(54) Title: NEUROCHROMATIC PRESCRIPTION DETERMINATION, TRIAL LENS KIT, AND NEUROCHROMATIC REFRACTOR DEVICE

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NEUROCHROMATIC PRESCRIPTION DETERMINATION, TRIAL LENS KIT, AND
NEUROCHROMATIC REFRACTOR DEVICE

RELATED U.S. APPLICATIONS


FIELD OF THE INVENTION

[006] 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

[007] 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.

[008] 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.

[009] 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

[010] Embodiments of the present invention medically and therapeutically treat or enhance the performance of the human visual experience by physician prescribed neurochromatic lenses. Embodiments of the present invention further provide effective
treatment for the enhancement of vision and therapeutic treatment for a variety of neurovisual processing symptoms, anomalies, conditions, and syndromes.

[011] 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 make use of Neurochromatic© lens or trial lens available from NeuChroma Vision, Incorporated of Redding, California.

[012] In one embodiment, the present invention is implemented as a method for determining a neurochromatic prescription. The method includes selecting a first ultraviolet (UV) trial lens and a second UV trial lens and determining whether the first UV trial lens or the second UV trial lens results in greater improvement in visual acuity. The second UV trial lens may then be selected for the neurochromatic prescription when the second UV trial lens results in greater improvement in visual acuity as compared to the first UV trial lens. The method further includes selecting a first color group comprising a first color trial lens and a second color trial lens and determining whether the first color trial lens or the second color trial lens results in greater improvement in visual acuity. The second color trial lens may then be selected for the neurochromatic prescription when the second color trial lens results in greater improvement in visual acuity as compared to the first color trial lens. Whether removal of the second UV trial lens results in an improvement in visual acuity may then be determined.

[013] The method may further include selecting a first infrared (IR) trial lens and a second IR trial lens and determining whether the first IR trial lens or the second IR trial lens results in greater improvement in visual acuity. The second IR trial lens may then be selected
for the neurochromatic prescription when the second IR trial lens results in greater improvement in visual acuity as compared to the first IR trial lens. In one embodiment, a camera operable to record the improvement in visual acuity is activated. The camera may be operable to record pupillary responses of a patient to trial lenses.

[014] In one exemplary embodiment, the color group may comprise a third color trial lens and it may be determined whether the second color trial lens or the third color trial lens results in greater improvement in visual acuity. The third color trial lens may then be selected for the neurochromatic prescription when the third color trial lens results in greater improvement in visual acuity as compared to the second color trial lens. A second color group may be further selected which comprises a third color trial lens and a fourth color trial lens. A determination may then be made as to whether the third color trial lens or the fourth color trial lens results in greater improvement in visual acuity. The fourth color trial lens may then be selected for the neurochromatic prescription when the fourth color trial lens results in greater improvement in visual acuity as compared to the third color trial lens.

[015] In one exemplary embodiment, after determining improvement in visual acuity with a plurality of color trial lenses from a plurality of color groups, the second UV trial lens may be reevaluated for improvement in visual acuity. In one embodiment, a full spectrum lighting element is activated to create a full spectrum lighting environment during the prescription process.

[016] In one embodiment, the present invention is implemented as a method for selecting a color neurochromatic lens for a prescription. The method includes selecting a first color group comprising a plurality of color trial lenses and selecting a first color trial lens of the plurality of color trial lenses corresponding to a first frequency or wavelength of light. The first color group may be selected from the group consisting of red, orange, yellow, green, blue, indigo, and violet. The method further includes determining if there is a first improvement in visual acuity with the first color trial lens and in response to the first improvement in visual acuity, selecting a second color trial lens corresponding to a second frequency or wavelength of light. If there is a second improvement in visual acuity with the second color trial lens may then be determined. In response to the second improvement in
visual acuity, the second color trial lens may be placed into a holding mechanism operable to hold a plurality of trial lenses. The second frequency or wavelength of light may then be recorded into the prescription. In response to not determining the second improvement in visual acuity, the first color trial lens may be placed into the holding mechanism and the corresponding frequency or wavelength added to the prescription. In response to not determining the first improvement in visual acuity, another color group may be selected.

[017] The method may further include selecting a third color trial lens corresponding to a third frequency or wavelength of light in response to the second improvement in visual acuity. If there is a third improvement in visual acuity with the third color trial lens may then be determined. In response to the third improvement in visual acuity, the third color trial lens may then be placed into the holding mechanism. In response to not determining the third improvement in visual acuity, the second color trial lens may be placed into the holding mechanism. In one embodiment, the method may further include determining if there is a third improvement in visual acuity with the first color trial lens and the second color trial lens and in response to the third improvement in visual acuity, the first color trial lens and the second trial lens are placed into the holding mechanism. The corresponding frequencies or wavelengths for the first and second color trial lens may then be added to the prescription. The trial lenses (or corresponding frequencies or wavelengths) may then be added to the prescription.

[018] In another embodiment, the present invention is implemented as a method for selecting a neurochromatic ultraviolet (UV) trial lens for a prescription. The method includes selecting a first UV trial lens of a plurality of UV trial lenses corresponding to a first frequency or wavelength and determining if there is a first improvement in visual acuity with the first UV trial lens. In response to the first improvement in visual acuity, a second UV trial lens corresponding to a second frequency of wavelength is selected. The method further includes determining if there is a second improvement in visual acuity with the second UV trial lens and in response to the second improvement in visual acuity, the second UV trial lens may be placed into a holding mechanism operable to hold a plurality of trial lenses. The second frequency or wavelength may then be recorded into the prescription. In response to not determining the second improvement in visual acuity, the first UV trial lens may be
placed into the holding mechanism. In response to not determining the first improvement in visual acuity, a first color trial lens may be selected.

[019] The method may further include selecting a third UV trial lens corresponding to a third frequency or wavelength in response to the second improvement in visual acuity and determining if there is a third improvement in visual acuity with the third UV trial lens. In response to the third improvement in visual acuity, the third UV trial lens may be placed into the holding mechanism. In response to not determining the third improvement in visual acuity, the second UV trial lens may be placed into the holding mechanism. In one embodiment, the method may further include determining if there is a third improvement in visual acuity with the first UV trial lens and the second UV trial lens and in response to the third improvement in visual acuity, the first color trial lens and the second trial lens may then be placed into the holding mechanism. The trial lenses (or corresponding frequencies or wavelengths) may then be added to the prescription.

[020] 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 neurochromatic 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.

[021] 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.

[022] 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.

[023] 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.

[024] Embodiments of the present invention comprise an apparatus to facilitate selection of trial lenses and determination of a neurochromatic prescription for a patient. Embodiments of the present invention allow a physician to observe a patient's eyes during the prescription process and thereby observe vision function, e.g., among other things, expansion of visual field and calming of the letters, words, and enhanced neural visual processing, retention, and reduction of reaction time, etc. Embodiments of the present invention provide for centering of multiple trial lenses within a patient's line of sight for the left and the right eye during the prescription process.

[025] More specifically, 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. Embodiments of the present invention are further operable for use in improving 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 make use of Neurochromatic© lens or trial lens available from NeuChroma Vision, Incorporated of Redding, California.
[026] In one embodiment, the present invention is implemented as an apparatus for determining a neurochromatic lens prescription addressing the visual issues mentioned above for the eye. The apparatus includes an opening operable for alignment with a line of sight of a patient observing a visual target and a trial lens slot operable for use in receiving a trial lens into the line of sight and the opening. The opening may be rectangular in shape and operable for accommodating viewing of the visual target through the opening with both eyes of the patient. The apparatus further includes a channel operable for allowing sliding of the trial lens into a centered position within the opening and a trial lens retainer operable for holding one or more trial lenses comprising a prescription for visual function improvement. The channel is coupled to the trial lens slot and the channel is operable for allowing sliding of the trial lens horizontally into the opening. The opening and the channel may have metric dimensions. The channel may include a first slide stop and a second slide stop adjacent to each respective end of the channel.

[027] Thus, when a first trial lens and a second trial lens are in the channel and a first trial lens is in contact with the first slide stop, the second trial lens in contact with the first trial lens is centered in the opening. The trial lens retainer is operable to retain the one or more trial lenses within the line of sight. The apparatus may further include a phoropter bar opening operable for coupling a phoropter bar to the trial lens slot (e.g., above the trial lens slot). The phoropter bar may be operable for coupling a camera (e.g., with infrared functionality), corrective lenses (e.g., ophthalmic lenses), and the visual target. The apparatus may further include a headrest for positioning the patient’s head. The headrest is coupled to the trial lens slot.

[028] In one embodiment, the present invention is implemented as a refraction device for selecting one or more color neurochromatic lenses for a prescription. The device includes a trial lens channel for allowing sliding of a trial lens into a centered position within line of sight of a patient and a trial lens retainer operable for holding one or more trial lenses within the line of sight. The trial lens channel is operable for allowing sliding of the trial lens horizontally into the line of sight. The device further includes a locking mechanism operable to clamp the one or more trial lenses into place and a base portion operable for providing support to the trial lens channel. The locking mechanism is coupled to the trial lens retainer.
The base portion is operable for height adjustment of the trial lens channel. The device may further include an opening operable for alignment with the line of sight of the patient observing a visual target. The opening may be rectangular in shape and operable for accommodating viewing of the visual target through the opening with both eyes of the patient. The device may further comprise a phoropter bar opening operable for coupling a phoropter bar to the trial lens channel. The phoropter bar may be operable for coupling of a camera and corrective lenses.

[029] In another embodiment, the present invention is implemented as a device for use in determining a chromatic prescription. The device includes a channel for allowing sliding of a trial lens into a centered position within a line of sight of a patient and a trial lens retainer operable for holding one or more trial lenses within the line of sight. The channel is operable for allowing sliding of the trial lens horizontally into the line of sight. The device further comprises a phoropter bar operable for coupling of a camera. The camera is operable for recording a response of the eyes of the patient looking through the trial lens. In one embodiment, the phoropter bar is operable for coupling corrective lenses within the patient's line of sight. The phoropter bar may further be operable for coupling a target (e.g., eye chart). The device may further include a locking mechanism coupled to the trial lens retainer. The locking mechanism is operable to lock the one or more trial lenses into place. The device may further include a base portion operable for providing support to the channel. The base may be operable for height adjustment of the channel.

[030] 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 make use of Neurochromatic© lenses or trial lens available from NeuChroma Vision, Incorporated of Redding, California.

[031] In one embodiment, the present invention is implemented as a method for determining a neurochromatic prescription for the eye. The method includes selecting a first ultraviolet (UV) trial lens and determining whether the first UV trial lens results in improvement in visual function. The first UV trial lens may then be selected for the lens prescription when the first UV trial lens results in improvement in visual function. The method further includes selecting a first color group comprising a first color trial lens and a second color trial lens and determining whether the first color trial lens or the second color trial lens results in greater improvement in visual function. The second color trial lens may then be selected for the prescription when the second color trial lens results in greater improvement in visual function as compared to the first color trial lens. The method further includes reevaluating the first UV trial lens for improvement in visual function after determining improvement in visual function with the second color trial lens when the first UV trial lens did not result in improvement in visual function prior to selection of the second color trial lens. The method may further include activating a full spectrum lighting element and activating a camera operable to record the improvement in visual function. The camera may be operable to record a pupillary response to the first color trial lens and other trial lenses. In one embodiment, the first color group comprises a first infrared (IR) trial lens and a second IR trial lens. In one exemplary embodiment, the first color group is selected from the group consisting of brown, orange, amber, yellow, green, moss green, pink, red, burgundy, rosewood, lavender, violet, royal blue, blue, sky blue, and aqua.

[032] The method may further include selecting a neutral density group comprising a first neutral density trial lens and a second neutral density trial lens and determining whether the first neutral density trial lens or the second neutral density trial lens results in greater improvement in visual function. The second neutral density trial lens may then be selected for the lens prescription when the second neutral density trial lens results in greater improvement in visual function as compared to the first neutral density trial lens.
In one embodiment, the present invention is implemented as a method for determining a lens prescription. The method includes selecting a first ultraviolet (UV) trial lens and a second UV trial lens and determining whether the first UV trial lens or the second UV trial lens results in greater improvement in visual function. The second UV trial lens may then be selected for the lens prescription when the second UV trial lens results in greater improvement in visual function as compared to the first UV trial lens. The method further includes selecting a neutral density group comprising a first neutral density trial lens and a second neutral density trial lens and determining whether the first neutral density trial lens or the second neutral density trial lens results in greater improvement in visual function. The second neutral density trial lens may then be selected for the prescription when the second neutral density trial lens results in greater improvement in visual function as compared to the first neutral density trial lens. The method may further include activating a full spectrum lighting element and activating a camera operable to record the improvement in visual function. The camera may be operable to record a pupillary response to the first UV trial lens and other trial lenses.

The method may further include selecting a first color group comprising a first color trial lens and a second color trial lens and determining whether the first color trial lens or the second color trial lens results in greater improvement in visual function. The second color trial lens may then be selected for the prescription when the second color trial lens results in greater improvement in visual function as compared to the first color trial lens. The color group may comprise a third color trial lens and method may further include determining whether the second color trial lens or the third color trial lens results in greater improvement in visual function and selecting the third color trial lens for the lens prescription when the third color trial lens results in greater improvement in visual function as compared to the second color trial lens. The method may further include reevaluating the first UV trial lens for improvement in visual function after determining improvement in visual function with the second color trial lens when the first UV trial lens did not result in improvement in visual function prior to selection of the second color trial lens.

In one embodiment, the color group may include a first infrared (IR) trial lens and a second IR trial lens and the method further include selecting a first infrared (IR) trial
lens and a second IR trial lens and determining whether the first IR trial lens or the second IR trial lens results in greater improvement in visual function. The second IR trial lens may then be selected for the lens prescription when the second IR trial lens results in greater improvement in visual function as compared to the first IR trial lens.

[036] In another embodiment, the present invention is implemented as a method for selecting a trial lens for corresponding prescription. The method includes selecting a neutral density group comprising a first neutral density trial lens and a second neutral density trial lens and determining whether the first neutral density trial lens or the second neutral density trial lens results in greater improvement in visual function. The second neutral density trial lens may then be selected for the prescription when the second neutral density trial lens results in greater improvement in visual function as compared to the first neutral density trial lens. The method further includes selecting a first color group comprising a first color trial lens and a second color trial lens and determining whether the first color trial lens or the second color trial lens results in greater improvement in visual function. The second color trial lens may then be selected for the prescription when the second color trial lens results in greater improvement in visual function as compared to the first color trial lens.

[037] The method may further include selecting a first ultraviolet (UV) trial lens and a second UV trial lens and determining whether the first UV trial lens or the second UV trial lens results in greater improvement in visual function. The second UV trial lens may then be selected for the lens prescription when the second UV trial lens results in greater improvement in visual function as compared to the first UV trial lens. The method may further include reevaluating the second UV trial lens for improvement in visual function after determining improvement in visual function with the second color trial lens when the second UV trial lens did not result in improvement in visual function prior to selection of the second color trial lens. The method may further include activating an infrared camera operable to record the improvement in visual function. The camera may be operable to record a pupillary response to the first color trial lens.
BRIEF DESCRIPTION OF THE DRAWINGS

[038] 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.

[039] Figure 1 shows a flowchart of an exemplary process for determining a neurochromatic prescription in accordance with an embodiment of the present invention.

[040] Figure 2 shows a flowchart of an exemplary process for selection of an ultraviolet (UV) trial lens in accordance with an embodiment of the present invention.

[041] Figure 3 shows a diagram of an exemplary configuration of selected trial lenses and a trial lens being tested in accordance with an embodiment of the present invention.

[042] Figure 4 shows a flowchart of an exemplary process for selecting one or more color lens in accordance with an embodiment of the present invention.

[043] Figure 5A-B show exemplary neurochromatic prescriptions in accordance with embodiments of the present invention.

[044] Figure 6 shows a block diagram of an exemplary trial lens kit in accordance with an embodiment of the present invention.

[045] Figure 7 shows a block diagram of an exemplary trial lens in accordance with an embodiment of the present invention.

[046] Figure 8 shows a block diagram of an exemplary case in accordance with an embodiment of the present invention.
[047] Figure 9 shows a diagram of a side view of an exemplary refraction apparatus in accordance with an embodiment of the present invention.

[048] Figure 10 shows a diagram of a frontal orthogonal view of an exemplary refraction apparatus in accordance with an embodiment of the present invention.

[049] Figure 11 shows a diagram of a top orthogonal view of an exemplary refraction apparatus in accordance with an embodiment of the present invention.

[050] Figure 12 shows a side view of an exemplary refraction device operable for chromatic lens selection in accordance with an embodiment of the present invention.

[051] Figure 13 shows a frontal view of an exemplary refraction device operable for chromatic lens selection in accordance with an embodiment of the present invention.

[052] Figure 14 shows a back view of an exemplary refraction device operable for chromatic lens selection in accordance with an embodiment of the present invention.

[053] Figure 15 shows a back view of an exemplary refraction device, operable for chromatic lens selection, coupled with a phoropter bar in accordance with an embodiment of the present invention.

[054] Figure 16A shows a top orthogonal view of an exemplary refraction device with exemplary dimensions in accordance with an embodiment of the present invention.

[055] Figure 16B shows a back orthogonal view of an exemplary refraction device with exemplary dimensions in accordance with an embodiment of the present invention.

[056] Figure 16C shows a side orthogonal view of an exemplary refraction device with exemplary dimensions in accordance with an embodiment of the present invention.
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 METHODS OF NEUROCHROMATIC PRESCRIPTION

[065] Figure 1 shows a flowchart of an exemplary process for determining a neurochromatic prescription in accordance with an embodiment of the present invention. Process 100 include evaluating each of a set of infrared (IR) trial lenses, ultraviolet (UV) trial lenses, and color trial lenses for resulting in improvements in visual performance and function. 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. The following terms may be trademarked or protected: neurochromatic and neurochromatic refraction.

