Pita RM, et al., J Neonatol Clin Pediatr 2025, 11: 133
DOI: 10.24966/NCP-878X/100133

HSOA Journal of Neonatology and Clinical Pediatrics

Case Report

Learning Difficulties in School-Aged Children: Uncommon Etiologies

Rita Marchante Pita[1]*, Ana Ferraz[1,2], Cristina Pereira[3], Teresa Mota Castelo[1] and Inês Nunes Vicente[1]

[1]Neurodevelopment Pediatrics, Child Development Center, Department of Pediatrics, Unidade Local de Saúde de Coimbra, Coimbra, Portugal

[2]Neonatology Department, Unidade Local de Saúde de Coimbra, Coimbra, Portugal

[3]Neuropediatrics and Neurophysiology, Child Development Center, Department of Pediatrics, Unidade Local de Saúde de Coimbra, Coimbra, Portugal

Abstract

Learning difficulties are a common problem in school-aged children and represent one of the main reasons for referral to neurodevelopmental appointment. Learning difficulties should not be considered a final diagnosis, but as a symptom of a problem or disease, as they include a large spectrum of etiologies. The most common causes are specific learning disorders, language disorders, borderline cognition/intellectual developmental disorder and attention deficit hyperactivity disorder. Other neurodevelopmental disorders, neurological diseases, sensorial deficits, chronic diseases, and poor socioeconomic environment are also a part of differential diagnoses. We report three cases referred for neurodevelopmental appointment due to learning difficulties. The final diagnoses were a developmental coordination disorder, epilepsy and attention deficit hyperactivity disorder, and neuromuscular disease.

The purpose of this paper is to increase awareness of less prevalent, but relevant, causes of learning difficulties that need specialized care. We also emphasize the importance of clinical history and physical examination in the diagnostic algorithm and the relevance of multidisciplinary characterization.

Keywords: Learning difficulties; Developmental coordination disorder; Epilepsy; Neuromuscular diseases

***Corresponding author:** Rita Marchante Pita, Department of Pediatrics, Unidade Local de Saúde de Coimbra, Coimbra, Portugal. Tel: +351239 488 700. Email: ritacoelhopita@gmail.com

Citation: Pita RM, Ferraz A, Pereira C, Castelo TM, Vicente IN (2025) Learning Difficulties in school-aged children: Uncommon Etiologies. J Neonatol Clin Pediatr 11: 133.

Received: December 24, 2024; **Accepted:** January 08, 2025; **Published:** January 17, 2025

Introduction

Learning difficulties (LD) are one of the most common reasons for neurodevelopmental appointment in school-aged children. It is estimated that three million children worldwide, between the ages of six and 11, experience school or learning difficulties [1-3].

The definition of LD is not consensual. The term is used with different meanings, from mild difficulties to school failure. However, LD should be considered as a manifestation of a problem or a disease that may have several underlying etiologies. Currently, the Diagnostic and Statistical Manual of Mental Disorders - fifth edition (DSM-5-TR) does not include the term LD, considering only the specific learning disorder (SLD), which has individualized and specific criteria [4].

LD etiology is multifactorial and can be divided into intrinsic causes, namely neurodevelopmental disorders; and extrinsic causes, related to socio-familial environmental conditions or inadequate teaching methodology [2]. SLD, language disorders, attention deficit hyperactivity disorder (ADHD) and intellectual developmental disorder (IDD)/borderline cognition are some of the diagnoses most frequently associated with poor school performance [5]. However, neurological diseases or sensorial deficits may also explain LD [6-9].

LD can also be an expression of a wide spectrum of clinical conditions that can coexist. A detailed medical history and physical examination are critical for the initial diagnosis and etiological investigation and exclusion of serious or less common etiologies or diseases that require specific treatment [3].

We describe three cases of children referred to neurodevelopmental appointment for LD and whose diagnoses were: developmental coordination disorder (DCD), epilepsy and ADHD and neuromuscular disease. We intend to highlight the wide range of differential diagnosis and to reinforce the importance of an accurate medical history and a multidisciplinary evaluation.

