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Navigating “Technoference” in the Family System

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Abstract

This integrative literature review explores the increase of technology use in families, with a focus on how technology is disrupting in-person social interactions within the family system. Many studies have been conducted on how technology impacts a couple's romantic relationship, and only a few have examined the relationship between the parent and child. This review is one of the first to examine how technology may affect the entire family unit from before children to raising adolescents. Each section of the family unit is examined, beginning with before children, followed by the early bonding and attachment associated with infant/childhood, and then the adolescent parent relationship. Research is then provided on how technology cues our ancestral adaptations making it more difficult for families to disconnect. This review finishes with clinical recommendations from the research. The recommendations are separated into two clinically relevant subcategories: 1) interventions; 2) and conversations.

Navigating “Technoference” in the Family System

Technology has rapidly increased over the last two decades and has revolutionized the way people communicate (Newsham et al., 2018; Stockdale et al., 2018). One area that has been impacted by technology may be the family system in the way they communicate and interact with one another. An example of this was found in the link between parents' use of technology when interacting with their children and an increase in childrens' acting out behaviors (Stockdale et al, 2018). Fewer parent-child interactions, lower responsivity to child bids, and parent hostility in response to child requests for attention have all been associated with parent's technology use and their children (McDaniel & Radesky, 2018). Technology has not only changed behaviors in children and adult interactions, there are studies to support the idea that child development may also be negatively impacted by excessive technology use (Reed et al., 2017).

Reed et al., (2017) studied the ability of toddlers to learn words when their parent is distracted by a technological device. The toddlers who had a parent that received a phone call were negatively impacted in their word learning ability. This leads one to assume that distractibility in a primary caregiver can impair the child's development. As technology becomes more prominent in the home environment, more research is needed to assist parents and helping professionals in determining the role of technology in healthy families. The inclusion of technology is positive in that it may benefit users by providing social support for new mothers and allows parents to work from home (McDaniel & Radesky, 2018). This inclusion of technology may also include negative consequences such as disruptions in face to face social interactions like those between family members (McDaniel & Radesky, 2018).

This disruption may cause concern because infants and young children rely on responsive caregivers for information about the world (Reed et al., 2017). Thus, a lack of face-to-face responsivity may negatively impair traditional child development. A recent term that has been coined to describe these intrusions of media and technology is “technofence” (Stockdale et al., 2018, p. 219). One example of this technofence occurs when a parent pauses or ends a conversation abruptly to answer a call or receive a text (Stockdale et al., 2018). More examples of these intrusions occurring in the family can be observed when a parent is playing with their infant and interrupts the connection to text someone back, or when a parent is conversing with their adolescent and the teen turns away to answer a call. Those instances have become a normal part of everyday living for a great majority of people, and it is those repeated patterns of technological intrusions that cause concern. Regardless of the age of the child or which member has felt the interruption, negative consequences of these technofence encounters are now identified in the empirical research.

Literature Review

According to McDaniel, Galovan, Cravens, and Drouin (2018), there is a mobile phone subscription for almost every resident in the United States and Canada. Around 95% of Americans own some sort of cellphone, with 77% of those owning a smartphone (Mobile fact sheet, 2018). That has gone up from 35% when the original survey was administered in 2011 (Mobile fact sheet, 2018). In considering other devices, 78% of adults own a laptop or desktop computer, and 51% own a tablet (Newsham et al., 2018). From these statistics, it is easy to believe that technofence may be a problem because of the rate of changing technology and how it is increasing in so many households without support or recommendations for healthy use.

The shift in how people use technology has dramatically increased and there is a proportion of people who now use electronic devices almost nonstop (Sbarra et al., 2019). According to Sbarra et al. (2019), there are more than a quarter of adults in the United States that report being online almost constantly. This can be seen in how adults are transitioning from one technological device to the next in a sequence without much of a break. For example, when people are not on their cellphones, they are most likely on their computers sending emails or involved in a virtual world, when not on either of those devices then adults can be found in front of their television watching or playing video games. This change in lifestyle is noted in all developmental stages from early childhood to older adulthood.

It is estimated that six hours a day is how much a child between the ages of eight and ten are now spending on technology, and four of those hours are typically spent watching television (Centers for Disease Control and Prevention, 2018). Adolescents between the ages of eleven and fourteen may be spending around nine hours a day in front of a screen. And when examining the older adolescent population, ages fifteen to eighteen, it is estimated they are spending about seven and a half hours in front of a screen (Centers for Disease Control and Prevention, 2018). What makes this even more alarming is that those hours are only accounting for the time spent in front of a screen for entertainment and leisure purposes. These stats do not account for the technology used in schools as many students are provided one-to-one devices for class assignments and in-class work. These numbers highlight how technology is now incorporated into the lives of children, adolescents, and adults. A deeper look at how each member of the family is being impacted by technofence will now be provided.

Technoference in the Co-parenting Relationship

The family may be affected and changed when technoference is happening within the co-parenting relationship. According to McDaniel, Galovan, Cravens, and Drouin (2018) co-parenting can be described as the ability to which parents are able to support or fail to support each other's parenting. This relationship is important for the family because a positive association has been found between effective co-parenting and couple relationship satisfaction (McDaniel et al., 2018). Therefore, when technology is interfering within the couple's relationship, it may be disrupting the effectiveness of the couple as parents.

