

Comparative performance trial of soft contact lenses and spectacles in suitability for alpine skiing

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Purpose

The aim of this trial was to compare soft contact lenses and spectacles when used at alpine skiing. Objective measures included especially visual acuity and contrast sensitivity, as well as the subjective ratings. All subjects were asked to use both vision devices while active skiing in a parallel group cross over trial design.

Material and Methods

Methods

The trial was conducted in Saas Fee, Switzerland between December 05 and 10, 2005. Thirty-five subjects with an average age of 41.6 ± 9.8 years were included in this trial. Two stations (base camp 1900 meter and peak station 3500 meter) were used for measurements and interviews three times a day (morning, noon and evening) and randomly allocated into two groups. The first group were asked to test contact lenses in alpine skiing whereas the second group tested spectacles. The next day included the device cross-over. The vision devices were switched between the groups and all objective and subjective measurement were repeated using the same methods and procedures as shown in Figure 1.

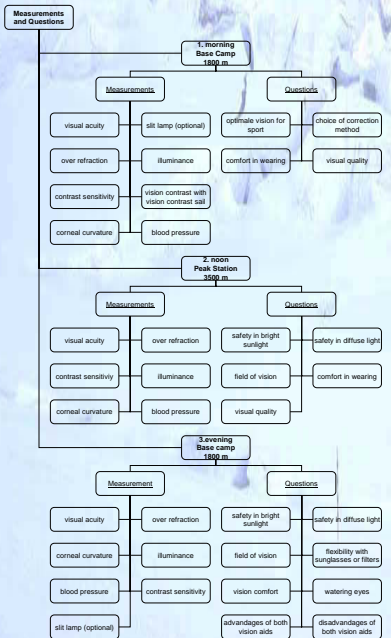


Figure 2 Downhill course and altitudes

Grading

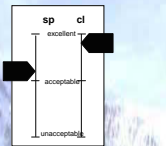


Figure 3 Visual analogue grading scale, front side
cl: spectacles
sp: contact lenses

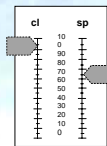


Figure 4 Visual analogue grading scale, back side

Figures 3 and 4 show the schematic principle of the grading scales used. These were made from plastic and used a mechanical slider for the assessments. Three times a day comfort and visual quality was graded by subjects using the visual analogue grading scales with verbal descriptors for both vision devices. The assessment of the subjects were transferred into values placed on the back of the device. The values were transferred to a paper case report form for documentation and analysis.

Results

Visual Acuity

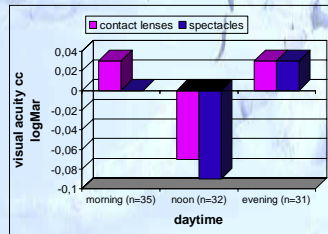


Figure 5 Visual acuity over the day

A statistical significant difference was found comparing contact lenses and spectacles, in the morning (Wilcoxon test, $p = 0.031$) and with the Friedman test ($p < 0.001$). In the morning, average visual acuity was 0.00 logMar ($=20/20$) with spectacles, and two letters worse with contact lenses. Visual acuity was best for both vision devices at the peak station (approximately 20/15). In the evening, back at the base camp, visual acuity was down by two letters from 20/20 with both correction methods.

Contrast Sensitivity

The contrast sensitivity was subjectively verified three times a day for each patient. The "sufficient" value of 0.03 with contact lenses at noon and in the evening is remarkable. The spectacles, with an average value of 0.02 at all times of the day, have proven to deliver best results. On the other hand, the contact lenses managed to provide an average logMar visual acuity of 0.02 in the morning; visual acuity decreases to an average logMar 0.03 at noon throughout the evening. Still, both values are in the range sufficiently. The Wilcoxon test shows a statistically significant difference between contact lenses and spectacles in the morning ($p=0.02$) and at noon ($p=0.001$). By comparing all times of the day (Friedman test) and both corrections, a statistical significance exists with $p=0.001$.

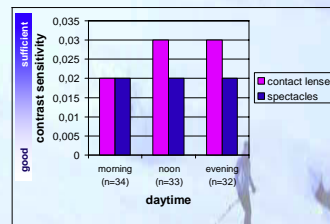


Figure 6 Contrast sensitivity over the day

Wearing comfort

For the evaluation of the comfort, the visual analogue slide with a grading scale of 0 (unacceptable) to 100 (excellent) was used, as shown in figures 3 and 4. The athletes were questioned in the morning at the base camp and later on at the peak station. Participants were asked to express their subjective experience about the comfort in wearing the respective correction method. Contact lenses felt comfortable the whole time, whereas the spectacles were sensed more unpleasantly in the morning. A statistically significant difference could not be proven with the Friedman test ($p = 0.147$).

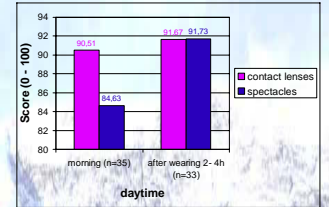


Figure 7 Wearing comfort over the day

Vision Quality and Vision Comfort

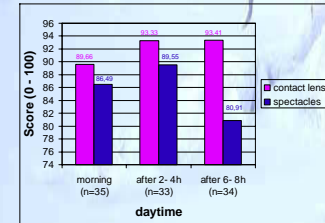


Figure 8 Vision quality and vision comfort over the day

Within all aspects of vision, contact lenses were regarded as the best solution all over the day. Also, in the morning and at noon, the opinions of the athletes show that the contact lenses provide a substantial advantage in vision. Subjective vision comfort with contact lenses rises during the course of the day, while vision comfort with spectacles was graded worse in the evening, compared to the other two times of the day. The Friedman test shows that there only exists a statistical significance if the assessment of the vision comfort in the evening is added to the statistical calculation ($n = 33$; $p = 0.004$). The reason for that was found in the overall improved vision during the course of the day for both vision devices ($n = 33$; $p = 0.649$). However, if the evening assessment is also taken into consideration, the decrease of the vision comfort with spectacles affects the calculation.

Choice of correction method

At the beginning of the study, 35 skiers were asked: which correction would you spontaneously choose for sports? Thirty test persons chose contact lenses and 5 of them to the spectacles, so 85.7% decided for contact lenses. The question was not posed again at the end of the trial but it might be assumed that the answers would have been the same because of the positive subjective ratings about contact lenses.

Conclusion

Both vision devices are good options for alpine skiing. Contact lenses showed better results in subjective ratings like comfort in wearing, vision quality and vision comfort in comparison to spectacles for visual acuity and contrast sensitivity. Although the measured data were in favour of spectacles most subjects felt better with contact lenses over the day and therefore contact lenses might be the first choice in recommending vision correction devices for alpine skiing.