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Borderline intelligence, academic and social emotional development: The role of ICTs

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Abstract

The purpose of this study is to examine the cognitive deficits that children with borderline intelligence exhibit and where they are at a disadvantage in the social-emotional domain compared to their "typically developing" peers. Finally, an attempt is made to emphasize the need for special learning and social support, so that in the future children and adults with borderline intelligence can claim the same rights and opportunities. A total of 12 studies were recorded from the international literature that studied the particular cognitive and socio-emotional profile of children with borderline intelligence

Keywords: Borderline Intelligence; Borderline Intellectual Functioning; Cognitive Functions; Academic Skills; Social Deficits

1. Introduction

To be classified as having Borderline Intellectual Functioning (BIF), according to the DSM-II, one must have an IQ of 68-83 (up from 70-85). Later, in the DSM-III version, BIF is not part of what was then called an intellectual disorder. Mental retardation is now covered in the chapter on disorders that are commonly seen in infants, during childhood and adolescence. BIF now belongs to the V- 'exiled' codes. This is a chapter where the V codes are for conditions not attributable to a mental disorder and are listed on the back of the DSM. V-code BIF will be used when the therapy is related to BIF and will have an IQ ranging between 71-84. What should be noted as a difference is that now in V-code BIF, IQ is the sole criterion for identifying BIF (APA, 1980). This classification lasted for the next 30 years without anything "additional" to define BIF and thus DSM-III, DMS-IV and IV- TR used the V-code BIF. At the same time, in the International Classification of Diseases (ICD), BIF was moved to code R41.8, which is a non-specific code referring to "other unspecified symptoms and signs involving cognitive functions and awareness" (WHO, 2010). The latest and most important change regarding the definition of BIF is in the DSM-V version. There is no longer a definition in the manual. The "V- code" has been retained, which states that the V code can be used when an individual's borderline intellectual functioning is the focus of clinical attention or affects the treatment or prognosis of the individual (Wieland, 2015).

2. The cognitive deficits of children with Borderline Intelligence

These children show a quite problematic and non-adaptive cognitive functioning in school. They show delayed cognitive development and information processing, limited short-term memory capacity (Pennington & Bennetto, 1998) and limited working memory capacity (Henry, 2001; Van der Molen, Van Luit, Jongmans & Van der Molen, 2007). In addition, they face problems of selective attention when the demands of a task or the number of tasks increase. They also show moderate academic performance, with mild and generalized learning problems. Students with borderline intelligence show deficits in basic cognitive functions such as attention, concentration, short-term memory and the mechanisms of encoding and storing stimuli in long-term memory (Cohe et al., 2006). According to Connors, Atwell, Rosenquist and Sligh (2001), they also have difficulties in synthetic and analytical thinking and in generalizing the

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knowledge they have already acquired. Poor reading skills and weaknesses in spelling were found in children with BIF compared to children with average intellectual functioning (Claypool, Marusiak, & Janzen, 2008), in mathematics and in reading comprehension skills (Claypool et al., 2008; Kortteinen, Närhi & Ahonen, 2009; MacMillan, Gresham, Bocian & Lambros, 1998), research results seemed to underline the difficulty of these children compared to their peers. According to Bonifacci et al. (2008), children with BIF are slower to process information and tasks, exhibit hyperactivity and higher levels of school anxiety and depressive mood than their peers with average intellectual functioning (Alesi et al., 2015) as there are reports that they experience low levels of self-esteem and high levels of stress. A typical example is the period of examinations and various assessment procedures, where the student seems "lost" and the balance of the individual is disturbed. In short, school-aged children with BIF have more cognitive problems than their peers with "normal" mental functioning. This increases the risk of educational failure and dropping out of school (Fernell et al., 2010; Karande et al., 2008), particularly when adequate support is not provided. The impact can be identifiable across the lifespan and in different areas of functioning, also affecting their quality of life.

