CLAIMS

What is claimed is:

1. A self-standing device for delivery of photobiomodulation (PBM) to retinal tissue of an eye of a patient, the device comprising:

a housing comprising an interior;

an eyepiece or eyebox configured and arranged for placement of an eye of the patient adjacent the eyepiece;

a first light source selected from one or more LED, lamp, or laser, or any combination thereof, wherein the first light source is configured to produce a first light beam having a first therapeutic wavelength, and wherein the first light source is disposed within the housing;

a second light source selected from one or more LED, lamp, or laser, or any combination thereof, wherein the first light source is configured to produce a second light beam having a second therapeutic wavelength, wherein the second light source is separate from the first light source and is disposed within the housing, wherein the second therapeutic wavelength differs from the first therapeutic wavelength by at least 25 nm, and wherein at least one of the first and the second therapeutic wavelength comprises near-infrared (NIR) light;

a programmable controller operatively coupled to the first light source and to the second light source, wherein the programmable controller is configured to direct the first light source and the second light source to produce the first light beam and the second light beam, respectively, wherein directing the first light source and the second light source comprises controlling one or more PBM parameter selected from a light energy emission, a light energy density, a light energy duration, a light energy frequency, a light energy area, or a light energy sequence, or any combination thereof, of the light beams produced by the first and the second light sources;

an aperture disposed within the housing, wherein the device is configured and arranged to direct the first light beam and the second light beam through the aperture and through the eyepiece or eyebox to provide PBM to the retina of the patient; and

a patient interface surface for positioning the patient to receive the PBM, wherein the patient interface surface comprises a chin rest, a forehead rest, or both.

2. The device of claim 1, further comprising a third light source configured to produce a third light beam having a third therapeutic wavelength, wherein the third light source is disposed within the housing, and wherein the third therapeutic wavelength differs from the first and therapeutic wavelength and the second therapeutic wavelength by at least 25 nm.

3. The device of claim 1, wherein the first light source is configured and arranged to emit a pulsed light beam comprising a plurality of pulses having a temporal pulse width, wherein the temporal pulse width is in a range from 0.1 milliseconds to 150 seconds.

4. The device of claim 1, further comprising a relay structure configured and arranged to receive the first light beam and the second light beam from the aperture and direct the first light beam and the second light beam to the eyepiece or eyebox.

5. The device of claim 4, further comprising an actuator configured and arranged to move at least a portion of the relay structure to change a direction of the first light beam and the second light beam from at least a first position to at least a second position.

6. The device of claim 1, further comprising a biomedical sensor operatively coupled to the programmable controller and configured to provide real-time feedback information regarding the patient’s eye.

7. The device of claim 6, wherein the programmable controller is configured and arranged to regulate emission of light from the first light source and the second light source in accordance with the feedback information.

8. The device of claim 1, wherein the first therapeutic wavelength is in a range from 800 to 900 nm and the second wavelength is in a range from 600 to 700 nm.

9. The device of claim 1, wherein the first therapeutic wavelength is in a range from 800 to 900 nm and the second therapeutic wavelength is in a range from 550 to 650 nm.

10. A self-standing device for delivery of photobiomodulation (PBM) to retinal tissue of a patient, the device comprising:

a housing comprising an interior;

an eyepiece or eyebox disposed on the housing and configured and arranged for placement of an eye of the patient adjacent the eyepiece or eyebox;

a first light source selected from one or more LED, lamp, or laser, or any combination thereof, wherein the first light source is configured to produce a first light beam having a first therapeutic wavelength and disposed within the housing;

a second light source selected from one or more LED, lamp, or laser, or any combination thereof, wherein the first light source is configured to produce a second light beam having a second therapeutic wavelength and disposed within the housing, wherein the second therapeutic wavelength differs from the first therapeutic wavelength by at least 25 nm and wherein at least one of the first and the second therapeutic wavelength comprises near-infrared (NIR) light;

a programmable controller operatively coupled to the first light source and to the second light source, wherein the programmable controller is configured to direct the first light source and the second light source to produce the first light beam and the second light beam, respectively, wherein directing the first light source and the second light source comprises

controlling one or more PBM parameter selected from a light energy emission, a light energy density, a light energy duration, a light energy frequency, a light energy area, or a light energy sequence, or any combination thereof, of the light produced by the first and the second light sources;

a reflective filter disposed within the housing and configured and arranged to substantially pass light having the first therapeutic wavelength and substantially reflect light having the second therapeutic wavelength, wherein the device is configured and arranged to direct the first light beam and the second light beam to the reflective filter and then through the eyepiece or eyebox in order to provide PBM to the eye of the patient; and

a patient interface surface for positioning the patient to receive the PBM, wherein the patient interface surface comprises a chin rest, a forehead rest, or both.

11. The device of claim 10, further comprising a biomedical sensor operatively coupled to the programmable controller and configured to provide real-time feedback information regarding the patient's eye.

12. The device of claim 10, wherein the first therapeutic wavelength is in a range from 800 to 900 nm and the second therapeutic wavelength is in a range from 600 to 700 nm.

13. The device of claim 10, wherein the first therapeutic wavelength is in a range from 800 to 900 nm and the second therapeutic wavelength is in a range from 550 to 650 nm.

14. The device of claim 1, further comprising a user interface selected from (i) a touchscreen interface or (ii) a keyboard and display, wherein the user interface is operably coupled to the programmable controller.

15. The device of claim device of claim 1, further comprising one or both of (i) a camera and (ii) a pupil tracking sensor to observe the patient's eye.

16. The device of claim 5, further comprising a beam positioning mechanism operably coupled to the actuator.

17. The device of claim 16, wherein the beam positioning mechanism comprises one or more of a joystick, a trackball, or a touchscreen.