Evaluation of the Standard Patient Evaluation of Eye Dryness (SPEED)

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Introduction

- Dry eye is a multifactorial disease of the ocular surface, meibomian, and lacrimal glandular system that results in decreased stability and quality of the tear film, accompanied by visual disturbance and symptoms of discomfort.[1]
- There are a number of dry eye questionnaires that assess patient symptoms, either as a tool to screen for dry eye disease or to grade disease severity in clinical settings.[1] However, the assessment of symptoms is purely subjective and cannot be compared to a physical reference.
- The Standard Patient Evaluation of Eye Dryness (SPEED) questionnaire has been recently developed by Korb *et al*. to assess symptoms and to monitor changes.[2]

Purpose

- To evaluate the performance of the SPEED questionnaire by assessing its dimensionality, repeatability, validity, and by comparing it to four existing dry eye questionnaires.

Methods

- A total of 50 subjects, 30 symptomatic and 20 asymptomatic, as determined using the Ocular Surface Disease Index (OSDI) were enrolled. All subjects completed 5 different dry eye questionnaires (SPEED, OSDI, DEQ, McMonnies and SESoD) in a random order on two separate visits. Clinical measurements were obtained during the initial, screening visit (see Figure 1).
- Concordance correlation coefficient (CCC) was used to determine repeatability, Principal Component, Factor and Rasch analyses were used to determine dimensionality, and the comparison of SPEED scores to dry eye diagnosis defined by the OSDI (primarily using receiver-operator characteristic (ROC) curve analysis) was used to determine validity.

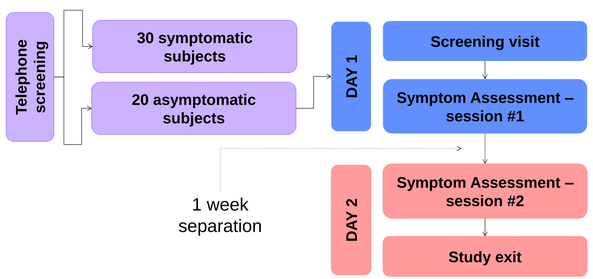

Figure 1: Study Design

Results

- The mean age of the subjects was 47.16 years (median 52 years, ranging from 20 to 86 years).
- There was a statistically significant difference ($p < 0.05$) between the symptomatic and asymptomatic groups for all questionnaires at each visit (Table 1). The SPEED questionnaire scores between visit CCC was 0.923 (upper and lower 95% CI 0.868 to 0.955).
- There was a statistically significant difference ($p < 0.05$) between symptomatic and asymptomatic groups in corneal staining, meibomian gland score (MGS), and meibomian gland yielding liquid secretions score (MGYLS) (Table 2).

TABLE 1

Questionnaire	Average composite scores visit 1		Average composite scores visit 2	
	Symptomatic	Asymptomatic	Symptomatic	Asymptomatic
OSDI	34.01 ± 14.51	6.49 ± 5.39	31.57 ± 17.82	5.39 ± 7.00
SESoD	2.57 ± 0.67	0.90 ± 1.00	2.63 ± 0.80	0.70 ± 0.84
McMonnies	18.07 ± 7.23	8.80 ± 6.67	18.57 ± 6.76	8.90 ± 7.26
DEQ	85.63 ± 29.4	29.75 ± 24.70	85.00 ± 28.69	25.90 ± 25.46
SPEED	21.00 ± 7.44	6.25 ± 5.80	20.50 ± 7.38	5.00 ± 6.12
p-value	**<0.05 for all**		**<0.05 for all**	

TABLE 2

Clinical signs	Symptomatic	Asymptomatic	p-value
Corneal staining	2.73 ± 1.72	1.20 ± 0.95	**<0.05**
Conjunctival staining	1.20 ± 1.68	1.60 ± 1.79	>0.05
Tear break-up time (s)	4.51 ± 3.11	7.23 ± 7.32	>0.05
Schirmer's test (mm)	9.98 ± 8.42	14.08 ± 9.26	>0.05
MGS	11.87 ± 8.23	17.43 ± 9.10	**<0.05**
MGYLS	3.97 ± 3.88	6.55 ± 4.33	**<0.05**

