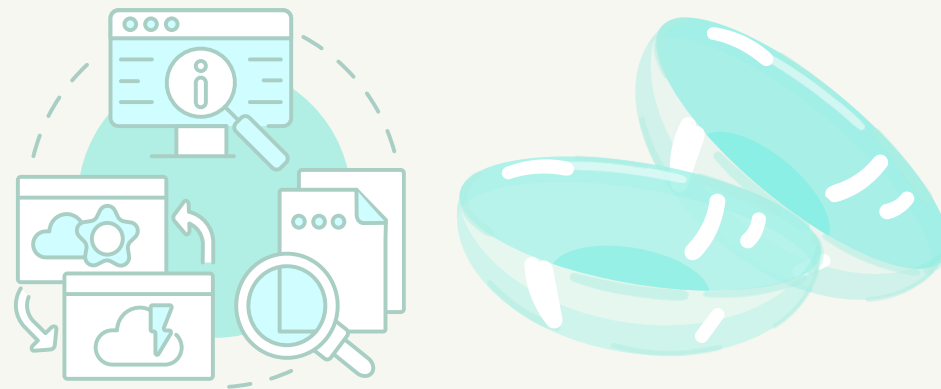


# How Optical and Visual Quality Evolve Over Time in Scleral Lens Wearers



Rute J. Macedo-de-Araújo



# Curriculum Vitae

Rute J. Macedo de Araújo





# About Me

I am a clinical researcher and optometrist with a strong focus on specialized contact lenses, particularly scleral lenses and ocular surface management. With experience spanning both academia and clinical practice, my career is guided by the goal of becoming an independent researcher in eye health and contact lens innovation, driving innovative solutions to improve patient care.





# Education



2012

Optometry & Vision  
Sciences

2014

Master - Advanced  
Optometry

2019

PhD - Optometry and Vision  
Sciences

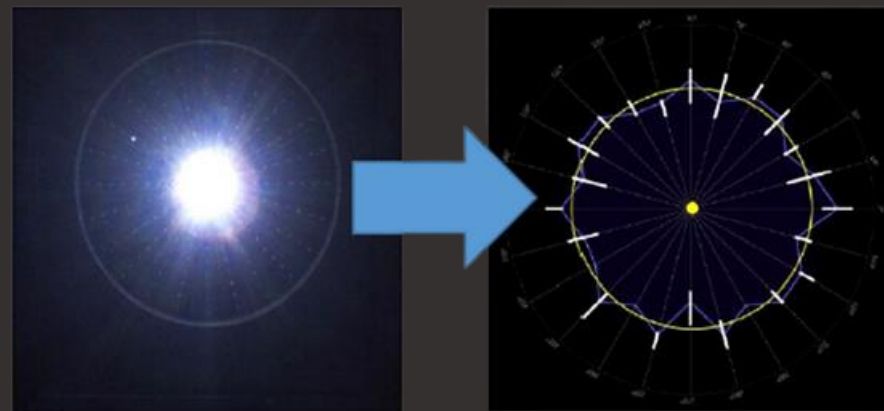


# Projects

2013-2014

(FCT)  
Light Disurbance Analyzer

Development & validation of a device for measuring night vision disturbances



IAPMEI Grant (2014/2015) ->  
1st prize SpinUM -> Spin-off  
Company (BinaryTarget)

2015-2018

PHD - international grant  
from Bausch+Lomb (USA)

“Clinical Performance and Biological  
Interactions During Scleral Contact  
Lens Wear”



12 month follow-up study on  
scleral lens performance,  
biocompatibility and patient  
satisfaction.

2018-2019

(FCT)  
Optical Customization of  
Electrophysiological Retinal  
Activity in Humans



Myopia control  
Development of new sensors (PeX  
2021 & 2024 - not funded)



# Projects

2022



2023-2025

## 2023.00047.RESTART

“Development and application of new fenestrated scleral contact medical devices for visual correction to increase tear exchange and for in situ intraocular pressure measurement.”

2021-2024

## OBERON

## Marie-Curie ITN

Developing opto-biomechanical models of the human eye





# Publications

macedo de araujo R

Advanced Create alert Create RSS User Guide

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28 results Page 1 of 1

- Statistical Model of Ocular Wavefronts With Accommodation.**  
1 Mechó-García M, Arcas-Carbonell M, Orduna-Hospital E, Sánchez-Cano A, López-Gil N, **Macedo-de-Araújo RJ**, Faria-Ribeiro M, Fernandes P, González-Méijome JM, Rozema J.  
Cite Invest Ophthalmol Vis Sci. 2024 Oct 1;65(12):12. doi: 10.1167/iovs.65.12.12.  
Share PMID: 39377736 [Free PMC article.](#)
- Lid wiper epitheliopathy: Topical review of current identification strategies and future perspectives.**  
2 Arvind A, Nanjappa R, Gupta KK, **Macedo-de-Araújo RJ**, Fadel D.  
Cite Cont Lens Anterior Eye. 2024 Dec;47(6):102312. doi: 10.1016/j.clae.2024.102312. Epub 2024 Sep 23.  
Share PMID: 39317557 [Review.](#)
- Influence of midday removal and re-application of a scleral lens on fluid reservoir thickness, pre-lens tear film quality and visual acuity.**  
3 **Macedo-de-Araújo RJ**, Amorim-de-Sousa A, González-Méijome JM.  
Cite Cont Lens Anterior Eye. 2024 Jun 18:102250. doi: 10.1016/j.clae.2024.102250. Online ahead of print.  
Share PMID: 38897843
- Enhancement of the Inner Foveal Response of Young Adults with Extended-Depth-of-Focus Contact Lens for Myopia Management.**  
4 Amorim-de-Sousa A, **Macedo-de-Araújo RJ**, Fernandes P, González-Méijome JM, Queirós A.  
Cite Vision (Basel). 2024 Apr 14;8(2):19. doi: 10.3390/vision8020019.  
Share PMID: 38651440 [Free PMC article.](#)
- Daytime Changes in Tear Film Parameters and Visual Acuity with New-Generation Daily Disposable Silicone Hydrogel Contact Lenses-A Double-Masked Study in Symptomatic Subjects**

[Review](#) > [Cont Lens Anterior Eye](#). 2024 Dec;47(6):102312. doi: 10.1016/j.clae.2024.102312. Epub 2024 Sep 23.

## Lid wiper epitheliopathy: Topical review of current identification strategies and future perspectives

Anitha Arvind <sup>1</sup>, Rakesh Nanjappa <sup>2</sup>, Krishna Kumar Gupta <sup>2</sup>, Rute J Macedo-de-Araújo <sup>3</sup>, Daddi Fadel <sup>4</sup>

Affiliations + expand

PMID: 39317557 DOI: 10.1016/j.clae.2024.102312

[Review](#) > [Clin Optim \(Auckl\)](#). 2022 Apr 7:14:47-65. doi: 10.2147/OPTO.S284632. eCollection 2022.

## How Can We Best Measure the Performance of Scleral Lenses? Current Insights

Rute J Macedo-de-Araújo <sup>1</sup>, Daddi Fadel <sup>2</sup>, Melissa Barnett <sup>3</sup>

Affiliations + expand

PMID: 35418790 PMCID: PMC9000539 DOI: 10.2147/OPTO.S284632

[Open Access](#) [Review](#)

## Light Disturbance Analysis and Applications

by Rafaela S. Alves-de-Carvalho <sup>1,2,\*</sup>, Rute J. Macedo-de-Araújo <sup>1,2</sup> and José M. González-Méijome <sup>1,2</sup>

<sup>1</sup> Clinical & Experimental Optometry Research Laboratory (CEORLab), University of Minho, 4715 Braga, Portugal

<sup>2</sup> Physics Center of Minho and Porto Universities (CF-UM-UP), University of Minho, 4715 Braga, Portugal

\* Author to whom correspondence should be addressed.

[Home](#) / [Archives](#) / [Vol. 8 No. 1 \(2024\): JCLRS](#) / [Original Article](#)

## THE PATIENT-PHYSICIAN RELATIONSHIP AND ROLE OF EMPATHIC COMMUNICATION IN CONTACT LENS PRACTICE

MEASUREMENT OF PATIENT SATISFACTION

> [Optom Vis Sci](#). 2020 Sep;97(9):775-789. doi: 10.1097/OPX.0000000000001570.

## Optical Quality and Visual Performance for One Year in a Sample of Scleral Lens Wearers

Rute J Macedo-de-Araújo <sup>1</sup>, Miguel Faria-Ribeiro <sup>1</sup>, Colm McAlinden, Eef van der Worp <sup>2</sup>, José M González-Méijome <sup>1</sup>

Affiliations + expand

PMID: 32941333 DOI: 10.1097/OPX.0000000000001570





# Other Scientific Activities



Co-Chair/Organizing Committee of the International Congress “The Summit of Specialty Contacts” (Online 2022 // Rome 2024 // Rome 2026)

*Journal of*  
**CONTACT LENS  
RESEARCH & SCIENCE**

**Rute Macedo-de-Araujo, PhD**  
***Associate Editor***



[rjfmaraujo@gmail.com](mailto:rjfmaraujo@gmail.com)

Rute Macedo-de-Araújo received her Doctorate in Optometry and Vision sciences (University of Minho, Braga – Portugal) in 2019. She is invited assistant lecturer in Department of Physics of University of Minho (graduation and master degree in Optometry) and research assistant at Clinical and Experimental Optometry Research Lab (CEORLab) since 2013. Her investigation is focused on contact lenses, mainly scleral lens fitting for visual rehabilitation, but also optical quality of the human eye, electrophysiological response of the human retina and light disturbance analysis. She has several publications in peer-review ISI journals, is author of several communications in national and international conferences and is co-author of a book chapter. Invited Reviewer for different Scientific Journals indexed in ISI Web of Science.

