Supplementary Online Content

De Moraes CG, Mansouri K, Liebmann JM, Ritch R; Triggerfish Consortium. Association between 24-hour intraocular pressure monitored with contact lens sensor and visual field progression in glaucoma. *JAMA Ophthalmol*. Published online May 24, 2018. doi:10.1001/jamaophthalmol.2018.1746

This supplementary material has been provided by the authors to give readers additional information about their work.

eAppendix 1. Institutional Review Boards

The sites where an IRB/ Ethics Committee approved their studies are:

- Landesärztekammer Rheinland-Pfalz Ethik Kommission
- Comité Ético de Investigación Clínica de la Fundación Jiménez Díaz
- Comité d'éthique local de l'hôpital d'instruction des armées Desgenettes
- Research Ethics Committee Universiti Kebangsaan Malaysia

All other data were obtained from registries, i.e., existing databases with de-identified clinical data shared for this study.
This type of data does not require IRB/EC approval in the countries of origin.

eAppendix 2. Triggerfish Parameters Tested In the Present Study

Number of large peaks (24 hours)
Number of large peaks (sleep)
Number of large peaks (awake)
Number of brief peaks (24 hours)
Number of brief peaks (sleep)
Number of brief peaks (awake)
Mean peak ratio (24 hours)
Mean peak ratio (sleep)
Mean peak ratio (awake)
Wake-to-sleep slope
Amplitude of the cosine curve
Area under curve (sleep)
Variability from mean (24 hours)
Variability from mean (sleep)
Variability from mean (awake)
Variability from smooth (24 hours)
Variability from smooth (sleep)
Variability from smooth (awake)
All bursts amplitude mean
All bursts amplitude standard deviation
All bursts ocular pulse amplitude mean
All bursts ocular pulse amplitude standard deviation
All bursts ocular pulse frequency mean
All bursts ocular pulse frequency standard deviation
All bursts peak count mean
All bursts peak count standard deviation
All bursts standard deviation mean
Day 1 bursts amplitude mean
Day 1 bursts amplitude standard deviation
Day 1 bursts peak count mean
Day 1 bursts peak count standard deviation
Day 1bursts standard deviation mean
Night bursts amplitude mean
Night bursts amplitude standard deviation
Night bursts ocular pulse amplitude mean
Night bursts ocular pulse amplitude standard deviation
Night bursts ocular pulse frequency mean
Night bursts ocular pulse frequency standard deviation
Night bursts peak count mean
Night bursts peak count standard deviation
Night bursts standard deviation mean
Ocular pulse amplitude maximum

Ocular pulse amplitude minimum
Ocular pulse amplitude night amplitude smoothed
Ocular pulse amplitude night delta
Ocular pulse amplitude night delta smoothed
Ocular pulse amplitude night noise
Ocular pulse amplitude standard deviation
Cosinor ocular pulse amplitude acrophase
Cosinor ocular pulse amplitude amplitude
Cosinor ocular pulse amplitude mesor
Tojo
Standard deviation
Amplitude
Level sleep start before 00h

eAppendix 2. Triggerfish Parameters Tested In the Present Study (continued)

Triggerfish parameters definition

Full curve:

Peaks: A peak is defined as a local maximum point in the smoothed Triggerfish function. The calculation of the number of peaks occurs as follows: each trough is noted as the start of a peak. The increase in Triggerfish value (mVeq) from the preceding trough to the local maximum is termed the height. The time elapse (s) from the trough to the local maximum is termed "Time to Peak." The time interval between the trough immediately before the peak and immediately after is the "Peak Width," while "Peak Height" is the length of the perpendicular line from the trough preceding the peak to the peak itself.

Large Peaks are defined as peaks with a height of 90mVeq or greater. This distinction differentiates between peaks that may be very small and frequent, but with little clinical interpretation, and those that are more clinically meaningful. The choice of 90mVeq is based on the Height at which there appears to be a large separation between healthy and glaucoma subjects.

Brief peaks are defined as peaks which occur in a short span of time. A brief peak is a peak in which the time from trough to peak is no more than 30 minutes. This distinction is meant to highlight potentially "high risk" peaks which may be missed on a local IOP reading (such as GAT), but which can be recognized on a Triggerfish curve.

Mean Peak Ratio**:** for each peak, Peak Ratio is calculated to encompass both the peak height and time to peak values.

Peak Ratio = Peak Height / Time to Peak

A peak will have a high peak ratio if the Height is great or the Time to Peak is small or both. This ratio highlights those peaks that are more likely to be clinically significant.

Wake-to-Sleep slope: defined as the slope of the linear regression line that is fitted to the data between one hour before sleep to one hour after sleep. Clinically, this slope is expected to be positive, as IOP tends to rise when one is lying down.

Amplitude of the Cosine Curve: difference between the maximum and minimum values of the cosine-fit curve.

Auc Sleep: Area under the curve during sleep period.

Variability from the mean: variability around the mean value of all raw (not smoothed) Triggerfish measurements.

Variability from smooth: mean of difference between smoothed curve and original curve.

For each of the above-described parameters, we calculated their values during 24-hours, during sleep, and while awake.

