

범죄두려움 저감을 위한 도로조명 조도 기준 연구

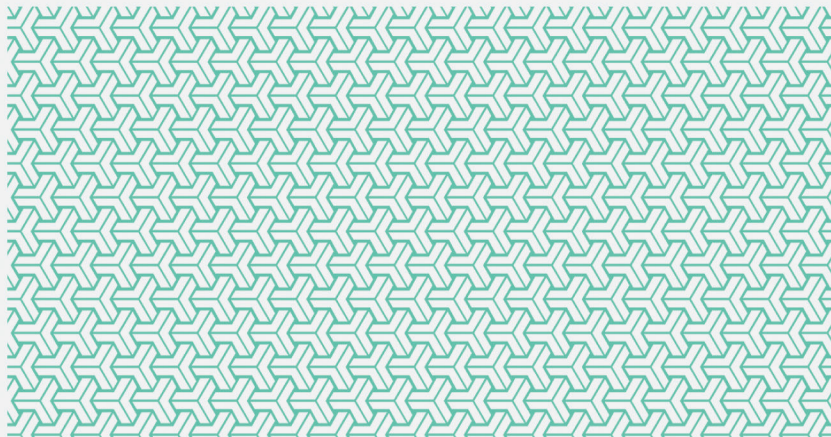
A Study on Road Lighting Standards to Reduce Fear of Crime

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Summary



Lighting has been regarded as an important factor for creating a safe environment at night. In the West, analysis studies on the effects of lighting have been conducted along with the lighting improvement project aimed at reducing crime in the 1960s. This can be seen as a part of satisfying people's desire for living in a safe space, and the safety that people feel here also includes relieving anxiety about crime. Because fear of crime can have a more negative effect on people's behavior and psychology than actual crime, research on reducing fear of crime is important. Theories related to the fear of crime have developed from an individual side to an environmental side based on the assumption that people's cognitions and behaviors will be changed by the environment. In particular, people perceive and react to the environment mainly through their eyes, but if they do not secure a proper field of view, people feel fear. So, lighting has been playing an important role because it expands the scope of spatial perception by providing people with a wider field of view.

Lighting is closely related to people's night activity, and previous studies have proven the effect of lighting to alleviate fear of crime. However, previous studies have limitations in not systematically analyzing differences in people's safety perceptions that change according to the brightness of lighting. In reality, it is very difficult to build various experimental environments in an actual urban space and conduct experiments by gathering residents in the space. In order to compensate for this limitation, some studies have been conducted by using photographic data taken of the actual target site or constructing a 3D virtual environment, but it has another limitation in that accurate analysis is difficult due to the lack of reality.

In this study, the change in fear of crime according to changes in illumination is analyzed by using 360-degree VR images targeting 4 streets in Seoul. In addition, it was attempted to propose improvement proposal on a road lighting standard that comprehensively considered brightness and visual information recognition by identifying the degree of perception of visual information according to changes in illumination.

First, as a result of measuring the horizontal illumination, in the case of residential areas, the illumination was generally maintained at 10 lux or less after sunset, and the lowest was recorded up to 0.74 lux. On the other hand, in the case of commercial areas, the illumination was generally maintained at 10 lux or

more until the shops were closed, and after all the shops were closed, it was recorded up to 2.18 lux. The vertical illumination showed similar values to the horizontal illumination, and the minimum vertical illumination was recorded as 0.27 lux in residential areas and 1.18 lux in commercial areas.

Second, the level of intensity at which people feel the fear of crime was analyzed by analyzing the change in fear of crime according to the change in level of illumination. Looking at the average fear of crime by time period, the average and median fear of crime increased the most after sunset. Specifically, in the 5th experiment (average horizontal illumination: 17.55 lux, minimum vertical illumination: 5.32 lux), the subject's fear increased significantly compared to the previous one. In the subsequent experiments, the fear of crime all appeared at an average of the late 3 point range, and it was high at the 9th round (average horizontal illumination: 4.6 lux, minimum vertical illumination: 0.37 lux).

