Evaluating the Prediction Accuracy of the Hill-RBF 3.0 Formula using a Heteroscedastic Statistical Method

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Maria Tsessler MD, Shir Cohen, Li Wang MD PhD, Douglas D Koch MD, David Zadok MD, Adi Abulafia MD

Presenter: Maria Tsessler, MD

FINANCIAL DISCLOSURE

M. Tsessler, S. Cohen, D. Zadok: None.
A. Abulafia: Consultant for Alcon, Haag-Streit and Zeiss.
L Wang: Consultant for Carl Zeiss Meditec and Alcon Laboratories.
DD Koch: Consultant for Alcon, Carl Zeiss Meditec, and Johnson & Johnson Vision.

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THE HILL-RBF 3.0 FORMULA

- Based on artificial intelligence
- Big-data and “out/in of bounds”
- A recently released new version of this IOL power selection formula is now available online
- Hill-RBF 3.0 vs. Hill-RBF 2.0:
  - Significantly expanded database
  - Added new parameters

Hill-RBF Calculator Version 3.0

HOME | HILL-RBF CALCULATOR 3.0 | INSTRUCTIONS | LENS CONSTANTS | PHYSICIAN TEAM

Patient

ID
Name
First name
Date of birth DD.MM.YYYY
Gender Not provided

Surgeon

Name
First name
E-Mail
Calculation ID

OD

Target Refr.[D] 0.00

1 Please select used measuring device...

AL mm
CCT µm
ACD mm
LT mm

K1 D/°
K2 D/°
n 1.3375
WTW mm

2 Biconvex 1:1

Manufacturer
Model
A-Constant

OS

Target Refr.[D] 0.00

1 Please select used measuring device...

AL mm
CCT µm
ACD mm
LT mm

K1 D/°
K2 D/°
n 1.3375
WTW mm

2 Biconvex 1:1

Manufacturer
Model
A-Constant

THREE POPULAR METHODS OF MEASUREMENT

SS-OCT

IOLM 700- K and TK Values

OLCR

LENSTAR LS 900

IOL CALCULATION FORMULAS

Available on the Biometry Devices

SRK/T

Holladay 1

Holladay 2 (for IOLM 700)

Hoffer Q

Haigis

Olsen (for LENSTAR)

Available Online

*#Hill-RBF 2.0

*Hill-RBF 3.0

BUII

*Kane

EVO 2.0

*Formulas based on AI

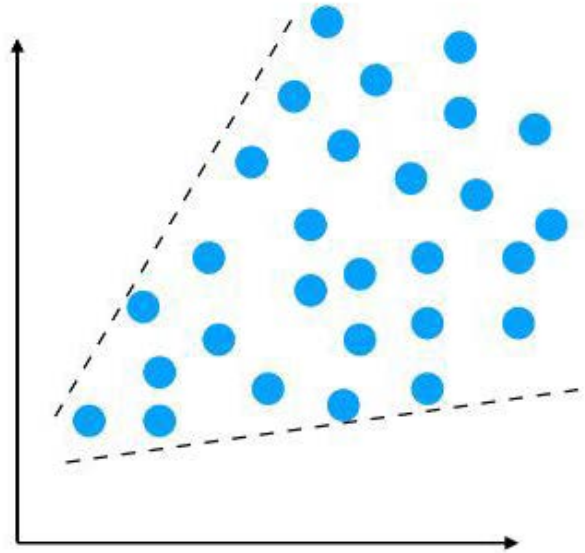
#Was recently replaced both online and on the Lenstar device with its newer version

