On the Brightening of Subjective Luminosity in Ganzflicker Meditation: A Dual Pathway Hypothesis

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Experiences of unusual inner luminosity are widely reported in contemplative, psychedelic, and near-death states, yet their neurophysiological basis remains poorly understood. This exploratory self-experimentation study investigated fluctuations in the perceived brightness of ganzflicker-induced visual hallucinations following brief intervals of eye closure, square breathing, or horizontal eye movements. Across 20 days of daily flicker meditation, brightness ratings revealed three consistent findings: (1) eye closure reliably produced transient enhancements of subjective luminosity, peaking 40-60 seconds after reopening the eyes; (2) horizontal eye movements produced transient darkening; and (3) these temporal dynamics were highly reproducible. Building on convergent evidence from EEG alpha research, sensory deprivation studies, and the physiology of flicker, the paper proposes a **dual-pathway hypothesis**: enhanced luminosity arises from the *simultaneous alpha-mediated suppression of cortical visual processing* and *compensatory activation of the evolutionarily older retinotectal pathway*, particularly the superior colliculus. When cortical visual areas are inhibited by alpha rebound following eye closure, flicker-driven subcortical excitation becomes unmasked, producing a perception of immersive, colourless, boundless light with pronounced affective and cognitive effects. It is suggested that alpha rhythms originally evolved in early nocturnal mammals to shift processing from external vision to internal imagery, with brightness serving as a primitive coding mechanism for salience within the SEEKING motivational system. Under ganzflicker, this ancient brightness-based signalling may re-emerge into consciousness, producing awe, stillness, and mood elevation. Together, the dual-pathway and evolutionary models offer a parsimonious account of mystical-type luminosity experiences and suggest that ganzflicker occultation - alternating periods of flicker with eyes open and closed - may provide a safe, controllable method for inducing therapeutically beneficial peak experiences.

INTRODUCTION

Background

The use of stroboscopic light as a means of inducing altered states of consciousness has a long history in the context of psychedelic research. Aldous Huxley, in Heaven and Hell (1956), the sequel to The Doors of Perception, noted that stroboscopic light appeared to enhance and intensify the visions induced by mescaline and LSD. Huxley's mescaline experiences, which formed the basis of The Doors of Perception, had been facilitated in 1953 by the psychiatrist Humphry Osmond, who would later coin the term 'psychedelic.' Osmond worked closely with his colleague John Smythies, who became one of the first to document the synergistic effect of stroboscopic light on drug-induced visions (Peretz, Smythies & Gibson, 1955) and subsequently conducted some of the first systematic investigations into stroboscopically induced visual hallucinations (Smythies, 1959a, 1959b, 1960). This line of inquiry influenced other pioneers, most notably Stanislav Grof, who experienced a life changing epiphany in 1956 involving LSD combined with stroboscopic stimulation. Grof (2019) later credited this experience with inspiring his lifelong pioneering work in altered states of consciousness, transpersonal psychology, and psychedelic therapy. Following the prohibition of psychedelic substances in the early 1970s, Grof and others turned to stroboscopic light as a legal and practical alternative for inducing non-ordinary states of consciousness in therapeutic contexts, a strategy adopted by the present author.

The author is a retired psychiatrist who specialised in trauma-focused psychotherapy using EMDR (Eye Movement Desensitization and Reprocessing) to treat Complex PTSD. He integrated the psychedelic effects of stroboscopic light stimulation into the EMDR protocol via high-intensity LEDs mounted laterally in glasses (the LEDs being switched between either flicker stimulation or prompting eye movements) to facilitate access to dream-like visual imagery (pseudo-hallucinations) relevant to patients' problems (Carr, 2020). During the COVID-19 pandemic, a need for remote treatment led to the development of a mobile phone app that delivered Ganzflicker - flickering full-field visual stimulation - through the screen of a phone mounted in a headset. Having practised stroboscopic meditation with LED glasses for many years, and having learnt how to advance from elementary to complex levels of imagery, the author switched to ganzflicker meditation with the new app. This shift from intense stroboscopic stimulation to lower-luminance screen-based flicker revealed subtler fluctuations in the perceived brightness and structural complexity of visual imagery. These observations formed the experiential and conceptual foundation for the present exploratory study.

Peak Bright Light Experiences

There is currently a renaissance of interest in the use of psychedelic drugs to boost the effectiveness of psychotherapy. A widely accepted principle of this psychedelic-assisted psychotherapy, one supported by many empirical studies, is that the quality of peak mystical-like experiences occurring during the therapy sessions contributes significantly to a positive long-term outcome (Griffiths, 2006; Roseman, Nutt & Carhart-Harris, 2018). This consistent finding from clinical studies is supported by a rich historical background of philosophers and psychologists proposing that transient experiences imbued with sufficient profundity and meaning have long-term transformative effects on the personality - from Edmund Burke’s notion of the sublime, Richard Bucke's cosmic consciousness, William James’s detailed accounts of conversion raptures, Rudolf Otto’s formulation of the numinous, to Abraham Maslow’s formal conceptualisation of the term 'peak experience'. The emotion of awe, transcendence of the habitual self, and transformation of the personality feature prominently in these accounts. Spinoza argued that a negative emotion such as anxiety or depression can only be neutralized by another more powerful positive emotion (Damasio, 2003), and awe seems singularly efficacious in this respect (Keltner & Haidt, 2003; Hendricks, 2018).

