

Claims

1. A measurement device for stress assessment of a user, comprising:
a sensor module comprising a photoplethysmography (PPG) sensor for
measuring, from the user, a number of sets of physiological data, each set of
physiological data measured during a discrete time period;
a database for storing the physiological data;
a display module comprising a set of graphical user interface (GUI)
portions for displaying visual information from the stress assessment based
on the physiological data; and
a processor configured for:
determining a stress parameter for each set of physiological
data for comparison against a predefined stress reference;
identifying a first stress parameter for a current time period;
generating a stress alert in response to a determination that
predefined stress conditions are satisfied based on at least the first
stress parameter; and
communicating the stress alert to the display module for
displaying, on at least one of the GUI portions, the visual information
corresponding to the stress alert and assistive to the user in relieving
the stress state,
wherein the stress conditions are satisfied if the first stress
parameter is indicative of a stress state of the user relative to the
predefined stress reference.
2. The device according to claim 1, the processor further configured for:
identifying a second stress parameter for a second time period
preceding the current time period;
wherein the stress conditions are satisfied if, additionally, the second
stress parameter is indicative of a stress state of the user relative to the
predefined stress reference.
3. The device according to claim 1, the processor further configured for:

identifying a recent stress state of the user based on the stress parameters for earlier time periods before the current time period, the recent stress state indicative by a recent stress parameter for an earliest of the earlier time periods,

5 wherein the stress conditions are satisfied if, additionally, the recent stress parameter is indicative of the recent stress state of the user, and none of the stress parameters for the other earlier time periods is indicative of a normal state of the user.

10 4. The device according to claim 1, the processor further configured for:

 identifying a second stress parameter for a second time period preceding the current time period;

 identifying a third stress parameter for a third time period preceding the second time period,

15 wherein the stress conditions are satisfied if, additionally, both the second and third stress parameters are indicative of a stress state of the user relative to the predefined stress reference.

5. The device according to claim 1, the processor further configured for:

20 identifying two recent stress states of the user based on the stress parameters for earlier time periods before the current time period, the recent stress states indicative by two recent stress parameters for two recent time periods, respectively, within the earlier time periods, one of the two recent time periods being an earliest of the earlier time periods,

25 wherein the stress conditions are satisfied if, additionally, both the recent stress parameters are indicative of the recent stress states of the user, and none of the stress parameters for the other earlier time periods is indicative of a normal state of the user.

30 6. The device according to claim 1, the processor further configured for:

 identifying a plurality of recent stress states of the user based on the stress parameters for earlier time periods before the current time period, the recent stress states indicative by a plurality of recent stress parameters for a

plurality of recent time periods within the earlier time periods, the plurality of recent stress parameters including an earliest stress parameter for an earliest of the earlier time periods,

5 wherein the stress conditions are satisfied if, additionally, all of the plurality of recent stress parameters are indicative of the recent stress states of the user, and none of the stress parameters for the other earlier time periods is indicative of a normal state of the user.

7. The device according to any one of claims 1 to 6, wherein stress parameters
10 for all time periods before the current time period are disregarded for the stress conditions if the first stress parameter is indicative of a normal state of the user.

8. The device according to any one of claims 1 to 7, wherein the visual
information from the stress assessment comprises colour indicators.

15 9. The device according to claim 8, wherein the colour indicators comprise purple, green, and monochrome.

10. The device according to claim 8 or 9, wherein the colour indicator of the visual
20 information corresponding to the stress alert is purple for relieving the stress state.

11. The device according to any one of claims 1 to 10, further comprising a haptic module for generating haptic feedback corresponding to the stress alert.

25 12. The device according to any one of claims 1 to 11, the processor further configured for determining measurement conditions for each set of physiological data.

30 13. The device according to claim 12, the processor further configured for discarding a set of physiological data if the measurement conditions therefor are determined to be unsatisfactory.

14. The device according to any one of claims 1 to 13, wherein the predefined stress reference and/or predefined stress conditions is adjustable by the user.