Technology does have positive effects for couples; texting and messaging allows a couple to stay in contact with one another throughout the day. This constant contact can allow for a deeper level of commitment, satisfaction, and overall, more communication between the partners (McDaniel, Galovan, Cravens, & Drouin, 2018). Especially for parents whose evenings may include managing children's activities and homework, this ability to communicate with one another can help to prioritize the parental dyad. However, when technology begins to negatively interfere in the couple's relationship is when problems can arise. This perceived interference can lead to decreased time spent together, conflict over the use of technology, lower levels of intimacy, and decreased emotional support (McDaniel et al., 2018). The excessive use of smartphones in a couples' relationship was related to lower quality face-to-face interactions, and a decrease in relationship satisfaction as well as relationship quality (Stockdale et al., 2018).

McDaniel, Galovan, Cravens, and Drouin (2018) found that even small interruptions by technology were associated with greater levels of conflict and lower relationship satisfaction. It was noted in the article by McDaniel et al. (2018) that 35% of women reported experiencing technoference within their couple's relationship at least once a day.

Another finding by McDaniel, Galovan, Cravens, and Drouin (2018) showed that women tend to perceive a greater amount of technofence in the couple's relationship. However, if technofence is perceived by either men or women then there is a greater likelihood of more conflict and decreased relationship functioning. These findings by McDaniel et al. (2018) were explained using the social exchange theory which is the idea that couples make exchanges with their partner to obtain the things they need and want while also minimizing the costs. This idea relates to couples using technology in that one partner will begin to shift their attention and energy towards the electronic device which would have been given to the partner and in turn, this may lead to the partner experiencing the negative costs such as negative feelings and conflict. Attending to technology and ignoring the face to face interactions with a partner may send the message that the device is more important (McDaniel & Drouin, 2019). This can lead to a feeling of greater costs than benefits in the relationship.

These negative feelings of rejection and conflict may arise in partners when the partner using a device is perceived as preferring to communicate with someone else on the device instead of their partner (McDaniel, Galovan, Cravens, & Drouin, 2018). Another way technology can interfere within a couple's relationship is when a partner forms an unhealthy dependency to their electronic device (McDaniel & Coyne, 2016). This may happen for several reasons, one being that the device may allow a person to feel valued, important, and/or loved whenever they are sending and receiving messages. Another reason for this happening has to do with the multifunctional aspect of the device. Smartphones now can serve the user in a multitude of ways outside of communicating, such as a calculator, a GPS, a music player, a source of entertainment and so much more (McDaniel & Coyne, 2016).

In an era that has coined phrases like instafamous and followers, it is apparent that technology use is impacting how individuals perceive relationships and connectedness. Using technology to communicate with other people may not always be for a social benefit. McDaniel and Coyne (2016) note in their study that technology can become intrusive for families because it leads to a greater amount of work-to-family spillover. Technology has made it easier for caregivers to bring work home and this blurs the boundaries between work and family life, leading to what is called spillover.

Adults may feel the need to respond to work emails at home because of expectations set by employers. When boundaries are blurred between work and home, it can lead to an increase in negative work-to-family spillover, negative mood, and lower satisfaction with family life (McDaniel & Coyne, 2016). In examining the findings on how technoference affects the co-parenting relationship it is easy to see the negative impact technology can have on parent relationship satisfaction, sustained adult attention, and boundaries within the workplace. Being mindful of how much time is spent on technology compared to face to face interactions is crucial in a world that spends the majority of the time living in the digital world. Now a deeper look will be given to technoference in the parent-infant and child relationship.

Technoference in the Parent-Infant/Child Relationship

Courtney and Nowakowski-Sims (2018) note the importance of attachment, in addition to social and emotional skills which are developed through social interactions and play activities. This is an area of focus because screen media use can interrupt essential affective exchanges and it diminishes the opportunity for in-person interactions.

The researchers highlighted the importance of attachment because it has been shown to be a key factor in developing the right brain's neurobiological systems. The right side of the brain is involved in the processing of emotions, modulation of stress, and self-regulation (Courtney & Nowakowski-Sims, 2018). Excessive use of technology has been associated with an increase in cortisol, the stress hormone. Infants are even more susceptible to electronic stimuli because of the rapid flashing lights (Courtney & Nowakowski-Sims, 2018). When sensory input is being changed quickly, the brain must process the stimuli even faster. Sensory overload may occur if the pace required to keep up with the fast-changing stimuli is more than the sensory threshold. Permanent changes in the sensory processing speed may result in higher activity levels, risk-taking, diminished short-term memory, and poorer cognitive functioning (Courtney & Nowakowski-Sims, 2018). Therefore, technology may not only be harming the infants' relationship with their caregivers but also affecting the way their brains will function in the future.

With the rates of people owning smartphones increasing and the hours spent on electronic devices rising, there is a strong chance that infants will be exposed to more screen time. An overexposure of media in infants and children has been linked to obesity, sleep problems, aggressive behavior, speech delays, and attention-deficit/hyperactivity disorder (Courtney & Nowakowski-Sims, 2018). This concern could be a bigger problem in the future since parents are turning to digital devices such as tablets and phones to occupy their infant or child's attention (Courtney & Nowakowski-Sims, 2018). With technology being more portable it leads to what is now being termed as virtual pacifiers which could impact children's ability to regulate strong emotions. It also has children shifting their attention to the technological device and thus impeding the development of social skills.

