Markedsafdækning Lysteknologi			
#	TEMA	VIRKSOMHED	KILDE
1.	INTELLIGENT SYSTEM	2CTRL	https://2ctrl.dk/index.html
2.	VIDENSORGANISATION	Accelerace	https://www.accelerace.io/
3.	INTELLIGENT SYSTEM	Acces IoT	http://access-iot.com/losninger/
4.	VIDENSORGANISATION	Albertslund Kommune	https://albertslund.dk/borger/by-trafik-og-natur/byen-i-udvikling/innovative-samarbejder-om-lys-og-smart-city/
5.	INTELLIGENT LYS	Anna Winthereik	https://www.gloedaarhus.dk/
6.	INTELLIGENT SYSTEM	Anyware Solutions	https://anyware.solutions/about-us/
7.	APPUDVIKLER	Applikator	http://www.applikator.dk/
8.	LYSPRODUCENT	Ario Inc.	https://www.arioliving.com/residential/
9.	LYSPRODUCENT	Artemide Scandinavia	http://www.artemide.dk/
10.	INTELLIGENT LYS	Aura Light	http://www.auralight.com/
11.	INTELLIGENT LYS	AVDAN, Rene Juel, Sales Manager/Owner	https://avdan.dk/sundhedvelfaerd/
12.	INTELLIGENT LYS	Bellman & Symfon Europe AB	https://bellman.com/en/our-solutions/light-my-way/
13.	VIDENSORGANISATION	Bolls ApS	https://bolls.dk/
14.	INTELLIGENT SYSTEM	Bosch	https://www.bosch.dk/
15.	DØGNRYTMELYS	BrainLit	www.brainlit.se
16.	DØGNRYTMELYS	Bright	https://www.bright-light.dk/ewindow/
17.	VIDENSORGANISATION	Center for specialundervisning til voksne	https://csv.kk.dk/artikel/kontakt-0
18.	DØGNRYTMELYS	Chromaviso	https://chromaviso.com/
19.	LYSPRODUCENT	Circadia	https://circadia.health/
20.	INTELLIGENT SYSTEM	Cisco	https://www.cisco.com/c/da_dk/index.html
21.	INTELLIGENT LYS	Citelum	https://citelum.com/da/
22.	INTELLIGENT LYS	Comlight	https://www.comlight.no/solution/
23.	INTELLIGENT LYS	Danintra	https://www.danintra.dk/index.php?id=about
24.	VIDENSORGANISATION	Dansk Center for Lys	https://centerforlys.dk/om-dansk-center-for-lys/organisation/
25.	VIDENSORGANISATION	Dansk Erhverv	https://www.danskerhverv.dk/
26.	VIDENSORGANISATION	Dansk Rehab Gruppe	https://www.danish.care/
27.	LYSPRODUCENT	Delux Denmark	https://www.deluxdk.com/
28.	APPUDVIKLER	Ditmer A/S (app NemDialog)	https://www.ditmer.dk/nyheder/app-taenkning-skaber-dialog
29.	VIDENSORGANISATION	Doll Living Lab/Gate 21	http://doll-livinglab.com/contact/
30.	VIDENSORGANISATION	DTU FotoniK*	http://www.fotonik.dtu.dk/
31.	INTELLIGENT SYSTEM	EHQ - Samsung	https://www.samsung.com/dk/
32.	INTELLIGENT SYSTEM	Electrolux	https://www.electrolux.dk/
33.	INTELLIGENT SYSTEM	Eltel Networks*	https://www.eltelnetworks.com/da/dansk
34.	LYSPRODUCENT	Erco	https://www.erco.com/en/
35.	DØGNRYTMELYS	ESYLUX	https://www.esylux.dk/innovationer/human-centric-lighting
36.	INTELLIGENT LYS	Ewo	https://www.ewo.com/company
37.	DØGNRYTMELYS	Fagerhult	https://www.fagerhult.com/da/application-areas/health-care/guider/Patientrum/
38.	LYSPRODUCENT	Fischer Lighting*	https://www.fischer-lighting.com/koncept/
39.	INTELLIGENT LYS	Fluxunit	https://www.fluxunit.de/
40.	INTELLIGENT LYS	Focus lighting	http://www.focus-lighting.dk/om-os/
41.	VIDENSORGANISATION	Force teknologies	https://forcetechnology.com/da
42.	DØGNRYTMELYS	Gamma Light Therapy	https://gammalighttherapy.com/
43.	INTELLIGENT LYS	Glamox A/S	https://glamox.com/dk
44.	LYSPRODUCENT	Glowee	https://www.glowee.eu/

45.	DØGNRYTMELYS	Glumac	https://www.glumac.com/circadian-lighting/
46.	INTELLIGENT LYS	Gobo & Highlight	http://gobo.dk/
47.	INTELLIGENT LYS	Gooee	https://gooee.com/overview
48.	DØGNRYTMELYS	Halla	https://www.halla.eu/
49.	DESIGN	Halskov & Dalsgaard Design*	http://halskovdalsgaard.dk/
50.	DESIGN	Harrit Sørensen*	https://harritsorensen.dk/
51.	APPUDVIKLER	Hartdesigns	http://www.hartdesigns.dk/
52.	DØGNRYTMELYS	Helvar	https://www.helvar.com/en/lighting-now/light-over-time/
53.	DESIGN	Holscher Design*	http://holscherdesign.com/home
54.	INTELLIGENT SYSTEM	Human Tech	http://www.htaps.dk/
55.	VIDENSORGANISATION	Hvidovre Hospital	https://www.hvidovrehospital.dk/afdelinger-og-klinikker/Klinisk-Forskningscenter/Sider/Klinisk-forskningscenter.aspx
56.	INTELLIGENT SYSTEM	IBM Danmark	https://www.ibm.com/dk-da/
57.	APPUDVIKLER	Ideal development	https://idealdev.dk/
58.	INTELLIGENT LYS	iGuzzini*	https://www.iguzzini.com/
59.	INTELLIGENT LYS	IKEA	https://www.ikea.com/dk/da/catalog/products/80356911/
60.	LYSPRODUCENT	IKEA	https://www.ikea.com/dk/da/catalog/products/10302969/
61.	INTELLIGENT SYSTEM	Infomir	https://www.infomir.eu/eng/about/profile/
62.	DØGNRYTMELYS	Inger Erhardtsen / Allan Pedersen / MotoMuto	http://www.sansevogn.dk/
63.	DØGNRYTMELYS	Inger Erhardtsen / ÅF Lighting + Allan Pedersen / MotoMuto	http://www.motomuto.com
64.	DØGNRYTMELYS	Innolux	https://www.lysterapi.dk/shop/innolux-aurora-dim-465p.html
65.	DØGNRYTMELYS	Innolux	https://www.lysterapi.dk/shop/innolux-rondo-400-835p.html
66.	DØGNRYTMELYS	Innolux	https://www.lysterapi.dk/shop/innolux-tokio-lysterapi--741p.html
67.	LYSPRODUCENT	innolux	https://www.lysterapi.dk/shop/innolux-candeo-air-744p.html
68.	VIDENSORGANISATION	Innovation Skåne	http://www.innovationskane.com/
69.	VIDENSORGANISATION	IT universitetet	https://www.itu.dk/om-itu/presse/find-en-forsker
70.	DESIGN	Jesper K. Thomsen	https://www.jesperkthomsen.dk/
71.	INTELLIGENT LYS	KC Light A/S	https://www.kclight.dk/om-os.html
72.	VIDENSORGANISATION	KEID Københavns Kommune	https://www.kk.dk/
73.	DØGNRYTMELYS	Lampeguru	https://www.lampeguru.dk/smart-home/jedi-lighting.html
74.	INTELLIGENT LYS	LED Mark ITS	http://ledmarkits.dk/om-os/
75.	DØGNRYTMELYS	LEDVANCE	https://www.ledvance.com/company/career/we-at-ledvance/we-at-ledvance-dieter-lang/index.jsp
76.	INTELLIGENT LYS	Lemvigh-Müller	http://www.lemu.dk/da/om-os
77.	INTELLIGENT LYS	LIFX	https://www.lifx.com/collections/featured-products/products/lifx-mini-color-e26
78.	DØGNRYTMELYS	Lightcare*	http://lightcare.dk/
79.	DØGNRYTMELYS	Lighten	http://lighten.dk/#personal-user-profile-section
80.	VIDENSORGANISATION	Lighting Europe	https://www.lightingeurope.org/focus-areas
81.	DØGNRYTMELYS	Lighting science	https://healthelighting.com/products/journi-mobile-task-light
82.	DØGNRYTMELYS	Lightmoves	https://www.lightmoves.com.au/
83.	INTELLIGENT LYS	Lightwell	https://www.lightwell.eu/en/
84.	DØGNRYTMELYS	Lindpro A/S	www.lindpro.dk
85.	INTELLIGENT LYS	Lite	https://lite-led.dk/
86.	DØGNRYTMELYS	Louis Poulsen A/S	https://www.louispoulsen.com/dk/om-os/om-louis-poulsen/
87.	LYSPRODUCENT	Luctra	https://www.luctra.eu/en/
88.	INTELLIGENT LYS	Lumileds	https://www.lumileds.com/
89.	INTELLIGENT LYS	Luminex*	http://www.luminex.dk/hjem/lightnet/
90.	INTELLIGENT LYS	Lutron	http://www.lutron.com/europe/Company-Info/Pages/AboutUS/OurStory.aspx
91.	DESIGN	Lyhne Design ApS*	www.lyhnedesign.com

