

TUNE INTO YOUR BIOLOGICAL RHYTHMS

Light for life

HUMAN CENTRIC LIGHTING IN PRACTISE

TUNE INTO YOUR BIOLOGICAL RHYTHMS

- A look at our biological responses to lighting
- Uses in Education
 - Research
 - Case study
- Uses in Health
 - Research
 - Case study
- Practical look at how easy it is to incorporate Human Centric lighting into a project

Over millions of years, people have conducted their life according to natural daylight.

We have become accustomed to sunlight and the natural day/night rhythm through our evolution.

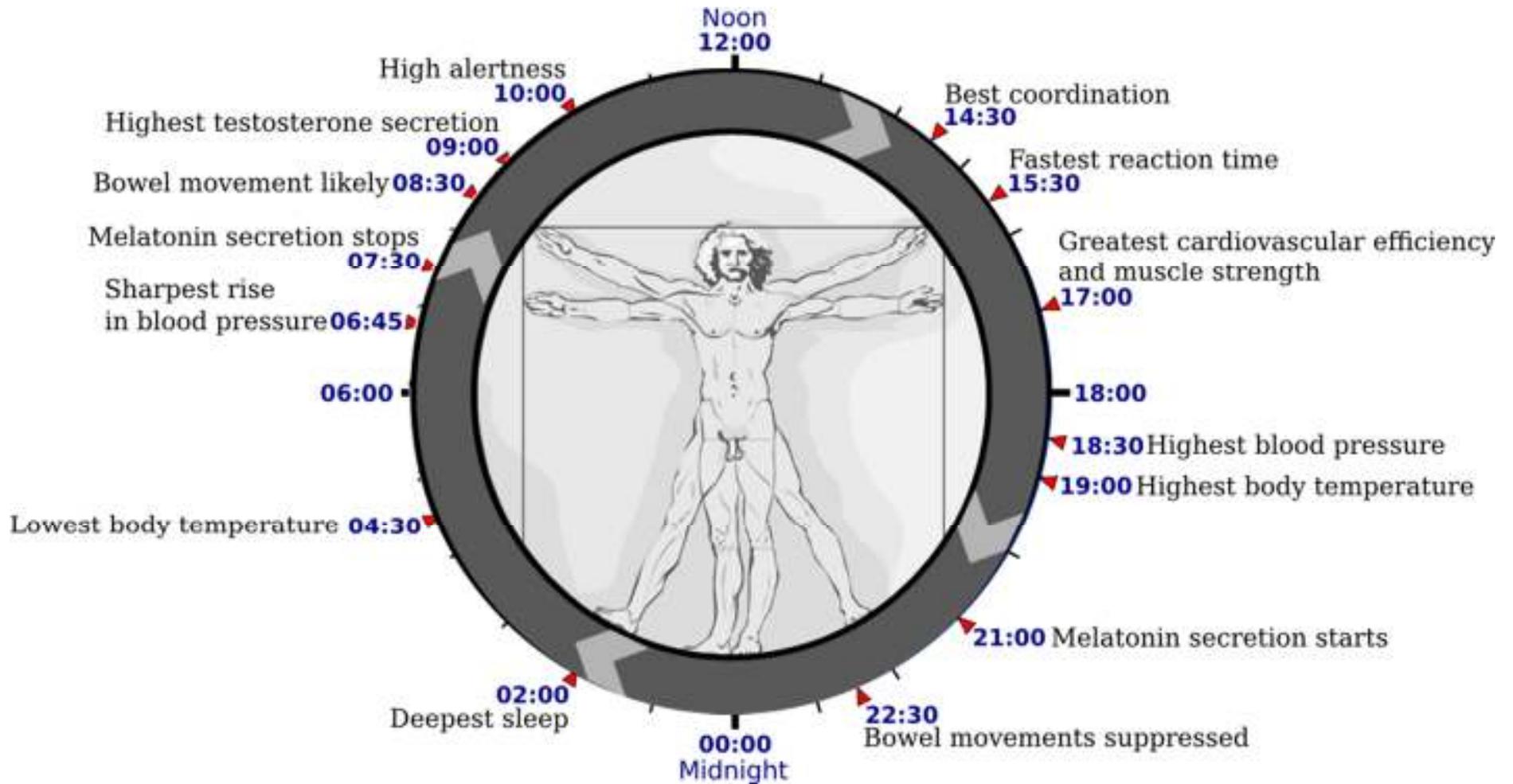


DYNAMIC LIGHT

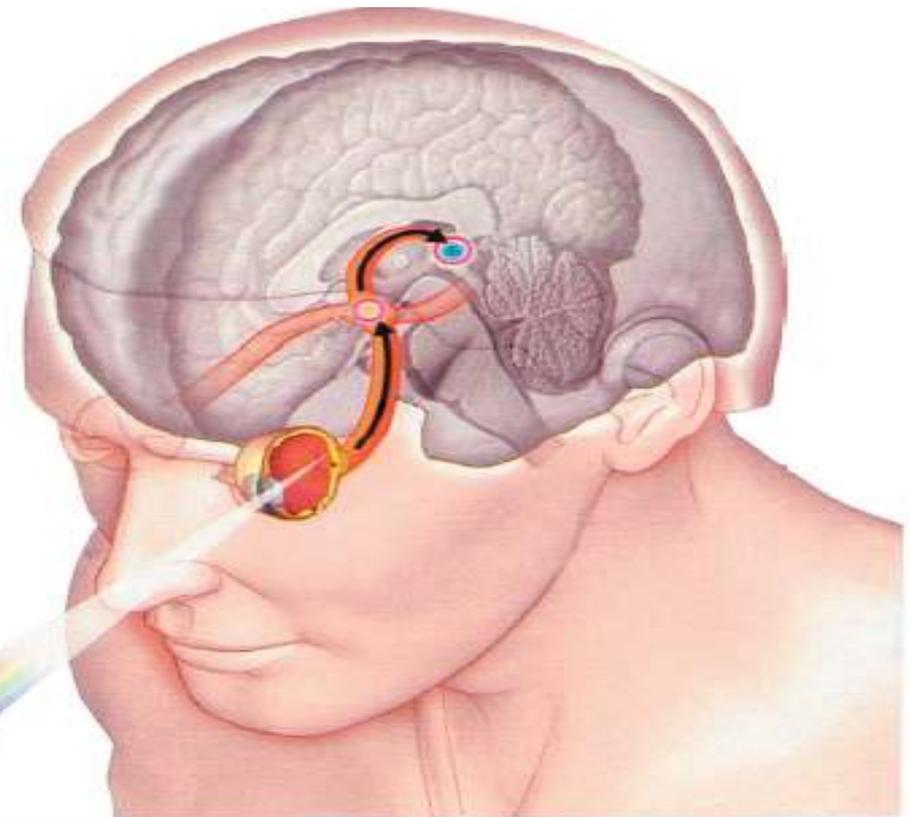
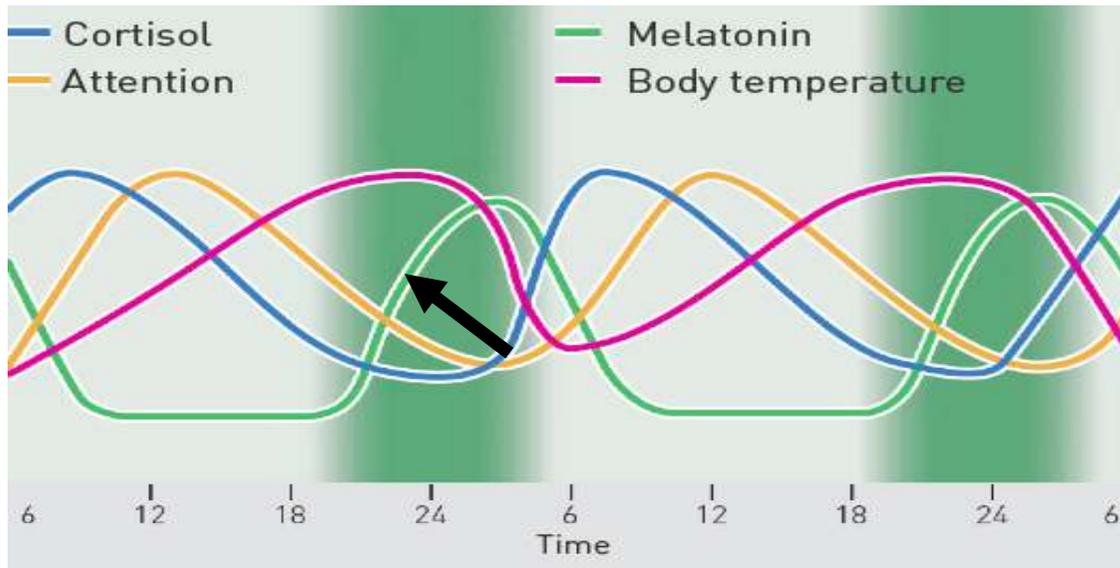
Natural light changes in intensity, colour temperature and direction...