STUDY POPULATION

- 2/2018 – 6/2020
- 153 Eyes/153 Patients
- 72± 8.2 Y (43-91)
- 61% ♀

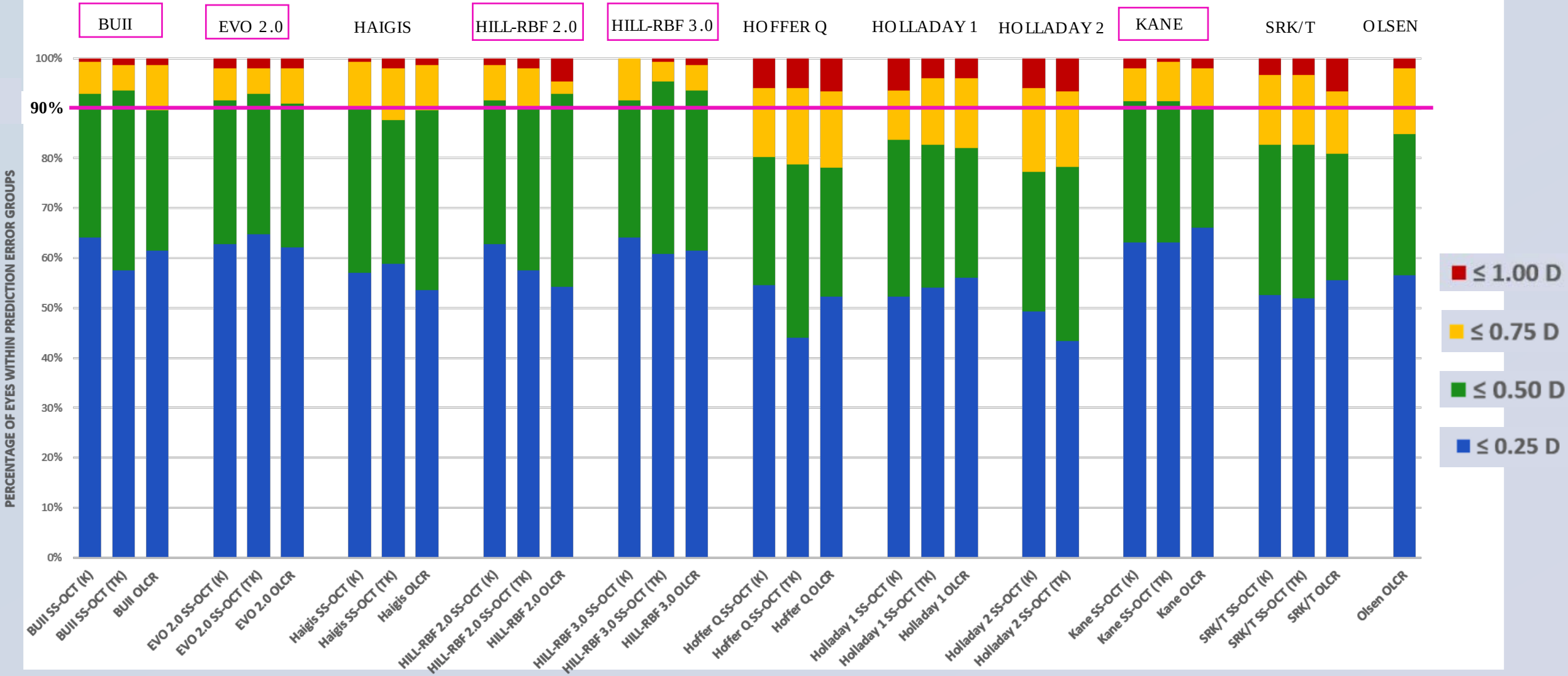
HETEROSCEDASTIC STATISTICAL ANALYSIS METHOD

- Holladay et al. proposed the use of standard deviation (SD) of the prediction error (PE) as the primary parameter to evaluate formula performance