[066] In one embodiment, the improvement in visual performance and function 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 process for selecting a plurality of trial lenses, each corresponding to frequencies or wavelengths to be
used in combination to create a prescription and a resultant lens to increase visual function (e.g., visual performance and visual function characteristics mentioned above).

[067] For each trial lens, patients may be asked which trial lens results in the viewing object (e.g., near or far chart) being visually sharper, clearer, or more distinct. This will be paired with enhanced visual functions which may be measured in a variety of ways including: improved saccade, changes in visual field, increase in ability to perceive (e.g., increased ability to identify colors that would not otherwise be seen). For example, the patient may be asked whether the trial lens makes things clearer, bold, less blurry on the near or far chart. The physician may ask which lens is "most clear?" or "most focused?"

[068] In one embodiment, process 100 is performed with use of a trial lens kit described in Figures 6-8. In one embodiment, the trial lens kit is arranged so that the physician may move sequentially through the lenses. In one exemplary embodiment, the trial lens kit is setup to test IR trial lenses, color trial lenses, and then UV trial lenses.

[069] At block 102, a lighting element is activated. In one embodiment, the lighting element is a full spectrum lighting element for creating a full spectrum lighting environment for a neurochromatic refractor.

[070] At block 104, infrared (IR) trial lenses are evaluated for improvement in visual function. As described further herein, patients may be checked for a variety of conditions which indicate that the patients benefit from IR trial lens.

[071] Patients with a traumatic brain injury, reduced levels of consciousness not induced by medications, cerebral hemorrhages, brain swelling, strokes, seizure disorders, migraines, ongoing and untreated chemical dependency of any substance, and severe auto-immune complex reaction often have an immediate reduction of symptoms and complications when introduced to infrared (IR) trial lenses or any other trial lenses (e.g., neurochromatic lens) or with an neurochromatic prescription. In one exemplary embodiment, IR lenses are the first choice due to increased probability of increased patient response. In one embodiment, such results occur when each or almost all of the available infrared trial lenses
are used and prescribed. Generally, infrared trial lens are prescribed within the context of a neurochromatic prescription process for the purposes of either treating one of many neurovisual compromises or to enhance visual performance.

[072] In one embodiment, if the patient's history or known dysfunction includes one of the above mentioned visually evoked phenomena, symptoms, or syndromes, it is recommended that the physician have available IR trial lenses for an aggressive and immediate therapeutic intervention. Patients having visually evoked or responses to light which either trigger or agitate the symptoms of a migraine, seizure, unexplained auto-immune responses, and withdrawal symptoms from chemical dependency may experience a reduction, if not cessation, of the symptoms and syndromes within 5-30 seconds of wearing a trial lens saturated to filter the maximum infrared.

[073] It is noted that exposure to a neurochromatic trial lens may trigger any one of the symptoms or syndromes while exposure to any one of the trial lens may immediately halt, control, or diminish the visually evoked migraine, seizure, auto-immune complex response, and symptoms of mood altering drug withdrawal. The determining of the neurochromatic prescription may necessitate exposure to both types of trial lenses. Accordingly, the physician should have infrared trial lenses ready for such type of patients.

[074] In one embodiment, should a patient have any of these dangerous neurovisual processing disorder caused conditions, syndromes, or complications, a physician should apply infrared trial lens to the patient. The complications, syndromes, headaches, seizures (tongue and tongue swallowing emergency responses should be ready), auto-immune and withdrawal symptoms may begin to reverse within approximately five seconds. Complete patient control and reversal of phenomenon might be likely regained within less than 30-60 seconds. The after-effects of those conditions, syndromes, conditions managed within less than five minutes from the applications of the infrared trial lenses.

[075] At block 106, ultraviolet (UV) trial lenses are evaluated for improvement in visual performance and function. The UV trial lenses are evaluated to determine whether to
include UV trial lens in the prescription. This may include determining the UV lens density or frequency or wavelength to be selected (e.g., process 200).

[076] At block 108, color trial lenses are evaluated. This may include determinations of which color or hue of the color trial lenses to include in the prescription (e.g., process 300). In one embodiment, the color trial lenses are separated into color groups each having multiple lenses each corresponding to different frequencies or wavelengths or densities. In one exemplary embodiment, the color groups may include red, orange, yellow, green, blue, indigo, and violet. For example, each color group may have two #1 density lenses, one #2 density lens, and one #3 density lens. The two #1 density lenses may be used together for the patient’s benefit when the patient does not benefit from a #2 density lens. The testing procedure for a color may include a #1 trial lens, #1 and #1 trial lenses, #2 trial lens, and #3 trial lens. The next color group may then be selected and tested. For example, if a blue lens is selected then each of the yellow lenses may be tested to determine which combination results in the greatest improvement in visual performance and function. It is appreciated that the use of each trial lens may remove a negative response of the human eye while increasing the body's response to the remaining transmitted light.

[077] In one exemplary embodiment, each color group has two #1 density trial lenses, one #3 density trial lens, and one #5 density trial lens thereby allowing combinations of various density levels from 1-10.

[078] At block 110, each color trial lens selected is evaluated with and without UV trial lenses. This evaluation may include determining whether to include a selected UV trial lens in combination with the color trial lens based on improvement of visual performance and function. In one embodiment, the UV trial lenses are introduced after a color trial lens is selected because the selected color trial lens may remove a portion of the UV light being transmitted. The evaluation of UV trial lenses may be performed for each color group.

[079] It is noted that darker or lighter refers to how much light is being transmitted to the eye. Darker means there is more color and less light is transmitted to the eye across the entire spectrum. The frequency or wavelength of the color within each trial lens separates the
lens from other lenses. In one embodiment, each color trial lens corresponds to a unique
frequency or wavelength of light.

[080] At block 112, UV trial lens are evaluated. The UV trial lens may be
reevaluated for improvement in visual performance and function after one or more trial lenses
are selected. In other words, consideration of the inclusion or exclusion of the UV trial lenses
is undertaken.

[081] At block 114, a prescription is recorded. The prescription may reflect the
order of the IR, UV, and color trial lenses and thereby the densities or frequencies or
wavelengths that result in visual improvement for the patient.

[082] 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 effective disorder).

[083] 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 determination 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.

[084] 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.

[085] 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.

[086] 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.

[087] Neurochromatic prescriptions determined, as described herein, are operable for enhance visual performance and/or provide neurovisual therapeutic intervention therapy for the symptoms, syndromes, conditions, and anomalies exemplified within Table I. It is appreciated that neurochromatic lenses may provide enhanced visual performance and/or therapy for other symptoms, syndromes, conditions, and anomalies as well.

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>Visual and auditory dyslexia.</td>
</tr>
<tr>
<td>2</td>
<td>Blurred vision not fully corrected by ophthalmic lenses.</td>
</tr>
<tr>
<td>3</td>
<td>Contrast sensitivity compromises.</td>
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</tr>
<tr>
<td>4</td>
<td>Color vision recognition compromises.</td>
</tr>
<tr>
<td>5</td>
<td>Restricted or compromised neurovisual fields of vision.</td>
</tr>
<tr>
<td>6</td>
<td>Convergence and divergence insufficiency.</td>
</tr>
<tr>
<td>7</td>
<td>Unilateral diplopia.</td>
</tr>
<tr>
<td>8</td>
<td>Compromises of night vision.</td>
</tr>
<tr>
<td>9</td>
<td>Wet and dry macular degeneration.</td>
</tr>
<tr>
<td>10</td>
<td>Visual aberrations and delusions not related to a psychotic or delusional condition.</td>
</tr>
<tr>
<td>11</td>
<td>Photophobia.</td>
</tr>
<tr>
<td>12</td>
<td>Visually evoked migraines.</td>
</tr>
<tr>
<td>13</td>
<td>Migraines characterized by aurora, photosensitivity, aberrations, dizziness, limited vision, or blindness.</td>
</tr>
<tr>
<td>14</td>
<td>Post migraines characterized by any one of the above.</td>
</tr>
<tr>
<td>15</td>
<td>Visually evoked seizure phenomena characterized by light stimulation or by any one of the above.</td>
</tr>
<tr>
<td>16</td>
<td>Post seizure activity characterized by any one of the above.</td>
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</tr>
<tr>
<td>17</td>
<td>Cranial and brain hemorrhages.</td>
</tr>
<tr>
<td>18</td>
<td>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.</td>
</tr>
<tr>
<td>19</td>
<td>Some forms of schizophrenia or schizoid phenomena including delusional auditory and visually induced hallucination-type activities.</td>
</tr>
<tr>
<td>20</td>
<td>Reduction in autistic-type over stimulation of the visual and auditory kind.</td>
</tr>
<tr>
<td>21</td>
<td>Compromised saccade performance.</td>
</tr>
<tr>
<td>22</td>
<td>Irregular and inconsistent pupillary responses to light and focus activities.</td>
</tr>
<tr>
<td>23</td>
<td>Compromised cognitive performance not related to conditioned responses of learning or physical development.</td>
</tr>
<tr>
<td>24</td>
<td>Eye pain and strain related to visual performance.</td>
</tr>
<tr>
<td>25</td>
<td>Headaches related to visual pain or strain.</td>
</tr>
<tr>
<td>26</td>
<td>Neck and shoulder pain or distress related to visual stress.</td>
</tr>
<tr>
<td>27</td>
<td>Compromised reading speeds related to visual performance.</td>
</tr>
<tr>
<td>28</td>
<td>Compromised recall related to visual or auditory stimulation.</td>
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<tr>
<td>29</td>
<td>Non-migraine visually induced headaches, stress, or discomfort.</td>
</tr>
<tr>
<td>30</td>
<td>Seasonal affective disorder.</td>
</tr>
<tr>
<td>31</td>
<td>Computer vision syndrome.</td>
</tr>
<tr>
<td>32</td>
<td>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.</td>
</tr>
<tr>
<td>33</td>
<td>Body coordination and physical performance requiring visual stimulation as one of several variables of perception.</td>
</tr>
<tr>
<td>34</td>
<td>Disorientation to space and motion.</td>
</tr>
<tr>
<td>35</td>
<td>Motion sickness.</td>
</tr>
<tr>
<td>36</td>
<td>Fear of heights.</td>
</tr>
<tr>
<td>37</td>
<td>Claustrophobia-type responses that cause a constriction and expansion of pupils seemingly consciously uncontrollable.</td>
</tr>
<tr>
<td>38</td>
<td>Some forms of general and specific anxiety disorders.</td>
</tr>
<tr>
<td>39</td>
<td>Physiologically related artistic performance.</td>
</tr>
<tr>
<td>40</td>
<td>Amblyopic (a.k.a. lazy eye) or wandering eye.</td>
</tr>
<tr>
<td></td>
<td>Excessive eye dominance.</td>
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</tr>
<tr>
<td>42</td>
<td>Suppressive vision or visual performance of one eye not related to eye trauma, disease, or aging.</td>
</tr>
<tr>
<td>43</td>
<td>Specific photophobia related to lighting conditions, working environments, tasks, seasons of the year, or tools.</td>
</tr>
<tr>
<td>44</td>
<td>Post surgical photophobia.</td>
</tr>
<tr>
<td>45</td>
<td>Post traumatic brain injuries independent of hemorrhages or not.</td>
</tr>
<tr>
<td>46</td>
<td>Post traumatic stress disorders or syndromes.</td>
</tr>
<tr>
<td>47</td>
<td>Post concussion hyper-light sensitivity.</td>
</tr>
<tr>
<td>48</td>
<td>Compromised night vision.</td>
</tr>
<tr>
<td>49</td>
<td>Hyper-sensitive night or storm-type related vision compromises.</td>
</tr>
<tr>
<td>50</td>
<td>Myopia phenomena.</td>
</tr>
<tr>
<td>51</td>
<td>Astigmatism phenomena.</td>
</tr>
<tr>
<td>52</td>
<td>Strabismus phenomena.</td>
</tr>
<tr>
<td>53</td>
<td>&quot;Comfort&quot; or &quot;performance&quot; (e.g., + 0.25 to + 0.50) ophthalmic prescriptions.</td>
</tr>
<tr>
<td>Page</td>
<td>Description</td>
</tr>
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</tr>
<tr>
<td>54</td>
<td>Pharmaceutical prescription induced photophobia, e.g., caused by most hormonal based medications such as birth control or menopausal prescriptions.</td>
</tr>
<tr>
<td>55</td>
<td>Compromises in spatial differentiation.</td>
</tr>
<tr>
<td>56</td>
<td>Disparity between reading, writing, or mathematic capabilities as to any or all of these related to kinesthetic and/or mechanical aptitude.</td>
</tr>
<tr>
<td>57</td>
<td>Visual comprehension enhanced by &quot;hearing the words&quot; inside one's head or by reading out-loud to process fully.</td>
</tr>
<tr>
<td>58</td>
<td>The use of a finger or any other kind of marker or place keeper to read and maintain proper tracking.</td>
</tr>
<tr>
<td>59</td>
<td>High end near-sighted prescriptions.</td>
</tr>
<tr>
<td>60</td>
<td>Patients suffering from minor to severe depression (e.g., situational to needs of chronic dimness or brightness of light).</td>
</tr>
<tr>
<td>61</td>
<td>Lacking in physical coordination or clumsiness.</td>
</tr>
<tr>
<td>62</td>
<td>Premature fatigue or sleepiness with prolonged visual tasks including and not limited to driving, reading, sewing, sightseeing.</td>
</tr>
<tr>
<td>63</td>
<td>Nausea or upset stomach with visual tasks.</td>
</tr>
<tr>
<td>64</td>
<td>Abnormal pupillary sizes and shapes not related to bright or darkness.</td>
</tr>
<tr>
<td>65</td>
<td>Patients who experience &quot;glare&quot; or excessive brightness in normal lighting</td>
</tr>
<tr>
<td></td>
<td>conditions and situations.</td>
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<tr>
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</tr>
<tr>
<td>66</td>
<td>Patients who cannot drive at night or in stormy conditions because of failed or compromised vision.</td>
</tr>
<tr>
<td>67</td>
<td>Patients who report a &quot;smudged&quot; or &quot;fogged&quot; vision where upon a physiological examination there are no known causal factors.</td>
</tr>
<tr>
<td>68</td>
<td>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.</td>
</tr>
<tr>
<td>69</td>
<td>Patients who see a white background on the printed page, from art, as having a color or hue, or glare.</td>
</tr>
<tr>
<td>70</td>
<td>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.</td>
</tr>
<tr>
<td>71</td>
<td>Patients affected by chronic and severe fevers.</td>
</tr>
<tr>
<td>72</td>
<td>Patients affected by Down Syndrome.</td>
</tr>
<tr>
<td>73</td>
<td>Patients with compromises in cognitive function caused by disease, accident, or trauma.</td>
</tr>
<tr>
<td>74</td>
<td>Patients with varied degenerative muscular diseases.</td>
</tr>
<tr>
<td>75</td>
<td>Patients affected with chronic fatigue syndrome.</td>
</tr>
</tbody>
</table>
Limited or narrow band of light spectrum photophobia.

Major depression not identified as seasonal affective disorder.

Post traumatic stress disorder visually evoked symptoms.

Patients who complain or say there is excessive glare or aberrations around the words and images of printed material.

Patients who complain or say there never is enough light to read comfortably or effectively.

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.

Patients with albinism.

Compromised visually evoked responses.

Situational visual compromise or visual difficulties.

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

[088] Figure 2 shows a flowchart of an exemplary process for selection of an ultraviolet (UV) trial lens in accordance with an embodiment of the present invention. Process 200 may be performed by a physician (e.g., optometrist or ophthalmologist) to select an UV lens for a neurochromatic prescription.
At block 202, a lighting element is activated. In one embodiment, the light element may be full spectrum light operable for use in creating a full spectrum lighting environment. The lighting element may be a full room testing light. It is noted that without an appropriate lighting element diagnoses and neurochromatic prescriptions may be negatively impacted.

It is appreciated that testing and prescribing of neurochromatic lenses may necessitate a specific exposure to specific light where the patient experiences compromised visual performance and corresponding symptoms (e.g., headaches or eye strain). Common causes may be environmental, vocational, or sports related (e.g., glare in a baseball field, under light lights, "that time of day," or using equipment during a dental hygienic cleaning).

Generally speaking, patients are exposed to each of the lowest density or the lightest color (e.g., #1 of each of the group of colors or tinted neurochromatic lenses). Each trial lens maybe be inserted by the physician into the sliding tray of a refractor device (e.g., neurochromatic refractor) and compared with another lens of another color or same color just as two lenses would be compared in a standard ophthalmic refractive process in eye examinations. A patient observes an object selected and determined by a physician. In one embodiment, the same object will be used throughout the entire examination. The physician may then determine which of the trial lenses makes the object observed the most in focus, most clear, and easiest to see for the patient.

In one embodiment, the order in which lens (e.g., UV and color lens) are selected is maintained during the prescription determination process. Close attention to the order the lens are prescribed is maintained because lens from the prescription will be manufactured according to the ordering in the prescription. For example, the first lens selected will be farthest from the patient's eye and each successive lens will be closer to the patient's eyes.

The prescription reflects the order in which the trial lenses are within the selected tray during the prescription process. In one embodiment, the neurochromatic refractor device and neurochromatic refractive prescriptions can accommodate up to six trial...
lenses which are incorporated and ordered by the physician to manufacture a single eyewear prescription. For example, the first chosen lens will be placed furthest from the eyes. In one exemplary embodiment, the neurochromatic refractor device may accommodate up to seven trial lens (e.g., six color lenses and one UV lens).

[094] Referring to Figure 3, Figure 3 shows a diagram of an exemplary configuration of selected trial lenses and a trial lens being tested in accordance with an embodiment of the present invention. Diagram 300 includes trial lenses 302a-d, patient's eye 310, and slide channel 308. Slide channel 308 may be part of a refractor device, as described below, and facilitates testing of trial lens 302a by allowing trial lens 302a to be brought in and out of the patient's line of sight 312.

