Claims

1. A computerized method for aiding a human subject in the development of physical, mental, and/or emotional skills, the method comprising:

sensing first subject-internal signals, the first subject-internal signals comprising physiologic signals generated internal to the subject's body including first neural activity signals, first muscle activity signals, and first heart rate variability signals;

determining a baseline subject mind state, a baseline subject body state, and a baseline subject emotional state using the sensed first subject-internal signals;

exposing the subject to a stressor including at least one of: (a) an emotional stressor comprising visual image or scene and/or audio information capable of producing a stressed subject emotional state, and (b) a physical stressor comprising a subject body condition or stimulus capable of producing a stressed subject physical state;

sensing second subject-internal signals during and after exposing the subject to the stressor, the second subject-internal signals generated internal to the subject's body and including second neural activity signals, second muscle activity signals, and second heart rate variability signals;

determining a stressed subject mind state, a stressed subject body state, and a stressed subject emotional state using the sensed second subject-internal signals;

terminating exposure of the subject to the stressor;

determining at least one of: (i-a) a mind state recovery profile comprising a mind state measure recovery pattern that the stressed subject mind state exhibits as it returns toward the baseline subject mind state, (ii-a) a body state recovery profile comprising a body state measure recovery pattern that the stressed subject body state exhibits as it returns toward the baseline subject body state, and (iii-a) an emotional state recovery profile comprising an emotional state

measure recovery pattern that the stressed subject emotional state exhibits as it returns toward the baseline subject emotional state; and

determining or estimating a subject health state based on at least one of the mind state recovery profile, the body state recovery profile, and the emotional state recovery profile, wherein determining or estimating the subject heath state comprises

comparing the at least one of the mind state recovery profile, the body state recovery profile, and the emotional state recovery profile of the subject to at least one of a mind state recovery profile, a body state recovery profile, and an emotional state recovery profile of a healthy subject reference,

relative to the healthy subject reference, identifying in the subject at least one delay in at least one of: (i-b) a mind state recovery time interval across which the stressed subject mind state returns to within a first target percentage of the baseline subject mind state; (ii-b) a body state recovery time interval across which the stressed subject body state returns to within a second target percentage of the baseline subject body state, and (iii-b) an emotional state recovery time interval across which the stressed subject emotional state returns to a third target percentage of the baseline subject emotional state,

relative to the healthy subject reference, identifying at least one irregular pattern in the at least one of the mind state recovery profile, the body state recovery profile, and the emotional state recovery profile of the subject, and

correlating the identified at least one delay or irregular pattern to an unhealthy state of the subject.

2. The method of claim 1, wherein sensing the first and second neural activity signals comprises sensing electroencephalography (EEG) signals, and sensing the first and second muscle activity signals comprises sensing electromyography (EMG) signals.

3. The method of claim 1 or 2, wherein the subject has a physically impaired body part, wherein determining the subject health state comprises determining whether the at least one of the mind state recovery time interval, the body state recovery time interval, and the emotional state recovery time interval decreases over time following multiple subject physical skill development sessions, wherein each subject physical skill development session comprises presenting functional skill development activities to the subject simultaneous with presenting current mind state biofeedback and current body state feedback to the subject, and wherein presenting the functional skill development activities comprises presenting visual information showing usage of an unimpaired body part corresponding to the physically impaired body part in a mirror image manner during subject viewing of the visual information.

4. The method of claim 1, wherein the mind state recovery profile is determined by the mind state recovery time interval, the body state recovery time interval is determined by the body state recovery time interval, and the emotional state recovery profile is determined by the emotional state recovery time interval.

5. The method of claim 1, further comprising:

determining an extent of subject torso or trunk rotational asymmetry; and

determining whether the extent of subject torso or trunk rotational asymmetry is greater than a target or threshold torso or trunk rotational asymmetry value.

6. The method of claim 5, wherein the target or threshold torso or trunk rotational asymmetry value equals 9 mm +/- 20%.

7. The method of claim 6, wherein determining the subject health state further comprises determining whether the extent of subject torso or trunk rotational asymmetry decreases over time to less than or equal to the target or threshold torso or trunk rotational asymmetry value following the multiple subject physical skill development sessions.

