Clinical Reliability of Portable Autorefractor for cataract Postoperative Patients

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Purpose

- To evaluate clinical reliability of objective auto-refraction, post phacoemulsification surgery, using the *PlusOptix* autorefractor device to measure sphere and cylinder.
- To quantify the agreement of repeated measurements made by the *PlusOptix* device, so as to establish its clinical reliability for future studies and/or applications in mainstream ophthalmology.

Methods

- All patients had undergone phacoemulsification cataract surgery at SpaMedica Eye Hospital, United Kingdom, in a high volume clinical setting.
- Patients were reviewed 4 weeks postoperatively and autorefraction, using the *PlusOptix* device, was conducted.
- Subjective refractions were obtained from referring opticians 1 week later.

Methods

- Upon postoperative examination, pupils were dilated and two consecutive object refraction readings were taken per eye.
- 149 eyes of 86 patients were included.
- Inter-measurement agreement was calculated per refractive measure (Bland-Altman) with 95% limits of agreement.
- 95% confidence intervals were constructed.
- The following were calculated for each refractive measure:
  - Mean difference
  - Standard deviation
  - Coefficient of reliability
  - Correlation Coefficient

Results

Sphere

Mean difference: 0.0336 D

Standard Deviation: 0.3495 D

Standard Error: 0.02863 D

Correlation Coefficient (r): 0.92443

Repeatability Coefficient: 0.699

95% CI: -0.0901 D to 0.02303 D

Distribution of differences in sphere measures

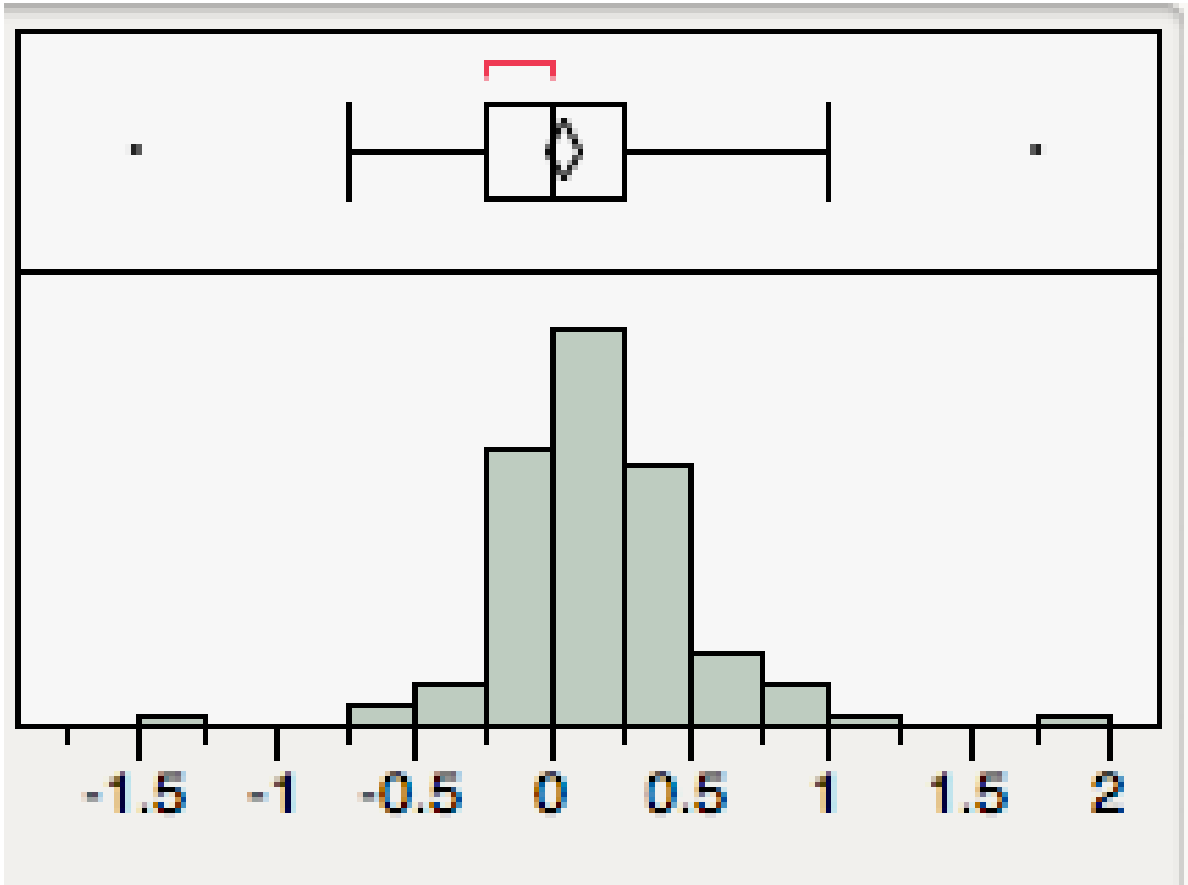

Figure S.1: Displays the distribution of differences in sphere readings 1 and 2. The distribution is approximately normal, with the exception of two visible outliers on opposite ends.

