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The Effects of Traditional- and Interactive Media Use on the Quality and Quantity of Parent-Child Interactions

Doctoral thesis

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Scientific Environment

I have been employed as a PhD research candidate in the Department of Psychology at the Norwegian University of Science and Technology in Trondheim from 2012 to 2017.

My main supervisor, Nunne Englund, is affiliated with the Department of Psychology at the Norwegian University of Science and Technology in Trondheim. My Co-supervisors have been Lars Wichstrøm and Ingvild Saksvik-Lehouillier, both affiliated with the Department of Psychology at the Norwegian University of Science and Technology in Trondheim. In addition, Stian Lydersen is affiliated with the Regional Centre for Child and Youth Mental Health and Child Welfare – Central Norway (RKBU) at the Norwegian University of Science and Technology in Trondheim and is a co-author on one of my thesis papers.

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English Abstract

Increased media use may, arguably, have a negative impact on the quality and quantity of parent–child interactions and, thus, a negative impact on children's overall development. How parents and children communicate with each other (the quality of parent–child interactions) may, in the long run, influence children's overall socio-emotional development (as greater maternal responsiveness may foster the development of social skills in children) as well as their ability to form strong bonds with significant others. Moreover, how much parents and children communicate (the quantity of parent–child interactions) may indirectly influence children's language development as talkative parents are more likely to expose their children to a rich and varied language environment, thereby contributing to their acquisition of a larger vocabulary. The overall aim of the current thesis was to explore how media use influences parent–child interactions immediately during media exposure and in the longer term. Two of the studies in the thesis included data from 23 mothers (with 2-year-old children) who participated in an experimental study at a university lab. We investigated how educational edutainment content presented via TV and tablet (in contrast to free toy play) influenced the quality and quantity of mother–child interactions as mother–child dyads watched TV together and played a game on a tablet. We predicted that the quality and quantity of mother–child interactions would decrease during TV co-viewing in contrast to joint tablet gaming and free toy play. In addition, we predicted that joint tablet gaming, representing an interactive setting, would yield higher-quality interactions than free toy play and passive TV viewing. Lastly, we predicted that the frequency and quantity of mother–child language interactions would be greater during unstructured play with traditional toys than structured play on a tablet computer.

The third paper comprised data from the Trondheim Early Secure Study (TESS), a longitudinal community study where 995 parent–child dyads participated in an observational

study first when the children were 4 years old and again when they were 6 years old (including 795 of the original 995 parent–child dyads). The purpose was to assess the quality of *children's* interactions with and behaviour towards their parents. We predicted that a greater amount of TV viewing would be associated with children being less responsive to their parents and less likely to involve them in play and interactions.

In stark contrast to the plethora of prior research, the results from Study I revealed no negative effects of TV viewing on the quality of mother–child interactions. However, the results showed that mothers and children do not benefit from watching TV together either. Moreover, our findings indicated that mothers were more sensitive and structuring during shared tablet play with their children than during play with traditional toys or TV co-viewing. Lastly, mothers were also more hostile towards their children during play with traditional toys than during joint play on a tablet or TV co-viewing.

The results from Study II showed, as expected, that the number of mother–child language interactions decreased during TV co-viewing compared to joint play on a tablet or play with traditional toys. However, only marginal differences were detected between the toy-play condition and the tablet-play condition on mother–child language interactions, as no differences were detected in the number of adult words. In contrast, toy play yielded more child vocalizations.

In Study III, we found that children who watched greater amounts of TV at the age of four involved parents less in play and interactions compared to children who watched less TV. However, the amount of TV viewing at the age of four did not predict how children would act towards their parents at the age of six.

Today, children's media use represents a growing concern for parents, teachers, health care providers, policy makers and researchers. However, the findings of this thesis show that media use, or at least some forms of it, may not be as detrimental to parent–child interactions

as most research has shown. Moreover, the findings indicate that interactive media use, e.g. in the form of joint gaming on a tablet computer, may enhance the quality and, to some extent, the quantity of parent–child interactions compared to TV viewing and traditional toy play. Furthermore, we found no negative effects of television co-viewing, although children who viewed more TV were more socially inhibited in play and interactions compared to those who viewed less. Establishing a safe media environment that stimulates both the quality and quantity of parent–child interactions can potentially ameliorate the negative effects of media use on parent–child interactions. This might be accomplished by parents co-using media content with their children and watching and/or engaging in media content that is primarily interactive.