92.	INTELLIGENT LYS	LYS Technologies	https://lystechnologies.co.uk/
93.	DØGNRYTMELYS	Lysterapi.dk	https://humancharger.com/
94.	INTELLIGENT SYSTEM	Media Connect	http://www.mediaconnect.dk/forside/overblik
95.	LYSPRODUCENT	Modular Lighting Instruments	http://www.supermodular.com/en/company/about/
96.	DESIGN	Moum Design AB*	https://www.moum.co/
97.	DØGNRYTMELYS	Naturebright	https://www.naturebright.com/sunframe.html/
98.	DØGNRYTMELYS	New Nordic Engineering	https://buildingnordic.com/index.php/l%C3%B8sninger?id=184
99.	INTELLIGENT LYS	Optoga	http://www.optoga.com/en/product-lineup/
100.	DØGNRYTMELYS	Osram	https://www.lampeguru.dk/osram-smart-e14-turnable-white.html
101.	INTELLIGENT LYS	Osram	https://www.osram.com/cb/applications/lightelligence/index.jsp
102.	INTELLIGENT SYSTEM	Panasonic Danmark	https://www.panasonic.com/dk/
103.	LYSPRODUCENT	Philips	https://www2.meethue.com/en-us/p/hue-white-and-color-ambiance-starter-kit-e26/046677530228
104.	DØGNRYTMELYS	Philips	https://www.lampeguru.dk/philips-scene-switch-led-paerer.html
105.	LYSPRODUCENT	Philips	https://www.lampeguru.dk/philips-hue-go.html
106.	LYSPRODUCENT	Philips	https://www2.meethue.com/en-us/p/hue-white-ambiance-wellness-table-lamp/4100730U7
107.	LYSPRODUCENT	Philips	https://www2.meethue.com/en-us/p/hue-white-ambiance-wellner-table-lamp/4100531U7
108.	DØGNRYTMELYS	Rune Lightning lysdesign	https://ing.dk/artikel/farvet-lys-er-sundt-sygeplejersker-og-patienter-115581
109.	INTELLIGENT LYS	Schreder	http://internal.schreder.com/da-dk
110.	INTELLIGENT LYS	SEAS-NVE	https://www.seas-nve.dk/
111.	INTELLIGENT LYS	Seneco	https://www.seneco.dk/
112.	INTELLIGENT LYS	SG Armaturen	https://www.sg-as.com/da
113.	DØGNRYTMELYS	SG Armaturen A/S*	www.sg-as.dk
114.	INTELLIGENT SYSTEM	Siemens	https://www.siemens.com/dk/da/home.html
115.	VIDENSORGANISATION	SIF gruppen	https://www.sif.dk/
116.	INTELLIGENT LYS	Signify	https://www.signify.com/da-dk
117.	INTELLIGENT LYS	SmartCiti Solutions	https://smartcitisolutions.com/smart-poles
118.	DØGNRYTMELYS	Solar	https://www.solar.dk/
119.	DØGNRYTMELYS	Sonovision	http://www.sonovision.dk/lysmiljoe.asp
120.	INTELLIGENT LYS	SoundEar	https://soundear.dk/
121.	DØGNRYTMELYS	Spectra Nord	https://www.youtube.com/watch?v=RxDPk7dgvTk
122.	DESIGN	Sweco	https://www.sweco.dk/vi-tilbyder/
123.	INTELLIGENT SYSTEM	TDC	https://erhverv.tdc.dk/perspektiv/digitalisering/kunstig-intelligens
124.	VIDENSORGANISATION	Teknologisk Institut	https://www.teknologisk.dk/ydelser/indeklima/side-5/22655,5
125.	INTELLIGENT LYS	Telensa	https://www.telensa.com/news/smart-street-lighting-leader-telensa-appoints-david-brown-as-vp-sales-emea
126.	INTELLIGENT LYS	Thorn Lighting	http://www.thornlighting.dk/da-dk/om-os
127.	DØGNRYTMELYS	TRILUX	https://www.trilux.com/products/en/Light-management/LiveLink-light-management-system/
128.	APPUDVIKLER	Viscom	https://www.viscom.dk/home/
129.	INTELLIGENT SYSTEM	Vitani	https://vitanigroup.com/vitani-building-control/
130.	VIDENSORGANISATION	Væksthus Hovedstadsregionen	https://startvaekst.dk/vhhr.dk/gunhild-sander-garsdal/0/5
131.	DØGNRYTMELYS	Waldmann	https://www.waldmann.com/home/health--care/products/free-standing-luminaires/vivaa-free~6f.en.html
132.	INTELLIGENT SYSTEM	Wastecontrol	https://www.wastecontrol.dk/
133.	DØGNRYTMELYS	Wavecare ApS*	http://www.wavecare.dk/
134.	VIDENSORGANISATION	Welfare Tech	https://www.magasinetpleje.dk/company/view/49778/welfare_tech
135.	LYSPRODUCENT	X-light	http://www.xlight.dk/om-x-light.aspx
136.	INTELLIGENT LYS	Zumtobel	https://www.zumtobel.com/dk-da/index.html
137.	INTELLIGENT LYS	Ørsted	https://shop.orsted.dk/shop/smart-belysning-40c1.html
138.	INTELLIGENT LYS	ÅF Lighting / AF Consult*	http://www.afconsult.com/

139.	VIDENSORGANISATION	Aalborg Universitet, Copenhagen	http://personprofil.aau.dk/118179

Lysteknologi
Udvalgt til test

#	VIRKSOMHED	PRODUKT	FOTO	TYPE	KILDE
1.	Innolux	Rondo 400		INTENSIVT LYS	https://www.lysterapi.dk/shop/innolux-rondo-400-835p.html
2.	Innolux	Aurora dim		INTENSIVT LYS	https://www.lysterapi.dk/shop/innolux-aurora-dim-465p.html
3.	IKEA	Floalt		INTENSIVT LYS	https://www.ikea.com/dk/da/catalog/products/10302969/
4.	Anna Winthereik	Glød		NATLYS	https://www.gloedaarhus.dk/
5.	Philips	Scene Switch		NATLYS	https://www.lampeguru.dk/philips-scene-switch-led-paerer.html
6.	Philips	Lys strip		NATLYS	https://www.lampeguru.dk/philips-hue-lightstrip-plus-2meters-startsaet.html
7.	MotoMuto	Solhylde		DØGNLYS	http://www.motomuto.com/
8.	Philips / IKEA	HUE Starter Kit White ambiance E26 / Sollefteå		DØGNLYS	https://www.lampeguru.dk/philips-hue-farvet-starter-kit.html
9.	Waldmann	VIVAA FREE		DØGNLYS	https://www.waldmann.com/home/health--care/products/free-standing-luminaires/vivaa-free~6f.en.html

Samtykke for brug af data i forbindelse med test af lysteknologi

Københavns Kommune gennemfører i øjeblikket en test af lysteknologier på Plejecenteret Rundskuedagen.

Formålet med testen er at kvalificere eksisterende belysningsløsninger for at vurdere om Københavns Kommune på sigt skal investere i teknologien.

Selve brugen af lyset udføres med vejledning af det daglige plejepersonale.

For at kunne vurdere, hvilke borgere har mest gavn af lysløsningen, har vi behov for at bruge en række oplysninger om dig og din brug af lys.

De oplysninger vi har brug for, er:

- Oplysninger om dit funktionsniveau og aktivitetsniveau under testperioden, herunder diagnose, søvnkvalitet, depression, angst og træthed og din oplevelse af hvor tilfreds du er med brugen af lyset. Disse oplysninger får vi fra indsamling af data via spørgeskemaer, udfyldt sammen med dig sammen med det daglige personale undervejs i testforløbet.

Det er frivilligt at medvirke i projektet, og du bestemmer selv, om du vil lade os bruge dine oplysninger. Hvis du ikke ønsker, at vi bruger dem, kan du til enhver tid sige nej tak.

Oplysningerne vil blive behandlet fortroligt, sikkert og i anonymiseret form. Alle personer med adgang til oplysningerne har tavshedspligt. Alle resultater fra projektet vil fremtræde i anonymiseret form, så du ikke kan blive genkendt.

Ønsker du at deltage i projektet, så vil du få mulighed for at afprøve en lysløsning, f.eks. en lampe eller et panel, som bliver installeret i din lejlighed. Alt efter, hvilken løsning der vælges til dig, så kan der blive tale om at bore hul i væggen. Dette vil blive udbedret efter projektperioden.

Du kan til enhver tid få indsigt i, hvilke oplysninger vi har registreret om dig i forbindelse med projektet. Du skal blot rette henvendelse til Projektleder Lene Vad Jensen på telefonnummer: 51 80 50 43

Desuden kan du når som helst forlange, at projektets oplysninger om dig slettes.

Ja, jeg giver hermed samtykke til at deltage i test og at mine oplysninger må benyttes til brug for projektet.

Nej, jeg ønsker ikke at indgå i test.

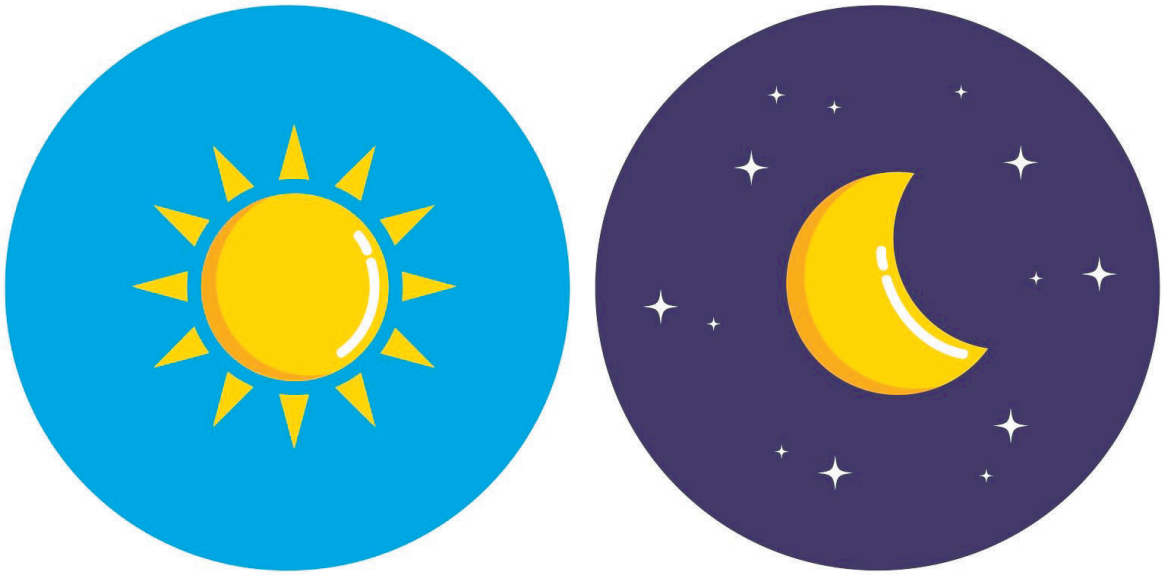
Navn:_____

Underskrift:_____ **På vegne af:**_____

Dato:_____

LYS project

Phase 1: Evaluating portable circadian lighting market solutions for elderly people



AAU Lighting Design, 14 March 2019

Emmanouil Xylakis, Georgios Triantafyllidis & Michael Mullins

1. Introduction

The goal of this report is to briefly evaluate different solutions and technologies that can be found in market, aiming to efficient circadian lighting for elderly people using portable luminaries.

More specifically, this project:

- Describes metrics in terms with circadian lighting

- Evaluates existing lighting solutions in regards to a list of parameters and validate their actual quality (visual and non-visual) using relevant metrics and measurements with specialized equipment.

- Produces generic circadian lighting scenarios, suitable for elderly residents, using portable luminaries.

2. Standards and metrics in circadian lighting

With the discovery of the intrinsically photosensitive retinal ganglion cells (ipRGC) in 2002, a biochemical link was made between the circadian rhythm and circadian light (light that acts as a stimulus for the human circadian rhythm). This has enabled a shift in focus from lighting as a purely visual and functional aid (**visual impact)**, to one that can equally enhance and help regulate aspects of the diurnal rhythm, and as such our health and well-being (**non-visual impact**). This has made lighting a recent addition to welfare technology, which relies to a great extent on solid state lighting technologies, in particular LED lighting.

In this context, the lighting research community is currently considering the development and use of metrics that characterize circadian light to establish a design-performance standard. This is the goal of the standard DIN SPEC 5031-100:2015-08 "Optical radiation physics and illuminating engineering – Part 100: Melanopic effects of ocular light on human beings - Quantities, symbols and action spectra" as well as DIN SPEC 67600:2013-04 [21] "Biologically effective illumination – Design guidelines".