Case Report

Case one

An eight-year-old boy was referred to neurodevelopmental appointment for suspected dysgraphia. At first visit, he was in fourth grade, with good school performance, but the family was concerned about his fine motor skills (e.g. pre-writing skills, cutting with scissors) since kindergarten. Difficulties were also described in gross motor skills, namely activities that required constant changes in his body position (some sports) and in daily tasks (e.g. dressing, eating, and tying shoelaces). Reading abilities were regular, but his handwriting was irregular, difficult to read, and with frequent misspellings. There were no complaints about behavior, namely inattention, and there were no suspected sensorial deficits. Growth was regular and all psychomotor milestones were acquired at typical ages, including major motor and language skills. Family history was unremarkable. Physical examination revealed a child with an unstable gait without preferential side, difficulty walking in a straight line, mild intention tremor and mild bilateral dysmetria and dysdiadochokinesia.

These clinical manifestations triggered a multidisciplinary evaluation and etiological investigation. Cognitive assessment with the Wechsler Intelligence Scale for Children (WISC-III) [10], showed cognitive performance within the expected average for his age. He underwent a pedagogical evaluation that reinforced the hypothesis of a diagnosis of dysgraphia. He demonstrated good attentional skills during the cognitive and pedagogical evaluation. Occupational therapy evaluation identified dysregulation in sensory processing and difficulty in bilateral motor coordination with low functional performance. Strategies were provided to improve motor performance, with a positive clinical impact. He performed brain magnetic resonance imaging (brain MRI) and analytical evaluation (blood count, renal function, transaminases, creatine phosphokinase [CPK], lactate dehydrogenase [LDH], venous blood gases, thyroid hormones, copper metabolism) - all normal. Visual function examination was normal. The diagnosis of DCD was established, and the child started Special Education Support (SES) measures at school. He maintains follow-up in neurodevelopmental appointment and occupational therapy. He is currently in fifth grade, and despite higher demands of the school curriculum, he has been improving with the adequate support measures.

Case Two

An eight-year-old girl was referred to neurodevelopmental appointment for LD. Initial concerns were reported in preschool, with difficulties in comprehension, memory and increased time to fulfill tasks. The difficulties gradually increased, particularly in reading, writing and logical reasoning. Additionally, she showed frequent inattention, lack of autonomy and difficulty in organizing tasks. After tonsillectomy and myringotomy at six years old she underwent audiological evaluation, which was unremarkable. The cognitive assessment (WISC-III) performed, at the age of seven, showed a cognitive level within the mean expected for her age but with difficulties in sustaining attention, short-term memorization, planning, and visuospatial coordination. She fulfilled DSM-5-TR ADHD diagnostic criteria (predominantly inattentive presentation) and started pedagogical support since second grade. When she was at third grade, difficulties in mathematics increased. Sleep was described as very agitated, requiring a bed rail to avoid falls. There were no sudden stops of activity, loss of consciousness or nocturnal enuresis. Behavior was unremarkable. Physical examination was normal. She had two maternal second-degree cousins with epilepsy and IDD. The electroencephalogram (EEG) revealed generalized paroxysmal activity in photic stimulation (Figure 1) and right central spikes in sleep (Figure 2). Brain MRI was normal. She started levetiracetam therapy with improvement of sleep pattern. Despite epilepsy control, she maintained LD. Cognitive reassessment was done. The global intelligence quotient was one standard deviation above the mean for her age (borderline cognition), with strong difficulties in memory, processing speed and sustained attention abilities.

Currently, epilepsy is controlled with antiseizure medication. She maintains follow-up in both neurodevelopmental and neuropediatric appointments and benefits from SES. Improved attention and planning performance was achieved after introduction of a psychostimulant drug (methylphenidate), with good tolerance and no adverse effects.

Case three

An eight-year-old girl was referred to neurodevelopmental appointment for LD and concerns regarding global motricity. She

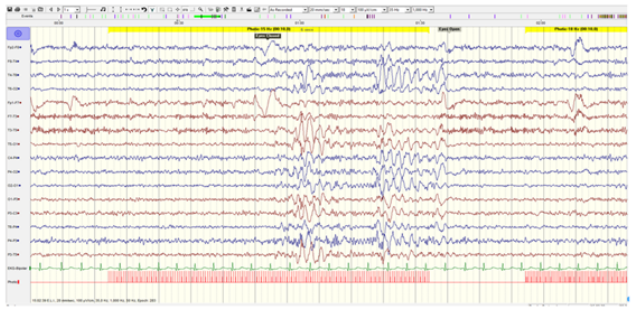

Figure 1: Interictal electroencephalogram with generalized paroxysmal activity (spike-and-wave at 3-4 Hz) in photic stimulation at 15 Hz with eyes closed.

