

Beyond good and evil: The impact of digital environment in family life

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Abstract. Internet has changed the way we interact with others and has become an essential tool for daily activities. Children and adolescents are the main users of new digital technologies and their first contact with a screen happens increasingly earlier in life. Its premature use can be dangerous: technology represents a “supernormal stimulus” that can act on the brain reward circuit and affect neural development. In this article we describe the effects of technology on the brain, well-being, social and family relationships, highlighting both positive and negative ones: rather than defining *a priori* any type of technology as “good” or “bad”, we should consider how specific applications are used in order to determine their impact. Adults, as parents and role models, should be a guide for kids in order to help them regulate the use of technology in both qualitative and quantitative terms.

Keywords: digital device, iGeneration, digital natives, Internet abuse, social networks

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Introduction

Postmodern society is characterized by the massive presence of technology and mass-media (Vattimo, 1989). Today, the Internet has turned our existence upside down, being it embedded in every aspect of our day-to-day lives, changing the way we interact with others. Indeed, people use the Internet for different purposes such as work, communication, entertainment and daily needs. Moreover, several studies highlighted the influence of technology on our mind improving and/or modifying several cognitive functions (Greenfield, 2016; Mondéjar, Hervas, Johnson, Gutierrez, & Latorre, 2016), such as visuospatial capacity, visual acuity, task switching, decision making and object tracking (Bavelier et al., 2011). Furthermore, if on one hand the Internet allows individuals to be exposed to multiple points of view, it also exposes them to contradicting information (Dunn & Castro, 2012).

Understanding how family dynamics both influence and are influenced by the use of technology is essential to plan interventions to benefit child health and development (Lauricella, Wartella, & Rideout, 2015). Indeed, nowadays parents have a tendency to communicate with their children through digital devices and social media (CISF, 2017; Kabali et al., 2015).

In order to provide a view of the impact of technology on family life without running into simplifications, this article provides a brief overview of the effects of the use of the Internet, social media and videogames on the individual and on social relationships. Specifically, scientific literature research was performed using MEDLINE, PsycINFO, ScienceDirect and Wiley Online Library databases. In order to identify, through a process of search and refine, relevant contributions, a list of keywords was used: “digital natives”, “digital environment”, “children and digital media”, “parenting and digital media”, “family and digital media”. There was no restriction on the year of publication.

Digital natives and digital environment

The main users of the new digital technologies are children and adolescents (Mascheroni et al., 2013; Twenge & Campbell, 2018). Today, children grow up in a “media ecology” (Ito et al., 2009) and, because of this, kids born within the age of technology are part of the so-called “*iGeneration*” (Rosen, 2010). The *iGeneration* includes all individuals born from the second half of the 1990s to the present day. According to Prensky (2001), these people are “*digital natives*”, because digital communication is not something they have had to learn but it is something that has always

surrounded them. Millennials live the Internet (Greenfield, 2016), inhabiting their daily life both inside and outside digital spaces (Livingstone, 2009).

Moreover, the digital environment is becoming increasingly pervasive, so children can have their first contact with a screen earlier than the previous generation. Carson and colleagues (2013) found that children aged 2 to 4 years old are engaged with computers for an average of 8.4 minutes per day, while Kabali et al. (2015) showed that 28% of 2-year-olds did not need any help navigating a mobile media device. Furthermore, a famous toy company introduced an iPad holder seat for babies (Grubb, 2013), highlighting how massive the presence of such technologies is in their lives.

Moreover, the way we learn is also changing: increasingly, children, their parents and their teachers are using interactive digital media and toys in education and entertainment (Anand & Krosnick, 2005). In their review and meta-analysis, Clark, Tanner-Smith and Killingsworth (2016) found that digital games significantly enhanced student learning relative to nongame conditions. In this regard, the Authors underlined that it is the design within the medium that allows to take full advantage of the affordances that will determine the efficacy of a learning environment.

The Internet as supernormal stimulus

In this context, according to Tinbergen (1951), we can think that technology represents a “supernormal stimulus”, a word used to indicate a particular phenomenon whereby an artificial stimulus can overrule a genetic response that has been developed through evolution. As Barrett underlines, while animals encounter supernormal stimuli only if experimenters build them, humans can build supernormal stimuli by themselves: pornography and videogames are just a few examples (Barrett, 2010). In this regard, the Internet can be a supernatural stimulus because of its power to activate reward pathways (Ward, 2013). For example, self-disclosure through blogs or social networks like Twitter may exploit the intrinsic rewards associated with social sharing (Tamir & Mitchell, 2012).