Associate Editor Journal of Contact Lens Research & Science



OUR AMAZING SPEAKERS



Rute Araújo  
Portugal



Tom Arnold  
USA



Laura Batres  
Spain



Karen Carrasquillo



Karen DeLoss

Speaker @ EUROSCOLE  
(European School of Scleral Lenses)





# Other Scientific Activities



**Organizing Committee of CONTACTUM**  
(Jornadas de Contactologia - UMinho)



**Reviewer**  
(several journals)



**Organizing Committee of GLOW**  
(Global Ophthalmic Women)

empower ophthalmic women of diverse nationalities, cultural backgrounds and realities through education, leadership, and lifestyle strategies



# Other Scientific Activities



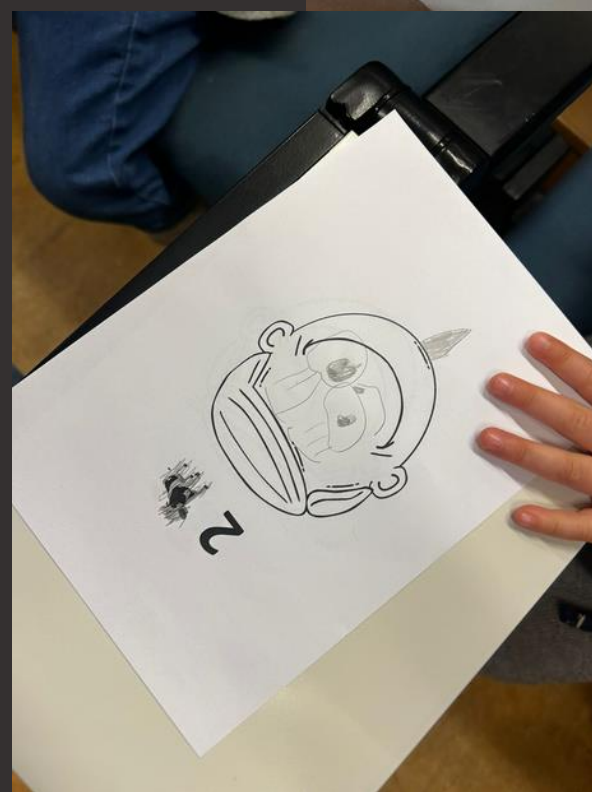
Invited Speaker

@several national and international conferences





# Outreach Activities



“Os olhos: como funcionam, como devemos usá-los e cuidá-los”

Ceorlab Uminho está com Jorge Jorge e 6 outras pessoas.  
10 de outubro de 2024 · 🌐

👉 ✨ Dia Mundial da Visão 2024 ✨ 👈

Ao longo do dia, tivemos a oportunidade de interagir convosco através de vários quizzes, e percebemos que surgiram muitas dúvidas e curiosidades sobre temas como miopia, presbiopia, lentes de contacto e saúde visual infantil. Estas imagens são dedicadas a esclarecer muitas dessas questões e trazer informações importantes para quem quer cuidar melhor dos seus olhos. Se ficaram com alguma dúvida ou se quiserem saber mais sobre como proteger... Ver mais

**Dia mundial da VISÃO**  
10 de outubro de 2024

**5 factos sobre MIOPIA**

- É uma refracção caracterizada por má visão ao longe, normalmente, associada a um comprimento do olho maior.
- A prevalência tem vindo a aumentar e espera-se que em 2050 mais de metade da população mundial seja míope.
- Atividades ao ar livre - fator protetor
- Atividades visão perto - fator de risco
- A maior incidência de miopias altas pode levar a problemas mais sérios.
- Existem métodos que permitem abrandar o progresso da miopia!

**4 factos sobre LENTES CONTACTO**

- Lentes diárias - uso único (descartar ao final do dia)
- Lentes mensais - 30 dias após abertura (e não 30 utilizações)
- Trocar estajo a cada 3 meses
- As lentes devem ser descartadas no lixo comum, nunca na sanita ou reciclagem.
- Seguir as recomendações do profissional de saúde e ir a consultas regulares - essencial para evitar complicações oculares.
- Se sentir desconforto, olho vermelho ou dor, interrompa o uso e consulte um especialista.

**OLHÓ QUIZ!**  
DIA 10 DE OUTUBRO

Participa nos nossos Quiz no Dia Mundial da Visão!  
Testa os teus conhecimentos e aprende mais sobre a saúde ocular de uma forma divertida.

11h00 - Lounge da Biblioteca UM-Gualtar (+participação ONLINE)

12h30 - Bar do Grill (a saída da cantina e do restaurante grill)

13h00

13h30

14h00

HÁ PRÉMIOS PARA O 1º CLASSIFICADO EM CADA QUIZ!

Com o apoio de: EssilorLuxottica, CASA LUCAS DO CONHECIMENTO, HOVA, etc.

**AGE AGORA, VÊ AMANHÃ!**  
Os desafios da miopia no presente e as suas implicações no futuro.

Act Now, See Tomorrow!  
**MYOPIA AWARENESS WEEK** 13-19 May 2024

Jorge Jorge, António Queirós-Pereira, Rute Araújo, Maria Mechó, Paulo Fernandes, Sofia Matos


Clinal & Experimental Optometry Research Lab

Actividades “Dia Mundial da Visão” e “Semana Internacional da Miopia”






# Honors & Awards

 **2015** | **Best Oral Communication**  
APLO 2015: "Adaptação de Lente Escleral após Infecção Ocular com Cicatriz na Área Pupilar"


 **2015** | **First prize at Business Ideas Contest SpinUM**  
"Analisador da Distorção Luminosa"

 **2016** | **Best Oral Communication**  
APLO 2016: "Acuidade Visual e Sintomatologia com Lentes de Contacto de Apoio Escleral em Córneas Irregulares e Altas Ametropias"

 **2016** | **Best Poster**  
"SENSIBILIDAD AL DESENFOQUE ESFERICO Y ASTIGMATICO EN UN NUEVO DISPOSITIVO PARA LA DETERMINACIÓN RAPIDA DE LA DISTORCIÓN LUMINOSA"

 **2018** | **Best Oral Communication**  
CAOS, Porto - Portugal "Avaliação da Topografia Escleral Anterior: Diferenças entre Olhos com Córneas Regulares e Córneas Irregulares e Mudanças na Forma Esclero-Conjuntival após Uso de Lentes Esclerais "

 **2018** | **Best Poster**  
"PRACTITIONER LEARNING CURVE IN FITTING MINI-SCLERAL CONTACT LENSES IN IRREGULAR AND REGULAR CORNEAS USING A FITTING TRIAL" - GSLS, Las Vegas

 **2021** | **Best Oral Communication**  
CAOS 2021 "Tear Reservoir Thickness During Scleral Lens Wear"

 **2023** | **Best Poster**  
"Prospective Assessment of Corneal Biomechanical Properties and Intraocular Pressure During Scleral Lens Wear" Rute J. Macedo de Araújo, Ana Amorim, José Méijome. CIOCV23

 **2024** | **Best Poster**  
"The Patient-Physician Relationship and Role of Empathic Communication in Contact-Lens Practice - Patient Satisfaction" Rute J. Macedo de Araújo, Daddí Fadel, Melissa Barnett. CIOCV24



# The Future?

Innovations in specialty contact lenses  
Personalized treatments  
.....who knows?

