Manual for Clinical Brain Profiling (**C.B.P.**)

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Go to Clinical Brain Profiling (CBP) at: http://neuroanalysis.org.il/cbp/index.php or type NeuroAnalysis in the search engine (Google) and then click on CBP linkage.

ENTER THE DATA

CBP translates the clinical findings from your patient to his presumed brain disturbance. As such it is based on the clinical assessment of mental status examination, the complaints of the patient and psychiatric history.

You enter the data by clicking on the small boxes of the item list. Start with entering the signs based on the mental status examination, proceed to enter the symptoms based on the complaints of the patient, and finally enter the relevant information about the history of the patient. Use **Appendix 1** to obtain reliability (inter-rater agreement).

OBTAIN THE NEUROSCIENTIFIC DIAGNOSIS

After entering the data by clicking on the small boxes of the item list, go (scroll down) to the bottom of the list press "Brain Profiling Results."
A graph will appear containing 9 value-items as follows (see axis X):

DMN= Default Mode Network.
D= De-optimization dynamics.
O=hyper-optimization dynamics.
CF= Constrain Frustration.
CFb= Constrain Frustration bound (stimulus).
Cs= Connectivity segregation.
Ci=Connectivity integration.
Hbu = Hierarchical bottom-up insufficiency.
Htd= Hierarchical top-down shift.

Axis Y outputs a percentage value for each item. It is the percentage of entries clinically relevant to that item. The value is maximal 100% if the clinical assessment codes all the components related to that value. For example if signs, symptoms and history of the patient are related to all of the parameters that indicate disconnection dynamics (i.e., Connectivity segregation Cs) than Cs will acquire the value of 100.

Thus CBP offers a set of parameter-outputs reflecting to which extent each item of brain disturbance is present in the patient.

SHORT EXPLANATION; THE MEANING OF CBP RESULTS

For an in-depth explanation and discussion of CBP, see the relevant literature in the attached bibliography.

i. **DMN**= Default Mode Network.

Ego and object-relationship are psychological constructs related to personality disorders, both define personality disorders as disorders of Ego development and disordered internal presentations which bias the perception and reaction of personality disordered patients, as a consequence making them suffer from maladaptive behaviors.

As early as 1800 Meynert defined the ego in terms of network organization of the brain assuming that the ego is a neuronal network organization of the cortex. Recently it has been shown with imaging methods that the "resting" (non task-related) brain is actually organized as a network. Such network has been given the name of Default Mode Network (DMN).

We know today that internal representations can be embedded in "attractor formations" created from strengthening connectivity among neuronal ensembles. Thus personality can now be related to the organization of the DMN and to the adequacy of the internal configurations. Consequently it is conceivable that patients suffering from personality disorders are predicted to show altered DMN configurations and maturation.

Using CBP the clinical findings related to personality disorders are translated into disturbances to the DMN.

ii. **D**= De-optimization dynamics.

Mood is an emergent property related to neural-network plasticity-dynamics in the brain. We know today that depression is correlated with damage to neurons, cell death and abolition of dendrites and synapses. We also know that antidepressant effects correlate with synaptogenesis and cell proliferation. Plasticity of the DMN becomes relevant here.

The DMN is continually adapted to the environment in such a way that the internal representations of the environment are embedded in the connectivity configuration of the DMN. The environment is highly dynamic and the plasticity of the DMN must match the ever-changing environment.

In effect the internal representations in the form of DMN-configurations continually optimize to match the environmental ever-changing occurrences. If a good match is maintained over-time optimization dynamics is dominating the brain organization. But if not, if the occurrences in the environment shift too rapidly, or the ability of the brain DMN organization to change according to the environment is hampered, than deoptimization dynamics ensues.

From the above we know that plasticity is critical for the DMN to be able to change and adapt to the environment. Thus we can conclude that deoptimization causes depression (as an emergent property), while optimization dynamics translates to (the emergent property of) elevated mood.

iii. **O**=hyper-optimization dynamics.

As optimization dynamics translates to the emergent property of elevated mood so Hyper-optimization dynamics underlies manic symptoms. Thus CBP translates manic signs and symptoms into presumed Hyper-optimization dynamics spread in the cortex.

iv. **CF**= Constrain Frustration.

When large discrepancy between the internal organization of the DMN and the upheaval of environmental occurrences take place, than constraints (connections) between neurons in the network become "frustrated" strained, mathematically meaning that the values of the neuronal activation do not match the value of weighted (synaptic) connections.