One notable form of peak experience, traditionally occurring in religious contexts but now a frequently reported phenomenon of psychedelic drug and near-death experiences, is the subjective perception of intense bright light, perceived as either interior or projected onto a transfigured externality. Both William James and Richard Bucke identified such *photisms* - episodes of illumination - as central features of peak mystical experience, with James documenting numerous luminous conversion raptures and Bucke emphasizing them as hallmarks of cosmic consciousness. Despite this historical emphasis on luminous phenomena, contemporary psychedelic research has largely overlooked these experiences. The standard questionnaires for measuring altered states and mystical experience - including the widely-used Hood Mysticism Scale and the MEQ30 - contain no items that directly assess experiences of extraordinary light or luminosity, focusing instead on more abstract qualities such as unity, noetic quality, and ineffability (Dinsmore, 2024).

The perception of unusual brightness is amongst the most universal of acute religious experiences, the subjective light generally being interpreted as the radiance of divinity or of supreme consciousness (Kapstein, 2004). Visions of heightened luminosity have been purposefully cultivated by mystical traditions through the ages and there is a plenitude of anecdotal accounts from the world religions of their profoundly transformative impact upon the perceiver.

A study by Lindahl et al. (2014) investigated luminous phenomena reported by contemporary meditators. They found that of twenty eight experienced Buddhist meditators, the majority being meditation teachers, nine (32%) voluntarily reported luminous experiences, suggesting that such phenomena are not uncommon within advanced contemplative practices. In many Eastern meditative traditions, the experience of internally generated light is cultivated as a means of facilitating transformative states of consciousness or is regarded as an indicator of such transformation. Visionary experiences of bright light are typically interpreted as markers of profound meditative absorption, signifying attainment of sustained attentional focus.

Analogous bright light experiences have been reported as occurring spontaneously during depth psychotherapy. Carl Jung (1962) noted the extraordinary impact a vision of bright light had upon his patients: "Its effect is astonishing in that it almost always brings about a solution of psychic complications, and thereby frees the inner personality from emotional and imaginary entanglements, creating thus a unity of being, which is universally felt as a *release"*. Jung quotes Hildegard of Bingen who in the 12th century wrote: "While I am enjoying the spectacle of this light, every sadness and pain vanishes from my memory so that I am again as a simple maid and not as an old woman".

In the 1960s Wolfgang Luthe made detailed and systematic studies of the changes in perceived brightness of visual hallucinations occurring during autogenic abreaction (Luthe, 1973). This method of depth psychotherapy involves prolonged exposure to visual hallucinations emerging spontaneously in a dream-like state of deep relaxation after induction of amplified interoceptive awareness of body-feeling. Its therapeutic effects arise from repetitive confrontation and desensitisation of disturbing hallucinatory content related to trauma, adversity, aggression, identification, sexuality and death. Over the course of many sessions, as such themes are desensitised and integrated, there is a hallucinatory progression from elementary to increasingly complex levels of visual imagery. The awe evoked by these unusual visionary experiences seems to contribute to their therapeutic effects.

From his quantitative studies of this progression Luthe found that the brightness and colour of visual hallucinations serve as significant indicators of therapeutic progress. Patients typically experience a progression from darker to lighter colours as emotional disturbances are resolved, with approximately 20% of patients experiencing phases of unusually intense brightness. He classified these phases of intense brightness into three ascending levels: Bright Colour Phase, Bright Light Phase, and Very Bright Light Phase. The Bright Colour Phase features intense brightness with structural and chromatic components still present, while the Bright Light Phase exhibits greater luminosity with minimal structural components. The Very Bright Light Phase, characterized by almost blinding "pure light" without structural features, represents the most advanced stage and is associated with profound therapeutic breakthroughs. Luthe noted that these brightness phenomena occur following successful resolution of difficult psychological material. The Very Bright Light Phase, in particular, is accompanied by intense positive affect and beneficial psychological effects, including feelings of liberation, renewal, and profound calmness, along with lasting improvements in energy, initiative, and outlook.

Hypothesis

Luthe's findings from autogenic abreaction are of interest in two respects. First they suggest that bright light experiences result from the successful processing of emotional disturbance towards resolution. His findings complement those of the meditative traditions which also see these phenomena as markers of progress but attribute them more to the attainment of a sufficient degree of concentration rather than the clearing of emotional disturbance. Also, whereas religious texts tend to give the impression that experiences of heightened luminosity are an all-or-none phenomenon, Luthe's work found a continuum of varying degrees of experiential light intensity. Taken together these two findings by Luthe gave rise to the hypothesis that it should be possible to experimentally demonstrate incremental brightening of visual hallucinations immediately following the practice of anxiety-neutralization techniques during psychedelic-assisted meditation. If successful processing of emotional disturbance leads to brighter visual hallucination, then therapeutic interventions which neutralize anxiety and emotional tension will enhance the hallucinated luminosity induced by a psychedelic agent.