The most recent research suggest circadian light and circadian stimulus which are two metrics that characterize the spectral and absolute sensitivities of the human circadian

system. These metrics have been developed by the Lighting Research Center (LRC) at Rensselaer Polytechnic Institute and are based on fundamental knowledge of retinal physiology as well as the measured operating characteristics of circadian phototransduction—the process by which the retina converts light into neural signals for the circadian system—from response threshold to saturation.

Circadian stimulus is a transformation of circadian light into relative units, from zero (the threshold for circadian system activation) to 0.7 (response saturation), and is directly proportional to nocturnal melatonin suppression after one hour of light exposure (zero to 70 percent). In terms of applications, six field studies showed that daytime light exposures of **circadian stimulus greater than or equal to 0.3** are associated with better sleep, better mood, and lower depression. Perhaps of most interest, in three of those field studies, Alzheimer's patients who received light exposures of circadian stimulus **greater than or equal to 0.3 during daytime hours and less than 0.1 during the evening hours** consistently and significantly increased their sleep duration, improved their sleep quality, and reduced their symptoms of depression and agitation.

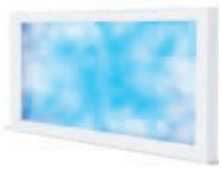
In this project the web-based version of the circadian stimulus calculator is used (available on https://www.lrc.rpi.edu/cscalculator/), in order to evaluate the potential for circadian-effective light exposure.

3. Evaluation of existing lighting solutions

3.1 Luminaries

Nr.	Company	Product	Image
1	Anna Winthereik	Glød	

2	(Company wishes anonymity)		
3	Philips	HUE Starter Kit White and color ambiance E26	
4	LIFX	LIFX COLOR A19	
5	MotoMuto	Solhylde	
6	Innolux	Rondo 400	
7	Innolux	Aurora dim	
8	Philips	Hue Wellner lamp	

9	IKEA	Floalt	
10	Bright	Ewindow	
11	Innolux	Candeo Air Pendel	
12	Waldmann	VIVAA FREE	
13	ESYLUX	Prana+	
14	Philips	Sceneswitch	
15	Philips	Hue Ambiance Aurelle panel	

16	IKEA	SOLLEFTEÅ	
17	Nielsen light	Trafik gulvlampe	

3.2 Description of experiment

3.2.1 Measurements

Metrics on Visual impact

- Vertical Illuminance levels (lux) from distance i cm. 20, 50, 100
- Color temperature (Kelvin)
- Spectral power distribution curve(SPD)
- Flicker

Metric on non-visual impact

- Circadian stimulus metric

Others:

- CE-Mark / Medical product
- Glare
- Intended use and setup needs

3.2.2 Set-up

The luminaire measurements occurred during weeks 9, 10 and 11, dating from 25/2 to 13/3 and with a total duration of three weeks. These measurements took place in the Light lab (Lighting Design lab) at Aalborg University Copenhagen.

For each one of the tested luminaires a particular approach to measuring their characteristics was taken, dependant on their function and their future usage. Considering the above, the aim was to generate **measurements at eye level** in order to generate information for their optimal usage.

Glare is caused by a significant ratio of luminance between the task (that which is being looked at) and the glare source. Numerous methods for measuring direct discomfort glare have been proposed over the years. Until recently the most widely used was the Unified Glare Rating (UGR), proposed by Sorensen in 1987 and adopted by the International Commission on Illumination (CIE) in 1995 before being recommended for international application. The UGR adds up the contributions of all glare sources in the visual field, taking into account source luminance, source size, source position and

background luminance. UGR value may also vary depending on the size of the room, the reflection factors of the ceiling, walls, and floor, and the position and viewing direction of the observer in the room. Given this, it has been decided not to report specific numbers, but only subjective evaluations, since as discussed before, glare is highly subjective and dependent on usage and environment. Therefore, each luminaire will be characterized as low, medium or high risk of glare but as mentioned above those can vary according to placement.

Ultraviolet (UV) designates a band of the electromagnetic spectrum with wavelength from 10 nm to 400 nm, shorter than that of visible light but longer than X-rays. UV radiation is present in sunlight constituting about 10% of the total light output of the Sun.

It is not visible to human eyes, but can affect human health, most notably by causing skin cancer. UV light can be useful to humans, as well (production of vitamin D). However, the considered LED luminaries do not produce UV radiation (since LED lights do not produce any UV light due to the phosphors within an LED lamp that convert the Ultraviolet light to white light. Incandescent and fluorescent bulbs can emit UV radiation, but the levels are very low especially when compared to reptile basking bulbs or tanning bulbs. In this context, UV light for the tested luminaries was not measured.

Luminaire categorization according to usage is the following:

- Table lamps (2)
- Nightstand lamps (3)
- Pendants (1)
- Floor lamps (4)
- Frame lamps (wall/ceiling placement) (3)
- Bulbs (4)

For each luminaire, the following information will be provided:

- Category
- Specifications
- Measurements (on visual and non-visual impact)
- Description on indented use and setup needs

3.3 Luminaire data

LUX is the measurement of intensity of incident light on a surface. For all measurements taken, LUX values were taken vertically at eye level in order to calculate the various CS.

Flicker measurements included three metrics: percentage, index and frequency. Flicker frequency of a luminaire should be at its lowest of around 50-60Hz. Measurements of flicker frequency of around these values could be causing headaches and migraines.

CRI (Color rendering index) should be over 80 and it is indicating color appearance of objects under the light effect of the luminaire. CRI is actually a quantitative measure of the ability of a light source to reveal the colors of various objects faithfully in comparison with an ideal or natural light source. The closer to 100 the index value gets, the better. CRI values don't appear on monochromatic luminaire presets (e.g. blue or red light)

TM30 -15 RF and **TM30-15 RG** define the color fidelity and gamut index accordingly. RF takes values from 0-100 while RG values over 100 translate to average increase in color saturation while below that an average decrease. TM30 - 15 values don't appear on monochromatic luminaire presets (e.g. blue or red light)

GAI is another representation of color saturation and is advised for good indication to expect from 80-100 while below or above that, would indicate over or undersaturated color appearances. GAI values don't appear on monochromatic luminaire presets (e.g. blue or red light)

3.3.1 Glød luminaire

Category:

Nightstand lamp

Specifications:

- Height 16 cm and diameter of 10 cm
- Weight: 600 g
- Material: Birchwood
- Battery powered and charged via USB cable
- LED

Measurements:

Distance(cm)	20	
2 colors presets	Red	Warm white
Vertical Illuminance from distance(Lux)	2	3
Color Temperature Avg(Kelvin)	-	1747
Circadian stimulus value(CS)	0,01	0,04
Flicker percentage(%)	100	100
Flicker index(0-1)	0,45	0,36
Flicker frequency(Hz)	112	102
CRI(Ra)	-	24
TM30 Rf	-	33,2
TM30 Rg	-	132,90
GAI	-	80,40

Glare Assessment:

The Glød lamp was tried in various dimming levels but due to its lack of high illuminance values there was no indication of glare experience. The led modules are placed underneath a diffuser plate shedding up-light resulting in non-direct illuminance thus no perceived glare.

Description on intended use and setup needs:

- For bedroom use and mainly during night time.
- There are two modes: day-time (warm white) and night-time (red light)
- Various placements: on a night stand, can be hung on a baby cot or bed, etc
- Battery powered and charging by USB cable
- On/off using a handy knob
- More like a decorative lamp, rather than providing sufficient illumination (during night time)

Figure 1: Glød lamp

3.3.3 Philips HUE starter kit

Category:

Bulb

Specifications:

The bulb

- Fitting: E27
- Wattage equivalent: 60 W
- Power factor: >0.5
- Number of switching cycles: 50000
- Energy efficiency label: A+
- Rated lifetime: 25000 hour(s)
- Form factor: A60
- Lifetime: 25000 hour(s)
- Colour temperature: 2000K-6500K +16 million colours
- Wattage: 10 W
- Input voltage: 220 V-240 V
- Lumen output: 806 lm @ 4000K
- Software upgradable
- Start up: Instant 100% light output
- Height: 110 mm
- Max. standby power: 0.2 W
- Diameter: 62 mm
- Light output: Dimmable via smart device only, >80
- CRI @ 4000K

The bridge

- Height: 26 mm
- Frequency band: 2,400-2,483.5 MHz
- Max. number of accessories: 12
- Max. number of bulbs: 50
- Power adapter: 100–240 V AC / 50–60 Hz

Measurements:

Distance(cm)	20					50				
3 CCT presets + 2 Color	Red	Blue	2300	3000	4500	Red	Blue	2300	3000	4500
Vertical Illuminance from distance(Lux)	74	29	257	405	496	23	8	68	107	130
Color Temperature Avg(Kelvin)	-		2373	3041	4547	-		2367	3035	4551
Circadian stimulus value(CS)	0,005	0,377	0,22	0,409	0,374	0,01	0,15	0,06	0,144	0,142
Flicker percentage(%)			20	57,2	13,7					
Flicker index(0-1)			0,06	0,21	0,02					
Flicker frequency(Hz)			130	130	130					
CRI(Ra)	84									
TM30 Rf	83,9									
TM30 Rg	95									
GAI	77,6									

Glare Assessment:

The diffuser of the Hue wellner lamp was used for testing the bulbs (Philips bulbs and LIFX) for the measurement process, mainly to the fact that the diffuser was defined as a common design for table lamps. Glare assessment of Philips HUE lamp was characterized as low risk in producing glare, regardless of viewing angle. Diffusing qualities of the lamp and its curvy shape allowed for well distributed and even illumination of all bulbs used.

Description on intended use and setup needs:

- 2 options: White ambiance or White and Color ambiance - the one tested is the White and Color ambiance
- Bridge is required to control the bulb. Bridge is connected using a LAN cable to a

router and wifi is needed in order to set up and control the bulb.

- The Philips HUE bulb can operate according to the plan, even in cases, where wifi is down or even absent, if it is still connected to a bridge that has already programmed to follow this plan
- For 24-hour use
- No any recommended circadian lighting curve. But there is the possibility of programming our own
- Can work with Philips Switch which is a dimmer switch allows you to wirelessly turn your lights up high or down low.
- No CCT presets as LIFX

Figure 3: Philips HUE bulb

3.3.4 LIFX

Category:

Bulb

Specifications:

- Lumens: 890 lumens (60W equivalent)
- Wattage: 11W at full brightness
- Beam Angle: 139 Degree
- Color Temperature: 2,700 K - 6,500 K
- CRI: >90
- Wi-Fi Router Requirements: Wi-Fi router must be standard 802.11 b, g or n 2.4Ghz compliant. WPA2 security (highly recommended)

Measurements:

Distance(cm)	**20**					**50**				
3 CCT presets + 2 Color	Red	Blue	2500	3000	4000	Red	Blue	2500	3000	4000
Vertical Illuminance from distance(Lux)	90	28	275	351	440	52	15	159	198	247
Color Temperature Avg(Kelvin)	-		2355	2918	4342	-		2164	2858	4310
Circadian stimulus value(CS)	0,003	0,551	0,299	0,366	0,345	0,001	0,455	0,203	0,258	0,235
Flicker percentage(%)			18,6	23,3	9,1					
Flicker index(0-1)			0,05	0,07	0,02					
Flicker frequency(Hz)			85	85	85					
CRI(Ra)	87									
TM30 Rf	85,1									
TM30 Rg	98									
GAI	80,9									

Glare Assessment:

The diffuser of the Hue wellner lamp was used for testing the bulbs (Philips bulbs and LIFX) for the measurement process, mainly to the fact that the diffuser was defined as a common design for table lamps. Glare assessment of LIFX was characterized as low risk in producing glare, regardless of viewing angle. Diffusing qualities of the lamp and its curvy shape allowed for well distributed and even illumination of all bulbs used.

