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(54) **NEUROCHROMATIC TRIAL LENS KIT**

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(57) **ABSTRACT**

(21) **Appl. No.: 13/434,676**

A trial lens kit for determining a neurochromatic lens prescription for the eye. The trial lens kit includes a first plurality of trial lenses wherein each of the first plurality of trial lenses is operable to filter a particular wavelength of light. The first plurality of trial lenses corresponds to a first type of visual function improvement. The trial lens kit further comprises a second plurality of trial lenses where each of the second plurality of trial lenses is operable to filter a particular wavelength of light. The second plurality of trial lenses corresponds to a second type of visual function improvement. The first plurality of trial lenses and the second plurality of trial lenses are operable for determining a neurochromatic prescription.

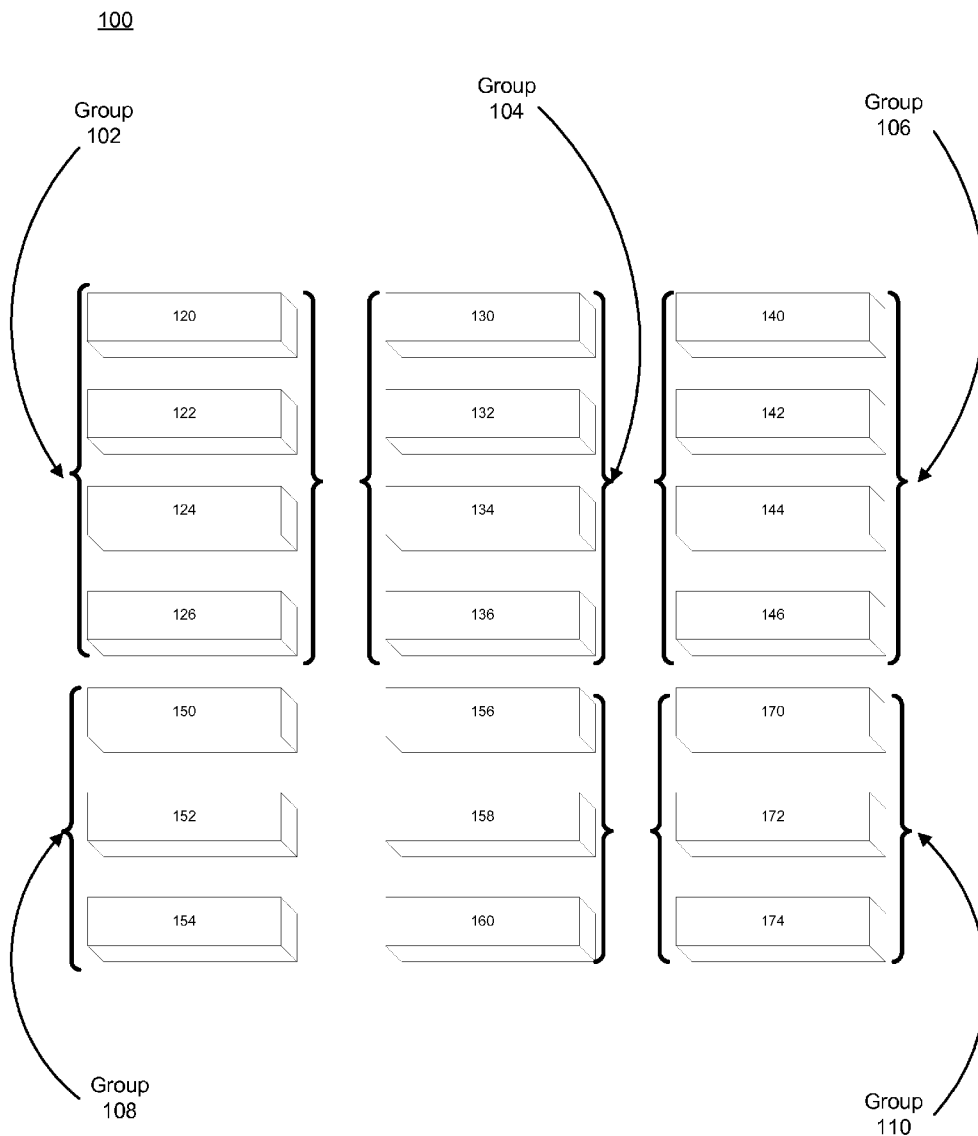
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Related U.S. Application Data