15. The device according to any one of claims 1 to 14, wherein the PPG sensor is
5 a pulse oximeter sensor comprising an illumination element and at least two photodetectors.

16. The device according to any one of claims 1 to 15, the processor further configured for communicating the sets of physiological data to an electronic device
10 and/or a remote server for processing by the electronic device and/or the remote server, respectively.

17. A computerized method for stress assessment of a user, the method performed by a measurement device and comprising:

15 retrieving, from a database of the measurement device, a number of sets of physiological data measured from the user, each set of physiological data measured during a discrete time period;

determining a stress parameter for each set of physiological data for comparison against a predefined stress reference;

20 identifying a first stress parameter for a current time period;

generating a stress alert in response to a determination that predefined stress conditions are satisfied based on at least the first stress parameter; and

25 displaying, on at least one graphical user interface (GUI) portion, visual information corresponding to the stress alert and assistive to the user in relieving the stress state,

wherein the stress conditions are satisfied if the first stress parameter is indicative of a stress state of the user relative to the predefined stress reference.

30 18. The method according to claim 17, further comprising:

identifying a second stress parameter for a second time period preceding the current time period;

wherein the stress conditions are satisfied if, additionally, the second stress parameter is indicative of a stress state of the user relative to the predefined stress reference.

- 5 19. The method according to claim 17, further comprising:

identifying a recent stress state of the user based on the stress parameters for earlier time periods before the current time period, the recent stress state indicative by a recent stress parameter for an earliest of the earlier time periods,

- 10 wherein the stress conditions are satisfied if, additionally, the recent stress parameter is indicative of the recent stress state of the user, and none of the stress parameters for the other earlier time periods is indicative of a normal state of the user.

- 15 20. The method according to claim 17, further comprising:

identifying a second stress parameter for a second time period preceding the current time period;

identifying a third stress parameter for a third time period preceding the second time period,

- 20 wherein the stress conditions are satisfied if, additionally, both the second and third stress parameters are indicative of a stress state of the user relative to the predefined stress reference.

21. The method according to claim 17, further comprising:

- 25 identifying two recent stress states of the user based on the stress parameters for earlier time periods before the current time period, the recent stress states indicative by two recent stress parameters for two recent time periods, respectively, within the earlier time periods, one of the two recent time periods being an earliest of the earlier time periods,

- 30 wherein the stress conditions are satisfied if, additionally, both the recent stress parameters are indicative of the recent stress states of the user, and none of the stress parameters for the other earlier time periods is indicative of a normal state of the user.

22. The method according to claim 17, further comprising:

identifying a plurality of recent stress states of the user based on the stress parameters for earlier time periods before the current time period, the recent stress states indicative by a plurality of recent stress parameters for a plurality of recent time periods within the earlier time periods, the plurality of recent stress parameters including an earliest stress parameter for an earliest of the earlier time periods,

wherein the stress conditions are satisfied if, additionally, all of the plurality of recent stress parameters are indicative of the recent stress states of the user, and none of the stress parameters for the other earlier time periods is indicative of a normal state of the user.

23. The method according to any one of claims 17 to 22, wherein stress parameters for all time periods before the current time period are disregarded for the stress conditions if the first stress parameter is indicative of a normal state of the user.

24. The method according to any one of claims 17 to 23, wherein the visual information corresponding to the stress alert comprises a purple colour indicator for relieving the stress state.

25. The method according to any one of claims 17 to 24, further comprising generating haptic feedback corresponding to the stress alert.

26. The method according to any one of claims 17 to 25, further comprising determining measurement conditions for each set of physiological data.

27. The method according to claim 26, further comprising discarding a set of physiological data if the measurement conditions therefor are determined to be unsatisfactory.

28. The method according to any one of claims 17 to 27, wherein the predefined stress reference and/or predefined stress conditions is adjustable by the user.

29. The method according to any one of claims 17 to 28, further comprising
5 communicating the sets of physiological data to an electronic device and/or a remote server for processing by the electronic device and/or the remote server, respectively.

30. A non-transitory computer-readable medium having stored thereon instructions that, when executed, cause a processor of the measurement device to
10 perform the method according to any one of claims 17 to 29.