METHODS

Therapeutic Interventions

Two anxiety-reducing interventions were tested: horizontal eye movements (from EMDR) and square breathing (also called box breathing). Both have been shown to reduce physiological arousal (Chen et al., 2014; Lehrer & Gevirtz, 2014). A third control intervention was simply resting with eyes closed.

Ganzflicker as Psychedelic Agent

Visual hallucinations are induced both by ganzfeld procedures (Wackermann, Putz & Allefeld, 2008; Pistolas & Wagemans, 2025) and by flickering light at alpha frequencies (Amaya et al., 2023; Hewitt et al., 2025; Montgomery et al., 2024). When these two methods are combined as *ganzflicker*, they give an appreciable psychedelic effect productive of visual imagery (Königsmark et al., 2021). A recent study by Shenyan et al. (2024) comparing ganzfeld and ganzflicker supports the view that these methods share underlying hallucinogenic mechanisms, though with distinct contributions: flicker stimulation preferentially induces elementary hallucinations, while the homogeneous field of the ganzfeld component facilitates emergence of endogenously generated complex hallucinations.

Unlike drug effects, ganzflicker is fully controllable in real time and can be switched on and off at will. A significant limitation of psychedelic drugs for research purposes is the variable time course of their pharmacokinetics. Hallucinogenic effects fluctuate with blood concentrations, rising to a peak before declining, which introduces a major confound when studying how different therapeutic interventions affect the brightness and complexity of visual hallucinations during a session. Ganzflicker, by contrast, provides a constant, consistent, and precisely replicable psychedelic effect.

The term *Ganzfeld* - from the German *ganz* (“whole”) and *Feld* (“field”) - was introduced by Metzger in the 1930's to denote complete homogeneity of the visual field, without boundaries or structure. Though the term *ganzflicker* is meant to describe the combination of ganzfeld with flicker (Königsmark et al., 2021), in practice studies employing this term (Königsmark et al., 2021; Reeder, 2022; Shenyan et al., 2024) typically use computers to deliver only monitor-wide flicker. Such stimulation does not encompass the entire visual field and some authors have therefore cautioned that ganzflicker should not be equated with a true ganzfeld (Hewitt et al., 2024).

Ganzflicker delivered via a mobile phone in a headset fills more of the visual field than a computer monitor and the flickering field is experienced as an immersive surround: the visible frame around the flicker-screen moves with the head, so the field remains continuous wherever the user looks. In contrast, when flicker is viewed on a monitor, the screen boundaries remain fixed in external space and the surrounding room is always perceptible in peripheral vision, diminishing the sense of full-field immersion. Headset implementation may therefore be considered closer to a true ganzfeld experience than monitor-based presentation.

Ganzflicker App

The ganzflicker in this study was delivered in the form of alternating bilateral stimulation, in accord with EMDR protocol, each hemifield illuminated alternately by light flickering at alpha frequencies (8-12 Hz). Red light of a wavelength of 660 nm was used because (a) red flicker at 10 Hz has been shown to induce greater photic driving than other colours (Milone, Minelli & Cian, 2013); (b) it passes through the eyelids more effectively than other colours; and (c) to some extent replicates the natural flicker of firelight to which the human brain has evolved over aeons of fire-gazing. The app can be switched out of flicker mode into eye movement mode, to give a vertical laterally located bar of light which alternates from side to side to prompt the user to carry out horizontal sweeps of the eyes.

Like other hallucinogens, at the most elementary level of hallucination ganzflicker induces the perception of a focus of increased brightness, a small dot or circle of light, at the centre of the visual field (Kluver, 1966; Siegel, 1977). Ganzflicker meditation, the practice of sustained attention to the central focus with the eyes open, is similar to traditional methods of meditation upon a candle flame. As described by Ronald Siegel, the dot tends to enlarge into a vortex or tunnel and complex visual hallucinations emerge from within the tunnel.

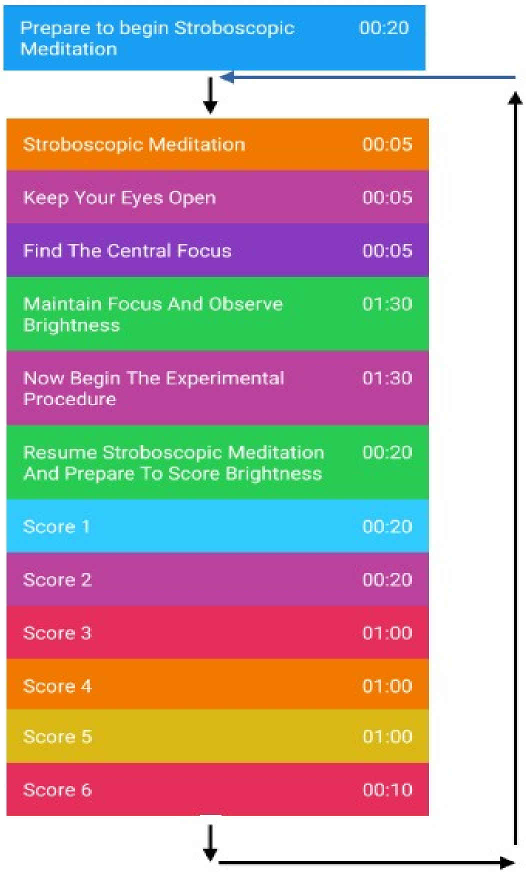
The Experimental Procedure

For 20 consecutive days the author did 45 mins of ganzflicker meditation first thing each morning scoring the perceived brightness of visual hallucinations from 0 to 10 after each of three different experimental interventions:-

A = resting with eyes closed
B = square breathing with eyes closed
C = eye movements with eyes open

The method involved the use of two mobile phones each running two apps:
1. A primary mobile phone in the headset ran the ganzflicker app and a voice-activated recorder to record the brightness scores;
2. A secondary mobile phone delivered audio through earbuds of a workout timer programme and a playlist of meditation music.