[095] Selected trial lenses 304 include trial lenses 302b-d which have been selected on the basis improving the visual performance and visual function of the patient. In one embodiment, as each trial lens is selected, the selected trial lens is placed in front of the previously selected lenses. For example, if trial lens 302 is selected, trial lens 302 will be placed in position 306 in front of selected trial lens 304. As shown in diagram 300, trial lens 302d was selected before trial lens 302c which was selected before trial lens 302b.

[096] In one embodiment, the UV lens is maintained in a position farthest from the patient's eyes during the prescription process. During the prescription process if an UV trial lens is rejected in the first round of the neurochromatic refraction prescription process, the UV trial lens may be reintroduced after each of the other trial lenses (e.g., color trial lenses) have been rejected. Each of the UV trial lenses may be reintroduced at the outermost distance away from the eyes.

[097] The prescription process may be completed with use of a neurochromatic refractor device as described in Figures 9-20. The other trial lenses (e.g., non-UV) may be positioned in the refractor device in the order the lenses are prescribed with the first lens being farthest away from the patient's eyes and the last prescribed trial lens being closest to the patient's eyes.
It is appreciated that for accurate neurochromatic prescriptions, patients should wear their ophthalmic prescription during the neurochromatic refractive process. It is appreciated that if a patient wears a tinted lens, an anti-glare reflective lens, an ultraviolet coated lens, a progressively darkening lens (e.g., Corning Photo-Grey lenses), Transition lenses, or polarized lenses, the prescription process may be negatively impacted. In one embodiment, patients with contacts should wear them during the neurochromatic prescription process. The contact prescription should be free of any tint, which may introduce error into the neurochromatic prescription process.

Patients with surgically implanted artificial lens which have 100% UV protection need not be exposed to the UV trial lenses. This is also true for patients having ophthalmic prescriptions that already have an UV coating. Accordingly, the presence or non-presence of an UV coating may be determined prior to the neurochromatic prescription process.

The addition of an UV trial lens is anticipated to be about 50%. It is appreciated that the restriction of transmission of some UV light through a plastic lens is already inhibited by absorbing and distillation of the UV frequency within the plastic lens itself. Consequently, only some patients may require further reductions of the UV frequency.

Referring back to Figure 2, at block 204, a first UV trial lens is selected. In one embodiment, a pre-selected lowest density UV trial lens (e.g., UV #1) is placed into a neurochromatic refractor in such fashion that a patient may view through the UV trial lens at a near-point reading object or a far-point eye chart. The objective being to improve or enhance the visual clarity, acuity, or functional sight by having the patient look through the UV trial lens. The exact line or object of either the near or far point eye chart may be designed by the physician. The physician may then direct and ask the patient to follow the physician's instructions and comment upon the visual clarity or acuity with and without the patient viewing the selected object through the UV neurochromatic trial lens.

At block 206, whether there is an improvement in visual function is determined. Based on subjective and existential reporting of the patient, determination of the
visual clarity or performance and function may be determined. The physician may easily
measure and confirm what the patient has reported using the physician's standards applicable
during routine eye or ophthalmic examinations. In one embodiment, a camera may be used to
record the neurochromatic prescription process. The camera may be attached or coupled to a
phoropter and/or a neurochromatic refractor. The camera allows the physician to observe and
record pupillary responses and thereby determine the most proper trial lens or lenses (e.g.,
neurochromatic lenses). The camera allows recording of prescription process in accordance
with external examination determinations subsequent to approval of specific neurochromatic
CPT (Common Physician Terminology) and IDC (International code of Diagnostic) codes.

[0103] The camera allows monitoring of the pupillary response and determining
whether the pupil shape has responded to the trial lens. The camera thereby allows
assessment, diagnosis, and treatment for pupillary conditions. For example, the camera
allows watching for a normalized pupillary response which occurs with stabilized and
enhanced vision. The camera further allows monitoring of pupil movement to determine
which trial lenses are more effective, which show poor pupil movement, and which show
good pupil movement. It is appreciated that monitoring the patient's pupillary response
provided a cross check to determine whether the patient's response is objective or subjective.
In one exemplary embodiment, the camera is used to record a time tagged movie of the
patient's responses to the trial lens which may be stored on a computer.

[0104] The physician may observe the patient taking into account both the ease upon
which, and the time allotted to sustain and maintain focus with and without the UV trial lens.
The physician may further take into account the variety of pupillary reactions including both
size and shape of the patient's pupil denoting consistency of a uniform pupillary response
eye-to-eye and uniform circular shape corresponding to and consistent with normal versus
abnormal or statistically infrequent pupillary responses to a fixed object of focus.
Observation of pupillary response may be done via physician observation or by using a
camera attached to an arm of a neurochromatic refractor.

[0105] If the patient reports back either an improvement or enhancement of visual
clarity or performance and function with the UV trial lens versus viewing the object without
the UV trial lens then the UV trial lens is selected over no UV trial lens. The patient's reporting of an improvement of, or an enhancement with the UV trial lens should correspond with the physician's observation that the patient's ease of focus and pupillary responses are more normalized when viewing through the UV trial lens. If the patient and the physician are unable to evoke a positive improvement of visual function or performance, the UV trial lens should not be selected or chosen. If there is an improvement, block 208 is performed. If there is no improvement, block 214 is performed.

[0106] At block 208, the next UV trial lens is selected. If the patient has selected the initial UV trial lens (e.g., UV trial lens #1), then the physician selects the next highest density of the UV scale (e.g., UV trial lens #2) for comparison against the initially selected UV trial lens. In one embodiment, using a routine refraction of either plus or minus ophthalmic lenses the physician and patient may either select or reject UV trial lens #1 or #2.

[0107] At block 210, whether there is an improvement in visual function is determined. If there is not an improvement, block 212 is performed. If there is an improvement block 208 is performed. If the patient has selected UV trial lens #2, then UV trial lens #2 may be compared against UV trial lens #3. It is appreciated that additional levels of increasing density of UV trial lens may be tested and embodiments of the present invention are not intended to be limited to the exemplary discussion of three UV trial lens (e.g., #1 - 3).

[0108] At block 212, the previous UV trial lens that resulted in improvement in visual function is placed in a holding mechanism. For example, if the patient has rejected UV trial lens #2 and favors UV trial lens #1, then the UV trial lens #1 is selected to remain in the neurochromatic refractor's sliding tray. Whichever of the UV trial lens selected (e.g., resulting in improved visual acuity) is placed into the holding mechanism (e.g., tray) of the neurochromatic refractor and subsequently compared with the rest of the trial lenses (e.g., tinted or colored trial lenses).

[0109] At block 214, whether there are any remaining UV trial lenses to be tested is determined. If the patient has rejected UV trial lens #1, the physician will compare the patient's vision with UV trial lens #2 and #3 by placement and viewing via the
neurochromatic refractor's hold-sliding tray for comparative analysis, rejection, or selection (e.g., via blocks 216 and 206). At block 216, the next UV trial lens is selected.

[01 10] At block 218, color trial lens are evaluated or tested. The color trial lens may be tested as described with respect to Figure 4.

[01 11] Figure 4 shows a flowchart of an exemplary process for selecting one or more color trial lenses in accordance with an embodiment of the present invention. Process 400 may be performed by a physician (e.g., optometrist or ophthalmologist) to select one or more color trial lenses for a neurochromatic prescription. Process 400 may be performed whether or not a patient has selected an UV trial lens. A physician may expose the patient to color trial lenses starting with the lightest color, hue, or density of each of the colors present in a trial lens kit. The lowest density of each color trial lens may be marked or labeled #1 and each increasingly dense trial lens may be marked with a #2, #3, etc. For example, a blue colored or tinted trial lens may be identified as "BL 1," "BL 2," and "BL 3."

[01 12] In one exemplary embodiment, the #1 lens is the lightest lens, #2 lens is next darkest, and #3 is the darkest. In one embodiment, process 400 is performed starting with the lightest lens for each color and then subsequent lenses which are increasingly dark. Increasingly dark lenses may thus be tried while improvements are observed and when a trial lens just results in increased darkness (e.g., casting a shadow or a sun glass effect), trial lens selection is made of the previous trial lens resulting in improvement in visual function. It is appreciated that a #1 lens may not be half as dark as a #2 lens. For example, a yellow #1 lens may be a very light yellow that may be hardly noticeable while a yellow #2 lens may have a tint substantially similar to a yellow traffic sign. It is noted that the different densities correspond to different frequencies or wavelengths that the trial lenses transmit.

[01 13] At block 402, a color is selected. The color may be selected based on pathology of a patient or based on an ordering of a lens trial kit (e.g., color groups). In one embodiment, the basic colors are tested first.
At block 404, a first color trial lens is selected. In one embodiment, the first color trial lens selected has the lowest density for the selected color. For example, it may be the lowest density blue trial lens of the trial lens kit (e.g., blue #1).

At block 406, whether there is an improvement in visual function is determined. If there is an improvement block 408 is performed. If there is not an improvement, block 426 is performed.

As the physician exposes the patient to each of lightest color or lowest density of the trial lenses, the physician observes the patient taking into account both the ease upon which and the time allotted to sustain and maintain focus with each of the trial lenses. The physician may also take into account both the size and shape of the patient's pupils denoting consistency of a uniform pupillary response eye-to-eye and uniform circular shape corresponding to normal versus abnormal pupillary responses to a fixed object of focus.

At block 408, the next color trial lens is selected. As the prescriptive process is performed, each density of the selected color of the trial lenses is tested against the other trial lenses for the selected color. For example, a blue #1 trial lens is compared with a blue #2 trial lens. If the #2 trial lens is selected over a #1 trial lens, then the #2 trial lens is compared with a #3 trial lens. The same clinical and visual criteria for the trial lens selection is to be maintained by the prescribing physician as during an ophthalmic prescription.

At block 410, whether there is an improvement in visual function is determined. If the patient reports either an improvement of visual function or an enhancement of visual clarity or performance and function with the trial lens versus viewing the same object without the color trial lens, then the trial lens is selected. If there is an improvement, block 408 is performed. If there is not an improvement, block 412 is performed.

At block 412, the previous color trial lens is placed in a holding mechanism. If the patient's visual criteria is either improved or enhanced and the patient sees a color or any through the lens as a tint, then the darker or denser trial lens has been over-prescribed. Then
the lower density trial lens with an observable improvement and without the perceived tint is selected. The selected lens is placed in the holding rack of the refractive device closest to the patient's eyes. If an UV trial lens was previously selected, the color trial lens will be placed closer to the patient's eyes than the UV trial lens. In one embodiment, the selected lenses are added from the back toward the eye. For example, the second color trial lens selected is placed in front of (or closer to the patient's eye) than the first selected color trial lens or UV trial lens.

[0120] The physician selection process therefore determines which color groups and which specific densities of the trial lenses in each color group that result in improvement in terms of visual function and visual performance. For example, blue may be selected over yellow based on the patient's responses and the physician observed improvements in the patient's visual function or performance.

[0121] At block 414, whether an UV trial lens was previously selected is determined. If an UV trial lens was previously selected, block 416 is performed. If an UV trial lens was not previously selected, block 424 is performed.

[0122] In one embodiment, if an UV trial lens was previously selected prior to a colored trial lens, then the choice for or against the UV trial lens should be challenged. This may include the density of the UV trial lens selected. Consequently, the physician removes the UV trial lens and compares the color trial lens with and without the UV trial lens of each density. For example, a selected color trial lens is compared with UV trial lenses of #1 density, #2 density, and #3.

[0123] At block 416, the UV trial lens is removed.

[0124] At block 418, whether there is an improvement in visual function is determined with and without an UV trial lens. If there is an improvement, block 420 is performed. If there is not an improvement, block 422 is performed.
[0125] Based on the clinical observations and the patient's improvement or enhancement of vision, the physician determines both the need for and the particular density of the UV trial lens to be selected as one of the component frequencies or wave lengths of light included or excluded from the refraction or neurochromatic prescription.

[0126] At block 420, the UV trial lens is removed from the selected trial lenses. For example, the UV trial lens may be removed from the holding mechanism of a neurochromatic refractor. In one embodiment, the UV trial lens is returned to the trial lens kit.

[0127] At block 422, the UV trial lens is returned to the holding mechanism because the UV trial lens improves visual function.

[0128] At block 424, reevaluation for UV trial lens is performed. For example, a patient, who previously did not select an UV trial lens, is checked for improvement with UV trial lenses. In one embodiment, the UV trial lenses of each density are tested one at time in the neurochromatic refractor at the furthest position from the patient's eyes. The physician and patient continue to execute and rely upon the same clinical standards of measurement of visual acuity, visual ease and comfort, performance, and enhancement as the clinical criteria for including an UV trial lens as one of the prescriptive elements of the neurochromatic prescription. It is appreciated that it is not uncommon for a patient who has not selected an UV trial lens to select one. Similarly, it is appreciated that it is not uncommon for the UV trial lens to be rejected at the end of the prescriptive process.

[0129] At block 426, whether any colors (e.g., color groups) remain to be tested is determined. If colors remain, block 428 is performed. If there are no other colors to be tested, block 430 is performed.

[0130] At block 428, a next color is selected. In one embodiment, the next color group selected is based on an ordering of the trial lens kit.
[0131] At block 430, the neurochromatic prescription based on the trial lens selected is recorded. In one embodiment, the prescriptive process is complete when a patient accepts the a trial lens or lenses and the addition of another trial lens compromises or make difficult the patient's visual acuity, visual performance, visual function, or there is a notable reduction of the patient's visual performance. That is, a neurochromatic prescription may be complete when visual performance and enhancement cannot be improved by the addition of other trial lenses.

[0132] In one embodiment, any one of a plurality trouble shooting strategies may be undertaken by a physician during the prescriptive process. It is noted that in approximately 10% of the time a patient and physician may be unable to determine the benefit by comparison between any two of the physician selected neurochromatic trial lenses. It is noted that this is not of concern as the manufactured neurochromatic trial lenses do not individually or in collection with other trial lenses combine to articulate a neurochromatic prescription to exemplify each and every color or hue that effect the patient neurologically or neurophysiologically by impacting the patient's neurovisual processing within the brain itself.

[0133] A variety of strategies may be used to accomplish a more thorough exposure to more of the visual and non-visual spectrum to which the patient may respond favorably. These strategies may include: 1) varying the hue, intensity, or density (e.g., darkness of color) of the selected trial lenses, 2) changing the order of the initial neurochromatic trial lens prescription, 3) eliminating one or more of the initially selected trial lens (e.g., when there are three or more lenses within the prescription itself), 4) prescribing a slight modification to one or more of trial lenses, and 5) an overt challenge to a pre-existing ophthalmic prescription.

[0134] Changing the hue, density, color: If a patient has undistinguishable differentiation between any two of the trial lenses, by increasing each of the two trial lenses up the next highest density or color (e.g. up from a #1 to a #2, or up from a #2 to a #3), then a patient and physician can observe whether there is a benefit for each hue, density, or color.

[0135] In one embodiment, if the patient has selected a second or third level density trial lens (e.g., #2 or #3), by reducing the density of that selected trial lens, or all of the second
or third preselected lenses may make it possible for the patient to select the appropriate trial lens. The increased or decreased density lenses may then be inserted into the neurochromatic refractor device for testing and the prescriptive process continued thereby resolving the dilemma of a choice between any two of the trial lenses. The increased or decreased density trial lens should be inserted in place of the trial lens being replaced to maintain the ordering of trial lenses.

[0136] Changing the order in which the trial lenses were selected: Patient and physician selections of neurochromatic trial lens may result in patients being confused by dysfunctions of general photophobia and neurovisual processing disorders. A patient may experience immediate comfort which may cause the patient and physician to initially choose the wrong trial lens. This may be due to selection of comfort over pathology. For example, the absence of eye strain may favorably alter a patient's pupil shape and be confusing for the physician. The cause of this may be that the resulting comfort the patient is experiencing is a result of the pathology to a frequency of light which has been detrimentally affecting neurovisual processing and thereby causing the symptoms. Though trial and error, with the exception of the UV trial lens, changing the order of the trial lens prescriptions and determining the results favoring the more functional or enhanced vision in each altered order of the initial trial lens selection or prescription may then be performed. The examination and prescription process may then be continued in the order determined.

[0137] Eliminating one or more of the previous neurochromatic trial lenses: Patients who present with multiple neurovisual and neurovisual processing disorders, symptoms or syndromes, are most commonly severely photophobic. Thus, darkness of any kind provides relief to such patients. For the physician this is problematic because symptoms, syndromes, and disorders often camouflage each other, thereby making it difficult to clinically differentiate. This may lead to these patients being prescribed multiple trial lenses of greater density.

[0138] However, once darkness is accomplished addressing most likely photophobia of a more general sort versus wave-length or frequency specific photophobia, the selection of more specific trial lenses is now possible. In one embodiment, upon the patient reporting that
a trial lens is too dark or observes a tint when looking through the trial lens onto a white surface, there are two options: 1) reduce the density or hue of any trial lenses that do not exemplify a base trial lens (e.g., #1 trial lens) which has previously been prescribed or 2) completely eliminate any one of the trial lenses within the prescriptive formula choosing from the selection the specific trial lens for which the patient will denote a color or hue on a white surface during the examination and prescriptive process.

[0139] Increasing or decreasing the predetermined trial lens selected: Some patients may require increased darkness or hue while some patients will require less darkness or hue than in the trial lenses. Patients needing increased darkness or hue may be prescribed a quarter gradient. For example, if blue #1 is insufficient while blue #2 is an over prescription (e.g., seeing color or tint on white object), the prescription could be blue #1 + 50%. Similarly, if blue #1 is an over prescription, the prescription could be blue #1 - 50%.

[0140] Challenge an ophthalmic prescription: Due to the complexity of visual systems, the natures and pathologies of some patients, the ophthalmic prescription may be in error. Such an error is frequently a manufacturing error not congruent with a physician's orders. It is also possible that the physician did a "best guess" ophthalmic prescription. An ophthalmic prescription in error will likely negatively impact the ability to make an accurate neurochromatic prescription.