(60) **Provisional application No. 61/470,417, filed on Mar. 31, 2011.**

Publication Classification

(51) **Int. Cl. A61B 3/06 (2006.01)**



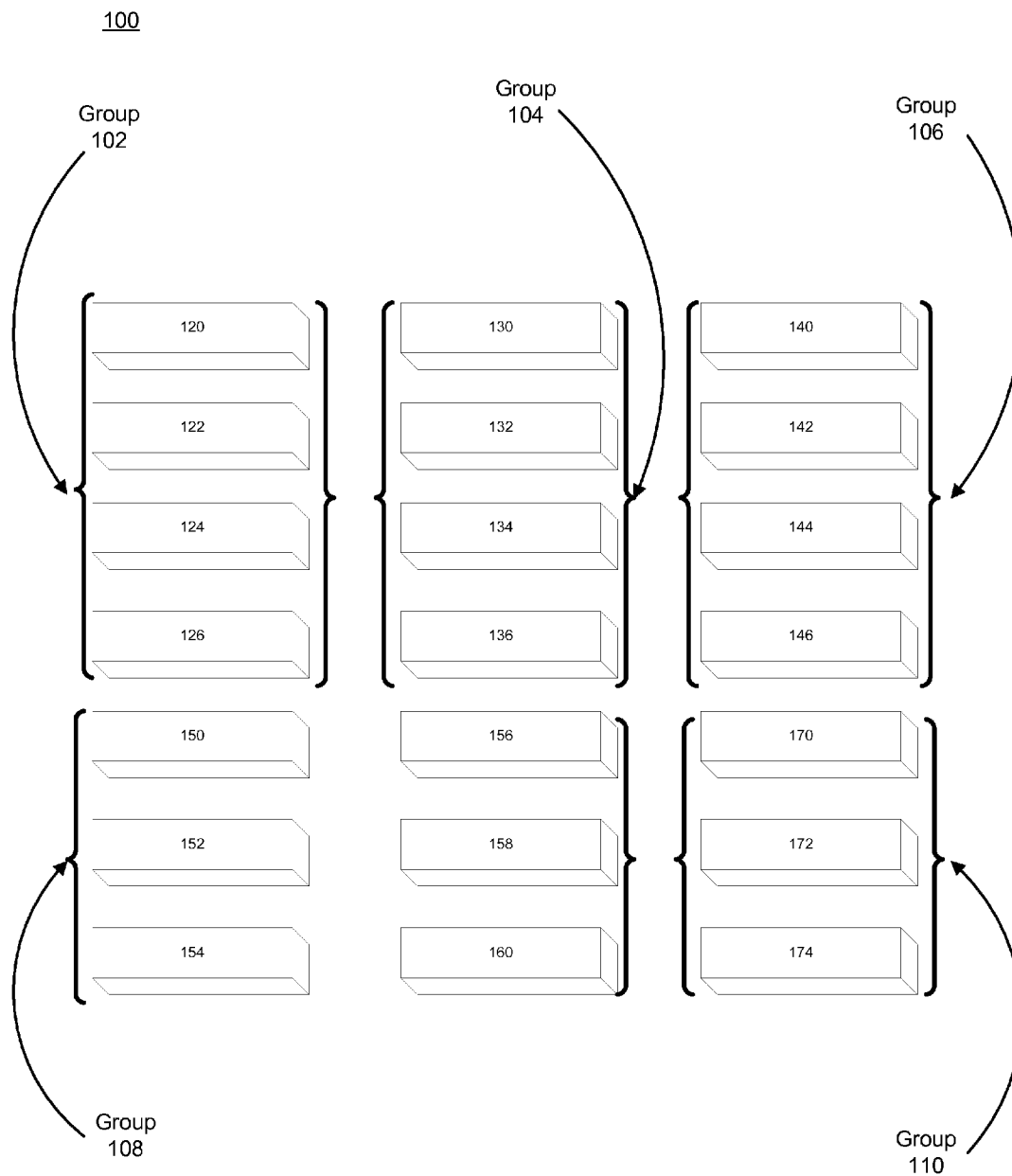


FIG. 1

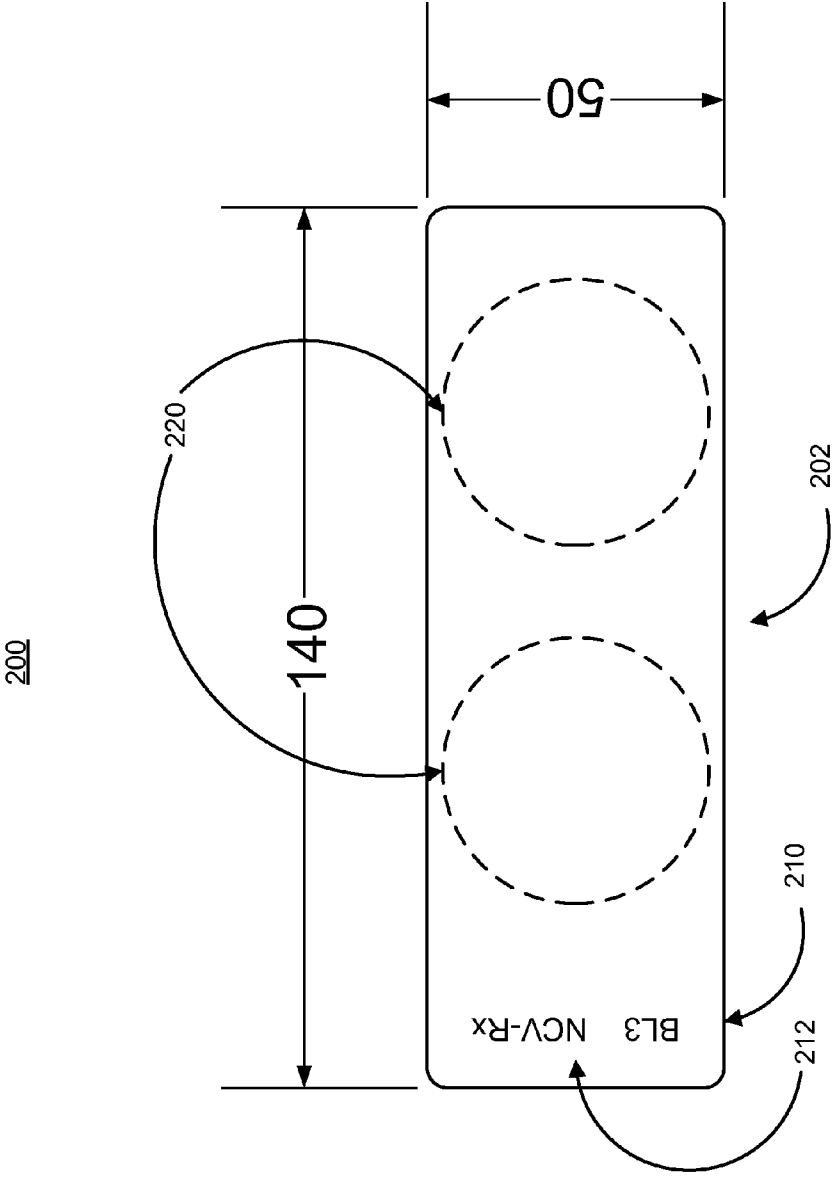


FIG. 2

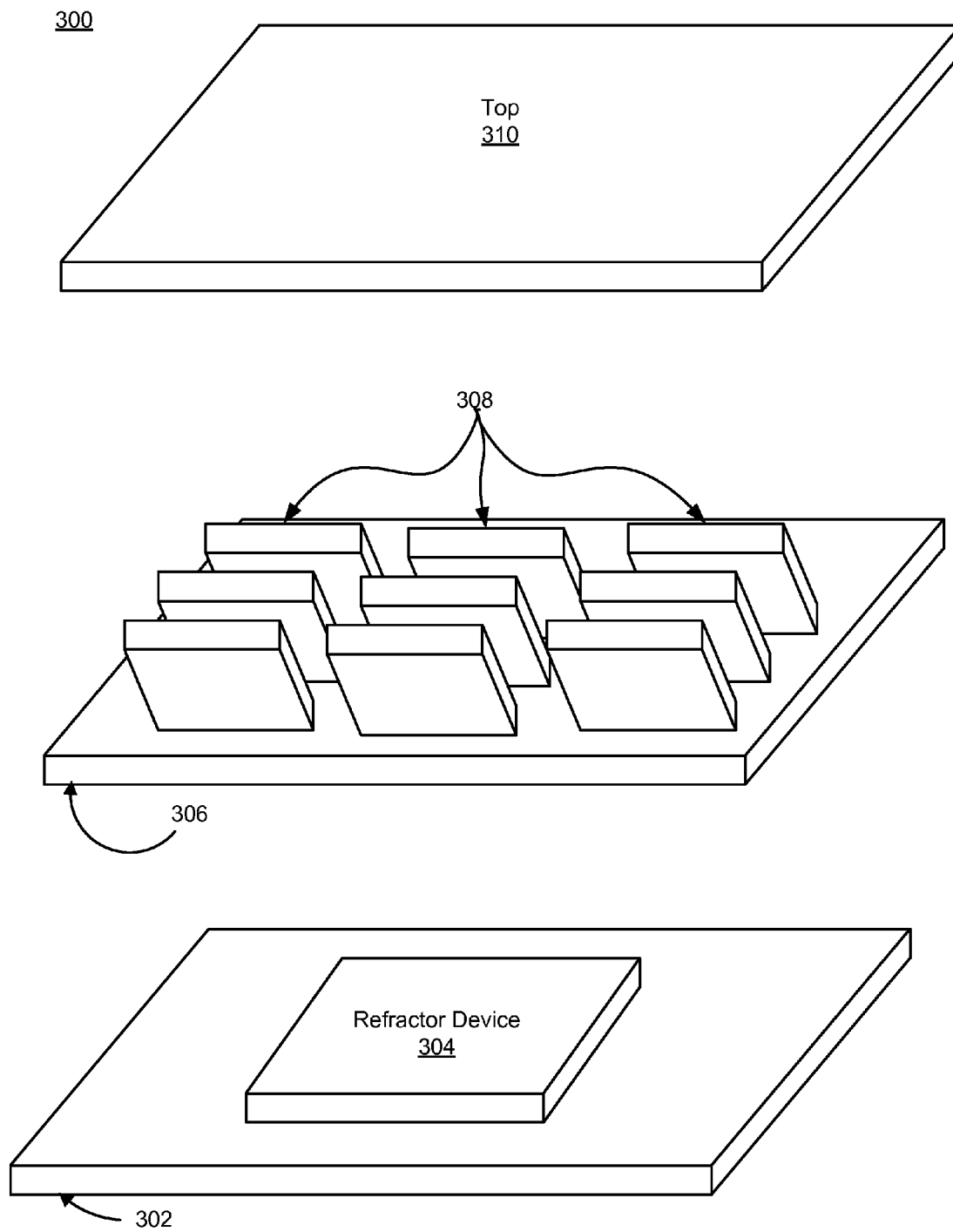


FIG. 3

NEUROCHROMATIC TRIAL LENS KIT

RELATED U.S. APPLICATIONS

[0001] This application claims the benefit of and priority to the copending provisional patent application Ser. No. 61/470, 417, Attorney Docket Number NCVS-0001.A, entitled "SYSTEMS AND METHODS FOR CHROMATIC VISION ENHANCEMENT," with filing date Mar. 31, 2011, and hereby incorporated by reference in its entirety.

[0002] This application is related to copending non-provisional patent application, Serial Number 13/368,149, Attorney Docket Number NCVS-0001.US1, entitled "NEUROCHROMATIC PRESCRIPTION DETERMINATION," with filing date 2/7/12, and hereby incorporated by reference in its entirety.

[0003] This application is related to copending non-provisional patent application Ser. No. _____, Attorney Docket Number NCVS-0001.US3, entitled "NEUROCHROMATIC REFRACTOR," with filing date _____, and hereby incorporated by reference in its entirety.

[0004] This application is related to copending non-provisional patent application Ser. No. _____, Attorney Docket Number NCVS-0001.US4, entitled "NEUROCHROMATIC PRESCRIPTION DETERMINATION," with filing date _____, and hereby incorporated by reference in its entirety.

FIELD OF THE INVENTION

[0005] Embodiments of the present invention are generally related to vision enhancement, e.g., with the application of specialized and custom lenses for the eyes.

BACKGROUND OF THE INVENTION

[0006] Vision is one of the most important senses. People are in particular heavily visual in nature, often favoring visual perception over other senses. Further, humans constantly use their eyes in almost every task whether it be for reading, walking, or driving. This reliance on the visual system as the primary sense for interacting with the world makes the human eye incredibly important and thereby meaning any deficiency in visual performance can have a large negative impact on health and perception.

[0007] The eye and the visual processing system are quite complex and as such can be negatively impacted by a variety of conditions, syndromes, and complications. Such problems can result in photophobia, reduced field of vision, clarity of vision, and other visual compromises. While ophthalmic prescriptions are somewhat effective in reducing the negative effects of near-sightedness and far-sightedness, ophthalmic prescriptions and lenses are not able to solve or reduce a variety of conditions, syndromes, and complications. For example, ophthalmic lenses have limited effect on photophobia or reduced field of vision. Regular eye glasses mostly correct for image clarity and focus but do little to correct for other visual performance and acuity issues.

[0008] Thus, a need exists for a solution to alleviate visual system problems that are not solved or fully solved with current ophthalmic prescriptions and lenses.

SUMMARY OF THE INVENTION