TUNE INTO YOUR BIOLOGICAL RHYTHMS



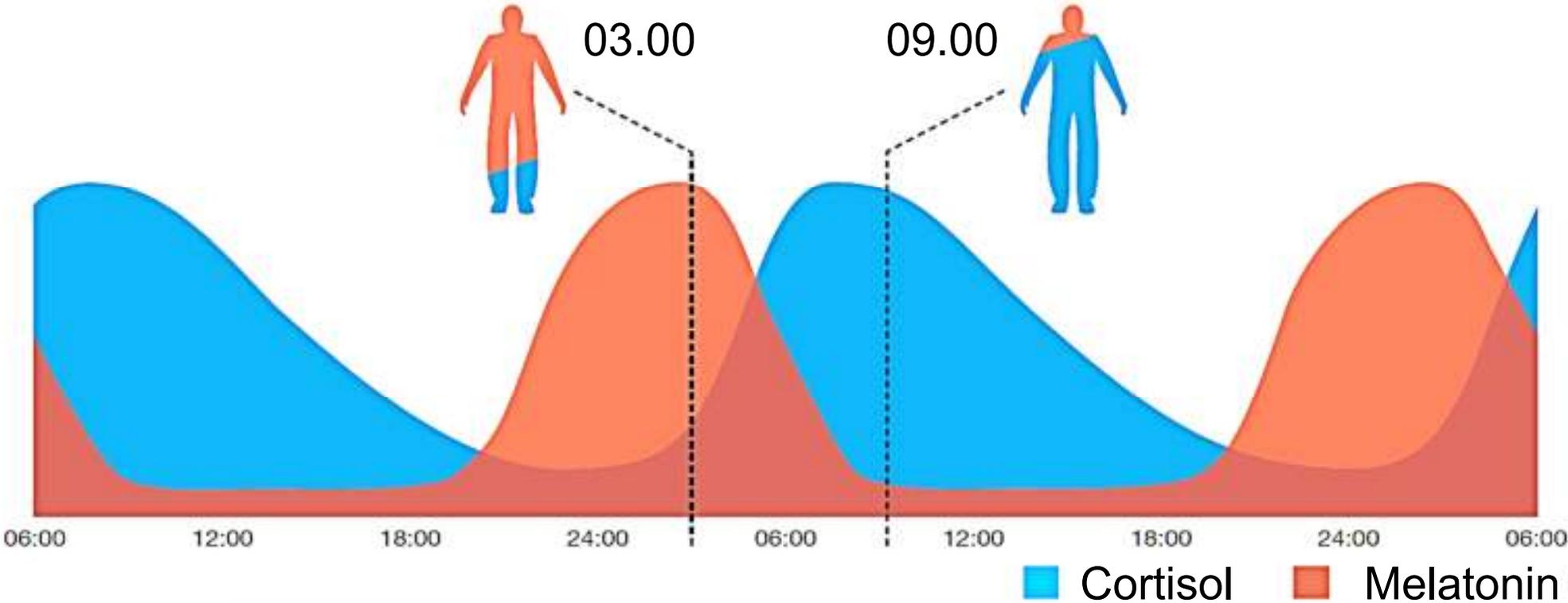
CYCLE OF DIFFERENT CIRCADIAN RHYTHMS

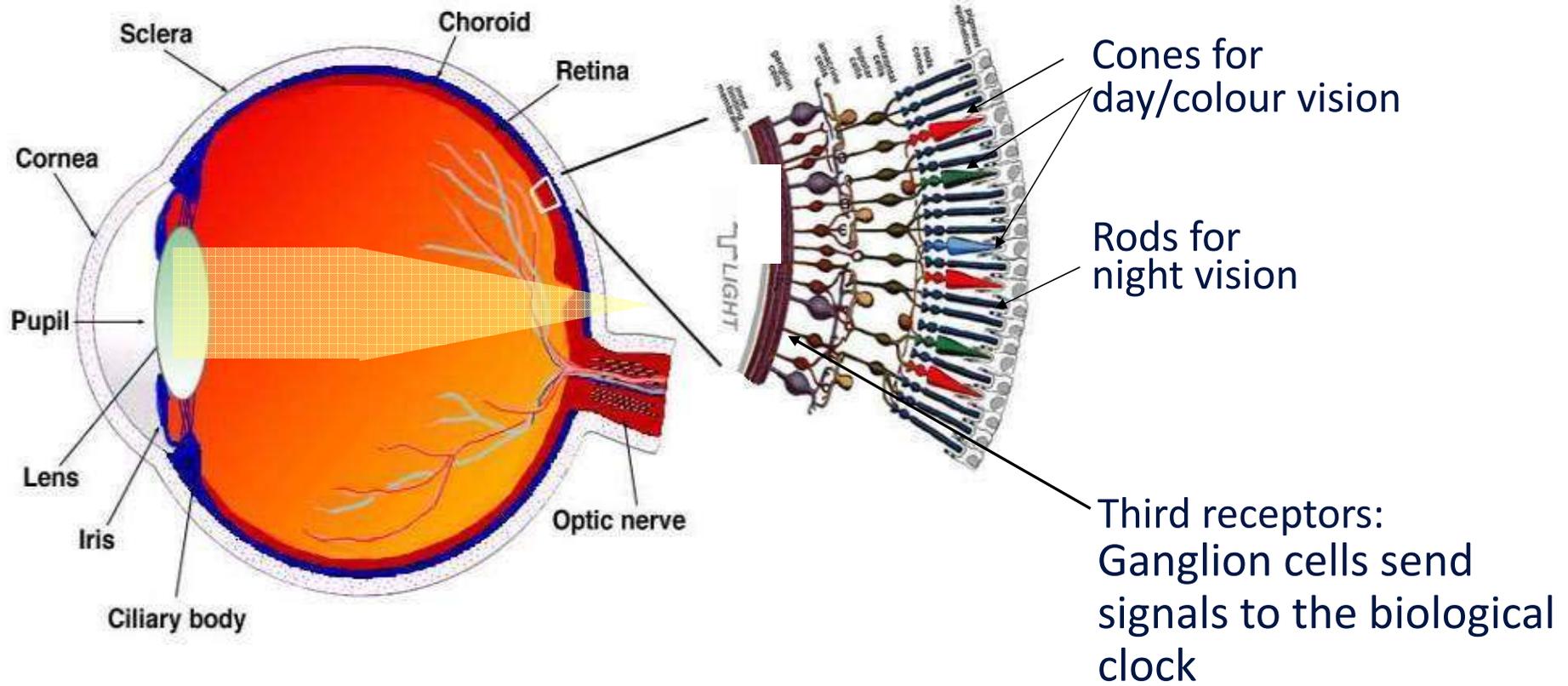


- The biological clock is triggered daily via specific receptors in the retina

Dynamic lighting can support the biological rhythm.

BIOLOGICAL RESPONSE





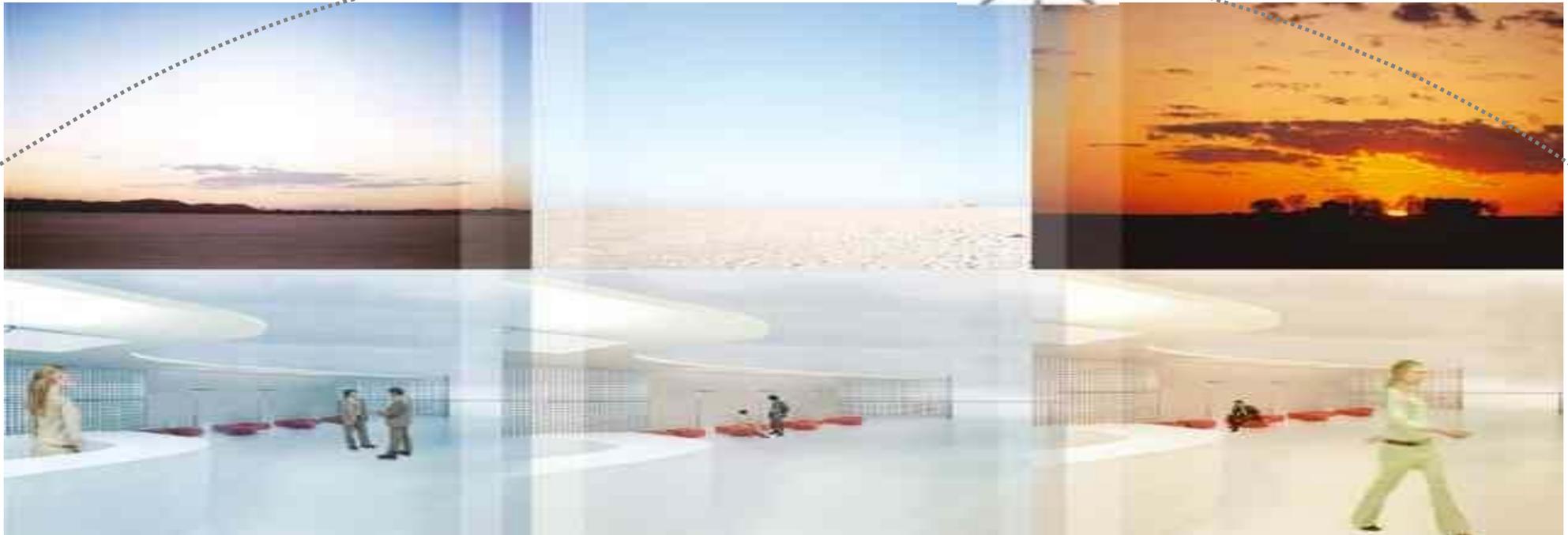
DYNAMIC LIGHT

Natural light changes in intensity, colour temperature and direction...



DYNAMIC LIGHT

... and so we should try to reproduce it with flexible artificial light.



Dynamic light can affect concentration or well-being...

**in a
meeting room**



EDUCATION



JOINT RESEARCH IN HAMBURG SCHOOLS 2011-2012