[0141] In one embodiment, the following three strategies may be performed. First, the ophthalmic prescription may be checked and verified for manufacturing error at another manufacturing laboratory other than the one which manufactured the lenses. If an error is found, the lenses may be remanufactured matching the physician's prescription.

[0142] Second, to the extent possible the closest neurochromatic prescription may be determined. A completely accurate neurochromatic prescription may not be possible because the ophthalmic prescription is not accurate. However, using the neurochromatic prescription in front of the patient's eyes and another ophthalmic refractive examination may be performed. If there are ophthalmic changes, which may be common, another neurochromatic
prescription process may then be performed when a more correct and altered ophthalmic
prescription can be worn by the patient.

[0143] Third, in some cases a patient's neurovisual processing is so negatively
effected by the light that a physician cannot determine an appropriate nor accurate ophthalmic
prescription. In such a case, a neurochromatic resultant lens may be made prior and worn
during the standard ophthalmic examination. Generally, the physician will be able to more
readily and accurately determine a standard ophthalmic prescription by having the patient
view through the trial lens with the patient holding the selected trial lens in place. After the
ophthalmic prescription is prescribed, the neurochromatic prescription may be removed and
the neurochromatic prescription redone. It is expected that the neurochromatic prescription
will be different.

[0144] It is appreciated that protection from an over-prescription should be quickly
undertaken. Over-prescription may manifest as a compromised vision including making
visual function blurry. Procedures to protect from over-prescription may include:

[0145] Visual performance and function have been improved by assessing before and
after criteria established by pre-existing symptoms and syndromes therapeutically address by
the prescribed neurochromatic lenses.

[0146] White appears white while colors become more distinct, more bold, with
notable improvements in contrast sensitivities noted and treated with neurochromatic lenses.
White may appear to a patient as very slightly "shaded." In other words, abnormally higher
amounts of "glare" have been neurochromatically altered by the neurochromatic trial lens.

[0147] Improvements in saccade should be noted. There will be increased ease in
sight recognition, reading speed, and flow while a patient is wearing the neurochromatic
lenses as compared to not wearing the neurochromatic lenses.
[0148] Patients should have a measurable increase in visual performance and function at all distances with the resultant prescribed neurochromatic lenses as compared to the same viewing without the neurochromatic lenses. Patients should have a measurable increase in their visual fields as a result of wearing the resultant prescribed neurochromatic lenses as compared to the same determination without the wearing of the prescribed neurochromatic lenses.

[0149] Longstanding conditions, symptoms, syndromes, complications (e.g., cerebral hemorrhage, strokes, brain swelling, and reduced consciousness) will frequently respond favorably to trial lens and neurochromatically prescribed lenses. The observation in terms of positive changes within the patient may take days or weeks. It is noted that since neurochromatic lenses are a noninvasive therapeutic intervention, little if any harm can be done. It is appreciated that many patients have dramatic improvements through the use of neurochromatic prescriptive lenses.

[0150] Figure 5A-B show exemplary neurochromatic prescriptions in accordance with embodiments of the present invention. Figure 5A shows an exemplary prescription 500 comprising ophthalmic prescription 502 and neurochromatic prescription 504. Ophthalmic prescription 502 may be a conventional ophthalmic prescription (e.g., for near-sightedness or far-sightedness). Neurochromatic prescription 504 comprises NVC-Rx Bl-2, Yl-1 which indicates that the patient needs a lens with blue of #2 density or frequency or wavelength and yellow of #1 density.

[0151] Figure 5B shows an exemplary neurochromatic prescription 550. Prescription 550 may be for a patient who has normal vision (e.g., does not need an ophthalmic prescription) but can benefit from neurochromatic lenses. Prescription 550 includes neurochromatic prescription 552 which comprises NVC-Rx IR-1, Bl-2, Yl-1, UV-1 which indicates that the patient needs a lens with infrared of #1 density or frequency or wavelength, blue of #2 density, yellow of #1 density, and UV of #1 density.

[0152] Lenses may then be manufactured in accordance with the order of the prescription. The trial lenses that are selected correspond to the layers of the resultant lens.
and reflect the order of lens saturation. In one embodiment, the order is a contingent component in the manufacturing process. In one embodiment, the resultant lens material is heated and dyed with a first frequency or wavelength, bleached back, and then dyed with a second frequency or wavelength. The heating allows for some expansion and facilitates increased absorption of the dyes. The amount of time and the temperature impact the lens darkness. In one embodiment, a resultant lens based on the prescription has an intermingling (or saturation) of the adjacent dyes. For example, a resultant lens having Blue #1 and Yellow #2 would have a region of intermingling of blue #1 and Yellow #2.

EXEMPLARY NEUROCHROMATIC TRIAL LENS KIT

[0153] Figure 6 shows a block diagram of an exemplary trial lens kit in accordance with an embodiment of the present invention. Exemplary trial lens kit 600 includes trial lenses 620-674. Figure 1 depicts an exemplary grouping or ordered arrangement according to characteristics of each lens of trial lens kit 600. Each trial lens of trial lens kit 600 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 600 includes 100 lenses. It is appreciated that trial lens kit 600 can have any number of lenses.

[0154] In one exemplary embodiment, exemplary trial lens kit 600 includes groups 602-610. It is noted that groups 602-610 are exemplary and that exemplary trial lens kit 600 may comprise more or less groups and embodiments of the present invention are not limited to groupings of groups 602-610. It is further noted the groups 602-610 may comprises more or less trial lens than shown in Figure 6 and are not limited to the number of lenses corresponding to groups 602-610. Each of groups 602-610 may comprise similar properties associated with treating one or more pathologies or pupillary anomalies.

[0155] In one embodiment, trial lens kit 600 is operable for determining a chromatic or neurochromatic prescription as described in Figures 1-5B and 21-23.
In one embodiment, trial lens kit 600 and corresponding groups 602-610 are arranged so that a physician may move sequentially through the lenses of lens kit 600 providing visual samples to a patient to determine a neurochromatic prescription. In one exemplary embodiment, trial lens kit 600 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 602-610 may be combined to arrive at a chromatic prescription and thus a prescriptive lens. In one embodiment, trial lens kit 00 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, California.

Exemplary groupings of trial lens kit 600 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 II. It is appreciated that trial lens kit 600 may have different groupings than those shown in Table II. In one embodiment, trial lens kit 600 is arranged such that a physician can step through lens kits in the order shown in Table II (e.g., starting with UV trial lenses in the bottom left front corner of trial lens kit 600 and continuing up over, down, and up through lens kit 600). Exemplary spectrometry readings and corresponding information of exemplary trial lens kit 600, in accordance with one embodiment, are shown below in Appendix A.

<table>
<thead>
<tr>
<th>Group / Lens</th>
<th>Visible Light Transmitted (%)</th>
<th>Red Transmitted (%)</th>
<th>Green Transmitted (%)</th>
<th>Yellow Transmitted (%)</th>
<th>Blue Transmitted (%)</th>
<th>UV Transmitted (%)</th>
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<tbody>
<tr>
<td>1 Ultraviolet (UV) Group</td>
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</table>

Exemplary groupings of trial lens kit 600 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 II. It is appreciated that trial lens kit 600 may have different groupings than those shown in Table II. In one embodiment, trial lens kit 600 is arranged such that a physician can step through lens kits in the order shown in Table II (e.g., starting with UV trial lenses in the bottom left front corner of trial lens kit 600 and continuing up over, down, and up through lens kit 600). Exemplary spectrometry readings and corresponding information of exemplary trial lens kit 600, in accordance with one embodiment, are shown below in Appendix A.

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<th>Green Transmitted (%)</th>
<th>Yellow Transmitted (%)</th>
<th>Blue Transmitted (%)</th>
<th>UV Transmitted (%)</th>
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<tbody>
<tr>
<td>1 Ultraviolet (UV) Group</td>
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<tr>
<td>Group / Lens</td>
<td>Visible Light Transmitted (%)</td>
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</tr>
<tr>
<td>UV Lens #1 (UV1)</td>
<td>95.9%</td>
<td>96.7%</td>
<td>95.6%</td>
<td>96.4%</td>
<td>95.3%</td>
<td>0.1%</td>
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<tr>
<td>UV Lens #2 (UV2)</td>
<td>95.4%</td>
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<td>95.2%</td>
<td>95.9%</td>
<td>94.9%</td>
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<td>UV Lens #3 (UV3)</td>
<td>95.7%</td>
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<td>96.2%</td>
<td>95.1%</td>
<td>0.0%</td>
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<tr>
<td>2 Neutral Density Group: Reduces Spectrum (e.g., removing glare and providing darkness)</td>
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<tr>
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<td>83.5 %</td>
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<tr>
<td>Group / Lens</td>
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<td>3 Infrared (IR) Lens Group</td>
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<td>2.1 %</td>
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<tr>
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</tr>
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</tr>
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<td>97.0%</td>
<td>90.2%</td>
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<td>Visible Light Transmitted (%)</td>
<td>Red Transmitted (%)</td>
<td>Green Transmitted (%)</td>
<td>Yellow Transmitted (%)</td>
<td>Blue Transmitted (%)</td>
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<td>2.8%</td>
</tr>
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<td>Group / Lens</td>
<td>Visible Light Transmitted (%)</td>
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<td>Blue Transmitted (%)</td>
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</tr>
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<td>Group / Lens</td>
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<td>Red Transmitted (%)</td>
<td>Green Transmitted (%)</td>
<td>Yellow Transmitted (%)</td>
<td>Blue Transmitted (%)</td>
<td>UV Transmitted (%)</td>
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<td>Group / Lens</td>
<td>Visible Light Transmitted (%)</td>
<td>Red Transmitted (%)</td>
<td>Green Transmitted (%)</td>
<td>Yellow Transmitted (%)</td>
<td>Blue Transmitted (%)</td>
<td>UV Transmitted (%)</td>
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<td>84.0%</td>
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<td>Group / Lens</td>
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<td>Green Transmitted (%)</td>
<td>Yellow Transmitted (%)</td>
<td>Blue Transmitted (%)</td>
<td>UV Transmitted (%)</td>
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<td>Group / Lens</td>
<td>Visible Light Transmitted (%)</td>
<td>Red Transmitted (%)</td>
<td>Green Transmitted (%)</td>
<td>Yellow Transmitted (%)</td>
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</tr>
<tr>
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<td>83.7%</td>
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<tr>
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<td>72.2%</td>
<td>83.5%</td>
<td>2.1%</td>
</tr>
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</table>

Table II - Exemplary Trial Lens Kit Groupings and Characteristics

[0158] In one exemplary embodiment, trial lens kit 600 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.

[0159] One or more trial lenses of trial lens kit 600 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.
[0160] 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.

[0161] 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. 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. The following terms may be trademarked or protected: neurochromatic and neurochromatic refraction.

[0162] 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).

[0163] Each lens of trial lens kit 600 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.

[0164] 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.

[0165] Trial lens kit 600, 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 I. Each wavelength or frequency may be selected to address pupillary anomalies and/or address the ailments of Table I. It is appreciated that neurochromatic lenses may provide enhanced visual performance and/or therapy for other symptoms, syndromes, conditions, and anomalies as well.

[0166] Figure 7 shows a block diagram of an exemplary trial lens in accordance with an embodiment of the present invention. Figure 7 depicts exemplary trial lens 700 including viewing area 702 and label area 710. In one exemplary embodiment, one side of trial lens 700 has a scratch resistant coating.

[0167] Label area 710 facilitates handling of exemplary trial lens 700 such that viewing area 702 is not touched or collects fingerprints. In one embodiment, label area 710 includes trial lens identifier 712 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 712 may indicate that exemplary trial lens 700 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 712 may be laser engraved in exemplary trial lens 700 and may further include a tradename or trademark (e.g., NCV-Rx).
[0168] Viewable portion 702 is the portion of exemplary trial lens 700 that has been modified to filter out a specific wavelength or frequency of light. In one embodiment, viewable portion 702 comprises areas 720 which are the areas that a patient looks through during the determination of chromatic prescription. The chromatic prescription may be determined as described in Figures 1-5B and 21-23. The determination of the prescription may be determined using a refraction device as described in Figures 9-20.

[0169] In one embodiment, an exemplary trial lens 700 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 700 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 dying process as described herein). In one exemplary embodiment, trial lens 700 may be made out of piano optical quality tintable plastic.

[0170] In one embodiment, trial lens 700 is designed to substantially match ophthalmic standard and in particular allows use of the lens while light comes in from behind the patient looking though trial lens 700.

[0171] Figure 8 shows a block diagram of an exemplary case in accordance with an embodiment of the present invention. Exemplary case 800 comprises top portion 810, trial lens holder 806, and bottom portion 802. Exemplary case 800 is operable to facilitate transportation of a trial lens kit (e.g., trial lens kit 600) and optional refractor device (e.g., refractor device 804).

[0172] In one embodiment, exemplary case 800 comprises two layers: a first layer for holding or storing refractor device 804 in bottom portion 802 and a second layer for holding or storing trial lenses 808 (e.g., trial lens kit 600) in trial lens holder 806. Trial lens holder 806 may be removed (e.g., lifted out) from exemplary case 800 to allow for access to refractor device 804. Trial lens holder 806 may be made of wood, foam, or any material capable of supporting trial lenses 808 during transportation without causing damage to trial lenses 808. In another embodiment, exemplary case 800 is a reversible case that allows removal of
refractor device 804 from one side of the case and removal of trial lenses 808 from the other side of the case. Exemplary case 800 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 800 may be made with a variety of metals including stainless steel, aluminum, high impact plastic, or other materials. In one embodiment, exemplary case 800 may be 16 inches long and 14 inches wide and have ½ inch spacing between trial lenses.

[0173] Refractor 804 may be folded up for storage in bottom portion 802. Refraction device 804 may be a neurochromatic refractor device as described in Figures 9-20. Refractor device 804 and trial lenses 808 facilitate determination of a chromatic prescription.

[0174] 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 effective disorder).

[0175] 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 determination 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.

[0176] 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.

[0177] 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.

[0178] 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.

**EXEMPLARY NEUROCHROMATIC REFRACTOR**

[0179] Embodiments of the present invention comprise an apparatus to facilitate selection of trial lenses and determination of a neurochromatic prescription for a patient. Embodiments of the present invention allow a physician to observe a patient's eyes during the prescription process and thereby observe, among other things, expansion of visual field and calming of the letters, words, and enhanced neural visual processing, retention, and reduction of reaction time. Embodiments of the present invention provide for centering of trial lenses within a patient's line of sight during the prescription process.

[0180] 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. Embodiments of the present invention are further operable for use in improving 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 are operable for use in performing neurochromatic diagnostic and treatment inquiry, therapeutics, and components of an eye examination. Embodiments of the present invention may make use of Neurochromatic© lens or trial lens available from NeuChroma Vision, Incorporated of Redding, California.

[0181] Figure 9 shows a diagram of a side view of an exemplary refraction apparatus in accordance with an embodiment of the present invention. Figure 9 shows exemplary refraction apparatus 900 from the side. Exemplary refraction apparatus 900 includes base 902, lower portion or adjustable height support 904, upper portion 908, and phoropter bar 938. In one embodiment, exemplary refraction apparatus 900 has metric dimensions and is operable for use with metric sized trial lenses.

[0182] In one embodiment, exemplary refraction apparatus 900 can be used with a trial lens kit as described in Figures 6-8. In one exemplary embodiment, exemplary refraction apparatus 900 is operable for use in determining a chromatic or neurochromatic prescription as described in Figures 1-5B.

[0183] Base 902 provides support and stability for other portions of exemplary refraction apparatus 900. Base 902 may be weighted to provide stability to exemplary refraction apparatus 900. Base 902 may be further operable to provide a sturdy protective base frame for protecting other parts of refraction apparatus 900 (e.g., upper portion 908) during transport. In one embodiment, base 902 comprises metal (e.g., steel) and may be coated with a black crinkle finish to prevent light from being reflected by base 902 and provide friction between a surface (e.g., table) and exemplary refraction apparatus 900. In one exemplary embodiment, base 902 comprises granite (e.g., black granite). It is appreciated
that any coating that reflects little or no light may be used on base 902. In one embodiment, base 902 may be 700 mm in length with a height and width of 20 mm.

[0184] Base 902 is coupled to adjustable height support 904 which provides a vertical mounting portion for upper portion 908 to rest on. Adjustable height support 904 includes height adjustment lock 906 which allows a user or physician to adjust the height of exemplary refraction apparatus 900 for a patient. Height adjustment lock 906 allows the height to be variable and adjusted and/or locked in for each patient. In one embodiment, height adjustment lock 906 is locked with downward force thereby allowing the height to be locked in without exemplary refraction apparatus 900 shifting. For example, a physician using height adjustment lock 906 will be pushing toward the surface that exemplary refraction apparatus 900 is resting upon (e.g., a table). The locking of height adjustment lock 906 may involve a small motion with a relatively eccentric cam.

[0185] In one embodiment, upper portion 908 is coupled to adjustable height support 904 and is coupled to phoropter bar 938. Upper portion 908 may be made of injected molded plastic. Phoropter bar 938 may be a reading rod, square rod, or near point rod. Upper portion 908 may further include a headrest (not shown) operable to comfortably rest against a patient's head (e.g., a spring loaded headrest) during the prescription process.

[0186] Upper portion 908 comprises trial lens slot 918, lens bracket 912, trial lens retainer 914, and lens release lever 910. Trial lens slot 918 allows one or more trial lenses to be presented (e.g., moved or slid back and forth) in front of patient's eye 950 as patient observes target 960. In one embodiment, trial lens slot 918 comprises a channel which allows uniform movement of one or more trial lenses thereby allowing trial lenses to be presented to a patient in quick succession for comparison. For example, a physician may slide one trial lens into trial lens slot 920 for a patient to observe target 960 and slide another trial lens into the patient's line of sight via trial lens slot 920 which pushes the first trial lens out of the patient's line of sight.

