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A PROPOSED SYMPTOMATOLOGICAL-NOSOLOGICAL CLASSIFICATION SYSTEM FOR LEARNING AND BEHAVIORAL DISRUPTIONS: WHAT EDUCATIONAL THERAPISTS SHOULD KNOW FROM DISABILITIES/DISORDERS *PER SE* TO MULTIPLEX DISABILITIES/DISORDERS

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Abstract:
The aim of this paper, especially written for educational therapists, is twofold. First, it is to provide educational therapists a systematic symptomatological-nosological framework to identify or distinguish learning disruptions (LDs) and/or behavioral disruptions (BDs) ranging from their simplicity *per se* based on their respective triad of key symptoms/impairments up to multiple complexity of LDs and BDs. Second, it is also to help educational therapists as well as other allied professionals in the field of special education to identify and categorize all different LDs and BDs amidst the wide spectrum of diverse types and subtypes with varying degrees of severity. In this way, with a more accurate identification of LD/BD, an appropriate intervention plan can be designed to treat the disability/disorder concerned, instead of just having a name and a list of symptoms associated with a specific LD and/or BD, which is no longer an efficient way of identifying disabilities/disorders. In the current millennium of the 21st century, new research studies, especially with the emerging of the Science of Complexity, are uncovering the complexities as well as multiplexities behind all the challenging issues associated with LDs and/or BDs.

Keywords: behavior, complex, disruption, learning, multiplex, syndrome

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1. Introduction

In the context of a regular classroom where a teacher conducts a lesson to a class of students, learning and behavior are interacting with each other to ensure that appropriate learning behavior takes place. The term *learning behavior* refers to "*the crucial link between the way in which children and young people learn and their social knowledge and behavior. In doing this the focus is upon establishing positive relationships across three elements of self, others and curriculum*" (Northampton Center for Learning Behavior, 2012, para.1). In other words, "*behavior in classrooms and whole schools/settings does not occur in isolation – it is the product of a variety of influences and not simply the product of a pupil's unwillingness to behave or learn as required by the teacher*" (Northampton Center for Learning Behavior, 2012, para.2).

According to the Northampton Center for Learning Behavior (2012), there are three sets of relationships which contribute to a cultural ethos of learning behavior and such as approach has been described as 'ecosystemic'. Briefly, the three sets of relationships are (Northampton Center for Learning Behavior, 2012, para.3-5): (1) relationship with self, i.e., a student who lacks confidence as a learner with an internalized mindset of his/her inability to succeed in learning "*will be more likely to engage in the challenge of learning and (in consequence) may be more inclined to present 'unwanted behaviors*" (para.3); (2) relationship with others, i.e., all behavioral needs must be understood in the context, where they happen. In other words, any student behavior can be triggered by interactions with other students, teachers and others in class/school/other settings; and (3) relationship with the curriculum, i.e., "*pupil (or student) behavior and curriculum progress are inextricably linked,"* and the teachers are the people promoting "*a sense of meaningful curriculum progress in learning for each pupil will be more likely to create a positive behavioral environment*" (Northampton Center for Learning Behavior, 2012, para.5). These three sets of learning-behavior relationships can be illustrated in one simple diagram (see Figure 1 below).

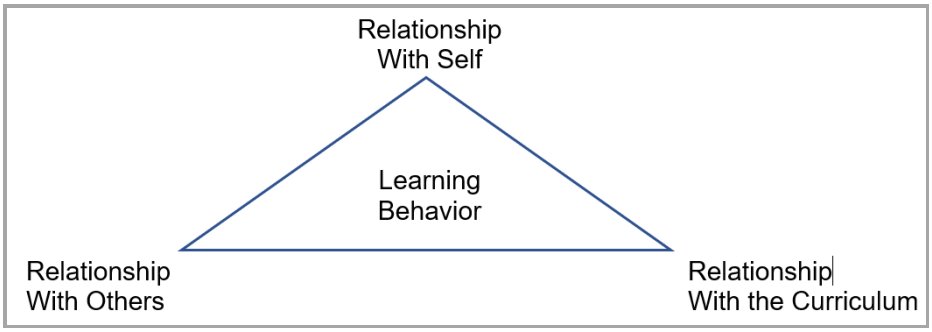

Figure 1: The 3 Sets of Relationships in Learning Behavior

When any problem arises from one of these three sets of relationships, the learning behavior is disrupted and what results can be a learning disruption (LD), a behavioral disruption (BD) or both. That is to say the learning act does not happen in the way that a student is expected to perform (e.g., a student with dyslexia struggles to decipher print though he can do fairly well in his listening comprehension) or the appropriate behavioral act to take place in a specific context does not go the way it should be (e.g., a student with undiagnosed sensory processing disorder suffers an unexpected meltdown when the florescent light in his classroom suddenly goes flickering for several minutes before it goes off).

