Proposal for New Classification Model of Psychiatric Disorders
Michael Levin, M.D., M.S. (Pharmacology)

Abstract
Psychiatry lags behind other medical fields in the diagnosis and classification of disorders. While other medical specialties came up with reasonably cohesive nomenclature and organization, mental disorders remain in apparent disarray. The proposed classification model approaches psychiatric disorders using the logic that guided the classification of medical diseases. Brain is not one organ and its disorders should not be viewed either through differential diagnosis (reserved for one organ diseases) or as creative labeling of various combination. Instead, we need a classification based on underlying psychobiology which in many cases is shared by seemingly unrelated entities. AMPERIC model is an attempt to approach psychiatric disorders in a sensible and practical way. The model organizes and directs treatment option toward intrinsic psychobiological pathology of the disorders and helps in bridging the gap between psychopharmacological and psychotherapeutic interventions.

Content
Introduction
Part I Review of Systems
Part II Disorders of First Order (pathology limited to one system)
Part III Disorders of Second Order (two systems disorders)
Part IV Disorders of more than two systems
Part V DSM Disorders not belonging to classification
Conclusion and additional considerations
References

Introduction
Current DSM (1) classification exemplifies nosological chaos in psychiatry. It lacks a unifying theme and fails to resolve conflicts among competing theories. Instead of connecting, it wedges between the disorders and their treatment. Notwithstanding the caution not to assume “each category of mental disorder … [as] a completely discrete entity with absolute boundaries” and not to utilize it “in a cookbook fashion”, the manual is used in a precise manner against which it carefully advises. Detailed criticism of the DSM classification deserves a separate forum, but it’s imperative to recognize that existing taxonomy doesn’t serve the needs of practitioners and researchers alike.

Steadily, we are developing a better understanding of mental disorders. Neuropsychological, genetic, and psychiatric research data are strong. Neuroimaging techniques offer objective tools to investigate the diseases and lead the way to a new classification model.

Reducing mental disorders to components
Our brain is a collection of integrated systems, or modules, each with intricate functional responsibilities. Complex behaviors and psychiatric disorders can and should be broken down into comprising parts. The
new model is based on the premise that various psychiatric disorders share common physiological and pathological pathways. "Pathognomonic" psychiatric symptoms are not tied to a single diagnostic entity. Unique symptom combinations, however, make specific diagnoses.

The proposed model identifies seven key modules. Evidently, there are more functional systems in the human brain. The seven, however, form the majority of psychiatric disorders, as either abnormalities of one or more systems or as uncompensated mismatch between the systems.

For convenience, the modules are listed under an acronym, AMPERIC, which stands for
Arousal system
Mood and reward system
Perseveration system
Executive function system, also referred to as Executive Function Network (EFN)
Reality testing system
Interpersonal (social) skills system
Cognitive (information processing) skills

Part I Review of Systems
This section describes the systems in their natural, physiological – in contrast to pathological – states. The division doesn't imply simplicity of individual components. Each system is regulated by a multitude of subsystems and neurotransmitters to perform as a sum of all influences.

Arousal System
Arousal (also referred to as alertness or vigilance) is not limited to wakefulness. Regulation of arousal is essential for survival as well as for daily tasks.

Insufficient arousal turns predators into pray, and persistently high arousal is wasteful. In addition, it is advantageous for arousal to rise quickly from the baseline in case of danger and decrease rapidly when the alarm proves to be false or resolved. Anything short of that would be unsafe and imprudent.

Arousal is regulated by several complex structures which include amygdalae, thalamus, orbitofrontal and ventromedial PFC and others. (2) While tightly connected to the limbic system and often described as parts of it, mood and arousal are semi-autonomous and can act independently.

Arousal is affected by situations and chemicals. In a natural setting, omnipresent caffeine increases it for a short duration, moderate doses of alcohol have the opposite effect.

Mood and Reward System
Mood is the state of feelings – high and low, joy and sadness. There is a distinction between mood and emotion: mood refers to one’s state of mind over period of time and is unfocused, while emotions are short-lived and in reaction to recent events. The role of this system is to determine emotional significance of an event, then generate and regulate an appropriate emotional response. (3)
The Limbic system is a regulator of emotions. It includes the hippocampus, amygdalae, anterior thalamic nuclei, and limbic cortex (mostly cingulate cortex), and also mammillary body, dentate gyrus, nucleus accumbens, etc. (4) (5)

The reward system consisting of anterior cingulate cortex, basal forebrain, amygdalae, ending at nucleus accumbens and the "disgust" system, which ends at insula, play critical roles in motivational drive and psychopathology of some disorders (e.g. antisocial behavior, substances abuse, paraphilias, obsessive disorders, bulimia, etc.)