The presumed emergent property of constraint-frustration (CF) is "Anxiety," in effect any destabilization of cortically-spread global neuronal-network organization will be felt as anxiety sensation.

v. **CFb**= Constrain Frustration bound (stimulus).

When cortically spread-global neuronal-network organization is perturbed by a specific stimulus, this can be related to a learning-processes where stimulus acts as destabilization trigger of previously learned perturbation.

vi. **Cs**= Connectivity segregation.

"Connectivity segregation" relates to disconnection dynamics, different subsystems and neuronal networks of the brain act statistically independent of each other. The literature relates this type of disturbance to psychosis. Accordingly CBP translates signs and symptoms of psychosis to connectivity segregation.

vii. **Ci**=Connectivity integration.

"Connectivity integration" is the opposing dynamics to connectivity segregation. It is over-connectivity dynamics which was found to constraints the dynamism of the system limiting its activity and causing it to "freeze." Connectivity integration reduces the dynamical space of the system creating repetitive activations, over and over again the same states of neuronal activations create preservatives ideations.

This type of behavior simulates poverty of thought and speech, and perseverations typical to negative signs schizophrenia, thus such symptoms are translated by CBP into Connectivity integration disturbance.

viii. **Hbu** = Hierarchical bottom-up insufficiency.

The brain is an hierarchal system, with higher mental functions emerging at higher-levels of brain organization. Insufficiency in the function of such levels translates into deficiencies of high mental functions such as "volition" and "motivation." Thus signs and symptoms of disturbances to high mental functions and motivations are translated with CBP into bottom-up brain insufficiency.

ix. **Htd**= Hierarchical top-down shift.

At higher level of brain organization "context" and "schemata" of ideations and thoughts are formed. These can bias incoming environmental experience causing false ideations about what is transpiring. In cases of hierarchal imbalance in which top-down influences overcome bottom-up processes a top-down shift may explain systemized delusional ideations.

VALIDATION OF CBP

CBP is not in any sense a final product, on the contrary, it is merely a starting point, to be developed and elaborated upon. Thereafter, and concomitantly with, the development of CBP, it will need to be validated. As evident CBP is formulated in a Testable-Prediction manner.

To validate CBP powerful signal processing methods applied to potent brain-imaging will be required.

The CBP information would need to be extracted from the brain via signal processing methods which are sensitive to changes of neuronal-network organization.

These can begin with simple "coherency" and "synchrony" measures, but will eventually require detections of "small-world" organization "free-energy" and altered "entropy" measurements.

Table1 attempts to propose the different signal processing methods for different CBP measurements.

Table 1

Clinical phenomena	**Network disturbances**	**How to detect, diagnose & monitor**
Personality disorders	Disturbances to development of default mode network	Age-related changes resting-state functional connectivity MRI (rs-fcMRI). Age related Matching complexity, Free energy estimations, Entropy measurements integrated information theory
Mood & Anxiety	Disturbances to Optimization dynamics	Short-term over time Dynamics of Matching complexity, Free energy estimations, Entropy measurements integrated information theory
Schizophrenia delusions and avolition	Hierarchal (top-down bottom-up) disorders	Small world network analysis for hub composition, Estimating hierarchy, k-shell decomposition percolation theory and fractal geometry

Schizophrenia Disorganization deficiency	Connectivity imbalances Disconnection over-connection	Correlations, Synchrony, Granger causality, Mutual information, Dimension estimation, Bayesian statistics Dynamic Causal Modeling, Independent components analysis Neural complexity (Correlation matrix), overall Small world network analysis

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Appendix 1; scoring with reliability