The workout timer was programmed to cue a forty five minute session of six sets of experimental interventions, each having a duration of 90 seconds. The programme prompted the user to score the brightness of visual hallucinations six times at set intervals after each intervention - at 20 secs, 40 secs, 1 min, 2 mins, 3 mins, and 4 mins. The text in this diagram shows the instructions heard by the user:



Brightness was scored from 0 to 10 by taking the objective brightness of the flicker screen when seen free of any projection at the start of a session as 5/10. A score of 0/10 signifies completely dark and a score of 10/10 as the brightest intensity of light imaginable. Brightness scores were spoken out loud and recorded by the voice activated recorder app in the primary phone. After the session the audio recording was transcribed by an AI website and the scores transferred to a spreadsheet.

RESULTS

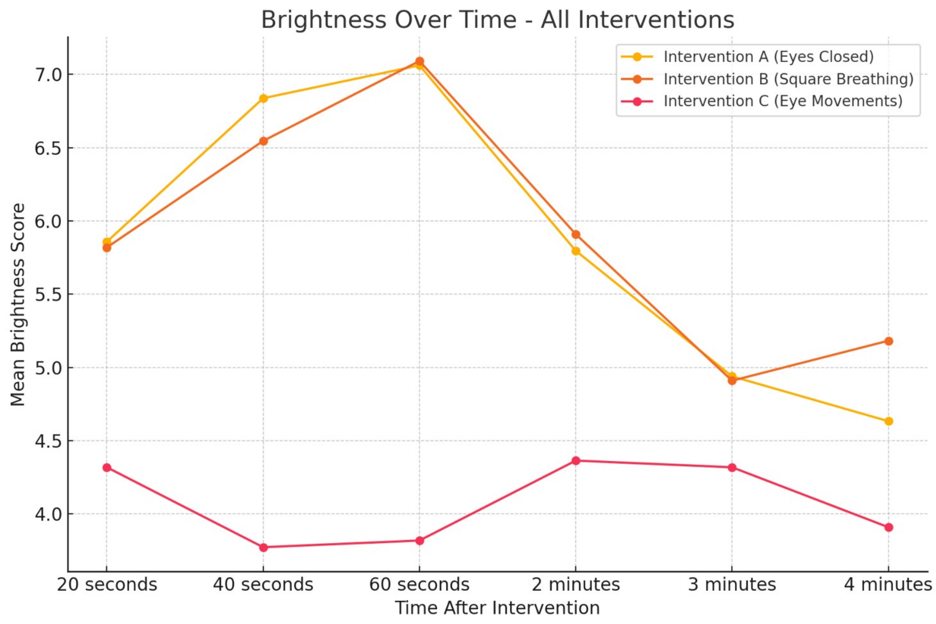
Early in the investigation the author discovered that the major variable affecting perceived brightness after the three interventions was whether the eyes had been open or closed. He was surprised to find that the control condition of simply resting with eyes closed was more effective in brightening the flicker screen than either of the other two procedures. He found it relatively easy to prolong and intensify this effect by sustained attention of meditation so that the red flickering light was replaced by a whitish non-flickering radiantly luminous mist which filling the entire screen. He became intrigued as to the nature and source of this mystical-like luminosity and broke from the planned protocol of the study to investigate, enjoy, and relax deeper into the light's effects. Consequently brightness scores after Intervention A were recorded 49 times, after Intervention B only 11 times, and after Intervention C 22 times.

Descriptive Statistics

	Mean	Median	Min	Max	S.D.
	Intervention A (resting with eyes closed): n=49				
Score 1	5.9	6	5	7	0.6
Score 2	6.8	7	4	8	0.9
Score 3	7.1	7	4	8	0.9
Score 4	5.8	6	3	8	1.4
Score 5	4.9	5	3	7	1.2
Score 6	4.6	5	3	7	1.1
	Intervention B (square breathing with eyes closed): n=11				
Score 1	5.8	6	5	8	0.9
Score 2	6.5	7	5	8	0.8
Score 3	7.1	7	7	8	0.3
Score 4	5.9	6	4	7	1.3
Score 5	4.9	5	4	6	0.7
Score 6	5.2	5	4	6	0.8
	Intervention C (eye movements with eyes open): n=22				
Score 1	4.3	4	3	6	0.8
Score 2	3.8	4	3	5	0.6
Score 3	3.8	4	2	5	0.8
Score 4	4.4	4	3	6	0.8
Score 5	4.3	4	3	6	0.7
Score 6	3.9	4	3	5	0.8

Comparative Analysis

The investigation yielded three principal findings:
1) The primary finding was that there was a substantial difference between conditions involving eye closure versus eyes open. There was minimal difference between simple eye closure (Intervention A) and square breathing with eye closure (Intervention B), suggesting that the period of eye closure itself, rather than the specific breathing technique, was the critical factor in inducing increased brightness.
2) Contrary to the investigation's hypothesis, the effect of Intervention C, eye movements, was a transient darkening of visual hallucination with decrease from the baseline score of 5 rather than an increase.
3) There was a consistent temporal pattern in the changes to the brightness scores following the experimental procedures. Both brightening and darkening showed highly reproducible maximum effects at the 40 second and 60 second scores. Both were transient phenomena lasting for a few minutes.