A study cited by Courtney & Nowakowski-Sims (2018) concluded that increased TV use was resulting in children spending large amounts of time alone and not interacting with their caregivers. It was also noted that parents were shown to be less attentive, less engaged, spend less time speaking with their children and speak to them in shorter sentences while in the presence of a TV (Courtney & Nowakowski-Sims, 2018). The findings from this article give another reason why more research on technology in the family is needed.

McDaniel and Radesky (2018) examined the relationship between parent's self-reported problematic technology use and the frequency of technofence in daily parent-child interactions. They were also examining the association between technofence in daily parent-child interactions and the externalizing and internalizing behaviors of children. Internalizing behaviors in this study consisted of whining, sulks a lot, and feelings easily hurt. Externalizing behaviors consisted of can't sit still, restless, hyperactive, easily frustrated, temper tantrums or hot-tempered (McDaniel & Radesky, 2018). The researchers for this study were looking at families with children five years of age or younger.

McDaniel and Radesky (2018) found that 17% of parents reported technofence occurring once a day, 24% reported twice a day, and 48% reported three or more times a day. Parents that reported greater amounts of problematic mobile use also significantly reported greater amounts of mobile technofence in parent-child interactions (McDaniel & Radesky, 2018). An association was found between greater amounts of technofence during parent-child activities by both mothers and fathers and greater internalizing behaviors in children. Children were also found to have greater amounts of screen time when both parents reported higher rates of technofence (McDaniel & Radesky, 2018).

McDaniel and Radesky (2018) also found with greater amounts of mobile technofence in the mother-child relationship, greater externalizing and internalizing behaviors were significantly predicted by both mothers and fathers. Greater amounts of technofence in the father-child relationship did not significantly predict greater internalizing or externalizing behaviors in children (McDaniel & Radesky, 2018). McDaniel and Radesky (2018) discussed the possible reasons behind these findings, and one thought was that since 82% of fathers in this study worked 30 hours or more outside of the home compared to 45% of mothers, children are spending more time with their mothers which could be the reason children were found to be more affected by technofence in the mother-child relationship. The study by McDaniel and Radesky (2018) is important because it was the first to show significant associations between parent self-reported problematic technology use, perceived technofence in parenting, and reported child behavioral difficulties.

Stockdale et al., (2018) reported in their research that a previous study found 70% of parents would use their phones during a meal and these families frequently had children who displayed limit-testing behavior. From the observations, the researchers were able to draw out a few main points. Those main points are that disruption by the media is common, repeated technofence in the parent-child relationship may relate to limit-testing behaviors in children, and it may cause the parents to react harsher to their children when the children are acting out. It is suspected that children and adolescents are testing limits and acting out to receive attention from their parents. However, these bids for attention are not always received pleasantly by the parents. McDaniel and Radesky (2018), noted that parents will respond in a hostile manner when they are interrupted during their use of technology.

Parents have reported experiencing more difficulty switching their attention to their children from an interactive electronic device compared to a more passive form of media such as newspapers, TV, or books (Newsham et al., 2018). Therefore, parents are also susceptible to behavioral changes when technology is involved.

Technology has been found to support new mothers, specifically an association between blogging and social support was found in a study conducted by McDaniel, Coyne, and Holmes (2012). Social support, in turn, has been linked with better marital functioning and a decrease in depressive symptoms (McDaniel et al., 2012). Conversely, McDaniel et al., (2012) found that using social network sites did not provide the same feeling of social support or connectedness that blogging created. These findings lend support to the idea that technology does hold some benefit and it is important to know in what way technology benefits or hurts the user.

Technofence can further complicate the parent-child relationship when depressed mothers turn to their electronic devices and fail to attend to their children (Newsham et al., 2018). An association between maternal depression and problematic phone usage was found and is correlated with technofence in the parenting relationship (Newsham et al., 2018). Mothers with depressive symptoms display less communication, less physical interactions, and less positive affect toward their infants (Newsham et al., 2018). Newsham et al. (2018) found that when looking at time spent in the activity, problematic phone use was only significantly correlated with mealtimes. However, technofence was significantly associated with 9 out of 11 parenting domains, the only domains that were not associated with technofence were changing diapers and bathing (Newsham et al., 2018). The activities that were associated with technofence are mealtime, bedtime routine, playtime no technology, morning routine, traveling, playtime excursions, joint technology, naptime routine, and chores with their child.

Playtime and completing chores with the child were two areas that were found to be significantly related to technofence and maternal depression (Newsham et al., 2018). Mothers with a greater number of depressive symptoms were found to report experiencing greater amounts of technofence when their child was not using technology in play (Newsham et al., 2018). Newsham et al. (2018) found that during playtime depressed mothers will tune in less to their children, display less support, less voiced interactions, and less turn-taking. The social development of the parent-child dyad suffers when mothers are not as available to their children. Playtime is also an important time for bonding to occur between the parent and child (Newsham et al., 2018). The comorbidity of depression and technology addiction could be causing mothers to be less attentive to their children than a mother who is only struggling with technology addiction or depression (Newsham et al., 2018).

