

### REVIEW / DERLEME

## IMPACT OF EXCESSIVE SCREEN-BASED MEDIA USE ON EARLY CHILDHOOD DEVELOPMENT: A SHORT REVIEW\*

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### ABSTRACT

Over the recent years, a significant increase has been observed in screen-based media use among different age groups. Unregulated and excessive use of technological instruments such as smart phones, tablets or computers also leads to a number of health problems. Vision problems induced by the use of technological instruments among youth and children are gradually increasing in several countries across Europe. When we examine Eastern Asian countries, we see that the prevalence is much higher. A study based in Taiwan discovered that 84% of children have vision disorders. Apart from this, excessive screen-based media use is known to cause other problems during early childhood period at various ages including attention deficit, sleep disorders, depression, anxiety, academic inadequacy and linguistic development disorders. Unregulated and excessive screen-based media use demonstrates an incline with an increasing acceleration every day. The objective of this brief evaluation article is to investigate the problem in its current state in general, to highlight brain plasticity during the early childhood period, and to open the effects of excessive screen-based media use particularly on linguistic development to discussion in light of current studies.

### Key Words

*Screen-Based Media, Unregulated Use, Children's Health, Language Development, Critical Period*

## ÖLÇÜSÜZ EKРАН TABANLI MEDYA KULLANIMININ ERKEN ÇOCUKLUK GELİŞİMİ ÜZERİNE ETKİLERİ: KISA BİR İNCELEME

### ÖZ

Son yıllarda ekran tabanlı medya kullanımında çeşitli yaş aralıklarını kapsayacak bir biçimde dramatik bir artış olduğu görülmektedir. Akıllı telefon, tablet ya da bilgisayar gibi teknolojik araçların kontrolsüz ve aşırı kullanımı çok çeşitli sağlık sorunlarını da beraberinde getirmektedir. Genç ve çocuk nüfusta teknolojik araç kullanımına bağlı olarak görme bozuklukları Avrupa'nın birçok ülkesinde giderek artmaktadır. Doğu Asya ülkelerine bakıldığında ise prevalansın çok daha yüksek olduğu görülmektedir. Tayvan merkezli bir araştırma çocukların %84'ünde görme bozukluklarının olduğunu ortaya koymuştur. Bunun dışında, ölçüsüz ekran tabanlı medya kullanımının erken çocukluk döneminde çeşitli yaşlarda; dikkat dağınıklığı, uyku bozuklukları, depresyon, anksiyete, akademik yetersizlik ve dil gelişim bozuklukları gibi diğer başka sorunlara yol açtığı bilinmektedir. Kontrolsüz ve ölçüsüz ekran tabanlı medya kullanımı günden güne artan bir ivmeyle yükseliş göstermektedir. Bu kısa değerlendirme makalesinin amacı mevcut sorunu genel hatlarıyla mercek altına almak, erken çocukluk dönemi beyin plastisitesine vurgu yapmak ve ölçüsüz ekran tabanlı medya kullanımının özellikle dil gelişimi üzerindeki etkilerini güncel araştırmalar ışığında tartışmaya açmaktır.

### Anahtar Kelimeler

*Ekran Tabanlı Medya, Ölçüsüz Kullanım, Çocuk Sağlığı, Dil Gelişimi, Kritik Dönem*

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## Introduction

Nowadays, smart phones, internet, computers, tablets, game consoles, televisions or put differently all digital technologies which have become a part of daily life are named as “new media” (Kurt & Kurum, 2010). Besides all these, all technological instruments that people are in communication and interaction with through a screen are classified under the heading “screen-based media”. Along with the opportunities provided by the media, its increasing diversity and the impact of this diversity on early childhood development has recently started to attract the attention of researchers from different disciplines.