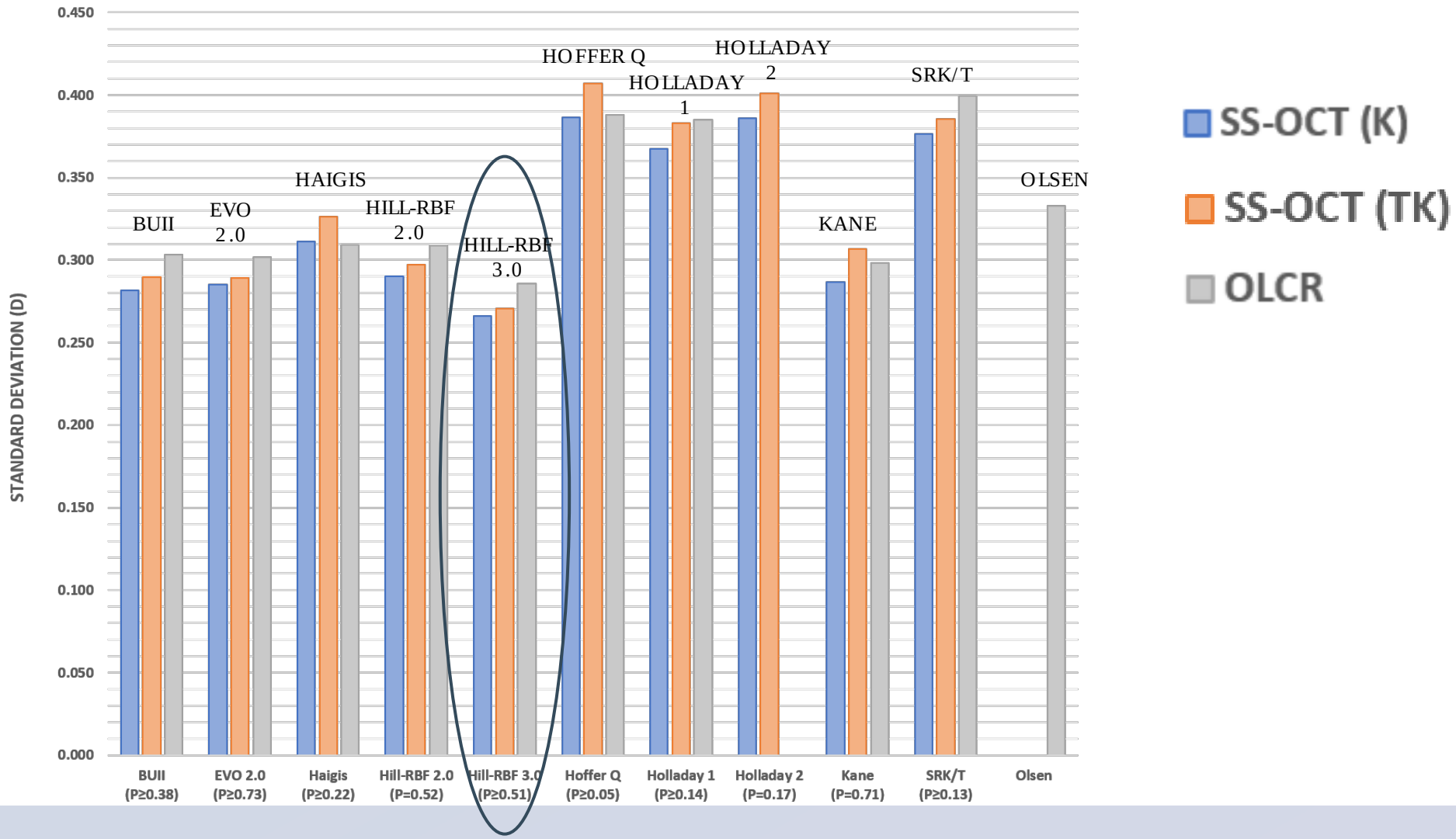


- Holladay JT, Wilcox RR, Koch DD, Wang L. Review and recommendations for univariate
- statistical analysis of spherical equivalent prediction error for IOL power calculations. J Cataract
- Refract Surg. 2021 Jan 1;47(1):65-77