In burst data:

We compute descriptive statistics of parameters computed on in-burst data. Those in-burst parameters are the following:

Amplitude: The amplitude of the signal over the 30 seconds (max(Triggerfish) - min(Triggerfish))
Std: The standard deviation of the signal over the 30 seconds
Opa: The ocular pulse amplitude
Opf: The ocular pulse frequency
Peak Count: The number of brief peaks in the burst

Then for all those parameters above, we compute the distribution among all bursts and we compute the mean and the standard deviation to produce the following parameters:

All Bursts Amplitude mean
All Bursts Amplitude standard deviation
All Bursts standard deviation mean
All Bursts OPA mean
All Bursts OPA standard deviation
All Bursts OPF mean
All Bursts OPF standard deviation
All Bursts Peak Count mean
All Bursts Peak Count standard deviation

Other parameters:

Tojo: This feature has been proposed by professor Tojo (Tojo N, et al. Graefes Arch Clin Exp Ophthalmol. 2014;252(9):1463-8.), defined as: Max(Triggerfish burst curve during sleep) - Min(Triggerfish burst curve during sleep). By Triggerfish Burst Curve we mean the curve composed of the 288 medians from the actual curve.

Standard deviation: the standard deviation of the Triggerfish burst curve

Amplitude: the amplitude of the Triggerfish burst curve, defined as: Max(Triggerfish burst curve) - Min(Triggerfish burst curve)

Level sleep start: defined as the median of the Triggerfish burst curve during the hour preceding sleep start – Triggerfish value of first burst considered as asleep

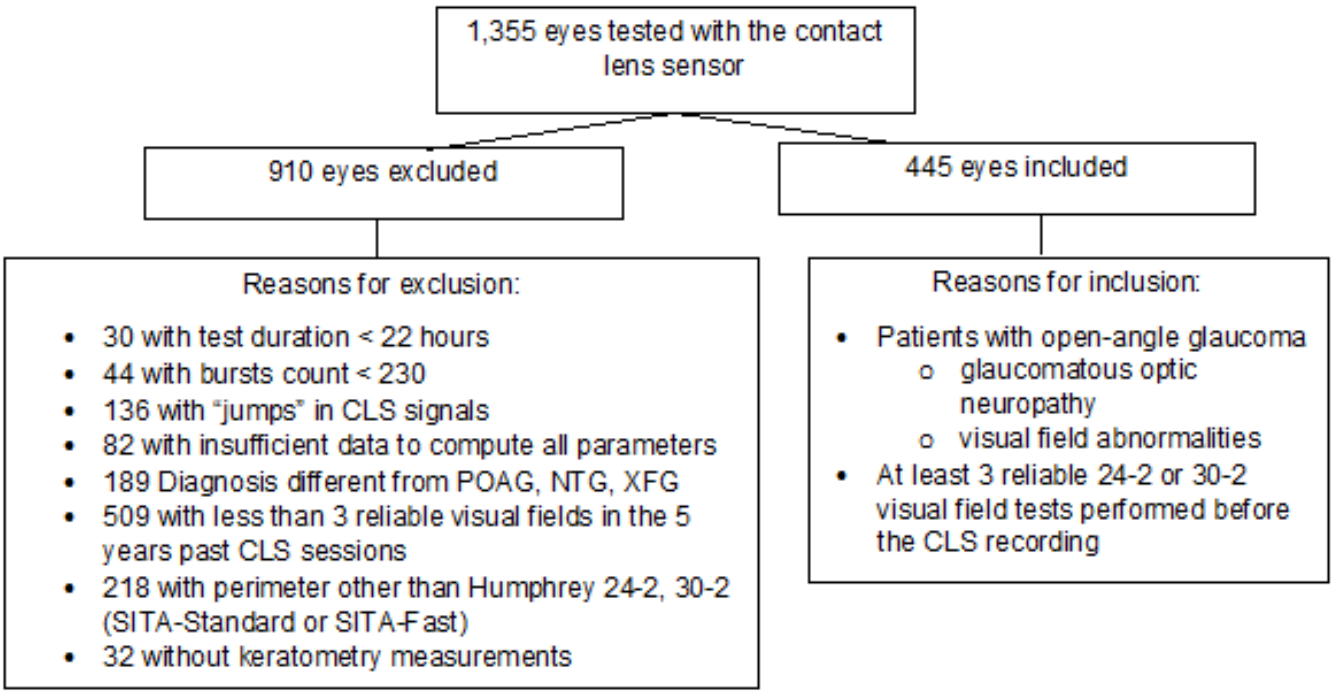
eAppendix 3. Principal Component Analysis

The 55 contact lens sensor (CLS) parameters are intrinsically correlated to one another, which could potentially lead to the undesired effects of collinearity in the analyses.[16] Moreover, testing the relationship between each parameter and the rate of visual field progression would require multiple testing, which could lead to inflated type I error rates.

To minimize these issues, we performed principal component analysis (PCA). In brief, PCA is a technique for reducing the dimensionality of a dataset, increasing interpretability but at the same time minimizing information loss. It does so by creating new uncorrelated variables that successively maximize variance. This means that preserving as much variability as possible translates into finding new variables that are linear functions of those in the original dataset that successively maximize variance and that are uncorrelated with each other.

The total number of principal components (PCs) can range from 1 to N, where N is the total number of parameters. To determine the smallest number of PCs that can still explain most of the variance of the construct, the leading eigenvectors from the eigen decomposition of the correlation matrix of the variables describe a series of uncorrelated linear combinations of the variables that contain most of the variance. We selected this number using the Kaiser-Guttman criterion, that is, based upon eigenvectors equal to or greater than 1.0 as the lower bound for the number of factors. The Table shows the total number of PCs (N=55) and their respective eigenvalues. Based upon the Kaiser-Guttman criterion and the Scree Plot (**eFigure 3)**, 14 PCs explained about 84% of the total variance of the CLS output. This means that 16% of the variance remained unexplained by the combined 14 PCs. Then, the predicted score of each PC (PC1 to PC14) was calculated based upon their eigenvectors and normalized value of each parameter (i.e.: by subtracting their mean and dividing by their standard deviation, SD).