2. Learning Disruptions (LDs)

These happenings suggest that learning or behavioral disruption can take place anytime of the day and in any context to anyone resulting in the breakdown of a student's learning behavior. To understand these learning and behavioral disruptions, we need to know and recognize the six levels of learning and behavioral disruptions. According to Chia and Wong (2010), there are six levels of LDs and they can be classified under three categories/types, as follows:

2.1 First Category of Causation: Sociogenic origin

LD Level 1: Learning Disadvantages
LD Level 2: Learning Differences
LD Level 3: Learning Dysfunctions, but Chia and Lim (in press) have renamed this level as Learning Dimensions to be in sync with Behavioral Dimensions (see Lee, Lim, & Chia, 2017).

2.2 Second Category of Causation: Psychogenic origin

LD Level 4: Learning Difficulties
LD Level 5: Learning Disabilities

2.3 Third Category of Causation: Neurogenic origin

LD Level 6: Learning Disorders

The learning disruptions at LD Levels 4 to 6 can also be the results of neuro-psychogenic origin. Similarly, too, LD Levels 1 to 4 can also be the results of socio-psychogenic origin.

Briefly described, the LD Level 1 refers to learning problems caused by "*inadequate environmental experiences, socio-cultural differences, or lack of appropriate educational experiences*" (National Health and Medical Research Council, 1990), and it is not the result of intellectual disability, physical and sensory defects, and/or socio-emotional-behavioral problems. The LD Level 2, according to Sykes (2009), refers to a child "*with average or above average intelligence, with adequate vision and hearing, without primary emotional disturbance who has failed or is at high risk to fail when exposed to school experiences using conventional educational techniques*" (p.1) whose learning style does not match with the teaching style. For instance, a kinesthetic student learns best by doing, but his/her teacher is giving oral instruction throughout the lesson. The student finds the lesson unbearable and does not learn anything since he has to sit and just listen without any task to perform in order to aid in his understanding of the lesson. A mismatch results and Learning Difference comes into picture. The LD Level 3 refers to the two learning dimensions: learning aptitude or capacity (on y-axis) and learning attitude or ability (on x-axis). The intersection between these two learning axes is the learning altitude or capability. The higher the point of intersection between these two learning axes, the higher is the learning capability (see Figure 2).

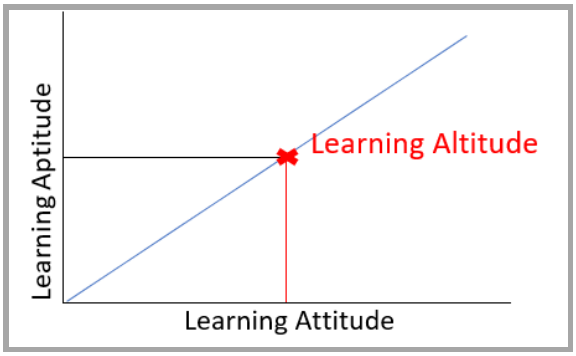

Figure 2: Learning Dimensions

The LD Level 4 is defined by the National Health and Medical Research Council (NHMRC, 1990) as follows:

> *"the substantial proportion (10%–16%) of children and adolescents who exhibit problems in developmental and academic skills. These difficulties are considered to result from one or more of the following factors: intellectual disability, physical and sensory defects, emotional difficulties, inadequate environmental experiences, lack of appropriate educational opportunities"* (p.2).

LD Level 5 is differentiated by NHMRC (1990) from LD Level 4 as follows:

> *"the much smaller proportion (2%–4%) of children and adolescents who exhibit problems in developmental and academic skills which are significantly below expectation for their age and general ability. The disabilities, which often include severe and prolonged directional confusion, sequencing and short-term retention difficulties, are presumed to be intrinsic to the individual, but they are not considered to be the direct result of intellectual disability, physical and sensory defects or emotional difficulties. Neither do they appear to derive directly from inadequate environmental experiences, or lack of appropriate educational experiences"* (p.2).

However, the National Joint Committee on Learning Disabilities (NJCLD, 1994) did not differentiate among the three LD levels at Level 4 (learning difficulties), Level 5 (learning disabilities) and Level 6 (learning disorders), but used all the three terms interchangeably as follows:

> *"a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities. These disorders are intrinsic to the individual and presumed to be due to central nervous system dysfunction. Problems in self-regulatory behaviors, social perception, and social interaction may exist with learning disabilities but do not by themselves constitute a learning disability. Even though a learning disability may occur concomitantly with other handicapping conditions (e.g., sensory impairment, mental retardation, social and emotional disturbance) or environmental influences (e.g., cultural differences, insufficient or inappropriate instruction, psychogenic factors), it is not the result of those conditions or influences"* (p.65–66).

Finally, in this paper, we refer the LD Level 6 to some form of neuropathological impairment that causes learning disruptions. In other words, there is some form of neuropathway disconnection resulting in learning disruptions as in a child diagnosed with dyslexia, for instance. In other words, the LD Level 6 is brain-based.

3. Behavioral Disruptions (BDs)

Like the LDs, there are also six levels of behavioral disruptions (BDs) (Lee, Lim, & Chia, 2017a) and they are classified under three categories/types of causation, as follows:

3.1 First Category of Causation: Sociogenic origin

BD Level 1: Behavioral Disadvantages

BD Level 2: Behavioral Differences

BD Level 3: Behavioral Dimensions

3.2 Second Category of Causation: Psychogenic origin

BD Level 4: Behavioral Difficulties

BD Level 5: Behavioral Disabilities

3.3 Third Category of Causation: Neurogenic origin

BD Level 6: Behavioral Disorders

Like LD, the behavioral disruptions at BD Levels 4 to 6 can also be the results of neuro-psychogenic origin. Similarly, too, BD Levels 1 to 4 can also be the results of socio-psychogenic origin (see Lee, Lim, & Chia, 2017a, and Hutchinson, 2007, for more detail).