PREDICTION ERROR



STANDARD DEVIATION OF PREDICTION ERROR



HETEROSCEDASTIC STATISTICAL ANALYSIS BY ADJ. SD OF PE

LENSTAR

ADJ . P VALUE

	SD										
HILL-RBF 3.0	0.285	1.000									
Kane	0.298	0.957	1.000								
EVO 2.0	0.302	0.957	0.957	1.000							
BUII	0.303	0.814	0.957	0.957	1.000						
HILL-RBF 2.0	0.309	0.036	0.957	0.957	0.957	1.000					
Haigis	0.309	0.957	0.957	0.957	0.957	0.957	1.000				
Olsen	0.333	0.338	0.621	0.957	0.957	0.957	0.957	1.000			
Holladay 1	0.385	0.000	0.000	0.002	0.000	0.000	0.003	0.957	1.000		
Hoffer Q	0.388	0.000	0.000	0.012	0.002	0.001	0.000	0.935	0.957	1.000	
SRK/T	0.399	0.000	0.000	0.000	0.000	0.000	0.008	0.759	0.957	0.957	1.000
		HILL-RBF 3.0	Kane	EVO 2.0	BUII	HILL-RBF 2.0	Haigis	Olsen	Holladay 1	Hoffer Q	SRK/T

HETEROSCEDASTIC STATISTICAL ANALYSIS BY ADJ. SD OF PE

IOLM 700 (K)

ADJ . P VALUE

	SD	Hill-RBF 3.0	BUII	EVO 2.0	Kane	Hill-RBF 2.0	Haigis	Holladay 1	SRK/T	Holladay 2	Hoffer Q
Hill-RBF 3.0	0.266	1.000									
BUII	0.282	0.980	1.000								
EVO 2.0	0.285	0.980	0.980	1.000							
Kane	0.287	0.980	0.980	0.980	1.000						
Hill-RBF 2.0	0.290	0.031	0.980	0.980	0.980	1.000					
Haigis	0.311	0.080	0.980	0.980	0.980	0.980	1.000				
Holladay 1	0.367	0.000	0.000	0.002	0.001	0.000	0.142	1.000			
SRK/T	0.377	0.000	0.000	0.000	0.002	0.000	0.405	0.980	1.000		
Holladay 2	0.386	0.000	0.000	0.000	0.000	0.000	0.015	0.980	0.980	1.000	
Hoffer Q	0.387	0.000	0.000	0.002	0.000	0.000	0.000	0.980	0.980	0.980	1.000

HETEROSCEDASTIC STATISTICAL ANALYSIS BY ADJ. SD OF PE

IOLM 700 (TK)

	SD	ADJ . P VALUE									
HILL-RBF 3.0	**0.271**	1.000									
EVO 2.0	**0.289**	0.976	1.000								
BUII	**0.290**	0.394	0.976	1.000							
HILL-RBF 2.0	**0.297**	0.023	0.976	0.976	1.000						
Kane	**0.307**	0.333	0.976	0.976	0.976	1.000					
Haigis	**0.327**	0.004	0.976	0.522	0.976	0.976	1.000				
Holladay 1	**0.383**	0.000	0.001	0.000	0.000	0.085	0.171	1.000			
SRK/T	**0.385**	0.000	0.000	0.000	0.000	0.086	0.522	0.976	1.000		
Holladay 2	**0.401**	0.000	0.000	0.000	0.000	0.148	0.009	0.976	0.976	1.000	
Hoffer Q	**0.407**	0.000	0.000	0.000	0.000	0.011	0.000	0.976	0.976	0.980	1.000
		HILL-RBF 3.0	**EVO 2.0**	**BUII**	**HILL-RBF 2.0**	**Kane**	**Haigis**	**Holladay 1**	**SRK/T**	**Holladay 2**	**Hoffer Q**

LIMITATIONS

- A relatively small sample size
- “Real-Life Scenario” - IOL constants were not optimized for any of the formulas used in this study

ULIB

User Group for Laser Interference Biometry

CONCLUSIONS

- The Hill-RBF 3.0 showed better results compared to the Hill-RBF 2.0 as well as to older formulas and similar to new generation formulas
- Using total corneal measurements did not improve the formulas prediction accuracy

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THANK YOU FOR LISTENING