Infants are sensitive to caregiver responsiveness that is contingent on their behavior, as well as to disruptions during the flow of natural interactions (Reed et al., 2017). Therefore, Reed et al. (2017) studied the word learning ability of two-year old's when their caregiver is interrupted by a phone call while in the middle of teaching them a novel word. Reed et al. (2017), found that children in the uninterrupted teaching period preferred the target scene which showed comprehension compared to the children in the interrupted section who did not prefer the targeted scene. This result gives support to the idea that children learn from contingent responsiveness such as when there is a caregiver to guide the child in understanding novel labels, this helps guide their word to world mapping process (Reed et al., 2017). Another finding in this study was that the performance of children who belonged to mothers with higher rates of texting and talking was relatively dampened compared to their peers (Reed et al., 2017).

The findings from Reed et al. (2017) suggested that the development of word learning in toddlers is hampered when caregivers are interrupted. Another study researched a similar phenomenon by considering how children are affected when there are unpredictable sensory signals in their environment. Davis et al. (2019) examined mothers and their children in two different groups regarding unpredictable sensory signals and its impact on executive function. This study was performed because it was found in previous research that patterned sensory signals to a developing brain are important for the maturation of sensory circuits that underlie hearing and vision (Tomasi, 2019). Davis et al. (2019) noted in their literature that exposure to unpredictability early in life was found to have a lasting impact on memory in both human children and rats. The study by Davis et al. (2019) focused on how unpredictability affects executive function since this is a vital part of emotional wellbeing.

The findings from this study were that unpredictable maternal sensory signals in an infant's life hold negative consequences for infant and child outcomes (Tomasi, 2019). Davis et al. (2019) found an association between unpredictable maternal sensory signals and low effortful control in infancy and childhood. Tomasi (2019) wrote an article using the research from Davis et al. (2019) and noted that maternal sensory information has a potent impact on the developing brain much like the well-established risk factors that go with maternal depression. To conclude, the effects of unpredictability on the developing brain lasted until the end of the study when participants were nine years of age. Therefore, the effects are lasting, and the trajectory of the developing brain is still unclear. It is clear from this study that predictable care is important for the developing brain. Limiting exposure to technology that contributes to unpredictable behavior could be an important goal for parents to make (Tomasi, 2019).

To conclude this section, researchers have found associations between technology and a change in behavior both in adults and their children (McDaniel & Radesky, 2018). Benefits have been found from technology such as in blogging, where new mothers can gain added support (McDaniel, Coyne, & Holmes, 2012). However, there are negative consequences that stem from disrupting face to face interactions that could delay word learning ability or make children feel the need to reach out for more attention (Reed et al., 2017). It is not whether technology is good or bad, technofence comes from how users interact with technology and the ways they allow it to interfere with their in-person social interactions. In the next section, technofence will be looked at within the parent-adolescent relationship and the ways parents influence their adolescent's technology use.

Technofence in the Parent-Adolescent Relationship

Twenge et al. (2018) conducted a series of surveys on psychological well-being in eighth, tenth, and twelfth graders each year from 1991 to 2016. Psychological well-being was the umbrella term for happiness, life satisfaction, domain satisfaction, self-esteem, and self-satisfaction. Using this survey, they identified that adolescent's psychological well-being stayed steady or increased from 1991 to 2011 and then noticeably dropped between 2012 and 2016. Twenge et al. (2018) conducted a second study using a two-part test to determine the contributors in the sudden decrease of psychological well-being. This test asked students about their psychological well-being and in addition to provide information on time spent in a variety of activities including electronic communication and screen time, in-person/face-to-face social interactions, and other non-screen activities (Twenge et al., 2018).

Twenge et al. (2018) also examined broader cultural indicators such as the adoption of the smartphone, unemployment, stock market performance, income inequality, median income, GDP, and college enrollment to help decipher what played a role in the decrease of psychological well-being among adolescents. Twenge et al. (2018) found that between the early 1990s and mid-2000s, 12th graders increased in their self-esteem and decreased in self-competence. Self-esteem and self-competence both declined after 2012. Twenge et al. (2018) broke down how rates of happiness compared to the number of hours spent on social media, texting, and the internet. It was found that eighth and tenth graders who spent approximately 20-29 hours per week texting were 45% more likely to be unhappy than those who only spent 1-2 hours a week texting.

Among twelfth graders, 68% were more likely to be unhappy when using social media a very high amount of time when compared to those who used it very little. The adolescents who did not use social media at all were 32% more likely to be unhappy than the ones who used it a small amount of time (Twenge et al., 2018). The happiest twelfth graders were those who only spent 3-5 hours on social media a week (Twenge et al., 2018). In-person social interactions were consistently correlated with greater happiness and self-esteem while electronic communication was consistently correlated with lower happiness and self-esteem (Twenge et al., 2018). Overall, psychological well-being was the highest during years when adolescents spent more time with their friends in person, reading print media, and on exercise/sports. Comparatively, psychological well-being was the lowest in years that adolescents spent more time online, on social media, and reading news online, and when more Americans owned smartphones (Twenge et al., 2018).