Results

Sphere

Mean difference: .0336 D

Standard Deviation: 0.3495 D

Standard Error: 0.02863 D

Correlation Coefficient (r): 0.92443

Repeatability Coefficient: 0.699

95% CI: -0.0901 D to 0.02303 D

Correlation between readings 1 and 2

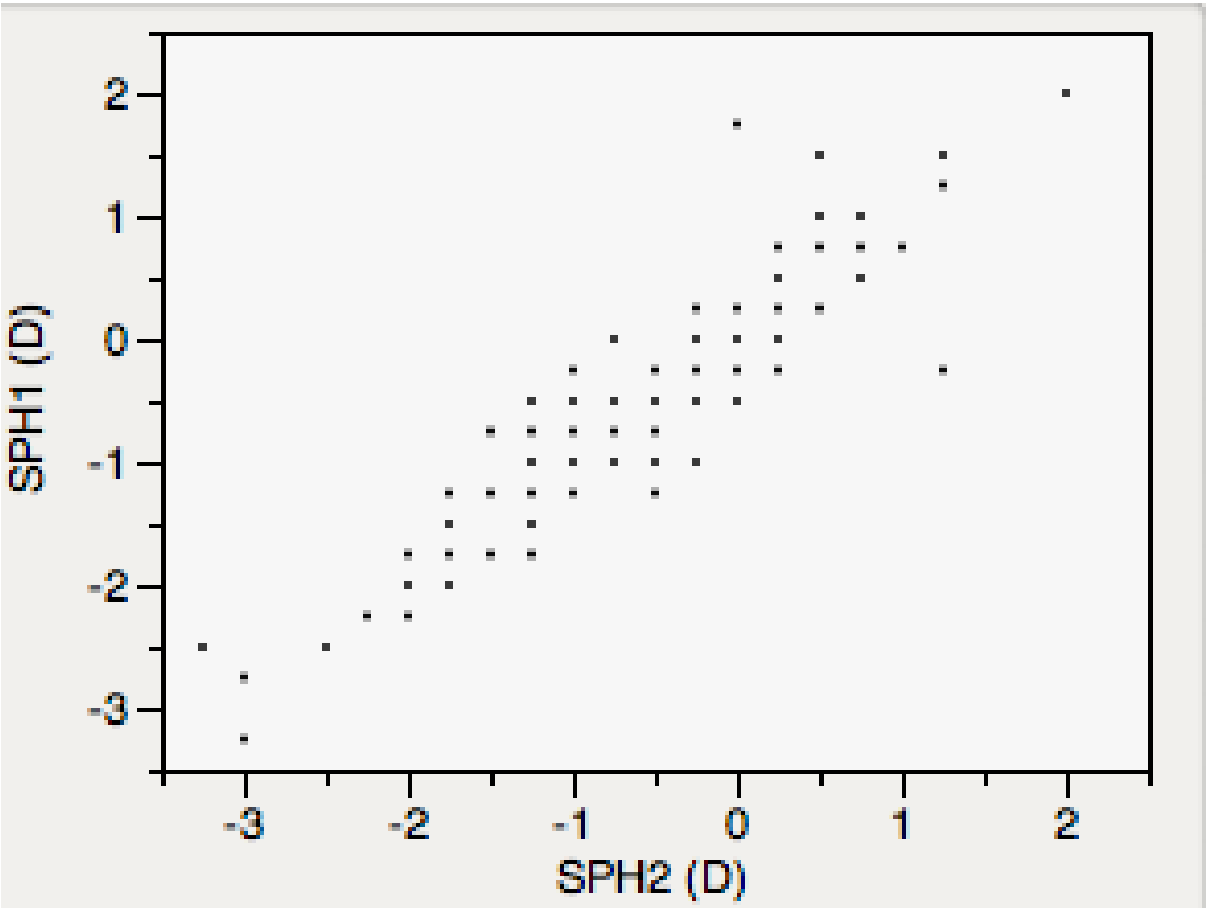

Figure S.2: Displays the strength of the relationship between *PlusOptix* readings 1 and 2 of the sphere measure.