Norsk Sammendrag

Man antar at et tiltagende mediebruk vil ha en negativ effekt på kvaliteten- og kvantiteten på foreldre-barn interaksjonene og muligens også ha negative konsekvenser for barnets utvikling. Hvordan foreldre og barn samhandler med hverandre (kvaliteten på interaksjonene) er antatt å være med på å forme barns sosio-emosjonelle utvikling (ved at mødre med en mer sensitiv og omsorgsfull oppdragerstil trolig vil styrke barns sosiale ferdigheter), inkludert den evnen de har til å skape og opprettholde trygge relasjoner. Hvor mye foreldre og barn samhandler med hverandre (kvantiteten på interaksjonene) er antatt å ha betydning for barns språklige utvikling, ved at foreldre som snakker mye til barna trolig vil eksponere barna for et rikt og variert språkmiljø, og derav bidra til at barnet får et større ordforråd. Målet for denne avhandlingen var å undersøke hvordan mediebruk påvirker foreldre-barn interaksjonen umiddelbart under medieeksponering, men også på lengre sikt. To av artiklene i avhandlingen inneholdt data der 23 mødre-barn par (hvor gjennomsnittsalderen på barna var to år) deltok i en eksperimentell studie som ble gjennomført i et laboratorium. Her undersøkte vi hvordan bruken av pedagogisk medieinnhold på TV og nettbrett (sammenlignet med vanlig tradisjonell lek som kontrast) påvirket henholdsvis kvaliteten- og kvantiteten på mor-barn interaksjonen, mens mødre-barn parene så på TV sammen- og spilte spill sammen på nettbrett. Vi forventet at kvaliteten og kvantiteten på mor-barn interaksjonen ville synke som en følge av TV-titting, sammenlignet med lek på nettbrett og tradisjonell lek. I tillegg forventet vi at mødre-barn lek på et nettbrett, som representativ av en interaktiv setting, ville fremme kvaliteten på interaksjonen i en høyere grad enn lek med tradisjonelle leker og passiv tv-titting. Helt til slutt forventet vi at kvantiteten på mødre-barn interaksjonen ville være høyere under ustrukturert lek med 'vanlige' leker, sammenlignet med mer strukturert lek med nettbrett.

Den tredje artikkelen inneholdt data fra den longitudinelle populasjonsbaserte studien Tidlig Trygg i Trondheim (TTiT) der 995 barn med foreldre deltok i en observasjonsbasert

studie da barna var fire år gamle. De ble deretter fulgt opp igjen to år senere, hvorav 795 av de opprinnelig 995 parene deltok. Her observerte vi også samspillet mellom foreldre-barn parene, men i dette arbeidet beskjeftiget vi oss med kvaliteten på *barnas* interaksjoner med sine foreldre. Vi forventet at en økende grad av TV-titting korrelerte med at barna skåret lavere på responsivitet og involvering av sine foreldre i lek og interaksjoner.

Resultatene fra studie I viste, i motsetning til hva hovedtyngden av forskningen så langt har funnet, ingen negative effekter av å se TV sammen med barna på kvaliteten på mødre-barn interaksjonen. Men, resultatene viste heller ikke at mødre eller barn profitterer på å se på TV sammen. Videre viste resultatene at mødre var både mer sensitive og strukturerte under lek med nettbrett sammenlignet med både lek med tradisjonelle leker og TV-titting, men også at mødre er mer fiendtlige ovenfor barna sine under vanlig lek med leker sammenlignet med både nettbrett-lek og TV-titting. Resultatene fra studie II indikerte, som forventet, at kvantiteten på mødre-barn interaksjonen synker mens barna ser TV sammen med mødrene sine, sammenlignet med både nettbrett-lek og vanlig lek. Derimot fant vi marginale forskjeller mellom lek med tradisjonelle leker og lek med nettbrett på kvantiteten på mødre-barn interaksjonen; det var ingen signifikante forskjeller mellom hvor mye mødre kommuniserte i de to gruppene. Imidlertid ble det observert signifikante forskjeller mellom vanlig lek og nettbrett-lek når det kom til hvor mye barna kommuniserte. Funnene viste at barn snakket mer under vanlig tradisjonell lek sammenlignet med når de spilte spill sammen på nettbrett.

I den siste studien (III) viste resultatene at fire år gamle barn som ser mer på TV, involverer foreldrene sine mindre i lek og samtaler, sammenlignet med de som ser mindre på TV. Økningen er lineær, det vil si at desto mer TV barna ser, desto lavere skåre blir oppnådd på involvering av foreldre. Vi fant derimot ingen langvarige effekter av mengden av barns TV-titting ved fire års alder på deres oppførsel mot sine foreldre igjen ved seks års alder.