[0009] Embodiments of the present invention are operable for use in determining a neurochromatic prescription to medically and therapeutically treat or enhance the performance of the human visual experience by physician prescribed neuro-

chromatic lenses. Embodiments of the present invention include a plurality of trial lenses for determining effective treatment for the enhancement of vision and therapeutic treatment for a variety of neurovisual processing symptoms, anomalies, conditions, and syndromes.

[0010] Embodiments of the present invention are operable to improve a variety of various visual performance and visual function characteristics including improved visual acuity (e.g., more clear and enhanced visual perception of distant objects), improved visual field, enhanced visual saccade (e.g., eye movement across a page), increased contrast sensitivity, and increased recognition of color hues. Embodiments of the present invention are further operable to improve visual performance and visual function characteristics including increased eye coordination, increased pupil stabilization (e.g., stabilization of pupil shape to round), improved visual invoked response time (e.g., vision to action time), and improved blood flow in the brain which results in enhancement to cognitive response to visual cues. Embodiments of the present invention may include such Neurochromatic™ lenses or trial lenses available from NeuChroma Vision, Incorporated of Redding, Calif.

[0011] In one embodiment, the present invention is a trial lens kit operable to be used by a technician or medical agent for determining a neurochromatic lens prescription for the eye. The trial lens kit includes a first plurality of trial lenses wherein each of the first plurality of trial lenses is operable to filter a particular wavelength of light. The first plurality of trial lenses corresponds to a first type of visual function improvement. The first plurality of trial lenses may comprise an ordered arrangement of colored trial lenses (e.g., made of tinted plastic). The trial lens kit further comprises a second plurality of trial lenses where each of the second plurality of trial lenses is operable to filter a particular wavelength of light. The second plurality of trial lenses may be in an ordered arrangement and corresponds to a second type of visual function improvement. In one embodiment, the second plurality of lenses may comprise infrared (IR) trial lenses operable to filter IR wavelengths. The first plurality of trial lenses and the second plurality of trial lenses are operable to be combined for determining a neurochromatic prescription as a result of visual sampling with the patient. The first type of visual function improvement and the second type of visual function improvement may be related to a first pupillary anomaly and a second pupillary anomaly respectively. The trial lens kit may further comprise a third plurality of trial lenses where each of the third plurality of trial lenses may be in an ordered arrangement and is operable to filter ultraviolet (UV) light. The third plurality of trial lenses may correspond to a third type of visual function improvement and may be combined with other selected lenses.