**Perseverations and Repetition**

Stereotypy is an essential part of grooming behavior in lower animals and primates and is present across species. Perseveration and repetition might be powerful in attracting attention. It has been pointed out that it is not the loudness of the phone ringing that gets a response but repetition and persistence. (6) Perseveration is essential in developing task automaticity (reduced dependency on complex cognitive processes on common tasks).

Basal ganglia, prefrontal cortex, cerebellum, and temporal lobe were suggested to contribute to perseveration and its regulation.

**Executive Function**

Executive function regulates and coordinates brain faculties for optimal choices. It consists of several independent facets under one umbrella which includes management of attention (top-down regulation), working memory, impulse control, regulation of arousal and mood, planning and organizational skills, monitoring of complex social and counter-instinctive behaviors, management of motivation and reward-related behaviors. Top-down attention regulation is active process that forces attention to cognitively challenging tasks, not necessarily of one’s choosing, against competing distracting stimuli. In contrast down-up regulation is more reactive to salient novelty. (7) (8)

Anatomically, the executive function is associated with, but not limited to, the prefrontal cortex (9). One might get an impression that Executive Function Network is one centralized unit controlling all functions. In reality, various tasks are assigned to different parts within the network.

**Reality Testing**

For adoptive behavior one needs an accurate representation of the reality. Reality testing (RT) is the method by which we judge the differences between the internal and external worlds. RT is the tool that enables us to separate subjective experiences from objective reality experienced by others.

It was suggested that the brain processes multiple inputs and then attempts to connect the information into cohesive narrative. In order to bring “meaning to input”, the left brain tends to narrow range of possibilities, while the right brain tends to widen it. (10) In functional individuals these competing tendencies are balanced into a reality check. The ability to generate abstract ideas and mentally test them against possible real scenarios is important tool of advanced brain. When balance is altered, generated
images and associations go unchecked leading to words and actions disconnected from reality, perceived by others as weird.

**Interpersonal, Social Skills**
We are governed by a multitude of fine social rules of great complexity and consequences. For appropriate social interactions we need to understand other person’s mind. In other words, we need "mind-reading" skills. Social skills also include ability to adjust behavior to fit in a group. Various interconnected brain parts involved in social interactions (medial prefrontal cortex, anterior cingulate cortex, precuneus, fusiform area, amygdale, as well as superior temporal and parietal cortexes (right temporoparietal junction) are referred to as "the social brain". Most interpersonal interactions are nonverbal and strongly culturally influenced.

**Cognitive (information processing) skills**
Cognitive Processing refers to a heterogeneous set of skills for acquisition, processing, storage, retrieval, and production of information. A partial list of these tools includes language skills, auditory and visual processing, memory in many forms, motor skills, and higher cognitive functions.

Although each subsystem has specific characteristics and objectives, complex tasks require cooperation and coordination of several tools. Detailed discussion of these systems is outside the scope of this article and can be found in neuropsychological and psychoeducational literature.

**How the systems work and interact**
The human brain is a system of systems. Each unit is an integral parts of continuous feedback regulation. A smooth ride is achieved when all systems match and work in concert toward specific goals.

All human beings are alike but not clones. The brain systems mature at individual rates while adapting to the environment. There might be component failures within one system or mismatches between two or more systems. If not compensated, these malfunctions can be detrimental for the whole machinery. Because of multiple complexity of their interactions, even an accurate description of a problem doesn't reveal a precise pathological mechanism. Instead, it offers possible scenarios that can be explored. It should be noted that coordinated effort of several brain parts, often acting in opposite directions, not one anatomical structure, are responsible for complex behaviors. It is not possible, and probably unnecessary, to connect every disorder to specific structural structure. Instead, we will focus on functional units.

**How the systems break**
The next sections discusses the ways the systems break. Although the reader will notice parallels and references to the DSM classification, there are fundamental differences. For convenience, and in accordance with the model design, the disorders are divided into two orders:
* Disorders of First Order describe malfunction of one system and serve as basic pathological units
* Disorders of Second Order present malfunctions of two or more systems
Part II Disorders of First Order (pathology limited to one system)

Disorders of Arousal

Arousal prepares us for a task. Numerous subsystems and neurotransmitters regulate arousal. Things can go wrong, arousal can be high (agitated), low (lethargic) or unstable (reactive).

