European Journal of Public Health and Environmental Research

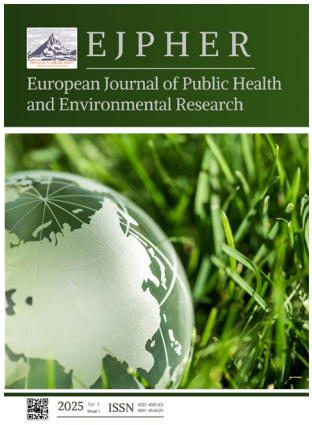
Vol. 1 No.1 2025

Article **Open Access**

The Role of Light Therapy in Mental Health and Depression

Rui Bai [1,*]

[1] School of Textiles & Design, Herriot-watt university, Edinburgh, Scotland, United Kingdom
* Correspondence: Rui Bai, School of Textiles & Design, Herriot-watt university, Edinburgh, Scotland, United Kingdom



Received: 04 April 2025
Revised: 09 April 2025
Accepted: 25 April 2025
Published: 29 April 2025

Abstract: The relationship between lighting science and mental health is a multi-dimensional and cross-disciplinary field, and they are closely related to each other. The light's illumination, through factors such as intensity, color, and rhythm, can affect people's emotions, cognition and behaviors through psychological and physiological mechanisms. Therefore, the scientific utilization of light in the field of mental health is an inseparable part of the therapeutic process. However, in the actual treatment process, there are limitations in how to make use of more personalized and attractive cost-effective treatment methods to provide better care for patients. By taking into account the impact of different light sensations and colors on patients, light therapy is applied, combined with artificial and natural light therapy technologies, to offer patients diverse treatment options. At the same time, the integration of online tracking technology and appropriate virtual reality technology effectively retains patients' treatment data, allowing them to not only enjoy a better treatment experience but also achieve better therapeutic outcomes during the treatment process. By saving costs while adopting more attractive and personalized theories and methods, better and more suitable treatment plans are formulated for patients with depression. Light therapy has expanded beyond merely promoting psychological well-being through functional specializations and now utilizes reasonable lighting strategies to better address the symptoms of depression for patients, serving as an important supplement to non-pharmacological approaches.

Keywords: lighting science; psychological health; depression patient; light therapy; virtual reality

1. Introduction

Color and lighting science have different effects on the physiological and psychological responses of the human body, such as on sleep, mood, vision, and mental state, etc. Colors themselves have the ability to influence emotions. Therefore, by integrating lighting science, it is possible to influence and treat psychological health problems of adults to some extent. This research focuses on the question of how the two tools of color and light science can be used to improve the mental health of adults with depression. There is now an increase in depression among adults in the world, which often leads to a loss of ability to live and work. Rehabilitation programs are one of the ways to help people with depression stay active in their working lives [1]. This research will investigate the use of color phototherapy to help patients combat emotional and physical disorders to assess whether the color phototherapy rehabilitation program can help depressed patients continue to work or return to work [2]. This research aims at exploring the possibility of promoting more creative lighting science product design at the intersection of design and healthcare.

2. Literature Review

2.1. Basic Concepts and Definitions

The science of light has great potential to help humans address mental health problems by improving their ability to interact with the world, as difficulties in social interaction are often at the heart of these issues [3]. Rehabilitation programs often aim at assisting people with depression in gaining different ways of thinking, reacting, and behaving in real life [4]. With color phototherapy technology, individuals are able to be in a simulation of treatment and receive guidance to respond appropriately based on an empirical understanding of a particular disease [2].

In terms of color therapy, it is believed that different colors can have different effects on the body. For example, some colors are thought to be stimulating, while others may be soothing. Monochrome or mixed colors (sometimes produced by lasers), combined with color light or color phototherapy, can be used to irradiate the whole body or specific areas, thereby exerting a psychological effect [5]. The emotional impact of eye color light therapy on individuals is significant, as projecting light into the eye through a color filter can provide treatment for those suffering from psychological disorders [6].

