Measure Name Blue lighting

Definition Blue LED lighting at stations with the potential to reduce the likelihood of a suicide attempt.

Tags

Incident Type	Suicide only
Location	Station only
Intervention Strategy	Engineering: technological and physical deterrents
Measure Group	Detection and lighting

Description

Blue Lighting refers to the installation of Light-Emitting-Diode (LED) lights in train stations that cast a blue light on the platform, particularly at night. Installing lights on the platform has the potential to influence an individual's behavior by calming emotions.

There is mixed evidence of the effectiveness of blue lighting to reduce suicidal ideation in the railroad environment. A 2014 study reported an 84-percent reduction in the number of suicides at stations where blue lights were installed [2]. However, a subsequent study reporting the same data found that these numbers may be exaggerated because only 14 percent of the suicide incidents occur where the blue lighting would have an impact (e.g., at night on station platforms) [3].

Research on the use of blue lighting has found some known side effects depending on exposure. High exposure of blue light in the evenings may contribute to sleep disorders due to its effects on circadian rhythm [4][5]. Prolonged exposure may also have direct impacts on retinal damage, especially among older individuals [6][7].

Additional search terms: *color, lights, platform*

Advantages

- Can be retrofitted into stations.
- If effective, the blue lighting may have lasting positive impacts on psychological health, especially in times of reduced sunlight exposure [2][3].

Drawbacks

- Research has shown mixed findings on the effectiveness of blue lights.
- Installation would be in stations only, therefore limiting potential to impact right-of-way incidents.
- Effects of blue lights during daylight hours are unclear.
- Prolonged exposure to blue light may have adverse effects on circadian rhythm and sleep cycles [4][5], and eye (retinal) health [6][7].

Notable Practices

- Coordinate with adjacent communities to ensure that the lighting does not adversely affect those living in proximity.
- Bright blue light may be necessary to make the blue hue noticeable to those on the platform. However, it should not be so bright that it interferes with the train operator's vision as they enter the station.
- Placement of blue lights should be in locations where risk is highest. Often this will be at the ends of station platforms.

References

[1] Kadotani, H., Nagai, Y., & Sozu, T. (2014). Railway suicide attempts are associated with amount of sunlight in recent days. *Journal of affective disorders*, *152*, 162-168.

Abstract: To assess the relationship between hours of sunlight and railway suicide attempts, 3-7 days before these attempts. Methods: All railway suicide attempts causing railway suspensions or delays of 30 min or more between 2002 and 2006. We used a linear probability model to assess this relationship. This study was conducted at Tokyo, Kanagawa, and Osaka prefectures in Japan. Data were collected from the railway delay incident database of the Japanese Railway Technical Research Institute and public weather database of the Japan Meteorological Agency. Results: About 971 railway suicides attempts occurred between 2002 and 2006 in Tokyo, Kanagawa, and Osaka. Less sunlight in the 7 days leading up to the railway suicide attempts was associated with a higher proportion of attempts (p=0.0243). Sunlight over the 3 days before an attempt had a similar trend (p=0.0888). No difference was found in sunlight hours between the days with (median: 5.6 [IQR: 1.1-8.8]) and without (median: 5.7 [IQR: 1.0-8.9]) railway suicide attempts in the evening. Finally, there was no apparent correlation between the railway suicide attempts and the monthly average sunlight hours of the attempted month or those of a month before. Limitations: Railway suicides were not the main suicidal methods in Japan, Conclusions: We observed an increased proportion of railway suicide attempts after several days without sunlight. Light exposure (blue light or bright white light) in trains may be useful in reducing railway suicides, especially when consecutive days without sunshine are forecasted.

[2] Matsubayashi, T., Sawada, Y., & Ueda, M. (2013). Does the installation of blue lights on train platforms prevent suicide? A before-and-after observational study from Japan. *Journal of affective disorders*, *147*(1-3), 385-388.

Abstract: Background: Installing physical barriers at suicide hotspots is known as an effective strategy for suicide prevention. However, the effectiveness of physical barriers may be nullified by the substitution phenomenon, i.e., that restricting access to a particular place induces people at risk to look for a nearby place for suicide. Methods: This study tests whether the substitution phenomenon exists in the case of railway and metro suicides. We focused on the prevention effort by a Japanese railway company that installed blue light-emitting-diode (LED) lamps on railway platforms to prevent people from diving to a running train. Using panel data of 71 train stations between 2000 and 2013, we compared the number of suicides before and after the installation of the blue lights at 14 stations where the lights were installed and at neighboring five stations on the same railway line, using the number of suicides at all other stations without the intervention as a control group. Findings: Our regression analysis shows that the introduction of blue lights decreased the number suicides by 74% (CI: 48-87%) at stations where the blue lights were installed, while it did not result in a

systematic increase in the number of suicides at the neighboring stations. Interpretation: The installation of blue lights generated no systematic substitution phenomenon at nearby stations.