Twenge et al. (2018) examined other cultural factors to determine the reasons psychological well-being dropped in adolescents, it appeared from the analyses that the changes in activities particularly those in new media screen time preceded the decrease in psychological well-being. Meaning that electronic communication increased before the decrease in psychological well-being. While other activities such as in-person interactions, print media, sports/exercise, and attending religious services were all linked to better psychological well-being and declined over time (Twenge et al., 2018). Other variables created by screen time may also lower well-being. Adolescents who spend more time on screen also sleep less and inadequate sleep is linked to poorer psychological well-being. Social media and texting may be addictive which means that adolescents could be spending more time on an activity that does not increase their well-being (Twenge et al., 2018).

Beyond the individual technology use of the adolescent, technoference is also being studied in the parent-adolescent relationship. Stockdale et al. (2018) were studying technoference in the parent-adolescent relationship with a focus on if adolescents would experience less warmth and support from parents and if in turn would have an increase in anxiety and depressive symptoms. Stockdale et al. (2018) noted that parent-child/adolescent relationship qualities can influence the development of anxiety and depression. The other hypotheses of this study were examining how much support, love, warmth, and connection would be affected by technoference in the parent-adolescent relationship. If the quality of the relationship suffered, the researchers wanted to know if adolescents would engage in more cyberbullying, less prosocial behaviors, and be less civically engaged.

This data was gathered using a five-point Likert scale with five being rated as a great deal and one being not at all. Higher scores were indicative of higher levels of technoference.

Statements in the measurement for determining whether parents were perceived as interrupting the social exchange with technology included if it was difficult to get the parent's attention or if the adolescent felt ignored (Stockdale et al., 2018). The statements that the adolescents rated themselves on were similarly worded phrases such as did they feel their parents had a difficult time getting their attention or if they interrupted a conversation to use their phone. Stockdale et al., (2018) found that 77.5% of adolescents reported that their parents were displaying technoference at least some of the time. And 85.5% of adolescents reported technoference occurring some of the time due to their behavior with technology. A conclusion drawn from these statistics is that technoference is not common and that when it does occur, parents and adolescents are almost equal in who disrupted the interaction with technology (Stockdale et al., 2018).

“However, 12% of youth reported that their parents were ‘quite a bit’ or ‘a great deal’ likely to ignore them when on their cellphone or tablet and approximately 11% said they struggled ‘quite a bit’ or ‘a great deal’ to get their parents attention when their parent was on their cell phone or tablet” (Stockdale, Coyne, and Padilla-Walker, 2018, p.223).

Stockdale et al. (2018) found a correlation between adolescents' perception of their parent's technoference and a decrease in parental warmth and cohesion. The reported feeling of parental warmth was related to anxiety, depression, cyberbullying, prosocial behavior, and civic engagement (Stockdale et al., 2018).

Parent's technofence behavior sends the message to their adolescent that technology and outside influences are more important, and the results of this study highlighted the relationship between parent's technofence and decreased amounts of perceived parental warmth (Stockdale et al., 2018). Parental warmth as perceived by adolescents appears to be a protective factor against negative behavioral outcomes (Stockdale et al., 2018).

A study by Assuncao and Matos (2017) studied adolescents in Portugal and how their Facebook use was influenced by psychological factors. They noted in their literature review that attachment to parents is positively associated with the quality of interpersonal relationships, and attachment with parents is negatively correlated with problematic internet use (Assuncao & Matos, 2017). Assuncao and Matos (2017) found that more problematic use of Facebook was related to less secure attachment to parents, higher levels of inhibition of exploration and individuality, and lower levels in the quality of emotional bond and higher levels of separation anxiety. Therefore, the quality of attachment to parental figures is related to problematic internet use, mediated by interpersonal relationships and interpersonal skills (Assuncao & Matos, 2017).

Another study was also conducted on internet addiction in adolescents and had similar findings on the influence of family. Zhou et al. (2018) examined Chinese adolescents and their use of the internet in addition to determining how other factors such as individual, parental, peer, and sociodemographic domains influence their internet use. The findings were that father's attitudes and behaviors toward adolescent's internet use were significantly related to the difference of problematic internet use and nonproblematic internet use in adolescents (Zhou et al., 2018). Zhou et al. (2018) noted that it may be the father's positive attitudes toward adolescent internet use that promote greater internet use in their adolescents. This could be leading to addictive symptoms surrounding their internet use.

The father's use of the internet was related to adolescents being more problematic internet users than non-problematic users (Zhou et al., 2018). The thinking behind this finding is that if fathers do not use the internet frequently then they are not as able to provide guidance or monitor their adolescent's internet use (Zhou et al., 2018). Another finding from this study was that maternal internet use and attitudes did not significantly correlate with their adolescent's use of the internet. This could be explained by the power differences and role division that exists within the Chinese culture (Zhou et al., 2018).