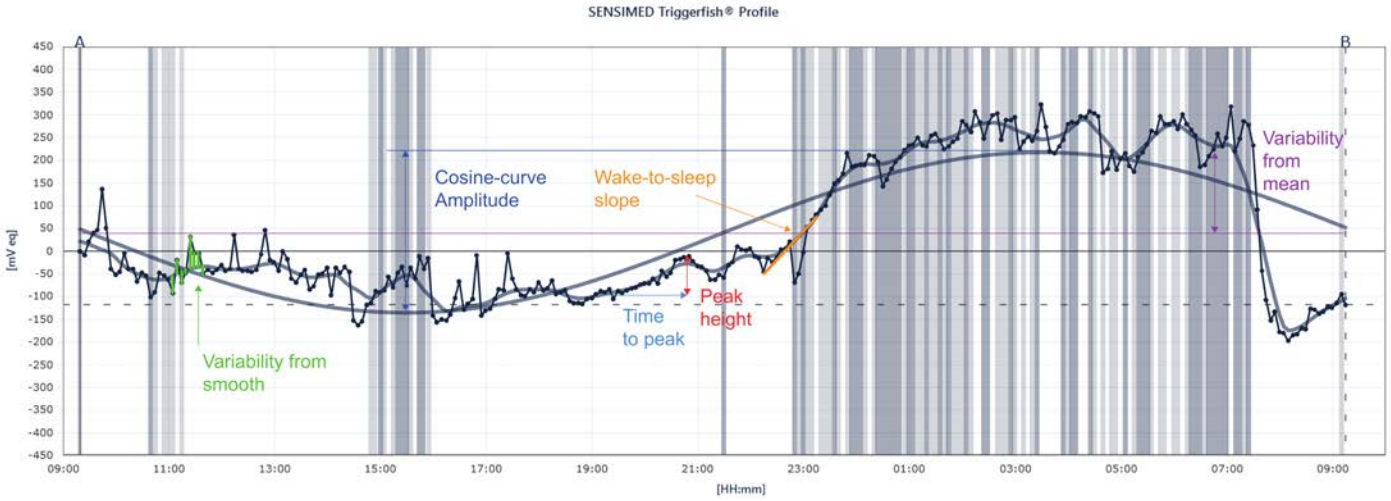
eFigure 1. Flowchart Showing the Reasons for Excluding / Including Patients in the Present Study. Please note that eyes could have been excluded for more than one reason, which is why the sum of each criterion is greater than the total number of eyes excluded.



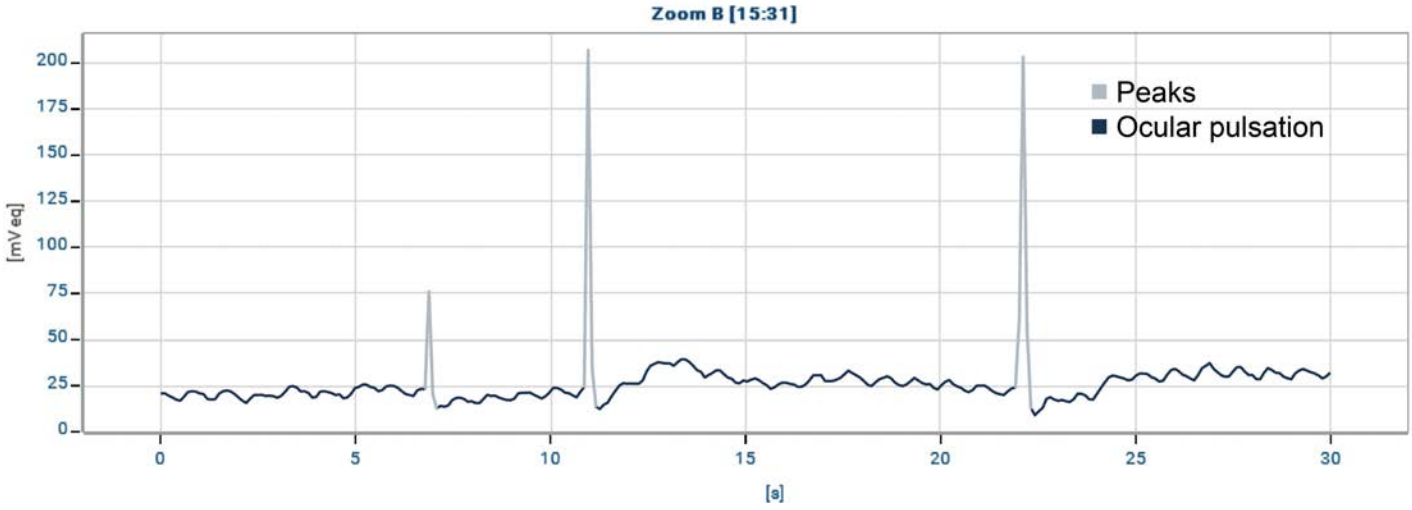
eFigure 2. Twenty-four Hour Contact Lens Sensor Output

A, Ouput expressed in mVeq. B, Ocular pulse amplitude signals are isolated from the output.

