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Mathematical Aspects of Colour Neurobics

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Abstract - Alternative medicine is a fast-growing sector in medicinal world. Colour therapy has its own importance and successfully used by many healing experts. Colour neurobics is the one of the healing methods using various combination of colours to cure ailments in patients. It has a vast history and scientific background. Research in colour science and its role to cure diseases is being done by many researchers.

This therapy is studied with medicinal approach. This study is a step towards elaborative form of the mathematical aspect.

Key Words*: *Mathematical aspects, Colour neurobics.

I. INTRODUCTION

In science, colours are considered as the manifestation of cosmic powers which are responsible for life. The colours act generators of energy in each biological body. The sun is an unending source of energy for the creatures of the earth. The sunlight has a pivotal role in our diet. All our food items have colours in them. Scientifically, light, an electromagnetic energy, can pass through transparent objects & empty space and do not require any medium to transmit from one place to another.

II. LITERATURE REVIEW

[1] Reena Tyagi-et-al in their research found that color therapy when integrated with traditional medical practices can contribute to a holistic sense of wellness and vitality. [2] Gupta R. reviewed the role of different colors as well as their properties relating to sustain the mental health and wellbeing. [3] Husaina N-et-al studied that modern medicines and therapy use the application of colours to help in healing. [4] Jill Strawn, the holistic nursing practitioner, studied and found that all the colors represent energy of light waves in the motion i.e. vibrating at distinct even with measurable rates. [5] After the study on youth group aged 15 to 25 years, Kriticka Acharjee proposed the role of colors and colored lighting to improve physical or mental health of a person and explored the interaction between human body & colors. The research clarified that in the field of psychology using colour therapy and its advancement one can raise awareness among today's youth. [6] Shahid, Sukhbir K. in his review paper studied role of colour therapy as trials on children comparing with the studies done on adults recommending it as complementary therapy on large and larger scale. [7] Khwaja S in his book "Colour Therapy" mentioned detailed basics and application of colour therapy to cure diseases. [8] Mr. Santosh Kumar J in his study considered colour therapy also called chromotherapy as healing method to balance energies in the chakras' as emotional, spiritual and physical and mental well-being of a person. [9] Lawrence C. Katz in his book "Keep Your Brain Alive" has given wide perspective of role of neurobics to live healthy life. [10] The physics of colour is explained in detail in this chapter.

All these researches direct the usefulness of colours in healing the illness of unhealthy persons.

III. MATHEMATICAL ASPECTS OF COLOURS AS HEALING TOOLS

A] Aspect1:

The following are the four physical processes in nature by which colour is ordinarily produced.

1) **Emission**: Sufficiently hot objects radiate energy in visible wavelengths. The best example is our Sun whose surface is approximately 5600 K and emits radiation with a peak around 560 nm.
2) **Absorption**. Most objects selectively absorb (or scatter) light incident on them. For example, a leaf appears green because it absorbs red and blue wavelengths and scatters green from the sunlight incident on it.
3) **Transmission** where a surface is transparent to certain wavelengths while it blocks others.
4) **Dispersion** in which different wavelength components travel at different velocities (phase

velocities to be precise) through a medium. Such differences in combination with other optical phenomena, typically refraction, lead to separation of the incident light into its component wavelengths (and, therefore, colours).

Colour by Emission:

Energy falling on the eye is almost always a combination of several wavelengths. That is, energy is distributed among different wavelengths and may be expressed as a function.

$$E = S(\lambda) \quad (1)$$

where E = energy

$S(\lambda)$ = Spectral Power Distribution Function (SPDF)

λ = wavelength

Spectral Power Distribution Function (SPDF) is a function depends on the temperature and heat-transfer characteristics and defined as:

$$S(\lambda) = f(\alpha, \rho, \tau) \quad (2)$$

such that

$$\alpha + \rho + \tau = 1 \quad (3)$$

where α = spectral absorption component

ρ = spectral reflection component

τ = spectral transmission component

$\alpha = 1$ indicates a black body with no reflection and transmission.