2.2. Prior Studies

Chromotherapy is considered an alternative medical treatment. Color phototherapy technology does have many other potential uses in mental health care [7]. For example, the psychology of color lighting, also known as illumination, involves the use of artificial light or blue light to improve mood and reduce symptoms of depression. Color has a significant effect on sleep [6]. While blue light from screens is known to disrupt sleep patterns, adding dark blue or other colors to your bedroom can create a calming atmosphere that can be conducive to restful sleep. These colors can also lower stress levels and prepare the brain for rest [5]. The blue light used for depression phototherapy is filtered to block ultraviolet (UV) radiation and is further adjusted using different modes to optimize therapeutic effects. Studies have shown that an hour of light exposure in the morning helps maintain the body's normal circadian rhythm [5]. When the eyes perceive bright light in the morning, they send signals to the brain to lower melatonin levels. Melatonin is a chemical messenger (neurotransmitter) in the brain that regulates the body's circadian rhythm and energy metabolism, allowing the body to function at a better level [8]. With respect to emotional disorders, light therapy can also be a good way to help patients with different physiotherapy and rehabilitation [9].

Light therapy is often associated with seasonal affective disorder, but it also has good results for both seasonal and non-seasonal depression [10]. A study of nearly 400 participants on the efficacy of light therapy versus antidepressants found no significant differences between the effects of light therapy and antidepressants, and that a combination of the two led to clear improvements [11].

Color light therapy technology uses different colored lights to give different help to people who need to go through treatment [2]. For example, red can energize the body and mind. Bright and vivid colors can help people feel younger because they increase brain activity. As a result, people are more energetic and ready to start the day [11]. This can be helpful to boost patients' energy levels and improve overall health, when the low energy levels are associated with depression. Thus, red light therapy has extraordinary potential in the treatment of mental health disorders. In a large mental health study conducted in 2018, researchers consistently concluded that light therapy has antidepressant properties [8]. These antidepressant properties have a moderate to large effect in patients with major depression. Red and near-infrared light therapy has also contributed significantly to treating mental health aspects of depression and anxiety disorders. Studies have found that these light therapies offer "promising treatments" for major depression, suicidal ideation, anxiety and traumatic brain injury [8]. Red light therapy is safe and easy to be used for

people of all ages. By bathing in therapeutic red and near-infrared light, patients can experience safe and effective rehabilitation outcomes. Red and near-infrared light reduce pain to varying degrees through safe, natural, and proven wavelengths of light energy, achieving soothing and relaxing rehabilitation effects [8]. Red light therapy also works faster than most or even other forms of treatment for mental health problems. As mentioned above, the patient's mood can be better improved after one or several sessions, and the maximum effect is usually achieved after a few weeks of continuous use [12]. In this case, light therapy can more effectively support patients in improving their mood and overall mental health [9].

2.3. Research Gaps

In future clinics, it will also be possible to evaluate problems in real time in the science of phototherapy. The technology has also helped to make substantial progress in understanding the causes of mental health disorders, for example, by identifying environmental characteristics that may increase the risk of adverse psychological reactions in the context of individual differences [9].

From a scientific perspective, it is worth considering whether adopting an engaging, personalized, and theory-based approach in affordable color light therapy can bring significant practical benefits to patients with depression, especially when the participation of clinical doctors is limited. For example, the problem of how to adjust the intensity of light in phototherapy technology to better suit the needs of patients can be solved. These are the difficulties we need to face and the problems we need to solve.

3. Methodology and Approach

3.1. Research Approach

Color light therapy and related technologies can help address the mental aspects of patients' problems, providing the best treatment for many people. However, the power of color light therapy may be so great that it promises more than just an improved approach to psychotherapy. Color light therapy allows us to try things that are not readily available in the real world [11]. This means that it may produce results that even the standard course of treatment cannot. For color light therapy and mental health care, it may actually be justified in the next few years. However, it needs to be presented in the treatment in a way that is more acceptable to users.

3.2. Research Methodology

The combination of color and light therapy techniques can improve the uncertainty in psychotherapy. For example, patients can experience mood improvement through the use of color and light therapy equipment. At the heart of Light Science's medical technology is psychotherapy, putting patients in situations that lead to bad emotions and learning different ways of thinking, feeling, and behaving [12]. Light without color can also produce different psychological effects. Repeated exposure to a simulated environment created by phototherapy technology has proven to be more effective in clinical mental health treatment. Therefore, design and development are a very important link [3]. One of the advantages of using light therapy technology to treat depression and other mental illnesses is that it can save a lot of manpower and material resources. AR technology requires some time investment for psychological treatment, whereas light therapy technology can significantly reduce labor costs. However, there are two sides to this advantage. When there is no medical care involved in psychotherapy, the question arises whether phototherapy technology can effectively replace human intervention [12]. This is because phototherapy technology is essentially a technology or machine, although it carries the will of one person to heal another. Therefore, to establish a scientific and cognitive framework, it can allow more people to understand the significance of light science and under-

stand the relationship to motor control [13]. With a large number of surveys and experiments in the field of lighting science, patient and user experience, a more reliable evaluation of the data can be obtained. When appropriate data protection regulations and local regulations are available, more sample data can be collected and analyzed for better research [12]. Improving the relationship between lighting equipment, patients and users in the application of technology is particularly important in lighting science [14].