To conclude this section, adolescents do experience technofence in their relationship with their parents and yet research shows that parents can have an impact on how technology will play a role between them (Stockdale et al., 2018). Whether it is technofence or smartphone addiction, parents can strengthen the bond between them and their adolescent to lessen the effect of negative technology use. This section highlighted the importance of how more research is needed since few studies have been conducted on technofence in this relationship. One of the studies that brought more attention to this topic was the study that found the dramatic drop in happiness and self-esteem. That article brings more light on how technology has an impact on psychological well-being (Twenge et al., 2018). In the next section, research will be provided on why technology may be having such an influence on in-person social interactions and why it is difficult to decrease the amount of time spent on technology.

Smartphones and Ancestral Adaptations

Sbarra et al. (2019) wrote an article on smartphones and close relationships and how there is a case to be made about the evolutionary mismatch between those two factors. Technology cues ancestral adaptations.

Early humans experienced things such as harsh weather conditions, wild animals, and scarce resources which influenced behaviors such as promoting trust, cooperation, and the formation of strong social bonds to survive and attain reproductive fitness (Sbarra et al., 2019). Sbarra et al. (2019) stated that if humans were to have those behaviors then it meant that relationships had to form attachments within interpersonal relationships that would evolve into intimacy. Responsiveness and self-disclosure are the building blocks to creating attachment and intimacy within relationships (Sbarra et al., 2019).

It was noted that around 30-40% of everyday speech is made up of self-disclosure such as the way people reflect their private information in experiences or personal relationships (Sbarra et al., 2019). Self-disclosure is now being conducted in other ways such as through social media sites like Facebook and Instagram, these were created for people to be able to share their thoughts and experiences to other people and then give other people the ability to respond about what was shared (Sbarra et al., 2019). Many studies are noting how people use smartphones and how often the users are on those types of sites. Sbarra et al. (2019) stated that people worldwide spent on average 137 minutes a day in 2017 on social media which was an increase from 126 minutes in 2016. The concern for using social media is not necessarily about a person using for social connection but more of whether a person is allowing their in-person interactions to be diminished by using social media (Sbarra et al., 2019).

Another study that was focused on a play therapy intervention for families with insecure attachment also discussed the effects of technology and why technology may be harmful to young children. In discussing the effects of technology, Courtney and Nowakowski-Sims (2018) highlighted a couple of reasons why it is difficult to disengage with digital devices.

One reason was that interactive screen time cues the ancestral adaptation of seeking and foraging, which is why interactive screen time is more likely to lead to hyperarousal and compulsive uses compared to more passive forms of technology like TV. Humans also have an innate sense of curiosity and that is another reason people struggle to control their use of technology (Courtney & Nowakowski-Sims, 2018). This study inferred that our brains may be biologically hardwired for technology and yet it could also be impeding an evolutionary drive to connect with other people. Courtney and Nowakowski-Sims (2018) went on to state other biological reasons people have difficulties disconnecting, dopamine is released in the brain while playing video games and this causes changes in the brain that resemble drug cravings.

Technology can also get in the way of other natural processes such as sleep cycles. When people are exposed to LED lights during the night, melatonin is suppressed and this causes a disruption to the natural sleep cycle and could inevitably lead to mental health problems like depression (Courtney & Nowakowski-Sims, 2018). With technology becoming more and more prevalent today, there is more need to research how the brain is affected at all ages from technology. The current and previous sections were written to inform both mental health professionals and families about the many different way's technology may affect the family. In the next section, clinical recommendations will now be shared from the literature on how families and mental health providers can navigate technoferece.

Clinical Recommendations

Clinical interventions for mental health providers found in the literature are provided first. Interventions geared specifically for clients with excessive technology use or experiencing technoferece is limited. In the following paragraphs, more information and details are provided for two different therapeutic approaches.

As previously mentioned, social and emotional skills are learned by social interactions and play activities (Courtney & Nowakowski-Sims, 2018). Time spent on technology is taking up time that would have been spent doing activities such as singing, talking, performing nurturing forms of touch, or first play activities which could lead to an insecure attachment style between parent and child (Courtney & Nowakowski-Sims, 2018). Therefore, an intervention has been designed to help foster a secure attachment bond between an infant and their caregiver which may help reverse some of the more negative consequences of technology.

Courtney and Nowakowski-Sims (2018) describe an intervention called FirstPlay Infant Storytelling Massage which is for ages from birth to two years. Their intervention FirstPlay Kinesthetic Storytelling is for children two to ten years, however, that was not the focus of this article. This intervention is conducted by registered play therapists, in doing this intervention the counselor will model, supervise, facilitate, and guide how to interact and behave with an infant by using a baby doll in front of the caregiver. The caregiver will then practice the skills with their infant alongside the therapist (Courtney & Nowakowski-Sims, 2018). When caring touch is provided, hormones such as serotonin, dopamine, and oxytocin are released. Pleasant touch and warmth activate the calm and connection which produces a feel-good feeling. Touch is an important aspect of this intervention because it is a form of emotional communication that allows the infant to grow a healthy and secure attachment with their caregiver. The union of the caregiver and the infant causes synchronization of neural activity in the right cortex of the brain (Courtney & Nowakowski-Sims, 2018).

This interactive experience between caregiver and infant sets an important foundation for the development of social, emotional, and cognitive development (Courtney & Nowakowski-Sims, 2018). Another intervention has been discussed in the literature and could potentially be used with any client. The Wheel of Wellness and the Indivisible Self Model of Wellness (IS-Wel) are the only two wellness models that have empirical support within the counseling literature (Kennedy, 2014). Using the five organizing factors of the IS-Wel, Kennedy (2014) proposed that clinicians use those same factors when looking at a client's TechnoWellness.

