

# NatureConnect

by @signify

## Research study

# The positive impact of NatureConnect on alertness and vitality of office workers

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# Study indicates that NatureConnect can increase alertness of office workers.

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A recent study has shown that NatureConnect has a positive impact on the alertness and vitality of office workers. In a mock-up office, participants were exposed to both the NatureConnect as well as standard office lighting and had to complete questionnaires and tasks related to their well-being and performance.

For alertness (measured with the Karolinska Sleepiness scale), the analysis showed that towards the end of the day participants feel more alert under NatureConnect, helping them to combat the natural decline in alertness.

Furthermore, the analysis of vitality (measured with Thayer's activation/deactivation list) showed that for participants above the age of 41 NatureConnect helped them to feel more vital. The study indicates the NatureConnect can give office workers a boost during the day to help them maintain alertness and feel activated.



**In interviews participants indicated, that they viewed NatureConnect as activating.**

# I. The power of daylight to people

In the western world we spend about 90% of our time indoors<sup>1 2</sup>. Moreover, a lot of this indoor time is spent inside offices. Different characteristics of the office, with lighting being one of them, plays an important role in office workers well-being and performance, making good lighting an important element within the office<sup>3</sup>. In the past, there has always been a large focus on the so-called visual aspects of light, but not so much on the non-visual aspects of light.

Receiving enough light during daytime hours is important for our well-being, such as for performance, alertness, and vitality<sup>4 6</sup>. Especially when light has high melanopic activation (so-called blue enriched light) it can have beneficial effects on subjective alertness, vitality and performance.<sup>6 8</sup> Furthermore, receiving enough light during daytime hours can result in a reduced sensitivity to the sleep disruptive effects of evening exposure to light<sup>9 11</sup>.



Besides the tendency of people to prefer natural light over artificial light<sup>12 14</sup>, it also seems that exposure to natural environments and features can have positive effects on well-being<sup>15</sup>. For example, previous work has shown that being exposed to nature, even for 3 minutes, can have a restorative effect on your mental energy<sup>16</sup>.

Traditional office lighting tends to be too dim and warm, delivering an insufficient amount of blue light, thus not achieving the right levels for melanopic activation. In effect, this means that many of us work in biological darkness during the day.

Bringing NatureConnect into an office environment could potentially have positive effects on the general well-being and performance of office workers, by increased light exposure (especially relating to supporting melanopic activation) as well as bringing the natural light inside design aspect. To see whether NatureConnect indeed can bring these positive effects to an office environment, a study was conducted.

## 2. Exploring NatureConnect

The NatureConnect lighting innovation by Signify is built on proven Biophilic Design principles to reconnect us to the outside world. It mimics the natural patterns of daylight to create comfortable, engaging and attractive indoor environments.

To see whether NatureConnect indeed can bring these positive effects to an office environment, a study was set up to answer the following questions.

What is the effect of NatureConnect on measures related to alertness and performance as compared to standard office lighting?

What is the effect of NatureConnect on the light appraisal and experience as compared to standard office lighting?



### 3. Higher alertness at end of day under NatureConnect

Analysis of the Karolinska Sleepiness scale<sup>17</sup> indicated that a significant interaction was found between alertness and time of day. In the current study our participants performed the study at either 12.00, 14.00 or 16.00. NatureConnect showed a positive effect on alertness and is helping to combat the natural decline in alertness over the day, while in the standard office lighting condition the subjective alertness did not recover from the natural decline in alertness ( $p = <.05$ ).

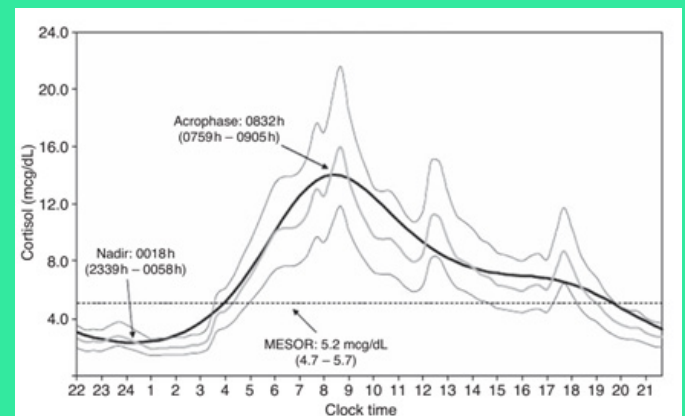
Besides the statistical evidence, 52% of the participants mentioned unprompted the alerting and activating effects.