## *Research Development*

## *Clinical Impact*

Enhancing patient care

## *Projects/ Funding*

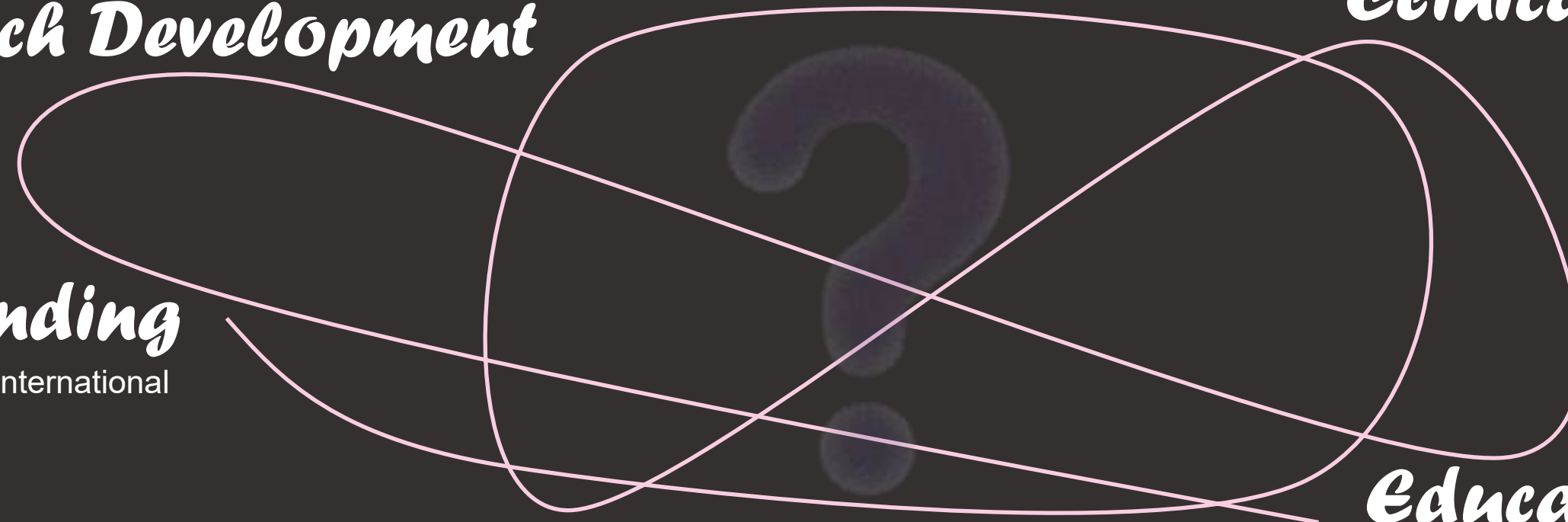
National and International

## *Education*

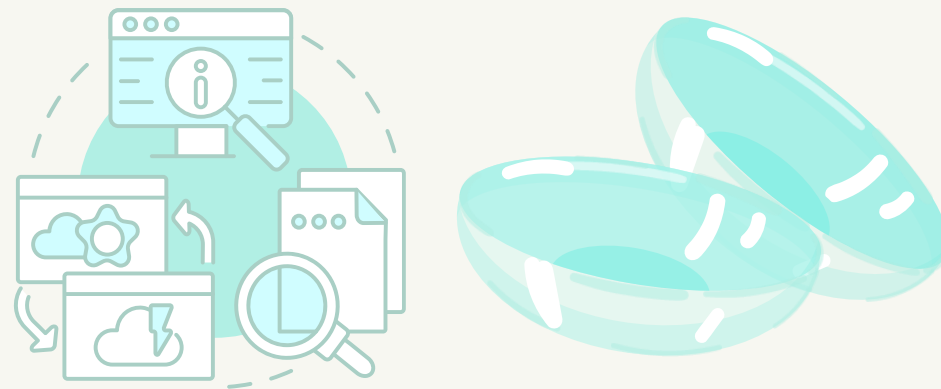
Training Professionals

## *Collaborations*

Strength International Partnerships  
European Projects  
Bridging research with Industry



