

# CLASSIFICATION OF NEURODEVELOPMENTAL DISORDERS

PROPOSAL SUBMITTED BY THE CHILD DEVELOPMENT CENTRE *DIFERENÇAS*

Author: Miguel Palha

## ***PROPOSED LIST OF NEURODEVELOPMENTAL DISORDERS***

### **SPECIFIC NEURODEVELOPMENTAL AND BEHAVIORAL DISORDERS**

i) INTELLECTUAL DEVELOPMENTAL DEFICITS:

(A) NONVERBAL COGNITIVE DEFICIT

(B) VERBAL COGNITIVE DEFICIT

(C) COGNITIVE DEFICIT NOT OTHERWISE SPECIFIED

ii) ADAPTATIVE BEHAVIOR DISORDERS :

(A) COMBINED TYPE (Social and Autonomy areas)

(B) PREDOMINATELY SOCIAL

(C) PREDOMINATELY IN THE AREA OF AUTONOMY

(D) ABD-NOS

ii) DEVELOPMENTAL COORDINATION DISORDER:

(A) COMBINED TYPE

(B) PREDOMINATELY GROSS MOTOR

(C) PREDOMINATELY FINE MOTOR

(D) PREDOMINATELY MOTOR SPEECH PROGRAMMING

(E) DCD-NOS

iii) DEVELOPMENTAL LANGUAGE DISORDERS

(A) LATE LANGUAGE EMERGENCE

(B) SPECIFIC LANGUAGE DISORDER PREDOMINATELY EXPRESSIVE TYPE

(C) SPECIFIC LANGUAGE DISORDER PREDOMINATELY COMBINED TYPE

(D) SPECIFIC LANGUAGE DISORDER -NOS

iv) SOCIAL INTERACTION DEVELOPMENTAL DISORDERS

(A) SOCIAL RECIPROCITY DISORDER

(B) DEFICITS IN NONVERBAL COMMUNICATION BEHAVIORS

(C) DEFICITS IN DEVELOPING AND MAINTAINING RELATIONSHIPS

(D) SOCIAL INTERACTION DEVELOPMENTAL DISORDERS NOS

v) ATTENTION DEFICIT DISORDERS

(A) ATTENTION DEFICIT DISORDER

(B) ATTENTION DEFICIT DISORDER – NOS

vi) LEARNING DEVELOPMENTAL DISORDERS

(A) READING

(B) SPELLING AND WRITING

(C) MATHEMATICAL SKILLS

(D) COMBINED TYPE

(E) LDD-NOS

vii) RESTRICTED, REPETITIVE PATTERNS OF BEHAVIOR DISORDERS AND OTHER SAMENESS ANOMALIES :

(A) TICS:

1. CHRONIC MOTOR OR VOCAL TIC DISORDER

2. LA TOURETTE´S SYNDROME

3. TRANSITORY TICS

4. TICS - NOS

**(B) MOTOR OR VOCAL STEROTYPIES**

**1. STERIOTYPED MOVEMENT DISORDERS**

**2. STERIOTYPIES - NOS**

**(C) EXCESSIVE ADHERENCE TO ROUTINES OR EXCESSIVE RESISTANCE TO CHANGE**

**(D) HIGHLY RESTRICTED, FIXATED INTERESTS THAT ARE ABNORMAL IN INTENSITY OR FOCUS**

**(E) HYPER-OR HYPO-REACTIVITY TO SENSORY INPUT OR UNUSUAL INTEREST IN SENSORY ASPECTS OF ENVIRONMENT**

**(F) RESTRICT, REPETITIVE PATTERNS OF BEHAVIORS - NOS**

# COMBINED NEURODEVELOPMENTAL AND BEHAVIORAL DISORDERS

i) INTELLECTUAL DEVELOPMENTAL DISORDER

ii) AUTISM SPECTRUM DISORDERS

(a) AUTISM

(b) PDD-NOS

iii) ATTENTION DEFICIT HYPERACTIVITY DISORDER

1. COMBINED PRESENTATION
2. PREDOMINATELY INATTENTIVE PRESENTATION
3. PREDOMINATELY HYPERACTIVE/IMPULSIVE PRESENTATION
4. NOT OTHERWISE SPECIFIED