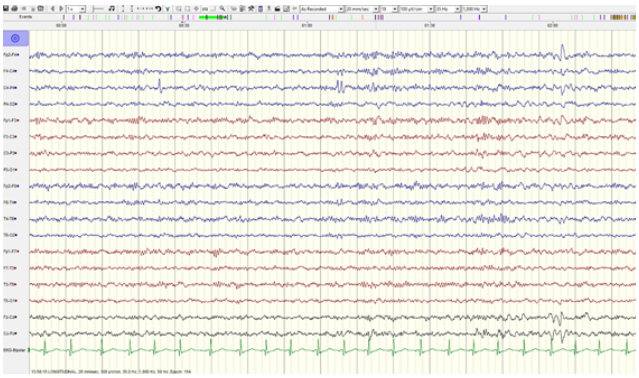

Figure 2: Interictal electroencephalogram in sleep with right central spikes (phase opposition in C4).

acquired main developmental milestones at expected ages, including motor landmarks. However, at the age of four, it was reported imbalance and frequent falls, difficulty in running and climbing stairs. Additionally, she presented greater fatigue in daily activities compared to her twin sister. There were no complaints of palpebral ptosis or daily variation of the symptoms. Perinatal history was unremarkable. Family denied repeated respiratory infection, constipation or feeding difficulties. Growth was regular. Parents were non-consanguineous and there was no family history of LD or neurological diseases. A school report highlighted difficulties in all subjects, slow and unprecise syllabic reading, difficulties in mental calculus, comprehension and problem solving, temporospatial orientation, and working memory. Behavior and sleep were normal. Neurological examination showed bilateral varus gait, decrease in muscle strength in flexion of the neck and extension of the thigh (grade 3/5), a positive Gowers maneuver, without evidence of winged scapula or spine deviations. Myotatic reflexes were diminished, and speech and cranial nerves evaluation were normal.

She was also observed in neuropediatric appointment and began investigation for neuromuscular disease. CPK serum level was 1266 U/L (reference value: <145 U/L) and LDH, ALT (alanine transaminase), AST (aspartate aminotransferase), thyroid hormones and blood count were normal. Cardiac evaluation was normal. Muscular biopsy revealed a limb-girdle muscular dystrophy. The genetic study identified a heterozygous variant of the COL6A2 gene (Bethlem myopathy). Cognitive assessment (WISC-III) revealed a cognitive level below the average for her age. She began SES and multidisciplinary

follow-up. Her twin sister has a similar phenotype and the same genetic change. The parents are asymptomatic, with normal CPK levels and the genetic study was negative for Bethlem myopathy.

Discussion

LD is a common reason for referral to neurodevelopmental appointments. There is great clinical heterogeneity depending on the etiology and comorbidities associated, which includes common problems such as SLD, ADHD and IDD, but also some rare diseases such as neuromuscular diseases.

Regarding case one, DCD is a poorly understood problem, but its prevalence is 5-6% between the ages of five and eleven [4,11]. According to DSM-5-TR, the acquisition and execution of coordinated motor skills is substantially below the expectations for the chronological age, learning opportunities and abilities of the individual [4]. This impairment of motor skills significantly interferes with the performance of daily tasks [4,11,12]. There may be a delay in motor milestones (e.g. sitting, walking), although many children reach them at normal ages [4]. Younger children may have difficulty walking up and down stairs, pedaling, doing up buttons and zippers. Older children and adults present lower speeds or inaccuracy in motor activities such as ball games, handwriting and driving. DCD may also affect cognitive and social development, since motor control is essential for interacting with the environment [13]. The diagnosis of DCD, according to DSM-5-TR, is based on developmental and medical history, physical examination, school or workplace report, and individual assessment using psychometrically sound and culturally appropriate standardized tests. The symptoms begin during early developmental period, but, usually, diagnosis is not made before the age of five due to a significant variation in the acquisition of motor skills in early childhood, or because the symptoms only become clear once the academic complexity increases, and school performance is affected. The difficulties are also not better explained by visual impairment or neurological condition affecting movement (e.g., cerebral palsy, muscular dystrophy, degenerative disorder), whereby visual examination and neurological examination must be included [4]. In selected cases, depending on clinical findings, additional evaluation can be considered. The case presented demonstrates how DCD can have an impact at academic level and how the symptomatology can be undervalued until it interferes in school performance. These children need school support measures, such as adaptations in evaluation process (e.g. having extra time for the test, test/exam sheets in accessible formats) [14], so that they feel that their effort is rewarded, avoiding feelings of low self-esteem, insecurity, or opposition. DCD is usually associated with other comorbidities, such as problems of inattention (ADHD up to 50% of the cases) and SLD, mainly in reading and writing, as in the case presented (dysgraphia) [4,15].