[0187] After an improvement in visual function has been determined with respect to a trial lens (e.g. trial lens 918), the trial lens may be added to selected trial lenses 916 thereby
allowing subsequent trial lenses to be tested for visual function improvement in trial lens slot 920. A physician may use lens release lever 910 to release selected trial lenses 916 from trial lens retainer 914 thereby allowing a physician to insert the newly selected trial lens (e.g., trial lens 918) into the plurality of lenses of selected trial lenses 916. As described in Figures 1-5B, a newly selected trial lens may be inserted into a group of trial lenses such that the newly selected trial lens is closest to the patient (e.g., in the front of selected trial lenses 916). After insertion of the newly selected trial lens in selected trial lenses 916, the physician may then secure selected trial lenses 916 with lens release lever 910 and continue the process to determine a neurochromatic prescription.

[0188] In one embodiment, upper portion 908 further comprises a rod lock 932 which allows phoropter bar 938 to be removably coupled to upper portion 908. Embodiments of the present invention may support phoropter bars of various lengths thereby allowing coupling of different devices. In one embodiment, target 960 may be coupled or held up by phoropter bar 938. Phoropter bar 938 may be substantially similar to a phoropter bar used during ophthalmic examinations. In one exemplary embodiment, phoropter bar 938 may be \( \frac{1}{2} \) inch by \( \frac{1}{2} \) inch or 12mm square. Target 960 may be an eye chart (e.g., subject plate, logMAR chart, Snellen chart, Landolt C, and the Lea test) or any other apparatus for use in determining visual acuity or function.

[0189] In one embodiment, phoropter bar 938 is operable for optional coupling of trial frame bracket 926. Rod lock 930 allows the locking of trial frame bracket 926 onto phoropter bar. Trial frame bracket 926 is coupled to a trial frame 928 which comprises, among other things, corrective lenses to be coupled to upper portion 908 of exemplary refraction apparatus 900. Patient's eye 950 looks through corrective lens (e.g., ophthalmic prescription lenses) of trial frame 928, if present, and then through an opening in upper portion 908 which allows the patient to see target 960 through trial lens 918 and selected trial lenses 916. The corrective lenses of trial frame 928 facilitate an accurate neurochromatic prescription to be determined by correcting ophthalmic conditions during the prescription process. Embodiments of the present invention are operable to allow coupling of an off the shelf trial frame 928. It is appreciated that a neurochromatic prescription may be inaccurate if the ophthalmic prescription is in error.
[0190] Phoropter bar 938 is further operable for coupling of camera 940. In one embodiment, rod lock 934 locks camera 940 into place (e.g., during a neurochromatic prescription process). Tilt lock 936 allows camera 940 to be tilted such that the camera 940 may be used to observe patient's eye 950 during the neurochromatic prescription process. Tilt lock 936 and rod lock 934 may be used in combination to precisely position camera 940 for the neurochromatic prescription process. In one exemplary embodiment, camera 940 may be an infrared camera.

[0191] In one embodiment, camera 940 may be used to record the neurochromatic prescription process. The camera allows a physician to observe and record pupillary responses and thereby determine the most proper trial lens or lenses (e.g., neurochromatic lenses). The camera allows recording of the prescription process in accordance with external examination determinations subsequent to approval of specific neurochromatic CPT (Common Physician Terminology) and ICD (International Code of Diagnostic) codes.

[0192] Camera 940 allows monitoring of the pupillary response and determining whether the pupil shape has responded to a trial lens. The camera thereby allows assessment, diagnosis, and treatment for pupillary conditions. For example, the camera allows watching for a normalized pupillary response which occurs with stabilized and enhanced vision. The camera further allows monitoring of pupil movement to determine which trial lenses are more effective, which show poor pupil movement, and which show good pupil movement. It is appreciated that monitoring the patient's pupillary response provides a cross check to determine whether the patient's response is objective or subjective. In one exemplary embodiment, camera 940 is used to record a time tagged movie of the patient's responses to the trial lens which may be stored on a computer.

[0193] Figure 10 shows a diagram of a frontal orthogonal view of an exemplary refraction apparatus in accordance with an embodiment of the present invention. Figure 10 shows exemplary refraction apparatus 900 from the front (e.g., the side which a patient will look through during a neurochromatic prescription process). From the frontal view of exemplary refraction apparatus 900, exemplary refraction apparatus 900 includes base 902, adjustable height support 904, height adjustment lock 906, rod lock 932, phoropter rod 938,
and camera 940. Exemplary refraction apparatus 900 further includes trial lens channel 922, slide stops 970a-b, phoropter opening 972, and trial lens frame 974.

[0194] Trial lens channel 922 allows movement of trial lenses into a patient's line of sight during the neurochromatic prescription process. Trial lens channel 922 allows one or more trial lenses to be moved back and forth from left to right and right to left (e.g., in a horizontal plane that intersects and is perpendicular to the patient's line of sight). The portions or walls of channel 922 may be rigid thereby allowing a portion of trial lens 922 to be held stiffly and slide without wobbling. In one embodiment, at each end of trial lens channel 922 is slide stop 970a and slide stop 970b. Slides stops 970a-b may allow positioning of trial lenses such that one trial lens is centered while another trial lens is adjacent to a slide stop. In other words, slide stops 970a-b allow centering (e.g., automatically) of a trial lens from either side. For example, centered trial lens 971 may have been pushed or slid to be centered within trial lens channel 922 while at the same time pushing trial lens 973 into contact with slide stop 970a. A physician may then push trial lens 973 to the depicted location of centered trial lens 971 which pushes centered trial lens 971 into contact with slide stop 970b.

[0195] Trial lens channel 922 thus allows a physician to evaluate a patient with respect to one or more trial lenses within a short period of time (e.g., in quick succession). For example, the physician may slide a first trial lens into the patient's line of sight and determine whether the trial lens (e.g., centered trial lens 971) results in an improvement (e.g., by asking the patient and observing the patient's eyes via camera 940) and then promptly slide a second trial lens (e.g., trial lens 973) into the patient's line of sight.

[0196] Trial lens frame 974 is operable to assist a physician in centering of a trial lens (e.g., centered trial lens 971) and provides structural support for mounting of phoropter bar via phoropter opening 972. Trial lens frame 974 further provides an opening for the patient to view target 960 and for a physician to observe a patient's eyes via camera 940. Phoropter opening 972 allows a phoropter bar (e.g., phoropter bar 938) to be coupled or mounted to exemplary refraction apparatus 900. In exemplary embodiment, phoropter opening 972 can accept a 10 mm to 15 mm square near point rod. Phoropter opening 972 may allow a
phoropter bar to extend beyond the front of phoropter opening 972 and thereby allow
coupling of another device (e.g., trial frame bracket 926).

[0197] Figure 10 further shows a frontal view of trial bracket 926 and trial frame 928. Trial frame bracket 926 includes phoropter bar opening 927 and rod lock 930. Trial frame bracket 926 is coupled to trial frame 928. Trial frame 928 includes corrective lenses 929 which may be ophthalmic prescription lenses or other corrective lenses. Phoropter bar opening 927 allows trial frame bracket 926 to be mounted on a phoropter bar (e.g., phoropter bar 938) thereby allowing placement of corrective lenses 929 into a patient's line of sight (e.g., to see target 960). Rod lock 930 allows trial frame bracket 926 to be attached and locked to a phoropter bar (e.g., phoropter bar 938).

[0198] Figure 11 shows a diagram of a top orthogonal view of an exemplary refraction apparatus in accordance with an embodiment of the present invention. Figure 11 shows exemplary refraction apparatus 9 from the top. From the top view of exemplary refraction apparatus 900, exemplary refraction apparatus 900 includes base 902, trial lens retainer 914, trial lens channel 922, trial frame bracket 926, trial frame 928, phoropter bar 938, and camera 940. Exemplary refraction apparatus 900 further includes selected trial lens rack 980 and opening for adjustable height rod 982.

[0199] Trial lens rack 980 holds or provides a place for placement of selected trial lenses (e.g., selected trial lenses 916) during the prescription process (e.g., after a trial lens has been determined to result an improvement in visual function). Trial lens rack 980 facilitates selected trial lenses being held in place within the patient's line of sight.

[0200] Opening for adjustable height rod 982 provides a space for insertion of a height adjustable rod (e.g., of upper portion 908) within an adjustable height support (e.g., adjustable height support 904). In one embodiment, opening for adjustable height rod 982 is a female threaded drill hole.

[0201] Figure 12 shows a side view of an exemplary refraction device operable for chromatic lens selection in accordance with an embodiment of the present invention.
Exemplary refraction device 1200 may be mounted on a table top, phoropter, or moveable arm. It is appreciated that when exemplary refraction device 1200 is mounted on a phoropter or moveable arm, a base (e.g., base 902) may not be needed. Exemplary refraction device 1200 includes lens release lever 1210, trial lens retainer 1214, trial lens slot 1220, selected trial lens rack 1280, refraction device mount 1294, bracket mount 1290, and mounting bracket 1292. Figure 12 depicts the relative location of a patient's eye 1250 during use of exemplary refraction device 1200 during determination of a neurochromatic prescription.

[0202] Trial lens retainer 1214 is operable to retain one or more trial lenses that have been selected during a prescription determination process (e.g., trial lenses that have resulted in improvement in visual function). Trial lens retainer 1214 is operable to hold one or more trial lenses placed on top of selected trial lens rack 1280. In one exemplary embodiment, trial lens rack 1280 is operable to hold six trial lenses. In one embodiment, trial lens retainer 1214 is spring loaded to provide sufficient pressure to hold selected trial lens (e.g., selected trial lenses 916). It is appreciated that trial lens retainer 1214 can operate with a newly selected trial lens being inserted in a position closest to a patient's eyes or farthest from a patient's eyes.

[0203] Trial lens retainer 1214 is coupled to lens release lever 1210. Trial lens release 1210 may be operable to lock and unlock the position of trial lens retainer 1214 thereby allowing a trial lens to be added or removed from the selected trial lenses. Trial lens release 1210 may be spring loaded. In one embodiment, trial lens release 1210 is operable to act as a dual directional operating mechanism. For example, trial lens release 1210 may have a concave finger grips (e.g., two grips) for both a downward vertical pressure to open the lens retainer and a horizontal pressures to open or move the trial lens retainer 1210.

[0204] Refraction device mount 1294 is operable to allow mounting of exemplary refraction device 1200 on to a variety of surfaces including, an adjustable height mount (e.g., as shown in Figure 1), a table, or any other suitable surface suitable for use in determination of an optical prescription.
Trial lens slot 1220 is operable to allow a trial lens be to inserted or removed from the line of sight of patient's eye 1250. Bracket mount 1290 is operable for coupling of mounting bracket 1292 to exemplary refraction device 1200. Bracket mount 1290 and mounting bracket 1292 are operable to allow attachment of exemplary refraction device 1200 for use (e.g., in a fixed position) during the prescription process. Mounting bracket 1292 may facilitate a plurality of adjustments to help provide positioning and cushioning of a patient's head during an eye examination.

Figure 13 shows a frontal view of an exemplary refraction device operable for chromatic lens selection in accordance with an embodiment of the present invention. Figure 13 shows an exemplary refraction device 1200 from the front (e.g., the side which a patient will look through during a neurochromatic prescription process). From the frontal view of exemplary refraction device 1200, exemplary refraction device 1200 includes lens release lever 1210, trial lens retainer 1214, trial lens slot 1220, selected trial lens rack 1280, bracket mount 1290, and mounting bracket 1292, refraction device mount 1294. Exemplary refraction device 1200 further includes trial lens channel 1222, trial lens stops 1270a-b, phoropter opening 1272, mounting clamps 1298, and opening 1296.

Opening 1296 allows a patient to look through a trial lens placed into the line of sight of a patient's eye (e.g., patient's eye 1250 or 950). In one embodiment, opening 1296 is 80mm wide. Trial lens channel 1222 and trial lens slot 1220 allow one or more trial lenses to be slid into opening 1296 for viewing by a patient. In one exemplary embodiment, trial lens channel 1222 comprises pins or other mechanisms to provide resistance when a trial lens is centered in trial lens channel 1222 and opening 1296. It is appreciated that opening 1296 provides an unrestricted field of vision (e.g., for both eyes). Opening 1296 may thus advantageously allow more light through than traditional optics devices which have two separate circular holes (e.g., one for each eye). In one embodiment, trial lens channel 1222 has trial lens stops 1270a-b at each end which allow trial lenses to be slid within channel and stopped (e.g., automatically) in a centered position.

Phoropter opening 1272 is operable for attachment of a phoropter bar and thereby attachment of a plurality of devices including a camera (e.g., camera 940) and
corrective lenses (e.g., trial frame bracket 926 and corrective lenses 929). In one embodiment, phoropter opening 1272 is formed between bracket mount 1290 and mounting bracket 1292. In one embodiment, mounting clamps 1298 are coupled to mounting bracket 1292 and allow mounting bracket 1292 to be used to mount exemplary refraction device 1200 on a variety of devices (e.g., chin rest 1700) with a portion of the device passing vertically in the space between mounting bracket 1292 and mounting clamps 1298.

[0209] Figure 14 shows a back view of an exemplary refraction device operable for chromatic lens selection in accordance with an embodiment of the present invention. Figure 14 shows exemplary refraction device 1200 from the back (e.g., the side where a target, camera, and the physician may observe the patient during a neurochromatic prescription process). From the back view of exemplary refraction device 1200, exemplary refraction device 1200 includes lens release lever 1210, trial lens retainer 1214, trial lens slot 1220, trial lens channel 1222, trial lens stops 1270a-b, phoropter opening 1272, selected trial lens rack 1280, bracket mount 1290, and mounting bracket 1292, mounting clips 1298, and opening 1296.

[0210] Figure 15 shows a back view of an exemplary refraction device, operable for chromatic lens selection, coupled with a phoropter bar in accordance with an embodiment of the present invention. From the back view of exemplary refraction device 1200, exemplary refraction device 1200 includes lens release lever 1210, trial lens retainer 1214, trial lens slot 1220, trial lens channel 1222, trial lens stops 1270a-b, phoropter opening 1272, selected trial lens rack 1280, bracket mount 1290, mounting bracket 1292, mounting clamps 1298, and opening 1296. Figure 13 depicts portion exemplary refraction device 1200 coupled with phoropter bar 1238 and trial lens 1270 in trial lens channel 1222.

[0211] Phoropter bar 1238 may be coupled to portion of exemplary refraction device 1200 via phoropter opening 1272. Phoropter bar 1238 is operable to allow coupling of other devices including a camera and corrective lenses (e.g., via trial frame bracket 926). In one embodiment, phoropter bar 1238 is operable for coupling to a visual target (e.g., eye chart) for use in the prescription process.
[0212] Trial lens 1270 is shown resting in trial lens channel 1222 and in a position adjacent to trial lens stop 1270b. In one exemplary embodiment, trial lens 1270 may be removed from or inserted into trial lens channel 1222 at positions adjacent to trial lens stops 1270a-b. In one embodiment, trial lens 1270 is 3.0 mm thick, piano (e.g., no refraction), and made of optical quality dye-tintable plastic. In another embodiment, trial lens 1270 may be 2.5 mm thick. Trial lens 1270 may then be slid or pushed into slots 1220 for viewing by a patient.

[0213] Figure 16A shows a top orthogonal view of a portion of an exemplary refraction device with exemplary dimensions in accordance with an embodiment of the present invention. Figure 16A depicts exemplary dimensions of a mounting bracket 1692 (e.g., mounting bracket 1292) portion of an exemplary refraction device. Mounting bracket 1692 may have a width of 25.0825 centimeters, a length of 14.9225 centimeters, and thickness of 2.53746 centimeters. The inner portion of mounting bracket 1692 may have a width of 21.1201 centimeters (e.g., width prior to attachment of mounting clamps 498).

[0214] Figure 16B shows a back orthogonal view of an exemplary refraction device with exemplary dimensions in accordance with an embodiment of the present invention. Figure 16B depicts exemplary dimensions of a width of a trial lens retainer (e.g., trial lens retainer 914) of 14.1732 centimeters, a width of bracket mount (e.g., bracket mount 1290) of 4.4958 centimeters, a height of 9.95426 centimeters and width of 46.355 centimeters for a portion comprising a trial lens channel (e.g., trial lens channel 1222), trial lens stops (e.g., trial lens stops 1270a-b), and an opening for a patient to look through (e.g., opening 1296). A height of 5.88772 centimeters is shown for a portion from bottom of a portion having a trial lens channel (e.g., trial lens channel 1222) and the bottom of a lens release lever (e.g., lens release lever 1210).

[0215] Figure 16C shows a side orthogonal view of an exemplary refraction device with exemplary dimensions in accordance with an embodiment of the present invention. Figure 16C depicts exemplary dimensions of a height of a 2.413 centimeters for a mounting bracket portion, a 2.54 centimeters height of a bracket mount (e.g., bracket mount 1290), a height of 15.54198 centimeters from the bottom of a lens release lever (e.g., lens release lever
1210) to the top of a portion comprising a trial lens slot (e.g., trial lens slot 1220), a width of 6.96036 centimeters for the front of a viewing opening (e.g., opening 1296) to a lens release lever (e.g., lens release lever 1210). Figure 16C further depicts a height of 11.31824 centimeters from the bottom of a lens release lever (e.g., lens release lever 1210) to the top of a trial lens retainer (e.g., trial lens retainer 914), a width of 5.05714 centimeters from the front of a portion comprising a trial lens channel (e.g., trial lens channel 1222) to a portion of trial lens retainer (e.g., trial lens retainer 1214), and a width of 3.01752 centimeters for a portion supporting a bracket mount (e.g., bracket mount 1290).

[0216] Figure 17 shows an exemplary chin rest operable for coupling with an exemplary refraction device in accordance with an embodiment of the present invention. Figure 17 depicts exemplary components of exemplary chin rest operable for use with a refraction device (e.g., exemplary refraction device 1200) during a neurochromatic prescription process. Exemplary chin rest 1700 may be operable for use in a variety of eye examinations including a slit lamp eye examination.