3. Social-emotional deficits of children with Borderline Intelligence

On average, people with borderline intelligence are more likely to live in adverse social and economic circumstances, are often unemployed and are more likely to report being in a poor psychological state without having someone close to them for emotional support (e.g. Emerson, Hatton, Robertson, & Baines, 2014 ; Havercamp & Scott , 2015 ; Kavanagh, Krnjacki, Beer, Lamontagne, & Bentley, 2013 ; Mithen, Aitken, Ziersch, & Kavanagh, 2015). In addition, people with MID/BIF are at increased risk of developing substance use disorders (e.g. Slayter, 2008; Van Duijvenbode, VanDerNagel, Didden, Engels, Buitelaar, Kiewik & de Jong, 2015). Children with intellectual disabilities are between three and seven times more likely to experience neglect, physical, emotional and sexual abuse than other children (Spencer, Devereux, Wallace, Sundrum, Shenoy, Bacchus & Logan, 2005; Hatton et al., 2004). In addition, there is evidence that those with BIF are at greater risk of early life anxiety. Children with BIF are more likely to experience bullying, poor parenting, poverty, material hardship and parental unemployment than typically 'normal' developing children (Fenning, Baker, Baker & Crnic, 2007; Emerson et al., 2010). Also, adults with BIF have higher rates of incarceration, job insecurity, drug use/abuse, poor social functioning and are more than twice as likely to have a psychiatric diagnosis as those with average or higher IQ (Emerson et al., 2018 ; Gigi et al., 2014). These diagnoses are related to: depression, anxiety disorders, post-traumatic stress disorder, psychosis, substance abuse, personality disorders, suicide attempts and neurodevelopmental disorders (Morgan, Leonard, Bourke & Jablensky, 2008; Douma, Dekker, De Ruiter, Verhulst & Koot, 2006; Hassiotis et al., 2008; Wieland, Haan & Zitman, 2014; Hassiotis et al., 2017; Hassiotis, Tanzarella, Bebbington & Cooper, 2011).

4. Research Methodology

1.1. Purpose of the research

The aim of this paper is to provide as complete a record as possible of the new data on the academic and socio-emotional deficits of children with borderline intelligence through a literature review of 12 field studies.

For this purpose, a bibliographic review of articles in the international literature on the subject was carried out

1.2. Research questions

The main research questions addressed through this paper are the following:

- what are the main cognitive deficits of people with borderline intelligence and what is the most appropriate way to address them.
- what are the main socio-emotional deficits of people with borderline intelligence and what is the most appropriate way to address them.

1.3. Search sources

This paper was based on the method of systematic literature review of articles from reputable journals with English as the main language. International experimental studies related to the topic were studied. In the first stage, articles were found and collected through online search of Scopus , Pubmed , scholar google Research Gate, Science Direct databases. The key dates for identifying the studies were between 2012-2022. The search terms (key words) of the articles were as follows:

«Borderline Intelligence» OR «Borderline Intellectual Functioning» AND «Cognitive Functions» OR «Academic Skills» OR «Social Deficits»

5. Results

The aim of Nouwens, Lucas, Smulders, Embregts & van Nieuwenhuizen (2017), was to identify classes of individuals with mild intellectual disability or borderline intellectual functioning and to examine whether these classes are related to individual and/or environmental characteristics. In terms of personal characteristics, individuals with MID or BIF experience a wide variety of comorbid psychopathologies, e.g., autism spectrum disorders (Bryson, Bradley, Thompson & Wainwright, 2008), attention deficit hyperactivity disorder (Xenitidis, Paliokosta, Rose, Maltezos & Bramham, 2010) and substance use disorders (Frielink, Schuengel, Kroon & Embregts, 2015). In terms of environmental characteristics, people with MID or BIF come from a wide range of family backgrounds, so they either come from a supportive family, inconsistent parenting or even have faced abuse and maltreatment. Also, in addition to differences in personal and environmental characteristics, there are differences in the type of professional care these people receive (e.g. youth services, mental health facility, etc.).

In research conducted by Alloway (2010), he focused on the relationship between working memory and executive function skills in students with intellectual disabilities, especially those with borderline intellectual functioning (IQ scores ranging between 70 and 85). In summary, this study demonstrated students with mild to borderline intelligence have diffuse working memory and executive function deficits. Specifically, in visual-spatial working memory and the Sorting task, participants achieved the best scores.

There has also been much discussion around verbal and visual memory, as well as tasks that rely simultaneously on memory, executive functions and language in children with BIF. Researchers Águas Dias, Albuquerque & Simões (2019), addressed this very issue. Many of the results that emerged showed that compared to the control group, the BIF group had lower performance on tests of verbal memory, verbal fluency tasks and visual memory.

In a study conducted by Karande et al (2008), they documented the clinical and academic profile of children with borderline intellectual functioning ("slow learners") and assessed parents' knowledge and attitudes about this condition. Intelligence (measured as IQ) is one of the important predictive variables in children's academic outcome. Slow or borderline intelligence students, lag behind in the regular classroom due to teaching methods being inappropriate for their learning ability. Thus, these children seem incapable of achieving the academic standards expected of an average student (IQ 85-109). The only way a student with borderline intelligence can attend and achieve satisfactory academic proficiency is only if they receive some "additional individualized education". The results of the study showed that their main academic problems were difficulty in writing (92.7%), overall poor performance in all subjects (89.1%) and difficulty in mathematics (76.4%). In addition, 18 (32.7%) children had a significant perinatal history, i.e., premature birth, suffocation at birth, low birth weight, etc, 46 (83.6%) children had failed examinations and 34 of them (61.8%) had experience of grade retention. Behavioral problems such as aggression were noted in 22 (40%) children, anxiety in 10 (18.2%) and withdrawal in seven (12.7%). Only three (5.5%) children were diagnosed with depression. 24/55 (43.6%) parents had already changed their children's school either of their own volition or because previous school authorities had asked the child to leave. Also, most parents (83.3%) were hesitant to consider the special education option. Finally, although all parents were literate, only six (10.9%) were correctly aware of the term "slow learner", i.e. that it denotes a person with borderline intelligence.

