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A new light-adaptive lens improves contrast sensitivity when transitioning from bright to dark environments

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PURPOSE

Vision tends to be measured under perfect conditions —static lighting on acuity charts with 100% contrast.
However, real-world lighting significantly influences visual perception (1,2) and contrast sensitivity is primarily affected (3).



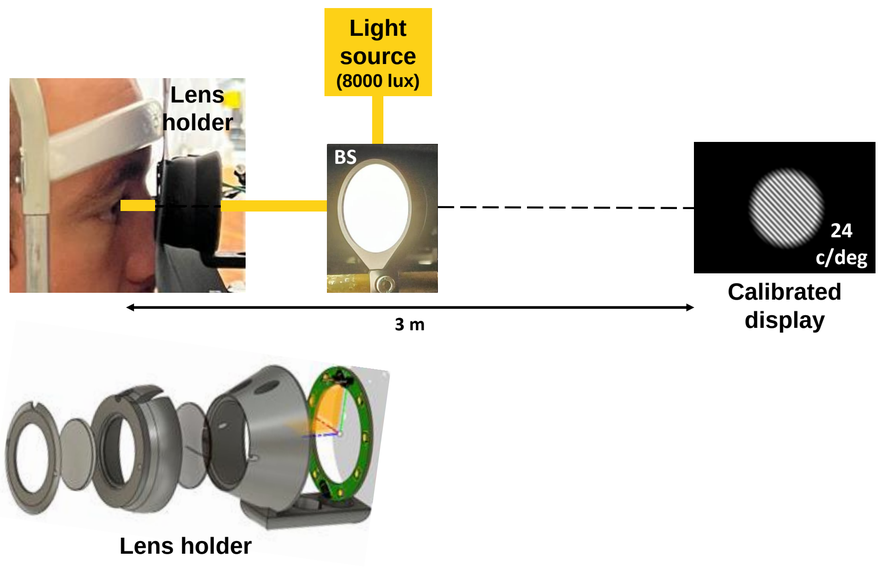
While standard photochromic lenses adjust light intake, they perform suboptimally when transitioning from bright to dim environments. A new ultra-fast light adaptive lens was designed with new advanced chemistry to ensure continuous vision quality across all light environments.

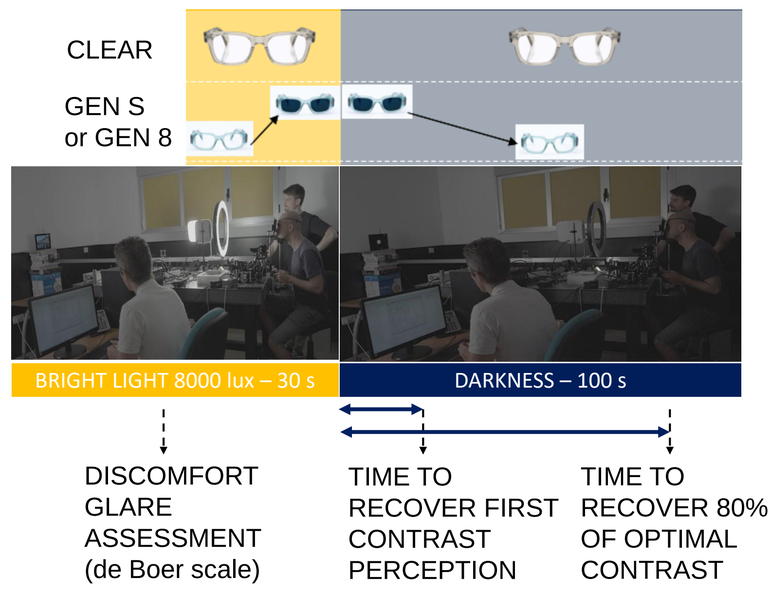
This study aimed to evaluate the impact of the **new light adaptive lens** on **dynamic contrast sensitivity recovery** in **healthy participants** under **varying light** conditions, during **transitions from bright to dim light**, compared to standard photochromic lens and to **static clear lens**.

METHODS

Comparative, prospective, double-blind, randomised, repeated measures

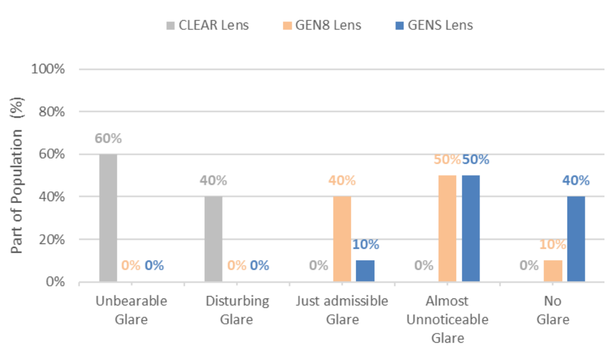
- 10 healthy young adults, 28.7 ± 3.4 years, pre-trained, 3 measures / participant
- From bright to dim light exposure Lenses activating and fading back as in real life
- New ultra-fast dynamic lens (Gen S™) vs Standard photochromic lens (Gen 8™) and vs Static clear lens
- Dynamic contrast sensitivity measured every 2 seconds for at least 100 seconds
- MANOVA with Tukey tests were used for statistical analysis.