[0217] In one embodiment, exemplary chin rest 1700 includes base 1702, chin rest 1704, headrest 1706, and support 1708. Base 1702 is coupled to support 1708 and base 1702 may allow coupling of chin rest 1700 to a variety of surfaces including a table or desk (e.g., with screws or clamps). Chin rest 1704 is operable for providing support of a patient's chin during an eye examination or neurochromatic prescription process. Head rest 1706 is operable to provide support for a patient's head during an eye examination or a neurochromatic prescription process. Head rest 1706 and chin rest 1704 are operable to allow a patient's head to rest comfortably in a fixed position during an eye examination and a neurochromatic prescription process. In one embodiment, head rest 1706 and chin rest 1704 are adjustable with respect to support 1708 to accommodate a variety of patients.

[0218] Support 1708 may be a cylindrically shaped support that extends up from base 1702 (e.g., in an up, over, and down shape) and is operable for attachment of chin rest 1704, head rest 1706, and exemplary refraction device 1200 (e.g., via mounting brackets 1292 and mounting clamps 1298). In one exemplary embodiment, a refraction device (e.g., exemplary refraction device 1200) may be coupled to support 1708 above head rest 1706.
Figure 18 shows a side view of an exemplary refraction device with a trial frame and trial frame mount in accordance with an embodiment of the present invention. Exemplary refraction device 1800 may be mounted on a phoropter bar or near point rod (e.g., phoropter bar 1238 or 938) and used in determination of a neurochromatic prescription. Exemplary refraction device 1800 includes lens release lever 1810, trial lens retainer 1814, trial lens slot 1820, selected trial lens rack 1880, trial frame 1828, trial frame mount 1897, phoropter mount support 1891, phoropter clamp 1899, phoropter or near point mount 1890, and spring mechanism 1893. Exemplary refraction device 1800 may have substantially similar components to that of exemplary refraction device 1200.

Trial lens retainer 1814 is operable to retain one or more trial lenses that have been selected during a neurochromatic prescription determination process (e.g., trial lenses that have resulted in improvement in visual function). Trial lens retainer 1814 is operable to hold one or more trial lenses placed on top of selected trial lens rack 1880. In one exemplary embodiment, trial lens rack 1880 is operable to hold six trial lenses. In one embodiment, trial lens retainer 1814 is spring loaded by spring mechanism 1893 to provide sufficient pressure to secure a selected trial lens (e.g., selected trial lenses 916). It is appreciated that trial lens retainer 1814 can operate with a newly selected trial lens being inserted in a position closest to a patient's eyes or farthest from a patient's eyes.

Trial lens retainer 1814 is coupled to lens release lever 1810. Trial lens release 1810 may operable to lock and unlock the position of trial lens retainer 1814 thereby allowing a trial lens to be added or removed from the selected trial lenses. Trial lens slot 1820 is operable to allow a trial lens to be inserted or removed from the line of sight of a patient.

Phoropter mount support 1891 is operable for coupling or mounting exemplary refraction device 1800 a phoropter bar or near point rod (e.g., phoropter bar 1238 or 938) via phoropter clamp 1899 and phoropter or near point mount 1890. Phoropter clamp 1899 is operable to clamp or lock phoropter mount 1890 on a phoropter bar (e.g., via screws in phoropter clamp 1899). In one exemplary embodiment, phoropter mount 1890 is operable to fit around and operable for securely mounting exemplary refraction device 1800 on a phoropter bar.
[0223] Trial frame mount 1897 is operable for mounting of trial frame 1828 on exemplary refraction device 1800. In one embodiment, trial frame mount 1897 comprises hook 1900 which is operable to hold trial frame 1828 in place (e.g., via a friction fit and/or gravity). Trial frame 1828 may comprise openings for insertion of corrective lenses (e.g., ophthalmic lenses) and thereby allows determination of a neurochromatic prescription with corrective lenses present. In one exemplary embodiment, trial frame 1828 may comprise side ear pieces (not shown) for resting upon the ears of a patient during the neurochromatic prescription process.

[0224] Figure 19 shows an exploded view of an exemplary refraction device with an exemplary trial frame and an exemplary trial frame mount in accordance with an embodiment of the present invention. Exemplary refraction device 1800 includes lens release lever 1810, trial lens retainer 1814, trial lens slot 1820, selected trial lens rack 1880, trial frame 1828, trial frame mount 1897, phoropter mount support 1891, phoropter clamp 1899, phoropter or near point mount 1890, and spring mechanism 1893. Exemplary refraction device 1800 further includes phoropter clamp portions 1899a-b, label 1889, opening 1896, and channel portions 1822a-b.

[0225] In one embodiment, phoropter mount 1890 comprises a first portion and a second portion operable to fit around or mount to a phoropter (e.g., phoropter bar 1238 or 938). Portions of phoropter mount 1890 may be secured to a phoropter bar (e.g., held in place) by phoropter clamp portions 1899a-b.

[0226] Label 1898 is operable for placement of a logo, source indicator (e.g., trademark), or other graphic on exemplary refraction device 1800. Channel portions 1822a-b form a channel (e.g., channel 1222) for trial lens to be inserted, slid into the line of sight of a patient, and removed during the neurochromatic prescription process. Channel portions 1822a-b may also form a portion of a lens slot (e.g., lens slot 1820 and 1220) and are proximate to opening 1896 through which a patient may look through a trial lens.

[0227] In one embodiment, exemplary refraction device 1800 includes a nose attachment device (not shown) operable for attachment of a nose piece to provide for the
comfort and stability of a patient during examination. In one exemplary embodiment, the nose piece may be proximate to or a portion of the nose piece may be in front of opening 1896.

[0228] In one embodiment, trial frame mount 1897 includes hooks 1900a-b which are operable for coupling of a trial frame (e.g., trial frame 1828) to exemplary refraction device 1800.

[0229] Figure 20 shows an exploded view of an exemplary refraction device with an exemplary trial frame and another exemplary trial frame mount in accordance with an embodiment of the present invention. Exemplary refraction device 1800 includes lens release lever 1810, trial lens retainer 1814, trial lens slot 1820, selected trial lens rack 1880, trial frame 1828, opening 1896, channel portions 1822a-b, and spring mechanism 1893. Exemplary refraction device 1800 further includes trial frame mount 1902 and retaining portion 1904.

[0230] Trial frame mount 1902 is operable for mounting of trial frame 1828 on exemplary refraction device 1800. In one exemplary embodiment, trial frame mount 1902 comprises a wire frame portion. It is appreciated that the wire frame portion may have reduced material design and have reduced weight. Trial frame 1902 may include retaining portion 1904 which may be a vertical portion which holds and/or secures trial frame 1828 into place (e.g., via a friction fit and/or gravity).

[0231] Figure 21 shows a flowchart of an exemplary process for determining a neurochromatic prescription in accordance with an embodiment of the present invention. Process 2100 includes evaluating each of a set of ultraviolet (UV) trial lenses, neutral density (ND) trial lenses, and color trial lenses (including infrared (IR) trial lenses) for resulting improvements in visual performance and function. Portions of processes 2100-2300 may be performed as depicted in Figure 3 as described herein. 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. The following terms may be trademarked or protected: neurochromatic and neurochromatic refraction.

[0232] In one embodiment, the improvement in visual performance and function are 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 process for selecting a plurality of trial lenses, each corresponding to frequencies or wavelengths to be used in combination to create a prescription and a resultant lens to increase visual function (e.g., visual performance and visual function characteristics mentioned above).

[0233] For each trial lens, patients may be asked which trial lens results in the viewing object (e.g., near or far chart) being visually sharper, clearer, or more distinct. This will be paired with enhanced visual function(s) which may be measured in a variety of ways including: improved saccade, changes in visual field, increase in ability to perceive (e.g., increased ability to identify colors that would not otherwise be seen). For example, the patient may be asked whether the trial lens makes things clearer, bold, less blurry on the near or far chart. The physician may ask which lens is "most clear?" or "most focused?"

[0234] In one embodiment, process 2100 is performed with use of a trial lens kit described in Figures 6-8. In one embodiment, the trial lens kit is arranged so that the physician may move sequentially through the lenses. In one exemplary embodiment, the trial lens kit is setup to test ultraviolet (UV) trial lenses, neutral density trial lenses, color trial lenses (including IR trial lenses), and optionally UV trial lenses again if no UV trial lens has been selected.
[0235] At block 2102, examination equipment is activated. In one embodiment, the examination equipment includes a lighting element which may be a full spectrum lighting element for creating a full spectrum lighting environment for a neurochromatic refractor. The examination equipment may further include a camera for observing a patient's response (e.g., pupillary response) to a trial lens. It is noted that without an appropriate lighting element diagnoses and neurochromatic prescriptions may be negatively impacted.

[0236] At block 2104, ultraviolet (UV) trial lenses are evaluated for improvement in visual function. The UV trial lenses are evaluated to determine whether to include UV trial lens in the prescription. This may include determining the UV lens density or frequency or wavelength to be selected (e.g., process 2200).

[0237] At block 2106, neutral density (ND) lenses trial lenses are evaluated for improvement in visual function. This may include determining the ND lens density or frequency or wavelength to be selected (e.g., in a manner substantially similar to process 2200). ND lenses may be tested with a patient and selected in a substantially similar manner to processes 2200, 2300, 100, 200, or 400. It is appreciated that additional lenses (e.g., plated lenses) may be tested with a patient and selected in a substantially similar manner to processes 2200, 2300, 100, 200, or 400. For example, a patient may be tested with ND #1 trial lens and if there is an improvement in visual function, the patient may be tested with two ND #1 trial lenses. If there is no improvement in visual function results from the two ND #1 trial lenses, the ND #1 trial lens may be selected for the neurochromatic prescription and block 2108 may be performed.

[0238] If the two ND #1 trial lenses result in improvement in visual function, then a ND #2 trial lens may be tested. If there is no improvement in visual function with the ND #2 trial lens, the two ND #1 trial lenses will be selected for the neurochromatic prescription and block 2108 may be performed. If there is an improvement in visual function with the ND #2 trial lens, a ND #3 trial lens may then be tested. If there is an improvement in visual function with the ND #3 trial lens, then the ND #3 trial lens is selected for addition to the neurochromatic prescription and the block 2108 is performed. If there is no improvement in
visual function with the ND #3 trial lens, then the ND #2 trial lens is selected for addition to the neurochromatic prescription and block 2108 is performed.

[0239] At block 2108, color trial lenses are evaluated. This may include determinations of which color or hue of the color trial lenses to include in the prescription (e.g., process 2300). In one embodiment, the color trial lenses are separated into color groups each having multiple lenses each corresponding to different frequencies or wavelengths or densities. In one exemplary embodiment, the color groups may include red, orange, yellow, green, blue, indigo, and violet. In another exemplary embodiment, the color groups may include brown, orange, amber, yellow, green, moss green, pink, red, burgundy, rosewood, lavender, violet, royal blue, blue, sky blue, and aqua. For example, each color group may have two #1 density lenses, one #2 density lens, and one #3 density lens. The two #1 density lenses may be used together for the patient's benefit when the patient does not benefit from a #2 density lens. The testing procedure for a color may include a #1 trial lens, #1 and #1 trial lenses, #2 trial lens, and #3 trial lens. The next color group may then be selected and tested. For example, if a blue lens is selected then each of the yellow lenses may be tested to determine which combination results in the greatest improvement in visual performance and function. It is appreciated that the use of each trial lens may remove a negative response of the human eye while increasing the body's response to the remaining transmitted light.

[0240] In one exemplary embodiment, each color group has two #1 density trial lenses, one #3 density trial lens, and one #5 density trial lens thereby allowing combinations of various density levels from 1-10.

[0241] In one embodiment, the color lenses may include infrared (IR) trial lenses to be evaluated for improvement in visual function. As described further herein, patients may be checked for a variety of conditions which indicate that the patients benefit from IR trial lens.

[0242] Patients with a traumatic brain injury, reduced levels of consciousness not induced by medications, cerebral hemorrhages, brain swelling, strokes, seizure disorders, migraines, ongoing and untreated chemical dependency of any substance, and severe autoimmune complex reaction often have an immediate reduction of symptoms and complications
when introduced to infrared (IR) trial lenses or any other trial lenses (e.g., neurochromatic lens) or with a neurochromatic prescription. In one exemplary embodiment, IR lenses are the first choice due to increased probability of increased patient response. In one embodiment, such results occur when each or almost all of the available infrared trial lenses are used and prescribed. Generally, infrared trial lens are prescribed within the context of a neurochromatic prescription process for the purposes of either treating one of many neurovisual compromises or to enhance visual performance.

[0243] In one embodiment, if the patient's history or known dysfunction includes one of the above mentioned visually evoked phenomena, symptoms, or syndromes, it is recommended that the physician have available IR trial lenses for an aggressive and immediate therapeutic intervention. Patients having visually evoked or responses to light which either trigger or agitate the symptoms of a migraine, seizure, unexplained auto-immune responses, and withdrawal symptoms from chemical dependency may experience a reduction, if not cessation, of the symptoms and syndromes within 5-30 seconds of wearing a trial lens saturated to filter the maximum infrared.

[0244] It is noted that exposure to a neurochromatic trial lens may trigger any one of the symptoms or syndromes while exposure to any one of the trial lens may immediately halt, control, or diminish the visually evoked migraine, seizure, auto-immune complex response, and symptoms of mood altering drug withdrawal. The determining of the neurochromatic prescription may necessitate exposure to both types of trial lenses. Accordingly, the physician should have infrared trial lenses ready for such type of patients.

[0245] In one embodiment, should a patient have any of these dangerous neurovisual processing disorder caused conditions, syndromes, or complications, a physician should apply infrared trial lens to the patient. The complications, syndromes, headaches, seizures (tongue and tongue swallowing emergency responses should be ready), auto-immune and withdrawal symptoms may begin to reverse within approximately five seconds. Complete patient control and reversal of phenomenon might be likely regained within less than 30-60 seconds. The after-effects of those conditions, syndromes, conditions managed within less than five minutes from the applications of the infrared trial lenses.
[0246] At block 2110, where a UV trial lens or lenses has not been selected, the UV trial lenses are evaluated with the selected neutral density lenses, selected color trial lenses, and any other selected trial lenses (e.g., plated lenses). The UV trial lens may be reevaluated for improvement in visual performance and function after one or more trial lenses (e.g., color and/or neutral density lenses) are selected. In other words, consideration of the inclusion or exclusion of the UV trial lenses is undertaken. This evaluation may include determining whether to include a selected UV trial lens in combination with the color trial lens based on improvement of visual performance and function. In one embodiment, the UV trial lenses are introduced after a color trial lens is selected because the selected color trial lens may remove a portion of the UV light being transmitted.

[0247] It is noted that darker or lighter refers to how much light is being transmitted to the eye. Darker means there is more color and less light is transmitted to the eye across the entire spectrum. The frequency or wavelength of the color within each trial lens separates the lens from other lenses. In one embodiment, each color trial lens corresponds to a unique frequency or wavelength of light.

[0248] At block 2112, a prescription is recorded. The prescription may reflect the order of the UV, ND, and color trial lenses (including IR lenses) and thereby the densities or frequencies or wavelengths that result in visual improvement for the patient.

[0249] 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 effective disorder).

[0250] 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 for determination 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.

[0251] 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.

[0252] 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.

[0253] 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.

[0254] Neurochromatic prescriptions determined, as described herein, are operable for enhance visual performance and/or provide neurovisual therapeutic intervention therapy for the symptoms, syndromes, conditions, and anomalies exemplified within Table I. It is
appreciated that neurochromatic lenses may provide enhanced visual performance and/or therapy for other symptoms, syndromes, conditions, and anomalies as well.

[0255] Figure 22 shows a flowchart of an exemplary process for selection of an ultraviolet (UV) trial lens in accordance with an embodiment of the present invention. Process 2200 may be performed by a physician (e.g., optometrist or ophthalmologist) to select an UV lens for a neurochromatic prescription.

[0256] At block 2202, examination equipment is activated. In one embodiment, the examination equipment includes a the light element which may be full spectrum light operable for use in creating a full spectrum lighting environment for a neurochromatic refractor. The lighting element may be a full room testing light. It is noted that without an appropriate lighting element diagnoses and neurochromatic prescriptions may be negatively impacted. The examination equipment may further include a camera for observing a patient's response (e.g., pupillary response) to a trial lens.

[0257] It is appreciated that testing and prescribing of neurochromatic lenses may necessitate a specific exposure to specific light where the patient experiences compromised visual performance and corresponding symptoms (e.g., headaches or eye strain). Common causes may be environmental, vocational, or sports related (e.g., glare in a baseball field, under light lights, "that time of day," or using equipment during a dental hygienic cleaning).

[0258] Generally speaking, patients are exposed to each of the lowest density or the lightest color (e.g., #1 of each of the group of colors or tinted neurochromatic lenses). Each trial lens maybe be inserted by the physician into the sliding tray of a refractor device (e.g., neurochromatic refractor) and compared with another lens of another color or same color just as two lenses would be compared in a standard ophthalmic refractive process in eye examinations. A patient observes an object selected and determined by a physician. In one embodiment, the same object will be used throughout the entire examination. The physician may then determine which of the trial lenses makes the object observed the most in focus, most clear, and easiest to see for the patient.
In one embodiment, the order in which lenses (e.g., UV, ND, and color lenses) are selected is maintained during the prescription determination process. Close attention to the order the lens are prescribed is maintained because lens from the prescription will be manufactured according to the ordering in the prescription. For example, the first lens selected will be farthest from the patient's eye and each successive lens will be closer to the patient's eyes.

The prescription reflects the order in which the trial lenses are within the selected tray during the prescription process. In one embodiment, the neurochromatic refractor device and neurochromatic refractive prescriptions can accommodate up to six trial lenses which are incorporated and ordered by the physician to manufacture a single eyewear prescription. For example, the first chosen lens will be placed furthest from the eyes. In one exemplary embodiment, the neurochromatic refractor device may accommodate up to seven trial lens (e.g., six color lenses and one UV lens).