Detected	Description for scoring
Is the patient untidy	Appearance is somewhat disheveled i.e., greasy hair, dirty clothes as in 'Grooming and Hygiene' section (1)
Is the patient very messy	Subject's clothes, body and environment are dirty and foul smelling as in 'Grooming and Hygiene section' (1)
Is the patient with excessive jewelry makeup and colored clothing	It is evident that the clothing makeup and jewelry are grossly exaggerated. Excessiveness is the criteria. This score should not be assigned to people who are well groomed.
Moves slowly	Obvious decrease of motor activity at interview as described in level '2' of retardation on the Hamilton Depression Scale (3) together with reduction of usage of expressive body gestures as in 'Marked' level of 'Paucity of expressive gestures' in the section of 'Affective Flattening' (1).
Stiff or frozen	Subject never gesticulates as in 'Severe' rating of 'Paucity of expressive gestures' in the section of 'affective flattening' (1). In addition motor activity is reduced as rated for 'stupor' in the 'retardation' item of the Hamilton Depression Scale.
Restless, moves a lot	As in 'Fidgets' in the 'Behavior at interview' score according to the Hamilton Anxiety scale (4) the patient finds it difficult to remain seated during the interview, moves a lot in the chair, moves arms legs, changes position often, he is 'Restless' as in the 'Tension' score (4).
Agitated looks as if on verge of "exploding"	As in 'Paces' in the 'Behavior at interview' score according to Hamilton Anxiety scale (4) looks as if making the effort to restrain himself from becoming violent. Finds it hard to remain seated during the interview.
Bizarre unexplainable movement	Makes movements that are bizarre and non-purposeful, to the extent that they must be effortlessly noticed as such by interviewer and others. If the movements are explainable and their oddity is questionable then this item must not be scored as 'present'
Repetitive stereotype movement	Movements that are repeated in the same (similar) manner; they can be 'repetitive stereotyped behavior' at the 'marked' level of the SANS (1)
Speaks slowly	Speech is slow, words are pronounced slowly and pauses between words are longer than usual, speech must be slower than those who speak slowly. It should be easily and readily evident for the examiner, if there is doubt then this item must not be scored.
Limited verbal communication, gives short responses	Restriction in the amount of spontaneous speech as in 'Alogia' section of the SANS (1) answers in single words or very short sentences, no spontaneous speech; the interview takes the form of investigation where the examiner repeatedly asks questions and the patient responds only briefly.
Limited verbal communication, few words only or non at all	Restriction in the amount of spontaneous speech as in 'Alogia' section of the SANS (1) Subject says almost nothing and frequently fails to answer.
Speech at low tone or whisper	'Lack of Vocal inflection' speaks in monotone, as in 'affective flattening' section of SANS (1). In addition voice is distinguishably weak
Speaks fast	Sentences are uttered rapidly - word follows word immediately. All speech is distinguishably fast more than the regular higher spectrum of normal speech. It should be easily and readily evident for the examiner, if there is doubt, this item should not be scored.
Speaks a lot, gives long spontaneous responses	Here the emphasis is on the volume of speech (rather than speed, the patient starts to speak continuously even when not asked any questions, once starting he never ends and it is difficult to stop him or insert a question while he is speaking).
Speaks without stopping, jumps from one issue to another	In addition to the description of the above previous score, here the patient is practically unstoppable and speech content is disturbed in the sense that jumping from one concept to unrelated (or loosely related) concepts is the rule.
Speech with elevated tone	Tone is elevated to the extent that the patient seems to be shouting. The tone is higher than the normal range of voice tones, if there is doubt then this item should not be scored.
Speech associations are loose; jumps from one sentence to another each a different topic	As in 'Marked Derailment' of the SAPS (2) 'Frequent instances of derailment: subject is often difficult to follow' only 'Marked' levels warrant a score here, 'Moderate' and 'Mild' do not.
Words are unrelated within sentences 'word	As in 'Severe Derailment' of the SAPS (2) 'Derailment so frequent and / or