# How Optical and Visual Quality Evolve Over Time in Scleral Lens Wearers



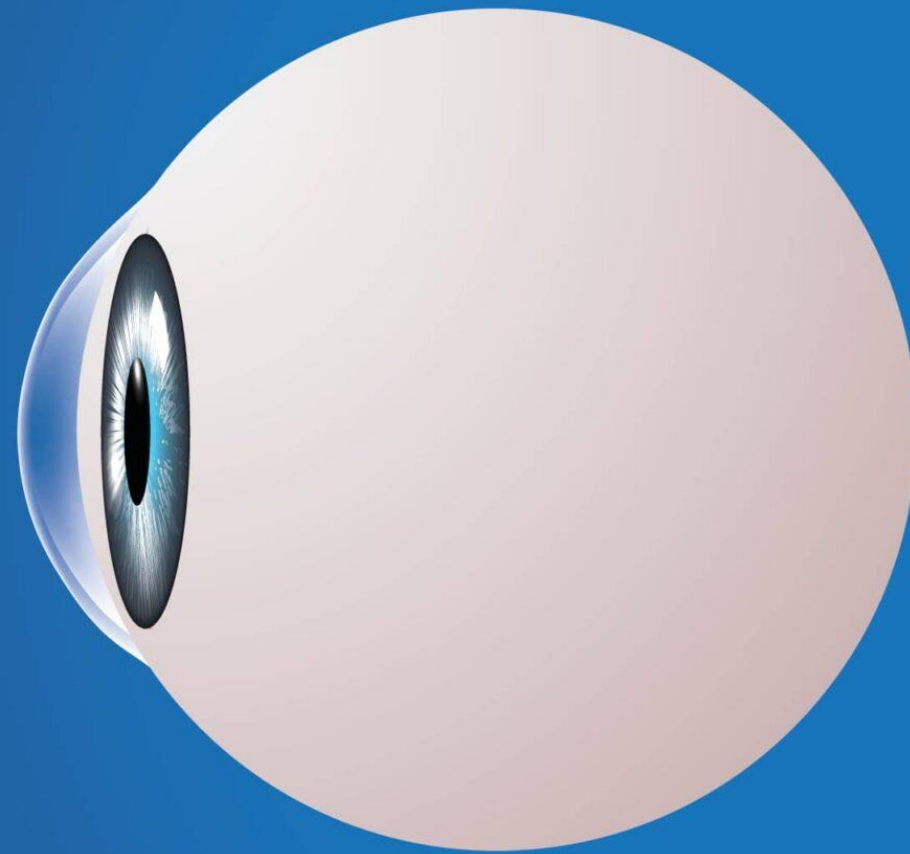
Rute J. Macedo-de-Araújo



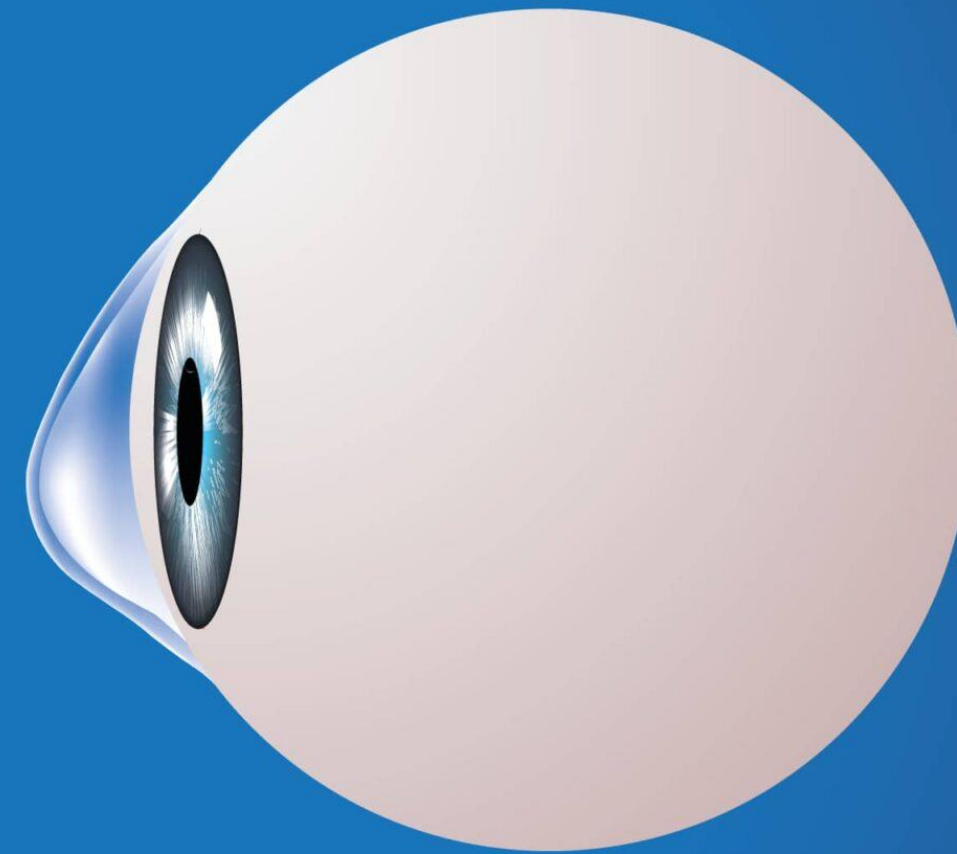


# *Introduction*

## KERATOCONUS

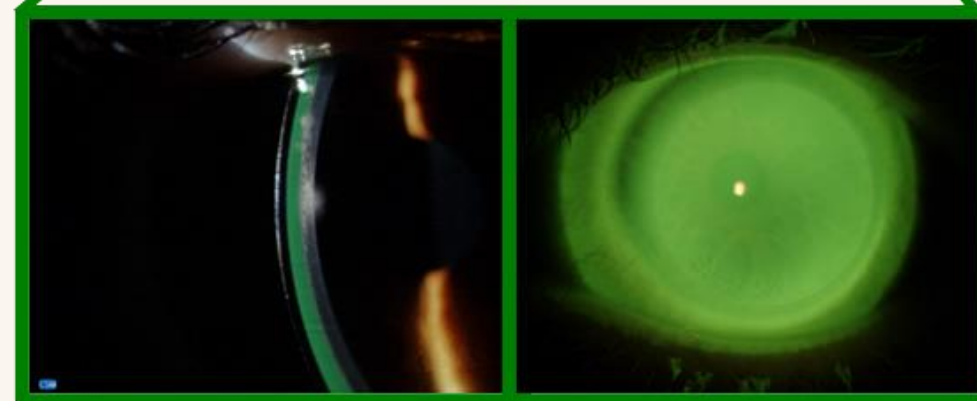
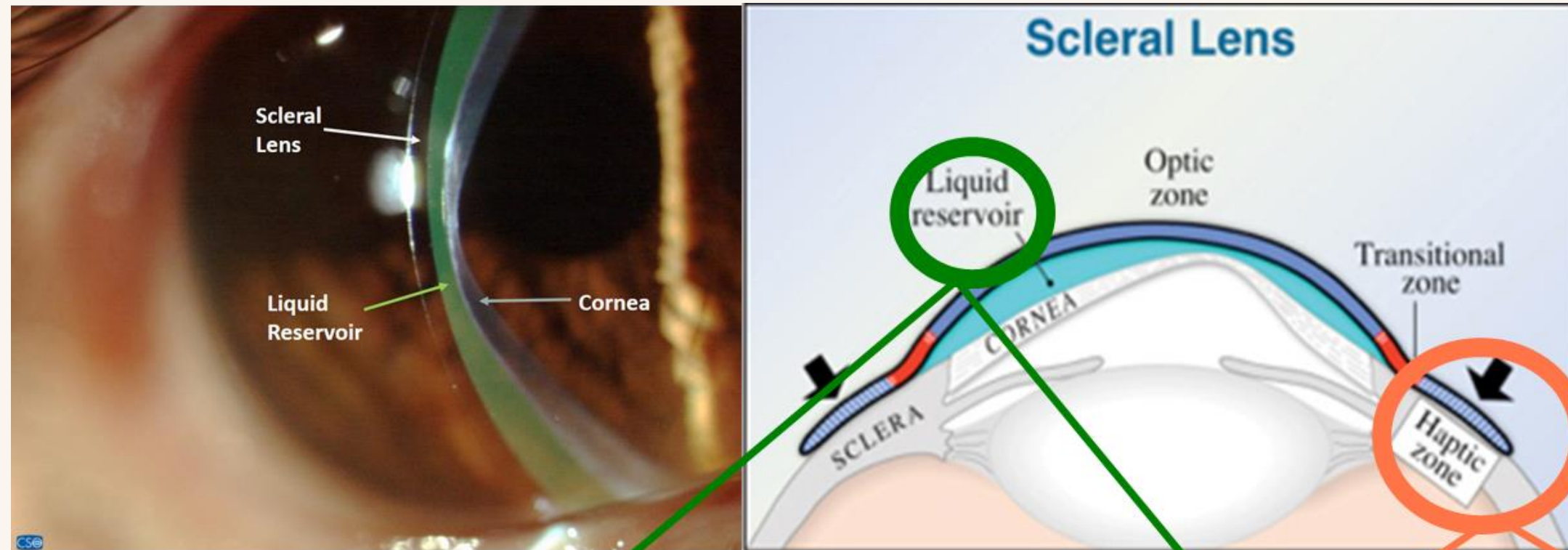


Normal cornea



Keratocunus

# Introduction





**To report the visual outcomes and  
symptomatology of subjects with irregular corneas  
who wore SL daily for 18 months+**



# METHODS



## Sample



33 subjects (57 eyes)  
with irregular corneas



Senso Mini Sclera



## Visual Acuity

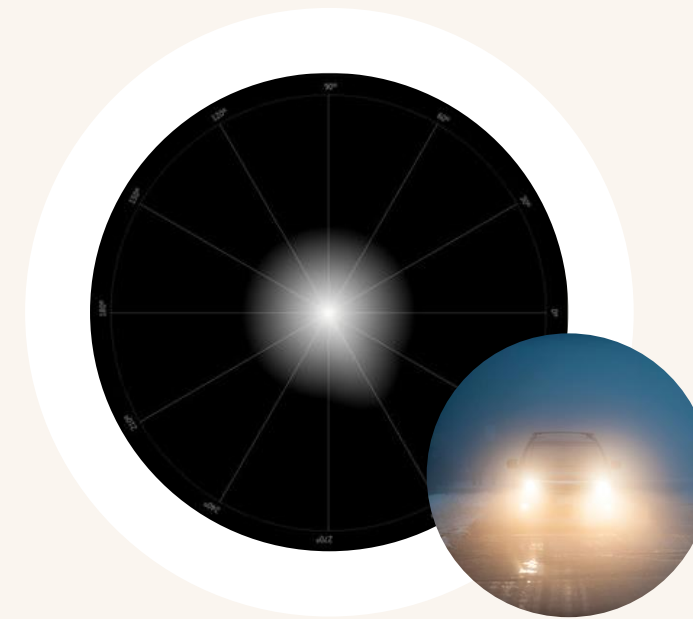
EDTRS Vision Chart  
(LogMAR Scale)

**High Contrast Visual  
Acuity (HCVA)**

H V Z D S  
N C V K D  
C Z S H N  
O N V S R  
K D N R O  
Z K C S V  
D V O H C  
O H V C R  
H Z C O D  
H A A D  
H A A D

**Low Contrast Visual  
Acuity (LCVA)**

H V Z D S  
N C V K D  
C Z S H N  
O N V S R  
K D N R O  
Z K C S V  
D V O H C  
O H V C R  
H Z C O D  
H A A D  
H A A D

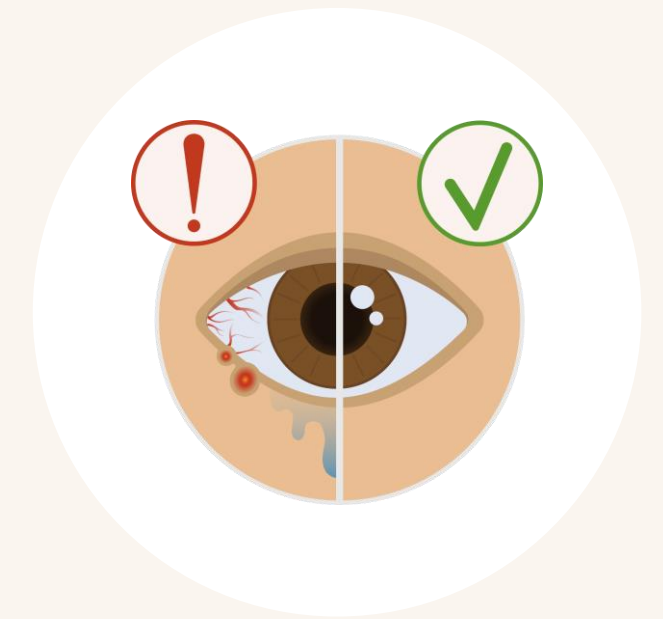


## Light Disturbance Analyzer

LDA, BinaryTarget, Portugal

Measure the visual performance under dim  
light conditions.

**LDI:** Light Distortion Index  
**BFCIrregSD:** Irregularity



## Symptoms

**OSDI:** Ocular  
Surface Index

**QoV:** Quality of  
Vision

**Ocular Surface Disease Index\* (OSDI<sup>1</sup>)**  
Ask your patient the following 12 questions, and tick the number in the box that best represents each answer. Then, fill in boxes A, B, C, D, and E, according to the instructions below each.

**HAVE YOU EXPERIENCED ANY OF THE FOLLOWING DURING THE LAST WEEK?**

	All of the time	Most of the time	Half of the time	Some of the time	None of the time
1. Eyes that are sensitive to light?	4	3	2	1	0
2. Eyes that feel gritty?	4	3	2	1	0
3. Itchy or sore eyes?	4	3	2	1	0
4. Blurred vision?	4	3	2	1	0
5. Poor vision?	4	3	2	1	0

Subtotal score for answers 1 to 5: [ ]

**HAVE PROBLEMS WITH YOUR EYES LIMITED YOU IN PERFORMING ANY OF THE FOLLOWING DURING THE LAST WEEK?**

	All of the time	Most of the time	Half of the time	Some of the time	None of the time	N/A
6. Reading?	4	3	2	1	0	N/A
7. Driving at night?	4	3	2	1	0	N/A
8. Working with a computer or bank machine (ATM)?	4	3	2	1	0	N/A
9. Watching TV?	4	3	2	1	0	N/A

Subtotal score for answers 6 to 9: [ ]

**HAVE YOUR EYES FEEL UNCOMFORTABLE IN ANY OF THE FOLLOWING SITUATIONS DURING THE LAST WEEK?**

	All of the time	Most of the time	Half of the time	Some of the time	None of the time	N/A
10. Windy conditions?	4	3	2	1	0	N/A
11. Hot or arid with low humidity (very dry)?	4	3	2	1	0	N/A
12. Areas that are air conditioned?	4	3	2	1	0	N/A