“It makes me feel like I’m really awake under this light, not that you are slowly losing energy.”

“I noticed that in both conditions I am focused, but with NatureConnect I noticed that I am sharper and quicker.”



Looking at cortisol production over the day (see Figure 1), this peaks around 08:30 and slowly declines over the course of the day, with some food-induced peaks around noon and 18:00<sup>20</sup>. Combining this with alertness and homeostatic sleep pressure, this results in people becoming less alert over the day. The difference in alertness levels between 12.00 and 16.00 can be quite big, leaving more room for improvement in alertness around 16.00.



## 4. Higher vitality under NatureConnect when $\geq 41$

Aging has an impact on the eye, leading to yellowing of the lens and other vision related issues. For example, ageing adults (60+) require three times more light than younger adults (<20)<sup>18 19</sup>. These changes to the eye will already begin to be noticeable after 40 and progress over time<sup>20</sup>. Since the average working population is 42<sup>21</sup>, it is relevant to take this into account.

When running the analysis on vitality (as measured by Thayer's activation/deactivation list<sup>22</sup>), the effect of age was also explored. The dataset was split in two groups (participants <41 and participants  $\geq 41$ ) and analysis showed a main effect of the light condition for the  $\geq 41$  group ( $p < .01$ ). The main effect indicates that participants who are  $\geq 41$ , feel more vital under the NatureConnect energize setting when comparing this to standard office lighting of 500 lx.



## 5. NatureConnect light conditions positively appraised

The current study showed a significant positive result of participants evaluating the NatureConnect as more activating when compared to standard office lighting ( $p < .01$ ).

This is in line with what participants have mentioned unprompted in the interviews as well:

### Perceived alertness

- 52% of the participants mentioned terms associated with alertness.
- 14% of the participants stated it gives them energy
- 17% mentioned that light helped them with concentration or focus

### Impact of skylight

- 90% of the participants were positive about the skylight, of those positive participants:
  - 48% perceived the skylight as a window
  - 31% perceived the skylight as a sun
  - 21% commented that it created a feeling of working outside



### Better experience

“I feel like I have more energy and am more excited”

“It’s great for me in working environment. When it’s gloomy outside, I prefer to have this.”

“With this light you don’t feel like it’s winter, it’s like summer outside.”

“It is nice to work in. It feels like you are outside. Especially with the blue it makes me feel like I can just look outside.”

## 6. Method used

The study was a laboratory-based study using a mock-up office. Reasons for this setup was the combination of a higher level of control but also increased ecological validity. A within (light condition: NatureConnect Energize versus regular office lighting) subjects design with repeated measurements was employed, the conditions were counterbalanced. Participants came to the lab on 2 separate occasions where they were exposed to one of the light conditions for 60 minutes (after an initial baseline exposure (regular office lighting) of 30 minutes). Per session there were 1-3 participants, with the experiment leader present in the room as well. Sessions were planned at 12.00, 14.00 and 16.00 and participants were asked to come back at the same time for both sessions when possible. Sessions were performed in late fall/early winter from November 21 until December 9.

### Light conditions

For this study NatureConnect has been compared to standard 500 lx lighting. Tables below show vertical light levels which are relevant for this study.

Table 1. Vertical light measurements with monitors turned off. Illuminance.

	Desk 1 vertical	Desk 2 vertical	Desk 3 vertical
<b>Regular office Lighting</b>	222 lx	209 lx	213 lx
<b>NatureConnect</b>	676 lx	658 lx	696 lx

Table 2. Vertical light measurements, with screens turned off. Melanopic equivalent daylight illuminance

	Desk 1 vertical	Desk 2 vertical	Desk 3 vertical
<b>Regular office Lighting</b>	156 m-EDI	147 m-EDI	149 m-EDI
<b>NatureConnect</b>	718 m-EDI	699 m-EDI	743 m-EDI

### Participants

For this study the goal was to invite 30 participants who represent the office population. Participants were recruited via an external agency with the following criteria:

- Work at least 20 hours per week in the office (doing desk work)
- No eye conditions.
- Between 23 and 60 years old (equally distributed)

In the end 29 participants were invited. The average age of our participants was 40 (SD = 9, range 27-59) which closely resembles that of the Dutch working population, for which the average age is 42<sup>15</sup>. For the quantitative analyses 1 participant had to be excluded. All participants were included in the interviews.



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