salad'	extreme that the subject's speech is almost incomprehensible' Here also the 'Marked and Severe Incoherence' items of the SAPS (2) apply, 'At least half of the subject's speech is incomprehensible'.
Repeating same topics of conversation	The patient is pre-occupied by a set of thoughts and repeatedly expresses them in speech. Typically this is expressed in conversation; no matter where the examiner takes the topics of discussion, the patient inevitably returns to his set of concerns. The examiner cannot divert the patient from his repeated issues for long and the patient returns to his original thoughts.
Repeating/perseverating the same sentences	Here sentences are concretely repeated over and over again
Responding to previous question	The patient is 'stuck' answering the first question although other additional questions were already asked. For example what is your name? John, where do you live? John… and so on
Obsessions and compulsions	As in DSM
Delusion, false unshakable belief	As in all delusions of the 'Delusions' chapter of the SAPS (2) rated 'Moderated' 'Marked' or 'Severe'
Systemized delusion	Delusion is non-bizarre stable over time tends to grow incorporating new events in the experience of the patient. As in the Delusional disorder of the DSM.
Illogical conclusions	As in 'Illogicality' SAPS (2) rated 'Moderated' 'Marked' or 'Severe'
Inappropriate affect	As in 'Inappropriate affect' SAPS (2) rated 'Moderate' 'Marked' or 'Severe'
Flight of ideas	As in 'Pressure of speech ' SAPS (2) rated 'Moderate' 'Marked' or 'Severe'
Speech content includes mainly issues of despair, hopelessness, and pessimism.	As in Hamilton depression scale (3) items 'Guilt,' Helplessness,' 'Hopelessness' and 'Worthlessness' - scores 1 to 4
Speech content includes mainly issues of megalomania, over empowerment and unrealistic optimism (and plans)	The subject is concerned with issues of megalomania, over empowerment and unrealistic optimism (and plans). This must be self-evident and obvious.
Bizarre or overly abstract response to categorization (proverbs) and abstraction	Bizarre or overly abstract response to categorization (proverbs) and abstraction
Concrete interpretation of proverbs	Concrete interpretation of proverbs for example the common characteristic of table chair and cupboard are that they are made of wood instead of that they are all furniture. Concrete responses are given even after assisting the patient with examples of abstraction from related issues - for example "apple banana orange are fruit"
Auditory hallucinations	As in 'Auditory Hallucinations' including voices commenting and conversing of the SAPS (2) rated 'Mild' 'Moderate' 'Marked' or 'Severe'
Visual tactile olphactory hallucinations	As in the other 'Hallucinations' Visual tactile and olphactory of the SAPS (2) rated 'Mild' 'Moderate' 'Marked' or 'Severe'
Constricted affect	As in 'Unchanging facial expression' in the SANS (1) 'Moderate: Subject's expressions are dulled overall, but not absent' and "Marked: Subject's face has a flat 'set' look, but flickers of affect arise occasionally"
Blunt affect	As in 'Unchanging facial expression' in the SANS (1) "Severe: Subject's face looks 'wooden' and changes little, if at all throughout the interview".
Expansive mood elevated affect	The subject seems elated overly happy, mood is excessive in a self-evident unquestionable manner.
Dysphoric (suffering) affect	Facial expression of suffering; uneasy as in an uncomfortable state of mind. Must be evident, if questionable no score is applied.
Depressed affect	Facial expression is of painful sadness (typical triangle form of eyebrow). Must be evident, if questionable no score is applied.
Anxious affect	Facial expression is of anxious form, constricted facial muscles, and bulging eye expression. Startled and / or crying expression. Must be evident, if questionable no score is applied
Detached from examiner	The patient behaves as if the examiner (and others), are not there, seems to be reflecting on inner thoughts and is not available for whatever is occurring in the interview or around him. Must be evident, if questionable no score is applied.
Perplexed, ambivalent	Face expression is similar to that of a person seeing something extraordinary for the first time, and seems to be lost, not knowing where to turn. Must be evident, if questionable no score is applied.
Inappropriately close to examiner (no boundaries)	Attitude toward the examiner is as if he were a 'buddy' of the patient or a close intimate relative. Asks intimate embarrassing intruding questions, sits close to the examiner (may touch or hug him). Must be evident, if questionable no score is applied
Suspicious with examiner	Suspicious attitude toward the examiner as if the examiner is a threat, or wants to harm the patient. Must be evident, if questionable no score is applied.