3.3. Research Design

Achieving cost-effective chromatic phototherapy through attractive, personalized, and theoretical approaches during the treatment process requires a change in traditional treatment methods to bring significant practical benefits to patients with depression. Scientific phototherapy is more effective in treating depression. It can be carried out by combining artificial light sources treatment with natural light sources treatment. Traditional treatment can still be combined with blue-white light boxes and red-white light boxes that meet clinical standards, and choose safe models without ultraviolet rays [15]. In addition, natural light sources can be appropriately supplemented. By using the irradiation of natural light, one can choose to do certain outdoor activities during the periods with sufficient sunlight (from 10 a.m. to 4 p.m.), such as walking, hiking, and doing yoga. Combining abundant natural light sources with exercise can effectively alleviate depressive emotions. Studies have shown that natural light has a significant effect on regulating melatonin [15]. The combination of these two methods can not only reduce treatment costs but also better enable patients to receive treatment in different scenarios and modes, meeting the corresponding needs of patients. Through screening of patients' contraindications, medical staff take into account their diverse needs and recommend natural light therapy for patients with photosensitive skin. This is because such patients are advised to avoid excessive exposure to artificial light sources. Then, progressive adjustment therapy is carried out. The treatment cycle of patients is controlled in terms of time to avoid various discomforts caused by stimulation [16].

In order to provide patients with more comprehensive services for solving psychological health problems, tools such as lighting science and online human-computer interaction can be utilized for real-time monitoring, and comprehensive treatment services can be offered to patients. During the treatment process, patients can use the combination of online mental health applications to record emotional changes and visualize the effects of different intensities of light therapy. This application can be connected to virtual reality devices. Additionally, virtual reality natural light experiences can be incorporated into the application. Through virtual reality devices, it can simulate various lighting scenarios such as sunrise, forests, and sunset glow, enhancing the sense of immersion. At the same time, it can facilitate patients to receive auxiliary treatment anytime and anywhere. The data after treatment will be synchronized to the patient's database. The mental health application is connected to the patient's artificial light therapy equipment, enabling synchronized collection of post-treatment data. This health application will synchronously record the specific treatment information of patients at different time periods, analyze and compare them, and then conduct regular evaluations for patients, thereby helping them receive more comprehensive treatment and rehabilitation services.

4. Conclusion

Light therapy is also seen as a medical tool that can enhance communication between patients and their doctors by providing a new dimension to share therapeutic experiences [14]. Different forms can help people "better understand and perceive themselves", so doctors can get more accurate and faster diagnoses through "more standardized and quantified measures", while increasing public participation [3]. Through creative expression, people can integrate well into therapy. Therefore, the application of lighting science in mental health treatments can become more diverse and enriched [7]. For example, more

events focusing on mental health, photography, and art could be organized. Additionally, exhibitions showcasing how technology can enhance clinical mental health could be curated, with lighting science as the central theme. Scientific phototherapy is a microcosm of medical progress. It enables us to truly perceive the indispensability of colors and light to mental health. There is a possibility of influencing emotions and cognition by altering the complex biological rhythms within the human body.