Phenomenology

A continuum of brightening effect was observed. At lesser degrees of brightening, those scored as 6/10, the extra luminosity appeared to emanate from the central focus of the flicker screen, like viewing the sun behind clouds, the flicker screen losing some of its red colour and becoming more yellowish. The structural forms of hallucinated scenes, figures and objects were sometimes still present within the enhanced brightness of the flicker screen.

As brightening became more intense, scored as 7/10, a uniform luminous mist filled the entire screen, replacing the red colour and a central focus was no longer apparent. The mist was colourless, or greyish-white, and seemed to glow with non-flickering luminosity. Structural forms, when present, became increasingly faint and ghost-like.

During phases of the most intense brightness, scored as 8/10, a state of complete "white-out" occurred. Bright luminous mist filled the entire headset screen and spilled over the edges to give an impression of immersion in boundless white light. Any residual structural forms were perceived as translucent and interpenetrating.

In addition to its visual effects, the enhanced luminosity at the higher scores of 7/10 and 8/10, had noticeable impact on cognition and affect. Though seen externally "out there" in the flicker screen, the luminosity was felt as having an internally-directed radiant power which supplanted thought and feeling. When sufficiently heightened the subjective bright light stilled the mind and body by cessation of cognitive activity and induction of a warm glow of profound immobility in the felt sense of the body. The overall effect was one of blissful awe. Post-session there was a noticeable positive effect on mood state and general lightening of the being.

From the evidence of meditation and psychotherapy the author construed the radiant power as representing an enhanced synchronisation and harmony of the brain's rhythms which allowed self-regulatory homeostatic mechanisms to operate with unusually high efficiency. He therefore adopted a passive receptive attitude of surrender towards it. In so doing, the experience of subjective bright light seemed to be facilitated and prolonged as long as attention was sustained successfully upon it. A prominent self-discovery during the investigation was that subjective brightening depended on sustaining meditative attention. As soon as distracting thoughts arose the brightness quickly faded.

DISCUSSION

Overview of Findings

Lindahl et al. (2014) propose that meditation-induced light experiences may arise through mechanisms similar to those observed in sensory deprivation and perceptual isolation studies. Drawing on evidence from these studies, they suggest that proficiency in meditative concentration leads to alpha-mediated inhibition of task-irrelevant cortical areas. This increased alpha activity is then followed by compensatory hyperexcitability, manifesting as bursts of high-frequency gamma at occipital sites just before the luminous experience. Their model is in line with traditional teachings of Eastern meditation which see heightened luminosity as reflecting ability to sustain attention effortlessly on the object of meditation.

Luthe (1973) on the other hand, from his studies of unusual brightness during depth psychotherapy, concluded that the enhanced luminosity was the outcome of successful processing and resolution of emotional disturbance. However the exploratory investigation under consideration here did not observe the predicted brightening of ganzflicker-induced visual hallucinations following anxiety-neutralizing therapeutic interventions. Instead, three unexpected findings emerged: (1) the control condition of resting with eyes closed consistently produced significant brightening after reopening the eyes, (2) horizontal eye movements caused transient darkening rather than brightening, and (3) both effects followed a highly reproducible temporal pattern with maximum impact at 40-60 seconds post-intervention. While these findings must be interpreted cautiously given the single-subject design, they align so well with established knowledge from three research traditions - EEG alpha rhythm dynamics, ganzfeld phenomenology, and the physiology of flicker - that they suggest a parsimonious neurophysiological explanation.

A Dual-Pathway Model

An effective hypothesis emerging from these findings is that the mystical-type bright light experience induced by ganzflicker arises from simultaneous opposing effects on two separate visual pathways: alpha-mediated cortical suppression of the primary visual pathway and compensatory flicker-induced activation of the secondary retinotectal visual pathway. This neurophysiological model accounts parsimoniously for the luminance findings, the temporal dynamics, and the broader phenomenological features including the characteristic cognitive and affective qualities of the bright light experience.

Primary Pathway Suppression: The Role of Alpha Rhythm

Enhanced occipital alpha power serves as an active inhibitory mechanism that suppresses cortical visual processing. This "alpha gating" theory, articulated by Klimesch (2007, 2012), Jensen & Mazaheri (2010), and others, demonstrates that increased alpha power implements dynamic inhibitory control over neural populations, particularly in the absence of meaningful external stimulation. The ganzflicker paradigm of the present study combines three factors known to amplify alpha activity: homogeneous visual field (ganzfeld), flickering light at alpha frequencies, and eye closure.