In a very recent study by Pulina, Lanfranchi, Henry & Vianello (2019), they wanted to analyze the intellectual profile of school-aged children with BIF, because in the last decades, BIF has been considered a "marginal" condition, without a clear definition or classification. The results showed that participants with BIF reported the lowest scores on the index related to working memory and higher scores on the indices of speed of comprehension, perceptual reasoning and processing speed. Apart from a generally lower average intellectual functioning, little is known about the intellectual profile of individuals with BIF. The results of this study confirmed that the profile of individuals with borderline intelligence differs from that of "typically developing" children. The present results confirm that the BIF population has a specific and distinct cognitive profile, and highlight the importance of differentiating between people with borderline intelligence from those with intellectual disability and those with specific learning disorders - both in research and in clinical and educational practice.

Another important study examined whether stress affects not only their performance in lessons, but more importantly the students with BIF themselves. Stathopoulou (2016) in her research, wanted to investigate the anxiety and psychological problems caused by low school performance in adolescents with borderline intelligence. According to the findings of the study, the adolescents with borderline intelligence in the sample scored high in terms of the questions

describing: fears and anxiety, intense nervousness, distress, feelings of having to be perfect, and feelings of inferiority. Furthermore, these findings confirm the international literature that suggests that the cognitive deficits of these adolescents may be a risk factor for their mental health.

Hassiotis et al (2017), decided to investigate whether borderline intellectual functioning (BIF) is associated with several neuropsychological deficits. The study involved 1701 participants, of which 983 were diagnosed with BIF. The findings of the study highlighted that BIF is directly associated with some possible psychosis and auditory hallucinations regardless of age, gender, current social class and ethnicity. The largest individual contribution to psychosis in the BIF group came from an increase in non-psychotic symptoms (symptoms of depression rather than anxiety). Reduced IQ may be a greater risk factor for depression compared to anxiety or may alter the symptoms of mental disorder, causing symptoms of depression. Thus, BIF is clearly related to psychopathology. In fact, some contributing factors may be amenable to early diagnosis and treatment.

Another group of studies, Emerson et al (2010), also wanted to examine firstly whether children with intellectual disability or borderline mental function are associated with mental health problems and then whether these two groups are likely to be exposed to a socio-economic disadvantage because of their cognitive abilities. The conclusion of all of the above is that children with limited intellectual functioning contribute to overall child psychiatric morbidity.

In addition, Szumski, Firkowska-Mankiewicz, Lebuda, & Karwowski (2018), decided in their research to compare how disability is associated with the placement of children with BIF in special schools and how personal and family resources can influence the quality and success or otherwise of the adult life of people with borderline intelligence. The results showed that low parental socioeconomic status increases the likelihood that a child will be labelled as having a disability and placed in a special school, thus confirming what has long been a topic of debate within the literature on Family Socioeconomic Status (SES) and BIF.

Alesi et al (2015), studied and compared levels of self-esteem, depression, anxiety and insecurity at school among children with Borderline Intellectual Functioning (BIF) and Gifted Intellectual Functioning (GIF) compared to an average intellectual functioning control group. In terms of outcomes, analysis of the data showed that individuals who experienced repeated failure, such as those with BIF, were more likely to experience higher rates of anxiety and depression, as well as develop neurotic personality disorders in contrast to their typically developing peers.

In another study, the aim of Baglio, Blasi, Sangiuliano Intra, Castelli, Massaro, Baglio & Marchetti (2016), was to study in children with BIF how the development of Theory of Mind is a pillar of their social competence. The results of the study show that children with BIF have a deficit in Theory of Mind that is strictly related to (a) their executive functions and (b) their meta-representational abilities.

Hassiotis et al (2008), examined a sample of 8,450 adults (12.3% of the sample had borderline intelligence and 87.7 had 'normal' intelligence) living in private households from across the UK and compared them with adults in the normal intelligence range. The comparison included, psychiatric disorders, intellectual level, social functioning and use of mental health services. The present study confirmed the increased incidence of several mental disorders and occupational problems previously associated with a lower level of mental functioning. Thus, adults with borderline intelligence showed a significant social disadvantage and increased rates of neurotic disorders, substance abuse and personality disorders compared to their counterparts with "normal" intelligence. The borderline group were more likely to receive psychiatric medication and finally, they appeared to use far more services, including emergency services.