Subtotal score for answers 10 to 12: [ ]



**HCVA**  
H V Z D S  
N C V K D  
C Z S H N  
O N V S R  
K D N R O  
Z K C S V  
D V G O G  
K X X X X

**LCVA**  
H V Z D S  
N C V K D  
C Z S H N  
O N V S R  
K D N R O  
Z K C S V  
D V G O G  
K X X X X

**LDA**

**SYMPTOMS**

**HC: Habitual Correction**  
**BSC: Best Spectacle Correction**

**HCVA**  
H V Z D S  
N C V K D  
C Z S H N  
O N V S R  
K D N R O  
Z K C S V  
D V G O G  
K X X X X

**LCVA**  
H V Z D S  
N C V K D  
C Z S H N  
O N V S R  
K D N R O  
Z K C S V  
D V G O G  
K X X X X

**LDA**

**SYMPTOMS**

**> 120' of scleral lens wear**

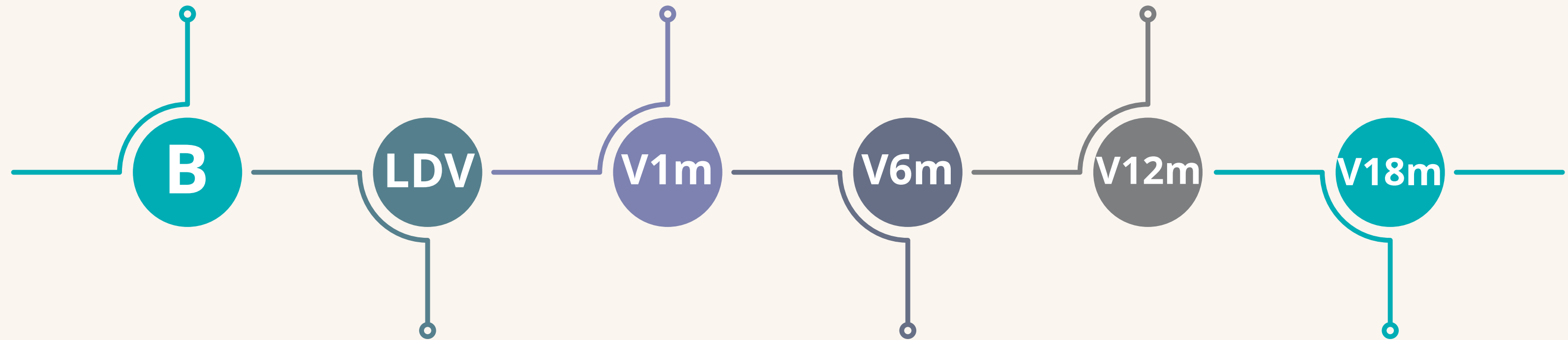
**HCVA**  
H V Z D S  
N C V K D  
C Z S H N  
O N V S R  
K D N R O  
Z K C S V  
D V G O G  
K X X X X