Results

Sphere

Mean difference: .0336 D

Standard Deviation: 0.3495 D

Correlation Coefficient (r): 0.92443

Repeatability Coefficient: 0.699

95% Limits of Agreement: -0.65142 D to 0.71862 D

Matched pairs differences between readings 1 and 2

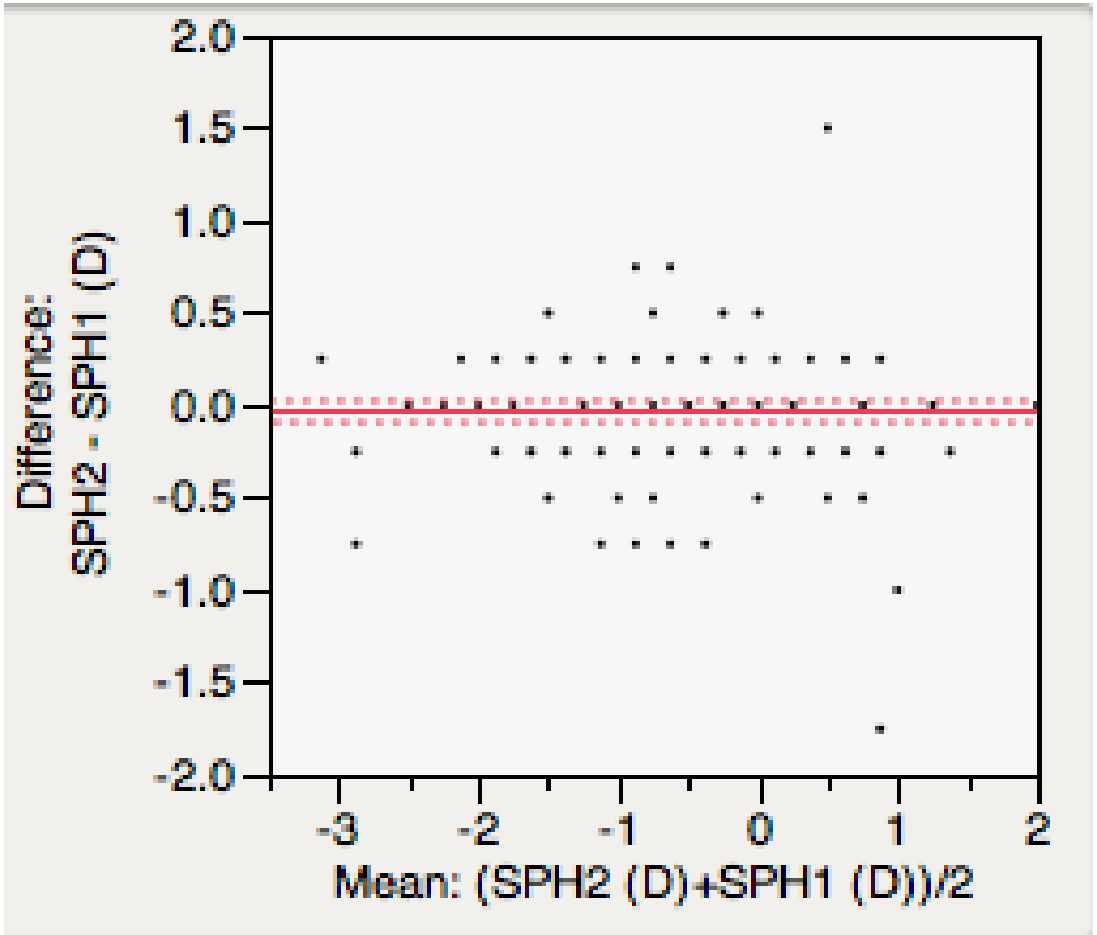

Figure S.3: This Bland-Altman plot displays differences in *PlusOptix* sphere readings 1 and 2 against their means. Limits of agreement are not displayed.