Colour by Absorption:

Most opaque objects in nature get their colour by selectively absorbing certain wavelengths in the incident light and scattering the rest.

An object P is irradiated by a light source having an SPDF given by $S_i(\lambda)$.

P selectively absorbs and scatters the incident spectrum such that a new spectrum $S_r(\lambda)$is produced.

This is the radiated energy from P. $S_r(\lambda)$is a complex function of $S_i(\lambda)$ depending on the nature of the constituent material, geometry and direction of viewing as well as incidence.

The total energy of the source

$$E_i(\theta_i, \phi_i, \lambda_i) = \int_0^\infty S_i(\lambda)\, d\lambda \quad (4)$$

where θ stands for the altitude and ϕ is azimuth characterizing the specific direction in 3-D

and

$$L(\theta_r, \phi_r, \lambda_r) = \int_0^\infty S_r(\lambda)\, d\lambda \quad (5)$$

The total energy of the source scattered in the direction (θ_r, ϕ_r) of an observer i.e. Colour Absorption equation is given by

$$L(\theta_r, \phi_r, \lambda_r) = \rho B(\theta_i, \phi_i; \theta_r, \phi_r; \lambda) Ei(\theta_i, \phi_i, \lambda_i) \quad (6)$$

where ρ is the albedo or the reflection coefficient and

B is known as the Bidirectional Reflectance Distribution Function (BRDF).

BRDF is so-called because it shows the effect of the two directions–incident and viewing–on the appearance of the object.

$$B(\theta_i, \phi_i; \theta_r, \phi_r; \lambda) = \frac{L(\theta_r, \phi_r, \lambda_r)}{Ei(\theta_i, \phi_i, \lambda_i)} \quad (7)$$

Colour by Transmission:

Colour by transmission is a special case of colour by absorption.

The role played by albedo ρ is played by transmission coefficient τ.

Most materials transmit different wavelengths differently and the transmission function may be modelled as $\tau(\lambda)$. Thus, the **colour by transmission equation** is analogous to the colour absorption equation (6) with $\rho(\lambda)$ replaced by $\tau(\lambda)$.

$$S_r(\lambda) = \tau(\lambda) S_i(\lambda) \quad (8)$$

B| Aspect2:

The energy of a photon is calculated using the formula

$$E = \frac{hc}{\lambda} \quad (9)$$

or $$E = h\nu$$

Where h = Planck's constant = 6.626×10^{-34} J.s

c = wave speed = 3.0×10^8 m/s

λ = wavelength

ν = frequency

The frequency and wavelength are interrelated by

$$c = f\lambda \quad (10)$$

Where f = frequency

λ = wavelength and

c = wave speed.

In this study, we use the **colour equation for energy in each chakra (Gland) after colour therapy**

$$E_{Gx} = E_G + E_x(f_x, \lambda_x) \quad (11)$$

Where x represents the colour.

E_G = initial energy of the gland (chakra) and

$E_x(f_x, \lambda_x)$ = energy after colour of certain frequency with specific wavelength.

1) **Muladhar/ Root Chakra**

Colour: Red (λ = 620–700 nm)

Location: Located at base of the spine, between the anus and genitals.

Associated with: the gonads (ovaries/testicles)

Colour equation for energy in Root chakra after Red colour energy

$$E_{RR} = E_R + E_R(f_R, \lambda_R) \quad (11.1A)$$

Where E_{RR} = energy of the **Root chakra**

E_R = initial energy of the **Root chakra**

$E_R(f_R, \lambda_R)$ = energy from **red colour** of related frequency with specific wavelength.

The energy of a photon for red colour is calculated from (9):

$$E = \frac{(6.626 \times 10^{-34})(3.0 \times 10^{8})}{620 \times 10^{-9}} \approx 3.20 \times 10^{-19}\text{Joules} \approx 2.00\ eV$$

$$E = \frac{(6.626 \times 10^{-34})(3.0 \times 10^{8})}{700 \times 10^{-9}} \approx 2.84 \times 10^{-19}\text{Joules} \approx 1.77\ eV$$

Thus $2.84 \times 10^{-19}\text{J} \leq E_R(f_R, \lambda_R) < 3.20 \times 10^{-19}\text{J}$ (11.1B)

$$1.77\ eV < E_R(f_R, \lambda_R) < 2.00\ eV$$

2) **Swadhisthan/ Sacral Chakra**

Colour: Orange (λ = 590–620 nm)

Location: Located in the lower abdomen, below the navel, or at the root of the sexual organs.

