

Influence on Cognitive Skill Development in 5 to 10 Years Old Children due to COVID-19 Lockdown

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Abstract: ***Introduction:** Under the circumstances created during lockdown period, children were deprived from the social interaction and companionship; because of which, they were susceptible to hampered cognitive development. Therefore, in this study, efforts were made to understand the impact of lockdown on the cognitive development of 5-10 year old children in India. **Material and methods:** A self-administered online questionnaire was distributed to the parents via social media platforms. This questionnaire included 20 questions divided into categories such as attention, passivity, organizing, perception of space and directions, concept of time, perception of visual forms and figures, memory, comprehension of spoken language, verbal communication, reading-writing-arithmetic, and emotional problems. Responses were automatically recorded in the Google forms. **Results:** A total of 151 participants had successfully filled out the online survey. Findings from this study revealed that 45.9% children had impact on attention/concentration, 49% children had become Inactive, 42% had impact on memory, 46.9% on reading, writing and arithmetic skills and 58% children experienced emotional problems as a result of lockdown. **Conclusions:** COVID 19 lockdown has affected most of the aspects of cognitive development in the children. But major effects were seen on attention / concentration, inactivity, memory, reading, writing, arithmetic and emotional problem sections.*

Keywords: Children, Cognitive development, COVID-19, Lockdown, Social isolation

1. Introduction

The World Health Organization (2020) declared the novel corona virus COVID-19 as a global pandemic, and it has been a source of distress and uncertainty among people all over the world. The impact of COVID-19 has affected various aspects of human life. According to statistics, the mortality rate was 1% –2.1% in the beginning, and the global case–fatality ratio grew to 6.2% subsequently. ¹ This created panic among people. The nature of psychological impact due to COVID 19 pandemic is determined by a number of elements. Adjusting to “new normal” has been difficult and a source of stress. ² Children's behaviour and cognitive development changed significantly as a result of the crisis. Isolation, school closure, reduced social life and physical activities, changes in routine, sleep difficulties, exposure to disharmony at home; excessive screen use, unhealthy diet, and other factors all have an impact on the physical and mental health of children and adolescents experiencing the stress of a pandemic. ³

It is crucial to pay attention to changes in children's psychological behaviour during the pandemic. Previous research has revealed that the family and social environment has a significant impact on children's psychological behaviour. ⁴

Young children are missing out on learning by doing, peer-to-peer learning, and developing critical cognitive skills due to lack of social interaction as an impact of COVID-19. The

learning and thinking process developed in the early years of life defines the capabilities and prowess to absorb and learn complex subjects later. The emotional and physical health, social skills, and cognitive-linguistic capacities that emerge in the early years are all important prerequisites for academic success and later success in the workplace and community. There is very little literature on the impact of COVID-19 lockdown on a child's cognitive development. As a result, the current study was carried out to assess this impact.

2. Material and Methods

This cross-sectional study used a self-administered online questionnaire that was distributed across India via social media platforms (e. g., Whats-app and mail). The Google forms platform was used to create, design, and distribute the questionnaire. This questionnaire included 20 questions divided into categories such as attention/concentration, passivity/inactivity, planning/organizing, perception of space and directions, concept of time, perception of visual forms and figures, memory, comprehension of spoken language, verbal communication, reading-writing-arithmetic, and emotional problems. Participants were encouraged to complete the form and help distribute the questionnaire among their family members, friends, and relatives. Thus, participants were selected by a snow ball sampling technique. Furthermore, to avoid duplicated or exaggerated data, participants were limited to single response. Participants included those who are currently living in India,

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have children aged 5 to 10 years, and who had successfully completed the questionnaire. Online surveys were the most appropriate method for data collection during the period of self-isolation and home quarantine.

3. Results

A total of 151 participants, residing in different parts of India had successfully filled out the online survey. When asked about their child's attention and concentration, 45.9% of parents reported that their child is easily distracted by vehicles passing by (Fig.1), whereas only 13.7% of parents reported that their child forgets to do his daily activities as a result of lockdown.

In the section for passivity or inactivity, 40.8% of parents observed that their child is frequently lost while doing any task (i. e. day-dreaming), and 49% of parents observed that their child has become slow, inert, or lacks energy while doing his everyday activities (Fig.2). So, in general, kids have become more inactive during this lockdown.