# COMPLEX NEURODEVELOPMENTAL AND BEHAVIORAL DISORDERS

i) DAMP: Deficits in Attention Deficit, Motor Control and Perception

(A) ATTENTION DEFICIT IN ASSOCIATION WITH DCD

(B) ADHD OF THE COMBINED TYPE IN ASSOCIATION WITH DCD

(C) DAMP - NOS

ii) NONVERBAL LEARNING DISORDER OR ROURKE'S SYNDROME

iii) GILLBERG'S SYNDROME/ESSENCE:

iv) LORNA WING'S SYNDROME

v) KANNER'S SYNDROME

vi) MULTIPLE COMPLEX DEVELOPMENTAL DISORDER

# CLASSIFICATION OF NEURODEVELOPMENTAL DISORDERS

PROPOSAL SUBMITTED BY THE CHILD DEVELOPMENT CENTRE **DIFERENÇAS**

Author: Miguel Palha

## PROJECT DEVELOPMENT

### INTRODUCTION:

*With regard to the taxonomy of Neurodevelopmental Disorders, that is to say, their Classification and Subtype categories, the available proposals, especially in the DSM IV, ICD 10 and, to some extent, in the DSM-5, albeit providing a valuable framework are nonetheless somewhat disappointing as they do not respond fully to the needs of clinical practice, specially the Sub-classifications criteria. As an example, two children with Intellectual Disability, Developmental Language Disorder or a Learning Disorder are integrated in certain nosological categories according to the definitions under the current system, would very likely be classified quite differently under a Neurodevelopmental perspective.*

*In order to address the need for a revised classification of Neurodevelopmental Disorders viewed from a Developmental perspective, a group of professionals with wide clinical experience in Neurodevelopmental Pediatrics embarked on the challenging task of designing an improved classifying system, with special emphasis on the complex process of Sub-Classifications. The primary target for re-appraisal was the area of Neurodevelopmental Disabilities although discrete forays were made into a domain shared with Behavior, Psychiatry.*

*In this proposal, categorization of the Neurodevelopmental Disorders are organized along three main areas: SPECIFIC NEURODEVELOPMENTAL AND BEHAVIORAL DISORDERS; COMBINED NEURODEVELOPMENTAL AND BEHAVIORAL DISORDERS AND COMPLEX NEURODEVELOPMENTAL AND BEHAVIORAL DISORDERS*

### SPECIFIC NEURODEVELOPMENTAL AND BEHAVIORAL DISORDERS

*COMMENTS: The concept of Specific Disorder of Neurodevelopment and Behavior has been defined in the DSM IV, ICD 10 and in the future DSM-5. In short, this means that the disorder relates essentially to a specific area of neurodevelopment or Behavior.*

*This chapter introduces several innovations, including, among others: Cognitive Disorders, Adaptive Behavior Disorders; Social Interaction Disorders, Attention Deficit Disorders: Repetitive Behavior Disorders. Other disorders that occur predominately in specific areas of Neurodevelopment and Behavior may be introduced, such as those related to impulse control.*

## **i) INTELLECTUAL DEVELOPMENTAL DEFICITS:**

*COMMENTS: Verbal or nonverbal cognitive performance have never been considered independently for nosographic purposes.*

*We think it is useful for an improved Neurodevelopmental characterization of a given subject, to enable categorization of cognitive deficits predominately in the NONVERBAL and verbal areas.*

*It will be virtually impossible to find Global Intellectual Deficits dissociated from sustained impairments in other specific areas of Neurodevelopment (Global Intellectual Delays are invariably associated with Language impairments, adaptive behavior, ...). Therefore, we contend that the Intellectual or Global Developmental Delays category is best included in the chapter dealing with Combined Disorders (Intellectual Disability).*