Too high arousal

Generally, the state of over-arousal or hypervigilance is reserved for threats when excessive use of resources is justified. If arousal was pre-set and stays too high regardless of circumstances, the person would remain in constant state of agitation. Persistent over-arousal is wasteful, dysphoric, and tiresome. Hypervigilance interferes with the task at hand and induces unjustified alarm in others. Living with perpetual high arousal is hard when everyone else’s arousal is average. High arousal is associated with elevated sensorium (e.g. touch, sound, light, etc.) when a silk shirt feels like wool sweater and ordinary noise as blare. A person would avoid new or unpredictable situations and resist changes, may dislike transitions (ostensibly, to avoid higher arousal associated with novelty). Other features of high arousal include stubbornness, rigidity and tendency to overfocus on familiar activities.

There are several disorders characterized by persistently high arousal as a prime feature. Young patients with chronically high arousal used to be diagnosed with now obsolete Overanxious Disorder, nowadays Generalized Anxiety Disorder (GAD).

Dysfunctional high arousal states, associated with particular situations or experiences, are referred to as Simple Phobias. High arousal associated with social situations is called depending on severity as excessive shyness, social phobia, or Social Anxiety Disorder. Most sleep disorders are associated with the arousal system.

Arousal rapidly reaching high extremes (with or without identifiable provocation) is called Panic Disorder. Rapid increase of arousal to panic is also associated with somatic symptoms: palpitation, muscle tremor, sweating, etc. In all cases of pathologically elevated arousal, Executive Function Network responsible for modulation of arousal fails to control the increase. We also find high arousal at the core of autistic spectrum disorders, OCD, Tourette’s, and tic disorders. In fact, high arousal is common in many psychiatric disorders as we will discuss further.

Too low arousal

Conversely, there are conditions with chronically low arousal. As always, “appropriate” level of daytime arousal is determined by average person.

Low arousal – subjectively experienced as feeling of ennui – leads to exploratory behavior in animals and humans in order to elevate it. (11) Low arousal has been documented in children with conduct disorder and is at the core of sociopathic personality in adults. (12)

Disorders with persistently low arousal, as dominant symptom, include hypersomnia and Excessive Daytime Sleepiness. Low arousal is present in various psychiatric disorders. Mirroring sudden increase of arousal in Panic Disorder, narcolepsy is a well-described disorder of sudden drop of arousal. It is not featured, however, in the DSM.
In addition to primarily neurobiological presentations, there are many medical causes for low arousal: endocrine disorders (e.g. hypothyroidism), anemia, chronic infections, cardio-vascular and pulmonary disorders, side effects of some medications, and many others.

Conceivably, given complexity of regulatory mechanisms, there should be disorders of Unstable and Flat Arousal. There are no separate clinical labels for these phenomena.

Disorders of Mood
Mood can be high (elation), low (dysphoria), be unstable (labile) or blunted (flat).

Too high mood
Mild and even moderate mood elevations are common occurrences and not regarded as pathological. Elevated mood (hyperthymia) can be a welcoming trait.

Extremely elevated and expansive mood at inappropriate times is called mania. Mania is described as elation, grandiosity, racing thoughts and excessive talkativeness, intensive but short lasted goal oriented activity, and hypersexuality. If associated with distractibility and can be confused with disorders of attention. Typically, pathological mania is accompanied by elevated arousal and technically should be considered under the category of Disorders of Second Order.

Too low mood
Low mood has many names: blues, depression, gloom, melancholy, mourning and grief (related to loss), nostalgia (associated with homesickness), sadness, sorrow, etc. Depressed mood is recognized by feelings of sadness and emptiness, loss of interest in pleasurable activities (anhedonia), feeling of hopelessness and worthlessness.

Under Major Depressive Episode in the DSM, other symptoms are listed. However, some of them come from deregulation of arousal (insomnia, early-morning wakefulness, or excessive sleeping, psychomotor agitation or retardation, fatigue and decreased energy) while others come from deregulation of the perseveration system (recurrent thoughts of suicide). An excessive feeling of guilt might be delusional and, therefore, filed under deregulation of the reality testing.

Labile Mood
Labile affect refers to quick and dramatic change of emotions: from crying to laughing, from solemn to cheerful. Unregulated, unstable, cyclical mood is called bipolarity. I use bipolarity as a descriptive term for mood, not as specific diagnostic category known as bipolar disorders discussed in the next section. Bipolarity is not limited to bipolar diseases. Labile affect is also observed in organic brain disorders (pseudobulbar palsy, multiple sclerosis, ALS, etc.). Cyclothymia is a variation of bipolarity. Alternatively, the affect can be flat as observe in schizophrenia and some organic brain disorders.