In one embodiment, the UV lens is maintained in a position farthest from the patient's eyes during the prescription process. During the prescription process if an UV trial lens is rejected in the first round of the neurochromatic refraction prescription process, the UV trial lens may be reintroduced after the other trial lenses (e.g., color trial lenses) have been tested (e.g., accepted or rejected). The UV trial lenses may be reintroduced at the outermost distance away from the eyes.

The prescription process may be completed with use of a neurochromatic refractor device as described in Figures 9-20. The other trial lenses (e.g., non-UV) may be positioned in the refractor device in the order the lenses are prescribed with the first lens being farthest away from the patient's eyes and the last prescribed trial lens being closest to the patient's eyes.

It is appreciated that for accurate neurochromatic prescriptions in various embodiments, patients should wear their ophthalmic prescription during the neurochromatic refractive process. It is appreciated that if a patient wears a tinted lens, an anti-glare reflective lens, an ultraviolet coated lens, a progressively darkening lens (e.g., Corning Photo-Grey...
lenses), Transition lenses, or polarized lenses, the prescription process may be negatively impacted. In one embodiment, patients with contacts should wear them during the neurochromatic prescription process. The contact prescription should be free of any tint, which may introduce error into the neurochromatic prescription process.

[0264] Patients with surgically implanted artificial lenses which have 100% UV protection need not be exposed to the UV trial lenses. This is also true for patients having ophthalmic prescriptions that already have an UV coating. Accordingly, the presence or non-presence of an UV coating may be determined prior to the neurochromatic prescription process.

[0265] The addition of an UV trial lens is anticipated to be about 50%. It is appreciated that the restriction of transmission of some UV light through a plastic lens is already inhibited by absorbing and distillation of the UV frequency within the plastic lens itself. Consequently, only some patients may require further reductions of the UV frequency.

[0266] Referring back to Figure 22, at block 2204, a first UV trial lens is selected. In one embodiment, a pre-selected lowest density UV trial lens (e.g., UV #1) is placed into a neurochromatic refractor in such fashion that a patient may view through the UV trial lens at a near-point reading object or a far-point eye chart. The objective being to improve or enhance the visual clarity, acuity, or functional sight by having the patient look through the UV trial lens. The exact line or object of either the near or far point eye chart may be designed by the physician. The physician may then direct and ask the patient to follow the physician's instructions and comment upon the visual clarity or acuity with and without the patient viewing the selected object through the UV neurochromatic trial lens.

[0267] At block 2206, whether there is an improvement in visual function is determined. Based on subjective and existential reporting of the patient, determination of the visual clarity or performance and function may be determined. The physician may easily measure and confirm what the patient has reported using the physician's standards applicable during routine eye or ophthalmic examinations. In one embodiment, a camera (e.g., infrared camera and/or visual spectrum camera) may be used to record the neurochromatic
prescription process. The camera may be attached or coupled to a phoropter and/or a neurochromatic refractor. The camera allows the physician to observe and record pupillary responses and thereby determine the most proper trial lens or lenses (e.g., neurochromatic lenses). The camera allows recording of prescription process in accordance with external examination determinations subsequent to approval of specific neurochromatic CPT (Common Physician Terminology) and ICD (International Code of Diagnostic) codes.

[0268] The camera allows monitoring of the pupillary response and determining whether the pupil shape has responded to the trial lens. The camera thereby allows assessment, diagnosis, and treatment for pupillary conditions. For example, the camera allows watching for a normalized pupillary response which occurs with stabilized and enhanced vision. The camera further allows monitoring of pupil movement to determine which trial lenses are more effective, which show poor pupil movement, and which show good pupil movement. It is appreciated that monitoring the patient's pupillary response provides a cross check to determine whether the patient's response is objective or subjective. In one exemplary embodiment, the camera is used to record a time tagged movie of the patient's responses to the trial lens which may be stored on a computer.

[0269] The physician may observe the patient taking into account both the ease upon which, and the time allotted to sustain and maintain focus with and without the UV trial lens. The physician may further take into account the variety of pupillary reactions including both size and shape of the patient's pupil denoting consistency of a uniform pupillary response eye-to-eye and uniform circular shape corresponding to and consistent with normal versus abnormal or statistically infrequent pupillary responses to a fixed object of focus. Observation of pupillary response may be done via physician observation or by using a camera attached to an arm of a neurochromatic refractor.

[0270] If the patient reports back either an improvement or enhancement of visual clarity or performance and function with the UV trial lens versus viewing the object without the UV trial lens then the UV trial lens is selected over no UV trial lens. The patient's reporting of an improvement of, or an enhancement with the UV trial lens should correspond with the physician's observation that the patient's ease of focus and pupillary responses are
more normalized when viewing through the UV trial lens. If the patient and the physician are unable to evoke a positive improvement of visual function or performance, the UV trial lens should not be selected or chosen. If there is an improvement, block 2208 is performed. If there is no improvement, block 2214 is performed.

[0271] At block 2208, the next UV trial lens is selected. If the patient has selected the initial UV trial lens (e.g., UV trial lens #1), then the physician selects the next highest density of the UV scale (e.g., UV trial lens #2) for comparison against the initially selected UV trial lens. In one embodiment, using a routine refraction of either plus or minus ophthalmic lenses the physician and patient may either select or reject UV trial lens #1 or #2.

[0272] At block 2210, whether there is an improvement in visual function is determined. If there is not an improvement, block 2212 is performed. If there is an improvement block 2208 is performed. If the patient has selected UV trial lens #2, then UV trial lens #2 may be compared against UV trial lens #3. It is appreciated that additional levels of increasing density of UV trial lens may be tested and embodiments of the present invention are not intended to be limited to the exemplary discussion of three UV trial lens (e.g., #1 - 3).

[0273] At block 2212, the previous UV trial lens that resulted in improvement in visual function is placed in a holding mechanism. For example, if the patient has rejected UV trial lens #2 and favors UV trial lens #1, then the UV trial lens #1 is selected to remain in the neurochromatic refractor's sliding tray. Whichever of the UV trial lens selected (e.g., resulting in improved visual acuity) is placed into the holding mechanism (e.g., tray) of the neurochromatic refractor and subsequently compared with the rest of the trial lenses (e.g., tinted or colored trial lenses).

[0274] At block 2214, whether there are any remaining UV trial lenses to be tested is determined. If the patient has rejected UV trial lens #1, the physician will compare the patient's vision with UV trial lens #2 and #3 by placement and viewing via the neurochromatic refractor's hold-sliding tray for comparative analysis, rejection, or selection (e.g., via blocks 2216 and 2206). At block 2216, the next UV trial lens is selected.
[0275] At block 2218, color trial lens are evaluated or tested. The color trial lens may be tested as described with respect to Figure 23.

[0276] Figure 23 shows a flowchart of an exemplary process for selecting one or more color trial lenses in accordance with an embodiment of the present invention. Process 2300 may be performed by a physician (e.g., optometrist or ophthalmologist) to select one or more color trial lenses for a neurochromatic prescription. Process 2300 may be performed whether or not a patient has selected an UV trial lens. A physician may expose the patient to color trial lenses starting with the lightest color, hue, or density of each of the colors present in a trial lens kit. The lowest density of each color trial lens may be marked or labeled #1 and each increasingly dense trial lens may be marked with a #2, #3, etc. For example, a blue colored or tinted trial lens may be identified as "BL 1," "BL 2," and "BL 3."

[0277] In one exemplary embodiment, the #1 lens is the lightest lens, #2 lens is next darkest, and #3 is the darkest. In one embodiment, process 2300 is performed starting with the lightest lens for each color and then subsequent lenses which are increasingly dark. Increasingly dark lenses may thus be tried while improvements are observed and when a trial lens just results in increased darkness (e.g., casting a shadow or a sun glass effect), trial lens selection is made of the previous trial lens resulting in improvement in visual function. It is appreciated that a #1 lens may not be half as dark as a #2 lens. For example, a yellow #1 lens may be a very light yellow that may be hardly noticeable while a yellow #2 lens may have a tint substantially similar to a yellow traffic sign. It is noted that the different densities correspond to different frequencies or wavelengths that the trial lenses transmit.

[0278] At block 2302, a color is selected. The color may be selected based on pathology of a patient or based on an ordering of a lens trial kit (e.g., color groups). In one embodiment, the basic colors are tested first. In one embodiment, the color groups include an infrared (IR) group. In one exemplary embodiment, the color groups include brown, orange, amber, yellow, green, moss green, pink, red, burgundy, rosewood, lavender, violet, royal blue, blue, sky blue, and aqua.
[0279] At block 2304, a first color trial lens is selected. In one embodiment, the first color trial lens selected has the lowest density for the selected color. For example, it may be the lowest density blue trial lens of the trial lens kit (e.g., blue #1).

[0280] At block 2306, whether there is an improvement in visual function is determined. If there is an improvement block 2308 is performed. If there is not an improvement, block 2326 is performed.

[0281] As the physician exposes the patient to each of lightest color or lowest density of the trial lenses, the physician observes the patient taking into account both the ease upon which and the time allotted to sustain and maintain focus with each of the trial lenses. The physician may also take into account both the size and shape of the patient's pupils denoting consistency of a uniform pupillary response eye-to-eye and uniform circular shape corresponding to normal versus abnormal pupillary responses to a fixed object of focus.

[0282] At block 2308, the next color trial lens is selected. As the prescriptive process is performed, each density of the selected color of the trial lenses is tested against the other trial lenses for the selected color. For example, a blue #1 trial lens is compared with a blue #2 trial lens. If the #2 trial lens is selected over a #1 trial lens, then the #2 trial lens is compared with a #3 trial lens. The same clinical and visual criteria for the trial lens selection may be maintained by the prescribing physician as during an ophthalmic prescription.

[0283] At block 2310, whether there is an improvement in visual function is determined. If the patient reports either an improvement of visual function or an enhancement of visual clarity or performance and function with the trial lens versus viewing the same object without the color trial lens, then the trial lens is selected. If there is an improvement, block 2308 is performed. If there is not an improvement, block 2312 is performed.

[0284] At block 2312, the previous color trial lens is placed in a holding mechanism. If the patient's visual criteria is either improved or enhanced and the patient sees a color or any through the lens as a tint, then the darker or denser trial lens has been over-prescribed.
Then the lower density trial lens with an observable improvement and without the perceived tint is selected. The selected lens is placed in the holding rack of the refractive device closest to the patient's eyes. If an UV trial lens was previously selected, the color trial lens will be placed closer to the patient's eyes than the UV trial lens. In one embodiment, the selected lenses are added from the back toward the eye. For example, the second color trial lens selected is placed in front of (or closer to the patient's eye) than the first selected color trial lens or UV trial lens.

[0285] The physician selection process therefore determines which color groups and which specific densities of the trial lenses in each color group that result in improvement in terms of visual function and visual performance. For example, blue may be selected over yellow based on the patient's responses and the physician observed improvements in the patient's visual function or performance.

[0286] At block 2326, whether any colors (e.g., color groups) remain to be tested is determined. If colors remain, block 2328 is performed. If there are no other colors to be tested, block 2330 is performed.

[0287] At block 2328, a next color is selected. In one embodiment, the next color group selected is based on an ordering of the trial lens kit.

[0288] At block 2330, reevaluation for UV trial lens is performed. If an UV trial lens was not previously selected, the patient may be tested or examined with any selected neutral density and color trial lenses in combination with UV trial lenses (e.g., with process 2200). For example, a patient, who previously did not select an UV trial lens, is checked for improvement with UV trial lenses. In one embodiment, the UV trial lens of each density are tested one at time in the neurochromatic refractor at the furthest position from the patient's eyes. The physician and patient continue to execute and rely upon the same clinical standards of measurement of visual acuity, visual ease and comfort, performance, and enhancement as the clinical criteria for including an UV trial lens as one of the prescriptive elements of the neurochromatic prescription. It is appreciated that it is not uncommon for a patient who has
not selected an UV trial lens to select one. Similarly, it is appreciated that it is not uncommon for the UV trial lens to be rejected at the end of the prescriptive process.

[0289] In one embodiment, if an UV trial lens was previously selected prior to a colored trial lens, then the choice for or against the UV trial lens should be challenged. This may include the density of the UV trial lens selected. Based on the clinical observations and the patient's improvement or enhancement of vision, the physician determines both the need for and the particular density of the UV trial lens to be selected as one of the component frequencies or wave lengths of light included or excluded from the refraction or neurochromatic prescription.

[0290] At block 2340, the neurochromatic prescription based on the trial lens selected is recorded. In one embodiment, the prescriptive process is complete when a patient accepts the a trial lens or lenses and the addition of another trial lens compromises or make difficult the patient's visual acuity, visual performance, visual function, or there is a notable reduction of the patient's visual performance. That is, a neurochromatic prescription may be complete when visual performance and enhancement cannot be improved by the addition of other trial lenses.

[0291] In one embodiment, any one of a plurality trouble shooting strategies may be undertaken by a physician during the prescriptive process. It is noted that in approximately 10% of the time a patient and physician may be unable to determine the benefit by comparison between any two of the physician selected neurochromatic trial lenses. It is noted that this is not of concern as the manufactured neurochromatic trial lenses do not individually or in collection with other trial lenses combine to articulate a neurochromatic prescription to exemplify each and every color or hue that effect the patient neurologically or neurophysiologically by impacting the patient's neurovisual processing within the brain itself.

[0292] A variety of strategies may be used to accomplish a more thorough exposure to more of the visual and non-visual spectrum to which the patient may respond favorably. These strategies may include: 1) varying the hue, intensity, or density (e.g., darkness of color) of the selected trial lenses, 2) changing the order of the initial neurochromatic trial lens
prescription, 3) eliminating one or more of the initially selected trial lens (e.g., when there are three or more lenses within the prescription itself), 4) prescribing a slight modification to one or more of trial lenses, and 5) an overt challenge to a pre-existing ophthalmic prescription.

[0293] Changing the hue, density, color: If a patient has undistinguishable differentiation between any two of the trial lenses, by increasing each of the two trial lenses up the next highest density or color (e.g. up from a #1 to a #2, or up from a #2 to a #3), then a patient and physician can observe whether there is a benefit for each hue, density, or color.

[0294] In one embodiment, if the patient has selected a second or third level density trial lens (e.g., #2 or #3), by reducing the density of that selected trial lens, or all of the second or third preselected lenses may make it possible for the patient to select the appropriate trial lens. The increased or decreased density lenses may then be inserted into the neurochromatic refractor device for testing and the prescriptive process continued thereby resolving the dilemma of a choice between any two of the trial lenses. The increased or decreased density trial lens should be inserted in place of the trial lens being replaced to maintain the ordering of trial lenses.

[0295] Changing the order in which the trial lenses were selected: Patient and physician selections of neurochromatic trial lens may result in patients being confused by dysfunctions of general photophobia and neurovisual processing disorders. A patient may experience immediate comfort which may cause the patient and physician to initially choose the wrong trial lens. This may be due to selection of comfort over pathology. For example, the absence of eye strain may favorably alter a patient’s pupil shape and be confusing for the physician. The cause of this may be that the resulting comfort the patient is experiencing is a result of the pathology to a frequency of light which has been detrimentally affecting neurovisual processing and thereby causing the symptoms. Though trial and error, with the exception of the UV trial lens, changing the order of the trial lens prescriptions and determining the results favoring the more functional or enhanced vision in each altered order of the initial trial lens selection or prescription may then be performed. The examination and prescription process may then be continued in the order determined.
[0296] Eliminating one or more of the previous neurochromatic trial lenses: Patients who present with multiple neurovisual and neurovisual processing disorders, symptoms or syndromes, are most commonly severely photophobic. Thus, darkness of any kind provides relief to such patients. For the physician this is problematic because symptoms, syndromes, and disorders often camouflage each other, thereby making it difficult to clinically differentiate. This may lead to these patients being prescribed multiple trial lenses of greater density.

[0297] However, once darkness is accomplished addressing most likely photophobia of a more general sort versus wave-length or frequency specific photophobia, the selection of more specific trial lenses is now possible. In one embodiment, upon the patient reporting that a trial lens is too dark or observes a tint when looking through the trial lens onto a white surface, there are two options: 1) reduce the density or hue of any trial lenses that do not exemplify a base trial lens (e.g., #1 trial lens) which has previously been prescribed or 2) completely eliminate any one of the trial lenses within the prescriptive formula choosing from the selection the specific trial lens for which the patient will denote a color or hue on a white surface during the examination and prescriptive process.

[0298] Increasing or decreasing the predetermined trial lens selected: Some patients may require increased darkness or hue while some patients will require less darkness or hue than in the trial lenses. Patients needing increased darkness or hue may be prescribed a quarter gradient. For example, if blue #1 is insufficient while blue #2 is an over prescription (e.g., seeing color or tint on white object), the prescription could be blue #1 + 50%. Similarly, if blue #1 is an over prescription, the prescription could be blue #1 - 50%.

[0299] Challenge an ophthalmic prescription: Due to the complexity of visual systems, the natures and pathologies of some patients, the ophthalmic prescription may be in error. Such an error is frequently a manufacturing error not congruent with a physician's orders. It is also possible that the physician did a "best guess" ophthalmic prescription. An ophthalmic prescription in error will likely negatively impact the ability to make an accurate neurochromatic prescription.
In one embodiment, the following three strategies may be performed. First, the ophthalmic prescription may be checked and verified for manufacturing error at another manufacturing laboratory other than the one which manufactured the lenses. If an error is found, the lenses may be remanufactured matching the physician's prescription.

Second, to the extent possible the closest neurochromatic prescription may be determined. A completely accurate neurochromatic prescription may not be possible because the ophthalmic prescription is not accurate. However, using the neurochromatic prescription in front of the patient's eyes and another ophthalmic refractive examination may be performed. If there are ophthalmic changes, which may be common, another neurochromatic prescription process may then be performed when a more correct and altered ophthalmic prescription can be worn by the patient.