Results

Cylinder

Mean difference: -0.0319 D

Standard Deviation: 0.33426 D

Standard Error: 0.02738 D

Correlation Coefficient (r): 0.89649

Repeatability Coefficient: 0.66852

95% CI: -0.086 D to 0.02223 D

Distribution of differences in sphere measures

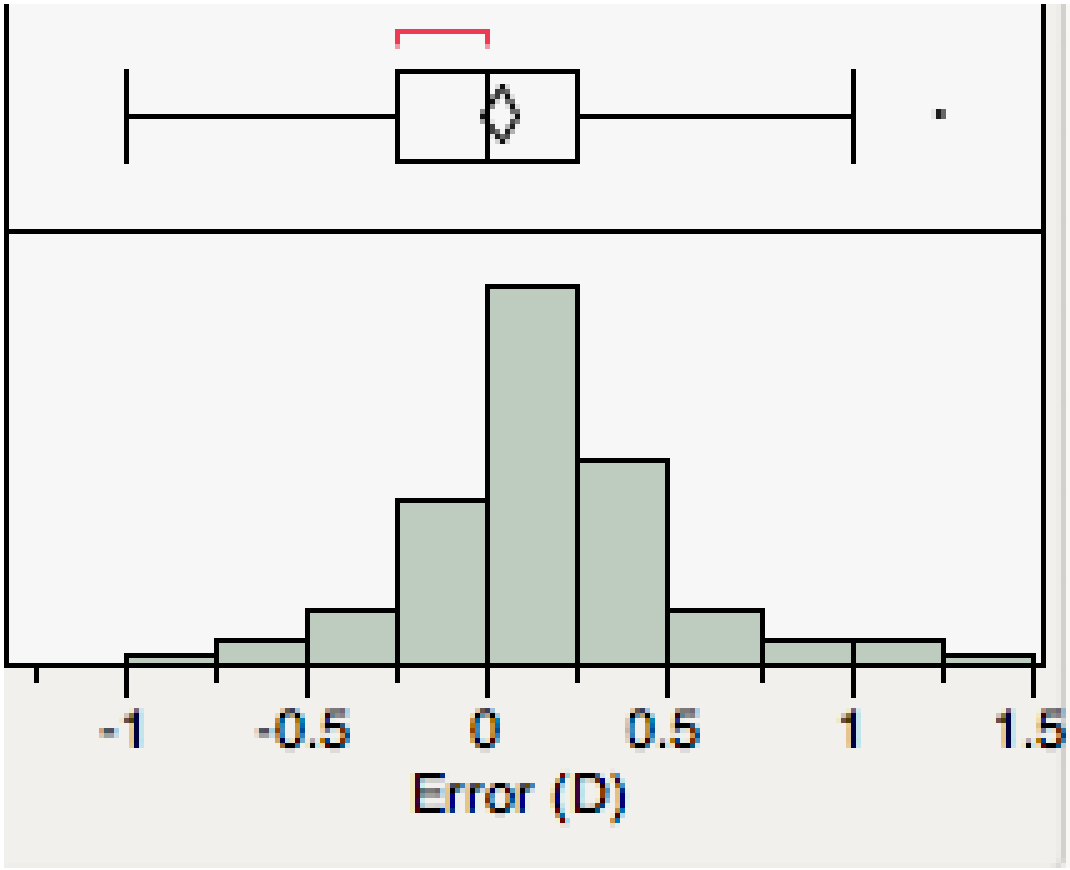

Figure C.1: Displays the distribution of differences in cylinder readings 1 and 2. The distribution is approximately normal.