I dagens samfunn utgjør barns mediebruk en stadig voksende bekymring for foreldre, lærere, helsepersonell, beslutningstakere og forskere. Imidlertid viser funnene fra forskningen som ligger til grunn for denne doktorgradsavhandlingen at mediebruk, eller i det minste; noen former for mediebruk, ikke er så skadelig for foreldre-barn-interaksjonen som hovedtyngden av forskning frem til nå har indikert. Videre viser funnene at interaktiv mediebruk, i form av spill på et nettbrett, kan fremme kvaliteten, og til en viss grad også kvantiteten på foreldre-barn-interaksjonen, sammenliknet med TV-titting og vanlig tradisjonell lek. Vi fant heller ingen negative effekter av å det å se på TV sammen med barna, til tross for at man fant at barn som ser mer på TV blir mer passive i lek og interaksjoner enn barns som ser mindre TV. Å opprette et trygt miljø for mediebruk som stimulerer både kvaliteten og kvantiteten på foreldre-barn interaksjonen kan potensielt redusere de negative effektene av mediebruk. Dette kan oppnås gjennom at foreldre og barn ser på TV sammen i fellesskap- og spiller nettbrettspill sammen i fellesskap, og at de ser på eller lar seg engasjere av medieinnhold som, i all hovedsak, er interaktivt.

List of Papers

Paper I:

Skaug, S., Englund, K. T., Saksvik-Lehouillier, I., Lydersen, S., & Wichstrøm, L. (2018). Parent-child interactions during traditional and interactive media settings: A pilot randomized control study. *Scandinavian Journal of Psychology, 59,* 135-145. doi:10.1111/sjop.12420

Paper II:

Skaug, S., Wichstrøm, L., Saksvik-Lehouillier, I., & Englund, K. T. (Submitted). Parent–Child Language Interaction While Using Touchscreen Tablets: A Randomized Crossover Study.

Paper III:

Skaug, S., Englund, K. T., & Wichstrøm, L. (2018). Young children's television viewing and the quality of their interactions with parents: A prospective community study. *Scandinavian Journal of Psychology, 59,* 503-510. doi:10.1111/sjop.12467

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Abbreviations

ADS	Adult Directed Speech
AWC	Adult Word Count
BCC	The Behavior Coding Scheme
CI	Confidence Interval
CVC	Child Vocalization Counts
DPICS	The Dyadic Parent-Child Interaction Scale
DVD	Digital Video Disk
DLP	Digital Language Processor
EA	Emotional Availability
EAS	Emotional Availability Scale
FIML	Full Information Maximum Likelihood Estimation
ICC	Intra Class Correlation
IDS	Infant Directed Speech
LENA	Language Environment Analysis
$M =$	Mean
M_{age}	Mean age
MB-CDI	MacArthur-Bates Communicative Development Inventories
$N =$	Number of Total Participants
NTNU	Norwegian University of Science and Technology
PAPA	Preschool Age Psychiatric Assessment
PPVT	Peabody Picture Vocabulary Test
SD	Standard Deviation
SDQ	Strengths and Difficulties Questionnaire
SES	Socioeconomic Status

SPSS	Statistical Package for the Social Sciences
TESS	Trondheim Early Secure Study
T1	Time 1
T2	Time 2
TTiT	Tidlig Trygg i Trondheim
TV	Television
US	United States

Introduction

Excessive media use has been posited to be a potential contributor to a range of maladaptive outcomes, such as aggressive behavior (Johnson, Cohen, Smailes, Kasen, & Brook, 2002; Singer, Slovak, Frierson, & York, 1998), obesity (Stiglic & Viner, 2019), attention deficit disorders (Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004), hyperactivity (Gupta, Saini, Acharya, & Miglani, 1994), academic problems (Shin, 2004) and somatic complaints (Robinson, 2001; Toyran, Ozmert, & Yurdakök, 2002).

It is a fairly straightforward prediction that excessive media use limits children's time for vital developmental activities including physical play and exercise, reading, storytelling, learning to talk, and spending time with peers and family members, among others. The potential impact of media use on relationships with caregivers merits particular attention because they play a substantial role in shaping children's socio-emotional health (Pianta & Stuhlman, 2004; Troseth, Russo, & Strouse, 2016) and language development (Anderson & Hanson, 2016; Tamis-LeMonda, Bornstein, & Baumwell, 2001).

Research investigating media's effects on the parent–child relationship has typically focused on traditional media, with evidence that TV viewing reduces the number and quality of dyadic interactions (e.g., Kostyrka-Allchorne, Cooper, & Simpson, 2017; Pempek, Kirkorian, & Anderson, 2014). The few studies analyzing the effects of new, emerging media technologies (such as touchscreen tablets) on parent–child interactions have shown that parents provide quality interactions (scaffolding [1]behaviours) during joint play with game-based educational apps (Carr, 2017; Neumann, 2017; Neumann & Neumann, 2016; Wood et al., 2016). Other studies (with respect to touchscreen tablets) have mainly emphasized the

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[1] "During scaffolding, a more knowledgeable adult uses specific behaviours to guide a child through a challenging task so that they can eventually master the task and complete it independently." (Neumann, 2018, p. 1654).

impacts of electronic versus printed storybooks (e.g., Korat & Or, 2010; Krcmar & Cingel, 2014; Lauricella, Barr, & Calvert, 2014; Munzer, Miller, Weeks, Kaciroti, & Radesky, 2019; Strouse & Ganea, 2017) with contradictory results. We did not evaluate the potential for children to learn from TV viewing or tablet use, considered a different type of contribution; however, research has identified that high-quality parent–child interactions in the context of sharing media, in addition to dialogic questioning, may increase the extent to which young children benefit and learn from media (Fender, Richert, Robb, & Wartella, 2010; Neumann, 2017; Stoneman & Brody, 1982; Strouse, O'Doherty, & Troseth, 2013; Zack & Barr, 2016).