Third, in some cases a patient's neurovisual processing is so negatively effected by the light that a physician cannot determine an appropriate nor accurate ophthalmic prescription. In such a case, a neurochromatic resultant lens may be made prior and worn during the standard ophthalmic examination. Generally, the physician will be able to more readily and accurately determine a standard ophthalmic prescription by having the patient view through the trial lens with the patient holding the selected trial lens in place. After the ophthalmic prescription is prescribed, the neurochromatic prescription may be removed and the neurochromatic prescription redone. It is expected that the neurochromatic prescription will be different.

It is appreciated that protection from an over-prescription should be quickly undertaken. Over-prescription may manifest as a compromised vision including making visual function blurry. Procedures to protect from over-prescription may include:

Visual performance and function have been improved by assessing before and after criteria established by pre-existing symptoms and syndromes therapeutically address by the prescribed neurochromatic lenses.
[0305] White appears white while colors become more distinct, more bold, with notable improvements in contrast sensitivities noted and treated with neurochromatic lenses. White may appear to a patient as very slightly "shaded." In other words, abnormally higher amounts of "glare" have been neurochromatically altered by the neurochromatic trial lens.

[0306] Improvements in saccade should be noted. There will be increased ease in sight recognition, reading speed, and flow while a patient is wearing the neurochromatic lenses as compared to not wearing the neurochromatic lenses.

[0307] Patients should have a measurable increase in visual performance and function at all distances with the resultant prescribed neurochromatic lenses as compared to the same viewing without the neurochromatic lenses. Patients should have a measurable increase in their visual fields as a result of wearing the resultant prescribed neurochromatic lenses as compared to the same determination without the wearing of the prescribed neurochromatic lenses.

[0308] Longstanding conditions, symptoms, syndromes, complications (e.g., cerebral hemorrhage, strokes, brain swelling, and reduced consciousness) will frequently respond favorably to trial lens and neurochromatically prescribed lenses. The observation in terms of positive changes within the patient may take days or weeks. It is noted that since neurochromatic lenses are a noninvasive therapeutic intervention, little if any harm can be done. It is appreciated that many patients have dramatic improvements through the use of neurochromatic prescriptive lenses.

[0309] 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.
CLAIMS

What is claimed is:

1. A method for determining a lens prescription, said method comprising:
   selecting a first ultraviolet (UV) trial lens and a second UV trial lens;
   determining whether said first UV trial lens or said second UV trial lens results in greater improvement in visual function;
   selecting said second UV trial lens for said prescription when said second UV trial lens results in greater improvement in visual function as compared to said first UV trial lens;
   selecting a first color group comprising a first color trial lens and a second color trial lens;
   determining whether said first color trial lens or said second color trial lens results in greater improvement in visual function; and
   selecting said second color trial lens for said prescription when said second color trial lens results in greater improvement in visual function as compared to said first color trial lens.

2. The method of Claim 1 further comprising:
   activating a full spectrum lighting element.

3. The method of Claim 1 further comprising:
   activating a camera operable to record said improvement in visual function.

4. The method of Claim 3 wherein said camera is operable to record a pupillary response to said first color trial lens.

5. The method of Claim 1 wherein said color group comprises a third color trial lens and said method further comprises:
   determining whether said second color trial lens or said third color trial lens results in greater improvement in visual function; and
selecting said third color trial lens for said lens prescription when said third color trial lens results in greater improvement in visual function as compared to said second color trial lens.

6. The method of Claim 1 further comprising:
selecting a first infrared (IR) trial lens and a second IR trial lens;
determining whether said first IR trial lens or said second IR trial lens results in greater improvement in visual function;
selecting said second IR trial lens for said lens prescription when said second IR trial lens results in greater improvement in visual function as compared to said first IR trial lens.

7. The method of Claim 1 further comprising:
determining whether removal of said second UV trial lens results in an improvement in visual function.

8. The method of Claim 1 further comprising:
reevaluating said second UV trial lens for improvement in visual function after determining improvement in visual function with a plurality of color trial lenses from a plurality of color groups.

9. The method of Claim 1 further comprising:
selecting a second color group comprising a third color trial lens and a fourth color trial lens;
determining whether said third color trial lens or said fourth color trial lens results in greater improvement in visual function; and
selecting said fourth color trial lens for said lens prescription when said fourth color trial lens results in greater improvement in visual function as compared to said third color trial lens.

10. A method for selecting a color lens for a prescription, said method comprising:
selecting a color group comprising a plurality of color trial lenses;
selecting a first color trial lens of said plurality of color trial lenses corresponding to a first wavelength of light;

determining if there is a first improvement in visual function with said first color trial lens;

in response to said first improvement in visual function, selecting a second color trial lens corresponding to a second wavelength of light;

determining if there is a second improvement in visual function with said second color trial lens;

in response to said second improvement in visual function, placing said second color trial lens into a holding mechanism operable to hold a plurality of trial lenses; and

recording said second wavelength of light into said prescription.

11. The method as described in Claim 10 further comprising:

in response to not determining said second improvement in visual function, placing said first color trial lens into said holding mechanism.

12. The method as described in Claim 10 further comprising:

in response to not determining said first improvement in visual function, selecting another color group.

13. The method as described in Claim 10 wherein said color group is selected from the group consisting of red, orange, yellow, green, blue, indigo, and violet.

14. The method as described in Claim 10 further comprising:

determining if there is a third improvement in visual function with said first color trial lens and said second color trial lens; and

in response to said third improvement in visual function, placing said first color trial lens and said second trial lens into said holding mechanism.

15. The method as described in Claim 10 further comprising:
in response to said second improvement in visual function, selecting a third color trial lens corresponding to a third wavelength of light, wherein said third color trial lens is darker than said second color trial lens; and
determining if there is a third improvement in visual function with said third color trial lens;
in response to said third improvement in visual function, placing said third color trial lens into said holding mechanism; and
in response to not determining said third improvement in visual function, placing said second color trial lens into said holding mechanism.

16. A method for selecting a ultraviolet (UV) trial lens for a prescription, said method comprising:
selecting a first UV trial lens of a plurality of UV trial lenses corresponding to a first wavelength;
determining if there is a first improvement in visual function with said first UV trial lens;
in response to said first improvement in visual function, selecting a second UV trial lens corresponding to a second wavelength;
determining if there is a second improvement in visual function with said second UV trial lens;
in response to said second improvement in visual function, placing said second UV trial lens into a holding mechanism operable to hold a plurality of trial lenses; and
recording said second wavelength into said prescription.

17. The method of Claim 16 further comprising:
in response to not determining said second improvement in visual function, placing said first UV trial lens into said holding mechanism.

18. The method of Claim 16 further comprising:
in response to not determining said first improvement in visual function, selecting a first color trial lens.
19. The method of Claim 17 further comprising:
   determining if there is a third improvement in visual function with said first
   UV trial lens and said second UV trial lens; and
   in response to said third improvement in visual function, placing said first UV
   trial lens and said second trial lens into said holding mechanism.

20. The method of Claim 16 wherein said method further comprises:
   in response to said second improvement in visual function, selecting a third
   UV trial lens corresponding to a third wavelength; and
   determining if there is a third improvement in visual function with said third
   UV trial lens;
   in response to said third improvement in visual function, placing said third UV
   trial lens into said holding mechanism; and
   in response to not determining said third improvement in visual function,
   placing said second UV trial lens into said holding mechanism.

21. 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.

22. The trial lens kit of Claim 21 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.

23. The trial lens kit of Claim 21 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.
24. The trial lens kit of Claim 21 wherein said first plurality of trial lenses comprises colored trial lenses.

25. The trial lens kit of Claim 24 wherein said colored trial lenses are made of tinted plastic.

26. The trial lens kit of Claim 21 wherein said second plurality of lenses comprises infrared (IR) trial lenses operable to filter IR wavelengths.

27. The trial lens kit of Claim 21 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.

28. 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.

29. The apparatus as described in Claim 28 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.

30. The apparatus as described in Claim 29 wherein said first trial lens and said second trial lens are tinted via a dyeing process.
31. The apparatus as described in Claim 29 wherein said color is selected from the group consisting of red, orange, yellow, green, blue, indigo, and violet.

32. The apparatus as described in Claim 28 wherein said first trial lens corresponds to a first ultraviolet (UV) wavelength and said second trial lens corresponds to a second ultraviolet wavelength.

33. The apparatus as described in Claim 28 wherein said first trial lens corresponds to a first infrared (IR) wavelength and said second trial lens corresponds to a second infrared wavelength.

34. The apparatus as described in Claim 28 wherein said first trial lens and second trial lens are made of plastic and made substantially accordingly to ophthalmic standards.

35. 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.

36. The lens kit of Claim 35 further comprising:
   - a plurality of neutral density trial lenses corresponding to a fourth visual function improvement.

37. The lens kit of Claim 35 further comprising:
a plurality of plated lenses corresponding to a fifth visual function improvement.

38. The lens kit of Claim 35 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.

39. The lens kit of Claim 35 wherein said plurality of color trial lenses is made of tinted plastic.

40. The lens kit of Claim 39 wherein said plurality of color trial lenses is tinted using a dyeing process.

41. An apparatus comprising:

an opening operable for alignment with a line of sight a patient observing a visual target;

a trial lens slot operable for use in receiving a trial lens into said line of sight and said opening;

a channel coupled to said trial lens slot, said channel operable for allowing sliding of said trial lens into a centered position within said opening, wherein said channel is operable for allowing sliding of said trial lens horizontally; and

a trial lens retainer operable for holding one or more trial lenses comprising a prescription for visual function improvement, wherein said one or more trial lenses are retained within said line of sight.

42. The apparatus of Claim 41 further comprising:

a phoropter bar opening operable for coupling a phoropter bar to said trial lens slot.

43. The apparatus of Claim 42 wherein said phoropter bar is operable for coupling to a camera.
44. The apparatus of Claim 43 wherein said camera comprises infrared functionality.

45. The apparatus of Claim 42 wherein said phoropter bar is operable for coupling of corrective lenses.

46. The apparatus of Claim 41 further comprising:
    a first slide stop and a second slide stop adjacent to each respective end of said channel, wherein when a first trial lens is in contact with said first slide stop, a second trial lens in contact with said first trial lens is centered in said opening.

47. The apparatus of Claim 41 wherein said opening and said channel have metric dimensions.

48. The apparatus of Claim 41 further comprising:
    a headrest for positioning said patient’s head, wherein said headrest is coupled to said trial lens slot.

49. The apparatus of Claim 41 wherein said opening is rectangular in shape and operable for accommodating viewing of said visual target through said opening with both eyes of said patient.

50. A refraction device comprising:
    a trial lens channel for allowing sliding of a trial lens into a centered position within a line of sight of a patient, wherein said trial lens channel is operable for allowing sliding of said trial lens horizontally into said line of sight;
    a trial lens retainer operable for holding one or more trial lenses within said line of sight;
    a locking mechanism coupled to said trial lens retainer, wherein said locking mechanism is operable to clamp said one or more trial lenses into place; and
    a base portion operable for providing support to said trial lens channel, wherein said base portion is operable for height adjustment of said trial lens channel.
51. The device as described in Claim 50 further comprising:
an opening operable for alignment with said line of sight of said patient
observing a visual target.

52. The device as described in Claim 51 wherein said opening is rectangular in
shape and operable for accommodating viewing of said visual target through said
opening with both eyes of said patient.

53. The device as described in Claim 50 further comprising:
a phoropter bar opening operable for coupling a phoropter bar to said trial lens
channel.

54. The device as described in Claim 53 wherein said phoropter bar is operable for
coupling of a camera.

55. The device as described in Claim 53 wherein said phoropter bar is operable for
coupling of corrective lenses.

56. A device for use in determining a chromatic prescription, said device
comprising:
a channel for allowing sliding of a trial lens into a centered position within a
line of sight of a patient, wherein said channel is operable for allowing sliding of said
trial lens horizontally into said line of sight; and
a trial lens retainer operable for holding one or more trial lenses within said
line of sight; and
a phoropter bar operable for coupling of a camera, wherein said camera is
operable for recording a response of eyes of said patient looking through said trial
lens.

57. The device of Claim 56 wherein said phoropter bar is operable for coupling
corrective lenses within said patient’s line of sight.
58. The device of Claim 56 wherein said phoropter bar is operable for coupling a target, wherein said target comprises an eye chart.

59. The device of Claim 56 further comprising:
   a locking mechanism coupled to said trial lens retainer, wherein said locking mechanism is operable to lock said one or more trial lenses into place.

60. The device of Claim 56 further comprising:
    a base portion operable for providing support to said channel, wherein said base is operable for height adjustment of said channel.

61. A method for determining a lens prescription, said method comprising:
    selecting a first ultraviolet (UV) trial lens;
    determining whether said first UV trial lens results in improvement in visual function;
    selecting said first UV trial lens for said lens prescription when said first UV trial lens results in improvement in visual function;
    selecting a first color group comprising a first color trial lens and a second color trial lens;
    determining whether said first color trial lens or said second color trial lens results in greater improvement in visual function;
    selecting said second color trial lens for said prescription when said second color trial lens results in greater improvement in visual function as compared to said first color trial lens; and
    reevaluating said first UV trial lens for improvement in visual function after determining improvement in visual function with said second color trial lens when said first UV trial lens did not result in improvement in visual function prior to selection of said second color trial lens.

62. The method of Claim 61 further comprising:
    activating a full spectrum lighting element.
63. The method of Claim 61 further comprising:
activating a camera operable to record said improvement in visual function.

64. The method of Claim 63 wherein said camera is operable to record a pupillary response to said first color trial lens.

65. The method of Claim 61 wherein said first color group comprises a first infrared (IR) trial lens and a second IR trial lens.

66. The method of Claim 61 further comprising:
selecting a neutral density group comprising a first neutral density trial lens and a second neutral density trial lens;
determining whether said first neutral density trial lens or said second neutral density trial lens results in greater improvement in visual function; and
selecting said second neutral density trial lens for said lens prescription when said second neutral density trial lens results in greater improvement in visual function as compared to said first neutral density trial lens.

67. The method of Claim 61 wherein said first color group is selected from the group consisting of brown, orange, amber, yellow, green, moss green, pink, red, burgundy, rosewood, lavender, violet, royal blue, blue, sky blue, and aqua.

68. A method for determining a lens prescription, said method comprising:
selecting a first ultraviolet (UV) trial lens and a second UV trial lens;
determining whether said first UV trial lens or said second UV trial lens results in greater improvement in visual function;
selecting said second UV trial lens for said lens prescription when said second UV trial lens results in greater improvement in visual function as compared to said first UV trial lens;
selecting a neutral density group comprising a first neutral density trial lens and a second neutral density trial lens;
determining whether said first neutral density trial lens or said second neutral density trial lens results in greater improvement in visual function; and
selecting said second neutral density trial lens for said prescription when said second neutral density trial lens results in greater improvement in visual function as compared to said first neutral density trial lens.

69. The method of Claim 68 further comprising:
activating a full spectrum lighting element.

70. The method of Claim 68 further comprising:
activating a camera operable to record said improvement in visual function.

71. The method of Claim 70 wherein said camera is operable to record a pupillary response to said first UV trial lens.

72. The method of Claim 68 further comprising:
selecting a first color group comprising a first color trial lens and a second color trial lens;
determining whether said first color trial lens or said second color trial lens results in greater improvement in visual function; and
selecting said second color trial lens for said prescription when said second color trial lens results in greater improvement in visual function as compared to said first color trial lens.

73. The method of Claim 72 wherein said color group comprises a third color trial lens and said method further comprises:
determining whether said second color trial lens or said third color trial lens results in greater improvement in visual function; and
selecting said third color trial lens for said lens prescription when said third color trial lens results in greater improvement in visual function as compared to said second color trial lens.
74. The method of Claim 73 further comprising:
    reevaluating said first UV trial lens for improvement in visual function after
determining improvement in visual function with said second color trial lens when
said first UV trial lens did not result in improvement in visual function prior to
selection of said second color trial lens.

75. The method of Claim 68 further comprising:
    selecting a first infrared (IR) trial lens and a second IR trial lens;
determining whether said first IR trial lens or said second IR trial lens results
in greater improvement in visual function; and
    selecting said second IR trial lens for said lens prescription when said second
IR trial lens results in greater improvement in visual function as compared to said first
IR trial lens.

76. A method for selecting a trial lens for corresponding prescription, said method
comprising:
    selecting a neutral density group comprising a first neutral density trial lens
and a second neutral density trial lens;
    determining whether said first neutral density trial lens or said second neutral
density trial lens results in greater improvement in visual function;
    selecting said second neutral density trial lens for said prescription when said
second neutral density trial lens results in greater improvement in visual function as
compared to said first neutral density trial lens;
    selecting a first color group comprising a first color trial lens and a second
color trial lens;
    determining whether said first color trial lens or said second color trial lens
results in greater improvement in visual function; and
    selecting said second color trial lens for said prescription when said second
color trial lens results in greater improvement in visual function as compared to said
first color trial lens.

77. The method of Claim 76 further comprising:
selecting a first ultraviolet (UV) trial lens and a second UV trial lens;

determining whether said first UV trial lens or said second UV trial lens results in greater improvement in visual function; and

selecting said second UV trial lens for said lens prescription when said second UV trial lens results in greater improvement in visual function as compared to said first UV trial lens.

78. The method of Claim 77 further comprising:

reevaluating said second UV trial lens for improvement in visual function after determining improvement in visual function with said second color trial lens when said second UV trial lens did not result in improvement in visual function prior to selection of said second color trial lens.

79. The method of Claim 76 further comprising:

activating an infrared camera operable to record said improvement in visual function.

80. The method of Claim 79 wherein said camera is operable to record a pupillary response to said first color trial lens.
Activate Lighting Element

Evaluate IR Trial Lenses

Evaluate UV Trial Lenses

Evaluate Color Trial Lenses

Evaluate Each Color Lens With UV Trial Lenses

Evaluate UV Trial Lenses

Record Prescription

FIG. 1
FIG. 7
Activate Examination Equipment 2102

Evaluate UV Trial Lenses 2104

Evaluate Neutral Density Trial Lenses 2106

Evaluate Color Trial Lenses 2108

Evaluate UV Trial Lenses 2110

Record Prescription 2112

FIG. 21