Results

Cylinder

Mean difference: -0.0319 D

Standard Deviation: 0.33426 D

Standard Error: 0.02738 D

Correlation Coefficient (r): 0.89649

Repeatability Coefficient: 0.66852

95% CI: -0.086 D to 0.02223 D

Correlation between readings 1 and 2

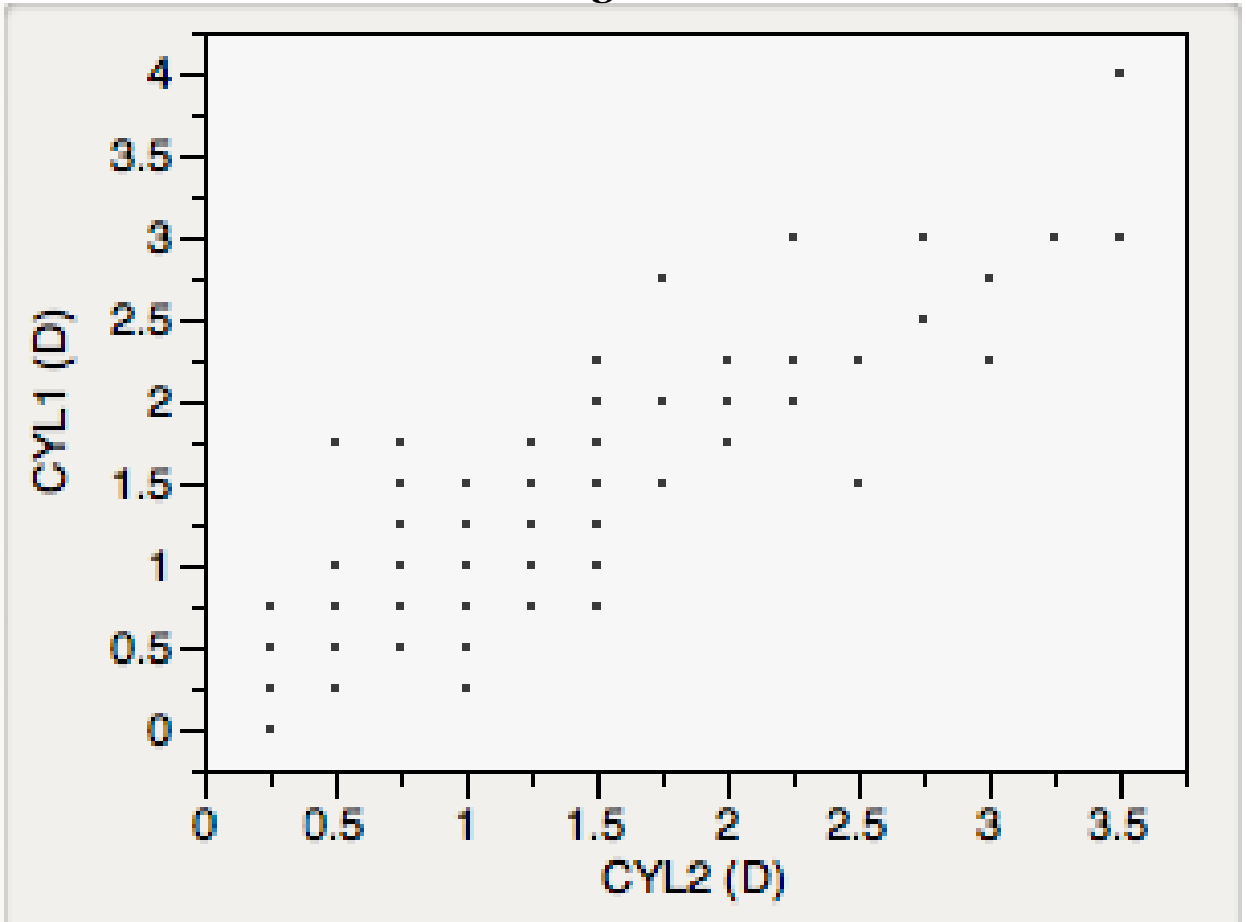

Figure C.2: Displays the strength of the relationship between *PlusOptix* readings 1 and 2 of the cylinder measure.