Threatening to examiner	Seems as if about to get up and hit the examiner. Must be evident, if questionable no score is applied.
Seductive toward examiner (theatrical)	Attitude toward the examiner is as if he were a 'buddy' of the patient or a close intimate relative but with a seducing actively probing attitude. Must be evident, if questionable no score is applied.
Sensitive easily offended	Overly reactive easily offended, tends to respond to regular instructions as if they were harsh criticism. Must be evident, if questionable no score is applied.
Childish dependent regressive	Attitude of the patient gives an impression of a little child, with childish facial expression and intonation of speech. Needs instructions and guidance even for simple tasks. Must be evident, if questionable no score is applied.
Manipulating demanding	The examiner senses a constant uneasy feeling of being pressed or utilized to say, feel or do uncomfortable things. Must be evident, if questionable no score is applied.
Stubborn, obsessive non adaptable	Attitude to examiner and other events are obstinate, inflexible, and repeatedly insisted upon. Must be evident, if questionable no score is applied.
Tend to idealize or devaluate examiner	Attitude to the examiner as if he is the most wonderful and best therapist in the world, or the worst person ever; these attitudes can interchange frequently. Must be evident, if questionable no score is applied.
Egocentric un-empathic	Thinks of no one but himself, unable to see the view point of others, cannot put himself in "others shoes" Must be evident, if questionable no score is applied.
Distractible	Every stimulus from the environment causes the subject to turns his attention from the main course of the interview. Must be evident, if questionable no score is applied.
Disoriented	Unable to orient himself, does not know the time and day, may not recognize faces of relatives.
Memory loss	Unable to remember things of recent past days and weeks. Recall is typically preserved and long term memory is typically present
Complaints of Insomnia or hypersomnia	Insomnia or hypersomnia
Complaints of Early insomnia	Early insomnia, hard to fall asleep
Complaints of Late insomnia	Late insomnia, early wake
Complaints of Anorexia Wight loss	Anorexia, Weight loss
Complaints of palpitations, dizziness, and / or abdominal cramps and / or tingling.	Palpitations, dizziness, and / or abdominal cramps and / or tingling.
Complaints of anxiety fear of dying or loosing control panic	Fear of dying or losing control panic
Complaints of fear of dying or loosing control panic in specific conditions.	Fear of dying or losing control; panic in specific conditions.
Complaints of tension, restlessness and agitation	Tension, restlessness and agitation
Complaints of avolition indifference apathy Anhedonia	Avolition, indifference, apathy, anhedonia
Complaints of depressed mood	Being sad as in the Hamilton Depression Scale items and major depression
Complaints of depressed mood especially in the morning	Being sad as in the Hamilton Depression scale items and major depression especially in the morning
Complaints about Flight of ideas	Head full of racing thoughts
Complaints that things are strange and unfamiliar - changing not as usual (dereisim depersonalization)	A sense that something is not usual, there are hidden meanings to things, there are forces acting behind things, things are connected in a meaningful way to the individual. Must be evident, if questionable no score is applied.
Complaints of external control, mind reading, bugging, persecution (about delusions)	Feeling as if controlled by external sources, others can read his mind; he is being persecuted. others intend and plan to hurt him. Must be evident, if questionable no score is applied
Complaints related to Systemized delusion	There is a dominating non-bizarre false idea that gradually grows and incorporates all occurrences and aspects of life. Must be evident, if questionable no score is applied
Complaints of low self esteem	Feeling worthless.
Complaints bout being easily offended, oversensitive	Easily offended, oversensitive to criticism and insinuations. Interprets even the slightest inattention from others as rejection and humiliation. Must be evident, if questionable no score is applied.
Complaints of being impulsive, over imposing	Reacts immediately without giving it another thought, unable to change the decision or reaction once taken. Must be evident, if questionable no score is applied

History of Delusions	As above
History of Hallucinations	As above
History of thought disorders loosening of associations	As above
History of thought disorders perseverations poverty of thought	As above
History of depressions	As in DSM criteria
History of mania	As in DSM criteria
History of anxiety	As in DSM criteria
History of phobias	As in DSM criteria
History of disturbed upbringing, parental loose	Parents were not available (or orphan) the family history is of turmoil, instability and frequent changes. Subject deprived of needed attention care and love, or / and abused maltreated. Must be evident from anamnesis, if questionable no score is applied
History of behavioral problems	Problems at school, patient often reprimanded in school because of misbehavior, must be more than regular child's mischief; later problems with the law are typical. Must be evident from anamnesis, if questionable no score is applied
History of inability to maintain employment and social relationships?	Unable to remain employed for an extended period of time, interpersonal relationships. Are generally short and unstable; and frequently changes partners. Must be evident from anamnesis, if questionable no score is applied.
History of unstable interpersonal relationships	Interpersonal relationships chaotic, characterized by turmoil. Must be evident from anamnesis, if questionable no score is applied.
History of psychosocial or other stress (regular life stressors)	As in Holmes-Rahe life changes scale (5): Changes to different line of work, Change in number of arguments with spouse, Mortgage over $100,000, Foreclosure of mortgage or loan, Change in responsibilities at work, Son or daughter leaving home, Trouble with in-laws, Outstanding personal achievement, Wife begins or stops work, Begin or end school, Change in living conditions, Revision in personal habits, Trouble with boss, Change in work hours or conditions, Change in residence, Change in schools, Change in recreation, Change in church activities, Change in social activities, Mortgage or loan less than $30,000, Change in sleeping habits, Change in number of family get-togethers, Change in eating habits, Vacation, Christmas alone, Minor violations of the law.
History of trauma (stressor exceeding regular life stress)	As in Holmes-Rahe life changes scale (5): Death of spouse, Divorce, Martial separation, Jail term, Death of close family member, Personal injury or illness Marriage, Fired at work, Marital reconciliation, Retirement, Change in health of a family member, Pregnancy, Sex Difficulties, Gain of new family member, Business readjustment, Change in financial state, Death of close friend