(a) Ganzfeld, Alpha Enhancement & Visual Suppression

The perception of structureless light observed in this study corresponds closely with classical descriptions of ganzfeld-induced perceptual alterations. Since Metzger's original investigations, the experience of "luminous fog" or "sea of light" has been consistently documented as characteristic of ganzfeld states (Avant, 1965; Gibson & Waddell, 1952). Observers describe "swimming in a mist of light" when exposed to homogeneous visual fields, giving descriptions that emphasize fog, haze, cloud, whiteness, softness, density, and endlessness (Cohen, 1957, 1958; Wackermann, Pütz & Allefeld, 2008; Pistolas & Wagemans, 2025).

A second hallmark of ganzfeld experience is the progressive fading or temporary disappearance of visual perception. "Blank-out" phenomena - abrupt, transient cessations of visual experience - reflect central inhibitory processes that emerge after extended exposure (typically 10-20 minutes) and are accompanied by increased alpha activity in occipital EEG recordings, indicating cortical disengagement from perceptual processing (Cohen & Cadwallader, 1958; Pistolas & Wagemans, 2025). Studies on sensory deprivation further corroborate this pattern, showing marked alpha enhancement in environments with drastically reduced or unstructured sensory input (Miskovic et al., 2019; Glicksohn et al., 2019).

Critically, converging evidence suggests that alpha-mediated suppression represents an active gating mechanism rather than merely passive reduction of input. Toscani et al. (2010) demonstrated that alpha power in occipital cortex approximately doubles during visual suppression even when retinal stimulation is held constant, indicating central rather than peripheral mechanisms. Toscani et al. proposed that alpha waves, generated in both thalamus and visual cortex, may function analogously to sleep spindles by hyperpolarizing thalamo-cortical relay cells, thereby reducing their receptivity to incoming visual signals (Lopes da Silva, 1991).

(b) Eye Closure and Alpha Rebound

Since Berger's initial EEG studies, it has been known that alpha amplitude is much greater with eyes closed - almost double that with eyes open (Haddix et al., 2018). Typically, alpha blocking occurs upon eye opening, with reduction of alpha amplitude. However, Adrian & Matthews (1934) reported that when eyes are opened in darkness or in an unstructured visual field, alpha power returns to its high amplitude after a short delay of 20-30 seconds. Lehtonen & Lehtinen (1972) reported an average delay of 24 seconds before resynchronization of the alpha rhythm following opening the eyes onto an unstructured ganzfeld-like visual field.

The timing of peak brightness observed in the present study (40-60 seconds after opening eyes) corresponds well with this established literature on alpha rebound dynamics. The delay likely represents the time required for alpha oscillations to re-establish and reach sufficient amplitude to substantially suppress cortical visual processing.

(c) Eye Movements and Alpha Suppression

The finding that horizontal eye movements caused darkening rather than brightening provides converging evidence for the alpha hypothesis. Eye movements are known to suppress alpha band activity (Bullock et al., 2023). This darkening effect is consistent with the therapeutic mechanism of Eye Movement Desensitization and Reprocessing (EMDR), in which lateral eye movements reduce the vividness and emotional intensity of trauma-related imagery, thereby lessening their distressing impact.

Secondary Pathway Activation: The Retinotectal Route

By the cortical inhibition theory, alpha rebound on opening the eyes onto an unstructured visual field would be expected to lead to suppression of visual processing and dimming of perceived luminance. However, the present study, employing ganzflicker rather than ganzfeld alone, found perceptual brightening. This apparent paradox is resolved by considering the simultaneous activation of a secondary visual pathway.

The flicker component of the ganzflicker in this study delivers photic stimulation in the alpha frequency range. The superior colliculus, a midbrain structure involved in orienting and multisensory integration, has been shown to be highly responsive to these frequencies of flickering light in non-human primates. Neurones in the superior colliculus show entrainment to flickering light at 10-20 Hz (Chen & Hafed, 2018; Hafed et al., 2023). Critically, these responses persist even when cortical input is reduced or absent, indicating a subcortical sensitivity to flicker that operates independently of the primary visual cortex.

The superior colliculus projects not only to oculomotor and attentional systems but also to higher thalamic nuclei such as the pulvinar, which connect reciprocally with parietal and limbic regions implicated in salience and conscious awareness (Cappe et al., 2009). James Austin (1999) specifically proposes that mystical experiences of enveloping light arise when visual excitation relays through the superior colliculus to the pulvinar, spreading throughout the normally subliminal 'sense of place' to create the perception of boundless luminosity. It is therefore plausible that the perception of bright internal light during ganzflicker meditation arises from compensatory activation of this retinotectal circuit when cortical visual areas are inhibited by alpha synchronization.

It may be noted that the brightening of visual hallucination reported in the present study seems to be a specific ganzflicker effect. The author has been unable to elicit any comparable mystical-type luminosity phenomena following a period of eye closure with flicker stimulation alone (i.e. using LED glasses without the ganzfeld component), or when meditating at night in hypnagogic states and opening the eyes into darkness.

The phenomenological characteristics of the mystical-type luminosity experience provide considerable support for the involvement of the retinotectal pathway and superior colliculus. Many features of reported mystical light are precisely what would be expected from activation of this subcortical visual route rather than the primary cortical pathway. Through the ages mystics have struggled to describe in words the luminosity they experience. It is like ordinary physical light but also peculiarly different and ineffable.