### **(A) NONVERBAL COGNITIVE DEFICIT**

*COMMENTS: Relating to cognitive performance functions uncontaminated by language. NONVERBAL Cognitive Deficits should be assessed using standardized tests.*

### **(B) VERBAL COGNITIVE DEFICIT**

*COMMENTS: Relating to cognitive performances contaminated by language. Verbal Cognitive Disorders should be assessed by means of standardized tests.*

*Verbal Cognition is inevitably contaminated by Language, which explains why Verbal Cognitive Deficits are usually associated with Language Impairments. The converse also holds true.*

### **(C) COGNITIVE DEFICIT NOT OTHERWISE SPECIFIED**

*COMMENTS: Relating to situations whereby characterization is impossible to achieve (inapplicable tests...).*

## **ii) ADAPTATIVE BEHAVIOR DISORDERS :**

*COMMENTS: Adaptive Behavior has always been omitted from the classification systems, despite its undeniable clinical value in Children's Neurodevelopment..*

*This is an important area within the context of Intellectual Impairments, although Adaptive Disorders may occur isolated (there are children with predominately Adaptive Behavior impairments!) as they may also occur in association with other disorders (eg., Developmental Coordination Disorder), Combined Disorders (eg., Autism Spectrum Disorder) or Complex Disorders (eg., Nonverbal Cognition Disorder).*

*For clinical purposes, it is advised that the assessment methodologies proposed by AAIDD Adaptive Behavior (American Association on Intellectual and Developmental Disabilities) be adhered to.*

**(A) COMBINED TYPE (Social and Autonomy areas)**

**(B) PREDOMINATELY SOCIAL**

*Evaluation of the following areas, amongst others:*

- *Interpersonal*
- *Social responsibility*
- *Self-esteem*
- *Gullibility*
- *Naiveté*
- *Follows rules*
- *Obeys laws*
- *Avoidance of victimization*
- *Social problem solving*
- ...

**(C) PREDOMINATELY IN THE AREA OF AUTONOMY**

*Assessment, amongst others, of the following areas:*

- *Daily Activities (personal care)*
- *Occupational skills*
- *Use of money*
- *Safety*
- *Health care*
- *Travel/transportation*
- ...

**(D) ABD-NOS**

**iii) DEVELOPMENTAL COORDINATION DISORDER:**

**(A) COMBINED TYPE**

*COMMENT: Major issues within the three motor skills types: gross motor, fine motor and Motor Speech programming*

**(B) PREDOMINATELY GROSS MOTOR SKILLS**

**(C) PREDOMINATELY FINE MOTOR SKILLS**

**(D) PREDOMINATELY MOTOR SPEECH PROGRAMMING**

*COMMENTS: Excluding situations resulting from structural changes in the vocal tract organs.*

**(E) DCD-NOS**

#### iv) DEVELOPMENTAL LANGUAGE DISORDERS

##### (A) LATE LANGUAGE EMERGENCE

*COMMENTS: The rule is that the delay disappears with time and so it can be viewed as a quantitative and provisory functioning impairment. See criteria in DSM-5.*

##### (B) SPECIFIC LANGUAGE DISORDER PREDOMINATELY EXPRESSIVE TYPE

*(For a better characterization, identify the affected areas:*

*COMMENTS: In clinical practice one often comes across two types of Language Impairments: Developmental Language Disorders Predominately Expressive and Developmental Combined Language Disorders (receptive and expressive).*

*However useful, this classification is inadequate, since we find, for example, children with the same diagnosis of SLD that show very different clinical profiles. It is necessary, therefore, to characterize the SLD language within its different dimensions. From a clinical point of view, a child with a SLD Predominately of the Expressive Type compared to a four-year old who just says two words is completely different from a child of four years of age who displays an MLU (mean length of utterance) of four. Thus, for an improved characterization of SLD, we propose a thorough analysis of all the different language dimensions.*