Disorders of Perseveration
Perseveration, or stereotypy, is unintentional repetition of a specific act. Often confused with perseverance, perseveration presents with lack of intent and perceivable reward.
**Too much**

Daily activity of workers in perfectionistic professions (accounting, engineering, laboratory research, to name a few) borders and overlaps with perseveration. It’s impossible to separate useful skills from excessive without the criterion of functionality.

Pathological perseveration is an inappropriate repetition of behavior, thought, or emotion, defined as behavior or thinking restricted to a few behavioral options, and appear to be functionless. It differs from normal behavior in quantity and duration.

Motoric perseverations in the form of tics and habits fall under a broader category of Stereotypical Movement Disorders and are associated with decrease activity in basal ganglia. (13) Mental perseveration are defined as obsessions. There are also complex cognitive perseverations in form of excessive preoccupation with “details, rules, lists, order, organization, or schedules” detrimental to the main goal of activity, described in DSM as Obsessive Compulsive Personality Disorder (OCPD).

Perseverations and compulsions are often mistaken for impulsiveness, although impulsiveness is not a problem of persistent drive, but lack of inhibition. This confusion is not surprising as we observe two systems working in opposite directions.

**Too little perseveration**

By itself, limited ability to persist on task is not an identifiable mental disorder. Excessive vacillation are not labeled as “perseveration-deficiency” but considered a negative trait.

**Disorders of Executive Functions**

**Too much EF**

There is no identifiable pathology exclusively associated with high executive function. Modern society rewards good organizational skills, impulse control, emotional stability, and efficient attention regulation.

**Too little EF**

Deficiency of executive functions can be developmental, secondary, or progressive. Children’s executive-control network is notoriously immature. It might take up to a child’s late 20’s or even early 30’s to develop fully mature executive system. Until then, those who lag behind would be in disadvantage on tasks demanding these skills when compared with unaffected peers. Delay in maturity is the most common cause of attention-deficit syndrome in children (not to be confused with Attention-deficit Hyperactivity Disorder – ADHD, a disease). Attention-deficit in adults is less uniform and has diverse etiologies.

Because of heterogeneity and anatomical spread of its components, deficiencies of EFN can manifest as isolated symptoms, as well as random combinations of impulsivity, hyperactivity, poor regulation of attention, deficiency of organizational skills, poor control over affect, poor working memory, and excessive perseveration.
Disorders of Reality Testing

Too little RT

Psychosis is another term used to describe grossly impaired reality testing. Psychosis is characterized by delusions, hallucinations, and disordered thinking (Formal Thought Disorder).

In French psychiatric literature we find bouffée délirante, acute nonaffective and non-schizophrenic psychotic disorder, often followed by complete resolution of symptoms. Psychosis is at the core of several disorders, most notably schizophrenia, with symptoms that include impairment in other systems. Reality testing deficit, not unique to schizophrenia, is present in Cluster A personality disorders and hallucinogens abuse. Psychotic symptoms are observed in states of high agitation, extremes of affect, dissociative disorders, hypochondriasis and somatoform disorders, pervasive developmental disorders, and damaged sensory organs.

Too much Reality Testing

By itself, excessive RT is not a pathological trait. However, overly concrete thinking can be problematic.

Disorders of Interpersonal Skills (Social Deficit)

Too little Interpersonal Skills

Lack of Theory of Mind, or the ability to understand others’ minds, is lacking in patients with Pervasive Developmental Disorders (PDD). (14) The deficiency manifests as lack of developmentally appropriate socialization, poor understanding of body language and facial expressions, lack of personal boundaries, and in some instances as verbal and cognitive deficit.

Poor ability to understand other people’s motivations and actions are common in Cluster A Personality Disorders and various entities under umbrella of autistic spectrum disorders.

Too much

Advanced social skills can offer some advantages and compensate for other deficiencies, which explains lack of corresponding psychopathology. The terms empathetic (if positive) and manipulative (if negative) are descriptors used for astute individuals with advanced skills.