Children’s exposure to excessive technological instruments as they are going through a sensitive stage in terms of brain development as they are equipped with a unique enthusiasm to learn and intuitive capabilities brings a number of problems along with it. American Academy of Pediatrics (AAP, 2016) underlines in the reports that it has published recently that the media use must particularly be limited during early childhood, otherwise excessive screen-based media use harms early childhood development from a number of aspects and especially linguistic development. In this study, impact of excessive media use on human health will firstly be investigated in general and this will be followed by, “Brain Development and Screen-Based Media in Early Childhood” and “Excessive Screen-Based Media Use and Linguistic Development”. The study will be concluded with the “Recommendations” section.

## Impact of Excessive Media Use on Human Health

Excessive and unregulated screen-based media use has been increasing in several countries and primarily in Far Eastern countries. 36% of smart phone user youngsters in Taiwan have shown deprivation symptoms, 30% have been observed to show tolerance, 27% have exhibited usage more than the intended time, 18% showed unsuccessful attempts to reduce their usage levels and 10% fulfilled all diagnosis criteria of addiction including deterioration in close relationships (Noyan, Darcin, Nurmedov, Yilmaz & Dilbaz, 2015, p.74). The studies conducted indicate that digital media use particularly among pre-school children has negative effects beyond disorders such as vision problems or neck pain. In particular, studies which state that smart phone use at various ages causes attention deficit (Zheng et al., 2014), depression (Thomé et al., 2011; Rosen et al., 2013), anxiety and academic inadequacy (Lepp et al., 2014) and problems associated with linguistic development (Zimmerman et al., 2007) have attracted attention. A recent study conducted by Ulm University’s Psychiatry Department based on around 200 scientific studies (Spitzer, 2016) has shown that digital media (particularly tablets, smart boards etc.) do not improve students’ grades, to the contrary they either decrease them or do not have any impact on academic success.

Majority of children enter the period of concrete operations between the ages of 5 and 6. during this period, they start to understand that the contents presented to them either via television or via different tools are fiction and imaginative. They consider numerous characters presented to them through different media tools as role models (Hummel, 2012). Exposure of pre-school children who are going through a sensitive phase in terms of linguistic development, whose cognitive abilities are developing and who are in a period where they discover the world, to technological instruments whether excessively or not and even for didactic reasons may induce the health problems described above.

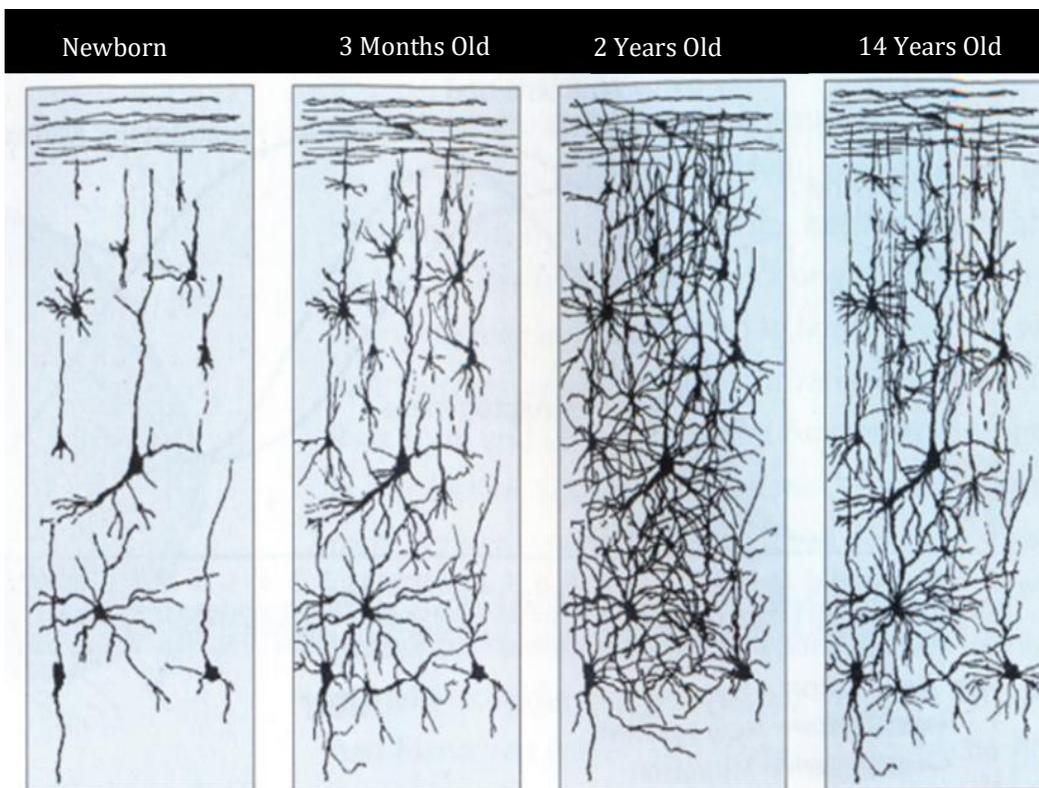
Research studies show that the television programs or videos designed for small children do not support linguistic development at all (Roseberry et al., 2009). Programs watched on television or on the phones (even if they are designed with a didactic purpose) do not enrich small children’s active vocabulary and in the best case scenario, they support their passive vocabulary relatively. A long-term study conducted with 1300 children in Canada (aged between 29 and 53 months) (Pagani et al., 2010) has shown that the children exposed to television experienced more social problems compared to other children, they are less active over the weekends and they consume snacks more intensively. Another study conducted at Robert Koch Institute with around 10.000 children who have recently started school (Sclack and Werner,