As a potentially treatable condition, with high impact in neurodevelopment and learning, epilepsy diagnosis should be kept in mind. The pediatrician should recognize the multiple forms of presentation which may suggest the diagnosis. Therefore, and as demonstrated in case two, it is essential to characterize sleep, namely the existence of falls, sudden "stretching", enuresis, non-repairing sleep or morning irritability, as well as episodes of sudden stop of activity or syncope. The EEG, with sleep recording, is a fundamental element in the diagnosis. There are several recognized clinical syndromes and the impact on neurodevelopment is related to the type of epilepsy, age of onset, frequency of seizures, treatment and symptomatic control [16]. Although most children and adolescents with epilepsy have average intellectual functioning, the impact on learning may be significant [17]. As case two revealed, despite epilepsy control, they can have ADHD as comorbidity demonstrating higher levels of inattention, slow performance and significant interference in working memory and executive functions. These deficits have a high impact on academic performance, especially in problem solving, planning and mental flexibility. In addition to educational and behavioral measures, depending on epilepsy etiology and control, stimulant therapy can be considered with close monitoring [18].

Neuromuscular diseases have multiple comorbidities, including neurodevelopmental disorders. It is reported that 44% of the cases of Duchenne muscular dystrophy have learning disabilities and 17% intellectual disability [17]. Severity relates to the underlying etiology. First red flags may occur in the prenatal period (decreased fetal movements, polyhydramnios, arthrogryposis) or in the first years of life (delayed acquisition of gross motor milestones, abnormal growth, respiratory infections). However, the manifestations may be milder and occur later, particularly with complaints of muscle weakness, fatigability, and palpebral ptosis. In case three, there were early complaints that could lead to the suspicion of a neuromuscular disease, but only the LD motivated the referral to neurodevelopmental appointment. The abnormal findings in physical examination, associated with complaints of fatigue and reduced motor agility, suggested this diagnosis. Neurological exam may disclose some specific features regarding underlying etiology and pathophysiology of the disease (muscle and/or nerve). They may include decreased muscle strength, diminished reflexes, muscle hypertrophy (e.g. lower leg muscles pseudohypertrophy) or hypotrophy (e.g. "winged scapula"), tendon retractions, abnormal gait (e.g. toe walking) and hyperlordosis. The etiological investigation begins with less specific tests (serum CPK, LDH and transaminases), proceeding to more specific examinations like electromyography, MRI, muscular biopsy, and genetic study. In our case, the genetic study found a rare disease, Bethlem myopathy, with an estimated prevalence of less than 1:1.000.000 according to ORPHANET [19]. It is an autosomal dominant disease, but there are cases described in heterozygosity and with recessive transmission [20]. There is usually a slow progression, with preserved ambulation in adult life [21]. As in the previous case, the multidisciplinary approach along with neuropediatric, psychology and other technical support were essential.

Conclusion

We reported three cases of children referred to neurodevelopmental appointment for LD who raised several diagnostic and therapeutic challenges. Physicians working with children should remember that LD are a first sign of a wide spectrum of clinical conditions that can coexist. A detailed medical history and physical examination are critical for the initial etiologic investigation and subsequent diagnosis. SES and multidisciplinary care are fundamental to improve outcomes of children with LD.

Acknowledgement

There are no acknowledgments for this submission.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest disclosure

The authors have no conflicts of interest to declare.