Briefly described, the BD Level 1 refers to "behavioral challenges resulting from social disadvantages such as dysfunctional family, lack of appropriate experiential exposure, civil unrest and poverty" (Lee *et al.*, 2017a, p.61). The BD Level 2 refers to an individual's behavior that "is affected by his/her preferred sensory perceptuo-behavioral style based on the most dominant sensory perceptuo-motor coordination and processing used frequently in social interaction with others in any environment. There are three key sensory perceptuo-behavioral styles: auditory-sequential, visual-spatial and kinesthetic-tactile" (lee *et al.*, 2017a, p.61). For the BD Level 3, according to Lee *et al.* (2017a), its singular noun *dimension* refers to two key aspects of behavior: (i) behavioral adaptability (i.e., behavioral aptitude) and (ii) behavioral responsivity (i.e., behavioral attitude).

> "*The former concerns how an individual's behavior is modified or changed over time to adapt to the environment to ensure his/her own survival (e.g., as a member of a minority race, an individual has to adapt his/her behavior to ensure social acceptance by the majority others). The latter concerns an individual's neurological threshold and behavioral response/self-regulation that are based on the administration of the Sensory Profile for adolescents and adults (Brown & Dunn, 2002), for instance.*" (Lee, Lim, & Chia, 2017a, p.62).

The BD Level 4 refers to "*specific difficulties relating behavior, which can be classified under different behavioral levels/types according to different behavioral manifestations*" described by Chia, Lim and Lee (2017, p.64), e.g., Pavlovian behavior refers to the reflexive/involuntary behavioral acts such as one's ears involuntarily pick up noises in a crowded place; this is not the same as eaves-dropping which is a deliberate act; and Watsonian behavior refers to explicit/directly observable behavioral acts such as a student is reading a storybook aloud (see Lee *et al*., 2017a, p.63-64). The BD Level 5 refers to "*developmentally inappropriate behavioral functions as a result of developmental delays in terms of one or more of the following domains: language and communication, intellectual or cognitive capacity, physical or psychomotor ability, socio-emotional relationships, and adaptive behavior*" (Lee *et al*., 2017a, p.64). Finally, the BD Level 6 is "*a general concept that refers to any type of behavioral abnormality that is functional in origin*" (The Free Dictionary, 2017, para.2.3). According to Lee *et al*. (2017a), "*[T]his is the level where the BD at level 6 becomes a chronic neuro-developmental challenge manifested by an individual, with or without a prospect of positive prognosis*" (p.65).

If there is any problem arising from learning, it can affect the behavior and vice versa. Teachers and parents as well as allied professionals in special education often ask which of the two factors – learning or behavior – is causing the problem in children. Whichever is the cause of it and whatever is the consequence (Lee, Lim, & Chia, 2017b), it is a chicken-and-egg issue and there is no clear answer to the question (see Figure 3).