Disorders of Cognitive Skills (Language and Learning Disabilities)

Cognitive deficit in language skills, memory, auditory & visual processing, motor skills, and higher order cognition can be either limited to one skill or exist in variety of combinations. The deficit is referred to as learning disabilities or neuropsychological disorders. They can be developmental and improve with maturity. When maturity is complete, the deficit is either residual or acquired through brain damage (degenerative, traumatic, secondary to systemic illness, substance abuse, etc).

The brain acts as a set of tools (skills) used in combination to accomplish specific tasks. Inadequacy of even one critical tool, without compensation, leads to failure of the entire task. For example, failure of visual processing (one tool) with intact attention and adequate language skills (other tools) will lead to a failure of reading (the whole task).
Deficit in specific cognitive skills, with some exceptions, may not make a psychiatric diagnosis but contributes to clinical picture. In Autism, for example, social skills deficit is at the core of the disorder. However, language deficit together with repetitive behavior (perseveration) complete clinical picture. A cognitive deficit can also affect treatment choices. A patient with substantial weakness in auditory processing and language skills couldn't benefit from certain types of psychotherapy.

Part III Disorders of Second Order (two systems)
Here we will find many familiar DSM entries, not because a failure of two systems is more common than failure of one (in fact, the opposite is true) but because individuals with several uncompensated deficiencies are more dysfunctional, and thus likelier to attract attention of mental health professionals.

Disorders of Arousal and another system
Many of these combinations have been identified in separate categories and under different names. Let’s sort them out.

Disorders of Arousal and Mood
High Arousal – Low Mood Combination
Low mood contributes feeling of sadness, emptiness, and anhedonia. High arousal contributes to sleeplessness, agitation, and loss of appetite to clinical picture. Agitated Depression (see DSM-III R) and Depression with melancholic features are included in this category.

Low Arousal – Low Mood Combination
In contrast to agitated depression, the combination of low arousal and low mood is diagnosed as Atypical Depression. Patients describe hypersomnia and ‘leaden paralysis’ (a descriptive term for remarkable sense of heaviness in the body). Hyperphagia is common; irritability – a trademark of all affective disorders – is also present.

High Arousal – High Mood is recognized as mania. Combination of labile high mood and elevated (and probably unstable) arousal presents as Bipolar I disorders. (15)

High Arousal – Unstable Low Mood might be called dysphoric mania or a mixed state. Labile mood without extreme mood elevation coupled with Low arousal state is characteristic for Bipolar II disorders.

Low arousal – High Mood Combination in a person with hyperthymic personality might be annoying but is not necessarily pathological.

Disorders of Arousal and Perseveration
High or unstable arousal and excessive perseveration
Disorders of elevated arousal and perseveration are very common. It has been suggested that perseverations might “cool down” elevated arousal through repetitive action. It was also said that heightened arousal leads to perseveration. In fact, many repetitive behaviors emerge at time of excessive agitation.
Common presentation are obsessions usually followed by compulsions, known as Obsessive Compulsive Disorder (ODD). This may also present itself as pure obsessional disorders without accompanying compulsions.

Excessive motor and cognitive perseverations (not under control of executive function) produce disorders presently described under broad categories of Impulse Control Disorders and Obsessive-Compulsive Spectrum Disorders. (16)

Some of these disorders present as stereotyped motor or grooming – habit and tic disorders. If the reward system is impaired, the group would include a) trichotillomania (compulsive hair pulling), b) dermatillomania (compulsive skin picking), c) onychophagia (compulsive nail biting), and d) self-injurious behaviors without suicidal tendencies, secondary gains, and associated psychosis. Although relatively weak executive function contributes to clinical presentation, these are primarily the disorders of high arousal and perseveration.

Other disorders in Impulse Control Disorders category are kleptomania, pathologic gambling, and paraphilias. The name implies primary deficiency of executive function. In my opinion, these conditions should be reclassified under a category of disorders of high arousal, perseveration, and reward systems dyscontrol. Intermittent Explosive Disorder, on the other hand, is in an uncomfortable position in the same group and should be placed with the disorders of emotional and arousal disintegration with weak executive control.

Labile arousal and low perseveration
Aided by relatively weak executive function this combination is observed in individuals with low frustration tolerance. Intuitively, there should be disorders of low arousal with low perseveration; the term “looser” is used broadly but does not make valid diagnosis.

Disregulations of Arousal and Executive Function
Maturation of executive function (EF) takes longer than other parts of the brain. Many children and adolescents are less mature than their peers until they reach developmental plateau in their mid-late twenties. They may either eventually achieve adequate level of maturity or arrest in their development prematurely and forever remain at the lower level of functioning.

