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ASSESSMENT OF EXECUTIVE FUNCTIONING IN PSYCHIATRIC DISORDERS:
FUNCTIONAL DIAGNOSIS AS THE OUVERTURE OF TREATMENT

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Abstract

The current paper describes the functional approach to the diagnosis of various psychiatric disorders as a necessary step beyond traditional, classificatory diagnosis. More specifically, it advocates a behaviour analytical focus on the diagnosis of executive dysfunctions (EF). Current neuropsychological methods are helpful in identifying EF-problem areas, but fail to clarify the precise contribution of executive subfunctions such as inhibition, switching, monitoring, and updating, to psychiatric disorders and to treatment-planning. This will be illustrated with an example from clinical practice. A functional approach is described and discussed with regard to its contribution to the differential diagnosis of several psychiatric disorders. Finally, a future research program is suggested in order to improve diagnostic accuracy and to contribute to differential diagnosis and treatment indication.

Key Words: Functional Approach – Diagnosis – Psychiatric Disorders – Executive Dysfunctions

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On the History of Diagnostic Categorization

One of the most important tasks psychiatrists and psychologists are confronted with, is diagnosing the patient. Yet, most problems are encountered in this very field. In his article on “Nosologomania”, van Praag (1999) calls attention to the way psychology and psychiatry have been dominated by the nosological view on mental disorders according to Kahlbaum (1863). Kahlbaum’s conceptualisation of psychiatric disorders comprises two axioms. First, that disorders can be characterized by a set of features or “symptom patterns” such as age of onset, family history, course of the disease, and treatment outcome, which are established relatively independent from empirical research. His second axiom was that the disorders are exclusive in that a clear demarcation line can be drawn between them.

Current classifications of psychopathology and clinical disorders, such as the Diagnostic and Statistical

Manual of Mental Disorders (APA 2000) must be understood in this tradition. They are predominantly based on structural or topographical features of behaviour, and the “operational criteria” are moulded into a hybrid-categorical system. The DSM system is principally a-theoretical and trait-based, which makes it unsuitable as a basis for interventions as it offers no insight into the variables to be controlled or controlling the disorder.

Like Carl Hempel (1965) in his “Fundamentals of Taxonomy” concluded, the centre of attention of any serious field of science has to shift from a purely descriptive level toward a level of theoretical systematisation. Any attempt at categorization per se, and more so if it is to be used as a basis for treatment, needs theory in the end. Without theory, categories tend to proliferate, as is highly apparent when we look at the growth in the number of pages and categories of the succeeding volumes of DSM, from the first edition in 1954 onwards to the revised fourth version in 2000.

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The proliferation of categories is a known sign of weakness of any system of classification not based on theory (Follette & Houts 1996). We can sense this weakness in the problem of comorbidity. The majority of psychiatric patients can be classified in more than one DSM category; and along with a growing number of categories, the number of diagnoses per patient will rise –without being stable in time. From all this it follows that these kind of diagnoses are not very useful as a basis for treatment design (Koerner et al. 1996). They simply lack explanatory power.

For psychopharmacologists and biological psychiatrists this already seemed obvious. As Cloninger (1987) puts it: “the structure of the observed behavioural variation may not be the same as the structure of the underlying biological variation.” But, if we shift the focus from biological variation to behavioural variation, the same point can be made. Behavioural contingencies give way to functionally similar but topographically very different manifestations of behaviour. For instance, alcoholism or compulsive sexual behaviours, might both serve the function of avoiding aversive experiences yet appear as different phenotypes.

We must conclude that categorization systems like the DSM are neither biologically nor behaviourally specific. With respect to the merits of this particular system, we can only state that it leads to research which is very much “inward-directed,” i.e., concerned with problems of the classification system itself, instead of being concerned with the usefulness of the diagnostic process.

Functional Diagnostic Approach

Diagnosis should serve the purpose of improving treatment-outcome. One should use a strategy that helps clinicians to analyse the behaviours within a theoretical system that puts the final causes in the environment so that they can be handled in treatment. This, however, implies that the essential elements of change should be known, or, at least, theoretically specified (Koerner et al. 1996).

