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A Case Study of Down Syndrome with No Prior Intervention Until 5.5 Years: Implications for Developmental Rehabilitation

¹Mridula Rani, ²Pradeep Kumar, ³Prasanta Kumar Sahoo, ⁴Rahul Shailat

Assistant Professor, Department of Audiology & Speech Language Pathology, S. S. College,
Bhopal, M.P., India^{1,2,4}

Audiologist & Speech Language Pathologist, Department of ENT, AIIMS, Bhopal, M.P., India³

ABSTRACT:

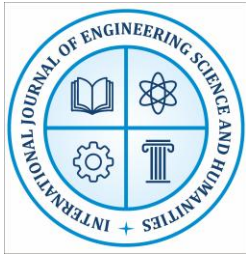
Purpose

Children with Down syndrome frequently demonstrate developmental difficulties affecting fine and gross motor skills, activities of daily living, receptive and expressive language, cognitive functioning, emotional regulation, social interaction, sensory processing, balancing. These challenges may interfere with independence, communication, learning and participation in daily activities. The chief complaints presented by the parents initially in the present case were, under sensitive sensory response, poor eye contact, poor eye hand coordination, limited attention span, dragging of hand during activities, poor command following and response to instructions, difficulty in performing tasks appropriately, preference for remaining within the comfort zone, weak core and back muscles, poor fine motor skills and grasping ability, fear during balancing activities, and poor verbal as well as non-verbal communication. Main aim was to elevate the effectiveness of structured therapeutic interventions in improving motor abilities, communication skills, cognitive functioning, emotional and social skills, sensory processing, balancing, and overall adaptive functioning in a child diagnosed with Down syndrome.

Method

A 6-year-old Male child was diagnosed with Down syndrome underwent Seguin Form Board Test (SFBT), Vineland Social Maturity Scale (VSMS), and Developmental Screening Test (DST). Initial evaluation revealed that form perception was not yet developed; the task could not be completed, and the mental age was found to be below 2.5 years. The developmental age was 1 year 2 months 9 days, and social age was 1 year 20 days. Therapy sessions included task-oriented activities, play-based exercise, communication training and parent guidance to improve the child's overall functional performance and participation.

Result



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Following the intervention plan, the child demonstrated improvement in eye contact, attention span, command following, balance, fine motor and grasping skills, core stability, participation in activities, and verbal as well as non-verbal communication. Progress was also observed in sensory responses, social interaction, emotional regulation, and overall functional independence in daily activities.

Conclusion

The present case study highlights that structured multidisciplinary intervention can effectively improve communication, motor functioning, sensory processing, balance, cognitive abilities, and social-emotional skills in a child with Down Syndrome. Early and consistent therapeutic support plays an important role in enhancing functional independence, participation in daily activities, and overall quality of life.

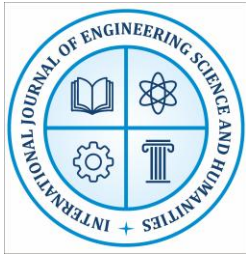
Keywords: Down Syndrome, Developmental Delay, Early Intervention, Developmental Rehabilitation, Child Developmental Outcomes.

I. INTRODUCTION

Down syndrome is a genetic condition caused by extra copy of chromosome 21, commonly known as Trisomy 21. It is one of the most frequently occurring developmental disorders and is associated with varying degrees of intellectual disability and developmental delay. Children with Down syndrome commonly present with hypotonia, delayed motor milestones, difficulties in speech and language development, impaired cognitive functioning, poor balance and coordination, sensory processing difficulties, and challenges in social and emotional development. These difficulties can affect the child's communication, learning abilities, independence in activities of daily living, and participation in social and educational settings.

Children with Down syndrome often demonstrate delays in both gross and fine motor development due to reduced muscle tone, ligament laxity, and decreased muscle strength. Fine motor impairments may affect grasping, eye-hand coordination, writing readiness, and self-help skills such as dressing and feeding. Gross motor difficulties may interfere with posture, gait, balance, stair climbing, and participation in physical activities. In addition, sensory processing difficulties may result in under-sensitive or over-sensitive responses to environmental stimuli, affecting attention, emotional regulation, and behavior.

Speech and language impairments are also commonly observed in children with Down syndrome. Receptive and expressive language development may be delayed, leading to difficulties in understanding instructions, verbal expression, vocabulary development, social communication, and non-verbal interaction. Cognitive limitations may further affect attention span, memory, problem-solving abilities, and adaptive functioning. Emotional and social challenges may include hesitation in new environments, preference for comfort zones, reduced confidence, and difficulty interacting with peers.