References

1. Rimrodt SL, Lipkin PH (2011) Learning Disabilities and School Failure. Pediatrics in Review 32: 315-324.
2. Fernandes JE, Nogueira SB (1992) School failure - the doctor's role. Saúde Infantil 32: 27-38.
3. Schulte EE (2015) Learning disorders: How pediatricians can help. CCJM 82: S24-S28.
4. American Psychiatric Association (2013) Diagnostic and Statistical Manual of Mental Disorders. Fifth Edition. American Psychiatric Association.
5. Arriaga C, Castelo TM, Vicente IN (2016) Learning Disabilities - the pediatrician's perspective. Saúde Infantil 38: 5-14.
6. Wo SW, Ong LC, Low WY, Lai PSM (2017) The impact of epilepsy on academic achievement in children with normal intelligence and without major comorbidities: A systematic review. Epilepsy Research 136: 35-45.
7. García-Peñas JJ (2015) School failure and pediatric epilepsy. Rev Neurol 60: 63-68.
8. Astrea G, Battini R, Lenzi S, Frosini S, Bonetti S, et al. (2016) Learning disabilities in neuromuscular disorders: a springboard for adult life. Acta Myol 35: 90-95.
9. Sarrazin E, Hagen MVD, Schara U, Von Au K, Kaindl AM (2014) Growth and psychomotor development of patients with Duchenne muscular dystrophy. European Journal of Paediatric Neurology 18: 38-44.
10. Wechsler D (1991) Weschler Intelligence Scale for Children: Third Edition Manual. The Psychological Corporation.
11. Zwicker JG, Missiuna C, Harris SR, Boyd LA (2012) Developmental coordination disorder: A review and update. European Journal of Paediatric Neurology 16: 573-581.
12. Deng S, Li WG, Ding J, Wu J, Zhang Y, et al. (2014) Understanding the mechanisms of cognitive impairments in developmental coordination disorder. Pediatr Res 75: 210-216.
13. Leonard HC (2016) The Impact of Poor Motor Skills on Perceptual, Social and Cognitive Development: The Case of Developmental Coordination Disorder. Front Psychol 7: 311.
14. https://www.european-agency.org/country-information/portugal/systems-of-support-and specialist-provision.
15. Prunty MM, Barnett AL, Wilmut K, Plumb MS (2016) The impact of handwriting difficulties on compositional quality in children with developmental coordination disorder. Br J Occup Ther 79: 591-597.
16. Banihani R, Smile S, Yoon G, Dupuis A, Mosleh M, et al. (2015) Cognitive and Neurobehavioral Profile in Boys With Duchenne Muscular Dystrophy. Journal of Child Neurology 30: 1472-1482.
17. Lopes AF, Simões MR, Monteiro JP, Fonseca MJ, Martins C, et al. (2013) Intellectual functioning in children with epilepsy: Frontal lobe epilepsy, childhood absence epilepsy and benign epilepsy with centro-temporal spikes. Seizure 22: 886-892.
18. Ono KE, Bearden DJ, Lee SM, Moss C, Kheder A, et al. (2022) Interventions for ADHD in children & adolescents with epilepsy: A review and decision tree to guide clinicians. Epilepsy & Behavior 135: 108872.
19. https://www.orpha.net/en/disease/detail/610.
20. Gualandi F, Urciuolo A, Martoni E, Sabatelli P, Squarzoni S, et al. (2009) Autosomal recessive Bethlem myopathy. Neurology 73: 1883-1891.
21. Martins AI, Maarque C, Pinto-Basto J, Negrão L (2017) Bethlem myopathy in a Portuguese patient - case report. Acta Myol 36:178-181.