Uncompensated low executive functions, known broadly as attention-deficit disorders, present with deficient regulation of attention, poor impulse control, and poor organizational skills, in addition to deficit in emotions and arousal control.

Low Arousal – low Executive Function
According to present classification, combination of low EF associated with low arousal is in clinical picture of ADHD, Predominately Hyperactive-Impulsive or Combined Type. These patients seek stimulating activities in order to keep their arousal elevated. State of low arousal is recognized as boredom and leads to shifting attention to new and exciting novel stimuli. Breaking monotony increases arousal. Low arousal
and low executive function often leads to failure to conform to societal norms. Conduct disorder and Antisocial PD fit that profile. A high rate of misuse and abuse of the stimulants is also common.

**High Arousal – low Executive Function**
Executive functions deficit coupled with relatively high arousal presents as ADHD, Predominately Inattentive (sub)Type. In contrast with under-aroused variety, these patients have more difficulties shifting focus from areas of their intense interest, avoid novelty, and prefer sameness. Both types share attention-deficit, which is at the core of the disorder.

Dependent Personality Disorder might another disorders associated with *low executive functions and high arousal*.

**High arousal – high Executive Function (provisional category)**
Generally, this combination is favored and rewarded in modern society. However, there is a group of Restrictive Disorders which include Selective Mutism, Encopresis, and Anorexia Nervosa. The latter has three areas of deficit: high arousal, excessive executive control, and poor reality testing (distorted body image).

**Disorders of Arousal and Reality Testing**

**Disorders of High Arousal and Poor Reality Testing**
Combination of highly agitated states with delusions and hallucinations is not uncommon. A representative condition for this pair would be psychotic reaction secondary to amphetamine abuse. Other conditions might include Borderline Personality Disorder, Schizotypal Personality Disorder, and with certain stretch, Posttraumatic Stress Disorder (PTSD). Dissociative disorders are another example.

High arousal with psychosis are at the core of Psychotic Agitation, not specifically identified in DSM and in Paranoid Schizophrenia. Perseverations add to clinical picture.

**Disorders of Low Arousal and poor Reality Testing**
These disorders are found among Cluster A personality disorders (e.g. Schizoid Personality Disorder) and other psychotic disorders not separated into specific entities. In European classification this condition might fall under the category of Simple Schizophrenia.

**Disorders of Arousal and Interpersonal Social Skills**

**High Arousal and Poor Social skills**
This association is at the core of Autism and Asperger’s Disorder and within the broader category of Pervasive Developmental Disorders. In addition to increased arousal and severe deficit in interpersonal skills, children with Autism have characteristic pathological perseverations and language deficit.

**Low arousal and poor Interpersonal Skills**
We don't have an identifiable diagnostic condition for this common combination unless we pathologize nerdiness.
Disorders of Mood and another system

Disorders of Mood and Executive Function
Clinically significant combinations include low mood-low executive function, unstable mood-low executive function, elevated mood-low executive function. Disorders of mood and executive function, have been described earlier but there are additional considerations.

Growing up, we learn to regulate our feelings according to social demand with help of an independent inhibitory and modulating system – Executive Function. Intact EF imposes partial control over emotions and adjusts them to the situation.

Clinically it might be impossible to separate pathologically excessive emotions from dysfunctional EF, and either one from a combination of two dysfunctional systems. In children, moderate mood fluctuations are poorly managed by immature prefrontal cortex and may look indistinguishable from mood disorders. Mild disorders of mood and executive function will present as disorders of mood, and we should exercise great caution diagnosing them with affective disorders.

Addiction is believed to be primarily a disorder of Reward circuitry malfunctions, specifically impairment in ability to experience pleasure through conventional means, are at the core of addiction disorders. In addition, a deficit of executive system (poor impulse control, weak organizational and estimation skills, ineffective learning), dysfunctional emotional state (labile, depressed or expansive mood), and dysfunctional arousal (too high, too low, unstable) distinguish individual addiction disorders and guide the choice for drug of abuse. (17)

Disorders of Mood and Reality Testing
Coming under different names and spaced among several categories, these disorders show disruption in both systems. There are schizoaffective disorders, a broad range of psychoses associated with elevated, depressed, or unstable mood; Major Depressive Disorder with psychotic features, also known as Psychotic Depression; Bipolar Disorder with psychotic features; and also Adjustment Disorders with disturbance of affect and reality testing.