- Trilux was involved in several research projects at schools in Hamburg, Dresden and Berlin.
- For the research project in Hamburg, 39 schools were modified with dynamic light from Trilux and Philips.
- The modified schools had the opportunity to switch their lighting to suit the situation.

300 lux	4.000 K (traditional light),
1.000 lux	6.000 K (concentration),
650 lux	12.000 K (activate)
300 lux	2.700 K (calm).



TRILUX
SIMPLIFY YOUR LIGHT.

PHILIPS



CASE STUDY: HAMBURG-EPPENDORF

Energy



- for a fresh start in the morning and after lunch

Normal



- for regular classroom activities

Calm



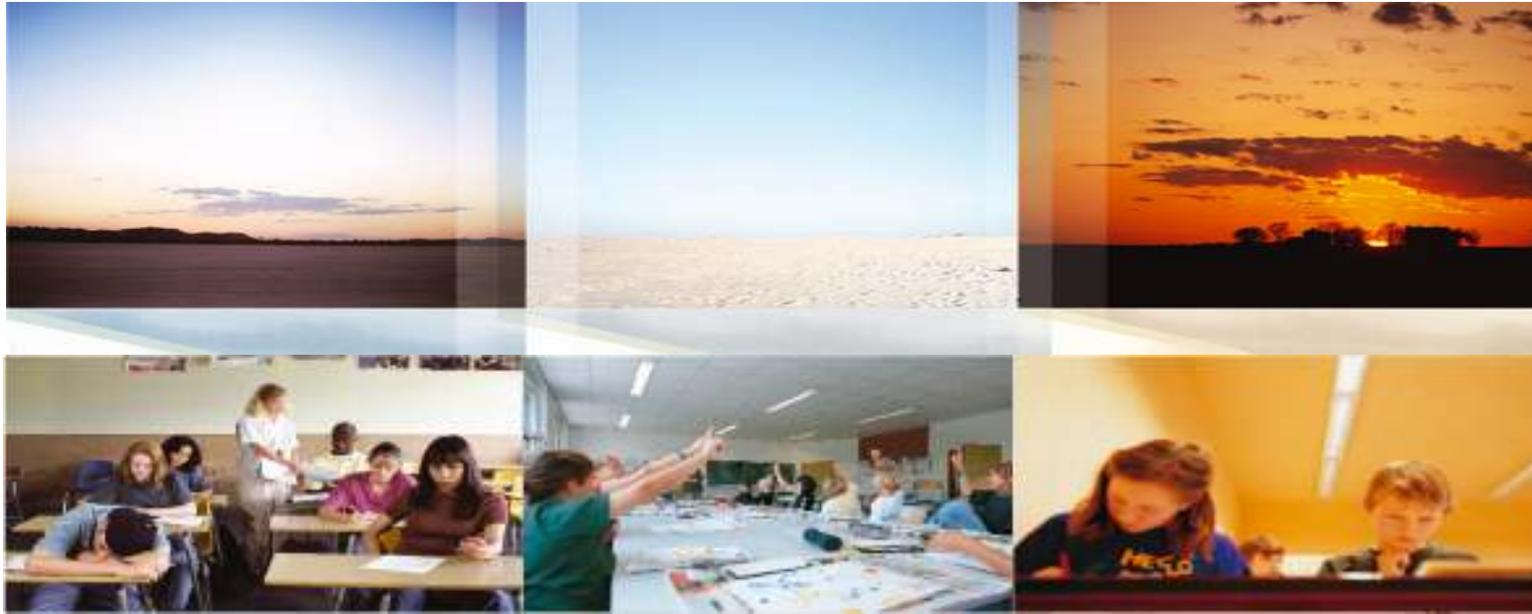
- to calm down when the children are over-active