Description on intended use and setup needs:

- No need to bridge
- Wifi is needed in order to set up and control the bulb.
- For 24-hour use
- LIFX is suggesting the “day & dusk” mode which mimics the change of light color, similar to the sun's daylight color shift throughout the day.
- CCT presets from the app

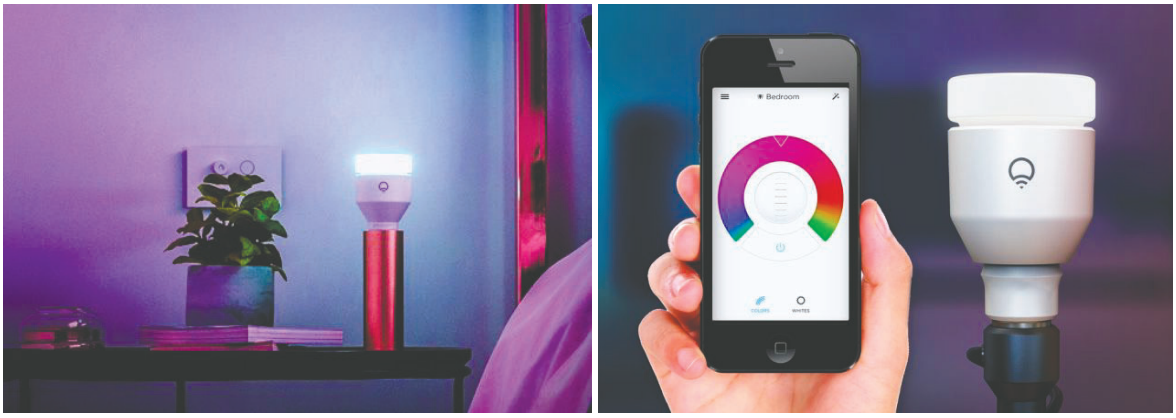


Figure 4: LIFX

3.3.5 Moto Muto Solhylde

Category:

Frame

Specifications:

Not available

Measurements:

Distance(cm)	20			50			100		
3 CCT presets	Cold	High Lux	warm	Cold	High Lux	warm	Cold	High Lux	warm
Vertical Illuminance from distance(Lux)	9056	13204	701	4320	6294	332	1674	2442	128
Color Temperature Avg(Kelvin)	7612	4541	1879	7510	4521	1881	7310	4463	1879
Circadian stimulus value(CS)	0,693	0,691	0,433	0,682	0,678	0,29	0,644	0,632	0,14
Flicker percentage(%)	10.3	7.5	88.4						
Flicker index(0-1)	0.02	0.02	0.15						
Flicker frequency(Hz)	130	463	160						
CRI(Ra)	96								
TM30 Rf	92								
TM30 Rg	101								
GAI	90,4								

Glare Assessment:

The Motomuto Solhylde luminaire was found low in potential of producing glare due to its large area and thick diffuser plate. In case of vertical placement, surrounding illuminance should be carefully adjusted due to its high lumen output capabilities.

Description on intended use and setup needs:

- Vertical placement on walls or horizontal on ceiling as recessed panel shedding downlight
- Great CR index for great color representation quality
- Can produce extremely cold CCT 7600K

Figure 5: Solhylde

3.3.6 Innolux Rondo 400

Category:

Table lamp

Specifications:

- Size: Ø 400 x K470, S120
- Therapy distance: 48 cm (2500 lx), 24 cm (10 000 lx)
- Power: 20W LED
- CCT: 4.000 Kelvin
- Material: Polycarbonate, steel
- IP class: IP 20
- Weight: 2,5 kg
- Electronic ballast: electronic: LED Driver electronic
- CE label: CE 0434 DNV
- Medical device: 12425-2007-CE-NOR

Measurements:

Distance(cm)	20	50	100
1 static Color Temperature			
Vertical Illuminance from distance(Lux)	4160	1193	453
Color Temperature Avg(Kelvin)	4000		
Circadian stimulus value(CS)	0,641	0,487	0,302
Flicker percentage(%)	0,4		
Flicker index(0-1)	0		
Flicker frequency(Hz)	125		
CRI(Ra)	85		
TM30 Rf	84		
TM30 Rg	96		
GAI	72,5		

Glare Assessment:

Rondo 400 produces high vertical illumination but due to its large area and diffuser it was characterized as a low risk glare luminaire.

Description on intended use and setup needs:

- Lamp intended to be used for light therapy
- For use of 30 - 60 minutes every day
- Its round shape relates to the sun

Figure 6: Innolux Rondo 400

3.3.7 Innolux Aurora

Category:

Table lamp

Specifications:

- Size: Ø 200 x 680 mm
- Therapy distance: 45 cm (2500 lx), 23 cm (10 000 lx)
- Power: 2 x 36 W TC-L
- Lamp base: 2G11
- Material: steel, Polypropen
- IP class: IP 20
- Including light source: Yes
- Weight: 2,3 kg
- Cord length: 2,5 m
- Electronic ballast: electronic

Measurements:

Distance(cm)	20			50			100		
1 static Color Temperature over 3 dimming levels	High	Mid	Low	High	Mid	Low	High	Mid	Low
Vertical Illuminance from distance(Lux)	3813	1948	116	952	542	35	543	123	21
Color Temperature Avg(Kelvin)	4189								
Circadian stimulus value(CS)	0,634	0,561	0,092	0,439	0,325	0,027	0,325	0,097	0,016
Flicker percentage(%)	9,3	4,0	1,1						
Flicker index(0-1)	0,05	0,01	0						
Flicker frequency(Hz)	91	97	100						
CRI(Ra)	82								
TM30 Rf	83								

TM30 Rg	84
GAI	85

Glare Assessment:

Aurora produces a significant amount of vertical illuminance but for its diffuser, the use of tube lighting (two Compact fluorescent lamps) and also the lamp area size was defined as a low glare-risk luminaire.

Description on intended use and setup needs:

- Bright light therapy device and dimmable table lamp in one 10,000lux unit
- Dimmable for use as a normal lamp as well as a therapeutic bright light

Figure 7: Innolux Aurora

3.3.8 Philips Hue Wellner lamp

Category:

Table lamp, nightstand lamp

Specifications:

Design

- Product colour * White
- Material * Glass
- Suitable for rooms * Bedroom,Living room
- International Protection (IP) code IP20
- Protection class II

Bulb (Philips Hue white ambiance)

- Fitting/cap type * E27
- Colour temperature: 2200 K-6500 K
- Included bulb power 9.5 W
- Bulb lifetime 25000 h
- Bulb voltage 230 V
- Luminous flux 806 lm

Ergonomics

- Dimmable Yes
- Dimmable with remote control Yes

Measurements:

Distance(cm)	20				50			
4 CCT presets	warm	warm white	cold white	Daylight	warm	warm white	cold white	Daylight
Vertical Illuminance from distance(Lux)	321	540	639	389	102	171	202	121
Color Temperature Avg(Kelvin)	2312	2935	4287	6158	2323	2945	4315	6252
Circadian stimulus value(CS)	0,23	0,399	0,386	0,4	0,08	0,19	0,174	0,191
Flicker percentage(%)	88,8	61,2	4,7	38,8				

Flicker index(0-1)	0,22	0,18	0,01	0,13	
Flicker frequency(Hz)	130	130	130	130	
CRI(Ra)	83				
TM30 Rf	84				
TM30 Rg	97				
GAI	74,3				

Glare Assessment:

Glare assessment of Philips HUE Wellner lamp was characterized as low risk in producing glare, regardless of viewing angle. Diffusing qualities of the lamp and its curvy shape allowed for well distributed and even illumination of all bulbs used.

Description on intended use and setup needs:

- Well designed diffuser, ideal for table, nightstand usage
- Ease of use via remote control, offering dimming capabilities but also change in color temperatures.
- Four different white modes (presets) that can be selected without the need of a mobile app
- Plug and play, no need for wifi connection or app to use it

Figure 8: Philips HUE Wellner lamp

3.3.9 IKEA floalt

Category:

Frame

Specifications:

- Default luminous flux: 2800 lm
- Default colour temperature: 2200 - 4000 K
- Width: 60 cm
- Height: 60 cm
- Thickness: 4 cm
- Power: 34 W

Measurements:

Distance(cm)	20			50			100		
3 CCT presets	Cold	Mid	Warm	Cold	Mid	Warm	Cold	Mid	Warm
Vertical Illuminance from distance(Lux)	8183	7208	6604	3517	3111	2843	1174	1035	954
Color Temperature Avg(Kelvin)	4149	2757	2246	4134	2758	2252	4115	2756	2246
Circadian stimulus value(CS)	0,68	0,67	0,66	0,64	0,64	0,60	0,51	0,52	0,45
Flicker percentage(%)	0,2	14,6	5,4						
Flicker index(0-1)	0	0,05	0,01						
Flicker frequency(Hz)	100	66	134						
CRI(Ra)	86								
TM30 Rf	85								
TM30 Rg	96								
GAI	75,9								

Glare Assessment:

As with the Motomuto's Solhylde, an identical design for a frame luminaire to be either placed in vertical position but also on horizontal on ceilings. The luminaire was characterized as low-risk glare luminaire due to its area size but also the type of its diffuser and its distance from the led modules.

Description on indented use and setup needs:

- Three different white tones from warm to cold (warm glow - 2200 Kelvin, warm white - 2700 Kelvin, cool white - 4000 Kelvin).
- TRÅDFRI remote can dim, switch off, turn on, and switch from warm to cold light in 3 steps.
- Plug and play, no need for Wifi or app

Figure 9: IKEA floalt

3.3.10 eWindow

Category:

Frame

Specifications:

- Power: 10 - 270 W
- Luminous Flux: 50 - 7300 Lm
- Luminous Intensity: 17 - 145000 cd
- Ra: 93-98
- CCT: 2500 - 10000 K
- Dimmable range: 1% - 100%
- Certification: CE / CCC

Measurements:

Distance(cm)	20			50			100		
Time based scenes	0520	0840	1300	0520	0840	1300	0520	0840	1300
Vertical Illuminance from distance(Lux)	1785	6092	8751	1200	5444	8015	718	4296	5770
Color Temperature Avg(Kelvin)	3578	5523	7934	3395	5381	7546	3341	5732	7299
Circadian stimulus value(CS)	0,55	0,68	0,69	0,48	0,68	0,69	0,38	0,67	0,69
Flicker percentage(%)	0,7	1,1	0,2						
Flicker index(0-1)	0	0	0						
Flicker frequency(Hz)	69	168	97						
CRI(Ra)	95								
TM30 Rf	93								
TM30 Rg	103,6								

GAI	99,9

Glare Assessment: eWindow was designed by having in mind the natural light and mimicking the qualities of warmer direct illumination (sunlight) and colder indirect lighting (skylight). Considering the above the shield placed in the front side of the luminaire, is not meant for diffusing purposes but to redirect the warmer led light. Vertical placement of the eWindow should be avoided because the luminaire is defined as a high glare-risk luminaire. Suggested placement of the luminaire to avoid glare would be on the ceiling, as also suggested by the manufacturer.