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To address these developmental concerns, multidisciplinary therapeutic interventions play a crucial role in improving the child's overall functioning and quality of life. Speech and language therapy focuses on enhancing receptive and expressive language, verbal and non-verbal communication, social interaction, eye contact, and command following. Occupational therapy aims to improve fine motor skills, eye-hand coordination, sensory integration, grasping abilities, attention span, and independence in activities of daily living. Physiotherapy helps strengthen core and back muscles, improve posture, gross motor functioning, coordination, gait, and balancing abilities. Sensory integration therapy assists in regulating sensory responses and improving participation in functional activities.

Play-based therapy, task-oriented training, cognitive stimulation activities, and parent-guided home programs are also important components of intervention. These approaches encourage active participation, improve motivation, enhance emotional and social development, and support the child's learning in natural environments. Early and consistent intervention can significantly improve developmental outcomes and help children with Down syndrome achieve greater independence and participation in daily life.

The present report focuses on the assessment and therapeutic management of a child with Down syndrome presenting with difficulties in motor functioning, communication, sensory processing, cognition, emotional regulation, social interaction, and balance, highlighting the importance of structured multidisciplinary intervention in promoting developmental progress.

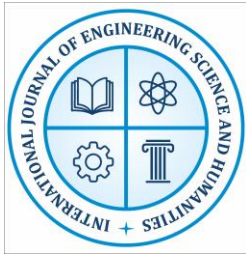
II. METHOD

Patient Information and Clinical Background

Lakshya Sahoo, A 6-year-old male child was referred for detailed developmental and behavioral evaluation due to significant concerns across multiple domains of functioning, including sensory responsiveness, communication, motor coordination, social interaction, adaptive behavior, and attention. The child demonstrated an under-responsive sensory profile, characterized by reduced responsiveness to environmental stimuli and limited engagement with surrounding activities. Poor eye contact and reduced social reciprocity were consistently observed during interactions. The child also exhibited a poor response to name calling, indicating deficits in auditory attention and social awareness.

Motor difficulties were prominent. The child showed poor eye-hand coordination, weak core and back muscle strength, impaired balance, and difficulty in walking. Fine motor abilities such as grasping, holding objects, and coordinated hand movements were significantly delayed. These deficits affected the child's ability to perform age-appropriate self-help and play activities independently. Attention span was markedly reduced, and the child required continuous prompting and support to remain engaged in structured tasks.

Communication abilities were severely impaired. Both verbal and non-verbal communication skills were found to be considerably below age expectations. The child was unable to



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appropriately express basic needs such as toileting, hunger, discomfort, or preferences. Functional communication was largely absent, and the child did not verbally request simple changes, such as changing television channels or asking for desired objects. Receptive language skills were also delayed, as the child had difficulty understanding and responding to simple instructions or social cues.

Social interaction patterns indicated significant dependency and social withdrawal. In unfamiliar social situations, the child preferred to remain seated on the mother's lap and displayed visible distress, irritability, or discomfort in the presence of strangers. The child showed limited initiation of interaction and preferred to remain within familiar routines and comfort zones. A strong preoccupation with television watching was also reported, suggesting restricted interests and limited engagement in functional or imaginative play activities.

Adaptive functioning was severely affected. The child was highly dependent on the mother for all activities of daily living, including feeding, dressing, toileting, and routine self-care. Independence appropriate for chronological age had not developed, and the child required extensive assistance and supervision throughout daily routines.

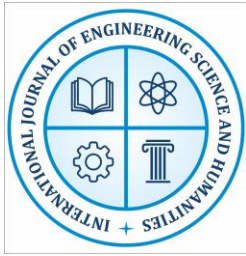
The overall clinical profile suggests severe global developmental delays affecting cognitive, social, communication, motor, and adaptive functioning. The child requires intensive multidisciplinary intervention, including special education, speech and language therapy, occupational therapy with sensory integration, physiotherapy for gross motor strengthening, behavioral intervention, and parent training to enhance functional independence and communication skills. Early and consistent therapeutic intervention is strongly recommended to improve developmental outcomes and adaptive functioning.

Assessment Procedures

A comprehensive developmental and psychological assessment was conducted to evaluate the child's cognitive, social, adaptive, and developmental functioning. The assessment procedures included administration of the Seguin Form Board Test, Vineland Social Maturity Scale (VSMS), and Developmental Screening Test (DST).