[0012] In one embodiment, the present invention is an apparatus for determination of a chromatic prescription. The apparatus comprises a first trial lens operable to filter a first portion of the electromagnetic spectrum and corresponding to a first type of visual function improvement related to a first pupillary anomaly. The apparatus further includes a second trial lens operable to filter a second portion of the electromagnetic spectrum and corresponding to a second type of visual function improvement related to a second pupillary anomaly. The first trial lens and the second trial lens are operable in combination to correspond to a third visual function improvement. In one embodiment, the first trial lens may correspond to a first tint of a color and the second trial lens corresponds to

a second tint of the color. The color may be selected from the group consisting of red, orange, yellow, green, blue, indigo, and violet. The first trial lens and the second trial lens may be tinted via a dyeing process. In one embodiment, the first trial lens corresponds to a first ultraviolet (UV) wavelength and the second trial lens corresponds to a second ultraviolet wavelength. In another embodiment, the first trial lens corresponds to a first infrared (IR) wavelength and the second trial lens corresponds to a second infrared wavelength. The first trial lens and second trial lens may be made of plastic and made substantially accordingly to ophthalmic standards.

[0013] In another embodiment, the present invention is as a lens kit. The lens kit includes a plurality of color trial lenses corresponding to a first visual function improvement and a plurality of ultraviolet (UV) trial lenses corresponding to a second visual function improvement. The plurality of color trial lenses may be made of tinted plastic (e.g., tinted using a dyeing process). The lens kit further includes a plurality of infrared (IR) trial lenses corresponding to a third visual function improvement. The plurality of color trial lenses, the plurality of UV trial lenses, and the plurality of IR trial lenses are operable for determination of a chromatic prescription. The first visual function improvement and the second visual function improvement may be related to a first pupillary anomaly and a second pupillary anomaly respectively. In one embodiment, the lens kit further comprises a plurality of neutral density trial lenses corresponding to a fourth visual function improvement. In another embodiment, the lens kit comprises a plurality of plated lenses corresponding to a fifth visual function improvement.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The present invention is illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings and in which like reference numerals refer to similar elements.

[0015] FIG. 1 shows a block diagram of an exemplary trial lens kit in accordance with an embodiment of the present invention.

[0016] FIG. 2 shows a block diagram of an exemplary trial lens in accordance with an embodiment of the present invention.

[0017] FIG. 3 shows a block diagram of an exemplary case in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0018] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. While the invention will be described in conjunction with the preferred embodiments, it will be understood that they are not intended to limit the invention to these embodiments. On the contrary, the invention is intended to cover alternatives, modifications and equivalents, which may be included within the spirit and scope of the invention as defined by the appended claims. Furthermore, in the following detailed description of embodiments of the present invention, numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be recognized by one of ordinary skill in the art that the present invention may be practiced without these specific details. In other instances,

well-known methods, procedures, components, and circuits have not been described in detail as not to unnecessarily obscure aspects of the embodiments of the present invention.

Exemplary Neurochromatic Trial Lens Kit

[0019] FIG. 1 shows a block diagram of an exemplary trial lens kit in accordance with an embodiment of the present invention. Exemplary trial lens kit 100 includes trial lenses 120-174. FIG. 1 depicts an exemplary grouping or ordered arrangement according to characteristics of each lens of trial lens kit 100. Each trial lens of trial lens kit 100 may filter a specific frequency or wavelength or portion of the electromagnetic spectrum or electromagnetic radiation (e.g., visible light, infrared, ultraviolet, etc.). Each trial lens of trial lens kit may be related to a visual function improvement of a particular pathology or pupillary anomaly. In one embodiment, trial lens kit 100 includes 100 lenses. It is appreciated that trial lens kit 100 can have any number of lenses.

[0020] In one exemplary embodiment, exemplary trial lens kit 100 includes groups 102-110. It is noted that groups 102-110 are exemplary and that exemplary trial lens kit 100 may comprise more or less groups and embodiments of the present invention are not limited to groupings of groups 102-110. It is further noted the groups 102-110 may comprises more or less trial lens than shown in FIG. 1 and are not limited to the number of lenses corresponding to groups 102-110. Each of groups 102-110 may comprise similar properties associated with treating one or more pathologies or pupillary anomalies.

[0021] In one embodiment, trial lens kit 100 is operable for determining a chromatic or neurochromatic prescription as described in related copending non-provisional patent application Ser. No. 13/368,149, Attorney Docket Number NCVS-0001.US1, entitled "NEUROCHROMATIC PRESCRIPTION DETERMINATION," with filing date Feb. 7, 2012, and hereby incorporated by reference in its entirety.

[0022] In one embodiment, trial lens kit 100 and corresponding groups 102-110 are arranged so that a physician may move sequentially through the lenses of lens kit 100 providing visual samples to a patient to determine a neurochromatic prescription. In one exemplary embodiment, trial lens kit 100 is setup to test plated lenses, infrared (IR) lenses, neutral density lenses, color trial lenses, and then ultraviolet (UV) trial lenses. One or more lenses from each of groups 102-110 may be combined to arrive at a chromatic prescription and thus a prescriptive lens. In one embodiment, trial lens kit 100 comprises a plated lenses/coded lenses group which includes lenses that are coated (e.g., reflectively coated and/or having a slight curvature). The plated lenses group may include lenses available from Mar-Lite Optical Suppliers of Modesto, Calif.

[0023] Exemplary groupings of trial lens kit 100 operable for determining a neurochromatic prescription for enhancing visual performance and/or providing neurovisual therapeutic intervention therapy for the symptoms, syndromes, conditions, and anomalies is shown within Table I. It is appreciated that trial lens kit 100 may have different groupings than those shown in Table I. In one embodiment, trial lens kit 100 is arranged such that a physician can step through lens kits in the order shown in Table I (e.g., starting with UV trial lenses in the bottom left front corner of trial lens kit 100 and continuing up over, down, and up through lens kit 100). Exemplary spectrometry readings and corresponding information of exemplary trial lens kit 100, in accordance with one embodiment, are shown below in Appendix A.