Description on intended use and setup needs:

- A frame light that follows the feature of daylight according to the season.
- It presents a natural scene of blue sky, clear clouds and bright sunshine.
- Sunshine: Dozens of lenses groups and micro structure are used. The light and shade are clearly distinguish by the edge of lighting spot.
- Blue Sky: The optimized LEDs illuminate the pure blue sky, and transform them into a translucent 3D visual appearance, for a clear blue sky.
- The intensity of “sunshine” and “blue sky” can be controlled
- There are three control ways: control panel, a mobile application, and Dali system. They are all easy to set and use.
- Horizontal placement in ceilings

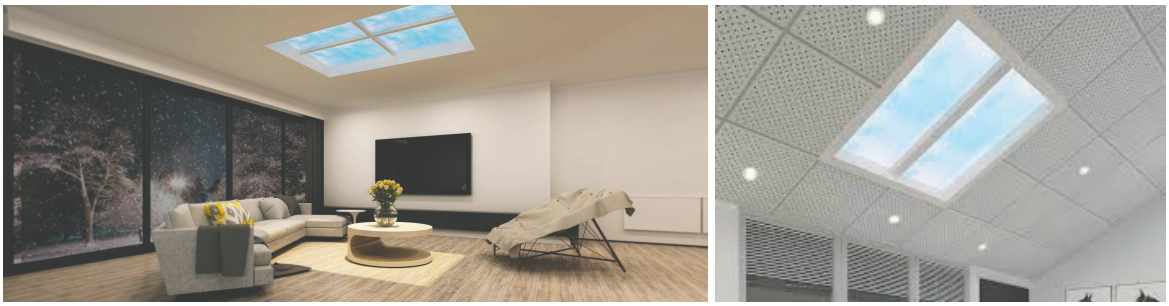


Figure 10: eWindow

3.3.11 Innolux Candeo Air Pendel

Category:

Pendant

Specifications:

- Light: 10.000 lux ca. 27 cm from lamp, 2.500 lux in a distance of 55 cm
- LED: 1 x 10 Watt + 1 x 29 Watt
- CCT: 4.000 Kelvin
- Dimensions: Diameter 38, højde 13 cm
- Weight:: 2,7 kg
- Material: Aluminium and acrylic
- Color: Hvid lampe med hvid skærm,
- CE Mark: CE 0434 DNV
- Medical device: 12425-2007-CE-NOR

Measurements:

Distance(cm)	20		50	
2 CCT presets	Cold	Warm	Cold	Warm
Vertical Illuminance from distance(Lux)	2854	593	1082	221
Color Temperature Avg(Kelvin)	3910	3143	3871	3110
Circadian stimulus value(CS)	0,614	0,430	0,476	0,253
Flicker percentage(%)	35,6	100		
Flicker index(0-1)	0,1	0,28		
Flicker frequency(Hz)	100	100		
CRI(Ra)	85			
TM30 Rf	84,6			
TM30 Rg	95,1			

GAI	70,7

Glare Assessment:

Innolux's pendant is characterized as a low glare-risk luminaire due to distance of led modules to the diffuser but also to their placement within the fixture.

Description on intended use and setup needs:

- Therapy light, attractive pendant design
- For use of 30 - 60 minutes every day
- Provides two types of settings, for warmer evening hours usage and colder, suggested for during the day usage
- No dimming capabilities

Figure 11: Innolux Candeo Air

3.3.12 Vivaa Free

Category:

Floor lamp

Specifications:

- Immediately ready for use thanks to Plug & Light
- A high direct light component provides an optimum lighting effect
- Additional luminaire shade designs upon request
- Colour temperature 3000K - 6500K - Visual Timing Light (VLT)
- Colour rendering Ra > 80
- Compliance with the requirements of standards EN 60598-1 and EN 60598-2-25

Measurements:

1st round of measurements (black diffuser)

Distance(cm)	**20**			**50**		
3 custom CCT	3000	4300	6500	3000	4300	6500
Vertical Illuminance from distance(Lux)	252	247	258	141	138	146
Color Temperature Avg(Kelvin)	3124	4264	6492	3123	4262	6467
Circadian stimulus value(CS)	0,26	0,23	0,34	0,17	0,14	0,23
CRI(Ra)	86					
TM30 Rf	85					
TM30 Rg	98					
GAI	79,8					

2nd round of measurements (white diffuser)

Distance(cm)	20			50		
3 custom CCT	3000	3900	4300	3000	3900	4300
Vertical Illuminance from distance(Lux)	328	523	605	78	125	155
Color Temperature Avg(Kelvin)	3090	3920	4292	3088	3908	4283
Circadian stimulus value(CS)	0,31	0,34	0,40	0,10	0,11	0,16
CRI(Ra)	86					
TM30 Rf	85					
TM30 Rg	98					
GAI	79,8					

Description of Measurements:

Vivaa free was measured twice with two different types of diffusers. The first round of measurements occurred with a black diffuser on the fixture while the second one with a white. Some further changes to the fixture resulted also in extracting different additional values and can be viewed on the tables above.

Glare Assessment:

Vivaa free floor lamp was characterized as a low glare-risk luminaire due to no direct illumination at any viewing angle and its shader allows only for downlighting and stronger uplight.

Description on intended use and setup needs:

- A nice designed floor lamp for home use (eg living room): a cosy free-standing luminaire. Different options for the fabric diffuser (eg black or other) and for the stand (eg wooden tripod or metal stick with a base)
- The light follows a pre-defined 24-hour circadian lighting curve that can also be

edited from the accompanying mobile application.

- There is a pull switch that can be programmed from doing nothing to switch the lamp on/off or even dim the lamp.

Figure 12: Vivaa Free

3.3.13 Esylux Prana+

Category:

Floor lamp

Specifications:

- Dimensions: length 780 mm x width 310 mm x Height/Depth 2000 mm
- Luminous efficacy 104 lm/W
- Luminous Flux (light) 11,475 lm
- Rated output 110 W
- Colour temperature 2700 - 6500 K (Tunable White)
- Protection type IP 20
- Beam angle 95 °
- Flicker factor 0 %
- Colour rendering index Ra > 85
- Colour tolerance SDCM <3
- Color Quality Scale CQS > 85

Measurements:

Distance(cm)	20			50		
3 custom CCT	Warm	Warm white	Cold	Warm	Warm white	Cold
Vertical Illuminance from distance(Lux)	1119	1138	1178	1015	1035	1070
Color Temperature Avg(Kelvin)	2848	3228	4177	2846	3219	4154
Circadian stimulus value(CS)	0,524	0,55	0,521	0,52	0,55	0,520
Flicker percentage(%)	1,2	1,3	1,2			
Flicker index(0-1)	0,00	0,00	0,00			
Flicker frequency(Hz)	107	115	68			
CRI(Ra)	87					
TM30 Rf	86					

TM30 Rg	97
GAI	78,3

Glare Assessment:

The Prana+ luminaire works ideally as a floor lamp mainly to be placed in office spaces and to be providing desk illumination while sitting. At sitting position and at specific viewing angles, the luminaire could be defined as glary. The diffuser design used for this luminaire does not hide the led modules thus resulting in defining this as medium glare-risk.

Description on indented use and setup needs:

- A floor lamp with a design more for an office, rather than domestic use
- Allows control either via their app or a touchpad located on the luminaire
- Multiple scenarios to choose from
- Provides upward and downward illumination

Figure 13: Prana+

3.3.14 Philips Scene Switch

Category:

Bulb

Specifications:

- Luminous Flux Setting(s) 806/320/80 lm
- Luminous Flux (Rated) Setting(s) 806/320/80 lm
- Color Designation Warm/Extra Warm/Very Warm
- Correlated Color Temperature Setting(s) 2700/2500/2200 K
- Luminous Ecacy (rated) (Nom) 100.75 lm/W
- Color Consistency <6
- Color Rendering Index (Nom) 80

Measurements:

Distance(cm)	**20**			**50**		
3 CCT presets	2300	2500	2700	2300	2500	2700
Vertical Illuminance from distance(Lux)	58	252	748	20	88	250
Color Temperature Avg(Kelvin)	2229	2579	2768	2214	2584	2783
Circadian stimulus value(CS)	0,05	0,23	0,45	0,02	0,1	0,02
Flicker percentage(%)	4,5	3,5	4,3			
Flicker index(0-1)	0,02	0,01	0,01			
Flicker frequency(Hz)	98	100	100			
CRI(Ra)	80					
TM30 Rf	82,8					
TM30 Rg	93					
GAI	41,6					

Glare Assessment:

The diffuser of the Hue wellner lamp was used for testing the bulbs (Philips bulbs and LIFX) for the measurement process, mainly to the fact that the diffuser was defined as a common design for table lamps. Glare assessment of Philips Scene Switch was characterized as low risk in producing glare, regardless of viewing angle. Diffusing qualities of the lamp and its curvy shape allowed for well distributed and even illumination of all bulbs used.

Description on intended use and setup needs:

- Three different settings: 2700/2500/2200 K and 806/320/80 lm
- Non-dimmable
- Simple plug and play: Works with the existing light switch on the wall.

Figure 14: Philips Scene Switch

3.3.15 Philips Hue Ambiance Aurelle panel

Category:

Frame

Specifications:

- Luminous Flux 4200 lm
- Correlated Color Temperature Setting(s) 2500/3000/4500/6500 K
- Height: 4.6 cm
- Length: 120cm
- Weight: 4.955 kg
- Width: 30 cm

Measurements:

Distance(cm)	20				50				100			
4 CCT presets	2300	3000	4500	6500	2300	3000	4500	6500	2300	3000	4500	6500
Vertical Illuminance from distance(Lux)	2596	3504	5559	3589	1228	1658	2616	1684	474	638	1011	653
Color Temperature Avg(Kelvin)	2375	2900	4482	6484	2351	2867	4420	6369	2343	2856	4374	6260
Circadian stimulus value(CS)	0.59	0.640	0.670	0.667	0.49	0.57	0.62	0.623	0.32	0.43	0.5	0.5
CRI(Ra)	85											
TM30 Rf	84,6											
TM30 Rg	97											
GAI	79,7											

Glare Assessment:

As with the Motomuto's Solhylde and IKEA's Floalt, an identical design for a frame luminaire to be used vertically or horizontally in ceilings. The luminaire is characterized as low-risk glare luminaire due to its large area size, type of its diffuser and its distance from the led modules.