8. The method of claim 4, further comprising:

sensing levels of subject-external signals, the subject-external signals generated external to the subject's body and including an ambient temperature level, an ambient relative humidity level, and an ambient noise level;

determining subject performance and/or subject outcome measures corresponding to each physical skill development session;

correlating the levels of sensed subject-external signals with the subject performance and/or subject outcome measures; and

determining whether subject performance and/or subject outcome measures across different physical skill development sessions was adversely affected by the level of one or more subject-external signals exceeding a target or threshold level or falling outside of a target or threshold range.

9. The method of claim 8, wherein determining levels of subject-external signals further comprises determining at least one of an ambient light level, an ambient atmospheric pressure

or altitude level, an ambient magnetic field intensity level, and an ambient electromagnetic signal level within at least one electromagnetic signal frequency band.

10. The method of claim 8, further comprising automatically transferring by way of cellular network communication the determined subject performance measures and/or subject outcome measures to a set of servers, without subject initiation, management, and/or acknowledgment.

11. The method of any one of claims 8 - 10, wherein the determining subject outcome measures comprises:

capturing image data and/or audio data representing a current subject outcome resulting from subject performance or attempted performance of a functional development activity sequence; and

comparing the received image data and/or audio data with target image data and/or audio data, respectively, to determine an extent to which the current subject outcome matches a target outcome for the functional development activity sequence.

12. A system for aiding a subject in the development of physical, mental, and/or emotional skills, the system comprising:

a set of subject-internal signal sensing devices wearable by the subject and configured for sensing signals generated internal to the subject's body, the set of subject-internal signal sensing devices comprising:

a head mountable sensing apparatus configured for sensing subject electroencephalography (EEG) signals; and

at least one of: a forearm mountable sensing apparatus configured for sensing subject electromyography (EMG) signals generated by particular subject forearm

and hand muscles, a neck mountable sensing apparatus configured for sensing EMG signals generated by particular subject neck muscles, a chest mountable sensing apparatus configured for sensing subject EMG signals generated by particular subject upper torso muscles, a waist / hip mountable apparatus configured for sensing EMG signals generated by particular subject abdominal, waist, hip, and/or gluteal region muscles; and an upper leg mountable sensing apparatus configured for sensing subject EMG signals generated by subject upper leg muscles; and a lower leg mountable apparatus configured for sensing EMG signals generated by particular subject lower leg muscles;

a set of subject-external signal sensing devices configured for sensing signals generated external to the subject's body, the set of subject-external sensing devices comprising:

a set of accelerometers and/or gyroscopes carried by the set of subject-internal signal sensing devices;

an ambient temperature sensor;

an ambient humidity sensor; and

an ambient noise sensor;

a local computing unit having a processing unit and a memory storing program instructions executable by the processing unit;

a display device configured for presenting biofeedback information to the subject simultaneous with presenting functional development activity sequences to the subject; and

a cellular network communication unit configured for communicating data corresponding to sensed subject-internal signals and sensed subject-external signals to at least one server by way of at least one cellular network,

wherein the processing unit is configured to

receive a first set of the sensed signals generated internal to the subject's body, wherein the first set comprises first subject-internal signals including first neural activity signals, first muscle activity signals, and first heart rate variability signals,

determine a baseline subject mind state, a baseline subject body state, and a baseline subject emotional state using the first subject-internal signals,

receive a second set of the sensed signals generated internal to the subject's body during and after exposure to a stressor configured to produce at least one of: (a) a stressed subject emotional state, and (b) a stressed subject physical state, wherein the second set comprises second subject-internal signals including second neural activity signals, second muscle activity signals, and second heart rate variability signals,

determine a stressed subject mind state, a stressed subject body state, and a stressed subject emotional state using the second subject-internal signals,

determine at least one of: (i-a) a mind state recovery profile comprising a mind state measure recovery pattern that the stressed subject mind state exhibits as it returns toward the baseline subject mind state, (ii-a) a body state recovery profile comprising a body state measure recovery pattern that the stressed subject body state exhibits as it returns toward the baseline subject body state, and (iii-a) an emotional state recovery profile comprising an emotional state measure recovery pattern that the stressed subject emotional state exhibits as it returns toward the baseline subject emotional state, and

determining or estimating a subject health state based on at least one of the mind state recovery profile, the body state recovery profile, and the emotional state recovery profile , wherein determining or estimating a subject

health states comprises identifying at least one irregular pattern in the at least one of the mind state recovery profile, the body state recovery profile, and the emotional state recovery profile of the subject when compared to at least one of a mind state recovery profile, a body state recovery profile, and an emotional state recovery profile of a healthy subject reference.