Associated with: the adrenals or ovaries/testicles.

Colour equation for energy in Sacral chakra after Orange colour energy

$$E_{SO} = E_S + E_O(f_O, \lambda_O) \quad (11.2A)$$

Where E_{SO} = energy of the **Sacral chakra**.

E_S = initial energy of the **Sacral chakra**

$E_O(f_O, \lambda_O)$ = energy from **orange colour** of related frequency with specific wavelength.

The energy of a photon for orange colour is calculated from (9):

$$E = \frac{(6.626 \times 10^{-34})(3.0 \times 10^{8})}{590 \times 10^{-9}} \approx 3.37 \times 10^{-19}\text{Joules}$$

$$E = \frac{(6.626 \times 10^{-34})(3.0 \times 10^{8})}{620 \times 10^{-9}} \approx 3.20 \times 10^{-19}\text{Joules}$$

Thus $3.20 \times 10^{-19}\text{J} < E_O(f_O, \lambda_O) < 3.37 \times 10^{-19}\text{J}$ (11.2B)

3) **Manipur/ Solar Plexus Chakra**

Colour: Yellow (λ = 570–590 nm)

Location: Located in the upper abdomen, above the navel in the solar plexus area.

Associated with: the pancreas, adrenals, and spleen.

Colour equation for energy in Solar Plexus chakra after Yellow colour energy

$$E_{SPY} = E_{SP} + E_Y(f_Y, \lambda_Y) \quad (11.3A)$$

Where E_{SPY} = energy of the **Solar Plexus chakra**

E_{SP} = initial energy of the **Solar Plexus chakra**

$E_Y(f_Y, \lambda_Y)$ = energy from **yellow colour** of related frequency with specific wavelength.

The energy of a photon for yellow colour is calculated from (9):

$$E = \frac{(6.626 \times 10^{-34})(3.0 \times 10^{8})}{570 \times 10^{-9}} \approx 3.49 \times 10^{-19}\text{Joules}$$

$$E = \frac{(6.626 \times 10^{-34})(3.0 \times 10^{8})}{590 \times 10^{-9}} \approx 3.37 \times 10^{-19}\text{Joules}$$

Thus $3.37 \times 10^{-19}\text{J} < E_Y(f_Y, \lambda_Y) < 3.49 \times 10^{-19}\text{J}$ (11.3B)

4) **Anahat/ Heart Chakra**

Colour: Green (λ = 500–570 nm)

Location: Located in the center of the chest, near the heart.

Associated with: the thymus gland

Colour equation for energy in Heart chakra after Green colour energy

$$E_{HG} = E_H + E_G(f_G, \lambda_G) \quad (11.4A)$$

Where E_{HG} = energy of the **Heart chakra**

E_H = initial energy of the **Heart chakra**

$E_G(f_G, \lambda_G)$ = energy from **green colour** of related frequency with specific wavelength.

The energy of a photon for green colour is calculated from (9):

$$E = \frac{(6.626 \times 10^{-34})(3.0 \times 10^{8})}{500 \times 10^{-9}} \approx 3.97 \times 10^{-19}\text{Joules}$$

$$E = \frac{(6.626 \times 10^{-34})(3.0 \times 10^{8})}{570 \times 10^{-9}} \approx 3.49 \times 10^{-19}\text{Joules}$$

Thus $3.49 \times 10^{-19}\text{J} < E_G(f_G, \lambda_G) < 3.97 \times 10^{-19}\text{J}$ (11.4B)

5) **Vishuddhi/ Throat Chakra**

Colour: Sky Blue (λ = 485–500 nm)

Location: Located at the throat or base of the neck.