[3] Ichikawa, M., Inada, H., & Kumeji, M. (2014). Reconsidering the effects of blue-light installation for prevention of railway suicides. *Journal of affective disorders*, *152*, 183-185.

Abstract: A recent preliminary communication suggested that the calming effect of blue lights installed at the ends of railway platforms in Japan reduced suicides by 84%. This estimate is potentially misleading from an epidemiological point of view and is reconsidered in the present study. Methods: Governmental data listing all railway suicide attempts in Japan from April 2002 to March 2012 were used to investigate the proportion of suicide attempts within station premises, where blue lights are potentially installed, and at night, when they would be lit. For those suicide attempts within station premises, we also estimated the proportion that occurred at the ends of the platforms at night. Results: Of 5841 total reported suicide attempts, 43% occurred within the station premises, 43% occurred at night (from 18:00 to 05:59), and 14% occurred both within the station premises and at night. Of the 2535 attempts within station premises, 32% occurred at night and 28% at most were at the end of a platform at night. Limitations: The exact proportion of nighttime suicide attempts at the ends of railway platforms was not calculable. Nonetheless, the proportion of suicide attempts that is potentially preventable by blue lights should be less than our conservative estimate. Conclusions: The installation of blue lights on platforms, even were they to have some effect in preventing railway suicides at night, would have a much smaller impact than previously estimated.

[4] Cajochen, C., Jud, C., Münch, M., Kobialka, S., Wirz-Justice, A., & Albrecht, U. (2006). Evening exposure to blue light stimulates the expression of the clock gene PER2 in humans. *European Journal of Neuroscience*, *23*(4), 1082-1086.

Abstract: We developed a non-invasive method to measure and quantify human circadian PER2 gene expression in oral mucosa samples and show that this gene oscillates in a circadian (¼ about a day) fashion. We also have the first evidence that induction of human PER2 expression is stimulated by exposing subjects to 2 h of light in the evening. This increase in PER2 expression was statistically significant in comparison to a non-light control condition only after light at 460 nm (blue) but not after light exposure at 550 nm (green). Our results indicate that the non-image-forming visual system is involved in human circadian gene expression. The demonstration of a functional circadian machinery in human buccal samples and its response to light opens the door for investigation of human circadian rhythms at the gene level and their associated disorders.

[5] Holzman, D. C. (2010). What's in a color? The unique human health effects of blue light. *Environmental Health Perspectives*, *118*(1).

Description: This article provides background information on the effects of blue light on human health.

[6] Ham Jr, W. T., Ruffolo Jr, J. J., Mueller, H. A., & Guerry III, D. (1980). The nature of retinal radiation damage: dependence on wavelength, power level and exposure time. *Vision research*, *20*(12), 1105-1111.

Abstract: Wavelengths between 400–1400 nm are transmitted by the mammalian ocular media to the retina. There are at least three types of retinal injury in this waveband. They are mechanical, thermal and actinic in nature. Each type of damage is described briefly and it is suggested that melanin plays a key role in all three types of damage. Some of the peculiar properties of melanin are discussed briefly.

[7] Taylor, H. R., Munoz, B., West, S., Bressler, N. M., Bressler, S. B., & Rosenthal, F. S. (1990). Visible light and risk of age-related macular degeneration. *Transactions of the American Ophthalmological Society*, *88*, 163.

Abstract: Sunlight exposure has been suggested as a cause of AMD. To examine this, we collected detailed histories of ocular sun exposure in 838 watermen who work on the Chesapeake Bay. The presence and

severity of AMD was assessed in stereo macular photographs. Macular changes were classified into four grades of increasing severity ranging from the presence of 5 or more drusen (AMD-1) to extensive geographic atrophy or disciform scars (AMD-4). Previously, we found no association between AMD and ocular exposure to either UV-B (290 to 320 nm) or two bands of UV-A (320 to 340 nm and 340 to 400 nm). We have undertaken further analysis to determine whether ocular exposure to violet light (400 to 450 nm), blue light (400 to 500 nm), or all visible light (400 to 700 nm) was associated with AMD. Ocular exposure was estimated using model computations of ambient irradiance and estimates of the ratio of ocular to ambient exposure. Compared to age-matched controls, established cases (AMD-4), but not milder cases, had significantly higher exposure to both blue and visible light over the preceding 20 years (Wilcoxon sign rank test, P = 0.027). There was no difference in exposure at younger ages. These data suggest that high levels of exposure to blue and visible light late in life may be important in causing AMD.

Related Measures

- Identify funding opportunities
- Incident cost estimation
- Lighting at hotspots