6. Conclusion

Regarding the first research question, on cognitive deficits, children with borderline intelligence are a student population with wider learning difficulties throughout their school life. These individuals have difficulties with everything from reading a text, writing and spelling to logical and mathematical reasoning, resulting in low performance relative to their 'typically developing' peers (Kortteinen et al., 2009). Also, due to their 'borderline' intelligence, they have limited working memory capacity (Henry, 2001), deficits in basic cognitive functions such as attention, concentration, short-term/long-term memory (Cohé et al., 2006) and finally deficits in working memory which are manifested through language development and visual-motor coordination (Alloway, 2010). In addition, scores on assessment procedures for these students are most often below average but not so low that they are referred to and supported by specialized educational services (Mercer, Jordan, Allsopp & Mercer, 1996). In addition, their slow cognitive processing rate results in them being disadvantaged relative to their peers in the acquisition of basic

developmental skills (social interaction, communication styles, thinking patterns) and placing them approximately one to two years behind their peers (Kaznowski, 2004).

Regarding the second research question - socio-emotional deficits - in the first stage, as children and adolescents they find it difficult to socialize in their school environment and thus live an "isolated" life. At a later stage and as adults, the problem of socialization has negative consequences, such as insecurity in their working environment, difficulties in their personal life and, in general, depressive behavior with intense stress and anxiety, which causes them to reach anti-social limits (Hassiotis et al., 2008; Gigi et al., 2014). More specifically, alcohol and drug use and socially unacceptable behaviors result in possible psychopathology and delusions (Hassiotis et al., 2017). In addition, suicide attempts are some of the behaviors that people with borderline intelligence exhibit in adulthood when they cannot manage their emotional crises (Hassiotis et al., 2011). Also, in Vlachou et al's (2006) research, it was shown that academically slow students create significant educational and behavioral difficulties in schools due to their deficiencies and psychosocial skills. All these deficits make them vulnerable and at risk of many psychosocial problems (Cooper et al., 2007).

It follows from all the above that due to the vulnerabilities of children with borderline intelligence, their cognitive deficits will only be addressed if they receive some "extra personalized education" (Karande & Kulkarni, 2005 ; Krishnakumar, Geeta & Palat, 2006) from qualified and trained teachers in order to be able to achieve adequate academic competence.

The basic part of the education of these students starts from the definition given by the International Classification of Diseases (ICD) and the Diagnostic and Statistical Manual of Mental Disorders DSM - 5, which does not entitle these individuals to special educational, medical or social services (Salvador-Carulla et al., 2013), since their IQ is between 1 to 2 standard deviations below the average (70-85). Therefore, the educational sociality and the family of these children should contribute decisively to their cognitive and socio-emotional development so that they can cope with the simple daily goals in school and in their personal life.

The cognitive problems presented by children with borderline intelligence could only be addressed by incorporating interventionist teaching strategies in inclusive classrooms to enhance their rate of adequate psychosocial development i.e., better interaction between adults and children with borderline intelligence, enhanced receptive and expressive communication, and strong social roles (Vlachou et al., 2006). However, in order to ensure the academic progress of these children, the inability to learn more slowly needs to be addressed through specially designed interventions focused on the level and abilities of children with borderline intelligence (Shaw, 2008). Equally important, is the fact of early intervention. All the international literature on any topic of special educational needs states that early diagnosis and even earlier intervention results in a reduction of dysfunctions that will be a barrier to the child's later growth and development.

Regarding socio-emotional deficits, also in this area employers should be informed and trained about this type of disability in order to be able to hire them (Campos, Sánchez, López & López, 2020). Thus, we can see that the state, with the help of the whole society, should promote the visibility of people with BIF, providing training and tools that can facilitate their recruitment, and on their part, companies should strengthen the role of the Human Resources Department so that people with BIF can successfully cope with the demands of the job. Finally, disability associations will also play a key role in promoting the recruitment of people with BIF and facilitating their adaptation in companies.

The positive and useful contributions that digital technologies provide to the field of education and social emotional development, should be highlighted as a final point. Mobile devices (55-59), a range of ICT apps (60-72), AI & STEM ROBOTICS (73-87), and games (88-90) are some examples of the technologies that enable and improve educational processes including evaluation, intervention, and learning. Additionally, the use of ICTs in conjunction with theories and models of metacognition, mindfulness, meditation, and the development of emotional intelligence [91-125], as well as with environmental factors and nutrition [51-54], accelerates and improves educational practices and outcomes, especially for borderline students.

Compliance with ethical standards

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Disclosure of conflict of interest

The Authors proclaim no conflict of interest.

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