Research

Summary of Validation Research for the Redesigned Kay Picture Test

In a comprehensive research study carried out by Liverpool University Directorate of Orthoptics and Vision Science and a number of clinical orthoptic departments across the UK and The Retina Foundation of the Southwest, USA, the Kay Picture Test was shown to be valid and repeatable within the limits of current gold standards with high testability.

	Apple	Boot	Duck	House	Star	Van	EDTRS
Mean	-0.17401	-0.17528	-0.10267	-0.17767	-0.17645	-0.12968	-0.103
SD	0.084482	0.080714	0.080637	0.094002	0.090301	0.094162	0.095

Picture Recognition

The chosen pictures were shown to be most easily recognised by a group of 420 children, including 33 non-English speakers and 53 with developmental delay.

Comparison with Current Tests

113 subjects were assessed and the mean bias indicated similar results for Pictures, ETDRS and Lea symbols. However, the limits of agreement were wider for Lea symbols than Kay Pictures when each was compared against ETDRS. The limits of agreement for ETDRS versus Lea symbols were slightly wider than for ETDRS versus Kay Pictures (see Bland-Altman plots below).

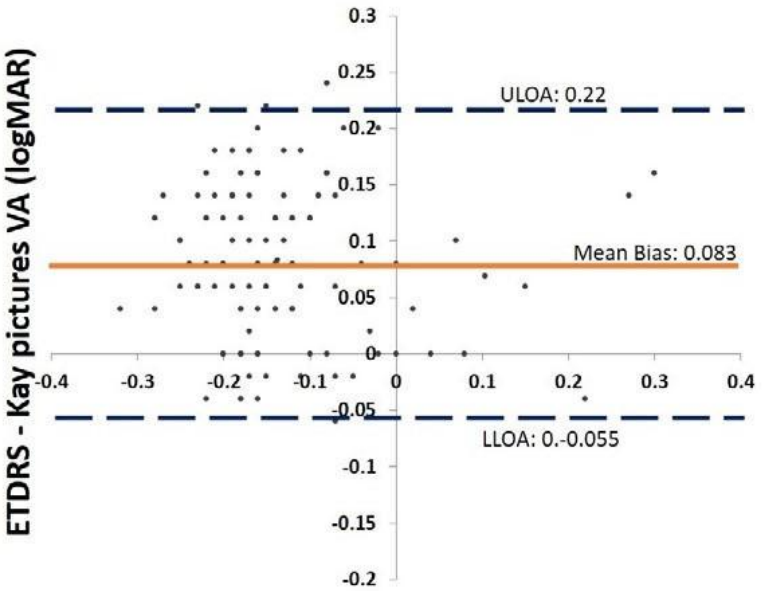
Legibility

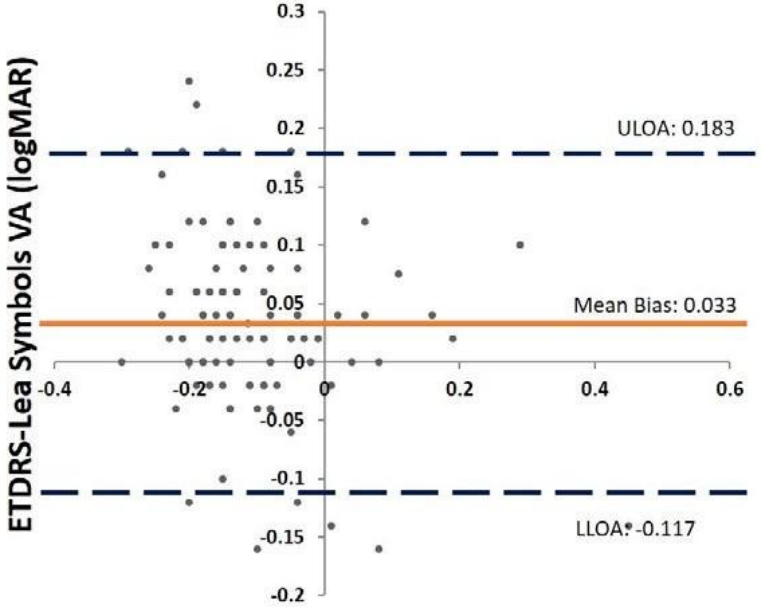
The visual acuities of 50 subjects were compared using 25 new Pictures, Landolt C and ETDRS in two phases. The six pictures chosen were those have consistent legibility (see table above).

Test Retest Variability

There was low test retest variability on 100 subjects, comparable with published values for other tests. Paired t-test analysis demonstrated no significant difference between test one and test two in either ETDRS (p=0.1) or Kay Pictures (p=0.1). The mean bias for both tests was 0.01 logMAR with similar limits of agreement.

Bland-Altman plots comparing ETDRS and Kay Pictures; ETDRS and Lea Symbols





Conclusion

The single crowded picture optotype design produces a reliable, repeatable visual acuity assessment, and allows the introduction of the crowding phenomenon to a younger age group with picture optotypes that are of equal resolution acuity and recognition for the targeted age group of pre-literate children and those with a learning difficulty.

1. O'Connor AR Kay H, Thomson D, Newsham D. Redesigning the Kay Picture Test for Children. Invest Ophthalmol Vis Sci April 2010 Volume 51, Issue 13. Redesigning the Kay Picture Visual Acuity Test for Children | IOVS | ARVO Journals.
2. Milling, A., Newsham, D., Tidbury, L., O'Connor, A.R. and Kay, H., 2016. The redevelopment of the Kay picture test of visual acuity. British and Irish Orthoptic Journal, 13, pp.14–21. DOI: http://doi.org/10.22599/bioj.97

Summary of Normative Data for the redesigned Kay Picture Visual Acuity Test

The paper by Anna O'Connor and Ashli Milling provides visual acuity norms for children with no ocular abnormality or known development delay aged 20 and 57 months.

The results show a high monocular testability rate of over 74% from 2 years, rising to 95% by three years of age. There was no difference between right and left acuities at all ages.

Comparisons with previously published norms of HOTV and Lea Symbols show that those tested with the Kay Picture Test have more consistent mean visual acuity scores across all ages and less variability in acuities (numerically lower standard deviations).

The mean VAs and 95% confidence intervals for each age using the Kay Picture Test are similar to those in a large HOTV study.

The Kay Picture Test shows a lower limit increase with age than HOTV and Lea Symbols, suggesting that Kay Pictures gives more consistent results in this age range.

3. O'Connor AR, Milling A. Normative data for the redesigned Kay Pictures visual acuity test. JAAPOS Volume 24, Issue 4, p242-244 August 2020. DOI: 10.1016/j.jaapos.2020.05.00.

Normative Data for Kay Picture Test Single Crowded

Age (years)	Months	n	Monocular Testability Rate %	Mean RE (SD)	Mean LE (SD)	Mean IAD (SD)	Kay Pictures lower limit
2	24-29	73	74	0.09 (0.062)	0.09 (0.056)	0.014 (0.029)	0.21
	30-35	82	83	0.10 (0.068)	0.09 (0.073)	0.013 (0.021)	0.24
3	36-41	61	95	0.06 (0.069)	0.06 (0.071)	0.01 (0.017)	0.20
	42-47	34	91	0.06 (0.073)	0.06 (0.069)	0.024 (0.043)	0.21
4	48-53	24	100	0.03 (0.071)	0.03 (0.072)	0.008 (0.014)	0.17
	54-59	3	100	0.05 (0.073)	0.05 (0.01)	0.047 (0.042)	