During the administration of the Seguin Form Board Test, the child was unable to complete the required tasks successfully. Observations revealed that form perception abilities were not yet adequately developed. The child demonstrated difficulty understanding task demands, poor problem-solving abilities, limited attention to tasks, and reduced persistence during structured activities. Due to these limitations, completion of the assessment tasks was not possible.

The Vineland Social Maturity Scale was used to assess adaptive and social functioning. Results indicated a social age of approximately 1 year and 20 days, suggesting severe delays in socialization, self-help abilities, interpersonal functioning, and adaptive behavior skills when compared to chronological age expectations.



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The Developmental Screening Test revealed a developmental age of approximately 1 year, 2 months, and 9 days, indicating profound developmental delays across various developmental domains, including motor, language, cognitive, and social functioning. Additionally, the child's overall mental age was assessed to be below 2.5 years, which is significantly lower than the chronological age of 6 years.

The assessment findings collectively indicate severe global developmental delays involving cognitive functioning, communication, motor development, social interaction, adaptive behavior, and independent functioning. The clinical profile suggests the need for intensive multidisciplinary intervention, including speech and language therapy, occupational therapy with sensory integration, physiotherapy, behavioral intervention, special education support, and parent training to improve communication, independence, and overall developmental functioning.

Intervention

A structured multidisciplinary intervention program was implemented to address the child's developmental difficulties across motor, language, cognitive, sensory, emotional, and social domains. The intervention included speech and language therapy, occupational therapy, physiotherapy, sensory integration techniques, cognitive stimulation activities, and parent-guided home training.

Speech and language therapy focused on improving receptive and expressive language skills, verbal and non-verbal communication, eye contact, attention span, command following, vocabulary development, imitation skills, and social communication through interactive and play-based activities.

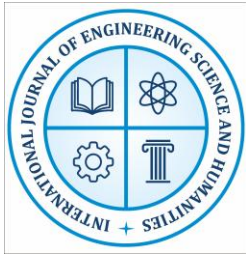
Occupational therapy targeted fine motor functioning, grasping abilities, eye-hand coordination, bilateral coordination, sensory processing, and independence in activities of daily living such as dressing, feeding, and functional task performance. Sensory integration activities were used to improve sensory regulation, participation, body awareness, and adaptive responses to environmental stimuli.

Physiotherapy intervention focused on strengthening core and back muscles, improving posture, balance, coordination, gait, and overall gross motor functioning through balance training, strengthening exercises, movement activities, and task-oriented exercises.

Cognitive and behavioral activities were incorporated to improve attention span, problem-solving, memory, emotional regulation, confidence, and social interaction. Play-based activities and positive reinforcement techniques were used throughout the sessions to increase motivation, participation, and functional learning. Parent counseling and home program guidance were also provided to ensure carryover of therapeutic goals in the child's daily environment.

Results

Following the structured multidisciplinary intervention, the child demonstrated noticeable improvement in multiple developmental domains. Improvement was observed in eye contact,



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attention span, command following, and response to verbal instructions. The child showed better receptive and expressive language abilities, increased verbalization, improved use of gestures, and enhanced verbal and non-verbal communication skills.

Progress was also noted in gross and fine motor functioning, including improved grasping abilities, eye–hand coordination, bilateral coordination, posture, and participation in functional activities. Core and back muscle strength improved, resulting in better balance, stability, and reduced fear during balancing activities.

Sensory responses became more regulated, and the child demonstrated improved participation, adaptability, and tolerance during therapeutic tasks. Emotional regulation, social interaction, confidence, and willingness to engage in activities also improved. Additionally, the child showed progress in activities of daily living and overall functional independence in structured and daily environments.

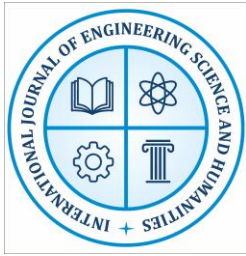
III. DISCUSSION

Down syndrome is a developmental genetic disorder commonly associated with delays in motor, cognitive, language, sensory, emotional, and social functioning. Due to hypotonia, ligament laxity, intellectual impairment, and delayed neuromuscular development, children with Down syndrome often experience difficulties in balance, coordination, posture, communication, attention, and activities of daily living. These developmental challenges can negatively affect the child's independence, participation in learning environments, and overall quality of life. Therefore, early identification and multidisciplinary therapeutic management are essential for promoting optimal developmental outcomes.