TABLE I

Exemplary Trial Lens Kit Groupings and Characteristics						
Group/ Lens	Visible Light Transmitted (%)	Red Transmitted (%)	Green Transmitted (%)	Yellow Transmitted (%)	Blue Transmitted (%)	UV Transmitted (%)
1 Ultraviolet (UV) Group						
UV Lens #1 (UV1)	95.9%	96.7%	95.6%	96.4%	95.3%	0.1%
UV Lens #2 (UV2)	95.4%	96.2%	95.2%	95.9%	94.9%	0.0%
UV Lens #3 (UV3)	95.7%	96.5%	95.5%	96.2%	95.1%	0.0%
2 Neutral Density Group: Reduces Spectrum (e.g., removing glare and providing darkness)						
Neutral Density Lens #1 (ND1)	83.5%	84.7%	83.5%	83.7%	84.2%	2.1%
Neutral Density Lens #1 (ND1)	83.5%	84.7%	83.5%	83.7%	84.2%	2.1%
Neutral Density Lens #2 (ND2)	62.2%	63.2%	63.3%	62.0%	65.3%	1.2%
Neutral Density Lens #3 (ND3)	44.2%	46.6%	44.5%	44.2%	47.3%	0.4%
3 Infrared (IR) Lens Group						
IR Lens #1 (IR1)	81.2%	83.1%	81.0%	81.9%	81.5%	2.1%
IR Lens #1 (IR1)	81.2%	83.1%	81.0%	81.9%	81.5%	2.1%
IR Lens #2 (IR2)	80.3%	84.9%	78.7%	82.8%	78.4%	1.8%
IR Lens #3 (IR3)	34.6%	45.8%	30.8%	40.4%	30.8%	0.0%
IR Lens #4 (IR4)	32.2%	42.0%	29.2%	36.8%	30.5%	0.0%
4 Colored Lens Group						
Brown #1 (BR1)	86.0%	89.7%	84.5%	88.2%	83.8%	2.1%
Brown #1 (BR1)	86.0%	89.7%	84.5%	88.2%	83.8%	2.1%
Brown #2 (BR2)	74.6%	81.5%	71.9%	78.6%	70.9%	1.4%
Brown #3 (BR3)	62.6%	72.6%	58.8%	68.4%	57.6%	0.6%
Orange #1 (OR1)	89.7%	93.2%	88.5%	91.7%	87.8%	2.3%
Orange #1 (OR1)	89.7%	93.2%	88.5%	91.7%	87.8%	2.3%
Orange #2 (OR2)	81.3%	89.7%	78.2%	85.7%	77.9%	1.6%
Orange #3 (OR3)	69.3%	87.5%	62.9%	78.6%	62.1%	0.3%
Amber #1 (AM1)	89.7%	92.9%	88.6%	91.7%	87.3%	1.8%

TABLE I-continued

Exemplary Trial Lens Kit Groupings and Characteristics						
Group/ Lens	Visible Light Transmitted (%)	Red Transmitted (%)	Green Transmitted (%)	Yellow Transmitted (%)	Blue Transmitted (%)	UV Transmitted (%)
Amber #1 (AM1)	89.7%	92.9%	88.6%	91.7%	87.3%	1.8%
Amber #2 (AM2)	82.9%	88.9%	80.9%	86.5%	79.2%	1.1%
Amber #3 (AM3)	75.5%	84.4%	72.6%	80.8%	70.0%	0.3%
Yellow #1 (YL1)	96.6%	97.8%	96.3%	97.4%	95.4%	2.4%
Yellow #1 (YL1)	96.6%	97.8%	96.3%	97.4%	95.4%	2.4%
Yellow #2 (YL2)	96.3%	97.9%	95.9%	97.5%	94.2%	1.9%
Yellow #3 (YL3)	94.7%	97.6%	94.1%	97.0%	90.2%	0.7%
Green #1 (GR1)	92.3%	92.1%	92.7%	92.1%	92.4%	2.3%
Green #1 (GR1)	92.3%	92.1%	92.7%	92.1%	92.4%	2.3%
Green #2 (GR2)	78.0%	75.2%	80.2%	76.1%	79.6%	0.6%
Green #3 (GR3)	61.9%	55.9%	65.7%	58.3%	64.7%	0.0%
Moss Green #1 (MS1)	84.3%	84.6%	84.7%	84.3%	84.5%	1.6%
Moss Green #1 (MS1)	84.3%	84.6%	84.7%	84.3%	84.5%	1.6%
Moss Green #2 (MS2)	76.0%	76.0%	76.8%	75.5%	77.2%	1.4%
Moss Green #3 (MS3)	60.3%	59.4%	61.8%	59.1%	62.4%	0.2%
Pink #1 (PK1)	92.4%	97.1%	90.6%	94.6%	91.0%	2.8%
Pink #1 (PK1)	92.4%	97.1%	90.6%	94.6%	91.0%	2.8%
Pink #2 (PK2)	87.5%	96.5%	84.1%	91.7%	85.3%	2.7%
Pink #3 (PK3)	78.4%	95.0%	72.2%	86.1%	74.7%	2.7%
Red #1 (RD1)	88.4%	92.8%	86.8%	90.6%	86.9%	2.7%
Red #1 (RD1)	88.4%	92.8%	86.8%	90.6%	86.9%	2.7%
Red #2 (RD2)	83.4%	90.5%	80.7%	86.9%	81.1%	2.2%
Red #3 (RD3)	60.5%	85.2%	51.6%	72.2%	53.5%	0.8%
Burgundy #1 (BG1)	70.6%	84.0%	65.7%	77.0%	67.5%	2.1%
Burgundy #1 (BG1)	70.6%	84.0%	65.7%	77.0%	67.5%	2.1%
Burgundy #2 (BG2)	67.4%	81.6%	62.2%	74.0%	64.5%	2.1%
Burgundy #3 (BG3)	59.4%	79.3%	52.0%	68.8%	54.5%	1.2%
Rosewood #1 (RW1)	75.6%	88.1%	70.9%	81.9%	71.8%	2.2%
Rosewood #1 (RW1)	75.6%	88.1%	70.9%	81.9%	71.8%	2.2%
Rosewood #2 (RW2)	74.6%	85.6%	70.5%	80.3%	70.7%	1.7%
Rosewood #3 (RW3)	63.2%	80.2%	56.8%	71.8%	57.7%	1.0%
Lavender #1 (LV1)	81.7%	84.2%	80.9%	82.5%	82.5%	2.4%

TABLE I-continued

Exemplary Trial Lens Kit Groupings and Characteristics						
Group/ Lens	Visible Light Transmitted (%)	Red Transmitted (%)	Green Transmitted (%)	Yellow Transmitted (%)	Blue Transmitted (%)	UV Transmitted (%)
Lavender #1 (LV1)	81.7%	84.2%	80.9%	82.5%	82.5%	2.4%
Lavender #2 (LV2)	76.3%	79.1%	75.5%	76.9%	78.1%	2.7%
Lavender #3 (LV3)	66.1%	71.1%	64.5%	67.6%	68.1%	2.5%
Violet #1 (VL1)	80.1%	84.5%	79.4%	80.6%	82.5%	2.7%
Violet #1 (VL1)	80.1%	84.5%	79.4%	80.6%	82.5%	2.7%
Violet #2 (VL2)	77.3%	82.1%	76.7%	77.8%	80.4%	3.0%
Violet #3 (VL3)	69.5%	76.0%	68.7%	69.9%	74.2%	2.6%
Royal Blue #1 (RB1)	81.8%	81.2%	82.5%	80.7%	84.0%	2.8%
Royal Blue #1 (RB1)	81.8%	81.2%	82.5%	80.7%	84.0%	2.8%
Royal Blue #2 (RB2)	67.3%	66.3%	68.9%	65.2%	72.0%	2.1%
Royal Blue #3 (RB3)	43.3%	41.9%	45.6%	40.1%	50.8%	1.0%
Blue #1 (BL1)	91.2%	89.2%	92.3%	89.8%	93.0%	2.7%
Blue #1 (BL1)	91.2%	89.2%	92.3%	89.8%	93.0%	2.7%
Blue #2 (BL2)	88.7%	85.3%	90.4%	86.3%	91.6%	2.6%
Blue #3 (BL3)	81.8%	75.2%	85.2%	77.2%	87.7%	2.7%
Sky Blue #1 (SK1)	90.3%	88.1%	91.3%	89.0%	91.5%	2.4%
Sky Blue #1 (SK1)	90.3%	88.1%	91.3%	89.0%	91.5%	2.4%
Sky Blue #2 (SK2)	85.6%	81.5%	87.5%	83.1%	88.3%	2.3%
Sky Blue #3 (SK3)	80.1%	73.2%	83.2%	76.0%	84.6%	2.2%
Aqua #1 (AQ1)	83.0%	77.9%	85.7%	79.5%	87.2%	2.2%
Aqua #1 (AQ1)	83.0%	77.9%	85.7%	79.5%	87.2%	2.2%
Aqua #2 (AQ2)	79.7%	75.9%	82.0%	76.8%	83.7%	2.3%
Aqua #3 (AQ3)	77.3%	69.9%	81.1%	72.2%	83.5%	2.1%