The subcortical pathway does not detect colours - mystical luminosity is classically described as white or colourless, sometimes as silver or golden. The mapping of the subcortical pathway is diffuse and without detailed localisation - mystical luminosity is experienced as boundless and immersive. The retinotectal pathway connects directly into ancient primal emotional areas of the brain - the mystical light is profoundly affective. The retinotectal route and superior colliculus serve as a very rapid emergency warning system - mystical light compels attention. The sense of encountering something of profound and fundamental significance may reflect conscious connection to the evolutionarily ancient "primary consciousness" (Merker, 2007; Panksepp & Biven, 2012) or "core consciousness" (Damasio, 1999) of the midbrain which is present in all mammals and underpins cortical elaborations.

Integration: A Continuum of Brightness Effects

This dual-pathway model explains not only the brightening phenomenon but also the continuum of effects with increasing brightness intensity observed in the study. As alpha-mediated cortical suppression deepens, primary visual pathway processing becomes progressively inhibited. Simultaneously, the flicker-driven retinotectal activation becomes more salient in the absence of competing cortical visual signals. The subjective experience thus represents the balance between these two opposing pathways.

At lower levels of alpha power, cortical processing dominates and structural visual content remains discernible, with only modest apparent brightening (scores of 5-6/10) arising from the central focus where flicker stimulation is strongest. As alpha power increases and cortical suppression deepens, structural forms fade and become ghost-like (7/10), and eventually dissolve entirely into a luminous mist that fills the entire visual field (8/10). At these higher levels, the retinotectal activation - now unmasked by cortical suppression - is experienced as boundless bright light, described phenomenologically as "white-out" with qualities of immersion and boundlessness.

This progression mirrors Luthe's (1973) descriptions from autogenic therapy of three ascending levels: Bright Colour Phase (structural and chromatic components present), Bright Light Phase (greater luminosity with minimal structure), and Very Bright Light Phase (almost blinding "pure light" without structural features). It also aligns with the phenomenological sequence described in meditation traditions, where increased luminosity is associated with sustained attention and deepening states of absorption.

Evolution of the Inner Light

The functional significance of alpha oscillations has been fundamentally revised over the past two decades, moving from a view of alpha as merely an "idling rhythm" to understanding it as an active mechanism for shifting attention between external and internal domains. Cooper et al. (2003) provided seminal evidence that alpha power was suppressed by external visual stimulation but increases during internal cognitive processes such as mental imagery tasks. This model has been progressively developed further by subsequent research: Palva and Palva (2007) proposed that alpha rhythms facilitate internal processing by actively inhibiting task-irrelevant cortical areas, while Klimesch's influential "inhibition-timing hypothesis" (Klimesch et al., 2007; Klimesch, 2012) articulated how alpha oscillations control access to internally stored information while gating out interfering external inputs. Jensen & Mazaheri (2010) further demonstrated that increased alpha power implements dynamic inhibitory control over neural populations, particularly during states requiring disengagement from external stimulation.

An evolutionary model has been proposed by Shibata et al. (2024) to explain the association of the alpha rhythm with the shift from external to internal processing. Shibata and colleagues argue that alpha rhythms evolved during the dinosaur era as mammalian ancestors adopted nocturnal lifestyles, enabling the shift of attention from external visual inputs to the internal cognitive processes of memory and imagination essential for survival in darkness. We propose extending the Shibata et al. model so as to also explain why successful meditation is characterized specifically by enhanced luminosity:- When mammals shifted processing from external to internal visual representation during nocturnal wakefulness, *brightness became a primary encoding mechanism for salience in the internal imagery generated during these states*.

This hypothesis aligns with Panksepp's framework of basic emotional operating systems, particularly the SEEKING system - the appetitive motivational circuit that energizes exploration and goal-directed behavior (Panksepp & Biven, 2012). In nocturnal mammals, when external visual input was minimized during dark conditions and alpha-mediated cortical suppression enhanced internal processing, the SEEKING system's objects of motivation - food sources, potential mates, safe refuges - may have been encoded through enhanced brightness in internally generated imagery. Images representing evolutionarily significant goals would be rendered more luminous, making them more salient and compelling, thereby more effectively directing attention and behavior toward survival-relevant targets. The superior colliculus, with its well-established role in orienting toward salient stimuli (Hafed et al., 2023), would be ideally positioned to translate motivational significance into luminosity through its retinotectal projections.

The model proposed here would explain why, when ganzflicker meditation produces simultaneous cortical suppression and subcortical activation, the resulting conscious experience is characterized by enhanced luminosity accompanied by compelled attention, and profound stillness of mind and body. The experience may represent direct conscious access to the ancient brightness-encoded salience signals of the mammalian SEEKING system - usually operating below conscious awareness but now unmasked by cortical suppression. The awe and sense of profound stillness and relaxation accompanying high-intensity luminosity experiences would thus reflect not merely the *activation* of the fundamental motivational circuitry that has driven mammalian goal-directed behaviour for millions of years, but represents the actual *accomplishment* of the motivational circuitry's instinctive goals. The bright light experience is the end of SEEKING. Immersed in bright light the midbrain need seek no further. That these experiences consistently produce lasting improvements in mood, energy, and outlook (Luthe, 1973) suggests they may activate the same reward mechanisms that originally evolved to reinforce successful foraging and reproductive behaviour in our nocturnal ancestors. The model may also imply that vernacular expressions such as "'lightbulb moment" and "light at the end of the tunnel" may have more than just metaphorical meaning.

