective plastic lenses, with a prism in the bottom segment of the spectacle lens, were put into a frame. The frame was adjusted with an inclination. The effect of the resulting prismatic refraction was measured, again in the three treatment positions determined including working distance, cervical spine flexion and eyeball depression, as was the line between the 0 position of the pupil and the treatment area.

Next, the subjects worked with these spectacles in daily practice and completed the Perceived Physical Discomforts lists (Dutch LEO-lists). These lists were also filled in before use of the spectacles with prisms so a comparison of the perceived physical discomfort(s) could be made.

Study results

The effect of spectacles with a prismatic effect of 22.29 Δ dpt resulted in a significant improvement of the cervical spine flexion with visibility on the three treatment areas studied. Placement of the prisms directly in the bottom segment of the lens, where the segment centre is determined with a mirror test and the calculated horizontal working distance, appeared to be correct in practice. A number of subjects thought the prism surface was too small. One subject observes chromatic dispersion, mainly at the edges of the occlusal areas.

On each of the elements, there is a significant reduction in eye rotation when the spectacles with prisms are worn till below the 30 degree limit and a reduction in cervical spine flexion below the set limit of 25°.

12 of the 13 subjects who could participate in the entire study showed an objective improvement on the level of functional movement results and/or nature of possible restrictions and/or pain complaints, with a large distribution from little improvement to dramatic improvement. No improvement was measurable with subject two; she only showed small discomforts in both the first and the second study.

In the LEO registration analysis, 13 persons showed an improvement of the complaints in the neck and shoulder regions. One subject did not have any neck complaints at the time of the study and one subject showed only a marginal difference.