Focus



- for concentration, such as for tests

CASE STUDY: HAMBURG-EPPENDORF

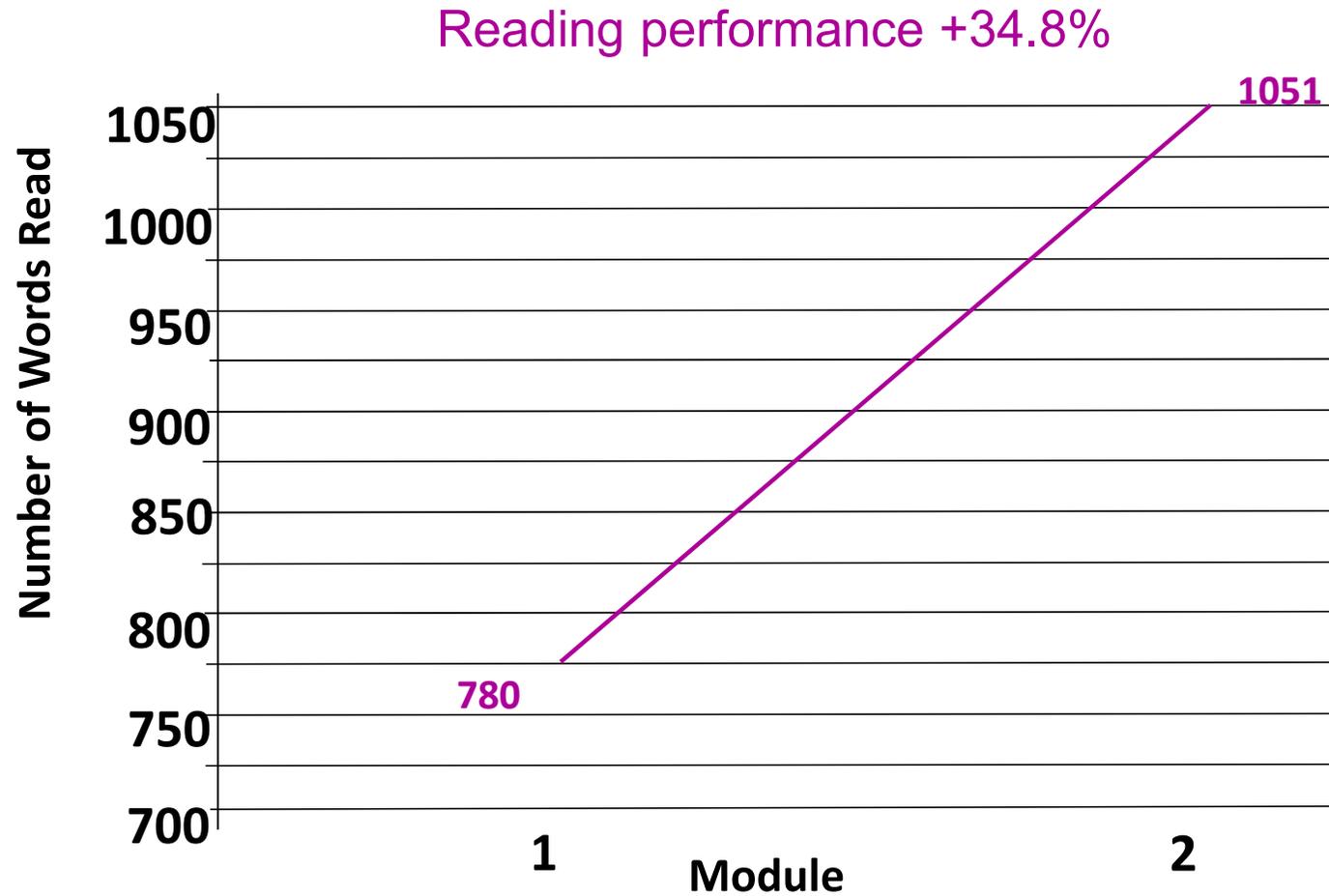


The study comprised of 166 students and 18 teachers over the course of 1 year.

The students were between 7 and 16 years of age.

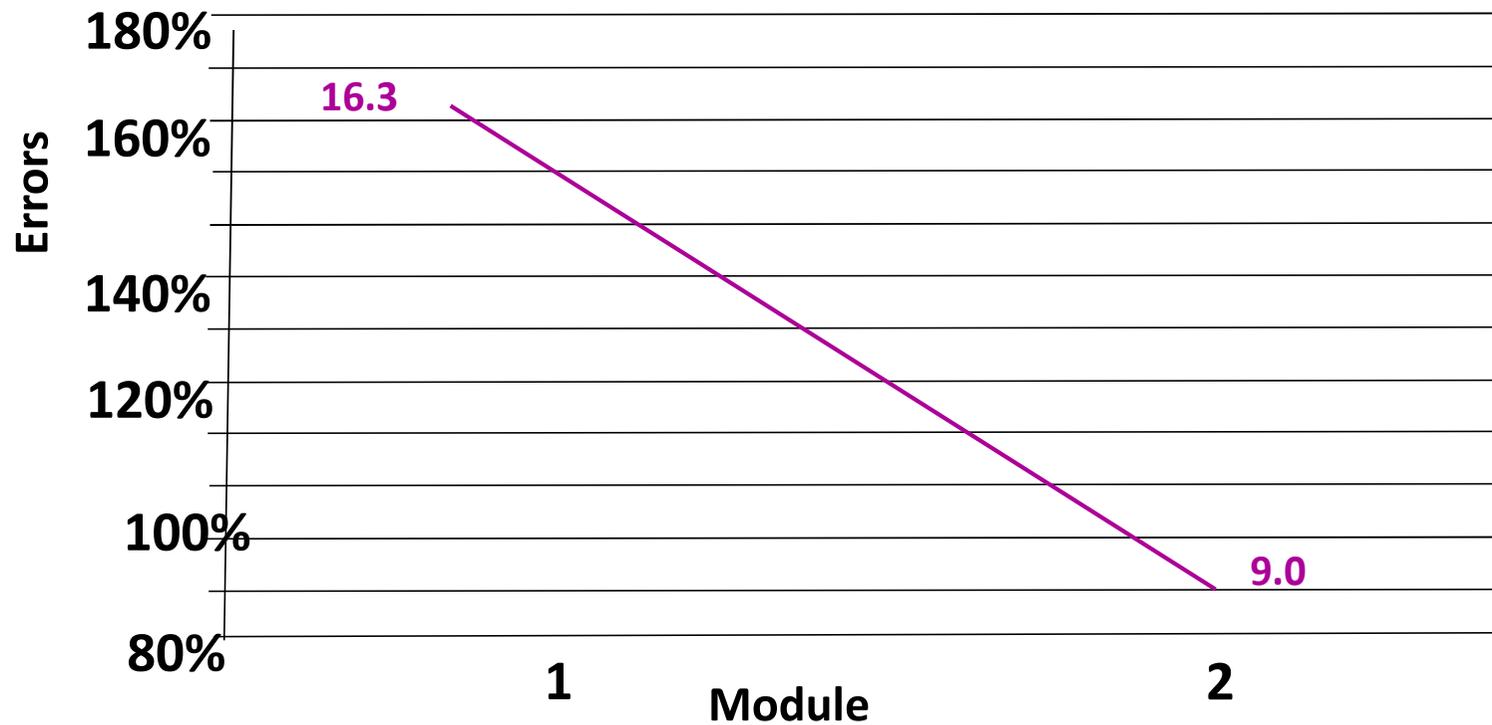
Conducted by the Hamburg UKE clinical centre for child and youth psychosomatic research.