Clearly, with so much time spent using electronic media devices, we need to dig deeper into the concept of traditional versus interactive media use and what types of interactions are 'common' while using these types of media. It is clear that various media and their different uses (traditional, passive television viewing versus interactive tablet gaming) can have different effects on parent–child interactions. Therefore, this thesis examines the effects of different media use (television viewing versus tablet gaming) on the quality and quantity of parent–child interactions. The question is, then, whether parent–child interactions during joint media use are of lower quality and quantity than interactions during more-traditional home-based learning activities, such as traditional toy play. The two perspectives delineated here (parent–child interactions and media use) will be used as a basis for predictions concerning developmental outcomes for children.

Definition and Delimitation of Concepts and Theoretical Background

Definitions of Traditional and Interactive Media Use

Children today use both traditional and new forms of electronic screen media including television, video/DVD, computers, video-game consoles, mobile phones, tablets, and so forth (Office of Communications [Ofcom], 2017). Innovative screen devices (e.g. smartphones, tablets and gaming consoles) have made digital technology an integral part of children's lives. Likewise, we have changed the ways we use the technology (Common Sense, 2017). Screens have become more versatile than ever, and instead of passively watching a TV screen, we are now able to engage with and use them interactively.

Interactive media is understood as any form of media that responds to the actions of a consumer, which, in turn, allows the consumer to further respond, making dialogue and participation possible (Radesky, Schumacher, & Zuckerman, 2015). By gaming, I refer to electronic games that are interactive, indicating that players are actively engaging with the material either alone or in competition or cooperation with other players (Granic, Lobel, & Engels, 2014). Compared to newer forms of media, the term traditional media (television, radio and newspapers) or *mass media* refers to the act of disseminating information intended to reach a large number of people in a one-to-many communication flow (Bertot, Jaeger, & Hansen, 2012).

Initially, the television was invented to entertain its audience and to be a more passive influence (Chassiakos, Radesky, Christakis, Moreno, & Cross, 2016). A typical conception of television viewing portrays children as zombie-like, staring passively at a screen and not digesting content, but the reality is not so black and white. Apparently, viewing traditional screen media has not provided the prompts that a real person can offer, such as contingency and responsiveness (Troseth et al., 2016). Adherents to the *passivity hypothesis* believe that TV-based media represent a static and passive influence, requiring no mental effort from the

viewer, and this passive impact might also be generalized beyond the viewing situation (Valkenburg & Calvert, 2012). Opponents of the passivity hypothesis believe that the perception of TV solely as a passive phenomenon is erroneous and argue that children actively seek information when they are watching TV and, therefore, are more cognitively engaged than they may appear to be, especially when viewing educational programs that allow for more interactive participation (Valkenburg & Calvert, 2012; Crawley, Anderson, Wilder, Williams, & Santomero, 1999: Strouse et al., 2013). This argument was made even before the current popularity of 'interactive characters' on TV like Blue and Daniel Tiger who invite children to engage in activities and ask them questions to which children actively respond (Crawley et al., 1999; Strouse et al., 2013). Theoretically, children's physical interactions with a tablet screen have been distinguished from their quasi-social interaction of responding to TV characters (Troseth et al., 2016). Although some types or components of interactivity are not possible on a TV screen, it must be acknowledged that television has an interactive potential if its use extends to console gaming, and likewise, the tablet can operate as a passive media device if used for watching movies. Thus, since children can now engage in many activities via television using apps, online video games, YouTube and video logs, the boundaries between traditional media (also referred to as broadcast or mass media) and interactive/social media have blurred (Chassiakos et al., 2016). Nevertheless, in the present thesis, one focus has been the interactive use of emerging digital devices (tablet gaming) and the passive use of traditional screen media technology (linear television viewing). During the initial phases of this thesis, tablets were used mostly for playing games and were, therefore, also perceived as more interactive, while television use was mostly 'passive' (Common Sense Media, 2017). Currently, young children are increasingly viewing traditional media, such as TV, movies, and videos, streamed on a handheld screen in favor of using them to play games (Common Sense Media, 2017; Swedish Media Council, 2017). This highlights the

importance of comparing passive media use with interactive media use as trends in media consumption are continuously shifting. In order to avoid overstating the differences between traditional TV screens and handheld screens for viewing purposes, we will focus on the interactive use of tablets and the passive use of television (as this mirrors children's use of TV and tablets in 2013) rather than focusing on the effects of the devices themselves. With this in mind, touchscreen tablets can be nothing more than a TV if used for viewing purposes. However, used as an interactive tool, this device has the potential to revolutionize and scaffold learning through the built-in features of apps (Herodotou, 2017).