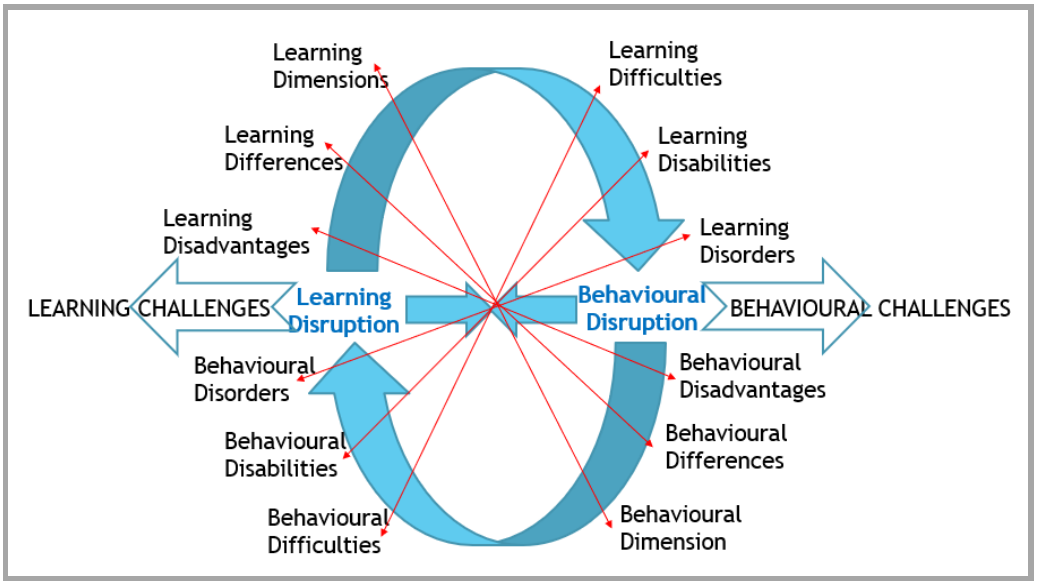

Figure 3: An Integrated Model of Learning and Behavioral Disruptions

There are also possibilities of a mix between LDs and BDs of different levels. For example, in an individual diagnosed with Developmental Gerstmann Syndrome, he/she displays four main symptoms: deficiency in the ability to write (dysgraphia), impaired mathematical skills (dyscalculia), left-right disorientation, and inability to distinguish or recognize their own fingers and others' fingers (finger agnosia) (National Organization for Rare Disorders/NORD, 2008). In other words, there is a mix between two LD Level 5 learning disabilities (i.e., dysgraphia and dyscalculia) and LD Level 6 learning disorder (i.e., finger agnosia) together with and two BD Level 4 behavioral difficulties (i.e., left-right disorientation, and inability to distinguish or recognize their own fingers and others' fingers). The last key symptom in the Developmental Gerstmann Syndrome may fall in both LD Level 6 and BD Level 4 categories.

In order for the educational therapists to decide how to treat their clients with LDs and/or BDs, they need to know clearly (especially in multiplex developmental disorders and syndromic complexes) and exactly (especially the specific LDs and/or BDs) what they are focusing on or targeting at as they design the treatment plan. Hence, there is a need for a proposed symptomatological-nosological classification of such complexity of LDs and/or BDs.

4. The Seven Guiding Principles for a Proposed Symptomatological-Nosological Classification System (SNCS)

Designing a proposed symptomatological-nosological classification system (SNCS for short) to help educational therapists to identify LDs/BDs *per se*, comorbid LDs/BDs, syndromic disorders, syndromic complex disorders and multiple complex disorders involves understanding how the complex system works. The term *complex system* refers any system that is composed of many components interacting with each other. For the SNCS to be functionally workable despite its complexity, there are seven guiding principles – adapted from Johnson's (2010) ingredients of a complex system – to follow. They are briefly described below.

First Principle: The SNCS contains a diverse range of many interacting LDs and BDs. The interactions between and/or among LDs and/or BDs may arise because they may share certain key symptoms either in parallel or overlapping comorbidities, i.e., existing simultaneously with and usually independently of another LD/BD condition (see Figure 4).

Parallel Comorbidity Overlapping Comorbidity

Figure 4: Two Types of Comorbidity

Second Principle: LDs and/or BDs can be affected by past unresolved cognitive, conative, affective and/or sensory issues that have been carried forward to the present time. "*This means that something from the past affects something in the present, or that something going on at one location affects what is happening at another – in other words, a sort of knock-on effect"* (Johnson, 2010, p.14).

Third Principle: The LDs and/or BDs can adapt their current patterns of traits according to their etiological histories be they of sociogenic, psychogenic, neurogenic or a mix of two or three different origins of causation.

Fourth Principle: The SNCS is typically open. "*This means that the system can be influenced by its environment … By contrast, a closed system means one which is not in contact with the outside*" (Johnson, 2010, p.14). It also means that the complex classification system has to be regularly reviewed in order to ensure that it is up-to-date to remain a useful identification tool for educational therapists.

Fifth Principle: The SNCS appears to be dynamic or "alive." Adapted from Johnson's (2010, pp.14-15) fifth ingredient of a complex system, the SNCS can evolve in a highly non-trivial and often complicated way, driven by an ecology of key symptoms that interact in parallel or overlapping comorbidities (see the first principle). As a result, there are many possible types of syndromic disorder, syndromic complex disorder and multiplex disorder that are the results of comorbidities of different LDs/BDs.

Sixth Principle: The SNCS exhibits emergent phenomena that are generally astonishing, and can be quite extreme. According to Johnson (2010), any system is far from stability or equilibrium. In other words, it means that any unknown kind of LD and/or BD can happen and it generally will. Hence, it should not be a surprise to educational therapists that rare disabilities/disorders are being identified every year and they need to be aware of such conditions. For example, Uner Tan syndrome is a rather recent and rare disorder that was first seen in a case study of the Ulas family in Turkey (Tan, 2006). There have been some critics of the disorder claiming that it is not medically valid. Another example is the recently named i-Disorder – a form of

obsessive compulsive disorder with technology (see Rosen, Cheever, & Carrier, 2012, for detail). Today, i-Disorder is commonly known as internet addiction or gaming disorder.

Seventh Principle: The SNCS shows a complicated mix of LDs and/or BDs. As a complex classification system, it can be considered as being more than the sum of the LDs and/or BDs. To be more effective, the SNCS is best to be used with other official classification systems such as the Psychodynamic Diagnostic Manual-Second Edition (PDM-2) (Interdisciplinary Council on Developmental and Learning Disorders, 2017; also see PDM Task Force, 2006, for detail), the Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (DSM-5) (American Psychiatric Association, 2013), and the International Classification of Diseases and Related Health Problems-10th Revision (ICD-10-R) (World Health Organization, 1992).