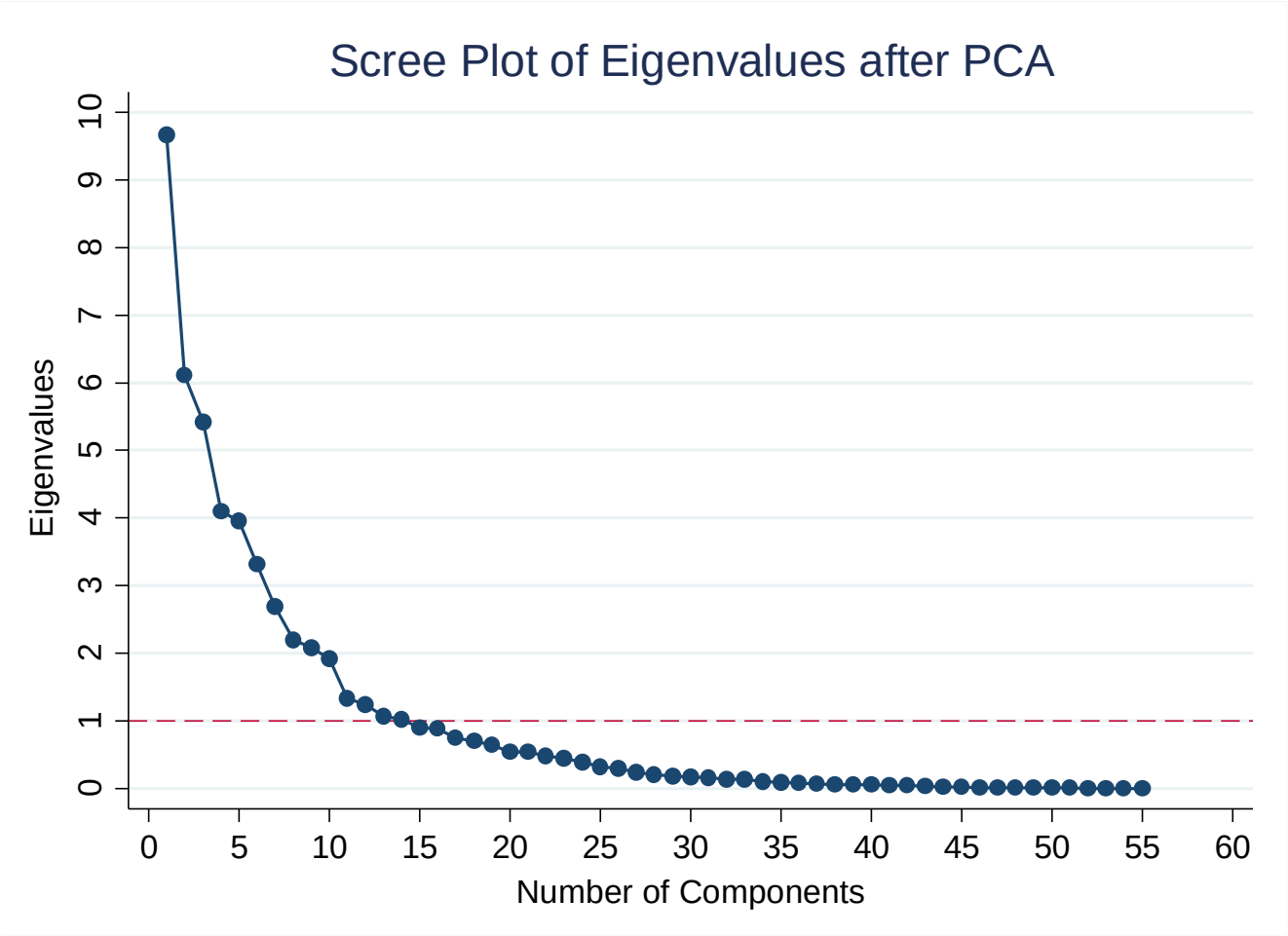
A)



B)



eFigure 3. Scree Plot Showing the Relationship Between Eigenvalues and the Number of Components