Description on indented use and setup needs:

- Four different white tones, same color temperatures found in Hue white Ambiance bulb, from warm to cold (2300 Kelvin - 6500 Kelvin).
- Woking with Philips HUE Switch
- Controllable with Philips Hue app
- Programmable allowing for creating and applying circadian daily curves

Figure 15: Philips White Ambiance panel

3.3.16 IKEA SOLLEFTEÅ

Category:

Floor lamp

Specifications:

- Max.: 40 W
- Shade width: 33 cm (13 ")
- Height: 128 cm (50 ")
- Base diameter: 22 cm (9 ")
- Cord length: 1.7 m (5 ' 7 ")

Measurements:

Distance(cm)	20				50			
4 CCT presets	Relax	Read	Concetrate	Energize	Relax	Read	Concetrate	Energize
Vertical Illuminance from distance(Lux)	317	514	622	393	149	243	289	176
Color Temperature Avg(Kelvin)	2341	2975	4378	6221	2340	2967	4368	6312
Circadian stimulus value(CS)	0.25	0.40	0.39	0.40	0.13	0.25	0.24	0.25
Flicker percentage(%)	33.9	26.5	24.9	2.5				
Flicker index(0-1)	0.08	0.07	0.07	0.01				
Flicker frequency(Hz)	139	152	130	130				
CRI(Ra)	84							
TM30 Rf	84							
TM30 Rg	96							

GAI	75.8

Glare Assessment:

IKEA‘s Solleftea comes with a perforated paper white diffuser, hiding the light bulbs and resulting in an even diffused light result. The glare assessment of the fixture was defined as low risk .

Description on indented use and setup needs:

- The lamp can use up to three light bulbs placed vertically
- Provides a footswitch for turning it on/off

Figure 16: IKEA SOLLEFTEÅ

3.3.17 Trafik gulvlampe

Category:

Floor lamp

Specifications:

- Height: 150cm
- Material: Metal
- Max consumption: 3 x 60W
- Number of light sources: 3

Measurements:

Distance(cm)	20				50			
4 CCT presets	Relax	Read	Concetrate	Energize	Relax	Reade	Concetrate	Energize
Vertical Illuminance from distance(Lux) *min Lamp orientation*	104	170	205	125	78	124	147	90
Color Temperature Avg(Kelvin)	2237	2804	4015	5592	2296	2900	4218	5990
Circadian stimulus value(CS)	0.09	0.18	0.16	0.18	0.07	0.14	0.11	0.13
Required LUX to reach 0.3 CS	470	340	490	260				
Flicker percentage(%)	39.2	34.3	37.6	8.7				
Flicker index(0-1)	0.09	0.10	0.12	0.03				
Flicker frequency(Hz)	143	130	130	93				
CRI(Ra)	84							
TM30 Rf	84							
TM30 Rg	96							
GAI	69.8							

Glare Assessment:

Trafik gulvlampe design enables customisable light bulb positions and with the provided lamp shades can limit the resulting light to a significant amount. Since its “arms” are fully controlled users can adjust it according to their needs.

Description on indented use and setup needs:

- The lamp can use up to three light bulbs
- Fully adjustable arms controlling the direction of resulting light

Figure 17: Trafik Gulvlampe

Trafik gulvlampe light measurements appendix

Since trafik gulvlampe offers the ability to adjust the direction of light, the following provides a description of how to adjust it in order to reach 0.3 CS and above. The table above includes measurements at the lowest CS acquired with the given Lux. This CS derives from a lamp position with the lowest resulting lux which can be viewed in Figure 18. This position was chosen since we can assume that its defined as a safe option for low risk for glare. Alternatively while keeping the arms position fixed and rotating the lamp around a 30 degree angle, a satisfactory CS level can be reached. Figure 19 depicts a lamp position where the 0.3 CS target is reached. The above measurements occurred in the Phillips Hue ambient “Energise” mode. Lastly user glare assessment should be while adjusting the correct direction for light bulbs.

Figure 18: Trafik Lamp position with min CS

Figure 19: Trafik Lamp position with 0.3 CS

4. Generic circadian lighting scenarios for the elderly

As one ages, changes to the circadian system are also more noticeable and may lead to sleep disturbances. Surveys indicate that 40-70 percent of the oldest members of the population (over 65 years old) suffer from chronic sleep disturbances. In general, older adults tend to go to bed earlier in the evening and wake earlier in the morning than younger adults. Frequent nocturnal awakenings, difficulty falling asleep, and an increased number of naps during the day are also more common in the oldest adults. Sleep disturbances are associated with decreased physical health, including increased cardiovascular problems, disruption of endocrine functions, and decline of immune functions.

Although not everything is known about the effects of light on health and wellbeing, with the information available today it seems reasonable to provide a 24-hour lighting scheme that maintains circadian entrainment as much as possible while promoting good visibility during waking hours and safe navigation at night. Following this logic, lighting in assisted living facilities and nursing homes should provide high circadian light stimulation during the day and low circadian stimulation at night, good visual performance (e.g., reading) during waking hours, and low-level nightlights that enable safe movement through the space and minimize sleep disruption.

In this context, various scenarios can be identified:

- a 24-hour circadian lighting curve that follows the daylight changes in color temperatures and intensity.
- A blue-enhanced lighting in mornings to suppress the production of melatonin and assist day energy boosting. This can be either a blue-LED based light or a cold (high CCT) white light.
- A red-enhanced lighting in evenings/nights to aid melatonin production, fall asleep faster and sleep better. This can be either a red-LED based light or a warm (low CCT) white light.

The technologies used can be grouped in 2 categories:

- An RGBW LED in which any color or white can be produced
- A tunable white LED in which we can get a specific range of CCT (eg 2700 to 6000

Kelvin)

Obviously the RGBW solution can provide the lighting designer with more options (eg very red light without any blue for night-time light). However, recent projects have shown that tunable white can also offer similar benefits when used in a circadian lighting context (eg very low CCT, ie very warm, dimmed light used for night-time light) by having the extra advantage of avoiding discomfort that may be created by a coloured lighting.

Another grouping can be made based on the technology used, which results in various usability issues (for example use of a wifi to control the lamp). Here we have the following categories:

- Low level technology use (eg Philips Scene Switch)
- High level technology use (eg LIFX)

The last grouping is based on the user interface and if the lamp can be programmed: The categories are:

- Automated light that has been programmed to offer circadian lighting and does not need any specific action from the user to operate it.
- Light that needs some user input. Eg select with a switch the right preset/mode or place the lamp in the corresponding position in order to get the wanted light.

5. Future directions

Besides the visual and non-visual parameters of lighting, there are more factors that need to be taken into account when designing lighting for elderly people, such as usability, design, light topology, functionality and adaptability to personal preferences.

The plan of offering portable solutions of circadian lighting for elderly people is challenging and multi-dimensional. That's why, there is a need of more testing of possible portable circadian lighting solutions by creating specific pilots. These pilots can then be used for:

- simulations and calculations with specialized design software to predict and control the visual, as well the non-visual effects of lighting for the specific cases of the pilots, in order to create environments that are safer and healthier for the elderly residents.
- Interventions by programming specific lighting solutions and evaluate them by collecting quantitative and qualitative data. Extra focus should be given in this case to the aforementioned other parameters (eg usability, user friendliness, personalization, etc).
- Follow up on-site observations, user interviews and assessment of design proposals for further improvements and possibilities for re-design.

Kvalificering af Døgnrytmelysteknologi i Plejehjem

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KVALIFICERING AF DØGNRYTMELYSTEKNOLOGI I PLEJEHJEM

Nyt forskningsprojekt har undersøgt virkningen og kvaliteten af en række bærbare LED-armaturer på det danske marked, som anvendes til at understøtte ældres døgnrytme. Projektet viser, at valget af armatur samt indstillingen af det er afgørende for resultatet

AF EMMANOUIL XYLAKIS, GEORGIOS TRIANTAFYLLIDIS OG MICHAEL FINBARR MULLINS, AAU

Lighting Design Research-gruppen på AAU har i partnerskab med Københavns og Aarhus Kommuner evalueret forskellige løsninger og teknologier, der kan sikre mere effektiv døgnrytmebelysning for ældre mennesker. Hvad angår lysets ikke-visuelle virkning, var der imidlertid store forskelle og en stor variation mellem målingerne for "Circadian Stimulus", ikke kun fra armatur til armatur, men også ved brug af samme armatur med forskellige indstillinger.

Introduktion

Opgaven gik ud på at kvalificere 15 mobile armaturer, som skal indgå i test på plejehjem i Københavns og Århus Kommune. Formålet var at sikre at skrøbelige ældre i plejeboliger og hjemmeboende, på en fleksibel og omkostningseffektiv måde, optager den rette mængde og type lys og dermed styrkes i egen døgnrytme, søvn, daglig energi, samt fysisk og psykisk helbred.

Nærmere bestemt sigtede projektet på at:

- anvende en nyligt indført vurdering af døgnbelysning ("Circadian stimulus calculator" se www.lrc.rpi.edu/cscalculator/)
- evaluere eksisterende lysløsninger med hensyn til forberedelsen af en liste over parametre for visuelle og ikke-visuelle kvaliteter ved hjælp af relevante målinger og målinger med specialudstyr
- fremstille generiske scenarier til døgnrytmebelysning, der passer til ældre beboere ved hjælp af bærbare armaturer

Metoder

I projektet vurderede forskningsgruppen effektiviteten af 15 bærbare armaturer med hensyn til deres visuelle og ikke-visuelle effekt i forhold til et døgnrytme-belysningsscenarie (Tabel 1), der passer til de ældres behov.

Generisk døgnrytme-belysningsscenarie

Klokkeslet	Lux	Kelvin
1.00	3	2500
2.00	3	2500
3.00	3	2500
4.00	3	2500
5.00	3	2500
6.00	3	2500
7.00	50	2500
8.00	200	3000
9.00	500	6500
10.00	500	6500
11.00	400	4500
12.00	200	4500
13.00	200	4500
14.00	200	4500
15.00	200	4500
16.00	200	3500
17.00	200	3000
18.00	200	2700
19.00	150	2700
20.00	100	2700
20.30	50	2500
21.00	3	2500
22.00	3	2500
23.00	3	2500
24.00	3	2500

Tabel 1 Skema for døgnrytmebelysning [1]

Udvælgelsen af armaturer var baseret på deres tilstedeværelse på det europæiske marked. Målingerne fandt sted i uge 9, 10 og 11 i 2019 i Lighting Design Laborato-riet på Aalborg Universitets københavn-ske Campus.

Armaturerne blev grupperet i følgende seks kategorier:

1. Bordlamper
2. Natbordslamper
3. Pendler
4. Gulvlamper
5. Væg- eller loftslamper
6. Lyskilder

For hver af de testede armaturer blev der foretaget målinger af deres karakteristika (se tabel 2) på det vertikale plan i øjenhøjde. Målet var at finde ud af, hvad det lys de "intrinsically photosensitive retinal ganglion cells" (ipRGCs) i øjet modtager. Disse ganglieceller er nøglen til styring af vores cirkadiske rytmer, og den ikke-visuelle virkning af belysningen.