Therapeutic Implications

The unexpected finding of this study was that mystical luminosity can be induced by using a specific technique, i.e. occultation between eyes-open and eyes-closed conditions, with a specific technology, i.e. ganzflicker. The finding that simple eye closure produces reliable brightening suggests that ganzflicker occultation - meditating on a flicker screen alternately with eyes open and eyes closed - could serve as an easily accessible method for promoting emotional well-being. This approach finds parallel support in traditional Buddhist meditation practices. Schoenberg et al. (2018) examined advanced practitioners of Indo-Tibetan essence-of-mind meditation, a technique that specifically alternates between eyes-open and eyes-closed conditions in order to cultivate experiences of luminosity and awakened awareness. Their study found significant alpha-band modulation associated with these luminosity-linked states, consistent with the alpha rebound mechanism proposed here. Like psychedelic-induced mystical experiences, the awe evoked by ganzflicker-induced bright light appears to possess inherent therapeutic capacity to liberate the mind from negative feeling states. The post-session effects reported in this study - notable positive effects on mood state and general lightening of being - align with Luthe's (1973) observations that Very Bright Light Phase experiences are accompanied by intense positive affect and lasting improvements in energy, initiative, and outlook.

The remarkable synergistic potentiation of psychedelic drugs by stroboscopic light, noted historically by Huxley (1956) and systematically investigated by early researchers (Peretz, Smythies & Gibson, 1955; Grof, 2019), remains clinically underused. Ganzflicker augmentation may enable full visionary and therapeutic peak experiences to be induced by sub-perceptual doses of psychedelic drugs.

The controllability of ganzflicker - its effects can be switched on and off at will, with brightness and duration fully adjustable in real time - makes psychedelic-assisted psychotherapy safer and more convenient, and enables progressive dose reduction of the drug over time. Once kindled, therapeutic peak experiences can continue to be self-induced by ganzflicker meditation alone on a long-term basis. The therapeutic induction of regular peak experiences by psychedelic drugs alone is time-consuming, inconvenient, and problematic; however, once established, daily experiences of mystical luminosity can be readily achieved with ganzflicker for the remainder of a lifetime, potentially accruing sustained mental and physical health benefits.

Limitations and Future Directions

This investigation has significant methodological limitations. The single-subject design, unequal sample sizes across conditions, lack of objective brightness measures, and potential bias toward the eye-closure condition mean that findings can only be considered preliminary and anecdotal. The author's failure to adhere to the original experimental protocol reflects the inherent difficulties of self-experimentation under the influence of a psychedelic agent.

However, it is worth noting that psychedelic research has been built significantly on self-experimentation, representing an important methodological tradition at the very foundations of psychedelic science. The pioneering contributions of Albert Hofmann, Alexander Shulgin, Stanislav Grof, and John Lilly, among others, were made possible precisely because they engaged in direct, disciplined, and phenomenologically informed self-experimentation. Their work, though often based on N=1 designs, led to profound insights that have proven not only reproducible but transformative for the field. Self-experimentation, in solitude and integrated into the regular rhythms and routines of the home environment, provides unique access to subjective phenomenology and can generate hypotheses that might not otherwise emerge. In the present case, the confirmation that simple eye closure produces more reliable brightening than therapeutic interventions came about because the author broke from the original protocol to explore unexpected subjective effects.

Future research needs to systematically investigate:
1. The relationship between occipital alpha power and subjectively reported brightness during ganzflicker meditation, using concurrent EEG recording and standard questionnaires for altered states of consciousness and mystical experience;
2. Whether superior colliculus activation can be detected via fMRI during bright light experiences;
3. Individual differences in alpha power and their correlation with capacity to experience bright light phenomena;
4. The optimal parameters for ganzflicker occultation (duration of eye closure, flicker frequency, colour wavelength) to maximize therapeutic effects.

Conclusion

This study proposes that mystical bright light experiences during ganzflicker meditation arise from a specific neurophysiological configuration: simultaneous alpha-mediated suppression of the primary visual cortical pathway and flicker-induced activation of the secondary retinotectal pathway via the superior colliculus. This dual-pathway model accounts parsimoniously for the continuum of brightness effects observed, the temporal dynamics of the phenomena, and the characteristic cognitive and affective qualities that make such experiences therapeutically meaningful. While preliminary and based on self-experimentation, these findings suggest testable hypotheses and point toward accessible, non-pharmacological methods for inducing therapeutically beneficial mystical-type experiences.

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Declaration

Ethics Statement: This study was a self-experimentation project conducted solely by the author, who is a retired medical professional. No external participants undertook the experimental procedures. The procedures did not involve physical risk. No ethical approval was sought, as per institutional norms for self-experimentation.

AI Assistance Statement: This manuscript was written with assistance from Claude (Anthropic) for literature review, prose refinement, and structural organization. All experimental work, data analysis, scientific interpretation, and theoretical contributions are solely the author's.

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