*The concept of Specific Disorder of Verbal Articulation or Phonological Disorder (DSM IV) corresponds, in the proposed grading system, to a DCD – Predominately Motor-Speech Programming (if this is not the result of structural changes of the vocal tract organs). The proposed Social Communication Disorder in DSM-5 will correspond to a SLD of Combined Type, predominately in the areas of semantics and pragmatics.*

For a better characterization of the SLD, identify the following affected areas:

1. Lexicon
2. Phonological Awareness
3. Non word repetition
4. Morpho-syntax
5. Semantics
6. Pragmatics
7. Prosody
8. Speech

##### (C) SLD – PREDOMINATELY COMBINED TYPE (Receptive and Expressive )

For a better characterization, identify the following affected areas:

1. Lexicon
2. Phonological Awareness
3. Non word repetition
4. Morpho-syntax
5. Semantics
6. Pragmatics
7. Prosody
8. Speech

##### (D) SLD-NOS



## v) SOCIAL INTERACTION DEVELOPMENTAL DISORDERS

*COMMENTS: Although the characterization of Social Interaction has never been considered in isolation for nosographic purposes, the same cannot be said of its occurrence in Autism Spectrum Disorders where this core symptom has been exhaustively described and highlighted in a manner that could suggest that it is unique to this disorder.*

*Most authors forgot that social interaction should be analyzed and understood in the context of, inter alia, Cognitive and Language Disorders. In addition, Social Interaction Disorder can sometimes occur independently, quite disconnected from any other Disorder (e.g. autism). In the former case, it will be defined as Social Interaction Developmental Disorder. We used the concepts, definitions and clinical criteria proposed at present in DSM-5.*

**(A) SOCIAL RECIPROCITY DISORDER**

**(B) DEFICITS IN NONVERBAL COMMUNICATION BEHAVIORS**

**(C) DEFICITS IN DEVELOPING AND MAINTAINING RELATIONSHIPS**

**(D) SOCIAL INTERACTION DEVELOPMENTAL DISORDERS NOS**

## vi) ATTENTION DEFICIT DISORDERS

*COMMENTS: The Attention Deficit Disorder has never been considered as a category on its own for nosological purposes. It has always been linked with Hyperactivity and Impulsiveness in order to fulfill the criteria for the entity ADHD.*

*However, despite the progress in the nosological proposal in DSM-5, Specific Attention Disorder does exist independently from Hyperactivity and Impulsiveness, which justifies this separate categorization.*

*Use the criteria proposed in DSM V for Attention Deficit*

**(A) ATTENTION DEFICIT DISORDER**

**(B) ATTENTION DEFICIT DISORDER – NOS**

## vii) LEARNING DEVELOPMENTAL DISORDERS

*COMMENTS: the categorization contained in the DSM IV, as opposed to the proposal in the DSM-5, seems much more appropriate, although totally insufficient. A 9 year old who cannot learn the letters has a Reading Disorder. An eight-year old child whose reading is slow has the same classification: Reading Disorder*

*Therefore, in order to achieve a better characterization of Reading Difficulties it is useful to resort to a characterization based on a developmental model approach.*

*The characterization hereby proposed has been tested successfully but requires the availability of experienced therapists duly accredited by specialized institutions*



### **(A) READING**

**To better characterize, identify the following affected area/s**

- Difficulties with grapheme-phoneme correspondence:
- Difficulties with phonemic blending
- Difficulties with syllabic fusion
- Difficulties with fluency (rate and prosody)
- Difficulties with accuracy
- Difficulties with reading comprehension
- Non specified

### **(B) SPELLING AND WRITING**

**To better characterize, identify the following affected area/s**

- Difficulties with grapheme-grapheme correspondence (copy)
- Difficulties with spelling accuracy (specify whether systematic or unsystematic spelling errors )
- Difficulties with text production:
  - In form (length, type, morpho-syntax, ...)
  - In content (lexical, coherence, creativity, ...)
- Difficulties with handwriting
- Non specified