Kennedy (2014) proposed that clinicians look at their client's use of technology on a continuum, examine how it is affecting their life holistically by using this scale for the base of the assessment. The first factor to consider is the social self which consists of the social support of the client (Kennedy, 2014). Kennedy (2014) supported his idea of technology being linked to the social life of the client by the statistic that 1,504 mental health professionals had at least one client who exhibited an internet-related problem. Out of those clients, 10% were choosing to avoid family, friends, and partners or isolated themselves with online activities (Kennedy, 2014).

Not all research has shown technology to be negative when it comes to being social, Kennedy (2014) notes that a study had results with technology strengthening offline friendships of adolescents. The second factor to examine is the creative self which contains thinking, emotions, control, work, and positive humor (Kennedy, 2014). Technology can be a great resource for finding humor and one study found that college students in Taiwan had their problem-solving skills improved by their use of the internet in problem-based courses (Kennedy, 2014). Excessive internet use, however, was linked to feelings of irritation and moodiness when offline as well as neglect in areas such as finances, employment, and school.

The third factor is the coping self which is made up of items like leisure, stress management, self-worth, and realistic beliefs (Kennedy, 2014). Users can find support groups online to help them manage stress and build self-efficacy. On the flip side, technology can potentially add stress to the workplace, and this was found to be the case for some professionals (Kennedy, 2014). The essential self is the fourth factor, this consists of spirituality, gender identity, cultural identity, and self-care. This factor also holds both benefits and problems, people from marginalized groups have the chance to connect online with people from their culture which can help to build self-acceptance and identity formation (Kennedy, 2014).

Self-care is one topic that could go either way, there are resources such as suicide prevention and online support and there are also resources online that can trigger and encourage self-injury (Kennedy, 2014). The last factor is the physical self, and this revolves around exercise and nutrition. In this section, the negative consequences of technology are that maladaptive use of technology may spur physical anxiety symptoms or lead to being overweight due to the excessive amount of time spent on technology for leisure (Kennedy, 2014). The benefits are that there are devices such as smartwatches and apps that allow users to track their health and motivate users to physically move. These factors hold both benefits and negative consequences for technology users, mental health professionals have the opportunity to discuss both benefits and consequences with their clients. Kennedy (2014) recommended as clinicians are discussing the client's holistic treatment plan that their TechnoWellness be discussed too. Technology is neither good nor bad, it is all in how the users interact with it in relation to these other factors.

Clinical Recommendations for Discussing Healthy Technology Use

A study conducted by Radesky et al. (2016) analyzed the responses of parents on their views of technology use for young children. The findings were that caregivers held mixed uncertainties about whether allowing young children to use technology was a benefit or harm to their development. This study highlighted that caregivers may hold misconceptions about the benefit of technology such as that children can learn words, fine motor skills, or other higher-order skills like patience from the use of screen media without an attentive adult which was noted as an incorrect assumption found by previous literature (Radesky et al., 2016). Recommendations from this study were that clinicians should remind caregivers that they are their child's best teacher and even the best educational application cannot parallel the benefits of hands-on, unstructured, face-to-face, or outdoor play.

Since parents may be very proud of their ability to provide technology to their children, clinicians should discuss both the benefits and pitfalls of technology. Caregivers may also begin teaching their children how to use technology by modeling digital literacy in that technology should be used as a tool to connect socially, be creative, and build knowledge rather than allowing the device to be the soothing or entertainment be all (Radesky et al., 2016). Modeling appropriate technology use is important because the parents' use of technology was found to be a predictor for the use of technology by their child and such an early imprint of technology could lead to an adult with a higher risk of technology use (Courtney & Nowakowski-Sims, 2018). This study found that socioeconomic status disparity played a role in how caregivers were different with technology and their children. Caregivers who were more digital-savvy were found to be more comfortable in setting rules around technology (Radesky et al., 2016).

Low-income caregivers wanted their child to have the advantage of technology by being exposed to all the benefits and yet these caregivers were feeling powerless in helping their child navigate the limitless use of the internet. Clinicians can help these caregivers regain their power by connecting them to sites such as HealthyChildren.org that will assist the family in setting family media plans and provide tips on setting boundaries around technology (Radesky et al., 2016). Radesky et al. (2016) noted that clinicians can connect with the family on how technology may be serving other means such as helping the household avoid conflict between siblings and then assist the family in finding alternative means by replacing the use of technology in those matters. According to Courtney and Nowakowski-Sims (2018), it's the parent's involvement with their child's digital use that divides the usefulness from the dangers. The benefits of technology for children include that they learn their numbers, letters, and are better prepared to start school (Courtney & Nowakowski-Sims, 2018).