When asked about their child's understanding of time, 80.7% of parents said that their child can read the clock mechanically and understands the concept of actual time, but 37.7% of kids had no idea about what time it is, whether it is morning or afternoon, or whether it is his / her online school time.

When asked about planning or organisation, only 18.4% of parents reported that their children required constant reminders to complete the homework. In terms of perception of space and directions, only 7.5% of parents reported that their child had difficulty catching a ball thrown at him. And only 9.5% of children faced difficulty noticing small differences in shapes, figures, words, and patterns that look alike (e. g. letters like-b, p, d or digits like 6, 9). So there is not much effect seen in these sections.

In the memory section, 42.2% of parents reported that their child faced difficulty in remembering the names of weekdays, months and seasons (Fig.3). However, only 12.9% of children were having difficulty in learning rhymes, songs, multiplication tables etc. by heart and only 15.6% children had difficulty in remembering multiple instructions at a time during this lockdown.

When asked questions about comprehension of spoken language, only 12.2% of children faced difficulty in understanding what other people say (i. e. often says what? What do you mean?). Only 8.2% of children faced difficulty in understanding abstract concepts like day after tomorrow, etc. So again these results are not much significant. But when asked about verbal communication, parents noticed that 36.3% of kids faced difficulty in taking part in a conversation as an effect of lockdown.

On the questions regarding reading, writing and arithmetic, 46.9% of children had difficulty in shaping letters or writing neatly (Fig.4) while, only 15.1% of kids faced difficulty in reading aloud at a normal speed, and 13% of kids had difficulty in doing basic mathematics skills like addition/subtraction.

And lastly, when asked about emotional problems a child faced during this lockdown, a highly significant result was observed, 58.2% of parents reported that their child seem to be unhappy, sad or depressed (Fig.5) while only 9.7% of parents said that their child often complained about bellyaches, headaches, breathing difficulties or other bodily symptoms.

4. Discussion

In this study, we shed light on impact on children's cognitive development during COVID-19 with home school and social isolation. The important question which arises of; why these early years are important. According to research, the brain is highly 'plastic' in the early years of life, but it becomes less and less adaptive to reorganisation or adapting to sudden and new challenges as we grow older. The quality of one's early experiences leads to the format of the central foundation for all of the learning, health and behaviour that follows in life. There are various stages of sensory and cognitive development as explained by Jean Piaget, the sensorimotor stage (up to 2 years), preoperational stage (2-6 years), concrete operational stage (6-11 years) and formal operational stage (11+ years). In the first 2 stages, more than 1 million new neural connections are formed every second within a human brain. It reduces drastically post these stages as the brain prunes itself to make the circuits more efficient. The first sensory pathways to develop are those for basic vision and hearing, followed by early language skills and higher cognitive functions. Later, more complex brain circuits are built upon earlier, simpler circuits, and connections proliferate and prune in a prescribed order. The emotional and physical health, social skills, and cognitive-linguistic capacities that emerge in the early years are all important prerequisites for academic success and later, success in the workplace and community.

Globally, the pre-lockdown learning of children predominantly involved one-to-one interaction with their mentors and peer groups. Unfortunately, the nationwide closures of schools and colleges have negatively impacted over 91% of the total student population.⁵ The home confinement of children is associated with uncertainty and anxiety which is attributable to disruption in their education, physical activities and opportunities for socialization.⁶ For long periods of time, the absence of a structured school setting causes disruption in routine, boredom, and a lack of innovative ideas for engaging in various academic and extracurricular activities. Some children have expressed lower levels of effect for not being able to play outdoors, not meeting friends and not engaging in the in-person school activities.^{5, 7, 8} Because of the long-term change in their routine, these children have become more clingy, attention-seeking, and reliant on their parents. It is expected that children will resist returning to school once the lockdown is lifted, and that they will have difficulty re-establishing contact with their mentors once the schools reopen. Consequently, the constraint of movement imposed on them can have a long term negative effect on their overall psychological well-being.⁵