**LCVA**  
H V Z D S  
N C V K D  
C Z S H N  
O N V S R  
K D N R O  
Z K C S V  
D V G O G  
K X X X X

**LDA**

**SYMPTOMS**

**> 120' of scleral lens wear**



**LDV1: 10' of scleral lens wear**  
**LDV2: >120' of scleral lens wear**

**HCVA**  
H V Z D S  
N C V K D  
C Z S H N  
O N V S R  
K D N R O  
Z K C S V  
D V G O G  
K X X X X

**LCVA**  
H V Z D S  
N C V K D  
C Z S H N  
O N V S R  
K D N R O  
Z K C S V  
D V G O G  
K X X X X

**LDA**

**SYMPTOMS**

**HCVA**  
H V Z D S  
N C V K D  
C Z S H N  
O N V S R  
K D N R O  
Z K C S V  
D V G O G  
K X X X X

**LCVA**  
H V Z D S  
N C V K D  
C Z S H N  
O N V S R  
K D N R O  
Z K C S V  
D V G O G  
K X X X X

**LDA**

**SYMPTOMS**

**> 120' of scleral lens wear**

**HCVA**  
H V Z D S  
N C V K D  
C Z S H N  
O N V S R  
K D N R O  
Z K C S V  
D V G O G  
K X X X X

**LCVA**  
H V Z D S  
N C V K D  
C Z S H N  
O N V S R  
K D N R O  
Z K C S V  
D V G O G  
K X X X X

**LDA**

**SYMPTOMS**

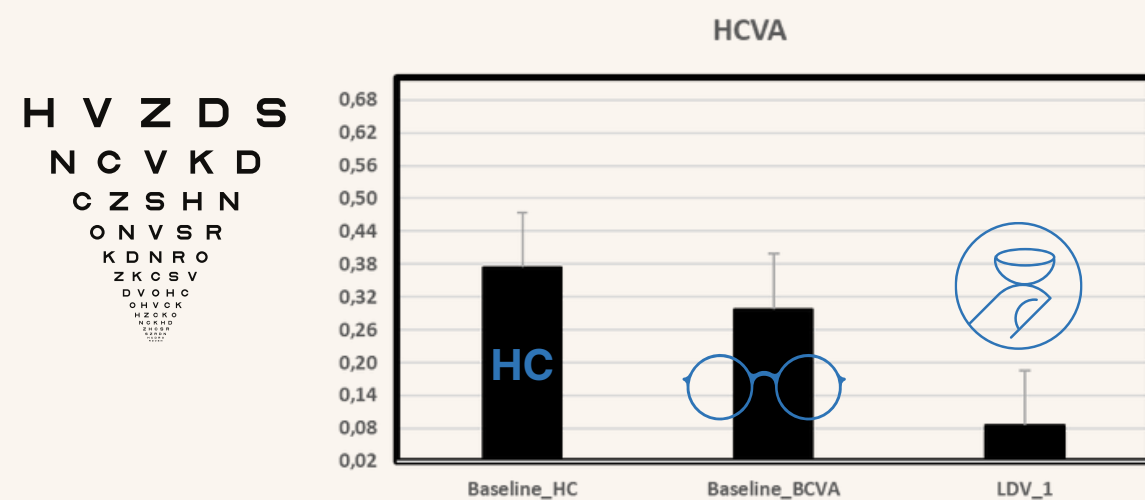
**> 120' of scleral lens wear**

# RESULTS

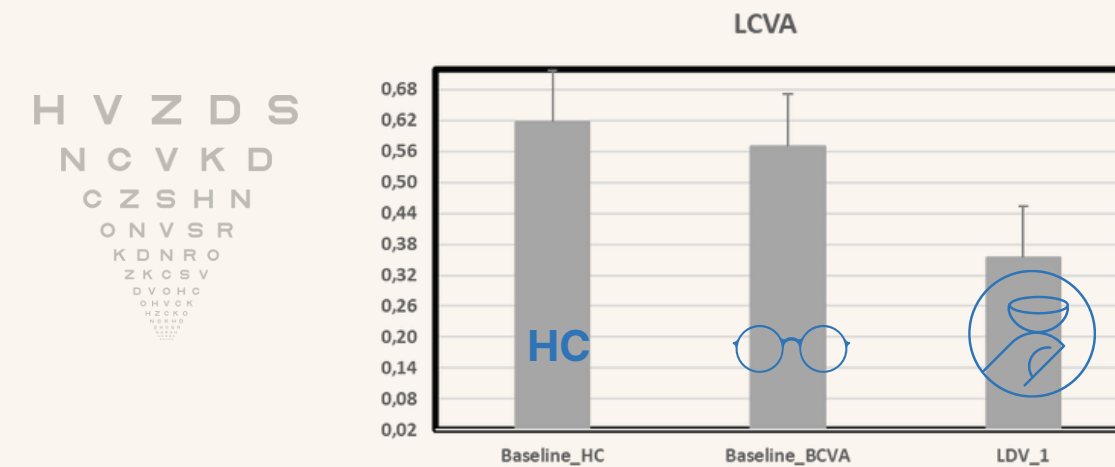
## VISUAL ACUITY

### LDA

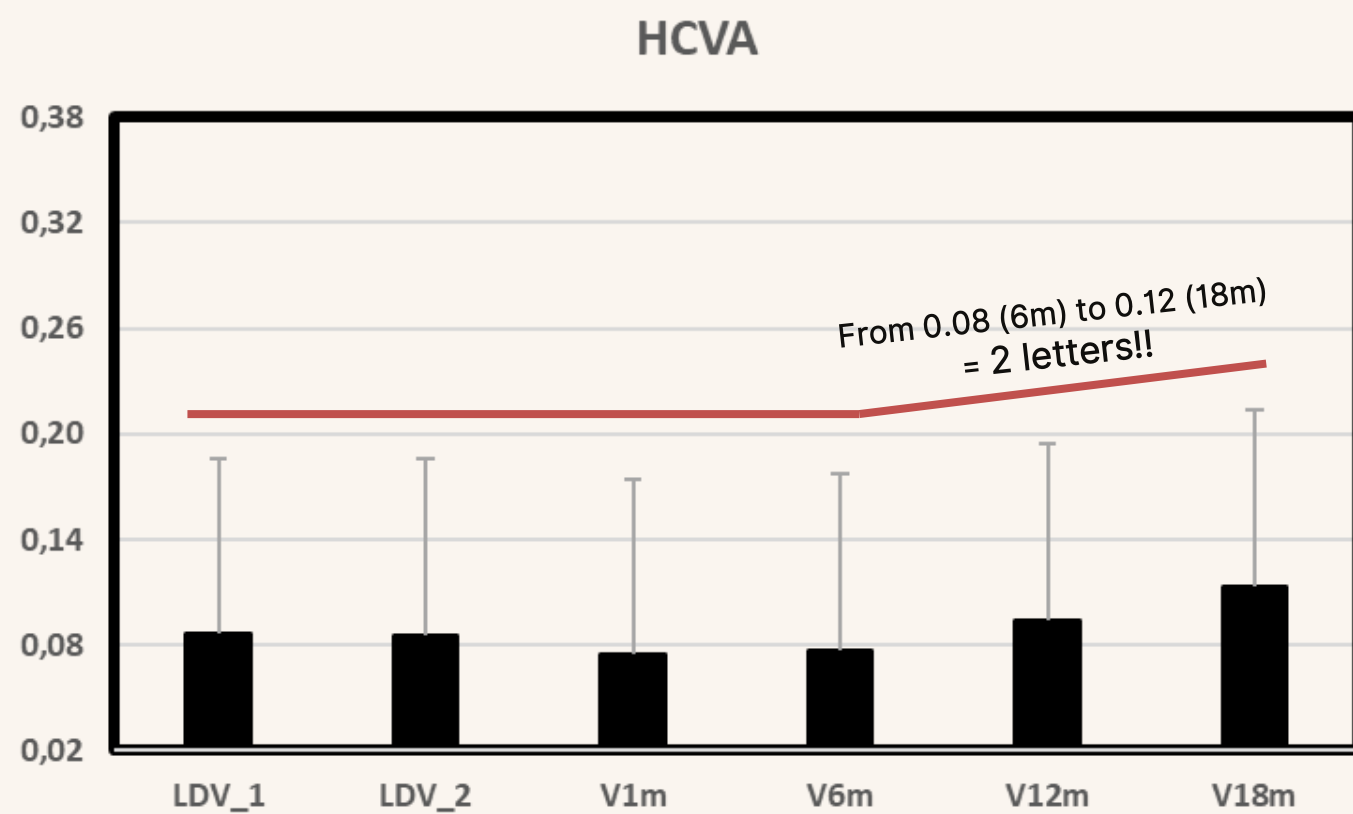
### SYMPTOMS



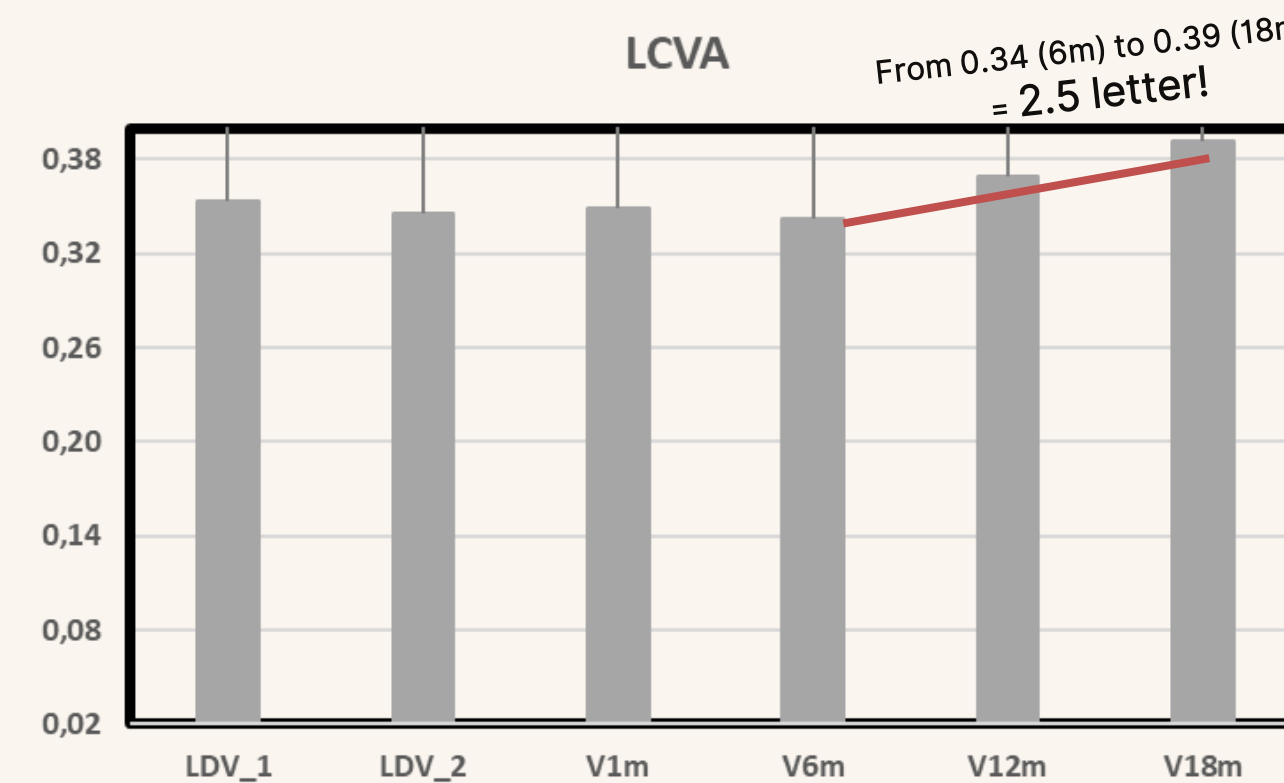
Statistically significant improvement of both HCVA when compared to HC and BSC (almost 3 lines) ( $p < 0.001$ )



Statistically significant improvement of LCVA when compared to HC and BSC (almost 3 lines) ( $p < 0.001$ )



- Visual fluctuations over 18 months of SL wear were no higher than 0.04 logMAR (2 letters) ( $p > 0.05$ )

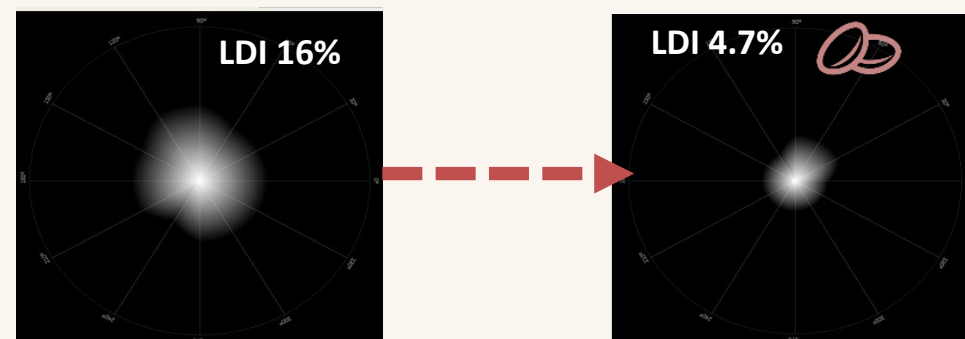
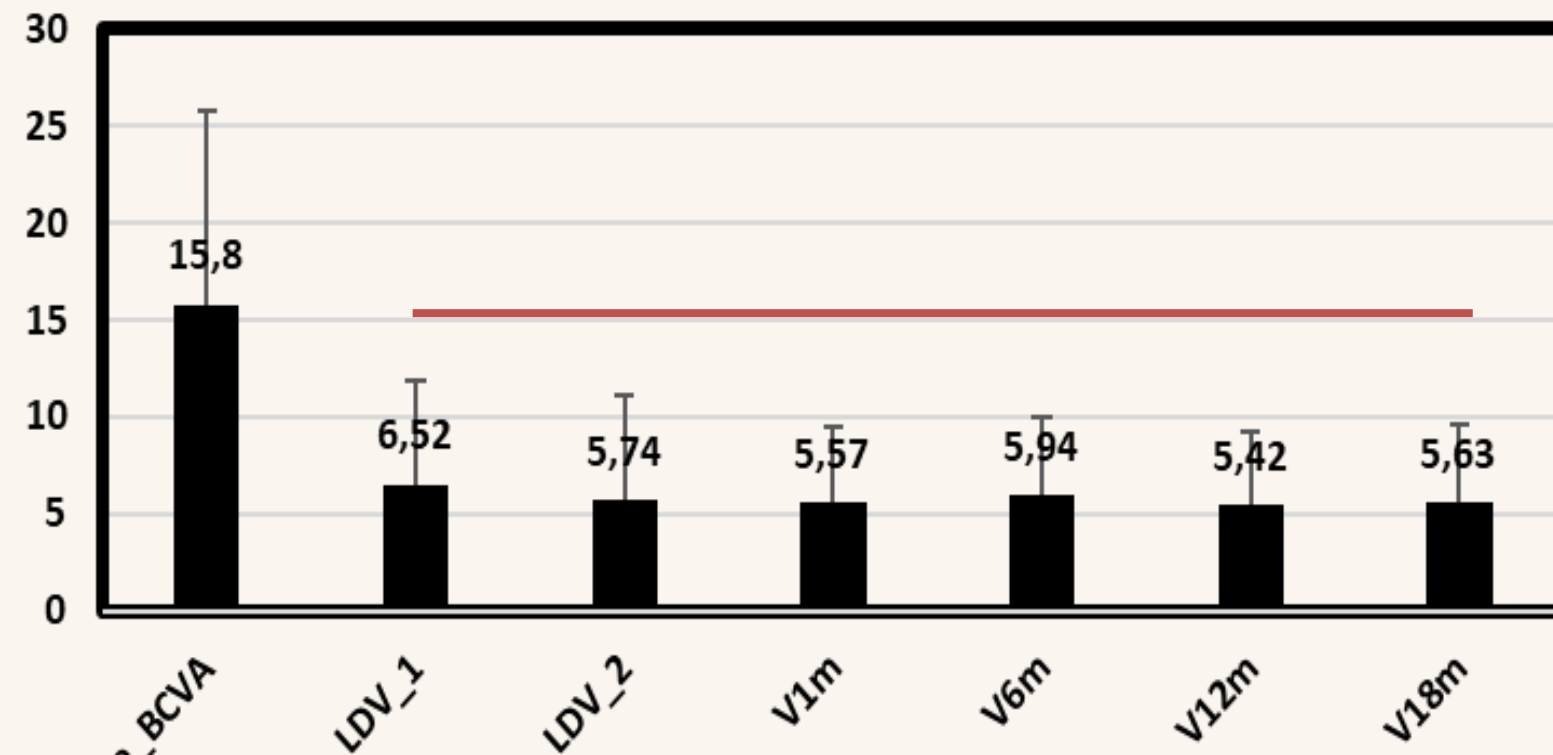