HERALD

Advances In Industrial Biotechnology | ISSN: 2639-5665

Advances In Microbiology Research | ISSN: 2689-694X

Archives Of Surgery And Surgical Education | ISSN: 2689-3126

Archives Of Urology

Archives Of Zoological Studies | ISSN: 2640-7779

Current Trends Medical And Biological Engineering

International Journal Of Case Reports And Therapeutic Studies | ISSN: 2689-310X

Journal Of Addiction & Addictive Disorders | ISSN: 2578-7276

Journal Of Agronomy & Agricultural Science | ISSN: 2689-8292

Journal Of AIDS Clinical Research & STDs | ISSN: 2572-7370

Journal Of Alcoholism Drug Abuse & Substance Dependence | ISSN: 2572-9594

Journal Of Allergy Disorders & Therapy | ISSN: 2470-749X

Journal Of Alternative Complementary & Integrative Medicine | ISSN: 2470-7562

Journal Of Alzheimers & Neurodegenerative Diseases | ISSN: 2572-9608

Journal Of Anesthesia & Clinical Care | ISSN: 2378-8879

Journal Of Angiology & Vascular Surgery | ISSN: 2572-7397

Journal Of Animal Research & Veterinary Science | ISSN: 2639-3751

Journal Of Aquaculture & Fisheries | ISSN: 2576-5523

Journal Of Atmospheric & Earth Sciences | ISSN: 2689-8780

Journal Of Biotech Research & Biochemistry

Journal Of Brain & Neuroscience Research

Journal Of Cancer Biology & Treatment | ISSN: 2470-7546

Journal Of Cardiology Study & Research | ISSN: 2640-768X

Journal Of Cell Biology & Cell Metabolism | ISSN: 2381-1943

Journal Of Clinical Dermatology & Therapy | ISSN: 2378-8771

Journal Of Clinical Immunology & Immunotherapy | ISSN: 2378-8844

Journal Of Clinical Studies & Medical Case Reports | ISSN: 2378-8801

Journal Of Community Medicine & Public Health Care | ISSN: 2381-1978

Journal Of Cytology & Tissue Biology | ISSN: 2378-9107

Journal Of Dairy Research & Technology | ISSN: 2688-9315

Journal Of Dentistry Oral Health & Cosmesis | ISSN: 2473-6783

Journal Of Diabetes & Metabolic Disorders | ISSN: 2381-201X

Journal Of Emergency Medicine Trauma & Surgical Care | ISSN: 2378-8798

Journal Of Environmental Science Current Research | ISSN: 2643-5020

Journal Of Food Science & Nutrition | ISSN: 2470-1076

Journal Of Forensic Legal & Investigative Sciences | ISSN: 2473-733X

Journal Of Gastroenterology & Hepatology Research | ISSN: 2574-2566

Journal Of Genetics & Genomic Sciences | ISSN: 2574-2485

Journal Of Gerontology & Geriatric Medicine | ISSN: 2381-8662

Journal Of Hematology Blood Transfusion & Disorders | ISSN: 2572-2999

Journal Of Hospice & Palliative Medical Care

Journal Of Human Endocrinology | ISSN: 2572-9640

Journal Of Infectious & Non Infectious Diseases | ISSN: 2381-8654

Journal Of Internal Medicine & Primary Healthcare | ISSN: 2574-2493

Journal Of Light & Laser Current Trends

Journal Of Medicine Study & Research | ISSN: 2639-5657

Journal Of Modern Chemical Sciences

Journal Of Nanotechnology Nanomedicine & Nanobiotechnology | ISSN: 2381-2044

Journal Of Neonatology & Clinical Pediatrics | ISSN: 2378-878X

Journal Of Nephrology & Renal Therapy | ISSN: 2473-7313

Journal Of Non Invasive Vascular Investigation | ISSN: 2572-7400

Journal Of Nuclear Medicine Radiology & Radiation Therapy | ISSN: 2572-7419

Journal Of Obesity & Weight Loss | ISSN: 2473-7372

Journal Of Ophthalmology & Clinical Research | ISSN: 2378-8887

Journal Of Orthopedic Research & Physiotherapy | ISSN: 2381-2052

Journal Of Otolaryngology Head & Neck Surgery | ISSN: 2573-010X

Journal Of Pathology Clinical & Medical Research

Journal Of Pharmacology Pharmaceutics & Pharmacovigilance | ISSN: 2639-5649

Journal Of Physical Medicine Rehabilitation & Disabilities | ISSN: 2381-8670

Journal Of Plant Science Current Research | ISSN: 2639-3743

Journal Of Practical & Professional Nursing | ISSN: 2639-5681

Journal Of Protein Research & Bioinformatics

Journal Of Psychiatry Depression & Anxiety | ISSN: 2573-0150

Journal Of Pulmonary Medicine & Respiratory Research | ISSN: 2573-0177

Journal Of Reproductive Medicine Gynaecology & Obstetrics | ISSN: 2574-2574

Journal Of Stem Cells Research Development & Therapy | ISSN: 2381-2060

Journal Of Surgery Current Trends & Innovations | ISSN: 2578-7284

Journal Of Toxicology Current Research | ISSN: 2639-3735

Journal Of Translational Science And Research

Journal Of Vaccines Research & Vaccination | ISSN: 2573-0193

Journal Of Virology & Antivirals

Sports Medicine And Injury Care Journal | ISSN: 2689-8829

Trends In Anatomy & Physiology | ISSN: 2640-7752