The fear of crime increased significantly in the 4th experiment conducted on the ㊤ site. After sunset, fear greatly increased to a similar degree in the sixth experiment. In the subsequent experiments, fear of crime appeared to be in the late 3's on average, and overall, people felt higher fears compared to ㊤ site.

The fear of crime on the ㊤ site was relatively lower than that of the target sites in the residential area. Specifically, fear of self victimization increased significantly in the 5th experiment, and fear for other's victimization increased significantly in the 6th. However, the average value of fear of crime was lower than that of the residential area of the same experiment. And it was found that fear of crime was the highest in the 10th.

Before sunset, level of fear of crime on ㊤ target site was similar to that of the ㊤ target site, but it was relatively higher after sunset. The fear of crime increased significantly in the 6th and 8th experiment as illumination decreased.

In summary, the specific critical point was different for each target site, but in general, the fear of crime increased sharply from the experiments after sunset, and then the change weakened. As a result of analyzing the relationship between fear of crime and illumination, it was found that as illumination increased, fear of crime decreased, and it was found to be greater in residential areas than in commercial areas with relatively high illumination.

Third, the experimental results on whether visual information is recognized

according to illumination are as follows. As for the color of the ㉓ site, it became difficult to distinguish between blue and green from the 6th experiment at the 10m point. In the case of letter information, there were cases in which the final consonant was wrong or only numbers were recognized correctly from the 3rd experiment. In particular, starting with the 4th experiment, it was difficult for the subjects to recognize the letter information at the 10m point. Recognition of behavior was accurate regardless of illuminance and distance, but it was found that the recognition of a person had difficulties from the 6th round at the 4m point and the 5th experiment at the 10m point.

It was found that the case of accurate recognition in the ㉔ site was less than that of the experiment on ㉓ site. In the case of color, there were cases where it was difficult to distinguish colors even at the 4m point. In the case of building addresses, there were many cases where only numbers were recognized at the 10m point, and there were more cases like this at the 4m point than ㉓ site. In the case of a person, there were cases where it was not possible to fully recognize a person's face at the 4m point, and the lower the illuminance, the more often the person's face could not be recognized properly.

There were less cases on ㉔ site to accurately recognize color properly than that target sites in a residential area. In case of text, there was case to recognize only numbers even at high illuminance because it was difficult to recognize regardless of the illuminance due to the complexity of the letters themselves. In the person recognition part, there were more cases of recognizing people's faces properly than in residential area.

The results of ㉔ site showed similar to the ㉓ site. The building address and road name address were difficult to recognize at the 10m point, and in the 6th experiment, they could not all be recognized correctly.

To summarize the analysis results, most of the visual information was recognized at the 4m point, but in the case of a residential area with less traffic, it was difficult to recognize even at a place 4m distance from letters or characters as the illumination was the lowest among the target areas. In particular, it was confirmed that the points where it was difficult to properly recognize visual information in each target site had a higher illuminance level than the current standard.

Combining the above two experimental results, this study proposed

improvement standard in considering the standard of light emission (less than 10lux), regional average illuminance and uniformity.

This study is meaningful in that it comprehensively analyzed whether fear of crime and visibility according to the change in level of illumination and verified the relationship between illumination and fear of crime. It is also meaningful in that it supplemented the limitations of existing field-based research and virtual reality research by using 360° video and VR equipment, which were not used in existing lighting research. However, there are some limitations in the process of performing the analysis, so a future study is required

First, luminance as well as illuminance exist in the lighting element, but it is not taken into account, and the consideration of the overall planning standard as well as the lighting property is insufficient. Second, due to the nature of VR research, a comprehensive approach to various crime-vulnerable classes is lacking by limiting the survey respondents to a specific group. Because this shows limitations in generalizing the study results, future studies need to approach more diverse groups. Therefore, in future study, it is necessary to find a way to supplement the limitations of this study, and to propose a plan for establishing a lighting plan to create a safer night environment.

Keywords

Crime Prevention, Fear of Crime, Lighting Standards, KS A 3701