


# Artificial Intelligence Techniques to improve cognitive traits of Down Syndrome Individuals: An Analysis

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## ABSTRACT

Improving the learning process requires to improve the cognitive traits of individuals with low mental skills. The artificial intelligence (AI) has been used to support the different individuals with impairments. People with Down syndrome fall in intellectual impairment. Different AI techniques of convolution neural network, artificial neural network and decision tree are widely applied to address the different cognitive traits. We have summarized the artificial intelligence review utilized for such individuals. The aim of this research article is investigate the usability of computational intelligence for addressing the deficits of cognitive skills and other traits. The individuals with cognitive impairment survive with limited mental challenge, therefore, they hardly perform daily life assignments. The individuals with down syndrome face mild to severe cognitive challenges that affects to their daily life activities, education and performing employment. So, they can have reduced the social and economic burden of their family and to make their live productive. Achieving these goals requires improvement in their cognitive challenge. A survey of (N = 50) of the individuals of Down syndrome has been carried out with the support of team of psychologists and teachers of homogeneous education system.

## KEYWORDS

Artificial Intelligence (AI), Down Syndrome Individuals (DSI), Cognitive Analysis and Traits

## 1. INTRODUCTION

### 1.1 About Down Syndrome

Down Syndrome Individuals are the part of every society born with multiple challenges and on other hand they are challenge for the family where they born. They are supposed to be social and economic burden on family and society. Down syndrome is caused by trisomy on

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chromosome-21 with a prevalence level of approximately 1 in every 800 births (Jamshidnezhad et al., 2021). Down syndrome is occurred due to an extra copy of 21<sup>st</sup> chromosome also called trisomy-21. Individuals with DS may have substantial intelligent impairments and normally possess a level of Intelligent Quotient (IQ) ranging from 30 to 70. In addition to cognitive skills that are mostly decreased in these individuals include expressive language, memory, and fine motor skills. In cognitive ability, these individuals also have significant limitations in adaptive behaviour (AB).

The adaptive abilities are linked with general cognitive skills measured with IQ (Hamburg et al., 2019). While the quality of life in both education and social domains are progressing for DS individuals, the attention is required to potentially treat the IQ and cognitive difficulties (Baburamani et al., 2019). Their learning consequences are either slower or satisfactory depend on the educational approaches (Leghari and Ali, 2021). Learning process associated with cultural, and environmental factors is important for DS individuals due to their social requirements and independency (Barbosa et al., 2018; Luna-Garcia et al., 2018 and Kamoun, 2001). Hence, due to their common difficulties in cognitive and fine-motor skills, the potential of individual with Down syndrome as learners might be perceived as limited (Marques et al., 2015; Jan Blacher, 2002 and Smith & Smith 2021). They face several different problems in daily life activities while walking, talking, chewing, and learning (Jan Blacher, 2002). Down Syndrome people have different cognitive level of strengths known as memory impairment in childhood and adulthood. A very rare research work has been done on facing problems in accessing technology support to Down Syndrome people.

## **1.2 Down's Mental Impairment**

The challenges that affect any Down syndrome are the lack of low mental capability. The mental challenge is further divided into four severities defined as mild, moderate, severe and profound. This categorization depends on range of intelligent quotient score and symptoms found in Down syndrome ((Hamburg et al., 2019). Around 85% population is owned by mild category. They can play games, use computers, and count numbers. Individuals those with lower cognitive efficiency are able to carry out their work and perform self-care tasks with the support of parents and teachers. The individuals with severe cognitive traits generally have very low ratio of intelligent quotient. Even they can learn self-care ability and linguistic performance.

## **1.3 Motivation**

A down syndrome individual's social life, education and employment can be affected by the limited mental impairment, wherein lack of thinking ability and decision-making power can affect the improvement in learning and in performing routine life activities, which adversely effect on their social development and interactions. Furthermore, lack of technological involvement and in education can demolish their competency. Vast research has been done in the field of Global Health and medical issues related to any individual and their families. Artificial Intelligent techniques are being used (Smith & Smith, 2021 and Kaelin et al., 2021) in the field of differently abled individuals (Special Needs people) from past few years. The motivation behind this research is to analyze and improve the limited mental capability with interactive software approach using Artificial Intelligent techniques for the productive development in the social and learning lifestyle of Down syndrome individuals.

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