

# BEHAVIOR OF THE ACCOMMODATION RESPONSE DURING THE SUBJECTIVE REFRACTION

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## PURPOSE

To study the relationship between the subjective refraction and the accommodative response by analyzing:

- The relative accommodation with the subjective refraction.
- The transition between relaxed and activated accommodation during the subjective refraction.

## MATERIALS AND METHODS

**Subjects:** 27 young healthy subjects between 18 and 30 years old.

**Set-up:** Hartmann-Shack aberrometer with a monitoring frequency of 10 Hz coupled to a phoropter working as an open-field system<sup>1</sup>. (See Figure 1)

**Measurement protocol:**

1. Monocular subjective refraction in the right eye.
2. Presentation of a sweep of lenses of spherical power ( $\Delta S$ ) from +1.50 D to -1.50 D in front of the eye wearing the subjective refraction while monitoring accommodation with the Hartmann-Shack system.



Figure 1. Set-up

**Analysis:**

1. The relative accommodation was obtained as the difference between the measured value of accommodation for each  $\Delta S$  and the minimum measured accommodation. For the subjective refraction, the relative accommodation was obtained for  $\Delta S=0$ .
2. The transition between relaxed and activated accommodation was obtained as follows:
  - 1st:** Obtention of two linear fitting for each spherical power  $\Delta S$  for the curves between -1.50 D and  $\Delta S$ , and between  $\Delta S$  and +1.50 D. (See dashed line in Figure 2, where curve fitting is shown for  $\Delta S=-0.5$  D)
  - 2nd:** The spherical lens  $\Delta S$  producing the linear fittings with the best cumulative coefficient of determination was selected as the transition point between relaxed and activated accommodation. (See red circle in Figure 2)

## RESULTS

### Accommodative response for the sweep of lenses

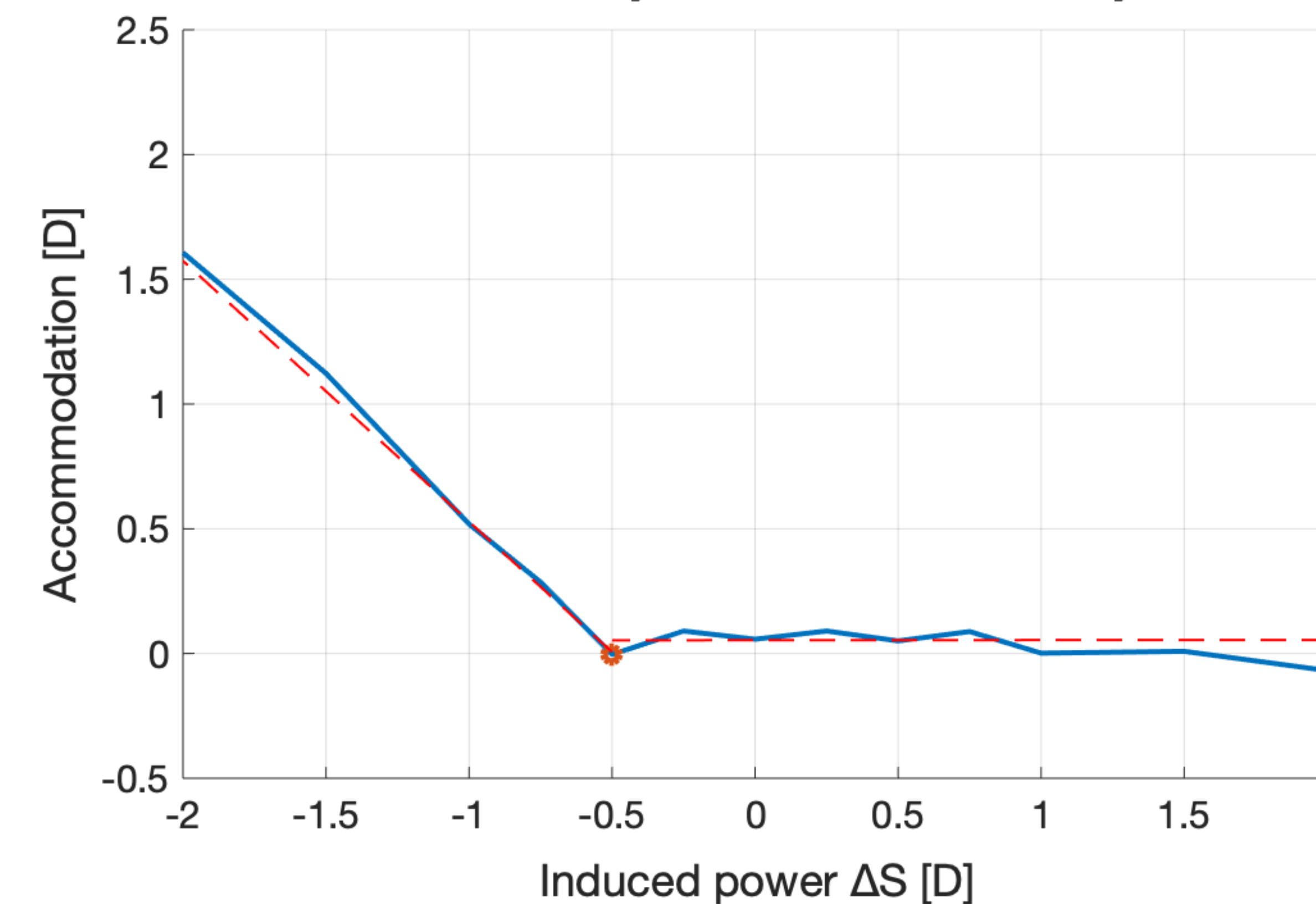


Figure 2. Accommodative response for a sweep of lenses.