eTable 1. Factors Loadings From Principal Component Analysis With 14 Components

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Comp8	Comp9	Comp10	Comp11	Comp12	Comp13	Comp14
nlpeaks24h~r	0.039	0.089	0.011	0.208	0.285	0.146	0.104	-0.227	0.055	-0.198	0.091	0.081	-0.189	-0.037
nlpeakssleep	0.036	0.052	-0.002	0.111	0.230	0.159	0.079	-0.158	-0.020	-0.164	0.069	0.028	-0.172	-0.003
nlpeakswake	0.029	0.087	0.019	0.209	0.245	0.110	0.093	-0.214	0.081	-0.178	0.083	0.097	-0.159	-0.043
nbpeaks24h~r	0.117	0.226	0.101	0.067	0.163	-0.114	0.098	0.046	-0.155	0.056	-0.050	0.037	0.227	0.080
nbpeakssleep	0.047	0.161	0.094	0.128	0.161	0.009	-0.292	-0.038	0.056	0.002	-0.163	-0.027	0.130	-0.014
nbpeakswake	0.102	0.138	0.055	0.017	0.149	-0.127	0.280	0.143	-0.202	0.101	0.070	-0.012	0.154	0.091
meanpeakra~r	0.140	0.201	0.084	0.099	0.268	-0.040	0.146	-0.003	-0.064	-0.001	-0.055	0.026	0.107	0.025
meanpeakra~p	0.109	0.140	0.091	0.139	0.202	0.076	-0.120	-0.050	0.043	0.000	-0.206	0.014	0.146	-0.298
meanpeakra~e	0.112	0.190	0.067	0.073	0.253	-0.078	0.211	0.039	-0.081	0.004	0.058	-0.014	0.059	0.145
waketoslee~e	0.016	0.071	-0.060	-0.062	-0.218	0.078	0.165	-0.264	0.031	-0.149	-0.279	0.342	0.243	0.089
amplitudeo~e	0.066	0.282	-0.057	-0.036	-0.272	0.032	0.097	-0.078	-0.036	-0.019	0.073	-0.049	-0.136	-0.066
aucsleep	0.002	0.245	0.010	0.066	-0.107	-0.055	-0.269	-0.106	0.125	0.035	-0.052	-0.077	0.006	0.267
varfrommea~r	0.079	0.303	-0.040	-0.035	-0.256	0.018	0.102	-0.055	-0.033	-0.020	0.064	-0.041	-0.116	-0.073
varfrommea~p	0.040	0.236	0.061	0.079	-0.025	-0.064	-0.367	-0.027	0.164	-0.033	-0.083	-0.058	0.086	0.080
varfrommea~e	0.091	0.267	-0.039	-0.026	-0.207	-0.006	0.119	0.018	-0.055	0.096	0.084	-0.123	-0.128	-0.056
varfromsmo~r	0.111	0.014	0.189	-0.171	0.071	-0.242	0.013	0.233	-0.072	0.086	-0.109	0.215	-0.072	0.013
varfromsmo~p	0.102	-0.008	0.156	-0.189	0.018	-0.006	-0.148	0.121	-0.095	0.070	-0.241	0.288	-0.137	-0.328
varfromsmo~e	0.092	0.029	0.158	-0.129	0.078	-0.286	0.043	0.237	-0.048	0.076	-0.033	0.138	-0.036	0.169
allburstsa~n	0.090	-0.126	0.316	-0.038	-0.083	-0.047	0.096	-0.193	0.077	0.015	0.039	-0.045	-0.105	0.047
allburstsa~d	0.069	-0.065	0.328	-0.074	-0.020	-0.070	0.036	-0.245	0.082	0.073	0.111	-0.126	0.047	-0.127
allbur~amean	0.259	-0.075	-0.154	-0.064	0.047	0.017	0.057	-0.048	0.071	0.057	-0.168	-0.139	-0.016	0.125
allburs~astd	0.245	-0.033	-0.112	-0.057	-0.010	-0.076	-0.034	-0.006	0.071	-0.121	0.236	0.130	0.047	-0.050
allbur~fmean	-0.028	0.100	0.049	-0.046	0.063	0.202	0.161	0.224	0.438	0.136	-0.062	0.145	-0.181	-0.043
allburs~fstd	-0.080	0.046	0.032	-0.166	0.013	0.197	0.116	0.128	0.247	-0.006	0.097	-0.216	0.367	-0.015
allburstsp~n	0.129	-0.109	0.056	0.341	-0.169	0.077	0.065	0.154	-0.046	0.012	-0.047	0.004	-0.022	-0.028
allburstsp~d	0.128	-0.085	0.044	0.362	-0.161	0.081	0.038	0.155	-0.054	0.054	-0.043	-0.010	0.076	-0.115
allburstss~n	0.134	-0.157	0.285	0.081	-0.128	-0.009	0.082	-0.088	0.053	0.031	-0.008	-0.012	-0.087	0.025
day1bu~emean	0.062	-0.083	0.330	0.000	-0.086	-0.119	0.027	-0.216	0.148	0.039	0.026	-0.042	-0.053	0.163
day1bur~estd	0.060	-0.010	0.190	-0.149	0.074	-0.028	0.104	-0.185	-0.010	0.103	0.132	-0.147	0.266	-0.295
day1bu~tmean	0.111	-0.092	0.065	0.362	-0.177	0.042	0.005	0.155	0.010	0.049	-0.066	0.008	0.007	0.035
day1bur~tstd	0.115	-0.064	0.022	0.296	-0.122	0.109	0.054	0.133	-0.082	0.091	0.007	0.002	0.198	-0.271
day1bu~dmean	0.102	-0.120	0.296	0.132	-0.139	-0.083	0.015	-0.112	0.141	0.055	-0.015	-0.007	-0.025	0.134
nightb~emean	0.132	-0.009	0.151	-0.231	0.021	0.301	-0.088	0.025	-0.155	-0.070	-0.001	-0.029	-0.059	0.074
nightbu~estd	0.072	0.006	0.190	-0.144	0.039	0.211	-0.151	-0.015	-0.132	-0.052	0.067	-0.081	-0.105	-0.115
nightb~amean	0.246	-0.076	-0.164	-0.067	0.050	0.058	0.060	-0.056	0.046	0.115	-0.209	-0.193	-0.036	0.098
nightbu~astd	0.265	-0.068	-0.133	-0.049	0.030	-0.030	-0.109	0.001	0.100	0.045	0.170	0.078	0.031	-0.120
nightb~fmean	-0.021	0.103	0.059	-0.021	0.053	0.194	0.148	0.224	0.433	0.133	-0.067	0.175	-0.214	-0.019
nightbu~fstd	-0.061	0.076	0.117	-0.090	-0.018	0.195	0.058	0.183	0.283	-0.021	0.161	-0.124	0.335	0.078
nightb~tmean	0.140	0.006	0.099	-0.070	-0.036	0.352	-0.090	0.104	-0.186	-0.133	0.087	0.036	0.061	0.230
nightbu~tstd	0.133	0.013	0.079	0.059	-0.066	0.298	-0.114	0.132	-0.192	-0.104	0.094	0.061	0.054	0.244