References

1. V. Leichtfried, W. Kantner-Rumplmair, C. Bartenbach, H. Guggenbichler, R. M. Gothe, and W. Schobersberger, "Bright light therapy: minimizing light induced side effects with an innovative light setup," *Int. J. Psychiatry Clin. Pract.*, vol. 14, no. 4, pp. 309–312, 2010, doi: 10.3109/13651501.2010.486900.
2. D. Jonauskaite, I. Tremea, L. Bürki, C. N. Diouf, and C. Mohr, "To see or not to see: Importance of color perception to color therapy," *Color Res. Appl.*, vol. 45, no. 3, pp. 450–464, 2020, doi: 10.1002/col.22490.
3. Y. Yaodong, Y. Zhang, G. Feng, Y. Lei, Q. Liu, and Y. Liu, "Light therapy for sleep disturbance comorbid depression in relation to neural circuits and interactive hormones—A systematic review," *PLoS One*, vol. 18, no. 9, p. e0286569, 2023, doi: 10.1371/journal.pone.0286569.
4. A. Kushkin, A. Giordano, A. Griffin, and A. Savelyev, "Cognitively congruent color palettes for mapping spatial emotional data. Matching colors to emotions," *Cartogr. Perspect.*, no. 102, pp. 38–62, 2023, doi: 10.14714/CP102.1821.
5. I. Mylona and G. D. Floros, "Blue light blocking treatment for the treatment of bipolar disorder: Directions for research and practice," *J. Clin. Med.*, vol. 11, no. 5, p. 1380, 2022, doi: 10.3390/jcm11051380.
6. A. M. Gagné, F. Lévesque, P. Gagné, and M. Hébert, "Impact of blue vs red light on retinal response of patients with seasonal affective disorder and healthy controls," *Prog. Neuropsychopharmacol. Biol. Psychiatry*, vol. 35, no. 1, pp. 227–231, 2011, doi: 10.1016/j.pnpbp.2010.11.009.
7. R. Tomassoni, G. Galetta, and E. Treglia, "Psychology of light: How light influences the health and psyche," *Psychology*, vol. 6, no. 10, pp. 1216–1222, 2015, doi: 10.4236/psych.2015.610119.
8. R. Pan, G. Zhang, F. Deng, W. Lin, and J. Pan, "Effects of red light on sleep and mood in healthy subjects and individuals with insomnia disorder," *Front. Psychiatry*, vol. 14, p. 1200350, 2023, doi: 10.3389/fpsyt.2023.1200350.
9. M. A. Oldham and D. A. Ciraulo, "Bright light therapy for depression: a review of its effects on chronobiology and the autonomic nervous system," *Chronobiol. Int.*, vol. 31, no. 3, pp. 305–319, 2014, doi: 10.3109/07420528.2013.833935.
10. L. Tao, R. Jiang, K. Zhang, Z. Qian, P. Chen, Y. Lv, and Y. Yao, "Light therapy in non-seasonal depression: An update meta-analysis," *Psychiatry Res.*, vol. 291, p. 113247, 2020, doi: 10.1016/j.psychres.2020.113247.
11. L. Lan, S. Hadji, L. Xia, and Z. Lian, "The effects of light illuminance and correlated color temperature on mood and creativity," *Build. Simul.*, vol. 14, pp. 463–475, Jun. 2021, doi: 10.1007/s12273-020-0652-z.
12. T. M. Penders, C. N. Stanciu, A. M. Schoemann, P. T. Ninan, R. Bloch, and S. A. Saeed, "Bright light therapy as augmentation of pharmacotherapy for treatment of depression: a systematic review and meta-analysis," *Prim. Care Companion CNS Disord.*, vol. 18, no. 5, p. 26717, 2016, doi: 10.4088/PCC.15r01906.
13. K. J. Rohan, K. B. Burt, R. J. Norton, J. Perez, P. Iyiewuare, and J. M. Terman, "Change in seasonal beliefs mediates the durability advantage of cognitive-behavioral therapy over light therapy for winter depression," *Behav. Ther.*, vol. 54, no. 4, pp. 682–695, 2023, doi: 10.1016/j.beth.2022.11.002.
14. M. Rossi, "A design-oriented approach for managing colored light sources in lighting design software," *Color Res. Appl.*, vol. 48, no. 1, pp. 32–39, 2023, doi: 10.1002/col.22823.
15. B. Plitnick, M. G. Figueiro, B. Wood, and M. S. Rea, "The effects of red and blue light on alertness and mood at night," *Light. Res. Technol.*, vol. 42, no. 4, pp. 449–458, 2010, doi: 10.1177/1477153509360887.
16. E. Austin, A. N. Geisler, J. Nguyen, I. Kohli, I. Hamzavi, H. W. Lim, and J. Jagdeo, "Visible light. Part I: Properties and cutaneous effects of visible light," *J. Am. Acad. Dermatol.*, vol. 84, no. 5, pp. 1219–1231, 2021, doi: 10.1016/j.jaad.2021.02.048.