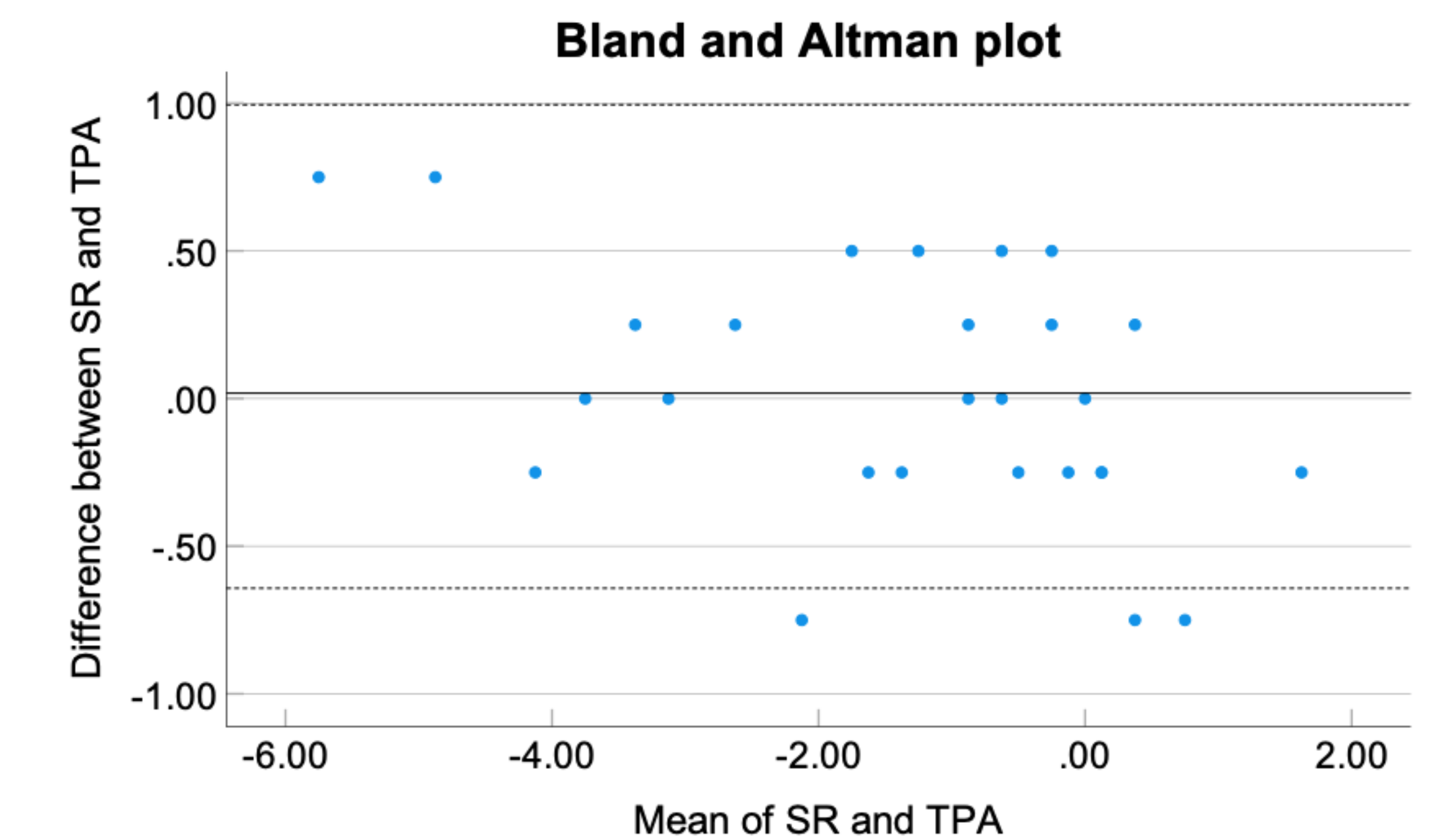


Figure 3. Bland and Altman analysis.

- The mean relative accommodation  $\pm$  SD with the subjective refraction was  $0.19 \pm 0.12$  D.
- The agreement between the subjective refraction (SR) and the the transition point of accommodation (TPA) is shown in the Bland and Altman plot, figure 3. The mean  $\pm$  SD of the differences between methods and 95% limits of agreement were  $0.019 \pm 0.42$  D (1.01 D, -0.64 D).

## CONCLUSIONS

- Considering the values of relative accommodation with the subjective refraction a tendency to have a residual activated accommodation can be observed.
- The transition between relaxed and activated accommodation may be a significant information and could be a useful supporting tool during subjective refraction

## References

1. C. E. García-Guerra, J. Martínez-Roda, M. Aldaba, S. Galera, C. Aransay, F. Díaz-Doutón, J. Pujol, M. Vilaseca; Real-time monitoring of accommodation during subjective refraction. *Invest. Ophthalmol. Vis. Sci.* 2020;61(7):1716.