Van Praag (1990) proposed a psychopathological classification system which should not primarily consist of nosological entities. Syndromes should be grouped by psychological dysfunctions, for example, in the area of memory or communication disorders. In this way, a syndrome can be understood in terms of its functional parameters, either biological or contextual. These psychological dysfunctions can act in several combinations, and can vary in severity. They thus form the key to the definition of the various psychiatric syndromes, all having their own specific aetiology, course, and prognosis.

In psychology, this point of view is not new. As Hayes et al. (1996b) already pointed out, this behavioural analytic strategy is called “logical functional analysis” or “functional dimensional approach.” This strategy finally aims at analysing a given disorder in terms of the nomological network of behaviour analysis (e.g., antecedents, consequents, establishing operations, etc.), from which decision rules may then be derived with respect to the problem behaviours making up the disorder. In this way, the best

is made of a contribution of structural and functional nosologies. Logical functional analysis has been applied to disorders such as alcoholism and paedophilia (Wulfert et al. 1996). Hayes and colleagues demonstrated the functional dimensional approach to the diagnosis and treatment of disorders that can be functionally classified as “experiential avoidance” (cognitive, emotional, etc.). Examples of this functional category are substance abuse, obsessive-compulsive disorders, panic disorder, and borderline personality disorder (Hayes et al. 1996b, Koerner et al. 1996).

Executive Dysfunctioning Underlies Several Disorders

In clinical practice and in the majority of cases, psychiatric and psychological examinations are carried out according to DSM-IV criteria. Yet, these examinations fail to differentiate subtypes of complex disorders and to disentangle overlapping syndromes.

A typical example of this kind of confusion is the differential diagnosis of autism-related disorders and that of schizotypal personality disorder. Several authors report conceptual overlap and difficulties in distinguishing autism, Asperger’s syndrome, and pervasive developmental disorder NOS (Miller & Ozonoff 2000). Also, the concept of schizotypal personality disorder is far from homogeneous and accommodates several syndromes with a varying accent on negative and positive symptomatology (Voglmaier et al. 2000).

Actually, both autism spectrum disorder (ASD) and schizotypal personality disorder (SPD) are characterized by impaired executive functioning, as reported by several authors (Hill 2004, Ozonoff et al. 2004), pointing at an underlying functional psychopathological class. The same is reported to be true for disorders of social communication and interaction (Waldeck & Miller 2000). Some researchers even suggest a strong relation between executive dysfunctions and disorders of social cognition (Gilotty et al. 2002, Langdon & Coltheart 1999).

Similar findings were reported in the authors’ own small-N study with four ASD patients and four SPD patients. On the Wechsler Adult Intelligence Scale (WAIS-III), the Behavioural Assessment of the Dysexecutive Syndrome Test (BADS), the Wisconsin Card Sorting Test (WCST), and an emotion recognition task (ERT) based on the Ekman faces, as well as on the Minnesota Multiphasic Personality Inventory (MMPI-2), results turned out to be similar for both groups (see Egger et al. 2005), again pointing to one underlying functional class (dysexecutive behaviour).

This phenomenon can be found not only in ASD en SPD, but also in a vast amount of other neuropsychiatric syndromes, such as obsessive-compulsive disorder, apathy syndrome, the “attention deficit hyperactivity” symptom pattern, Korsakoff’s syndrome, Parkinson’s disease, Alzheimer’s dementia, antisocial personality disorder, Turner’s Syndrome, Prader-Willi syndrome, which present themselves with executive dysfunctions (e.g., Lezak et al. 2004, Verhoeven et al. 2007). Dom and colleagues, for instance, hint in the same direction when advocating alcohol dependence and other

<i>Author</i>	<i>Definition</i>	<i>Accent</i>
Pennington et al., 2005	EF is the ability to maintain an appropriate problem-solving set for attainment of a future goal... EF includes inhibition, planning, and mental representation of tasks and goals”	Goal-orientated behaviour
Lezak et al., 2004	EF contains those capacities that enable a person to engage successfully in independent, purposive, self-serving behavior	Self-regulation and the adaptive function of EF
Stuss & Benson, 1986	EF consists of motivational, planning, and monitoring aspects (drive, sequencing and control)	EF as brain/cognition process
Hayes et al, 1996	EF is conscious, goal-oriented behaviour directing a person’s effort away from his habitual or automatic responding	Rule Governed Behaviour
Welsh et al., 1988	EF is a term for processes responsible for higher-level action control ... that are necessary in particular for maintaining a mentally specified goal and for bringing it to fruition against distracting alternatives	Conflict with automatic or ongoing behavior

disinhibitory psychopathology to be studied in terms of a common underlying etiological dimension (Dom et al. 2006).