CASE STUDY: HAMBURG-EPPENDORF

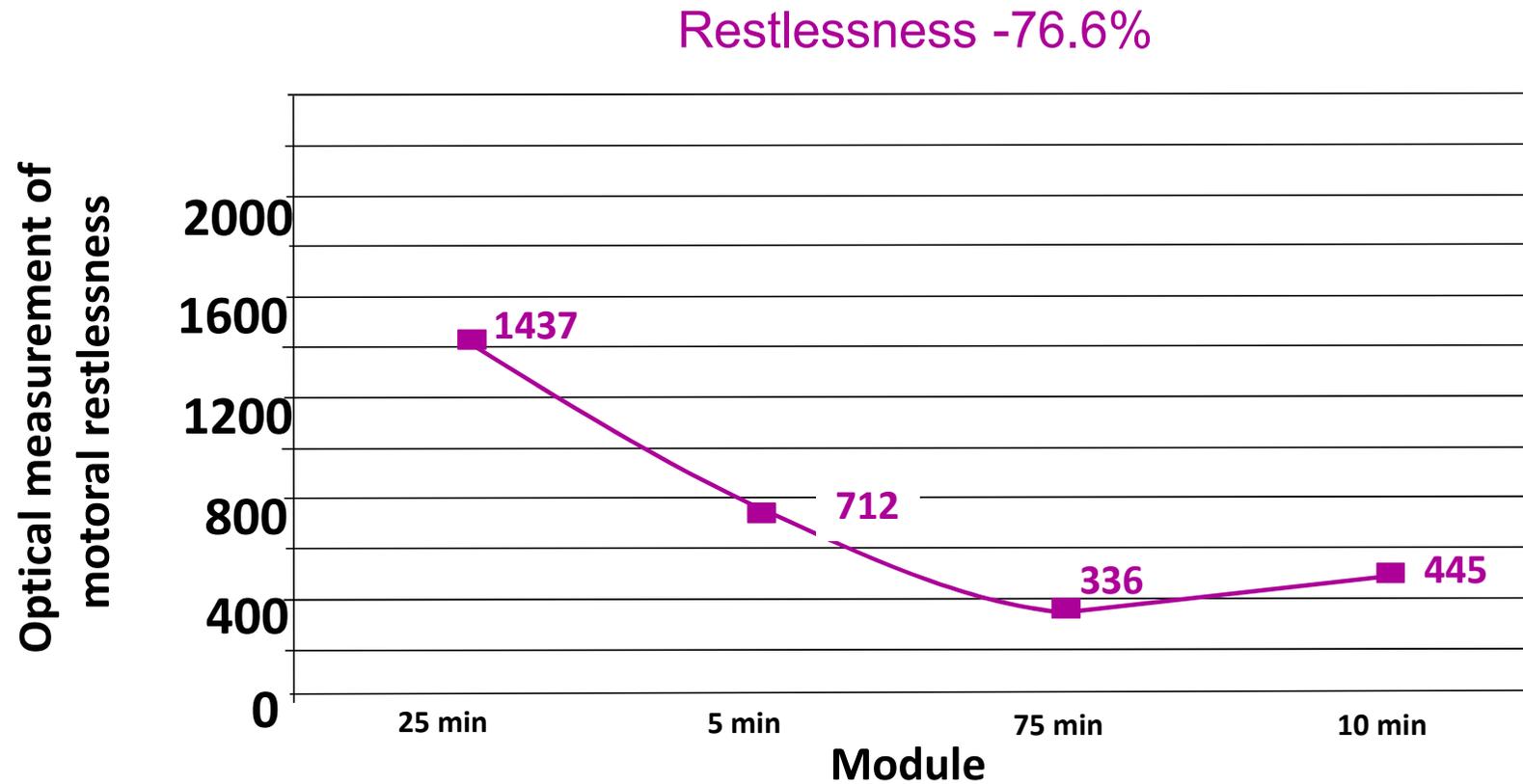


CASE STUDY: HAMBURG-EPPENDORF

Errors relating to concentration -44.9%



CASE STUDY: HAMBURG-EPPENDORF





Bridge
Academy
Hackney

Lighting by
BDP

2014/ HELEN LOOMES





2014/ HELEN LOOMES



Attainment and Progress

In August 2013, the Academy received its second full set of GCSE examination results and its first set of AS results.

- ◆ 63% of students gained 5A*-C GCSEs with English and Maths. 78% achieved an A*-C in Maths and 67.2% achieved an A*-C in English.
- ◆ 21.1% of GCSE grades were A/A* compared with a national figure of 21.3%, despite the fact that Bridge students arrive with lower than national attainment.
- ◆ The gap between the attainment of students on free school meals (FSM) and those without free school meals was only 12%, as compared to a national figure of 26%.
- ◆ At AS Level 81.2% of entries resulted in A-E grades with 20.5% at A-B. This translated into an ALPs score of 3 placing the Academy in the top 25% of schools adding value.



School of Business
University of Essex

Lighting by
BDP

Zero carbon





2014/ HELEN LOOMES





2014/ HELEN LOOMES





2014/ HELEN LOOMES



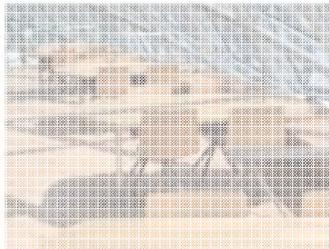
University of Essex - School of Business
Design Philosophy - An environment to enjoy

The reaction of the lighting scheme is to create an atmosphere of the very other higher education building, whilst utilising the latest in furniture and lamp design to ensure the building's energy usage will make a significant contribution to the low carbon goal. In order to achieve this, the following principles will be employed:

Utilise available daylight as the primary source of light.