13. The system of claim 12, wherein the subject has a physically impaired body part, wherein the set of subject-internal signal sensing devices is configured for sensing EMG signals generated by muscles within the impaired body part, and wherein presentation of the functional development activity sequences comprises presenting visual information showing usage of an unimpaired body part corresponding to the physically impaired body part in a mirror image manner during subject viewing of the visual information.

14. The system of claim 12 or 13, wherein the system includes a local wireless network communication and authentication unit coupled to the local computing unit, and wherein each subject-internal signal sensing device is configured for authenticated wireless network communication of sensed subject-internal signals to the local computing unit by way of the local wireless network communication and authentication unit.

15. The system of claim 12, wherein the set of subject-external signal sensing devices further comprises at least one of an ambient lighting level sensor, an ambient atmospheric pressure or elevation level sensor, an ambient magnetic field intensity sensor, and an ambient electromagnetic signal level corresponding to at least one electromagnetic signal frequency band.

16. The system of claim 12, wherein the processing unit is further configured to

expose the subject to the stressor including at least one of: (a) an emotional stressor comprising visual image or scene and/or audio information capable of producing a stressed subject emotional state, and (b) a physical stressor comprising a subject body condition or stimulus capable of producing a stressed subject physical state; and

store the second set of sensed signals during and after exposing the subject to the stressor.

17. The system of claim 12, wherein the processing unit is further configured to determine at least one of:

(i-b) a mind state recovery time interval across which the stressed subject mind state returns to within a first target percentage of the baseline subject mind state, wherein the mind state recovery interval is used to determine the mind state recovery profile;

(ii-b) a body state recovery time interval across which the stressed subject body state returns to within a second target percentage of the baseline subject body state, wherein the body state recovery interval is used to determine the body state recovery profile; and

(iii-b) an emotional state recovery time interval across which the stressed subject emotional state returns to a third target percentage of the baseline subject emotional state, wherein the emotional state recovery interval is used to determine the emotional state recovery profile.

18. The system of claim 12, wherein the processing unit is further configured to

determine an extent of subject torso or trunk rotational asymmetry;

determine whether the extent of subject torso or trunk rotational asymmetry is greater than a target or threshold torso or trunk rotational asymmetry value.

19. The system of claim 12, further comprising:

a set of servers including the at least one server; and

a database with which the set of servers communicates, and which stores subject information including (a) sensed subject-internal signal histories and/or subject mind state measures, body state measures, and emotional state measures derived therefrom, sensed subject external signal histories including, (b) sensed subject-external signal histories, and (c) target subject outcome data representing target outcomes of subject performance or attempted performance of particular types of functional development activity sequences,

wherein the set of servers includes at least one server processing unit and at least one server memory storing server program instructions which when executed by the at least one server processing unit cause the server to compare current subject outcome data associated with a specific functional development activity sequence and which was received from the local computing unit with corresponding target subject outcome data to determine an extent to which the current subject outcome data matches the target subject outcome data.

20. The system of claim 19, wherein the current subject outcome data comprises at least one of image data, audio data, electronic drawing pad and/or electronic stylus data, captured keyboard input, accelerometer and/or gyroscope data generated by an apparatus or device with which the subject interacts, and pressure mat data.

21. The system of claim 19, wherein the set of server program instructions when executed by the at least one server processing unit cause the set of servers to:

correlate levels of the sensed subject-external signals with subject performance measures and/or subject outcome measures corresponding to multiple physical skill development

sessions comprising subject performance or attempted performance of multiple functional activity development sequences over time; and

determine whether subject performance and/or subject outcome measures across different physical skill development sessions was adversely affected by a level of one or more sensed subject-external signals exceeding a target or threshold level or falling outside of a target or threshold range.