2005) revealed that watching television around 3 hours per day increased language disorders by 50%. It is also reported that in case of exposure to television around 4 hours per day, disorders regarding gross motor skills and visual-motor skills are observed twice as much.

### Brain Development in Early Childhood and Screen-Based Media

Early childhood period is the period when behavioral foundations are established and brain development gains speed. It can be said that the critical phase in brain development is the first 3 years of life (Sigman, 2007). Majority of nerve cells are developed during the first half of pregnancy. Around 500.000 nerve cells are created per minute during this stage. Brain development starts at the mother's womb and the ages between 0 and 3 are described as super intense baby brain development (Singer, 2002). On the other hand, the cells inside a newborn's brain are almost dysfunctional. This can be described as being similar to numerous computers not being able to communicate with each other due to the lack of internet connection. There is a communication potential; however, it cannot be used. As it may be seen in Figure 1, a newborn baby's nerve cells are isolated from each other and they are not in communication.

**Figure 1. Synaptic Growth and Pruning during Postnatal Development**



(Petermann, Niebank & Scheithauer, 2004).

An extraordinary growth in the number of connections between the neurons is observed during the first three years of life. Approximately 80% of dendrites grow and develop after birth. The connections produced are much more than needed during the synaptogenesis period. At the end of two years, number of synapses in a baby's brain exceeds 100 trillion and they are twice as much as the number of synapses in an adult. Synaptic connections are pruned and eliminated over time as the individual gets older (Singer, 2002). The only thing that babies or infants need during this period is natural interaction with their parents that is based on eye contact. Televisions, tablet computers or smart phones are not only "bad babysitters" but they can also be evaluated as triggering elements which cause the child to be neglected by isolating him/her from the parents.

In the experiments conducted with animals (Bock et al., 2003), it has been observed that the rats which have been subject to those situations such as parent deprivation, separation or social isolation (*Octodon Degus*) have developed low levels of activities in their brain and particularly in the prefrontal cortex and had reduction in synaptic

connections. In spite of this, it has been pointed out that the other rats which are involved in social interaction did not have any anomalies in their brain metabolism and they were competent from a sensory and cognitive perspective.

It has been observed that major sensory negligence and social isolation cases during early childhood showed abnormal development of the cortex and areas such as corpus callosum and hippocampus have remained smaller compared to the brain which developed normally (Perry, 2008). The picture presented below shows the brain images of a child who has had appropriate social interaction experiences with his/her surrounding until the age of 3, who has not been harmed or abused emotionally and brain images of a child who has been tragically neglected and subject to lack of stimulants.