Viner et al.⁹ carried out a rapid systematic review of 16 papers during the pandemic and concluded that school

closures and social disconnection could hamper the psychological and personal development of children. Similarly in this study, nearly 58.2% of parents reported that their child suffered from emotional problems (i.e. seem to be unhappy, sad or depressed). COVID-19 has been linked to stress in both younger and older children. This is due to a lack of social interaction, a family financial crisis, and cramped living conditions. Several studies have pointed out the risk of development of symptoms of PTSD, anxiety, and phobic reaction due to the excess of information available on social media.¹⁰

It is demonstrated that, for both parents and children, sleep routines and the balance of daily activities are usually altered during social isolation. In this situation, sleep quality and duration may be irregular, physical and outdoor activities are significantly reduced, and the use of electronic devices such as televisions, cell phones, and tablets (screen time) increases.¹¹ These changes prevent child development from reaching its full potential and mainly impairs the cognitive development of children.¹²

The child's frequency of TV watching was found to be significantly associated with delayed motor skills, cognitive and language development. The content of TV has a detrimental effect on cognitive development.^{13, 14} Similar effects were observed in this study. 42.2% of children showed negative impact on memory, 36.3% kids showed negative impact on verbal communication, 46.9% kids showed negative impact on reading, writing and arithmetic, while 37.7% of children showed negative impact on understanding the concept of time. Minimal impact was seen on planning and organising, perception of space and direction, and perception of visual forms and figures. A Japanese study observed that children aged 30 months, had increased chances of being inattentive due to excessive TV-viewing.¹⁵ In this study also, around 49 % of parents reported that their child had become inactive during this lockdown. Augmented digital media usage leads to reduced sleep, which in turn leads to increased TV exposure that seems to have a wider impact on the sleep quality.¹⁶ Children try to mimic their parental screen time behaviors^{17, 18} and/or the programs they watch on screens.

Furthermore, when children spend time on screens (especially at night) they are exposed to the blue light, which has been shown to delay sleep onset and reduce sleep quality.¹⁹ It has been found that greater time spent playing matured video games was associated with greater somatic complaints, aggressive behaviour, and reduced sleep duration.

The consequences of exposing children to screen time of > 60 min is that they are at a higher risk of developing negative effects on temper, character, and vulnerability to inattention and ADHD (Attention deficit hyperactivity syndrome) symptoms.²⁰ Similarly in this study, nearly 45.9% of children reported lack of attention and concentration. Previous research has established a link between emotional well-being and screen time. Twenge and Campbell²¹, in a population based study, showed that high screen time was associated with lower wellbeing, with the high screen users having twice as many individuals who

suffered from anxiety or depression diagnosis. This might also be the reason for increase in emotional problems of children during this lockdown.

Garrison et al.²² showed that children who viewed television at night were more likely to sleep restlessly. Restless sleep was attributed to the brightly lit screens that interrupted melatonin production.

The exposure of indiscriminate media content, especially if unsupervised, might hamper a child's behavioural outcomes. Furthermore, keeping children in one position for more than one hour has negative health consequences. However, it is reported that not all digital media is bad, as a child's level of physical activity, skill development, gain in knowledge, early learning, cognitive and functional development improved with specific contingent videos.²³

Since schools were closed due to pandemic, certain things could be done to stimulate the cognitive development of a child at home. Providing cognitive stimuli early on with the use of board games, engaging them in meaningful conversations, puzzles, etc. These could be great ways of introducing order, organisation and skills in kids. While reading a book, encourage critical thinking by asking questions like, "What do you think will happen next?" or "What do you think the author is attempting to convey to us?" Encouraging children to solve simple problems helps to improve their cognitive understanding and problem-solving approach. If you see your child struggling with a problem, instead of providing a direct solution, lead them with guiding questions. Assist the child in adjusting to new concepts, definitions, and learning methods. Allow your children to form their own opinions and hypotheses by giving them the opportunity to do so.

5. Conclusions

COVID 19 lockdown has affected all the aspects of cognitive development in most of the children. The major effects seen were on attention / concentration, inactivity, memory, reading, writing, arithmetic and emotional problem sections. As pediatric dentists, we can suggest the parents to carry out certain activities to stimulate the cognitive development of a child at home.

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Figure Legends:

- 1) Effect on Attention / Concentration of children due to lockdown.
- 2) Effect on Passivity / Inactivity of children due to lockdown.
- 3) Effect on Memory of children due to lockdown.
- 4) Effect on Reading, Writing and Arithmetic skills of children due to lockdown.
- 5) Effect on Emotional Problems faced by children due to lockdown.