[0024] In one exemplary embodiment, trial lens kit **100** includes an Ultraviolet (UV) trial lens or UV blocker which is operable to filter or block UV light. The UV trial lens may be made using a dye well known in the optics industry.

[0025] One or more trial lenses of trial lens kit **100** may be used or combined together to achieve improved visual function. For example, each trial lens, alone or in combination with other lenses, may uniquely expand the field of view, enhance perception, neurovisual processing, and decrease reaction time.

[0026] Such improved visual function may manifest as an improvement of a pupillary anomaly. The effect (e.g., benefits) of a particular trial lens on pupillary anomalies can be

viewed by a doctor using a camera during testing with the various lenses of trial lens kit. For example, the doctor can watch the pupillary responses, sizing, and shaping of the pupil to normal size. It is appreciated that there may be genetic predispositions to pupillary anomalies and ailments which correlate to neurovisual responses that may be treated with one or more trial lenses.

[0027] Embodiments of the present invention are operable for use in improving a variety of various visual performance and visual function characteristics including improved visual acuity (e.g., more clear and enhanced visual perception of distant objects), improved visual field, enhanced visual saccade (e.g., eye movement across a page), increased contrast sensitivity, and increased recognition of color hues. Embodi-

ments of the present invention are further operable to improve visual performance and visual function characteristics including increased eye coordination, increased pupil stabilization (e.g., stabilization of pupil shape to round), improved visual invoked response time (e.g., vision to action time), and improved blood flow in the brain which results in enhancement to cognitive response to visual cues. The following terms may be trademarked or protected: neurochromatic and neurochromatic refraction.

[0028] In one embodiment, the improvement in visual performance and function is substantially similar to the improvements in visual performance and function that ophthalmologists and optometrists look for. Embodiments of the present invention are operable for determination of a neurochromatic prescription resulting in neurological and physiological improvement. Embodiments of the present invention comprise a plurality of trial lenses, each corresponding to frequencies or wavelengths to be used in combination to create a prescription which can be used to create a resultant lens to increase visual function (e.g., visual performance and visual function characteristics mentioned above).

[0029] Each lens of trial lens kit **100** may correspond to a particular wavelength or frequency of light that is filtered and thus have a particular tinting or density. Each trial lens may be

tinted or otherwise configured to filter light based on particular wavelength or frequency. Each trial lens may be created by a dyeing process which may use a single dye or a mixture of dyes to make a unique trial lens. It is appreciated that glass or plastic may be used as long as the different refraction properties of glass and plastic are taken into account. In one embodiment, the tinting is done by time, heat, and saturation of the lens.

[0030] Each trial lens may thus correspond to particular pupillary response related to a specific pathology, anomaly, or syndrome. For example, visual field is impacted by the wavelength of the trial lens which impacts the measurable clarity of vision. A trial lens may further affect the ability of the eyes to function together which allows convergence and divergence in the behavior of the eyes to be observed.

[0031] Trial lens kit **100**, as described herein, is operable for use in determining a neurochromatic prescription to enhance visual performance and/or provide neurovisual therapeutic intervention therapy for the symptoms, syndromes, conditions, and anomalies exemplified within Table II. Each wavelength or frequency may be selected to address pupillary anomalies and/or address the ailments of Table II. It is appreciated that neurochromatic lenses may provide enhanced visual performance and/or therapy for other symptoms, syndromes, conditions, and anomalies as well.

TABLE II

Exemplary symptoms, syndromes, conditions, and anomalies
which neurochromatic lens provide relief

- 1 Visual and auditory dyslexia.
- 2 Blurred vision not fully corrected by ophthalmic lenses.
- 3 Contrast sensitivity compromises.
- 4 Color vision recognition compromises.
- 5 Restricted or compromised neurovisual fields of vision.
- 6 Convergence and divergence insufficiency.
- 7 Unilateral diplopia.
- 8 Compromises of night vision.
- 9 Wet and dry macular degeneration.
- 10 Visual aberrations and delusions not related to a psychotic or delusional condition.
- 11 Photophobia.
- 12 Visually evoked migraines.
- 13 Migraines characterized by aura, photosensitivity, aberrations, dizziness, limited vision, or blindness.
- 14 Post migraines characterized by any one of the above.
- 15 Visually evoked seizure phenomena characterized by light stimulation or by any one of the above.
- 16 Post seizure activity characterized by any one of the above.
- 17 Cranial and brain hemorrhages.
- 18 Compromises of visual performance and cognitive awareness/alertness caused by blood blockage or hemorrhages (e.g., stroke) and/or traumatic brain injuries or post surgical trauma.
- 19 Some forms of schizophrenia or schizoid phenomena including delusional auditory and visually induced hallucination-type activities.
- 20 Reduction in autistic-type over stimulation of the visual and auditory kind.
- 21 Compromised saccade performance.
- 22 Irregular and inconsistent pupillary responses to light and focus activities.
- 23 Compromised cognitive performance not related to conditioned responses of learning or physical development.
- 24 Eye pain and strain related to visual performance.
- 25 Headaches related to visual pain or strain.
- 26 Neck and shoulder pain or distress related to visual stress.
- 27 Compromised reading speeds related to visual performance.
- 28 Compromised recall related to visual or auditory stimulation.
- 29 Non-migraine visually induced headaches, stress, or discomfort.
- 30 Seasonal affective disorder.
- 31 Computer vision syndrome.
- 32 Compromises in depth recognition and perception. For example, some patients cannot sustain a sight vocabulary or recognition of other visual data which appears to be a problem of either cognition, memory, or concentration of the neurovisual data that was heretofore already compromised.