5. The Proposed Symptomatological-Nosological Classification System: From Disability/Disorder *per se* to Multiple Complex

Although learning and/or behavioral difficulties (LB/BD Level 4), disabilities (LD/BD Level 5) and/or disorders (LD/BD Level 6) seem to exist *per se*, in most cases, they often occur in comorbidities. In other words, a child or youth with learning disability/disorder can also manifest behavioral issues of concern. For example, a secondary school student diagnosed with dyslexia often refuses to attend learning support class for fear of being laughed at by his peers. The more the student is compelled to go for the additional class, the more resistant he can become. Even if special provisions are arranged for him during class assessment or school examination, the student will feel awkward as he may not want his peers to know about his learning and/or behavioral problems. In such a case, the student may develop a conversion reactive syndrome (CRS) which consists not only of learning disability but also reactive anxiety disorder and conversion disorder that can be traced back to a psychological trigger. In other words, the student has more than just a learning disability *per se*. An educational therapist working with the student should also take into consideration the other challenging behavioral issues, i.e., reactive anxiety disorder and conversion disorder that evolve into a CRS. The LD/BD condition can be a comorbid disorder, syndrome (or syndromic disorder) or even a complex (or complex disorder) depending on the psychoeducational evidence available.

As a result, there is a need to establish a more systematic way of identifying and recognizing the more complicated LD/BD conditions in terms of learning and/or

behavioral difficulties (at level 4), disabilities (at level 5) and/or disorders (at level 6) so that educational therapists and other allied professionals can be better prepared to know what is to be expected when working with children of such conditions of complexity, especially when preparing treatment plans.

To quote from Johnson (2010), a condition of complexity can be summed up with the following phrase: "*Two's company, three is a crowd*" (p.3). In a complex form of disabilities/disorders, some kind of phenomena is expected to emerge from a collection of interacting LDs and BDs – as Johnson (2010) has put it in his own words: "*and a crowd is a perfect example of such an emergent phenomenon, since it is a phenomenon which emerges from a collection of interacting people*" (p.4). When applied in the context of etiological, symptomatological and nosological studies of LDs and/or BDs, it is better for the educational therapists (including other allied professionals) to be prepared for the *unknowable unknown* which is "*characterized by high turbulence and no patterns*" (D'Souza & Renner, 2015, p.86) and "*in such a case, it is highly likely a new disorder that has never been identified or studied before*" (Chia et al., 2015, p.153).

Tossed into the science of complexity or those who are still struggling to acquaint themselves with the complexity theory, there is a need for educational therapists and other allied professionals to investigate and understand how such a comorbidity and/or complexity of difficulties/disabilities/disorders might "design" itself, by allowing the disability/disorder *per se* to develop, adapt and evolve of its own accord that *"can lead to three possible trajectories of developmental turbulence*" (Chia et al., 2015, p.152):

> *"(1) the progressive developmental turbulence (e.g., hyperlexia and autistic savantism), which may display exceptional abilities such as extraordinary recall memory, lightning calculations and spontaneous word recognition without being taught; (2) delayed developmental turbulence (e.g., Down syndrome and dysgnosia), which includes global or localized developmental delays in speech and walking, for example; and (3) degenerative developmental turbulence (e.g., neuron motor disease and Rett syndrome), which shows a regression in development as a child grows older* "(Chia, 2015).

There is a wide range of disabilities/disorders and each disability/disorder is arbitrarily represented by three overlapping circles – each circle represents a key symptom found in a specific disability or disorder – and together they constitute a disability/disorder *per se*. For example, attention deficit/hyperactivity disorder (ADHD) consists of three key symptoms (each is represented by a circle overlapping on the other two circles to make up the disorder in its entirety): inattention, hyperactivity and

impulsiveness. Each of these three key symptoms can be assessed formally and/or informally so that a proper individualized education plan (IEP) can be designed to deal with each symptom depending on its degree of severity and priority for intervention.

In proposing a symptomatological-nosological classification system that can be used by educational therapists when going through the diagnostic evaluation for each case review, the following several types of challenging LD/BD conditions[ii] must be taken into serious consideration:

(i) A disability/disorder exists as *per se* (see Figure 5). In other words, the disability/disorder consists of three key or core symptoms that best represent it. For example, the three core symptoms of attention deficit/hyperactivity disorder (ADHD) are inattention, hyperactivity and impulsiveness (EDM/OHI-8.00).

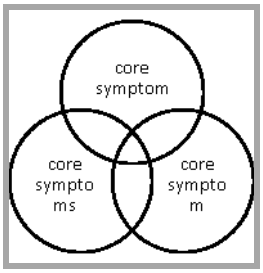

Figure 5: A Disability/Disorder *per se*

(ii) A comorbid disorder (represented with ✚) co-exists with another disability/disorder or a few other disabilities/disorders (see Figure 6). An example is the comorbidity of ADHD (EDM/OHI-8.00) is dyslexia (EDM/LD-4.00), whose three core symptoms are difficulty in fluency or accuracy in word recognition, poor decoding and spelling.