Der blev sat specielt fokus på en "circadian stimulus calculator"(CSC) udviklet af Lighting Research Center ved Rensselaer Polytechnic Institute [2]. Denne værdi bruges til at vurdere den ikke-visuelle virkning af belysningen og er baseret på den grundlæggende viden om retinal fysiologi, såvel som de målte driftsegenskaber ved cirkadisk fototransduktion – den proces, hvormed nethinden omdanner lys til neurale signaler for kredsløbssystemet – fra responsgrænsen til responsmætning. Seks tidligere udførte feltundersøgelser med CSC har empirisk indikeret, at en "circadian stimulus" (CS) leveret i dagtimerne større end eller lig med en værdi på 0,3 er forbundet med bedre søvn, bedre humør og mindre risiko for depression [3]. Et højst interessant resultat var, at tre af disse feltundersøgelser viste, at Alzheimers patienter, som blev eksponeret med et CS større end eller lig med 0,3 i dagtimerne og mindre end 0,1 om aftenen, konsekvent og signifikant fik øget deres søvn, forbedret deres søvnkvalitet, og reduceret deres symptomer på depression og agitation [3].

Målinger af visuelle effekter	Målinger af Ikke-visuelle effekter	Andre
• Vertikale belysningsniveauer (lux) fra en afstand på 20, 50, 100 cm • Farvetemperatur (Kelvin) • Spektral strømfordelingskurve (SPD) • Flimmer	• Circadian stimulus kalkulator (CSC)	• CE-mærke / medicinsk produkt • Blænding • Tiltænkte brugs- og installationsbehov

Tabel 2 Målinger af armaturers visuelle og ikke-visuelle karakteristika

Derudover, blev følgende kvalitative kriterier brugt i evalueringen af armaturerne:

De skal give den rette type og mængde af lys.

- De skal kunne tilpasse den enkelte ældre borgers særlige behov (dårligere lysoptag, fysiske og mentale vanskeligheder, sengeliggende, etc.).
- De skal være mobile, så de kan følge med borgere, der flytter fra privat hjem til lejebolig.
- De skal kunne fungere som et enkeltstående produkt og ikke være afhængig af store bagvedliggende it-systemer.
- De skal kunne være et supplement til eksisterende døgnrytmeløsninger, som typisk installeres i gange og fællesrum på plejehjem.

Resultater

Målingerne viser, at alle de undersøgte bærbare armaturer er af høj kvalitet i forhold til de målte visuelle effekter. Hvad angår lysets ikke-visuelle virkning, var der imidlertid store forskelle og en stor variation mellem målingerne for CS, ikke kun fra armatur til armatur, men også ved brug af samme armatur med forskellige indstillinger. Dette viser, nødvendigheden af at vælge det rigtige armatur, som kan tilvejebringe den nødvendige CS. Det viser også, at effektiviteten af et cirkadisk belysningsdesign er stærkt afhængig af den faktiske indstilling af sådanne armaturer. De skal indstilles på en måde, der sigter mod at tilbyde den optimale CS til mennesker.

Diskussion

De teknologier, der anvendes til CS-belysningen, kan grupperes i to kategorier: En RGBW LED, hvor de fleste farver og hvid kan fremstilles.

En indstillelig hvid ("tunable white") LED, med et specifikt udvalg af CCT (f.eks. 2700 til 6500 Kelvin). RGBW-løsningen giver lysdesigneren flere muligheder, som for eksempel at skabe rødt lys uden blåt til natlys. Nyere projekter har imidlertid vist, at indstilleligt hvidt lys også kan tilbyde lignende fordele, når det anvendes i en døgnrytmebelysningskontekst (f.eks. lavt CCT, dæmpet natlys) ved at have den ekstra fordel at undgå det ubehag, der kan skabes af en farvet belysning.

En anden gruppering kan laves ud fra den anvendte teknologi, hvilket kan resultere i forskellige anvendelighedsproblemer blandt de ældre. Med hensyn til denne specifikke karakteristik er kategorierne: Automatiseret lys, der er programmeret til at tilbyde døgnrytmebelysning og ikke har brug for nogen specifik handling fra brugeren for at betjene den.

Lys, der kræver brugervenlighed. F.eks. mulighed for på en kontakt at kunne vælge den rigtige forudindstillede / tilstand for at få det ønskede lys.

Dette projekt havde til formål at undersøge effektiviteten af de bærbare armaturer, der er tilgængelige på det danske marked, i forhold til deres anvendelse som supplement til døgnrytmelys i ældreplejen. Ikke overraskende var produktets testresultater meget varieret, og ikke alle blev fundet egnede til deres annoncerede funktioner. Det er derfor lysdesignerens ansvar at undersøge nøje, hvilke armaturer der anvendes, og hvordan de anvendes for at følge retningslinjerne for CS og såle-des optimere effekten af døgnrytmebelys-ningen.

Forfatterne til artiklen ønsker at takke for projektsamarbejdet og input fra Lene Vad Jensen, projektleder, afdeling for velfærdsinnovation, Københavns Kommune; samt Søren Holm Pallesen, projektleder, og Lotte Lucia Jelnes, sygeplejerske fra Center for Frihedsteknologi, Aarhus Kommune.

Referencer

1. Schledermann KM, Bech-Larsen P, Flyholm A, Mullins MF (2019) Entrainment and Disruption: Lessons Learned from Implementing Circadian Rhythm Lighting. **Proceedings of Architecture Research Care & Health,** Polyteknisk Boghandel og Forlag, In Press.
2. Rea M, Figueiro M, Bierman A, et al (2012) Modelling the spectral sensitivity of the human circadian system. Light Res Technol 44:386–396. https://doi.org/10.1177/1477153511430474
3. Figueiro M, Nagare R, Price L (2018) Non-visual effects of light: How to use light to promote circadian entrainment and elicit alertness. Light Res Technol 50:38–62.

SØVN

Dato for udfyldelse: _____

Borgers fornavn: _____

Angiv om borgeren har vist tegn på nogle af nedenstående adfærdstræk indenfor de sidste **2 uger.**
Er det tilfældet bedes du vurdere Frekvens, Sværhedsgrad og Stressfaktor.

Udfyldes af borger___eller medarbejder___ i samarbejde med borgeren. (sæt kryds)

	Symptomer	**Frekvens**	**Sværhedsgrad**	**Stressfaktor**
1	Problem med at falde i søvn			
2	Stod op i løbet af natten (tæller ikke, hvis borgeren blot står op 1-2 gange for at gå på			
3	Vandrer og går hvileløst rundt og bliver optaget af upassende aktiviteter.			
4	Vågner gradvist mere op i løbet af natten			
5	Vågner op om natten og tager tøj på og planlægger at gå ud. Tror det er morgen og tid			
6	Vågner tidligere end, hvad der ellers er normalt for borgeren			
7	Sover usædvanligt meget igennem dagen			
8	Andre nataktiviteter, som er generende			

Sådan vurderer du "Frekvens"
0 = Har ikke været aktuelt inden for de sidste to uger.
1 = Har været aktuelt mindre end 1 gang om ugen.
2 = Har været aktuelt 1-2 gange om ugen.
3 = Har været aktuelt flere gange om ugen, men mindre end hver dag.
4 = Har være aktuelt en eller flere gange hver dag (aften/nat).

Sådan vurderer du "Sværhedsgrad"
0 = Ikke belastende
1 = Mild (natlig adfærd hænder, men opleves ikke som belastende.
2 = Moderat (natlig adfærd hænder og opleves som forstyrrende for patienten og øvrige beboere. Mere end en type adfærd kan forekomme.
3 = Markant (natlig adfærd er tilstede, flere forskellige typer af natlig adfærd er tilstede. Borgeren er meget forstyrret/stresset om natten og det er "forstyrrende" for personalet eller de øvrige beboere).

Sådan vurderer du "Stressfaktor"
Hvor følelsesmæssig/stresset bliver du at pågældende borgers natlige adfærd?
0 = Overhoved ikke
1 = Minimalt
2 = Mildt
3 = Moderat
4 = Svært
5 = Meget svært/ ekstremt

ANGST

Dato for udfyldelse: _____

Skemaet udfyldes af borgeren ___ eller medarbejder ___ i samarbejde med borgeren. (sæt kryds)

Skemaet angiver almindelige symptomer på angst og stress. Læs venligst hvert punkt i skemaet omhyggeligt. Skemaet udfyldes ved at du angiver, hvor ofte borgeren har oplevet hvert symptom inden for **de sidste to uger, inklusive i dag**. Vær opmærksom på at du får sat kryds i det felt der bedst angiver, hvordan borgeren har det og har haft det.

	Symptomer	**Overhoved ikke (0)**	**Nogle gange (1)**	**Det meste af tiden (2)**	**Hele tiden (3)**
1	Borgeren var irritabel				
2	Borgeren følte sig løsrevet eller isoleret fra de andre				
3	Borgeren oplevede at være i en døs				
4	Borgeren havde svært ved at sidde stille				
5	Borgeren kunne ikke kontrollere sine bekymringer				
6	Borgeren følte sig rastløs, hængt op og udsat				
7	Borgeren følte sig træt				
8	Borgerens muskler var anspændt				
9	Borgeren følte ikke kontrol over sit liv				
10	Borgeren følte at der ville ske noget frygteligt med vedkommende				

DEPRESSION

Dato for udfyldelse: _____

Udfyldes af borger eller af medarbejder i samarbejde med borgeren.

	Spørgsmål	**Ja**	**Nej**
1.	Er du (borgeren) stort set tilfreds med livet?		
2.	Har du (borgeren) opgivet mange af dine aktiviteter og interesser?		
3.	Føler du (borgeren) et stort tomrum i dit liv?		
4.	Keder du dig (borgeren sig) ofte?		
5.	Er du (borgeren) for det meste i godt humør?		
6.	Er du (borgeren) bange for, at der skal ske noget alvorligt?		
7.	Føler du (borgeren) sig glad og tilfreds?		
8.	Føler du (borgeren) sig ofte hjælpeløs?		
9.	Vil du (borgeren) hellere blive hjemme end ud og opleve noget nyt?		
10.	Tror du (borgeren), at sin hukommelse er dårligere end de fleste andres?		
11.	Er du (borgeren) lykkelig ved livet lige nu?		
12.	Føler du (borgeren) sig værdiløs?		
13.	Har du (borgeren) masser af energi?		
14.	Synes du (borgeren) at sin situation er håbløs?		
15.	Tror du (borgeren), at de fleste mennesker har det bedre end sig?		

Resultat (antal kryds): _____

Resultat under 5: Normal

Resultat mellem 5-7: Mulig depression

Resultat mellem 8-10: Sandsynligvis let til moderat depression

Resultat mellem 11-12: Moderat til svær depression

Resultat over 13: Svær depression

TRÆTHED 1

Dato for udfyldelse: _____

Udfyldes af borger eller af medarbejder i samarbejde med borger.

	Hvor træt er du, når du…?	**Score**
1.	Sidder eller læser?	
2.	Ser tv?	
3.	Sidder inaktiv på et offentligt sted (f.eks. et teater, møde e.l.)?	
4.	Hviler dig om eftermiddagen?	
5.	Sidder og taler med en anden person?	
6.	Sidder stille efter frokost uden alkohol?	