The present case study demonstrated that structured and consistent intervention produced positive improvements across multiple developmental domains. Initially, the child presented with poor eye contact, reduced attention span, under-sensitive sensory responses, poor command following, weak core and back muscles, impaired balance, poor fine motor and grasping skills, dragging of the hand during activities, and limited verbal and non-verbal communication. The child also showed hesitation during balancing activities, difficulty performing functional tasks, and preference for remaining within the comfort zone, which affected participation and social interaction.

Speech and language therapy played a significant role in improving receptive and expressive language skills, communication abilities, eye contact, and response to verbal instructions. The child gradually demonstrated increased verbalization, improved imitation, better understanding of simple commands, and enhanced use of gestures and non-verbal communication during interaction. Improvement in communication further supported social participation and emotional expression.

Occupational therapy intervention contributed to improvements in fine motor functioning, grasping ability, eye–hand coordination, bilateral coordination, and independence in functional



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activities. Sensory integration activities helped regulate sensory responses and improved the child's tolerance, attention, body awareness, and participation during therapy sessions. The child became more willing to engage in structured tasks and showed reduced avoidance behavior over time.

Physiotherapy intervention focused on strengthening core and back muscles, improving posture, balance, coordination, and gross motor functioning. Balance training and movement-based activities reduced fear associated with balancing tasks and increased confidence during physical activities. Improvement in muscle strength and postural control also contributed to better stability and overall mobility.

Play-based and task-oriented therapeutic approaches were effective in maintaining motivation, encouraging participation, and promoting functional learning. Positive reinforcement and repetitive practice further enhanced skill acquisition and behavioral adaptation. Parent involvement and home-based training also played an important role in reinforcing therapeutic goals and facilitating the carryover of learned skills into the child's daily routine.

Overall, the findings of the present case study emphasize that individualized multidisciplinary intervention can significantly improve developmental functioning in children with Down syndrome. Early and consistent therapeutic management can enhance communication, motor performance, sensory regulation, emotional development, social participation, and functional independence, thereby improving the child's overall quality of life and long-term developmental outcomes.

IV. CONCLUSION

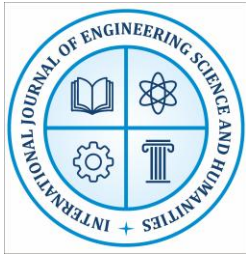
The present case study concludes that structured multidisciplinary intervention is effective in improving developmental functioning in a child with Down syndrome. Significant progress was observed in communication skills, gross and fine motor abilities, balance, sensory processing, cognitive functioning, emotional regulation, social interaction, and activities of daily living following consistent therapeutic intervention.

Speech therapy, occupational therapy, physiotherapy, sensory integration activities, and play-based interventions collectively contributed to improvements in eye contact, attention span, command following, coordination, muscle strength, verbal and non-verbal communication, and functional independence. Parent involvement and regular home-based practice further supported the child's developmental progress.

The findings highlight the importance of early identification, individualized treatment planning, and continuous therapeutic support in enhancing the overall quality of life and developmental outcomes of children with Down syndrome.

V. CLINICAL IMPLICATIONS

1. Early identification and intervention are essential for improving developmental outcomes in children with Down syndrome.



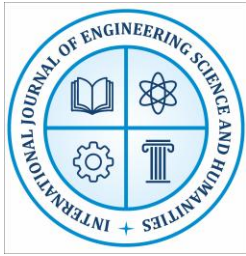
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2. Multidisciplinary therapeutic approaches help address difficulties across motor, language, sensory, cognitive, emotional, and social domains.
3. Speech and language therapy can improve receptive and expressive language, communication, eye contact, and social interaction.
4. Occupational therapy is effective in enhancing fine motor skills, eye–hand coordination, sensory processing, and activities of daily living.
5. Physiotherapy supports improvement in posture, muscle strength, balance, coordination, and gross motor functioning.
6. Sensory integration activities help regulate sensory responses and improve attention, participation, and adaptive behavior.
7. Play-based and task-oriented interventions increase motivation, engagement, and functional learning in children.
8. Parent counseling and home-based training are important for reinforcing therapeutic goals and promoting skill generalization in daily life.
9. Consistent therapeutic intervention can improve independence, confidence, emotional regulation, and overall quality of life.
10. Individualized treatment planning based on the child’s specific needs is important for achieving effective developmental progress

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