This will ensure the most comfortable and psychologically beneficial environment for the user whilst reducing the energy consumption of the artificial lighting. Utilising daylight also means that artificial lighting requirements are reduced, reducing the quantity of fittings and in turn the energy consumption.

Please refer to the standards criteria to determine when and how daylight will be utilised.



Intelligent Lighting Controls

Intelligent lighting controls will be effective throughout the whole building, as these are utilised will be determined by how each space is used.

Reducing the user contact with the switches helps to reduce the energy usage and so sensors and detection devices will be effective in each space ensuring that lighting is not used when the space is unoccupied. Motion control will be automatic to reduce energy consumption, however, manual controls will be available to give user

control over their environment. If people feel they have control in their environment, they will tolerate lower light levels.

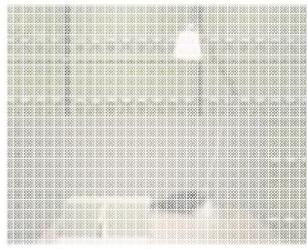
Also, to ensure that the lighting design will allow the general office lighting to only come on once the illuminance levels in the room are below what is required to perform the task.

Wall switching and integrated touch switches will allow certain areas with task lighting to be controlled independently. In case a task lighting will be controlled via daylight sensors and presence detection.

For more information on the lighting controls systems, please refer to the appendix, individual controls strategy for each space is listed in the job by use descriptions.

Task Focused Lighting

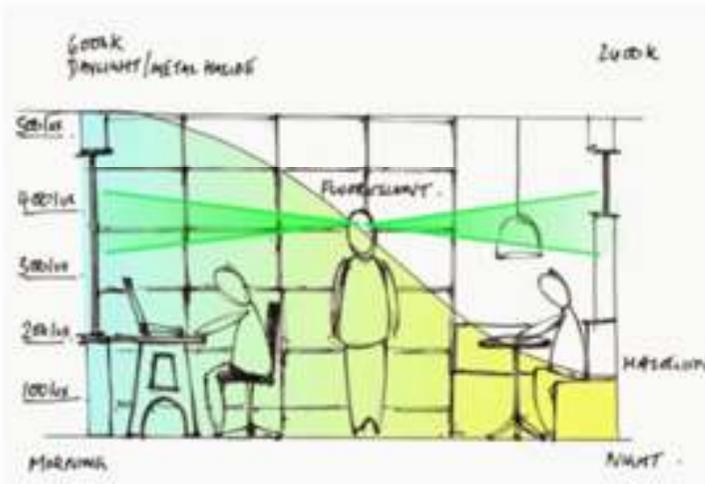
Focusing light to the task only, allows for a strong visual contrast between areas, adding weight and helping character to the space. Encouraging better clarity details for those people who are typographic and complementary to the architecture of the space. Using light in the way reduces the need for higher illuminance in areas a whole space and so reduces the wastage of the lighting scheme. The overall lighting levels are reduced whilst required light levels for the dedicated task are maintained.



Lamp Colour Temperature

Giving focus to the lamp colour temperature means that artificial light will mimic daylight throughout the day allowing the artificial lighting to appear neutral to the space. This also plays a key part in how we react to light.

Daylight is cool white 4000k to 6500k that is associated with work activity and concentration, whilst evenings and relaxation are associated with warm white colour temperature of 2700k. Allowing for this difference in temperature will make clear distinctions between areas of work and rest, as well as day and night. These subtle changes to the spaces work with the user's natural reactions to light (circadian rhythm) and help encourage focus and relaxation at appropriate times of the day.



The above diagram is a chart showing the ratio of illuminance between morning and evening and the comparison of colour temperature throughout the day compared to natural light.

It also shows how the positioning of the light should be similar to that of the sun. The main source of lighting in the day, when the sun is higher in the sky, should come from above the eye line, alternately when the sun begins to set, artificial lighting should be below the eye line to aid relaxation.

Overhead Integrated LED
LED recess lighting to be incorporated into ceiling structure for complete fit into ceiling structure. Beam spread to be adjustable and user controllable.

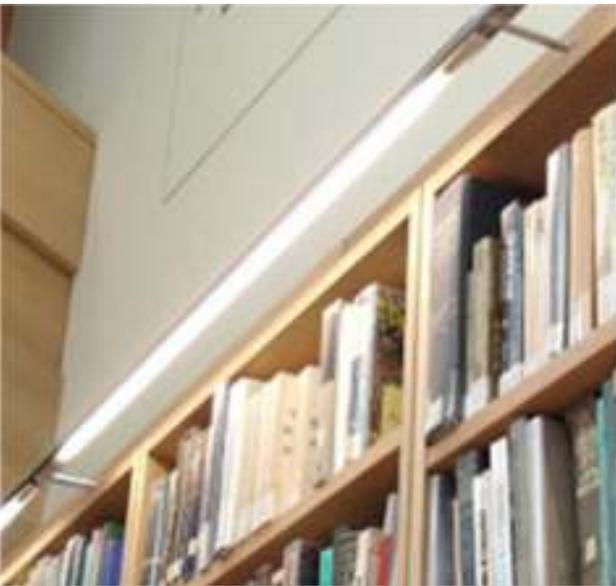
Product: Sibelux Systems recessed
Lamp: LED 1000lm 2700k (2000lm warm 2700k)
Lumen output: 1000lm
Lamp life: 50,000hrs

Desk mounted - Controlled beams
Require adjustable recessed ceiling fluorescent pendant with integrated office bar.

Product: Sibelux Sibelux
Lamp: 4 x 15W 4000k
Lumen output: 1700lm (per lamp)
Lamp life: 50,000hrs

Recessed Integrated LED - Controlled beams
Recessed lighting to be incorporated into ceiling structure. Beam spread to be adjustable and user controllable. To be incorporated into ceiling structure and user controllable.