The massive use of technology can affect neural development since the human brain is influenced by our life experiences (Kolb, 2009). Moreover, using technologies is a very rewarding and satisfying experience for our brain (Braams, van Duijvenvoorde, Peper, & Crone, 2015). Several studies have shown that adolescents are more inclined to develop addictive behaviours (Somerville, Jones, & Casey, 2010; Sharma & Morrow, 2016),

and this data explains why an excessively early use of technologies can be dangerous especially in an age where the brain development is still uncompleted (Spear, 2013).

Furthermore, the neural processes underlying video game playing have been studied with a neuroimaging approach suggesting an involvement of the brain reward system (Cole, Yoo, & Knutson, 2012; Gleich, Lorenz, Gallinat, & Kühn, 2017). Specifically, an enhanced dopamine release (Koepp et al., 1998), higher grey matter volume in left ventral striatum (Kühn et al., 2011), decreased grey matter volume in dorsolateral prefrontal cortex and in orbitofrontal cortex (Yuan et al., 2011), increased functional connectivity in the cerebellum posterior lobe and middle temporal gyrus, and decreased connectivity in the inferior parietal lobule and inferior temporal gyrus (Ding et al., 2013), were associated with habitual video game playing.

In a study with 19 healthy subjects aged between 18 and 23 years old who followed a 10-day training to play an online video game, Han et al. (2011) found that the desire to play was positively related to activity in the right mediofrontal lobe and right para-hippocampal gyrus. According to Ko and colleagues (2009), craving in online gaming addiction and craving in substance dependence may involve the same neurobiological mechanism.

Weinschenk (2009) listed several social network features that could lead to dopamine release. First of all, social networks give an immediate gratification: people can send a text and receive a reply or seek information on the web in a few seconds. Second, social networks provide an anticipatory excitement, because the anticipation of a reward can produce a more intense stimulation than the reward itself. Moreover, social networks offer bits of information. Finally, unpredictability and surprise play a key role: like in gambling, people don't know exactly what they could find when downloading their mail or scrolling their Facebook feed. Dopamine is involved in variable reinforcement schedules, and that explains why social networks can be so powerful.

However, according to Howard-Jones (2011), we should consider how specific applications are used and by whom, when and what for, in order to determine their impact on the human brain and on our well-being, rather than labelling technology as “good” or “bad”.

Social networks, online communication and empathy

It is well known that online communication can expose children and adolescents to cyberbullying (Slonje & Smith, 2008) and sexual harassment (Barak, 2005; Mitchell & Ybarra, 2009), but it also allows to overcome the

space-time boundaries and thus to communicate with people living in every corner of the world: for example, Valkenburg and Peter (2007) found that online communication was positively related to the closeness of friendships in a sample of 794 preadolescents and adolescents, while Mesch and Talmud (2006) highlighted that, even while face-to-face relationships remained highly important, online ties were strong and meaningful for those adolescents who found, through the Internet, others with whom they had developed intimacy.

Another body of research highlighted that using the Internet for socializing has been linked to lower levels of social connectedness and well-being (Nie, 2001; Bessièrè, Kiesler, Kraut, & Boneva, 2008); this result is in contrast with other studies that showed that online communication stimulates teenagers' social connectedness and well-being (Desjarlais & Willoughby, 2010; Valkenburg & Peter, 2007) and has a beneficial effect on self-esteem (Schmitt, Dayanim, & Matthias, 2008; Valkenburg, Peter, & Schouten, 2006). These results suggest that kids may need to be supported in developing general skills of awareness and risk evaluation, rather than being kept away from social networks (Howard-Jones, 2011).

Konrath, O'Brien and Hsing (2011) conducted a cross-temporal meta-analysis in order to examine changes in dispositional empathy and they found that decline in empathy has largely occurred after 2000. The authors discuss this result observing that narcissism, which is negatively correlated with empathy, has been rising in college students over a similar time period (Twenge, Konrath, Foster, Campbell, & Bushman, 2008). Konrath and colleagues (2011) assume that a contributor to declining empathy could be the rising relevance of technology and media use in everyday life: in other words, empathy might be altered because of the great deal of time spent interacting online rather than offline. Moreover, reality-shows are based on unhealthy competition and they propose narcissistic and aggressive models, so young people probably have less empathic models (Young & Pinsky, 2006; Konrath et al., 2011). On the other side, it seems that social networks use can encourage empathy because it allows youth to improve their ability to practice their empathic responses (Vallor, 2010): Vossen and Valkenburg (2016) surveyed 942 Dutch adolescents and they showed that adolescents' social media use improved both their ability to understand and share the feelings of their peers.