Contemporary media use in family households. Cultural variations exist in the ways media are consumed. In general, children from Scandinavian countries have watched more television than American children in recent times. Among 0-to-8-year-olds in the US, the amount of time spent watching TV on a typical day in 2017 was 1 minute less (58 minutes) compared to 2013 (Common Sense media, 2017). However, reporting on data with such a broad age span (from 0–8 years; Common Sense Media, 2017) might suppress the total viewing time among preschoolers and young school-aged children because infants are much less likely to watch television than older toddlers (as they are not able to attend and comprehend the content) (Anderson & Pempek, 2005). In regard to Scandinavian countries, in 2016, Danish preschoolers (ages 3+) watched the most TV (158 minutes/day) while Swedish preschoolers of the same age watched 148 minutes/day. Data for Norwegian pre-schoolers and younger school-aged children are not available; however, Norwegian school-aged children (ages 12+) were reported to watch 167 minutes of TV per day (Harrie, 2017). For 2013, data on viewing time for Danish preschoolers showed that they watched 180 minutes of TV per day, while Swedish preschoolers watched 159 minutes and Norwegian school-aged children 168 minutes. Nevertheless, the data summarizing the statistics from all the Scandinavian countries are based on preschoolers ages 3+, albeit with no upper age limit

addressed (Harrie, 2017). Overall, the different age categories addressed by national surveys make it difficult to conduct a cultural comparison in regard to children's ages.

In addition to television viewing, children up to 8 years old in the US spent an average of 48 minutes interacting with a mobile media device (i.e. a tablet computer) in 2017. However, 16 minutes of that time represent gaming, whereas 21 minutes were spent watching TV/videos on the device (Common Sense Media, 2017). In 2013, children ages 0–8 spent an average of 15 minutes on a mobile device; however, 8 minutes of that time involved gaming, whereas 5 minutes were spent watching TV/videos (Common Sense Media, 2017). Despite these figures, Common Sense Media (2017) has grouped tablets together with other mobile media devices such as smartphones and the iPod Touch. Because of that, the data in regard to tablets are commingled with data for mobile media use in general. In addition, Common Sense Media (2017) makes a distinction between time dedicated to playing games on mobile media devices and watching TV/movies on them. By contrast, Swedish Media Council (2017) does not apply this distinction, making it less optimal to compare the variety of tablet uses across nations. However, in general terms, it seems like there is an overweight of children using data and tablets (multiple times a week) to watch TV/movies compared to other uses such as drawing and painting, surfing the Internet, listening to music, doing homework, and searching for information other than school-related content (Swedish Media Council, 2017).

In 2017, among parents of 0-to-8-year-olds in the US, 84% reported watching TV with their child at least some of the time. In addition, 63% acknowledged that they play games/apps on a mobile device with their children at least sometimes (Common Sense Media, 2017). By comparison, children ages 2–10 years who watched TV in the US in 2013 co-viewed with parents approximately 52% of the time. Additionally, among those children ages 2–10 years who used mobile media devices, approximately 9% of the time was spent

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using such media together with parents (Rideout, 2014). For Swedish children ages 0–8, 77% of that time was spent co-viewing TV with parents in 2016 and 44% spent with parents who were present with their children as they played games or used apps (Swedish Media Council, 2017). Nevertheless, being 'present with their children as they play games/apps' does not indicate whether parents actively interact with their children, and whether they are engaging the material together. An adult's physical co-presence is not sufficient as evidence of joint attention. Making a timeline comparison, 81 % of parents reported 'often' or 'sometimes' watching TV with their child in 2012/2013, while 32 % said they were present when the child played games or used apps (Swedish Media Council, 2012/2013). Collectively, these findings were also echoed in a literature review, where the authors revealed that parents are more likely to co-use traditional media (i.e. TV) than newer technologies (i.e. tablets; Connell, Lauricella, & Wartella, 2015; Harrison, 2015). To summarize, American parents are currently more prone to co-use media with their children than they were in 2013 (Common Sense Media, 2017; Rideout, 2014), and they also reported co-using media to a greater extent than Swedish parents (Swedish Media Council, 2017). Swedish parents are also more likely to be with their children as they play games or use apps than they were in 2012/2013 but were co-viewing television less in 2016 (Swedish Media Council, 2012/2013; Swedish Media Council, 2017). Moreover, 41% of parents admitted using TV shows or movies to calm an upset child; 36% used TV shows or movies as a babysitter so that they could take time to make dinner or do household chores; and 33% used TV shows or movies to get a child ready for bed (Wartella, Rideout, Lauricella, & Connell, 2013). Compared to other screen media technologies, TV was dominant in regard to the percentage of parents who reported using media to calm their child, gain time to make dinner, or get the child ready for bed.