Score	
0	Blunder overhovedet ikke
1	Blunder lidt
2	Moderat risiko for at blunde
3	Høj risiko for at blunde

Scoren kan fortolkes således:

0-7: Det er usandsynligt, at du har et abnormt søvnbehov.

8-0: Du er lige så søvnig som gennemsnittet.

10-15: Du kan blive meget søvnig afhængig af situationen. Overvej evt. at søge læge.

16-24: Du er yderst søvnig i mange situationer og søge læge hurtigst muligt.

TRÆTHED 2

Dato for udfyldelse: _____

Udfyldes af borger eller af medarbejder i samarbejde med borger.

	Hvor træt er du, når du…?	**Score**
1.	Sidder eller læser?	
2.	Ser tv?	
3.	Sidder inaktiv på et offentligt sted (f.eks. et teater, møde e.l.)?	
4.	Hviler dig om eftermiddagen?	
5.	Sidder og taler med en anden person?	
6.	Sidder stille efter frokost uden alkohol?	

Score	
0	Blunder overhovedet ikke
1	Blunder lidt
2	Moderat risiko for at blunde
3	Høj risiko for at blunde

Scoren kan fortolkes således:

0-7: Det er usandsynligt, at du har et abnormt søvnbehov.

8-0: Du er lige så søvnig som gennemsnittet.

10-15: Du kan blive meget søvnig afhængig af situationen. Overvej evt. at søge læge.

16-24: Du er yderst søvnig i mange situationer og søge læge hurtigst muligt.

Interviewguide

Medarbejdere brugervenlighed og anvendelighed

Introduktion

Hvad her været jeres generelle oplevelse af lysløsningen?

Vis PtW billede af den teknologi som ønskes diskuteret. Stil nedenstående spørgsmål til hver teknologi.

Betjening

Hvordan har det været at betjene/styre lyset?

1. Hvordan har det virket at tænde og slukke for lyset?
2. Har det været personalet eller borgeren, som har styret lyset?
3. Har I haft lyst til at lave ændringer i styringen af lyset undervejs?

Design

Hvordan synes du at lyset har passet ind i borgerens hjem?

1. Hvordan er lamperne blevet taget imod af borgere og pårørende?
2. Hvor holdbar vurderer du teknologien til at være?

Lyset

Hvordan er din oplevelse af lyset?

1. Har I haft nok lys til at kunne udføre jeres arbejdsopgaver?
2. Har der været behov for at flytte lampen? (hvis muligt)

Effekt

Hvordan har I oplevet effekt af lyset hos borgerne?

1. Kunne borgerne vænne sig til typen af lys (blåt/rødt)?
2. Har I oplevet en adfærdsændring hos borgerne?

Afslutning

1. Har pårørende eller andre vist interesse for lyset? Og hvad har deres reaktion i givet fald været?
2. Hvad er din egen oplevelse af lyset og ideen om lys, som behandling i hjemmet? Har det en fremtid?
3. Hvis personligt lys skal implementeres, hvordan tænker I så det skal være? Hvad har I af ønsker og råd?
4. Er I klar over hvorfor borgerne fik netop de lyskilder, som de gjorde?

Personlig belysning

Brugervenlighed og anvendelighed

Vi ønsker at undersøge brugervenligheden på det lys, som har været afprøvet på Rundskuedagens Plejehjem de seneste uger. Du vil derfor blive spurgt ind til din oplevelse lyset. Spørgsmålene er inddelt i følgende fire kategorier: ***Betjening, Design, Lyset og Effekt***.
Du bedes tænke på dine generelle oplevelser af lyset hos borgeren, når du besvarer spørgsmålene.

Spørgeskemaet kan udfyldes af både borgere, pårørende og medarbejdere.

Spørgeskemaet tager max. 10 minutter at besvare.

I dette spørgeskema besvares spørgsmål vedrørende lyset hos:

Borgerens fornavn: _____

- ❑ **Er du borger?**
- ❑ **Er du pårørende?**
- ❑ **Er du medarbejder?**

Betjening (sæt x)

1. *Tændte lyset automatisk?*
   - ❑ Ja
   - ❑ Nej
   - ❑ Ved ikke

2. *Skulle lyset tændes og slukkes manuelt?*
   - ❑ Ja
   - ❑ Nej
   - ❑ Ved ikke

3. *Har du selv tændt, slukket og reguleret lyset?*
   - ❑ Ja
   - ❑ Nej
   - ❑ Ved ikke

Hvis nej, hvem har betjent lyset? (personale, pårørende, borger, ingen)

_____

_____

4. *Hvordan har det været at styre lyset? (tænd/sluk)*
   - ❑ Let
   - ❑ Middel
   - ❑ Svært

Uddyb gerne:

_____
_____

5. *Har du haft behov for at læse vejledningen på lyset, eller på anden måde søge hjælp til betjening?*
   - ❑ Ja
   - ❑ Nej
   - ❑ Ved ikke

Hvis "ja": Hvad havde du behov for hjælp til?

_____
_____

Design (sæt x)

6. *Hvordan synes du at det passer ind i borgerens hjem? (sæt evt. flere kryds)*
    - ❑ Lampen falder fint ind i borgerens hjem
    - ❑ Lampen signalerer hjemlighed
    - ❑ Lampen signalerer ikke hjemlighed
    - ❑ Lampen skæmmer borgens hjem
    - ❑ Ved ikke

Uddyb gerne:

_____

_____

7. *Hvad synes du om lysets/lampens fysiske udformning/design?*
    - ❑ Pæn
    - ❑ Neutral
    - ❑ Grim

Uddyb gerne:

_____

_____

8. *Hvor holdbar/robust vurderer du at lyskilden er?*
    - ❑ Stærk
    - ❑ Middel
    - ❑ Skrøbelig
    - ❑ Ved ikke

Uddyb eller tilføj gerne:

_____

_____

Lyset (sæt x)

9. *Hvornår på døgnet har lampen været tændt? (sæt evt. flere krydser)*
    - ❑ Morgen (07-11)
    - ❑ Middag (11-17)
    - ❑ Aften (17-22)
    - ❑ Nat (22-07)

Uddyb gerne:

_____
_____

10. *Oplever du at blive blændet af lyset?*
    - ❑ Ja
    - ❑ Nej
    - ❑ Ved ikke

Uddyb gerne:

_____
_____

11. *Oplever du lyset blinker?*
    - ❑ Ja
    - ❑ Nej
    - ❑ Ved ikke

Uddyb gerne:

_____
_____

12. *Kommer der lyd fra lyset? (f.eks. snurren)*
    - ❑ Ja
    - ❑ Nej
    - ❑ Ved ikke

Uddyb gerne:

_____
_____

13. Bliver lyskilden varm?

- ❑ Ja
- ❑ Nej
- ❑ Ved ikke

Uddyb gerne:

_____
_____

14. Hvordan vurderer du lyset i forhold til dit behov for aktivitet/arbejde?

- ❑ Jeg har haft fint med lys
- ❑ Jeg har nogle gange manglet lidt lys
- ❑ Jeg har ikke kunne orientere mig

Uddyb gerne:

_____
_____

Effekt (sæt kryds)

15. Hvordan har det været at vænne sig til det nye lys?

- ❑ Det var let at vænne sig til
- ❑ Det tog lidt tid at vænne sig til det
- ❑ Jeg har ikke vænnet mig til det

Uddyb gerne:

_____
_____

16. Har du registreret ændringer i din søvn?

- ❑ Ja
- ❑ Nej
- ❑ Ved ikke

Hvis ja, hvilke ændringer?

_____
_____

17. Har du registreret ændringer i dit energiniveau?

- ❑ Jeg er blevet mere energifyldt
- ❑ Jeg er blevet mere træt
- ❑ Nej, der er ingen ændringer
- ❑ Ved ikke

Uddyb gerne:

_____
_____

18. Har du registreret ændringer i dit humør mens du har haft lyset?

- ❑ Jeg er blevet mere glad
- ❑ Jeg er blevet mere irritabel
- ❑ Mit humør er uændret
- ❑ Ved ikke

Uddyb gerne:

_____
_____

19. Kunne du forestille dig at have lyset i dit hjem?

- ❑ Jeg vil gerne have lyset
- ❑ Jeg er ikke interesseret i lyset
- ❑ Måske
- ❑ Ved ikke

Har du haft flere lamper/lyskilder bedes du uddybe, hvilke(n) du er interesseret i:

_____
_____

Ved spørgsmål kontakt:
Søren Holm Pallesen
projektleder, Center for Frihedsteknologi
tlf: 4187 3508

Baseline

Informationer om borgeren

Nedenstående besvares og udfyldes af en medarbejder, som kender valgte borger.

Informeret samtykke
Borger og/eller pårørende har givet et informeret samtykket til deltagelse i afprøvning af mobil personlig belysning. Sæt kryds: ___ (se vedlagte bilag)

Fornavn: _____

Køn:
- ❑ Kvinde
- ❑ Mand

Alder: _____

Inklusionskriterier
Sæt kryds i relevante inklusionskriterie (et eller flere)

- ❑ Depressive symptomer
- ❑ Immobilitet (der begrænser borgeren i at komme ud i dagslys)
- ❑ Nedsat søvnkvalitet (afbrudt søvn, mange vågne perioder o.l.)
- ❑ Alment svækket
- ❑ Urolig/aggressiv adfærd (demente, smerteplagede, psykiske lidelser o.l.)

Primære diagnoser

Angiv den eller de diagnoser der er mest karakteristisk for borgers tilstand.

1. _____
2. _____
3. _____

Øvrige helbredsoplysninger (f.eks. smerteplaget o.l.)

_____

_____

_____

Søvn og hvile

Lyset har en afgørende betydning for borgers søvnkvalitet. For at kunne vælge rette lysløsning til borgeren, bedes du besvare nedenstående spørgsmål.

Har borgeren (medarbejdere) brug for lys om natten? Og hvor i boligen skal der være lys?

- ❑ Ja

  Hvis ja, angiv hvor: _____

- ❑ Nej

Er borgeren urolig om natten (f.eks. nattevandring)?

- ❑ Ja

  Hvis ja, uddyb gerne hvordan borgeren er urolig:

  _____

  _____

- ❑ Nej

Primære funktionsevnenedsættelser

Borgerens funktionsevne er afgørende for valg af lysløsning. Du bedes derfor besvare nedenstående spørgsmål.

Mobilitet

Hvor opholder borgeren sig (mest) om dagen?

- ❑ Seng
- ❑ Lænestol

- ❑ Toilet
- ❑ Stue
- ❑ Andet (uddyb gerne):

_____

_____

_____

- ❑ Fællesrum/-areal (uddyb gerne): _____

_____

_____

Mentale funktioner

Kan borgeren selv betjene sin daglige belysning (almindelige lamper og kontakter)?

- ❑ Ja
- ❑ Nej

Kan borgeren betjene en smartphone?

- ❑ Ja
- ❑ Nej

Kan borgeren betjene en fjernbetjening med fire knapper?

- ❑ Ja
- ❑ Nej

Egenomsorg

Er borgeren opmærksom på sit behov for dagslys?

- ❑ Ja
- ❑ Nej

Er borgeren opmærksom på at få en god sammenhængende nattesøvn?

- ❑ Ja
- ❑ Nej