Results

Cylinder

Mean difference: -0.0319 D

Standard Deviation: 0.33426 D

Correlation Coefficient (r): 0.89649

Repeatability Coefficient: 0.66852

95% Limits of agreement: -0.687 to 0.6232

Matched pairs differences between readings 1 and2

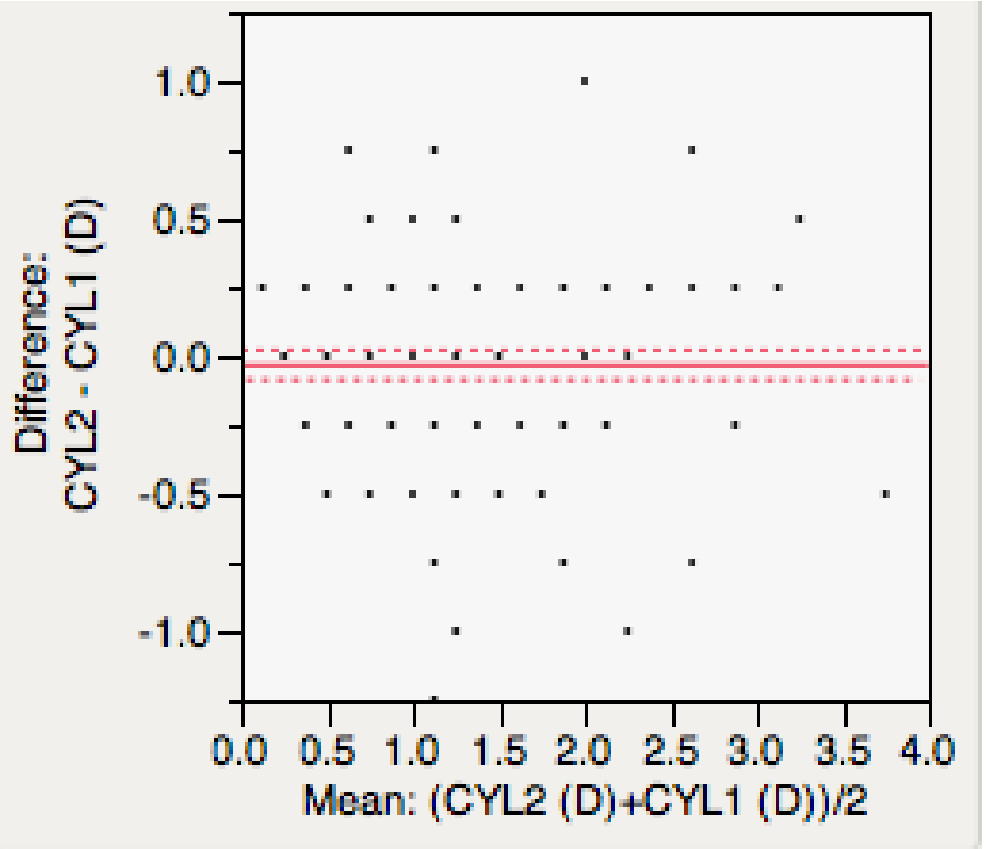

Figure C.3: This Bland-Altman plot displays differences in *PlusOptix* cylinder readings 1 and 2 against their means. Limits of agreement are not displayed.

Conclusion

- The *PlusOptix* autorefractor is a reliable tool for measuring refractive outcome post-phacoemulsification cataract surgery.
- The device is already used as a screening tool for refractive errors in pediatric ophthalmology.
- This is the first time the device was used and assessed for measuring refractive status post-cataract surgery.
- Further repeatability studies should be conducted using methods, aside from *PlusOptix* autorefraction, to establish a clearer standard of acceptable refractive errors.