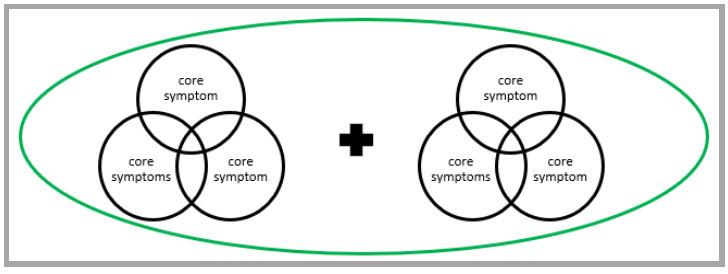

Figure 6: A Comorbidity of Disabilities/Disorders

[ii] Diagnostic codes used for all the learning and behavioral disabilities/disorders in this paper will be based on the multilevel coding system of *The Educator's Diagnostic Manual of Disabilities and Disorders* (EDM) (Pierangelo & Giuliani, 2007) unless stated otherwise.

(iii) When several disabilities/disorders share certain key symptoms, they form a syndrome. It is also known as syndromic disorder (see Figure 7). One good example is the generalized attention behavioral syndrome which consists of inattention as the key common symptom shared by two other disorders: (a) The first is ADHD (EDM/OHI-8.00) (see Rydelius, 2000, for detail); and (b) the second concerns the deficits in attention, motor control and perception (DAMP) (see Gillberg, 2003; Landgren, Kjellman, & Gillberg, 2000, for detail). It is interesting to note that "*[T]he concept of DAMP was first introduced as a variant of minimal brain dysfunction (MBD)*" (Rydelius, 2000, p.266). There is still no official diagnostic code for DAMP today.

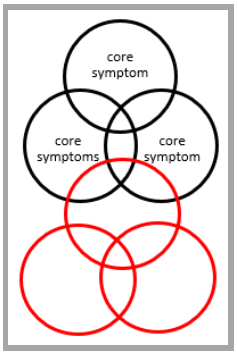

Figure 7: A Syndromic Disorder

(iv) When a syndrome co-exists with a disability/disorder, they constitute what is known as a syndromic comorbid disorder (represented with ✚) (see Figure 8). An example is the comorbidity of ADHD (EDM/OHI-8.00), dyseidetic dyslexia (EDM/LD-4.04) – a specific type of dyslexia with serious visual spatial problems – and Conversion Reactive Syndrome (CRS) (see Hoo, 2014, for detail). At the moment, there is no official diagnostic code for CRS. While all three co-exist as parallel comorbidities, they could be mistaken for a syndromic complex. For this reason, there are educational therapists who have mistakenly called this condition CRS Complex when, strictly speaking, it is actually not because there are no overlapping comorbidities among them.

To identify a comorbid syndromic disorder, there should be a syndromic disorder with a comorbidity of a LD or BD. A good example will be a comorbidity of attention behavioral syndrome (i.e., an overlapping comorbidity of ADHD (EDM/OHI-8.00) and DAMP) with spatial-motor dysgraphia, which is a mix of two specific types of dysgraphia (EDM/LD-3.00), i.e., motor dysgraphia (EDM/LD-3.02) and spatial dysgraphia (EDM/LD-3.03). The spatial-motor

dysgraphia is classified under the diagnostic code EDM/LD3.04, i.e., other types of dysgraphia (writing disorder) (Pierangelo & Giuliani, 2007, p.24). Although spatial-motor dysgraphia is a mix of two specific types of dysgraphia, it is not a syndrome or syndromic disorder because they belong to the same EDM/LD-3.00 category.

With such complexity is involved the procedure of identifying and differentiating LDs and/or BDs in order to prepare a more targeted treatment plan, the call to standardize the SNCS has become more urgent so as to reduce diagnostic confusion or avoid coming to a wrong diagnostic conclusion when educational therapists are confronted with more complicated forms of LD/BD comorbidities.

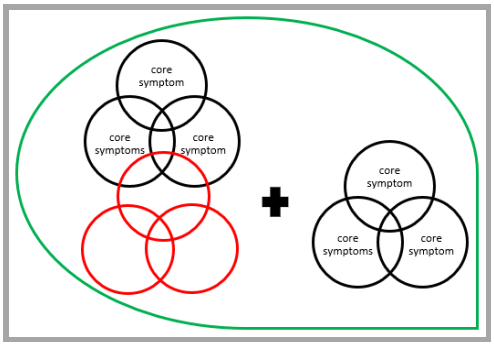

Figure 8: A Syndromic Comorbid Disorder

(v) When three or more disabilities/disorders share common key symptoms (represented by different colored circles) in a sequence, they form a syndromic complex of a linear type (represented with a series of black **Δ**s (see Figure 9). An example of this syndromic complex is the generalized behavioral syndromic complex which includes ADHD (EDM/OHI-8.00), DAMP and deficits in attention and motor perception with Pragmatic Disorder[iii] (DAMPP) and/or Dysgraphia[iv] (DAMP-D). ADHD and DAMP constitute the first **Δ,** i.e., attention behavioral syndrome. DAMP and Pragmatic Disorder constitute the second **Δ,** i.e., Deficits in Attention and Motor Perception with Pragmatic Disorder (DAMPP) (see Children and Young People's Health Services, 2015, for detail). DAMP and Dyspraxia[v] constitute the third **Δ**, i.e., Deficits in Attention and Motor Perception with Dyspraxia (DAMP-D).