Product: Sibelux Sibelux
Lamp: LED 1000lm 2700k
Lamp life: 50,000hrs



2014/ HELEN LOOMES



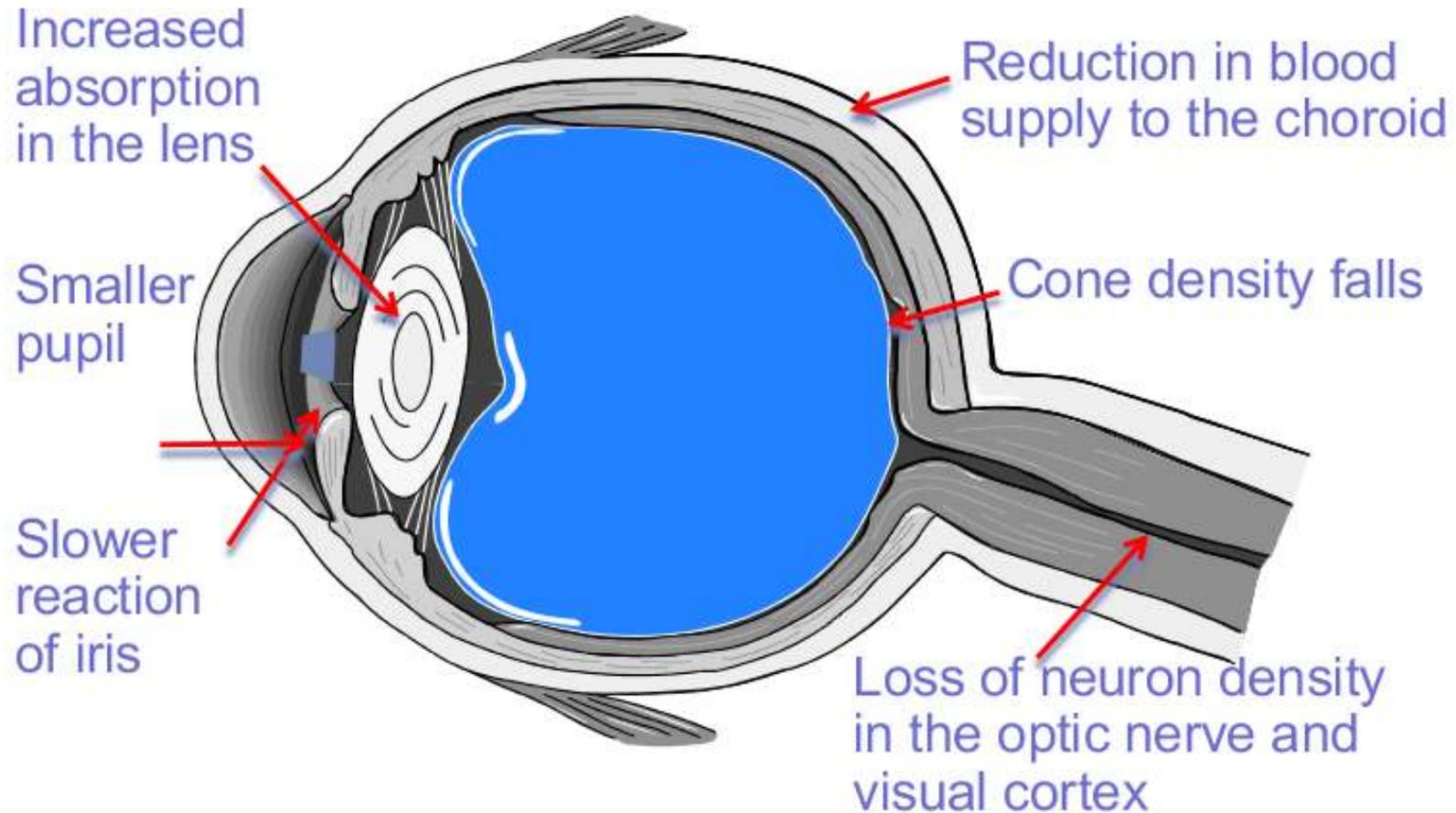
HEALTH



2014/ HELEN LOOMES



The ageing eye



THE AGEING EYE



25 years



47 years



60 years



70 years



82 years



91 years

A DARKER, MORE HAZY WORLD

Older people experience

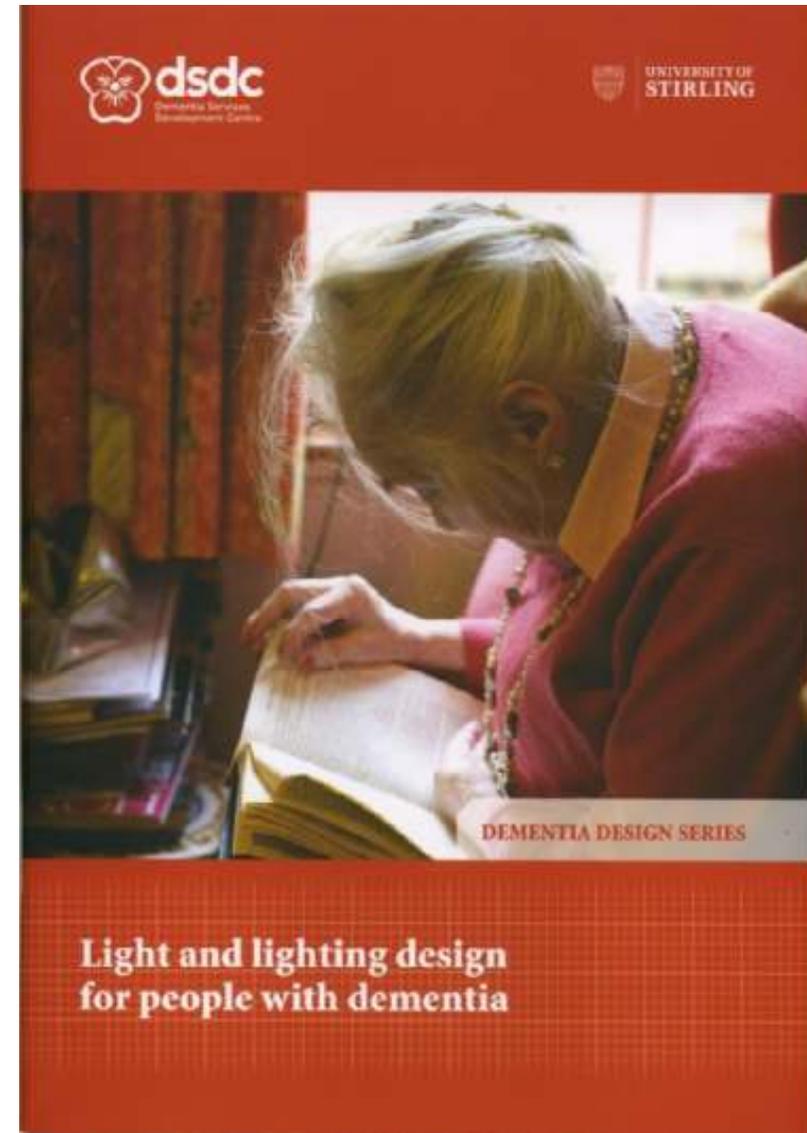
- A reduction in vividness of the colours of images e.g. reds begin to look like pinks
- A reduced ability to discriminate blues



LATEST RESEARCH

Dementia Services Development Centre
Sterling University

Thanks to
Kristina Allison BA (Hons), MA, MSLL, MILP
Lighting Enterprises Consultancy & Associates Ltd.



WHAT WE SEE DEPENDS ON

Light Quantity

Luminaires, Fire, Sun

Reflection

The light we actually see reflecting off objects and making them visible

Contrast

The key to vision including light colours against dark colours

DEMENTIA FRIENDLY LIGHTING

Primary elements

Use daylight wherever possible

Choose the right light source and high light levels

Use sufficient 'domestic' style fittings

Expose people to the 24-hour cycle of light and dark.