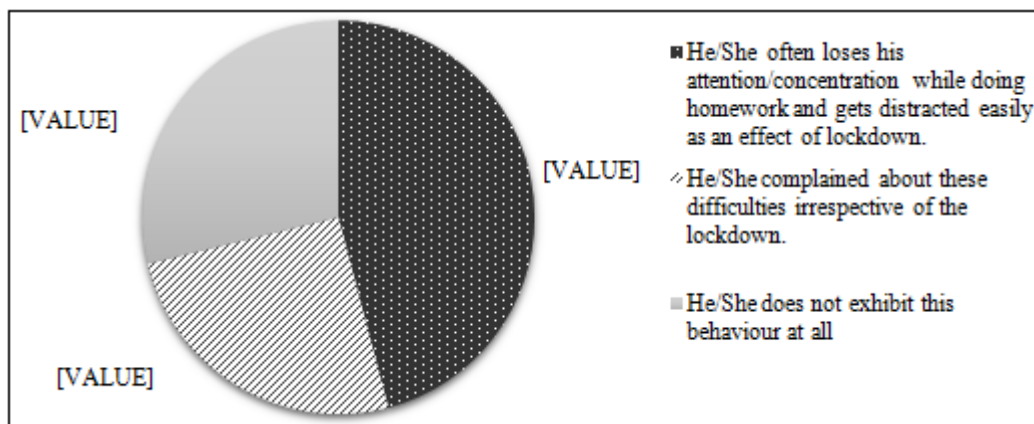


Figure 1: Effect on Attention / Concentration of children due to lockdown

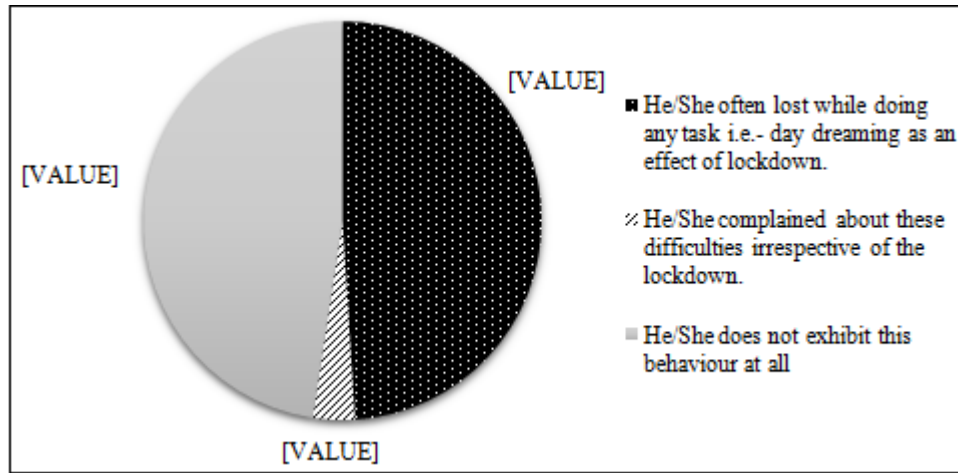


Figure 2: Effect on Passivity / Inactivity of children due to lockdown

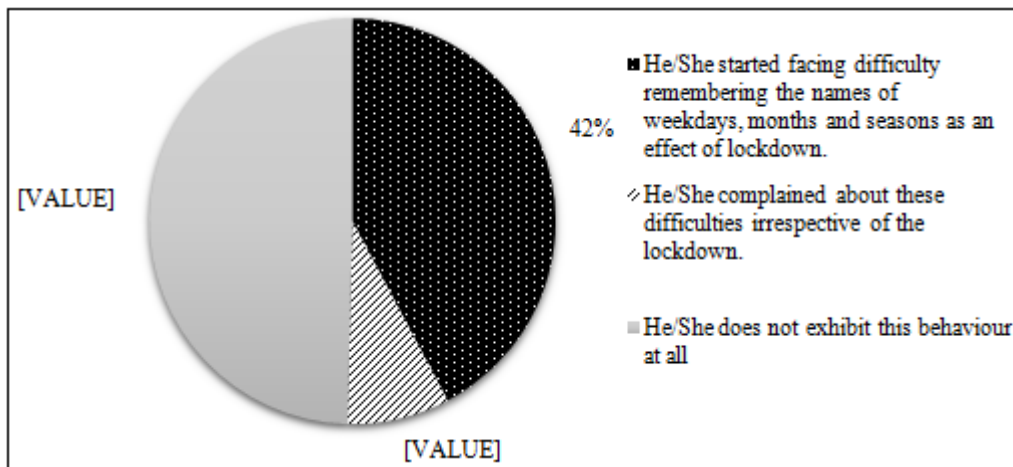


Figure 3: Effect on Memory of children due to lockdown