As it turns out, reports of everyday use of various types of media devices in family homes tend to indicate less parental consumption of media content with their children,

particularly for new, built-in interactive technologies. Simultaneously, there is increasing evidence of the importance of co-use and co-engagement with media content and its benefits for social interaction and learning (Sobel et al., 2017). Thus, more co-use is associated with more favourable outcomes in children, and likewise, less co-use may have less advantageous effects. This will be further elucidated later. While precisely predicting the various outcomes of media use is not feasible, it has been shown that differences exist among cultures in regard to media use, particularly for parental co-viewing patterns. Thus, due to these cultural differences in co-viewing patterns, children are likely to be affected differently by media use throughout the world.

Parent–Child Interactions

As previously mentioned, the early caregiver–child relationship is enduring and consequential for children's socio-emotional health (Pianta & Stuhlman, 2004; Troseth et al., 2016) and language development (Howe, 1995; Bukatko & Daehler, 1995; Tamis-LeMonda et al., 2001). Both the quality and quantity of parent–child interactions represent key investments in children's overall healthy development (Napier, 2014). The kinds of interactions believed to be growth-enhancing and, thus, high quality differ among scholars. Yet many bear resemblances to or originate from two central constructs; chronologically, the first is *sensitivity* as described by Bowlby (1969) and Ainsworth, Blehar, Waters and Wall (1978). From an object-relational stance, Mahler, Pine and Bergman (1975) launched the concept of *emotional availability (EA),* which subsumes parental sensitivity. In a practical sense, parents who are highly sensitive respond to their children's physical, social and emotional needs; scaffold the child's activities and set appropriate limits; recognize, interpret, and acknowledge their feelings; demonstrate affection and warmth; and perceive their children's expressions, needs and signals in appropriate and consistent ways (Howe, 1995).

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However, sensitive parenting can also be considered as the absence of intrusiveness and hostility, i.e. the ability to be available to the child without interrupting and redirecting his or her behaviour and displaying subtle signs of anger, irritation or boredom (Biringen, Derschied, Vliegen, Closson, & Easterbrooks, 2014). Likewise, it is just as important for the child to be mutually affectionate and responsive towards the parent. Thus, the development of healthy parent–child relationships depends not only on the mother's or primary caregiver's personal characteristics and attitude but also those of the child (Saunder, Kraus, Barone, & Biringen, 2015). For instance, the *child's responsiveness* to the adult as well as the *child involvement* of adults have been implicated as fundamental for their relationship (Biringen et al., 2014).

The parent–child relationship comprises the dynamic interplay between behaviours, emotions, and expectations unique to a parent and his or her child (Parent–Child Relationships, n.d.). Several socio-cognitive and *socio-emotional* processes are involved in early parent–child interactions, including the recognition and regulation of emotions, gaze following and social referencing, and communication and gesturing (Larocci & Gardiner, 2015)*. A positive parent–child relationship will help the child to regulate emotional experiences and to be more prone to initiate play and interactions (Howe, 1995) compared to less optimal parent–child relationships. Moreover, mothers who are responsive to their infants' needs and emotional states, a concept known as 'maternal sensitivity' or 'maternal emotional availability' (as referred to earlier) are believed to foster socially competent children (Howe, 1995). More on emotional availability in the upcoming section.

Socio-Emotional Development

Socio-emotional development is complex and involves children's emotional experiences and/or expressed emotions, emotion-management skills, ability to form and

maintain positive and rewarding relationships, and active exploration of their environments (Cohen, Onunaku, Clothier, & Poppe, 2005). In the present context, I adhere to the following definition of social and emotional development as the developing capacity of the child from birth through 5 years of age 'to form close and secure adult and peer relationships; experience, regulate, and express emotions in socially and culturally appropriate ways; and explore the environment and learn – all in the context of the family, community, and culture' (Yates et al., 2008, p. 2).

The existing complex variability in how socio-emotional development might be perceived and measured may make it more challenging for researchers to approach the field and undertake applied research. Against this backdrop, I target four domains that are deemed important and commonly applied subdomains of socio-emotional development as follows: social competence, emotional competence, behavioural problems and self-regulation (Halle & Darling-Churchill, 2016). A brief overview is provided below. For a more thorough exposition, see the paper by Halle and Darling-Churchill (2016).

Social competence is defined as the set of skills needed to get along with others. From a practical point of view, this includes initiating and maintaining social relations, being cooperative and flexible in play and interactions, and being able to adapt and regulate one's behaviour in various social contexts. In other words, social competence captures a child's prompt and appropriate reactions to another's initiative, demonstrating the capacity to communicate with peers and adults, and to listen, respond, and take turns in conversations.

Emotional competence involves the child's ability to perceive, recognize, and regulate his or her emotions and to respond appropriately to others' emotional experiences. To do so, the child must be capable of understanding others' feelings and controlling and managing his or her own emotional states.