### **(C) MATHEMATICAL SKILLS**

**To better characterize, identify the following affected area/s**

- Pre- Academic Skills
  - Difficulties with sequencing and Number Concept
  - Difficulties with Measurements and Standard Measures
- Academic Skills:
  - Difficulties with Number Sequencing and Seriating
  - Difficulties with Number and/or Language Concepts
  - Difficulties with Mathematical Symbols
  - Difficulties with Arithmetic Procedures
  - Difficulties with Problem Solving
  - Difficulties in Spacial and Geometry concepts
  - Difficulties in Metric System concept
  - Difficulties in Time concept
  - Difficulties in Money concept
- Non specified

**(D) COMBINED TYPE: For a better characterization of the disorder, identify the area/areas impaired according to the previous lists.**

### **(E) LDD-NOS**

viii) RESTRICTED, REPETITIVE PATTERNS OF BEHAVIOR DISORDERS AND OTHER SAMENESS ANOMALIES:

*COMMENTS: The definition of Restrictive Repetitive Behavior has never been considered isolated for nosographic purposes. However, from our clinical observations, these behaviors are often observed outside the context of Autism Spectrum Disorders or Obsessive Compulsive Disorders.*

*Tics and Stereotypic Behavior should be included in this category (in the phenomenological analysis of these behaviors, their repetitive nature prevails clearly over their motor "output").*

*In the following items, we used the concepts, definitions and, clinical criteria currently defined in DSM-5.*

**(A) TICS:**

1. CHRONIC MOTOR OR VOCAL TIC DISORDER
2. LA TOURETTE´S SYNDROME
3. TRANSITORY TICS
4. TICS - NOS

**(B) MOTOR OR VOCAL STEROTYPIES**

1. STERIOTYPED MOVEMENT DISORDERS
2. STERIOTYPIES - NOS

**(C) EXCESSIVE ADHERENCE TO ROUTINES OR EXCESSIVE RESISTANCE TO CHANGE**

**(D) HIGHLY RESTRICTED, FIXATED INTERESTS THAT ARE ABNORMAL IN INTENSITY OR FOCUS**

**(E) HYPER-OR HYPO-REACTIVITY TO SENSORY INPUT OR UNUSUAL INTEREST IN SENSORY ASPECTS OF ENVIRONMENT**

**(F) RESTRICT, REPETITIVE PATTERNS OF BEHAVIORS - NOS**

# COMBINED NEURODEVELOPMENTAL AND BEHAVIORAL DISORDERS

*COMMENTS: This chapter deals with Neurodevelopmental Disorders that reflect the association with one, two or more Specific Neurodevelopmental and Behavioral Disorders.*

*Other Combined Neurodevelopmental and Behavioral Disorders categories may be defined at a later stage*

## i) INTELLECTUAL DEVELOPMENTAL DISORDER

*COMMENTS: This category means global deficits in development functioning, that is, concomitant deficits with the diverse areas of Neurodevelopment, namely in cognition (verbal and nonverbal), adaptive behavior, language skills, motor coordination, attention, symbolic game, creativity and academic skills acquisition.*

*In order to fulfill the diagnostic criteria there should be concomitant Deficits in the nonverbal and verbal areas as determined by standard assessment tests.*

*We can use the DSM-5 or the AAIDD criteria.*

## ii) AUTISM SPECTRUM DISORDERS

*COMMENTS: refers to the association of Social Interaction Disorders with Repetitive Behavior Disorders as defined currently in the DSM-5. If other areas of Neurodevelopment are severely impaired to an extent that would lead to other diagnosis, a co-morbidity diagnosis should be formulated (e.g., Autism in association with a Developmental Language Disorder or with a Developmental Coordination Disorder or with Adaptive Behavior Disorder). Alternatively, and if acceptable, a diagnosis of Complex Neurodevelopmental and Behavioral Disorder could be formulated (corresponding to co-morbidities occurring frequently).*