Since empathy is developed over time through practice, probably these behaviours will become more habitual (Alloway, Runac, Qureshi, & Kemp, 2014). Wright and Li (2011) found that engagement in online prosocial behaviours through social networking sites, chat programs, email and text

messages, was related to face-to-face prosocial behaviours in a sample of young adults. Instead, other studies found that increased social networks use can lead to a lack of empathy (Konrath et al., 2011) because of a more individualistic and self-centred attitude, as indicated by Twenge (2014) who, using the label of “Generation Me”, underlines that today’s young people are more competitive, confident and assertive than the previous generation. As Rosen (2012) observed, if you hurt someone's feelings but you can't see his reaction, probably you will lose enough information to understand what happened, to apologize or to implement some other compensatory action.

Moreover, loneliness is increasing in postmodern society (Victor, Scambler, Bowling, & Bond, 2005; Victor & Yang, 2012) and it seems that new technologies are contributing to raising it (Turkle, 2017; Marche, 2012). In this regard, in their review, Nowland, Necka and Cacioppo (2018) proposed that the Internet is useful for reducing loneliness by enhancing existing relationships, while it increases feelings of loneliness when it is used to escape from the social world.

The impact of video games

The impact of the use of video games in development is another relevant topic. Konijn, Bijvank and Bushman (2007) found that violent video games increase aggressive behaviours in adolescents; in particular, players were likely to identify with violent characters in realistic games. This data was confirmed by a study that highlighted also that lower levels of education were related to higher levels of aggressiveness and sensation seeking in a sample of adolescents (Bijvank, Konijn, & Bushman, 2012). According to Anderson (2003), after exposure to media violence there is an increase in aggressiveness because of the stimulation of aggressive thoughts bringing the subjects to interpret ambiguous provocation as hostile and react to them.

A recent meta-analysis (Anderson et al., 2010) confirmed that exposure to violent video games is a causal risk factor for increased aggressive behaviour, aggressive cognition and aggressive affect and for decreased empathy and prosocial behaviour. Moreover, an American study found that college students who had previously played a violent video game had lower heart rate while viewing filmed real violence scenes, highlighting a physiological desensitization (Carnagey, Anderson, & Bushman, 2007).

On the other side, Ferguson and Rueda (2010) found that violent video games offer opportunities for mood repair, by reducing depression and hostile feelings in young adults. Similarly, Ferguson and Olson (2013)

showed that children play video games in order to socialize, having fun and reducing stress; in particular, children with clinically elevated levels of depressive and ADHD symptoms were more inclined to endorse catharsis motivations for video game use. Furthermore, a study that involved families with a child between the ages of 11 and 16 years old found that girls who played video games with their parents showed higher levels of parent-child connectedness, lowered internalizing and aggressive behaviours, and more prosocial behaviour toward family members. However, aggressive behaviours are related to the number of hours played, so the beneficial effects are probably due to spending time with the parents regardless (Coyne, Padilla-Walker, Stockdale, & Day, 2011)

Moreover, playing video games can improve some skills in children (Dye & Bavelier, 2010), such as spatial visual skills and problem-solving skills (Schmidt & Vandewater, 2008). Several studies highlighted that video-gamers reported a better performance at task-switching because of gamers' ability to suppress distracting visual information (Chisholm, Hickey, Theeuwes, & Kingstone, 2010; Mishra, Zinni, Bavelier, & Hillyard, 2011).

In a study published in *Nature* (Green & Bavelier, 2003), authors reported that after playing "Medal of Honor" for 10 days, subjects aged between 18 and 23 years old showed a drastic increase in visual attention and memory. Additionally, a study with a sample of players aged between 7 and 22 years old showed that action video game players have attentional skills that allow them to make faster correct responses to targets (Dye, Green, & Bavelier, 2009).

Another relevant topic is related to the connection between video game playing and attention. Several studies showed that video game playing is associated with attention disorders (Paulus, Sinzig, Mayer, Weber, & von Gontard, 2018; Swing, Gentile, Anderson, & Walsh, 2010), but the direction of this relationship is still unclear (Greenfield, 2016). Gentile and his group (2012) found that children who spend more time playing video games have more attention problems, and impulsive children spend more time playing video games. In an interesting population-based study, Twenge and Campbell (2018) examined more than 40000 2- to 17-year-old children and adolescents, and they observed the association between screen time and distractibility, lower psychological well-being, less curiosity, lower self-control, higher difficulty making friends and less emotional stability; moreover, among 14- to 17-year-olds, those who spent more than 7 hours per day using a device were more than twice as likely to ever have been diagnosed with depression or anxiety. Furthermore, associations

between screen time and lower psychological well-being were larger among adolescents than younger children.