Disorders of Mood and Perseveration
Low Mood and Perseveration
Like obsessive thoughts, emotions can be intrusive and unwelcomed. Disorders of low mood and perseveration can present as depressive ruminations. Depression is commonly associated with thoughts of worthlessness and unattractiveness. Patients with this syndrome re-experience intrusive negative emotions and repetitive thoughts associated with depressed mood. Depressive Personality Disorder (18) in old classification is characterized by perseveration of depressed mood and persistent pessimistic thoughts. Although some deficit of reality testing might be present, these patients are not psychotic.
High Mood and Perseveration
Elevated mood and perseveration may be pathological, gratifying, or both. Manic obsession might manifest as litigious behavior or inventive-creative drive. An intense goal-oriented activity might be placed in a separate diagnostic category but it's hard to pathologize success.

Disorders of Mood and Interpersonal/Social skills deficit
Without specific diagnostic entities in present psychiatric classification, these combinations are labeled based on diagnostician's preferences, either as Asperger’s disorder with co-morbid mood disorder or Schizotypal Personality Disorder.

Disorders of Executive Function and another system
Executive function system is the adjuster of human emotions and behavior, the regulator of inborn instincts in order to match personal goals with societal demands. The system regulates attention, organizes thoughts and actions, inhibits impulses, supports working memory, modulates emotions, and controls arousal. The EFN enables us to predict consequences of our actions and amend behavior accordingly. Deficient EFM turns mild and moderate digressions of the systems it regulates into full-blown disorders.

Disorders of Executive Function and Perseveration
Low EF – Excessive Perseveration
Several disorders were mentioned earlier in obsessive-compulsive disorders spectrum. Another disorder in this category is Obsessive-Compulsive Personality Disorder, OCPD. In contrast with Obsessive Compulsive Disorders, OCPD lacks strong arousal component.

High executive function – excessive perseveration
It is unlikely that we'll see impairment from this combination since excessive perseveration will be mitigated by functional EFN. In some cases this combination may lead to success in project requiring both traits (e.g. inventing or treasure hunting).

Disorders of Executive Function and Reality Testing
This combination can be found in many psychotic disorders. Although no disorders of Disorders of Executive Function and poor Reality Testing combination are identified, possible candidates might be Thought Disorder with inattention, psychosis with poor impulse control, etc.

Disorders of Executive Function and Interpersonal/Social Skills
As above, no specific diagnostic category, but the combination can be observed in conditions with more than two systems dysfunction, for example, Asperger's Disorders. (19)
Disorders of Perseveration and another system

**Disorders of Perseveration and Reality Testing**

Terms *idée fixe* and *monomania*, well described in old psychiatric literature, are not in present DSM classification. The combination is present in Body Dysmorphic Disorder (BDD), paranoia, kleptomania, pyromania, and some others.

Main difference between psychotic obsession and obsession in OCD is recognition by the OCD patients that intrusive thoughts and sensations, even unreasonable, are products of own mind and not imported from outside. Their reality testing remains intact.

**Disorders of Perseveration and Interpersonal/Social Skills deficit**

A pathological combination of excessive perseveration and inadequate social skills is observed in Asperger's disorder and in other PDD group disorders.

**Disorders of Reality Testing and Interpersonal/Social Skills**

Not a separate diagnostic entity but not an unusual blend. Also, this combination is central in Schizotypal Personality Disorder presentation.

**Part IV Disorders of more than two systems**

There are numerous possible combinations of three or more systems disregulations. These disorders are more dramatic but less common. It should be noted that incremental psychopathology causes exponential increase in dysfunction and is harder to pass to next generation. Instead of listing all possible disorders in limited space available, I will "unscramble", or deconstruct, several common psychiatric diagnoses using the AMPERIC model.

*Anorexia Nervosa* appears to be the product of potent executive function, increased perseveration, and deficit in reality testing.

*Bulimia Nervosa*, in contrast, is a disorder of deficit executive function (impulse control) and impaired reward system in its "pure" form.

*Borderline PD* is characterized by labile arousal and mood, low EF, and impairment of reality testing.

*Post-traumatic Stress Disorders* or PTSD is a disorder of excessive arousal, perseveration, and diminished reality testing.

*Schizophreniform Disorder* presents with high arousal, depressed mood, and poor reality testing. *Paranoid schizophrenia* presents with high arousal, low executive function, excessive perseverations, and poor RT.
Schizophrenia, Catatonic Type is the product of low or unstable arousal, low executive function, and poor reality testing.

Disorganized Schizophrenia, on the other hand, is a result of unstable arousal, unstable mood, low executive function, poor reality testing, and lack of social skills.