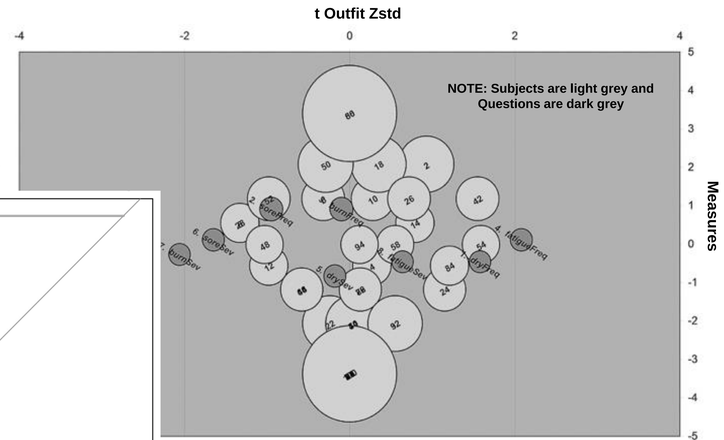

Figure 2: Bubble plot of the subject/question outfit statistics with binary answers, with the horizontal axis being each subject/question's outfit statistic. The expected outcome if the data are uni-dimensional is for each bubble to be within ±2,[3] which indeed is the case, highlighting the uni-dimensionality of the subject/question Rasch data.

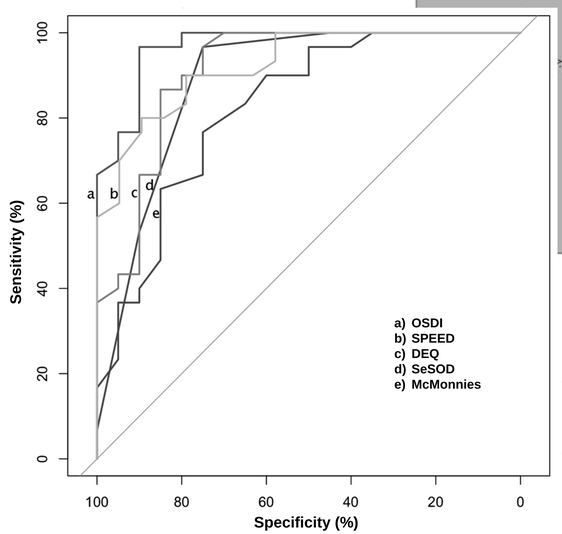

Figure 3: Comparison of ROC curves for different questionnaires at first visit. The questionnaires are labeled as a) OSDI questionnaire, b) SPEED questionnaire, c) DEQ questionnaire, d) SeSOD Questionnaire and e) McMonnies questionnaire. The SPEED questionnaire performed similarly with the other questionnaires. The area under the ROC was 0.928.

Results (continued)

- Three factors (dryness, burning, soreness/fatigue) were identified from the Principal Component analysis.
- The only clinical measures that correlated "well" with SPEED scores were corneal staining ($p < 0.05$), MGS ($p < 0.05$) and MGYLS ($p < 0.05$) (see Figure 4).

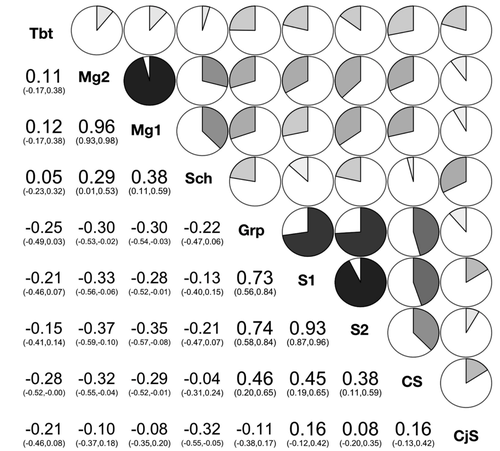

Figure 4: A correlogram showing numerically and graphically the strength of the linear associations between the clinical data and the SPEED summary scores. For the pie graphs, a clockwise direction indicates a positive correlation, and counter-clockwise direction indicates a negative correlation.

Conclusions

- These results indicate that the SPEED questionnaire is a valid and repeatable instrument for measurement of dry eye symptoms. The correlation of the SPEED score with clinical measures of meibomian gland function suggests potential additional clinical value for the diagnosis and/or management of meibomian gland dysfunction.

References

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