Family relationships and parental mediation

An Italian report (CISF, 2017) underlined that young couples have a tendency to communicate with their children via Facebook or WhatsApp: direct contact is often replaced by digital interactions. However, this finding is not always strictly undesirable: around 60% of parents, indeed, affirmed that they use digital media in order to communicate with their children living far from their home. The so-called “hybridized” family just proposes a different type of relationality. In particular, there are several types of hybridized family: the restrictive one is characterized by high parent control and low level of education; the permissive type is characterized by both low levels of education and control; in the affective family, parents pursue little control on the children’s online activities but they have a high level of educational presence. The “media-active” family is similar to the affective one, but media-active parents pay more attention to the children’s activities and they try to help them to develop a critical way of thinking about technology. Finally, the lax family just doesn’t see technology as a problem for the education of their children and they think that they can understand by themselves how to deal with it, while the “luddite family”, on the contrary, is hyper controlling and “erases” technology, i.e. procrastinating the purchase of the first smartphone.

Kabali et al. (2015) showed that 65% of parents use mobile media to calm down or keep quiet their children; this seems to be especially true for low-income parents with toddlers with social-emotional delays (Radesky, Peacock-Chambers, Zuckerman, & Silverstein, 2016).

In this regard, Seltzer, Prosofska, Ziegler and Pollak (2012) examined the hormonal responses of female children who communicated with their mothers after undergoing a stressor. In particular, they found that while children interacting with their mothers in person or over the phone released oxytocin, girls who instant messaged did not. On the contrary, these children showed levels of cortisol as high as control subjects who did not interact with their parents at all, so it’s conceivable that, in terms of stress mediation, instant messaging isn’t a viable alternative for spoken language or direct interaction, at least for what concerns girls in middle childhood.

Other studies found that social media can strengthen parent-child relationships and feelings of connection (Coyne, Padilla-Walker, Day, Harper, & Stockdale, 2014; Kanter, Afifi, & Robbins, 2012), especially

when they are not in close proximity with each other (Moawad & Ebrahim, 2016).

Parental mediation, which involves the interactions that parents have with their children concerning media use (Livingstone & Helsper, 2008), can play a key role. Active mediation refers to parent-child conversations about media, in order to help children improve critical skills about media (Rasmussen, 2013). Restrictive mediation is characterized by setting rules regarding the content allowed or the time spent consuming media, which can be used as a reward for good behavior or can be prohibited in reaction to bad behaviour (Hawi & Rupert, 2015). Finally, co-viewing refers to parents who use digital media with their children but do not necessarily discuss content with them (Coyne et al., 2011).

A recent meta-analysis showed that restrictive and active mediation can reduce negative media influence, such as the learning of aggressive behaviour or substance use, while the co-viewing style was associated with increased aggression and media use (Collier et al., 2016). Moreover, parents' perception of neighbourhood environment could influence children's screen time: children who live in neighbourhoods with good satisfaction, services and parks are more likely to engage in two hours or less of screen time and to be physically active (Carson, Kuhle, Spence, & Veugelers, 2010).

Family interactions are also influenced by parents' media use. Indeed, according to Lauricella et al. (2015), parents' screen time is the strongest predictor of child screen time. In a study with 73 mother-child pairs, Nathanson and Rasmussen (2011) found that when mothers viewed TV with their children the communication was less frequent and less verbally responsive compared with when they read books or they played with toys. Moreover, an American study with 225 mother-child pairs analysed the associations of maternal mobile device use with the frequency of mother-child interactions during a structured laboratory task. The Authors found that device use, when not associated with any maternal characteristics, including depressive symptoms or parenting style, was nonetheless common and associated with fewer nonverbal interactions with children and introductions of unfamiliar food (Radesky et al., 2015).

Conclusion

Even if it is not possible to state whether the use of technology is dangerous for children or not, it is possible to try and reach some conclusions based on scientific literature.

Technological devices are definitively part of everyday life due to their use in all fields as well as work, communication, entertainment, learning and daily needs. It is well established that technology can improve motor skills and cognitive functions in young people. On the other side, an excessive use of digital devices brings to a sedentary lifestyle, less sociability and, in general, to the unbalance of the development of some skills, including communication vis-à-vis and non-verbal communication. Moreover, it can limit the normal development of personality and increase dysfunctional behavioural patterns (such as in children with ADHD or with a disorder of Autistic spectrum). So Internet abuse could expose children to the risk to developing psychological diseases or mental disorders.

However, as our society is changing, weakening the ever more pervasive impact that technology has on our lives is unthinkable. As a consequence, what seems more useful is not to demonize technology, but to use it conscientiously rather than prematurely. In conclusion, adults, as parents and role models, should be a guide for kids in order to accompany them through every life experience and to help them for regulating the use of technology in both qualitative and quantitative terms. Therefore, digital interactions are harmful only if they replace direct interactions; smartphones can't be a substitute for parents, who have the power – and the responsibility - to transmit values, passions and interests to their children (Cazzullo, 2017).

Note

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