### (a) AUTISM

### (b) PDD-NOS (ATYPICAL AUTISM)

## iii) ATTENTION DEFICIT HYPERACTIVITY DISORDER

### (a) ADHD

1. COMBINED PRESENTATION
2. PREDOMINATELY INATTENTIVE PRESENTATION
3. PREDOMINATELY HYPERACTIVE/IMPULSIVE PRESENTATION
4. NOT OTHERWISE SPECIFIED

*COMMENTS: Use the criteria as currently defined in the DSM-5.*

# COMPLEX NEURODEVELOPMENTAL AND BEHAVIORAL DISORDERS

*COMMENTS: This chapter includes situations of co-morbidity between:*

- *Two or more Combined Disorders of Neurodevelopment and Behavior; or*
- *One or more Combined Disorders of Neurodevelopment and Behavior and one or more Specific Disorders of Neurodevelopment and Behavior.*

*Other Complex Disorders of Neurodevelopment and Behavior categories may be defined at a later stage.*

## i) DAMP: DEFICITS IN ATTENTION DEFICIT, MOTOR CONTROL AND PERCEPTION

*COMMENTS: DAMP, as proposed by C. Gillberg, is essentially equivalent to Attention Deficit (or Attention Deficit-Hyperactivity Disorder) in combination with Developmental Coordination Disorder. In a Neurodevelopment clinic, three key subtypes can be defined:*

**(A) ATTENTION DEFICIT IN ASSOCIATION WITH DCD**

**(B) ADHD OF THE COMBINED TYPE IN ASSOCIATION WITH DCD**

**(C) DAMP - NOS**

*COMMENTS: A diagnosis of DAMP-NOS should be made when the criteria for Attention Deficit and /or for Developmental Motor Coordination is atypical.*

## ii) NONVERBAL LEARNING DISORDER OR ROURKE'S SYNDROME

*COMMENTS: The nonverbal Cognitive Disorder or Rourke's syndrome, a tribute to its proponent Byron Rourke, corresponds basically to an association of an Autism Spectrum Disorder (frequently atypical) with Nonverbal Cognitive Deficits, Developmental Coordination Disorder, Dysgraphia, Dyscalculia, Developmental Language Disorder (mainly in the areas of semantics and pragmatics), and Attention Deficit.*

## iii) GILLBERG'S SYNDROME/ESSENCE:

*COMMENTS: ESSENCE (The Early Symptomatic Syndromes Eliciting Neuropsychiatric/Neurodevelopmental Clinical Examinations), proposed by C. Gillberg, corresponds basically to co-occurring variable clinical manifestations such as Autism Spectrum Disorder, Developmental Language Disorder (frequently of the Expressive type), Developmental Coordination Disorder, Attention Deficit/ Hyperactivity Disorder as well as Tic Disorder and Mood Disorder.*

*Whenever the criteria is met for confirmation of diagnosis, this categorization should be disregarded.*

*Outcomes are highly variable since the disorder can evolve, among others, an Autism Spectrum Disorder, an Attention Deficit/Hyperactivity Disorder, a Language Disorder, a Developmental Coordination Disorder, a DAMP and a Learning Disorder (please, see C. Gillberg papers on this subject)*



iv) LORNA WING'S SYNDROME

*COMMENTS: The Lorna Wing's syndrome, a tribute to the famous pediatrician, is essentially equivalent to High Functioning Autism. Its criteria include Autism, Verbal Cognitive Deficit and Developmental Language Disorder of combined Type. Nonverbal Cognition will be thus preserved.*

v) KANNER'S SYNDROME

*COMMENTS: Kanner's syndrome would correspond to the association of Autism with an Intellectual Disorder (both verbal and nonverbal cognitive impairments).*

vi) MULTIPLE COMPLEX DEVELOPMENTAL DISORDER

*COMMENTS: Multiple Complex Developmental Disorder, proposed by Towbin et al., corresponds to the association of an Autism Spectrum Disorder (atypical), a Mood disorder and a Thought Disorder.*