- Visual fluctuations over 18 months of SL wear were no higher than 0.05 logMAR (2.5 letters) ( $p > 0.05$ )



### ↔ The SIZE (%)

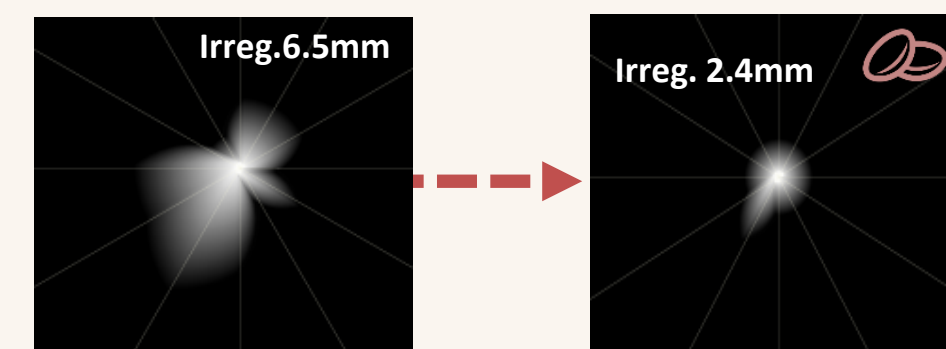
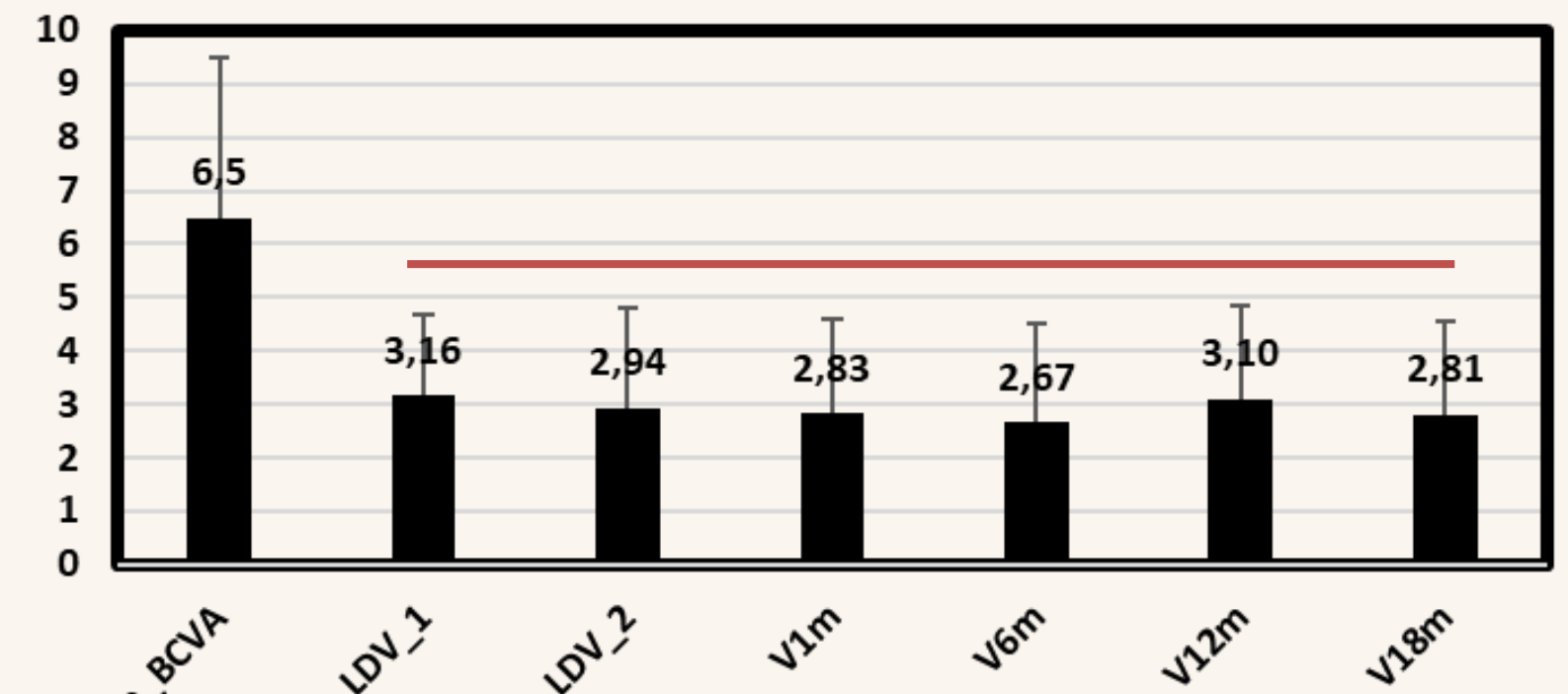
LDI - Light Disturbance Index



- LDI fluctuations were around 1% over time ( $p > 0.05$ )

### 👁 The IRREGULARITY (mm)

BFCIrregSD - Irregularity of Light Distortion



- ~Fluctuations were around 0.50mm over time ( $p > 0.05$ )