[iii] There is no EDM diagnostic code for Pragmatic Disorder. No other diagnostic code for this disorder is found in other diagnostic classification manuals.

[iv] The EDM diagnostic code for Dysgraphia is LD3.00.

[v] There is no EDM diagnostic code for Dyspraxia but it is given the diagnostic code R27.8 in ICD-10-CM.

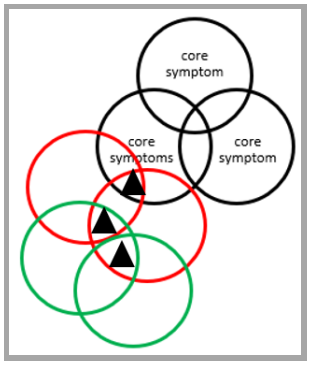

Figure 9: A Syndromic Complex

(vi) When three or more disabilities/disorders co-exist together but they do not share common symptoms, they result in a complex disorder (or simply complex) (see Figure 10). A good example is the academic anxiety behavioral complex which may consist of a specific learning disability (EDM/LD), anxiety reactive disorder (EDM/ED-6.00), oppositional defiant disorder[vi] and *la belle* indifference (see Donohue & Harrington, 2001; Rice & Greenfield, 1969, for detail), which used to be a pathognomonic symptom of conversion disorder.

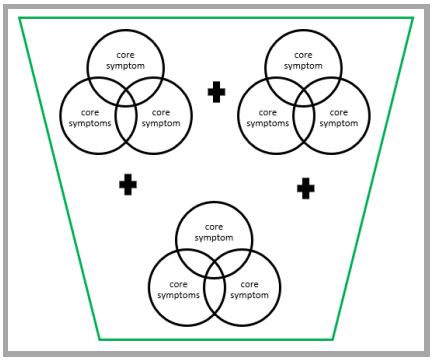

Figure 10: A Complex Disorder

(vii) When two or more complex disorders occur in comorbidity, they form a collective entity which is termed as a multiple complex disorder or multiplex disorder (see Figure 11). One good example is the multiple complex developmental disorder (MCDD) (see Ad-Dab'Bagh & Greenfield, 2001, for more detail) and it is also known as multiplex developmental disorder (MDD) (EDM/AU-6.00).

[vi] There is no EDM diagnostic code for oppositional defiant disorder but it is given the diagnostic code 313.81 in DSM-5 and the diagnostic code F91.3 in ICD-10-CM.

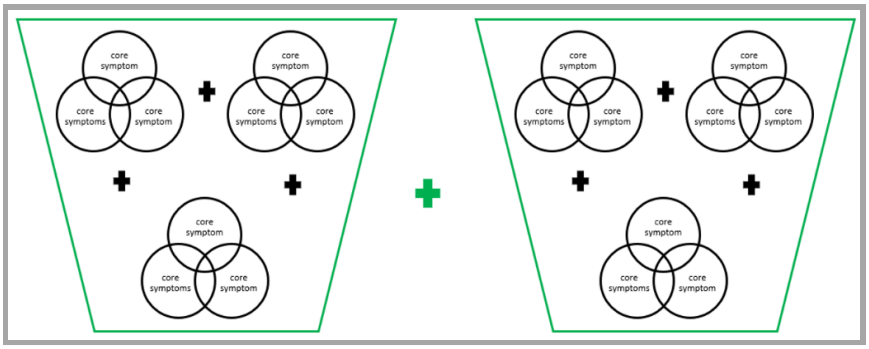

Figure 11: Multiplex Disorder

There are also several other rare combinations of disabilities/disorders such as kuklosyndromic complex (KSD for short) – a term derived from the Greek word *kuklos*, i.e., it means "ring" or "circle", and syndrome comes from two Greek derivatives, i.e., *sun* which means "together" and *dramein* which means "to run".

In the kuklosyndrome (see Figure 12), several other key symptoms of different disabilities and/or disorders co-exist and share at least one same key symptom that serves as the locus for the rest. A good example is the case study (see Voss *et al*., 2015) of a 22-year-old Korean man reported to manifest internet gaming disorder-pornography subtype and severe social withdrawal with strong preference for solitary activities. His severe social withdrawal (SW) is the one same symptom shared by several other disorders resulting in a kuklosyndrome.

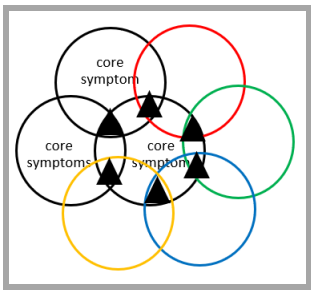

Figure 12: Kuklosyndrome

Returning to the case study of the Korean man, the other disorders that share the same SW symptom (inferred[vii] from the case report) are as follows:

- SW is noted in the internet addiction disorder[viii] (PDM-2/SA-94) as one of the three key symptoms; the other two being loss of self-control and conflict with others.

[vii] Since the other disorders sharing the SW symptom are inferred from the case report, they do not constitute as parts of the diagnosis of the subject's condition reported in Voss *et al*. (2015) study, but are used in this paper to illustrate *kuklosyndrome*.