nightb~dmean	0.149	-0.033	0.147	-0.232	0.012	0.259	-0.058	0.049	-0.155	-0.038	-0.063	0.016	-0.080	0.016
opamax	0.274	-0.075	-0.153	-0.040	0.033	-0.024	-0.020	-0.031	0.090	0.030	-0.043	-0.081	0.000	-0.016
opamin	0.191	-0.078	-0.145	-0.052	0.063	0.069	0.158	-0.062	0.031	0.097	-0.340	-0.267	-0.061	0.195
opanightam~d	0.203	-0.035	-0.117	-0.020	0.005	-0.081	-0.110	0.008	0.139	-0.005	0.278	0.081	0.112	0.012
opanightde~a	-0.066	0.027	-0.045	0.049	0.045	0.141	-0.013	-0.160	-0.098	0.509	0.115	0.212	-0.004	0.185
opanightde~d	-0.047	0.023	-0.058	0.053	0.021	0.131	-0.093	-0.160	-0.046	0.489	0.251	0.266	0.027	0.150
opanightno~e	0.247	-0.075	-0.118	-0.056	0.038	0.018	-0.080	-0.015	0.039	0.077	0.045	0.048	-0.038	-0.170
opastd	0.265	-0.068	-0.132	-0.049	0.030	-0.031	-0.110	0.001	0.099	0.043	0.170	0.077	0.029	-0.121
cosinorop~se	-0.017	-0.013	0.091	0.030	-0.018	-0.151	0.030	0.219	0.082	-0.331	0.137	0.126	-0.061	0.130
cosinorop~de	0.192	-0.006	-0.052	0.006	-0.073	-0.130	-0.015	-0.015	0.084	-0.206	0.224	0.174	0.035	0.120
cosinoropa~r	0.253	-0.068	-0.126	-0.023	0.006	-0.066	0.044	-0.005	0.091	-0.051	-0.072	-0.013	0.006	0.159
tojo	0.057	0.246	0.075	0.053	-0.026	-0.063	-0.364	-0.031	0.125	0.002	-0.151	0.022	0.042	0.039
std	0.089	0.311	-0.035	-0.039	-0.241	0.012	0.104	-0.043	-0.041	-0.011	0.056	-0.062	-0.113	-0.082
amplitude	0.111	0.306	0.014	-0.062	-0.136	-0.065	0.087	0.030	-0.063	0.053	0.027	-0.044	-0.080	-0.113
l~tbefore00h	-0.004	0.023	0.045	0.117	0.179	-0.081	-0.183	0.225	-0.032	0.142	0.233	-0.421	-0.312	0.023

eTable 2. Spearman's Correlation Coefficients (Top Row) and P-Values (Bottom Row)

Association Tested Between Mean Deviation (MD) Slopes, Age, Baseline MD, Goldmann Mean IOP, and the Contact Lens Sensor-Derived Principal Components

	MD slope (dB/year)	**Age (years)**	**Baseline MD (dB)**	**Mean GAT IOP**
MD slope (dB/year)	1.000			
Age (years)	**-0.122**	1.000		
	0.010			
Baseline MD (dB)	**0.571**	**-0.102**	1	
	0.000	**0.032**		
Mean GAT IOP	**0.128**	-0.079	**0.2359**	1
	0.007	0.097	**<0.001**	
PC1	0.034	**0.125**	0.0435	0.0409
	0.477	**0.008**	0.3603	0.3896
PC2	-0.041	0.006	0.022	0.0678
	0.390	0.897	0.6432	0.1535
PC3	-0.025	**-0.170**	-0.063	**-0.116**
	0.607	**<0.001**	0.1874	**0.0147**
PC4	-0.038	**0.096**	0.0147	0.0019
	0.419	**0.044**	0.7579	0.9682
PC5	-0.065	**0.134**	**-0.11**	0.0053
	0.172	**0.005**	**0.020**	0.9121
PC6	**0.095**	0.088	0.0304	0.0353
	0.045	0.063	0.5222	0.4586
PC7	-0.002	**-0.136**	-0.024	-0.016
	0.964	**0.004**	0.6119	0.7434

PC8	-0.070	-0.034	-0.028	**0.1116**
	0.143	0.476	0.5532	**0.0187**
PC9	0.031	-0.030	0.0215	0.0319
	0.516	0.533	0.6507	0.503
PC10	-0.084	-0.036	-0.089	**0.1271**
	0.076	0.444	0.0603	**0.0073**
PC11	0.004	**0.162**	-0.034	-0.047
	0.932	**0.001**	0.4793	0.3258
PC12	0.060	**-0.103**	-0.041	-0.01
	0.207	**0.030**	0.3882	0.8424
PC13	-0.014	0.000	-0.054	-0.088
	0.770	0.993	0.2564	0.0656
PC14	-0.082	-0.013	-0.083	-0.039
	0.085	0.784	0.080	0.415

eTable 3. Multivariable Linear Regression Analysis of Mean Goldmann Intraocular Pressure and Covariates.

The dependent variable is the mean deviation (MD) slope in dB/year.

	β	95% Confidence Interval		P-value
Mean IOP (per mmHg)	-0.004	-0.018	0.009	0.502
Age (per decade)	-0.020	-0.055	0.016	0.284
Baseline MD (per dB)	0.036	0.030	0.042	<0.001
Laser	-0.053	-0.146	0.040	0.265
Medications	-0.031	-0.052	-0.009	0.006
Surgery	0.025	-0.059	0.110	0.559

*****Akaike information criterion= 517.3; Adjusted R-squared= 27.8%

eTable 4. Univariable Linear Regression Analysis of Individual Principal Components (PCs) Derived From Contact Lens Sensor Parameters.
The dependent variable is the mean deviation (MD) slope in dB/year.