Executive Functions have their roots in behavioural neurology and neuropsychology, and executive dysfunction is mostly studied in psychiatric disorders. In this tradition, one is inclined to look at executive dysfunctions as resulting from some deficit in the prefrontal cortex. Theories about EF are especially interested in the neurological underpinnings of these psychological processes. Several researchers have suggested that there are three principal frontal subcortical circuits involved in executive functioning. The dorsolateral prefrontal circuit is being associated with executive cognitive dysfunction, the lateral orbital prefrontal circuit is being associated with disorders of self-regulation (e.g., inhibition), and the anterior cingulate circuit is being associated with activation and motivational problems (Alvarez & Emory 2006).

Although the former disorders are all characterized by the same underlying psychopathological class (dysexecutive behaviour), the concept of executive functioning, however, is considered to be not a unitary but a multifaceted construct (Stuss & Alexander 2000). This same statement can be found in the studies of Busch et al. (2005) and Happaney et al. (2004), which both suggest that research on executive functioning should primarily be directed at the subfunction development level and at the relation with affective and purely cognitive aspects, the so called “hot” and “cool” aspects of executive functioning (Zelazo et al. 2005).

The above considerations underscore the importance of profiling different types of psychopathology in order to elucidate the relation between EF and psychopathology for the purpose of functional diagnosis.

Executive Functioning: From Neuroscience to Behaviour Analysis.

As can be seen, in a neuroscience approach, the subfunctions mentioned earlier are sought in the prefrontal regions of the brain as they relate to cognitive functioning. However, as Stuss & Alexander state, we need measures of supervisory activity and self-awareness that are clinically useful for diagnosis, for prognosis, and for specifying treatment (2004). What is actually needed here is an analysis in terms of variables that can be used in psychological treatment or training procedures. Therefore, we need a closer look at the *behaviours* that make up executive functioning (Hayes et al. 1996).

The term executive functions (EF) is used to refer to many dimensions of human behaviour. It broadly encompasses a set of cognitive skills that are responsible for the planning, initiation, sequencing and monitoring of complex goal-directed behaviour and thus control the execution of complex activities (Royall et al. 2002). Some definitions of EF, and their respective accents are found in Table 1. Executive functioning is vital to human autonomy because it enables a person to engage successfully in independent, purposive and self-serving behaviour (Lezak et al. 2004). Higher levels of executive functioning lead to a more adaptive, hence successful life (Malloy & Grace 2005). Conversely, executive dysfunctions may give rise to major problems in daily living.

As argued before, research in this area is concerned with disentangling the components of EF and their location in the brain, on the assumption that it is the brain that will give the most clues in understanding and influencing dysexecutive functioning in psychiatric disorders. Moreover, if we look at the definitions in

table 1, they all point to the importance of EF in daily life, in which self-control, problem-solving, planning, attention, thinking, and organizing are *conditio sine qua non*. Yet, the successfulness of all these activities is highly dependent on interactions between the person and his environment. From an epistemological viewpoint, we must notice that brain activity per se, let alone brain activity location, has no *meaning* whatsoever. Only when we adopt an interactionistic perspective and see upon behaviour as emergent, i.e., the result of brain-context reciprocities, we can study the full range of it, as well as its meaning (Elman et al. 1996).

In a way, the idea of the brain as central agent is very legitimate. It is accompanied by research that teaches us about structure and mechanics of the brain and its physiological processes related to EF. Eventually, this could lead to changes in dysexecutive functioning via physical or biological interventions (e.g., surgery, electrostimulation, pharmacotherapy).

What we strive for, however, is full understanding of the phenomenon, something which we will not attain when only studying the structure and mechanics of the brain. We want to look for understanding and influencing behaviour through manipulating the environmental conditions, c.q. altering contingencies of reinforcement, which is a behaviour analytical agenda. This provides us with a theory that can guide us in developing good educational, rehabilitative or therapeutic practices with respect to executive dysfunctioning.