**Figure 2. Comparative presentation of the brain images of children who developed normally and who have been subject to severe sensory deprivation**



(Perry, 2005).

CT scan presented in figure 2 indicates the neuro-developmental impact of trauma and negligence. Therefore, it cannot be regarded as a result of excessive media use. The primary reason for the inclusion of the images which contain the results of this major sensory negligence in this study is to show the importance and sensitivity of the first 3 years together with birth and from a narrow perspective, of super intense baby brain from a developmental point of view. Another reason is to change the perspective towards the child which is a biological creature surrounded by and feeds off culture and to raise awareness in this regard. Exposing the child to screen-based media in an unregulated manner particularly during the first three years of life and parents preferring to use media as a “babysitter” instead of socially interacting with their children can be evaluated as a minor deprivation or indirect negligence from the child’s perspective. The failure of unregulated media use to create a deformation or anomaly as explained in Figure 2 does not mean that it will not have any neuro-development effects or that it will not cause any harm. Various studies indicate that a child’s brain cannot process video clips, cartoons and similar motion pictures before the age of 3 and that such stimulants are not appropriate for children going through a sensitive age in terms of brain development (Sigman, 2007). Long-term studies conducted in this regard highlight that screen media use during early childhood has a negative impact on their reading and mathematics skills during adolescence (Zimmermann & Christakis, 2005).

### **Unregulated Screen-Based Media Use and Language Development**

Children can acquire their mother tongue language within a couple of years and with a considerably high rate of success if they do not have any health problems related to their development, if they do not live isolated from their social environment and if they are not subject to lack of stimulants (Riemer, 2002, p.54). When the literature is reviewed, two fundamental stages can be discussed with regards to children’s language development. These are: “Pre-Speaking” and “Speaking” phases. (Büttner,

2007, p.16; Miosga and Bindel, 2012, p.38-45). Pre-school children complete the *complex syntax* stage in their mother tongue language until they start kindergarten for the most part and as of the 60<sup>th</sup> month, they reach the stage of language acquisition which is also described as the *perfection* stage in mother tongue development (Szagun, 2008; Zollinger, 2010; Tomasello, 2003; O’Grady, 2005; Tracy, 2008; Pinar et al. 2015). Language development in children is a complex process that is parallel to and supports cognitive, social and emotional development, and that are coordinated with each other. Healthy acquisition of the language and child’s competence in his/her mother tongue contribute positively to the development of other skills at the same level (Klein 1984; Datler et al., 2002; Pons 2003; Zollinger, 2010; Lütcke, 2012).

It is well known that parents and other individuals such as grandparents responsible for the child’s care have an important role in the child’s language development. The “input” provided to the child through these individuals can be described as the driving force in mother tongue language development. “Language Input” covers all kinds of information including elements such as sounds, words or grammar that the child needs and the nature of this input has an important effect on language development (Bruner, 1987; Tomasello, 2003; Bickes and Pauli, 2009). Studies conducted previously show that the interaction of the mother with the child plays an important role on the child’s language development. Those children who have the opportunity to spend more quality time with their mother have a richer vocabulary compared to their peers (Tomasello, 2003, p.65). In parallel to this view, certain other studies (Roseberry et al., 2009) show that small children can learn new verbs through a qualified social interaction where they have an adult actively with them. Inability to establish a high quality social interaction inside the family, lack of qualified stimulants and child’s exposure to mass communication devices or technological products in an unregulated manner can lead to disruptions in children’s language acquisition processes. Research studies show that the television programs or videos designed for small children do not support linguistic development at all (Roseberry et al., 2009). Programs watched on television or on the phones (even if they are designed with a didactic purpose) do not enrich small children’s<sup>1</sup> active vocabulary and in the best case scenario, they support their passive vocabulary relatively. Put differently, the child cannot use these words that he/she learns from the unilateral programs presented to him/her through a monologue in his/her daily life and he/she can understand these words that is heard through the television or smart phones only at limited rates. As pointed out above, social interaction that is qualified enough is required to support children’s language acquisition processes at an optimal level (Tomasello, 2003; Andresen, 2006; Albers, 2009; Zollinger, 2010; Jeuk, 2011).