Abstract concepts are also able to be taught by technology like acceptance for diversity, empathy, and respect for the elderly. Children can learn from passive or interactive technology by having their caregivers co-view, teach them about the content, and repeat this teaching in daily interactions (Courtney & Nowakowski-Sims, 2018). The American Academy of Pediatrics (2011) made several recommendations on how technology can be used healthily within the family. Specifically, there are recommendations for the way technology should be used around children. Children younger than 18 months of age should only be allowed to use the video-chat feature of a device (American Academy of Pediatrics, 2011). For children 18-24 months of age who have caregivers wanting to introduce technology, the American Academy of Pediatrics (2011) advises that only high-quality programs and apps be used and to never leave a child this young alone with technology.

This is recommended because many games and apps are categorized as educational programs when they are not effective for children. When using technology over the age of 2, only allow the child to use media for up to an hour per day and it is recommended that parents or caregivers be involved with their digital use. American Academy of Pediatrics (2011) stated that children have a difficult time transferring what they have learned on a digital screen to their real-life and need a caregiver to teach them how to make this application. Other recommendations made by the American Academy of Pediatrics (2011) were that parents should not feel pressured to introduce technology at an early age because once children do have access to the technology at school and at an older age they will adapt quickly. The other suggestions made were for keeping certain spaces of the house or times of the day free of technology, one room is the bedroom, and times of the day are mealtimes and during playtimes between caregivers and their children.

If caregivers are preventing technology at mealtimes and during playtime then this may decrease the amount of time technofence is occurring. Stopping screen time one hour before bedtime is an additional suggestion since disturbances in sleep have been linked to technology (American Academy of Pediatrics, 2011; Courtney & Nowakowski-Sims, 2018). The American Academy of Pediatrics (2016) had an article on how to help families with adolescents who are struggling with technology. Their suggestions were for parents to become more informed about the technology that their children use and to create a family online-use plan to create more dialogue about media usage. In the online-use plan, set family meetings to discuss online topics and to check privacy settings or for inappropriate media posts. It was also suggested that when having those conversations to center the idea around citizenship and healthy behaviors rather than punishment for inappropriate use of technology (American Academy of Pediatrics, 2016).

One final suggestion made was for caregivers to supervise the online activities by their adolescents in an active participant manner rather than using a remote monitoring program.

Conclusion

Technology has advanced quickly within the last two decades and changed the way people can interact with one another (Newsham et al., 2018; Stockdale et al., 2018). Some of those changes have been beneficial such as the way couples can remain in contact with one another and how it can provide additional support to new mothers (McDaniel, Galovan, Cravens, & Drouin, 2018; McDaniel, Coyne, & Holmes, 2012). Other benefits have been found in how children may experience an increase in school readiness. Adolescent friendships may potentially be strengthened because they stay in tune with one another by using social media (Courtney & Nowakowski-Sims, 2018; Kennedy, 2014).

More negative consequences have also been found to occur due to technology like technofence. Parents are susceptible to technofence which was found to impact their face to face interactions and their overall relationship quality (Stockdale et al., 2018). When the couple experiences technofence happening in their relationship, then it is likely that their ability to co-parent is also suffering. Children feel the impact of technofence in a multitude of ways, some of the effects are not physically seen because it is shaping their developmental trajectory. This was seen in how children suffered in their word learning ability when their parent was interrupted in the middle of teaching them a novel word (Reed et al., 2017). Other developmental changes may still be yet to be discovered as a new generation is being raised on technology and pacified with technological devices that are replacing times of social interaction. Social interaction was found to be needed to teach children both social and emotional skills (Courtney & Nowakowski-Sims, 2018).

An increase in testing limits by children was found during times when parents were distracted using technology. Parents were also found to react harsher while on their technological devices in moments where their children were making bids for attention (Stockdale et al., 2018). Adolescents have also been found to experience negative consequences because of technology. This was seen in how the psychological well-being of adolescents sharply decreased after the year 2012, which coincided with the rise of smartphones and was not found to be related to the economy or other possible factors (Twenge et al., 2018). When looking at technofence in the parent-adolescent relationship, adolescents felt a decrease in parental warmth when technofence was perceived by the adolescent (Stockdale et al., 2018).

Parental warmth may serve as a protective factor against negative behavioral outcomes. (Stockdale et al., 2018). Another study also found that the quality of the relationship between a caregiver and their adolescent was related to problematic internet use. In conclusion, socialization is an adaptive feature that helped promote the evolution of the human species (Sbarra et al., 2019). In socializing, humans desire to trust and cooperate which is made possible through responsiveness and self-disclosure. Social media specifically makes it easier to self-disclose and receive responsiveness from others and this is one reason that technology has a strong pull for people (Sbarra et al., 2019).

People are not just passive users of technology, users of technology do have the power to choose how they will interact and use technological devices (Russo, Ollier-Malaterre, & Morandin, 2019). Clinical mental health practitioners have reported seeing negative consequences of technology in their clients and can be the liaison in providing psychoeducation and resources to families on the effects of technology and how to use it in a healthy manner (Kennedy, 2014).

Limitations

In writing the literature review on technoferece, many studies had been conducted on the effects of it in a couple's relationship. There were few articles written however on the effects of technoferece in the parent-infant/child or parent-adolescent relationship. Other articles were chosen since they had also been performed on technology and how it was affecting infants, children, and adolescents and their relationship with their parents. This presents a gap in the literature and highlights the need for future research. This is the only article written on the entire family and how technoferece may be impacting all the parts within the family unit.

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