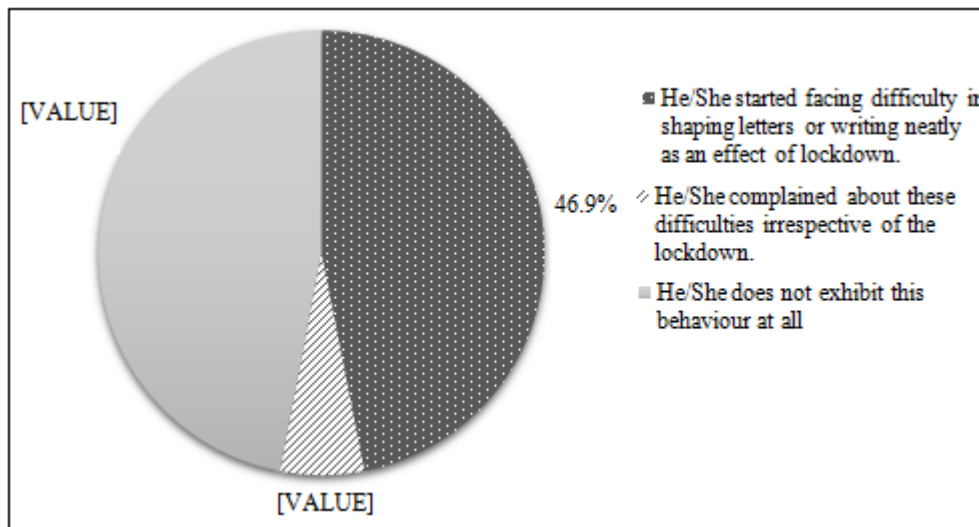


Figure 4: Effect on Reading, Writing and Arithmetic skills of children due to lockdown

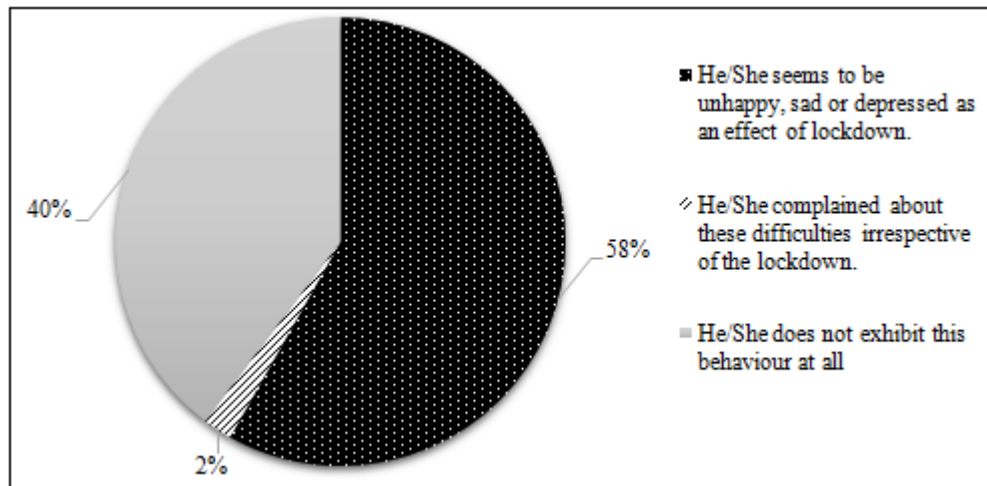


Figure 5: Effect on Emotional Problems faced by children due to lockdown

Author Profile

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