EF as Rule Governed Behaviour

Although goal setting (including continuous evaluation of attempts to reach that goal) is a necessary element of EF, it is not sufficient: a tiger chasing its prey is very goal-oriented, yet not functioning executively. EF is not routine, automatic, or habitual behaviour, but always evokes thinking, problem-solving, conscious planning, organizing, or decision making, in reaction to new or unusual situations, or whenever automaticity fails. It always implies some form of conflict, such as short-term versus long-term, self-interest versus public-interest, approach versus avoidance (e.g., impulse-control, delaying gratification, avoiding temptation).

From a behaviour analytical perspective, EF is subsumed under activities, such as self-control, problem-solving, thinking, and creativity, and refers to of behaviour that manipulates variables of which other behaviour is a function. For example, self-control is conceptualized by Skinner (1953) as consisting of a controlling response (e.g., counting from 1 to 10), and a controlled response (e.g., anger-control). In this example, the controlling response changes the variables of which the controlled response is a function: counting to 10 creates a pause during which autonomic arousal may drop and alternative behaviours are becoming more probable. A similar analysis has been adopted by Barkley in his analysis of the distinction between attention and executive functioning (Barkley 2005).

Skinner's analysis has been taken up and expanded by Hayes and colleagues who formulated EF as a subset

of *rule governed behaviour*. Not unlike EF, rule governed behaviour may be looked at as a person's conscious steering wheel, in contrast to *contingency-shaped behaviour*, which is considered as being automatic. Hayes defines EF as verbal behaviour, that precedes other behaviour that directs a person's effort away from his habitual or automatic responding. It can be understood as verbal antecedent behaviour that changes the probability of other behaviour in the direction of a certain goal (Hayes et al. 1996a). Recent research on rule governed behaviour links EF to Theory of Mind and autism (Barnes-Holmes et al. 2004, McHugh et al. 2004).

Toward a Treatment-oriented Diagnosis

How can these insights be integrated into clinical practice and advance the scientific study of EF in psychiatric patients?

To achieve this aim, we propose a research agenda comprising of five steps: (a) analysing EF and "classical diagnostic instruments" in terms of behaviour analytical terms, for instance by examining the executive processes by means of audio-video monitoring or "think aloud" procedures (Cabello et al. 2004, Hayes et al. 1998), (b) designing diagnostic training programs using multiple exemplar training (MET) procedures (Barnes-Holmes et al. 1999), (c) applying these programs to assess relative EF-strengths and -weaknesses in selected psychiatric disorders (assessing differences in learning performance and trainability on executive subfunctions), (d) constructing "EF-profiles" for the experimental differential diagnosis of these psychiatric disorders, and (e) validating these profiles through analysis of executive functioning in daily life, using different samples of psychiatric patients.

In the learning tasks mentioned above, we provide or train rules and then examine the effectiveness or the flexibility of these rules. With Hayes, we can state that this form of assessment is able to address the question: under what conditions do normal subjects and patients (a) select among available rules or generate new ones, (b) follow rules when they are available even though they conflict with other sources of behavioural control, and (c) change rules when they no longer work (Hayes et al. 1996a)?

In this way, functional diagnosis may be linked to the behaviour analytic domain in that rule governed behaviour can be assessed in greater detail with the learning tasks as an alternative to popular EF-tasks like the Wisconsin Card Sorting Task, Stroop Colour Word Test, and the Tower of London, which are known to yield contradictory results. For each psychiatric disorder under examination, we expect to find a typical strength-weakness-profile (profiles of executive dysfunctions), that can be of help in the differential diagnosis. This type of training-testing constitutes a dynamic assessment procedure from which the implications for treatment can be more directly derived.

In sum, for psychiatric diagnosis leading us to valid treatment considerations, we need *theory*. A behaviour analytical approach in which executive functions are considered as a subset of rule governed behaviour, seems appropriate. Behavioural analysis offers both

theoretical guidance and highly precise and well-developed methods for dynamically testing the effects of rules on executive functioning. We expect this dynamic assessment procedure to offer a broader window on the performance and trainability of individuals with various psychiatric disorders, and thus on the indication and monitoring of their treatment. In fact, neuroscience and behaviour analysis may profitably use each others' knowledge following their own independent agendas, but working together on a true multidisciplinary pursuit of a more comprehensive approach to treatment-oriented diagnosis.

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