	β	95% Confidence Interval		P-value
PC1	0.01	-0.01	0.02	0.404
PC2	0.00	-0.02	0.02	0.743
PC3	-0.01	-0.03	0.01	0.574
PC4	-0.01	-0.04	0.01	0.313
PC5	-0.01	-0.04	0.01	0.331
PC6	**0.03**	**0.00**	**0.05**	**0.055**
PC7	-0.01	-0.04	0.02	0.629
PC8	**-0.02**	**-0.05**	**0.01**	**0.195**
PC9	0.02	-0.02	0.05	0.295
PC10	**-0.04**	**-0.07**	**-0.01**	**0.022**
PC11	0.00	-0.04	0.04	0.945
PC12	**0.03**	**-0.01**	**0.07**	**0.165**
PC13	0.02	-0.03	0.07	0.379
PC14	**-0.04**	**-0.09**	**0.00**	**0.066**

Values in bold type face represent P<0.20.

eTable 5. Multivariable Linear Regression Analysis With Stepwise Backward Selection of Principal Components Derived From Contact Lens Parameters (P<0.20 in Univariable Models) and the Set of Covariates.

The dependent variable is the mean deviation (MD) slope in dB/year. The covariates laser, surgery, medications, age, and baseline MD are set as locked terms.

	β	95% Confidence Interval		P-value
PC6	0.023	0.001	0.045	0.041
Age (per decade)	-0.023	-0.058	0.013	0.216
Baseline MD (per dB)	0.035	0.029	0.041	<0.001*
Laser	-0.044	-0.136	0.049	0.355
Medications	-0.031	-0.053	-0.010	0.004*
Surgery	0.021	-0.063	0.105	0.624

Akaike information criterion = 513.5; Adjusted R-squared= 28.4%

*Significant after Benjamini-Hochberg Procedure

eTable 6. Multivariable Linear Regression Analysis With Covariates Included as Confounders. The dependent variable is a binary classification of fast progression based upon a mean deviation slope faster than -1.0 dB/year.

	Odds Ratio	95% Confidence Interval		P-value
Age (per decade)	1.023	0.763	1.371	0.879
Baseline MD (per dB)	0.861	0.823	0.900	<0.001
Laser	1.350	0.761	2.394	0.304
Medications	1.110	0.947	1.302	0.197
Surgery	1.235	0.717	2.128	0.446

*****Akaike information criterion = 263.8; Pseudo R-squared= 21.5%

eTable 7. Univariable Linear Regression Analysis of Individual Contact Lens Sensor Parameters (N=55).

The dependent variable is a binary classification of fast progression based upon a mean deviation slope faster than -1.0 dB/year.

	Odds Ratio	95% Confidence Interval		P-value
All bursts amplitude mean (per unit)	1.121	0.600	2.095	0.719
All bursts amplitude std (per 0.1 units)	**1.059**	**0.974**	**1.152**	**0.173**
All bursts opa mean (per 0.01 units)	0.979	0.890	1.077	0.673
All bursts opa std (per 0.01 units)	0.892	0.693	1.147	0.374
All bursts opf mean (per 10 units)	1.014	0.723	1.423	0.933
All bursts opf std (per unit)	**0.814**	**0.692**	**0.958**	**0.014**
All bursts peak count mean (per unit)	0.982	0.910	1.059	0.646
All bursts peak count std (per unit)	1.016	0.924	1.117	0.732
All bursts std mean (per 0.1 units)	1.014	0.667	1.541	0.948
Amplitude (per 100 units)	1.116	0.892	1.396	0.335
Amplitude of the cosinecurve (per 100 units)	1.036	0.633	1.695	0.886
Auc sleep (per 10 units)	1.022	0.939	1.114	0.604
Cosinor opa acrophase (per 0.1 units)	0.973	0.873	1.084	0.627
Cosinor opa amplitude (per 0.01 units)	0.967	0.832	1.125	0.671
Cosinor opa mesor (per 0.01 units)	0.973	0.887	1.067	0.570
Day1 bursts amplitude mean (per unit)	1.213	0.823	1.789	0.328
Day1 bursts amplitude std (per unit)	1.193	0.531	2.683	0.668
Day1 bursts peak count mean (per unit)	1.022	0.975	1.070	0.354
Day1 bursts peak count std (per unit)	1.030	0.917	1.156	0.616
Day1 bursts std mean (per 0.1 units)	1.140	0.884	1.471	0.310
Level sleep start (per 100 units)	1.176	0.675	2.050	0.566
Mean peak ratio 24hour (per 10 units)	1.041	0.905	1.198	0.566
Mean peak ratio sleep (per 10 units)	0.911	0.792	1.050	0.200
Mean peak ratio wake (per 10 units)	**1.077**	**0.964**	**1.203**	**0.188**
Number of brief peaks 24hour (per unit)	**1.155**	**0.955**	**1.397**	**0.136**
Number of brief peaks sleep (per unit)	1.060	0.747	1.504	0.742
Number of brief peaks wake (per unit)	**1.238**	**0.993**	**1.544**	**0.057**
Night bursts amplitude mean (per 0.1 units)	**0.905**	**0.785**	**1.044**	**0.175**
Night bursts amplitude std (per unit)	0.831	0.349	1.980	0.678
Night bursts opa mean (per 0.01 units)	0.985	0.901	1.076	0.744
Night bursts opa std (per 0.1 units)	0.101	0.002	4.109	0.225
Night bursts opf mean (per 10 units)	1.047	0.750	1.461	0.785
Night bursts opf std (per unit)	**0.856**	**0.706**	**1.036**	**0.112**
Night bursts peak count mean (per unit)	**0.753**	**0.493**	**1.150**	**0.190**