- SW is shared with two other key symptoms, i.e., strong preference for solitary activities and emotional coldness, resulting in the possibility of schizoid personality disorder[ix] (DSM-5/301.20).
- SW is shared with two other key symptoms, i.e., emotional coldness and inappropriate internet use, and social ineptness is noted.
- SW is shared with two other key symptoms, i.e., inappropriate internet use and excessive online surfing/gaming/etc., and internet gaming disorder is identified. Internet addiction disorder (PDM-2/SA-94) and internet gaming disorder have been used synonymously and interchangeably in literature.
- SW is shared with two other key symptoms, i.e., excessive online surfing/gaming/etc. and conflict with others, anti-social i-disorder is noted although the term is still not officially recognized.

As already mentioned earlier, the Korean man has been identified (based on diagnostic inference) to display severe SW, which is overlapped with and encircled by key symptoms of other disorders, resulting in a rare kuklosyndrome in addition to his manifestation of i-schizo-disorder[x] (Rosen, Cleever, & Carrier, 2012) – "*a comorbidity of schizotypal personality disorder[xi] (DSM-5/301.22) (whose key symptoms consisted of odd speech and thought patterns, magical thinking, and delusions) and schizoid personality disorder (whose key symptoms consisted of strong preference for solitary activities, emotional coldness, and social withdrawal)"* (p.170). Emotional coldness, also known as affective *la belle* indifference, was noted in the Korean man. Should schizotypal personality disorder co-exist with this kuklosyndromic disorder relating to serious social withdrawal, it is possible to include a kuklosyndromic complex in the diagnostic evaluation of the case review.

In all the examples illustrated above, "the precise nature of the crowd-like phenomena which emerge will depend on how *the disabilities or disorder per se* interact and how interconnected they are. It is very difficult, if not impossible (*though not totally impossible*), to deduce the nature of these emergent phenomena based solely on the *key symptoms of a disability/disorder per se*" (quote is borrowed from Johnson, 2010, with the adaptation we made in italic).

[viii] The diagnostic code for Internet Addiction Disorder is SA94 found in PDM-2.

[ix] The diagnostic code for Schizoid Personality Disorder is 301.20 found in DSM-5.

[x] The i-schizo-disorder is not yet accepted as an official term to describe the condition.

[xi] The diagnostic code for Schizotypal Personality Disorder is 301.22 found in DSM-5.

6. The Four Diagnostic Domains for LDs and/or BDs

Keeping in mind the complexities of LDs and/or BDs, it is not easy to decide if a child with any type of LD and/or BD could be having a disability/disorder *per se*, comorbidity, syndrome, complex, syndromic complex or multiple complex (multiplex) disorder unless a detailed assessment has been conducted. The assessment report should provide detailed results gathered from the appropriate or relevant battery of standardized tests administered so that an educational therapist will know about the LD/BD condition and understand what is to be expected in the design of an appropriate treatment plan.

With the proposed SNCS as described earlier, the classification framework provides the educational therapists as well as other allied professionals a better and clearer picture of the kind of LD/BD condition(s), especially when the key symptoms have been identified. In this way, the educational therapists become more aware of the severity as well as complexity of the LD/BD condition and how best to deal with such challenges as they consult each other to design a suitable treatment plan. They must understand that without a clear psychoeducational diagnostic evaluation and profiling (PEDEP), their treatment plan is at best a piece of guesswork and at worst not really effective at all. Because LDs and/or BDs can happen anytime and also change over time, there will always be some form of uncertainty in the prognosis.

In conclusion, educational therapists need to be mindful that any diagnostic evaluation of LD and/or BD can fall into one of the following four domains (Chia et al., 2015):

1. *"The simple domain of known knowns characterized by the familiar and well-defined core symptoms, e.g., difficulties with accurate and/or fluent word recognition, poor spelling and decoding abilities, used in identifying a disorder, as in dyslexia, for example.*
2. *The complicated domain of known unknowns characterized by some kind of an ordered and predictable underlying cause such as empathizing deficit which results in autistic disorder.*
3. *The complex domain of unknown unknowns "characterized by flux and unpredictability, no right answers, emergent instructive patterns, and many competing ideas" (D'Souza & Renner, 2015, p.86) of what the disorder can possibly be. It can be a very rare disorder that very little is known about it. An example is the*

callosal agenesis which is also known as agenesis of the corpus callosum (see Chia, 1995; Pilu & Nicolaides, 1999, for more detail).

4. *The chaotic domain of unknowable unknowns "characterized by high turbulence and no patterns" (D'Souza & Renner, 2015, p.86) and in such a case, it is highly likely a new disorder that has never been identified or studied before*" (p.152-153).

As a result, it is always important for educational therapists to acknowledge that they do not necessarily know and/or understand everything about the complexities of LDs and/or BDs. They have to work collaboratively with other more experienced educational therapists and/or allied professionals and consult them when it becomes necessary. More importantly, all educational therapists should always provide the best services when working with children with LDs/BDs and "*to assure their parents that nothing that is beneficial to their children will be withheld whether or not the parents can afford the time and/or payment for the services provided*" (Chia et al., 2015, pp.153).

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