Behavioural problems refers to internalizing emotions (e.g. anxiety, sadness, and extreme shyness or social withdrawal) and the subsequent externalizing behavioural reactions to them (e.g. aggression, hostility, roughness, disruptiveness and noncompliance).

Self-regulation encompasses the processes of emotional self-regulation, control behaviours and focus attention. This concept adapts elements of both the social and emotional competence domains and involves non-interruptive behaviour and the ability to maintain eye contact.

The quality of the early parent–child relationship is a fundamental precursor to healthy socio-emotional development and, hence, its four subdomains (mentioned above). Healthy socio-emotional development begins with parental bonding.

Emotional availability and parental scaffolding. Over the course of the first year of life, infants develop a differentiated and enduring relationship with their attachment figures (i.e. primary caregivers). According to Bowlby (1969), a responsive, available and supportive caregiver provides a secure base for the infant's exploration of its environment and a safe haven for support, comfort and safety. Referred to earlier, the term 'emotional availability' (EA) was originally conceptualized by Mahler et al. (1975) to depict the emotional presence and availability of the mother (or other primary caregiver) in the context of the child's explorations. Mahler et al. (1975) implied that an emotionally available caregiver supports the infant's play through an attitude of 'quiet supportiveness', thereby enabling and encouraging the child's autonomy and exploratory behaviours. As this exemplifies, emotional availability also addresses facets of learning support, such as *scaffolding,* structuring, or encouraging the infant to explore objects and the environment. In order for children to learn about the environment, sensitive parents will be encouraging and supportive/structuring as well as nurturing and loving (Howe, 1995). This establishes the importance of EA for children's cognitive development, showing that maternal sensitivity (Landry, Smith, &

Swank, 2006) and structuring (Barnard et al., 1989; Oxford & Findlay, 2012) are believed to foster young children's cognitive growth.

Vygotsky's sociocultural theory*.* In view of the foregoing, I will provide a brief glance at Vygotsky's theory of learning. Vygotsky's (1978) sociocultural theory encompasses the importance of parent–child interactions for children's cognitive development. Vygotsky stressed the parent's active role in the child's learning capabilities, claiming that children's knowledge is socially constructed through their informal interactions with adults, a viewpoint also recognized through the concept of 'adult structuring' as part of the wider concept of emotional availability (EA). Vygotsky postulated that more-profound learning can occur only through guided and structured interactions with caregivers or more-advanced peers in the zone of proximal development. According to this perspective, there is a definite boundary in regard to what a child can master unaided. Through solitary exploration and play, children can reach a certain level of understanding; to reach higher levels, they need guidance from others. The distance between the level of actual developmental, as determined by knowledge gained from independent exploration and problem-solving, and the level of potential development, as determined by knowledge that can be gained with the assistance of more-competent others is known as the zone of proximal development.

Scaffolding and adult structuring. The term 'scaffolding' originates from Vygotsky's zone of proximal development. It refers to the guidance of a more-competent adult who helps, motivates, and asks relevant questions to assist and facilitate the child's learning (Wood, Bruner, & Ross, 1976). Thus, Vygotsky's theory provides a framework for examining parental guidance, including the related term 'adult structuring' (originating from EA) in shared media activities. According to research, parental scaffolding during shared media engagement enhances children's learning from media (Barr, 2019; Reiser, Tessmer, & Phelps, 1984; Strouse & Troseth, 2014). Although learning from TV/tablets is not the focus

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of the present research, we must acknowledge that social interaction and scaffolding will affect the possible learning situations for the child.

Attachment theory. Drawing upon Mahler et al.'s (1975) insights about emotional availability, Ainsworth et al. (1978) emphasized the importance of parents' (in particular, mothers') emotional availability to foster secure attachment in infants. Perhaps the most important contribution to an understanding of this relationship is the discovery that sensitive and responsive parenting predicted secure attachments. Within this context, sensitivity can be understood as the hallmark of attachment theory as it emphasizes the significance of responsive and sensitive parenting for establishing secure attachment bonds.

Although, in this dissertation, we are only able to comment on the immediate effects of media use on the quality of parent–child interactions, long-term effects must also be considered. Extensive media use may be deleterious for parent–child interactions and, thus, in the longer term, obstruct the foundation of a secure attachment style. A promising avenue for future research would be to explore how parent–child relationships through family media ecology are related to attachment styles and children's socio-emotional functioning.

Ainsworth was one of the first to identify the different types and qualities of attachment relationships. She conducted an experiment that aimed to observe and identify different attachment types between caregivers and children, known as *'the strange situation'* (Howe, 1995). An overview of her work is presented below.