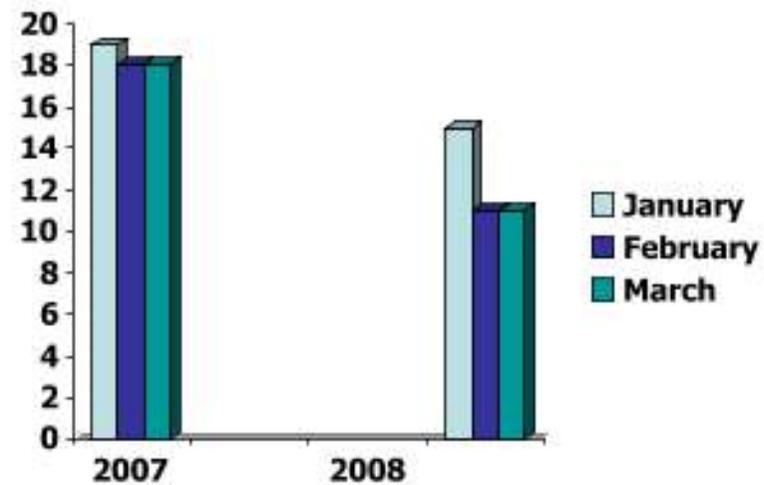
Recommended light levels

(sample page from the DSDC lighting book)

Area	Maintained average horizontal illuminance (in lux) not less than	Minimum overall colour rendering index (R _a)	Minimum lamp colour rendering index (R _c)	
Living rooms	300	85	80	
Ensure high lighting levels at activity tables and seats for reading by positioning lights nearby				
Recreation	300 supplemented by 300	85	80	
Provide 300 lux from artificial lighting. Supplement by 300 lux daylight when available and 300 lux from free-standing units when daylight is not available				
Kitchens	600	85	80	
Ensure high lighting levels at worktops, sinks and server counters by positioning lights nearby				
Bathrooms and toilets	300	85	80	
Ensure high lighting levels at wash-hand basins and WCs by positioning lights nearby				
Bedrooms	200	85	80	
Ensure high lighting levels at headboards and dressing tables by positioning lights nearby				
Dining rooms	300	85	80	
Ensure high lighting levels at dining tables by positioning lights directly above them				
Other areas				
Corridors – at night	No activity	20-50	85	80
	Activity	100-150		
Corridors - daytime	No activity	50	85	80
	Activity	150		
Corridors – mid point of relevant doors ¹	200 (vertical)		85	80
Offices	500	¹ A relevant door is one that is meant to be identified and operated by people with dementia		
Lifts	175			

Why should we bother?

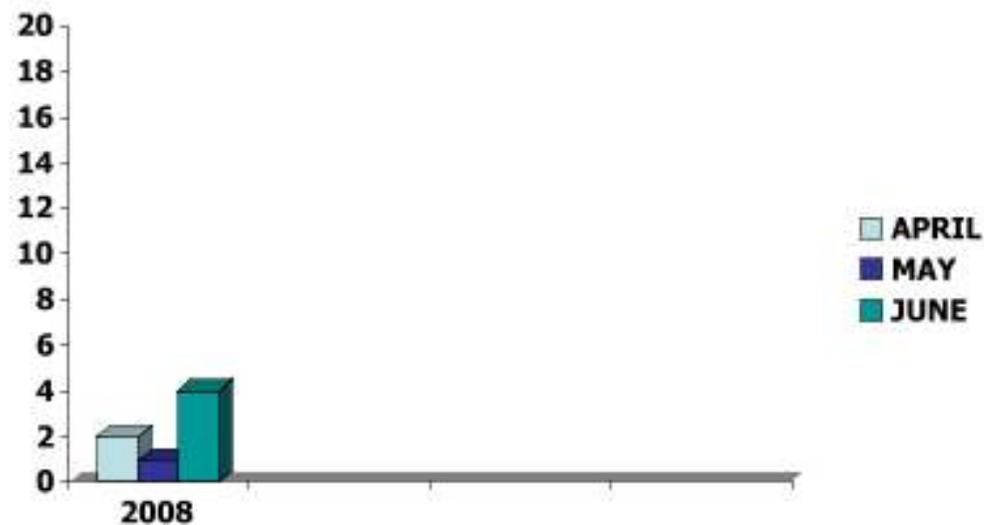
- We all fall down – or do we?



Courtesy of Momingside Care Homes

Why should we bother?

- Things appear to be improving!



Courtesy of Morningside Care Homes

Why should we bother?

Elmhurst, Cumbria

■ Average No. of slips, trips and falls







TheKing'sFund>

Improving the
patient experience

**Developing Supportive
Design for People with
Dementia**

**The King's Fund's
Enhancing the
Healing Environment
Programme 2009-2012**



- Ipswich Hospital was chosen to create a pioneering care environment in conjunction with the Kings Fund.
- Haughley Ward has had additional improvements including human centric lighting.
- Grundisburgh Ward and Saxmundham have now just been finished.





▼ ▼ *If we could only change three things, these would be:*

- *Signposting using accent colours*
- *Creating a central social space*
- *Improving the lighting*



Senior nurse,
dementia care and adult
safeguarding

CASE STUDY

MARIA-HILF HOSPITAL, BRILON, GERMANY

Human centric lighting has been installed in the geriatric department in all patient rooms and corridors.

All LED lighting is controlled via a central management system to give 600 lux at eye level and 300 lux at floor level in corridors and between 600 to 1,500 lux during the day in patient rooms.





2014/ HELEN LOOMES



Dynamic light can affect well-being...



Helping with medical therapy in hospitals

Dynamic light can calm anxiety.....during a visit to the dentist



2014/ HELEN LOOMES



Dynamic light can bring the outside in.....



2014/ HELEN LOOMES



Dynamic light can mark the passage of time.....

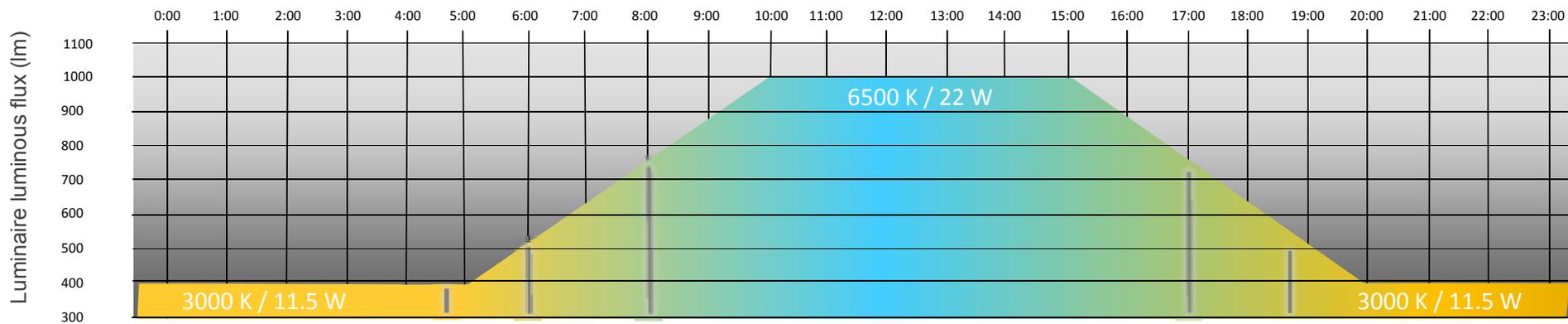


PRACTICALITY

- Active luminaires
- Mixing 2,700K and 6,500K lamps
- DALI
- Built in timer +TLM



Active – colour and luminance sequence during the day





Thank you for your attention