**CLAIMS**

1. A computational personalized cognitive therapeutic system comprising one or more processors and one or more associated memories configured to implement:

a patient clinical database comprising a data acquisition interface configured to receive and store input data for a plurality of patients from a plurality of heterogeneous data sources, the input data for a patient comprising: personal particular and sociodemographic data; patient medical history and background health data; medication data; clinical data; and wearable data comprising behavioural data and physiological data, wherein the input data sources for a patient comprise one or more wearable devices and one or more of an electronic medical record, a digitised caregiver record, a laboratory information management system, a clinical database, and/or a patient on-boarding module;

a data aggregation and pre-processing module configured to pre-process the input data in the patient clinical database and generate a patient profile for each patient;

a digital cognitive therapy delivery module configured to deliver a plurality of therapies according to a personalised cognitive digital therapy model to a patient using one or more computing devices, each therapy having a different mechanism of action (MOA) and comprising a plurality of adjustable parameters, and the digital cognitive therapy delivery module is further configured to collect a plurality of digital cognitive biomarkers for each therapy, a plurality of behavioural and physiological biomarkers from one or more wearable devices and/or the one or more computing devices, and to measure interactions of the patient with the digital cognitive therapy delivery module, wherein the plurality of therapies comprises at least a cognitive stimulation game therapy, a guided learning therapy, a reminiscence therapy and a physical and mental wellness therapy;

a cognitive analytics engine configured to process the patient profile, digital cognitive biomarkers, and the behavioural and physiological biomarkers using an ensemble of population-based and personalised prediction models trained using a plurality of Artificial Intelligence (AI) and Machine Learning (ML) methods, and which is configured to generate a plurality of metrics to characterize a current cognitive state of the patient and estimate the potential future improvement comprising the probability and size of an expected effect, wherein the plurality of metrics are generated on demand or at least once per day; and

a personalised cognitive platform configured to use the plurality of metrics to personalize the personalised cognitive digital therapy model for each patient by adjusting one or more of the plurality of parameters for one or more of the plurality of therapies to maximise the estimated effect level, and to use the metrics to generate one or more alerts if a therapy does not meet an expected threshold effect level or a side effect exceeds a threshold side effect level to enable adjustment of a medication by a clinician,

wherein the system iteratively refines the personalised cognitive digital therapy model for each patient over time by selecting specific therapies from the plurality of therapies and adjusting the associated adjustable parameters, and obtaining an estimate effect of the adjustments, and after delivery of an adjusted treatment by the digital cognitive therapy delivery module, the cognitive analytics engine generates the

plurality of metrics to assess actual effects compared to estimated effects in order to further refine the personalised cognitive digital therapy model by the personalised cognitive platform.

2. The system as claimed in claim 1, wherein the data aggregation and pre-processing module is configured to perform data cleaning, dimensionality reduction and data transformation to prepare the input data for further analysis and use by the cognitive analytics engine.

3. The system as claimed in claim 1 or 2, wherein:

the plurality of digital cognitive biomarkers for the cognitive stimulation game therapy comprises one or more of a game specific performance, finger tapping and finger movement related biomarkers, reaction time between a stimulus exposure and a response, and a proxy index of a cognitive load;

the plurality of digital cognitive biomarkers for the guided learning therapy comprises one or more of a quiz result, an answer confidence, a speed of information processing of content, or a time spent with content;

the plurality of digital cognitive biomarkers for the reminiscence therapy comprises one or more of a language marker derived from textual analysis or audio analysis, a speech characteristic derived from audio data of the patient; and

the plurality of digital cognitive biomarkers for the physical and mental wellness therapy comprises one or more of an access frequency of content, time spent with content, an application opening and closing frequency, a task completion within an allotted time, a compliance with an allotted task, a direct feedback from the patient on the likeability and difficulty of the therapy via a questionnaire, and an emotional expression capture indicating a level of enjoyment.

4. The system as claimed in claim 1, 2 or 3, wherein the plurality of behavioural and physiological biomarkers comprise one or more of an movement biomarker obtained from an accelerometer and/or a gyroscope, an electrodermal activity or skin conductance biomarker, a photoplethysmography or blood volume pulse biomarker, a heart rate biomarker, a heart rate variability biomarker, a skin temperature biomarker, a facial expression biomarker, an eye tracking biomarker, and a neural activity biomarker.

5. The system as claimed in any one of claims 1 to 4, wherein the plurality of metrics comprise:

a cognitive baseline pointer which is an estimate of a change in the cognitive state of the patient with respect to a baseline generated using the patient profile and an expected behaviour effect on the patient generated by the cognitive analytics engine;

a mechanism of action pointer for each of the plurality of mechanisms of action which estimates an effect level with respect to an expected effect level for the associated therapy generated by the cognitive analytics engine;

an average mechanism of action pointer which estimates an average effect of the plurality of therapies with respect to an estimate effect generated by the cognitive analytics engine; and

a side effects pointer which measures a severity of one or more side effects.

6. The system as claimed in claim 5, wherein the personalised cognitive platform comprises a MOA management module, an educational content management module and a medication/dose management module, wherein the MOA management module uses at least the mechanism of action pointers and the average mechanism of action pointer to adjust one or more of the plurality of parameters for one or more of the plurality of therapies and to adjust the dosage of each of the plurality of therapies to maximise the estimated effect level of a therapy, and wherein the content education module is configured to adjust a digital content provided to a patient based on the patient's interaction behaviour measured by the digital cognitive therapy delivery module, and the medication/dose management module is configured to record clinical data including medication and dosages and to generate suggested changes to medication and dosages using at least the side effects pointer and the cognitive baseline pointer.

7. The system as claimed in claim 6, wherein the MOA management module is configured to adjust the cognitive stimulation game therapy by adjusting one or more game parameters, game dosage and game timing, and is configured to adjust the guided learning therapy by adjusting the learn amount and timing, and learning content, and is configured to adjust the reminiscence therapy by adjusting the timing of content, content topics and stimulus and is configured to adjust the physical and mental wellness therapy by adjusting a modality, an intensity and a duration of physical exercise or mental exercise.

8. The system as claimed in any one of claims 1 to 7, wherein the digital cognitive therapy delivery module provides a user interface on a computing device comprising:

a reminder and calendar module configured to allow patients to record reminders and to notify the patient of a scheduled therapy, and monitors therapy compliance;

a note module configured to track goals and record electronic information to assist with daily living activities;

a medication schedule module configured to record a medication schedule and track compliance;

an electronic gratitude journal;

a mood tracker configured to estimate and/or record a mood of a patient, and to provide feedback on past mood history and to provide mood data to a clinician and/or the cognitive analytics engine;

a social media module to facilitate communication with family, friends and support groups;

a gamification system which awards points for completion of therapy or tasks, and rewards for achieving specific points goals, and a comparative score based on treatment progress with respect to other patients with similar diagnosis;

a diet tracking module configured to collect consumption data and provide dietary recommendations; and

a therapy module configured to provide the plurality of therapies to the patient.

9. The system as claimed in any one of claims 1 to 8, wherein the system comprises a cloud computing platform and the digital cognitive therapy delivery module is configured to execute on one or more patient mobile computing devices.