Tourette’s is a disorder of unstable high arousal, labile mood, low executive function, and excessive perseveration.

Part V DSM Disorders not belonging to classification

Reactive Attachment Disorder of Infancy or Early Childhood is a subjective conjecture with unclear pathologenesis and outcome. RAD can’t be proved, disproved, or tested.

Oppositional Defiant Disorder is a broad descriptive category encompassing various psychopathologies as well as nonspecific behaviors including tempestuous teenage years. It’s a descriptive, not diagnostic, term.

Primary Nocturnal Enuresis is a developmental condition which resolves without treatment with age and doesn’t belong to psychiatric classification.

Disorder of Infancy, Childhood, or Adolescence, NOS is invalid diagnostic entity and deserves no comments.

Eating Disorders, NOS is so vague that might be given to a child who hates broccoli. We need better definitions to enter classification.

Shared Psychotic Disorder should not be a separate condition. Psychotic disorder is what it is, shared or not.

Diagnosis of Adjustment disorders of any kind implies that ordinary life events cause bona fide psychiatric disorders. There is no evidence for that.

Mental Disorders Due to a General Medical Condition deserve a separate diagnostic manual.

Rett’s Syndrome might be tentatively considered for the classification as a disorder with clearly identifiable organic pathology. But what about Fragile X syndrome, Down’s, Turner’s syndrome and the rest of chromosomal abnormalities? At what point do tuberous sclerosis, neurofibromatosis, lipid storage diseases, and subacute sclerosing panencephalitis enter the classification? Why include some genetic, metabolic, or neurodegenerative disorders in the classification while excluding the others?
Conclusion and additional considerations
There are obvious complexities in drawing direct parallels between AMPERIC model and existing DSM classification; despite substantial overlap between diagnostic categories, that is not a match.

The format of the article and paucity of information impose limits on the content. I have not discussed either the origin of these disorders or their detailed anatomical locations. Proximal events are unlikely etiology of psychiatric diseases. Even if they were, it is impossible to discern multiple impacts into etiologically meaningful ranking. In addition, at the time a psychiatric disorder emerges, selected insult has already taken place. Also, the model doesn't describe disorders in their dynamic natural course, nor does it offer specific treatment options.

Nevertheless, I am convinced that the new model is a step in the right direction. I see advantages of proposed classification over the old one, because it groups disorder according to their intrinsic characteristics, instead of plausible but inaccurate description of proximal similarities. I expect this and similar models to redirect clinical research from chasing vague entities toward reproducible and verifiable pathology. In addition, the model proposes common ground for mental health practitioners and researchers who presently are coming from diverse and, on occasion, divergent views on the nature of psychiatric diseases and best treatments.

I would like to clarify possible misconceptions about the model. I explicitly stated that not every symptomatic deviations is strictly pathological. In order for a neurobiological variation to be called a disease, we need to demonstrate harmful dysfunction. The society guides the selection. ADHD, for instance, was not a disease until we entered modern age. New imperatives demanded that children by age five be able to regulate their attention up to six hours a day, control their impulses (not out of fear of physical punishment) before they turn ten, and develop complex organizational skills by teenage years. That rigid schedule demonstrates how past semi-relevant shortcomings turned into dysfunctional disorder today. In return, modern society no longer automatically rewards physical characteristics such as height, weight, and muscular strength. Also, many psychopathologies do not reach professional attention if compensatory mechanisms circumvent them or if a patient receives support from the family or community. In generous western society an individual with limited neuropsychological faculties can survive and procreate.

Lastly, I anticipate customary charges of reductionism and will happily respond to them.

© 2009-2012 Michael Levin, MD mishal@earthlink.net
References

(2) Filley CM. The neuroanatomy of attention. *Semin Speech Lang.* 2002 May;23(2):89-98


(6) Paul D. MacLean The Triune Brain in Evolution: Role in Paleocerebral Functions, Springer; 1 edition (January 31, 1990) p. 146


http://www.cns.nyu.edu/~frommer/reading/Kudson_annurev.neuro.30.051606.094256%5B1%5D.pdf


(10) Beitman, BD. Brains Seek Patterns in Coincidences Psychiatr Ann. 39:5 May 2009: 255 - 264

(11) Kytja K.S. Voeller, KK, Toward a Neurobiologic Nosology of Attention Deficit Hyperactivity Disorder J Child Neurol 1991 6: S2


(18) DSM-II (American Psychiatric Association 1968)