TABLE II-continued

Exemplary symptoms, syndromes, conditions, and anomalies which neurochromatic lens provide relief	
33	Body coordination and physical performance requiring visual stimulation as one of several variables of perception.
34	Disorientation to space and motion.
35	Motion sickness.
36	Fear of heights.
37	Claustrophobia-type responses that cause a constriction and expansion of pupils seemingly consciously uncontrollable.
38	Some forms of general and specific anxiety disorders.
39	Physiologically related artistic performance.
40	Amblyopic (a.k.a. lazy eye) or wandering eye.
41	Excessive eye dominance.
42	Suppressive vision or visual performance of one eye not related to eye trauma, disease, or aging.
43	Specific photophobia related to lighting conditions, working environments, tasks, seasons of the year, or tools.
44	Post surgical photophobia.
45	Post traumatic brain injuries independent of hemorrhages or not.
46	Post traumatic stress disorders or syndromes.
47	Post concussion hyper-light sensitivity.
48	Compromised night vision.
49	Hyper-sensitive night or storm-type related vision compromises.
50	Myopia phenomena.
51	Astigmatism phenomena.
52	Strabismus phenomena.
53	"Comfort" or "performance" (e.g., +0.25 to +0.50) ophthalmic prescriptions.
54	Pharmaceutical prescription induced photophobia, e.g., caused by most hormonal based medications such as birth control or menopausal prescriptions.
55	Compromises in spatial differentiation.
56	Disparity between reading, writing, or mathematic capabilities as to any or all of these related to kinesthetic and/or mechanical aptitude.
57	Visual comprehension enhanced by "hearing the words" inside one's head or by reading out-loud to process fully.
58	The use of a finger or any other kind of marker or place keeper to read and maintain proper tracking.
59	High end near-sighted prescriptions.
60	Patients suffering from minor to severe depression (e.g., situational to needs of chronic dimness or brightness of light).
61	Lacking in physical coordination or clumsiness.
62	Premature fatigue or sleepiness with prolonged visual tasks including and not limited to driving, reading, sewing, sightseeing.
63	Nausea or upset stomach with visual tasks.
64	Abnormal pupillary sizes and shapes not related to bright or darkness.
65	Patients who experience "glare" or excessive brightness in normal lighting conditions and situations.
66	Patients who cannot drive at night or in stormy conditions because of failed or compromised vision.
67	Patients who report a "smudged" or "fogged" vision where upon a physiological examination there are no known causal factors.
68	Patients who report visual aberrations such as letters or words moving, switching, disappearing, fading away, changing size or shape, having a glow or luminance around print or coming from the background of the print. These and other dyslexic symptoms are known to respond to a neurochromatic lens.
69	Patients who see a white background on the printed page, from art, as having a color or hue, or glare.
70	Patients who see night lighting such as street lights, vehicle lights as having a color or hue, streaks, or having an abnormal comfort or affect.
71	Patients affected by chronic and severe fevers.
72	Patients affected by Down Syndrome.
73	Patients with compromises in cognitive function caused by disease, accident, or trauma.
74	Patients with varied degenerative muscular diseases.
75	Patients affected with chronic fatigue syndrome.
76	Limited or narrow band of light spectrum photophobia.
77	Major depression not identified as seasonal affective disorder.
78	Post traumatic stress disorder visually evoked symptoms.
79	Patients who complain or say there is excessive glare or aberrations about the words and images of printed material.
80	Patients who complain or say there never is enough light to read comfortably or effectively.
81	Patients identified as having retinal pigmatosa, Graves' disease, chronic fatigue syndrome, degenerative muscle diseases of varied sorts, connective tissue diseases of varied sorts, lupus patients, other auto-immune diseased or compromised patients, patients having chemo or radiation therapies.

TABLE II-continued

Exemplary symptoms, syndromes, conditions, and anomalies
which neurochromatic lens provide relief

82 Patients with albinism.

83 Compromised visually evoked responses.

84 Situational visual compromise or visual difficulties.

[0032] FIG. 2 shows a block diagram of an exemplary trial lens in accordance with an embodiment of the present invention. FIG. 2 depicts exemplary trial lens 200 including viewing area 202 and label area 210. In one exemplary embodiment, one side of trial lens 200 has a scratch resistant coating.

[0033] Label area 210 facilitates handling of exemplary trial lens 200 such that viewing area 202 is not touched or collects fingerprints. In one embodiment, label area 210 includes trial lens identifier 212 which indicates the lens group (e.g., color or type of lens) and number of the trial lens in the group of lenses (e.g., the respective color in the color lens group). For example, trial lens identifier 212 may indicate that exemplary trial lens 200 is the third blue lens of the trial lens kit (e.g., Blue #3 or BL3 lens) which corresponds to a specific wavelength or frequency. Trial lens identifier 212 may be laser engraved in exemplary trial lens 200 and may further include a tradename or trademark (e.g., NCV-Rx).

[0034] Viewable portion 202 is the portion of exemplary trial lens 200 that has been modified to filter out a specific wavelength or frequency of light. In one embodiment, viewable portion 202 comprises areas 220 which are the areas that a patient looks through during the determination of chromatic prescription. The chromatic prescription may be determined as described in copending non-provisional patent application Ser. No. 13/368,149, Attorney Docket Number NCVS-0001.US1, entitled "NEUROCHROMATIC PRESCRIPTION DETERMINATION," with filing date Feb. 7, 2012, and hereby incorporated by reference in its entirety. The determination of the prescription may be determined using a refraction device as described in copending non-provisional patent application Ser. No. _____, Attorney Docket Number NCVS-0001.US3, entitled "NEUROCHROMATIC REFRACTOR," with filing date _____, and hereby incorporated by reference in its entirety.

[0035] In one embodiment, an exemplary trial lens 200 is 140 mm in length, 50 mm in height, and 2.5 mm in thickness or width. The thickness of exemplary trial lens may correspond to a 99.8% light transmission. Exemplary trial lens 200 may be of a thickness to allow or facilitate determination of a chromatic (e.g., neurochromatic prescription) prescription that allows neurochromatic lenses to be created therefrom (e.g., via a dyeing process as described herein). In one exemplary embodiment, trial lens 200 may be made out of plano optical quality tintable plastic.

[0036] In one embodiment, trial lens 200 is designed to substantially match ophthalmic standard and in particular allows use of the lens while light comes in from behind the patient looking through trial lens 200.

[0037] FIG. 3 shows a block diagram of an exemplary case in accordance with an embodiment of the present invention. Exemplary case 300 comprises top portion 310, trial lens holder 306, and bottom portion 302. Exemplary case 300 is operable to facilitate transportation of a trial lens kit (e.g., trial lens kit 100) and optional refractor device (e.g., refractor device 304).

[0038] In one embodiment, exemplary case 300 comprises two layers: a first layer for holding or storing refractor device

304 in bottom portion 302 and a second layer for holding or storing trial lenses 308 (e.g., trial lens kit 100) in trial lens holder 306. Trial lens holder 306 may be removed (e.g., lifted out) from exemplary case 300 to allow for access to refractor device 304. Trial lens holder 306 may be made of wood, foam, or any material capable of supporting trial lenses 308 during transportation without causing damage to trial lenses 308. In another embodiment, exemplary case 300 is a reversible case that allows removal of refractor device 304 from one side of the case and removal of trial lenses 308 from the other side of the case. Exemplary case 300 may be configured to have hinges and operate in a similar manner to a brief case (e.g., with a handle and mechanisms to facilitate closing the case). Exemplary case 300 may be made with a variety of metals including stainless steel, aluminum, high impact plastic, or other materials. In one embodiment, exemplary case 300 may be 16 inches long and 14 inches wide and have 1/2 inch spacing between trial lenses.