31. A computerized method for stress assessment of a user, the method performed by an electronic device and comprising:

receiving, from a measurement device, a measurement dataset
15 comprising a number of sets of physiological data measured from the user, each set of physiological data measured during a discrete time period;

storing the measurement dataset on a database of the electronic device;

determining a stress parameter for each set of physiological data for
20 comparison against a predefined stress reference;

identifying a first stress parameter for a current time period;

generating a stress alert in response to a determination that predefined stress conditions are satisfied based on at least the first stress parameter; and

displaying, on at least one graphical user interface (GUI) portion, visual
25 information corresponding to the stress alert and assistive to the user in relieving the stress state,

wherein the stress conditions are satisfied if, additionally, the second stress parameter is indicative of a stress state of the user relative to the predefined stress reference.

30

32. The method according to claim 31, further comprising:

identifying a second stress parameter for a second time period preceding the current time period;

wherein the stress conditions are satisfied if, additionally, the second stress parameter is indicative of a stress state of the user relative to the predefined stress reference.

5 33. The method according to claim 31, further comprising:

identifying a recent stress state of the user based on the stress parameters for earlier time periods before the current time period, the recent stress state indicative by a recent stress parameter for an earliest of the earlier time periods,

10 wherein the stress conditions are satisfied if, additionally, the recent stress parameter is indicative of the recent stress state of the user, and none of the stress parameters for the other earlier time periods is indicative of a normal state of the user.

15 34. The method according to claim 31, further comprising:

identifying a second stress parameter for a second time period preceding the current time period;

identifying a third stress parameter for a third time period preceding the second time period,

20 wherein the stress conditions are satisfied if, additionally, both the second and third stress parameters are indicative of a stress state of the user relative to the predefined stress reference.

25 35. The method according to claim 31, further comprising:

identifying two recent stress states of the user based on the stress parameters for earlier time periods before the current time period, the recent stress states indicative by two recent stress parameters for two recent time periods, respectively, within the earlier time periods, one of the two recent time periods being an earliest of the earlier time periods,

30 wherein the stress conditions are satisfied if, additionally, both the recent stress parameters are indicative of the recent stress states of the user, and none of the stress parameters for the other earlier time periods is indicative of a normal state of the user.

36. The method according to claim 31, further comprising:

identifying a plurality of recent stress states of the user based on the stress parameters for earlier time periods before the current time period, the recent stress states indicative by a plurality of recent stress parameters for a plurality of recent time periods within the earlier time periods, the plurality of recent stress parameters including an earliest stress parameter for an earliest of the earlier time periods,

wherein the stress conditions are satisfied if, additionally, all of the plurality of recent stress parameters are indicative of the recent stress states of the user, and none of the stress parameters for the other earlier time periods is indicative of a normal state of the user.

37. The method according to any one of claims 31 to 36, wherein stress parameters for all time periods before the current time period are disregarded for the stress conditions if the first stress parameter is indicative of a normal state of the user.

38. The method according to any one of claims 31 to 37, wherein the visual information corresponding to the stress alert comprises a purple colour for relieving the stress state.

39. The method according to any one of claims 31 to 38, further comprising generating haptic feedback corresponding to the stress alert.

40. The method according to any one of claims 31 to 39, wherein the predefined stress reference and/or predefined stress conditions is adjustable by the user.

41. The method according to any one of claims 31 to 40, further comprising communicating the stress alert to the measurement device for displaying corresponding visual information on the measurement device.

42. The method according to any one of claims 31 to 41, further comprising communicating the measurement dataset to a remote server for processing by the remote server.

- 5 43. The method according to claim 42, further comprising receiving, from the remote server, recommendation content for relieving a chronic stress state of the user, wherein the recommendation content is generated by and the chronic stress state is determined by the remote server based on the measurement dataset and historical measurement datasets of the user relative to a reference dataset.

10

44. A non-transitory computer-readable medium having stored thereon instructions that, when executed, cause a processor of the electronic device to perform the method according to any one of claims 41 to 43.

15