Unravelling the Enigma: How Behavioural Addictions Alter the Developing Child Brain?

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Behavioural addictions (BAs) have become a significant public health concern.[1] The global prevalence of BAs is alarmingly high, with smartphone addiction being the most common at 30.7%, followed by food addiction (21%), social media addiction (15.1%), internet addiction (10.6%), gambling (7.2%), shopping addiction (7.2%) and exercise addiction (7%).[2] In India, the reported prevalence of BAs ranges from 2% to 33%.[3–6]

Extended screen and internet usage may cause attention problems, reduced academic performance, and social difficulties in children, but research results on the effects of BAs on child development are mixed.

Smartphones (which determine screen time) are handy devices often used to engage in addictive behaviours, that is, gaming, social media, internet use, etc.,[7–9] which are a significant source of adverse effects on brain functioning. Smartphones emit radiofrequency electromagnetic radiation (RF-EMR), which may harm a child's brain development. Due to their developing brains, RF-EMR has both thermal and nonthermal effects. Children have a thinner myelin sheath, skull, head, and dielectric features that increase the chances of the negative impact of RF-EMR.[10]

Research on how BAs affect children's central nervous system (CNS) is still in its early stages. Adolescent studies have shown that digital technology exposure is linked to lower grey matter density in specific brain areas.[11] Furthermore, problematic internet use in young individuals has been connected to reduced grey matter in brain regions responsible for reward processing and inhibitory control. There is credible evidence of the harmful effect of problematic smartphone use (PSU) in adolescent and adult studies.[12]

Magnetic resonance imaging (MRI) studies have found an inverse association between PSU and lower volume of specific brain areas.[13–15] PSU can lead to changes in brain areas similar to substance and behavioural addiction. Functional MRI-neuroimaging studies have reported altered connectivity and functional interaction between and within specific brain areas, such as striatal, limbic, and frontal regions.[15] Fifteen people with high PSU demonstrated lower task performance alongside increased brain activity in the frontoparietal areas.[16]

A recent scoping review hardly found a direct causal relationship between screen exposure and cognitive harm in infants under 24 months of age. However, in children aged 1–3 years, screen time was found to reduce peer playtime and increase the possibility of developmental delay.[17] While excessive screen time positively influences intellectual capacity and language development, it reduces physical activity in children, which is correlated with cognitive aptitude, such as language development and inductive reasoning. Other studies demonstrate that prolonged screen time hurts brain development, language and cognitive skills.

Further research is necessary to understand the context of screen viewing fully. Appropriate methodologies should be implemented to assess infant cognition and screen usage in children adequately.[18] It is also essential to consider individual differences, co-occurring factors, and the specific type of BA when assessing its impact on child development. Parents should be educated about the importance of adequate parental monitoring and self-regulation to prevent poor academic achievement due to internet use and gaming in children.[19]

Although more robust and longitudinal studies are necessary to determine the specific neurobiological changes associated with BAs in children's developing brains, it is crucial to address this issue proactively. Parents, educators,

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and healthcare providers must work together to promote healthy digital habits and prevent the harmful effects of BAs on child development.

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