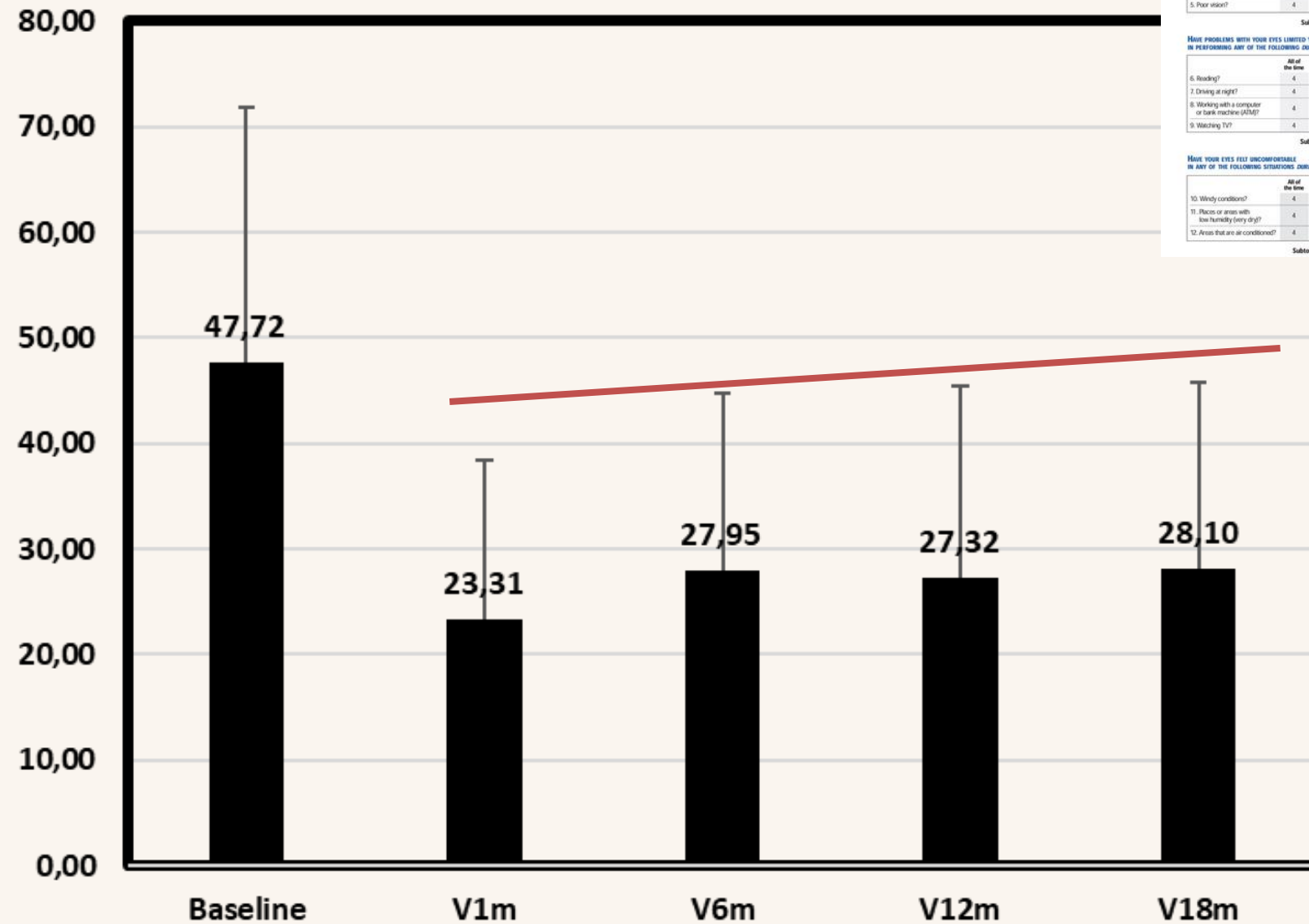
# RESULTS

## VISUAL ACUITY

## LDA

## SYMPTOMS

### OSDI



**Ocular Surface Disease Index® (OSDI®)**  
Ask your patient the following 12 questions, and circle the number in the box that best represents each answer. Then, fill in boxes A, B, C, D, and E according to the instructions beside each.

**HAVE YOU EXPERIENCED ANY OF THE FOLLOWING DURING THE LAST WEEK?**

	At all of the time	Most of the time	Half of the time	Some of the time	None of the time
1. Eyes that are sensitive to light?	4	3	2	1	0
2. Eyes that feel gritty?	4	3	2	1	0
3. Particular vision spots?	4	3	2	1	0
4. Blurred vision?	4	3	2	1	0
5. Poor vision?	4	3	2	1	0

Subtotal score for answers 1 to 5: [A]

**HAVE PROBLEMS WITH YOUR EYES LIMITED YOU IN PERFORMING ANY OF THE FOLLOWING DURING THE LAST WEEK?**

	At all of the time	Most of the time	Half of the time	Some of the time	None of the time
6. Reading?	4	3	2	1	0
7. Driving at night?	4	3	2	1	0
8. Working with a computer or cash machine/ATM?	4	3	2	1	0
9. Watching TV?	4	3	2	1	0

Subtotal score for answers 6 to 9: [B]

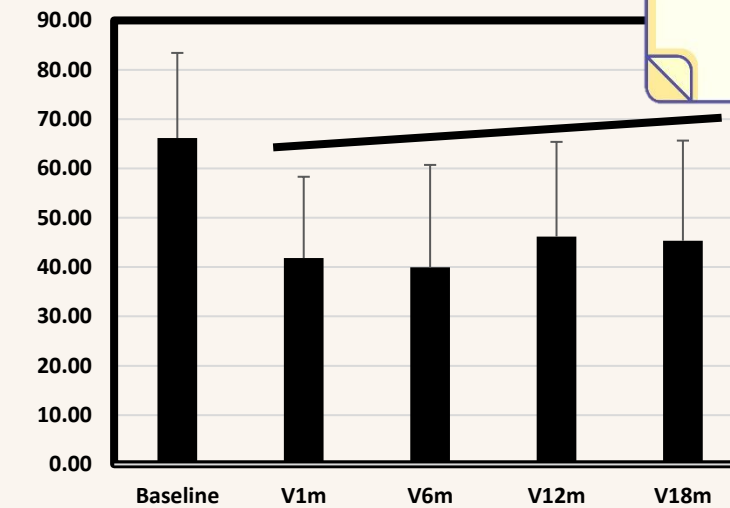
**HAVE YOUR EYES FEEL UNCOMFORTABLE IN ANY OF THE FOLLOWING SITUATIONS DURING THE LAST WEEK?**

	At all of the time	Most of the time	Half of the time	Some of the time	None of the time
10. Windy conditions?	4	3	2	1	0
11. Places or areas with low humidity (dry air)?	4	3	2	1	0
12. Areas that are air conditioned?	4	3	2	1	0

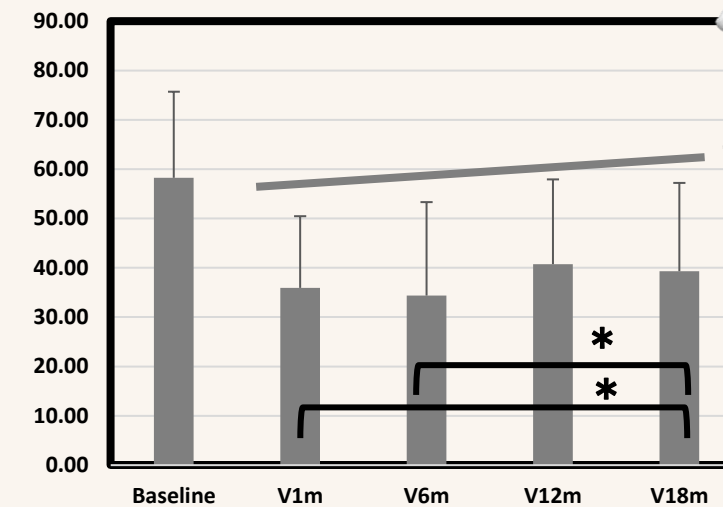
Subtotal score for answers 10 to 12: [C]

OSDI Scores (symptomatology) decreased from 47.72±24.17 with HC to 23.31±15.07 at V1 and had a slight increase through time (to 28.10 at V18m, p=0.022 compared to V1m).

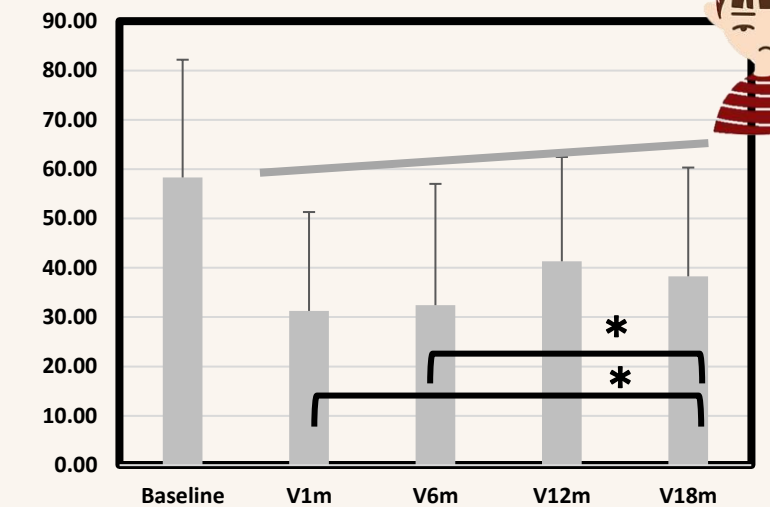
### QoV - Frequency



### QoV - Severity



### QoV - Bothersome



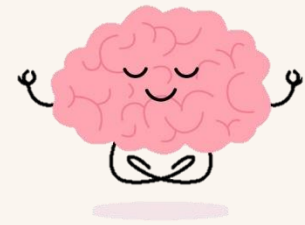
There was a slight increase in the frequency (p<0.05), severity (V6m vs V12m, p<0.05) and bothersome (V12m vs V1m and V6m, p<0.05) of visual quality symptoms (QoV).

# CONCLUSIONS



## Visual and Optical Stability

The study confirms that scleral lenses (SLs) provide a stable and effective visual correction for individuals with irregular corneas over 18 months. Despite minor fluctuations in visual acuity (up to 2 letters) and light distortion parameters (1% change), no clinically significant changes were observed in optical quality over time.



## Improved Symptomatology

Symptom scores measured with Ocular Surface Disease Index (OSDI) significantly improved from baseline habitual correction (HC) levels with SL wear. While there was a slight increase in symptoms over time, these remained within acceptable limits, reflecting long-term comfort and tolerability.



## Quality of Vision and Patient Comfort

SL wear showed a clear improvement in the frequency, severity, and bothersome of visual disturbances, particularly compared to habitual and best spectacle correction. However, the minor increases noted after 12 months emphasize the importance of monitoring patients for potential adjustments.



## Safety

No adverse events were reported throughout the 18-month follow-up, underscoring the safety of prolonged scleral lens wear when professionally managed (in this sample of SL wearers).





THANKS FOR  
YOUR ATTENTION!



*Rute J. Macedo de Araújo*