While social interaction established inside the family is important for supporting language development. Pre-school institutions where children have diverse experiences with their peers and teachers are as important. Strict and hierarchical structure of the family environment and limited interaction that occurs only between the parent-child can prevent the child from developing his/her own perspective by getting out of the parent’s shadow (Berger, 2010, p.8). Various experiences that the child will have at the kindergarten by coming together with his/her peers and teachers play an important role on both personality development and language development. Some research studies demonstrate that social interaction experiences, where the child is able to communicate with his/her peers and teachers in a harmonious manner, and he/she can be a part of the game or group, have a positive impact on language development (Datler, et al., 2012; Polzer, 2012; Pinar, 2016).

## Conclusion

Pre-school children are equipped with a unique enthusiasm to learn and intuitive skills compared to adults (Oksaar, 2000). In addition to this, they are going through a sensitive process with regards to language acquisition. The sensitivity of the hearing organs that they have also allow them with the capability to imitate the sounds that they hear (Jung, 2012). Children enter the “perfection” phase, which is the last phase

<sup>1</sup> This particularly refers to children aged between 0 and 3.

of the speaking stage, as of 60<sup>th</sup> month; phonetic or syntax errors show a tendency to gradually decrease during this phase (Miosga and Bindel, 2012, p.45). For this reason and similar other reasons, it can be stated that pre-school educational institutions where children spend an important part of their daily lives have an important function in language acquisition and language support. On the other hand, pre-school institutions being equipped with smart boards over the recent years and children being exposed to various stimulants such as films, cartoons and animations in an unregulated manner through a projector are thought-provoking.

Studies conducted with regards to media pedagogy highlight that smart phones and computers and especially televisions cannot go beyond being cold communication devices even if they are used for educational purposes and that they could never replace a printed book (Meder, 2007: 59f. Roseberry et al., 2009, Swertz, 2000). Televisions cannot be compared with a book, a magazine or a wooden toy that are all warm communication devices and appeal to the child's senses indirectly (Swertz, 2000). When considered from a communication or pedagogic perspective, television cannot replace social interaction due to its unilateral and monologue structure. The didactic aspect in the child's interaction experiences with his/her mother, father, sibling or peers must be much more than what the television can give him/her.

### Recommendations

American Academy of Pediatrics (AAP, 2016) reports that children aged below 18 months must stay away from screen-based media. Children aged 18 to 24 months should not be left unsupervised and alone and programs must be watched together with the parents. They also highlight that children aged between 2 and 5 years must not use screen-based media more than 1 hour per day. It is stated that for children aged 6 and above, consistent limits must be established with regards to media use and media must not replace sleep, physical activity and other behaviors necessary for human health. It is observed that many of the countries in Europe are much more careful in terms of media use when compared with the United States of America. Table 1 includes the recommendations regarding digital media use.

**Table 1. Media Use Recommendations**

| Age             | Recommended Digital Media Use |
|-----------------|-------------------------------|
| 0-2 years old   | None                          |
| 3-5 years old   | Maximum 30 minutes per day    |
| 6-9 years old   | Maximum 60 minutes per day    |
| 10-13 years old | Maximum 9 hours per week      |

(Schmidt, 2014).

Several European countries and primarily Germany, Switzerland, Austria, and Norway point out that children must not be allowed to use televisions, DVDs, computers, game consoles, tablet computers and smart phones before the age of 3. It is indicated that maximum 30 minutes of use per day must be allowed for children between the ages of 3 and 6 and maximum 45-60 minutes of use per day must be allowed for children aged between 6 and 10. Maximum 9 hours of media use per week is recommended for children aged between 10 and 13 (Schmidt, 2014).

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