Night bursts peak count std (per unit)	0.955	0.787	1.159	0.645
Night bursts std mean (per 0.01 units)	**0.937**	**0.857**	**1.024**	**0.155**
Number of long peaks 24hour (per unit)	0.949	0.870	1.036	0.248
Number of long peaks sleep (per unit)	0.919	0.734	1.150	0.462
Number of brief peaks wake (per unit)	0.937	0.838	1.048	0.261
Opa max (per 0.01 units)	0.981	0.928	1.037	0.499
Opa min (per 0.01 units)	1.003	0.880	1.144	0.955
Opa night amplitude smoothed (per 0.1 units)	0.711	0.205	2.463	0.591
Opa night delta (per 0.1 units)	**1.607**	**0.852**	**3.033**	**0.142**
Opa night delta smoothed (per 0.1 units)	1.412	0.586	3.397	0.441
Opa night noise (per 0.01 units)	**0.710**	**0.442**	**1.139**	**0.156**
Opa std (per 0.01 units)	0.797	0.550	1.154	0.231
Std (per 100 units)	1.125	0.552	2.290	0.745
Tojo (per 100 units)	0.914	0.678	1.233	0.559
Variability from mean 24hour (per 100 units)	0.954	0.435	2.091	0.908
Variability from mean sleep (per 100 units)	0.832	0.240	2.885	0.773
Variability from mean wake (per 100 units)	1.505	0.756	2.996	0.244
Variability from smooth 24hour (per 10 units)	**1.978**	**0.957**	**4.085**	**0.065**
Variability from smooth sleep (per 10 units)	0.698	0.296	1.642	0.411
Variability from smooth wake (per 10 units)	**2.002**	**1.164**	**3.443**	**0.012**
Wake-to-sleep slope (per 100 units)	0.842	0.454	1.563	0.588

Values in bold type face represent P<0.20.

eTable 8. Multivariable Logistic Regression Analysis With Stepwise Backward Selection of Contact Lens Parameters (P<0.20 in Univariable Models) and the Set of Covariates.
The dependent variable is a binary classification of fast progression based upon a mean deviation slope faster than -1.0 dB/year. The covariates laser, surgery, medications, age, and baseline mean deviation (MD) are set as locked terms.

	Odds Ratio	95% Confidence Interval		P-value
Variability from smooth wake (per 10 units)	2.142	1.130	4.060	0.019*
All bursts opf std (per unit)	0.812	0.675	0.978	0.028
Age (per decade)	1.046	0.776	1.409	0.766
Baseline MD (per dB)	0.859	0.820	0.899	<0.001*
Laser	1.282	0.721	2.279	0.397
Medications	1.092	0.933	1.277	0.274
Surgery	1.400	0.807	2.428	0.231

Akaike information criterion =256.5; Pseudo R-squared= 25.0%
*Significant after Benjamini-Hochberg Procedure

eTable 9. Multivariable Logistic Regression Analysis With Mean Goldmann Intraocular Pressure and the Set of Covariates.

The dependent variable is a binary classification of fast progression based upon a mean deviation slope faster than -1.0 dB/year.

	Odds Ratio	95% Confidence Interval		P-value
Mean IOP (mmHg)	1.016	0.915	1.130	0.762
Laser	1.355	0.763	2.404	0.300
Surgery	1.253	0.722	2.172	0.423
Medications	1.103	0.936	1.299	0.241
Age (per decade)	1.024	0.763	1.373	0.877
Baseline MD (per dB)	0.860	0.822	0.899	<0.001*

Akaike information criterion = 265.6; Pseudo R-squared= 21.5%

*Significant after Benjamini-Hochberg Procedure

eTable 10. Univariable Logistic Regression Analysis With Each Principal Component Derived From the Contact Lens Parameters.

The dependent variable is a binary classification of fast progression based upon a mean deviation slope faster than -1.0 dB/year.

	Odds Ratio	95% Confidence Interval		P-value
PC1	0.98	0.89	1.08	0.74
PC2	1.02	0.91	1.15	0.61
PC3	1.05	0.93	1.19	0.36
PC4	1.04	0.90	1.20	0.53
PC5	0.98	0.85	1.13	0.83
PC6	**1.21**	**1.02**	**1.43**	**0.02**
PC7	1.11	0.93	1.32	0.23
PC8	1.03	0.84	1.25	0.75
PC9	**1.14**	**0.93**	**1.40**	**0.19**
PC10	**1.32**	**1.06**	**1.65**	**0.01**
PC11	0.95	0.74	1.23	0.74
PC12	1.02	0.79	1.33	0.84
PC13	0.88	0.67	1.17	0.41
PC14	**1.25**	**0.93**	**1.68**	**0.13**

Values in bold type face represent P<0.20.

eTable 11. Multivariable logistic Regression Analysis With Stepwise Backward Selection of Principal Components Derived From the Contact Lens Parameters (P<0.20 in Univariable Models) and the Set of Covariates.

The dependent variable is a binary classification of fast progression based upon a mean deviation slope faster than -1.0 dB/year. The covariates laser, surgery, medications, age, and baseline MD are set as locked terms.

	Odds Ratio	95% Confidence Interval		P-value
PC6	0.761	0.621	0.934	0.009*
PC10	1.389	1.076	1.792	0.012*
Age (per decade)	1.076	0.791	1.464	0.640
Baseline MD (per dB)	0.856	0.817	0.897	<0.001
Laser	1.344	0.752	2.401	0.318
Medications	1.074	0.913	1.262	0.388
Surgery	1.385	0.790	2.431	0.256

Akaike information criterion = 254.6; Pseudo R-squared= 25.6%

*Significant after Benjamini-Hochberg Procedure