[0039] Refractor 304 may be folded up for storage in bottom portion 302. Refraction device 304 may be a neurochromatic refractor device as described in related copending non-provisional patent application Ser. No. _____, Attorney Docket Number NCVS-0001.US3, entitled "NEUROCHROMATIC REFRACTOR," with filing date _____. Refractor device 304 and trial lenses 308 facilitate determination of a chromatic prescription.

[0040] In one embodiment, the overall performance of photoreceptor cells at the retinal level is improved thereby changing the electrical signals going to the brain and changing blood flow. Embodiments of the present invention are operable to change the blood flow in the brain thereby resulting in measurable improvements in visual performance. Embodiments of the present invention are operable to adjust light received by the eyes which can result in beneficial changes in hormone response (e.g., seasonal affective disorder).

[0041] Embodiments of the present invention further facilitate increased visual acuity (e.g., more clear, bold, or distinct), increased visual field, enhanced visual saccade, increase contrast and sensitivity, increased recognition of visual color/hues, and increased blood flow resulting in enhanced cognitive response to visual queues. Embodiments of the present invention are operable to determine of a resultant lens for increased utility of both eyes working coordinately (e.g., vortex of function and focus). For example, the eyes may not be seeing the same point resulting in some degree of reversal or dyslexia. This may create a perception that things are moving or going in and out of focus. The improvements facilitated by embodiments of the present invention can be measured with machines which determine where the pupils of both eyes are actually aiming.

[0042] Embodiments of the present invention are further operable to facilitate stabilization of the pupillary response to visual stimulation. For example, patients may have observable difficulty reading or during exposure to certain light which manifests as an abnormal shape or not round pupil. The abnormal shape of the pupil may cause the patient to experience eye fatigue, eye strain, and loss of place (e.g., while

reading). Embodiments of the present invention can stabilize the pupillary response to result in a round pupil thereby enhancing other mechanical and neurophysical aspects of vision.

[0043] Embodiments of the present invention additionally facilitate enhanced visually evoked response time. For example, the time to blink when something comes toward your eye or time to shoot a weapon when something comes into your visual field may be lessened. In other words, embodiments of the present invention are operable to enhanced visual response time. Each of these improvements may be monitored during the trial lens (e.g., neurochromatic trial lens) selection process.

[0044] It is noted that some native populations have little trouble with near-sightedness or far-sightedness, stigmatism, etc. until they start to read because of how their eyes have been adapted over centuries. The problems may develop as a result of prolonged focused vision. Embodiments of the present invention are operable to provide treatment for problems that develop as a result of prolonged focused vision.

[0045] The foregoing descriptions of specific embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and many modifications and variations are possible in light of the above teaching. The embodiments were chosen and described in order to best explain the principles of the invention and its practical application, to thereby enable others skilled in the art to best utilize the invention and various embodiments with various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the claims appended hereto and their equivalents.

What is claimed is:

- 1. A trial lens kit comprising:
 - a first plurality of trial lenses wherein each of said first plurality of trial lenses is operable to filter a particular wavelength of light, and wherein said first plurality of trial lenses corresponds to a first type of visual function improvement; and
 - a second plurality of trial lenses wherein each of said second plurality of trial lenses is operable to filter a particular wavelength of light, and wherein said second plurality of trial lenses corresponds to a second type of visual function improvement.
- 2. The trial lens kit of claim 1 wherein individual lenses of said first plurality of trial lenses and individual lenses of said second plurality of trial lenses are operable to be combined for determining a chromatic prescription.
- 3. The trial lens kit of claim 1 wherein said first type of visual function improvement and said second type of visual function improvement are related to a first pupillary anomaly and a second pupillary anomaly respectively.
- 4. The trial lens kit of claim 1 wherein said first plurality of trial lenses comprises colored trial lenses.
- 5. The trial lens kit of claim 4 wherein said colored trial lenses are made of tinted plastic.
- 6. The trial lens kit of claim 1 wherein said second plurality of lenses comprises infrared (IR) trial lenses operable to filter IR wavelengths.
- 7. The trial lens kit of claim 1 further comprising:
 - a third plurality of trial lenses wherein each of said third plurality of trial lenses is operable to filter ultraviolet

(UV) light, and wherein said third plurality of trial lenses corresponds to a third type of visual function improvement.

- 8. An apparatus for determination of a chromatic prescription, said apparatus comprising:
 - a first trial lens operable to filter a first portion of the electromagnetic spectrum and corresponding to a first type of visual function improvement related to a first pupillary anomaly; and
 - a second trial lens operable to filter a second portion of the electromagnetic spectrum and corresponding to a second type of visual function improvement related to a second pupillary anomaly, wherein said first trial lens and said second trial lens are operable to be combined to correspond to a third visual function improvement.
- 9. The apparatus as described in claim 8 wherein said first trial lens corresponds to a first tint of a color and said second trial lens corresponds to a second tint of said color.
- 10. The apparatus as described in claim 9 wherein said first trial lens and said second trial lens are tinted via a dyeing process.
- 11. The apparatus as described in claim 9 wherein said color is selected from the group consisting of red, orange, yellow, green, blue, indigo, and violet.
- 12. The apparatus as described in claim 8 wherein said first trial lens corresponds to a first ultraviolet (UV) wavelength and said second trial lens corresponds to a second ultraviolet wavelength.
- 13. The apparatus as described in claim 8 wherein said first trial lens corresponds to a first infrared (IR) wavelength and said second trial lens corresponds to a second infrared wavelength.
- 14. The apparatus as described in claim 8 wherein said first trial lens and second trial lens are made of plastic and made substantially accordingly to ophthalmic standards.
- 15. A lens kit comprising:
 - a plurality of color trial lenses corresponding to a first visual function improvement;
 - a plurality of ultraviolet (UV) trial lenses corresponding to a second visual function improvement; and
 - a plurality of infrared (IR) trial lenses corresponding to a third visual function improvement, wherein individual lenses of said plurality of color trial lenses, individual lenses of said plurality of UV trial lenses, and individual lenses of said plurality of IR trial lenses are operable in combination for determination of a chromatic prescription.
- 16. The lens kit of claim 15 further comprising:
 - a plurality of neutral density trial lenses corresponding to a fourth visual function improvement.
- 17. The lens kit of claim 15 further comprising:
 - a plurality of plated lenses corresponding to a fifth visual function improvement.
- 18. The lens kit of claim 15 wherein said first visual function improvement and said second visual function improvement are related to a first pupillary anomaly and a second pupillary anomaly respectively.
- 19. The lens kit of claim 15 wherein said plurality of color trial lenses is made of tinted plastic.
- 20. The lens kit of claim 19 wherein said plurality of color trial lenses is tinted using a dyeing process.

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