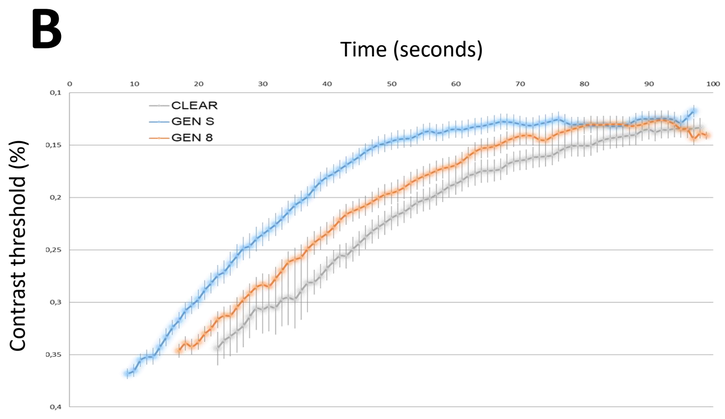


RESULTS

A



B

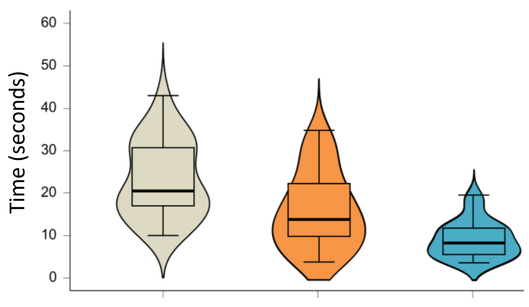


A Glare discomfort assessed during bright light exposure with a de Boer scale (1 to 5, from unbearable glare to no glare) with each lens for all participants (N=10)

B Contrast threshold (%) as a function of time (seconds), for all participants and all measures (N=30), mean +/- SEM.
t0 = time where bright light is transitioned to dark. 1 measure every 2 seconds for 100 seconds.

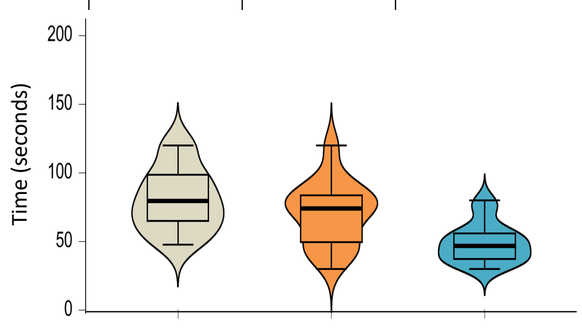
C

secs	Static Clear	GEN 8	GEN S
Mean	23,2	16,3	9,0
Std Dev	9,1	9,1	4,9
Min	10	4	0
Max	43	35	20



D

secs	Static Clear	GEN 8	GEN S
Mean	80,3	70,9	49,7
Std Dev	22,5	22,8	16,4
Min	48	30	30
Max	>100	>100	95



C Time (seconds) to recover contrast perception after bright light exposure (N=30, violin plot).

D Time (seconds) to recover 80% of optimal contrast threshold when transitioning from bright to dim light (N=30, violin plot).

- When using the new ultra-fast light-adaptive lens (Gen S™), 90% of participants reported experiencing 'no glare' or 'almost unnoticeable glare.' In contrast, 100% of participants using static clear lens reported experiencing at least a 'disturbing glare'. (Figure A)
- A statistically significant difference in dynamic contrast improvement was observed among the three lens types. ($p < 0.001$). (Figure B)
- The new ultra-fast light-adaptive lens (Gen S™) demonstrated the lowest inter-variability across all measured parameters. (Figures B and C)
- The new ultra-fast light-adaptive lens (Gen S™) provided 55% and 44% faster contrast perception after exposure to bright light, compared to static clear lens and standard photochromic lens (Gen 8™), respectively. (Figure C)
- The new ultra-fast light-adaptive lens (Gen S™) exhibited a 39% faster recovery to 80% of optimal contrast in varying light conditions compared to static clear lens ($p<0.001$). (Figure D)

CONCLUSION

- Validated new methodology to assess light influence on vision dynamically under realistic light conditions. Valuable to define vision improvements with light adaptive lenses compared to static clear reference lenses.
- The new ultra-fast light adaptive lens, Transitions® Gen S™, improved vision performance and comfort in dynamic light conditions compared to static clear lens and to usual photochromic technology.

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