Associated with: the thyroid and parathyroid glands

Colour equation for energy in Throat chakra after Sky Blue colour energy

$$E_{TB} = E_T + E_B(f_B, \lambda_B) \quad (11.5A)$$

Where E_{TB} = energy of the **Throat chakra**

E_T = initial energy of the **Throat chakra**

$E_B(f_B, \lambda_B)$ = energy from **sky blue colour** of related frequency with specific wavelength.

The energy of a photon for sky blue colour is calculated from (9):

$$E = \frac{(6.626 \times 10^{-34})(3.0 \times 10^{8})}{485 \times 10^{-9}} \approx 4.10 \times 10^{-19}\text{Joules}$$

$$E = \frac{(6.626 \times 10^{-34})(3.0 \times 10^{8})}{500 \times 10^{-9}} \approx 3.97 \times 10^{-19}\text{Joules}$$

Thus $3.97 \times 10^{-19}\text{J} < E_B(f_B, \lambda_B) < 4.10 \times 10^{-19}\text{J}$ (11.5B)

6) **Agnya/ Third Eye Chakra**

Colour: Indigo (λ = 450–485 nm)

Location: Located in the brain, between the eyebrows

Associated with: the pituitary and pineal glands

Colour equation for energy in Third Eye chakra after Sky Blue colour energy

$$E_{TEI} = E_{TE} + E_I(f_I, \lambda_I) \quad (11.6A)$$

Where E_{TEI} = energy of the **Third Eye chakra**

E_{TE} = initial energy of the **Third Eye chakra**

$E_I(f_I, \lambda_I)$ = energy from **Indigo colour** of related frequency with specific wavelength.

The energy of a photon for indigo colour is calculated from (9):

$$E = \frac{(6.626 \times 10^{-34})(3.0 \times 10^{8})}{450 \times 10^{-9}} \approx 4.42 \times 10^{-19}\text{Joules}$$

$$E = \frac{(6.626 \times 10^{-34})(3.0 \times 10^{8})}{485 \times 10^{-9}} \approx 4.10 \times 10^{-19}\text{Joules}$$

Thus $4.10 \times 10^{-19}\text{J} < E_I(f_I, \lambda_I) < 4.42 \times 10^{-19}\text{J}$ (11.6B)

7) **Sahastrar/ Crown Chakra**

Colour: Violet (λ = 380–450 nm)

Location: Located at the top of the head.

Associated with: the pineal gland (sometimes pituitary).

Colour equation for energy in Crown chakra after Violet colour energy

$$E_{CV} = E_C + E_V(f_V, \lambda_V) \quad (11.7A)$$

Where E_{CV} = energy of the **Crown chakra**

E_C = initial energy of the **Crown chakra**

$E_V(f_V, \lambda_V)$ = energy from **violet colour** of related frequency with specific wavelength.

The energy of a photon for violet colour is calculated from (9):

$$E = \frac{(6.626 \times 10^{-34})(3.0 \times 10^{8})}{380 \times 10^{-9}} \approx 5.23 \times 10^{-19}\text{Joules}$$

$$E = \frac{(6.626 \times 10^{-34})(3.0 \times 10^{8})}{450 \times 10^{-9}} \approx 4.42 \times 10^{-19}\text{Joules}$$

Thus $4.42 \times 10^{-19}\text{J} < E_V(f_V, \lambda_V) < 5.23 \times 10^{-19}\text{J}$ (11.7B)

IV. CONCLUSIONS

1) Diseases are the after effects of loss or excess of energies.
2) This difference can be removed by various known or unknown medicinal methods.
3) Alternative medicine is a method which does not harm the body organs.
4) Psychoneurobics is one of them.
5) This study succeeded to apply mathematical concepts to the colour therapy.
6) Equations (11) are the results of this study.

Limitation of the research:

1) As per the research title, the study covers only the mathematical aspects related to use of colour in psychoneurobics.
2) Only few equations and their relation with colours.
3) Only Psychoneurobics is covered in this study.

Future scope:

1) Such more equations can also be framed for getting the energies of elements, as per the need of the research.
2) More study can be done in the field of various alternative medicines so as to be accepted worldwide.

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