Ainsworth's attachment classification system. The overarching mechanism of attachment theory has its primary roots in evolutionary history. Attachment is triggered not only by our internal motives and physiological needs but also by external threats, stresses and danger. In response to an aroused state, infants seek 'help' to regulate their behaviour by initiating physical and verbal contact with the attachment figure. When the primary caregiver provides the child with a secure foundation for comfort, support and safety, thus lowering the

child's anxiety level, he or she can venture from the attachment figure to explore the environment. The secure-base phenomenon refers to the infant's ability to explore and learn about the environment. Thus, emotional availability is thought to play a critical role in the infant's active exploration and engagement with new people and objects (Howe, 1995).

As previously outlined, Ainsworth conducted an experiment aimed to observe different attachment types between caregivers and children. Her work explored how children coped with an unfamiliar and stressful situation by assessing the child's exploratory behaviour in the presence and absence of the caregiver (leaving the child with a stranger) and how the child responded to the caregiver leaving and returning to the room. Building upon this work, Ainsworth identified three types of attachment styles. More-recent work has identified two more categories. *Secure attachments* characterize those children who feel some distress upon separation but, when reunited with their caregiver, express happiness and seek physical contact, comfort or another form of acknowledgement. The children engage in exploratory activities most when the caregiver is in the same room, and they are able to quickly resume their activities after being reunited with their parent or caregiver. The caregiver is highly responsive and sensitive to the child's needs and bids for attention. *Insecure and avoidant attachment* portrays children who don't show any apparent signs of distress upon separation but, when the caregiver returns, avoid her and do not show any signs of emotion. Their play is reserved and introverted, and they show no particular preference for either the caregiver or a stranger. The caregiver is regarded as insensitive and often rejecting of the child's needs. *Insecure or ambivalent or resistant attachment* describes children who are highly distressed by separation and difficult to comfort when the caregiver returns. They seek contact and distance from the caregiver at the same time and are ambivalent regarding their feelings towards the caregiver. These children are typically anxious regarding exploration and toy play, even when the caregiver is present. The parents are often seen as both insensitive and

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inconsistent in their care. A child with an *insecure and disorganized attachment* expresses

ambivalent behaviour towards the parent. These children typically show no organized pattern

of consistent behaviour towards their parent. They are often seen approaching their mothers

but, by the same token, avoiding her. Upon reunion, they may behave mechanically and act

disoriented, without showing feelings or emotions. Additionally, they appear to accept being

held by their mothers; however, they often avoid looking at her or making eye contact. *Non-

attachment* represents children who have been raised in institutions and have missed the

opportunity to form emotional bonds with a caregiver. Non-attached children usually

experience little control over their impulses and feelings of anger.

There is sufficient evidence that the characteristics of early relationship attachment

seem to extend to thoughts, behaviours and subsequent relationships (Howe, 1995). Empirical

studies have found an association between attachment style and children's socio-emotional

functioning (for a review, see Grossmann et al., 2006). Along these lines, securely attached

children have longer play sequences than insecurely attached children, and they display better

concentration and persistence during play (Howe, 1995). Moreover, secure children seem to

exhibit more positive and rewarding relationships with peers and are often viewed as more

likeable. At the same time, they are capable of creating stronger and deeper relationships and

emphatic accuracy. From the age of 5 years on, during blind performance testing, teachers

begin to rate securely attached children as more resourceful and independent compared to

less secure peers. Secure children also appear to have higher self-esteem and lower levels of

anxiety and show more healthy ways of coping with frustration and anger than anxiously

attached children (Howe, 1995).

Less-optimal childhood attachment to a caregiver may also result in socio-emotional

maladjustment later in life (Ashcraft, 2011). Buist, Deković, Meeus, and Aken (2004)

emphasized the importance of attachment style in association with socio-emotional behaviour

in early adolescence, with low-quality attachment related to more internalizing and externalizing behaviours. Other findings have shown that insecurely attached children at the age of 10 reported either having 'no good friends' or many friends but being unable to name them (Howe, 1995). Furthermore, anxious and ambivalent individuals tend to be more cautious, wary and distrustful of others.

Extending the work on attachment theory beyond the field of socio-emotional development (as reviewed in the above-mentioned section), research examining attachment processes and language development has documented more-optimal outcomes for securely attached children. For example, parents who themselves are more secure may be more effective 'teachers,' while more-secure children may be more motivated to learn; as a result, their language development is likely to benefit because of this secure attachment relationship (lJzendoorn, Dijkstra, & Bus, 1995). Next, we will describe language development as a general concept, including its drivers in humans and how characteristics of parental language aids the child's language development.

Language Development

Language development includes understanding and acquiring language and the ability to use verbal and non-verbal communication skills. 'From birth on, children are programmed to develop speech and language. During the first five years, stimulation of language development is important' and the 'lack of stimulation during this time could result in a child making slower progress or ending up with poor communication skills' (Language development in children, n.d., para. 4). Hence, interacting with parents and other primary caregivers is critical for children's language development (Bukatko & Daehler, 1995).

Language development is a collaborative process whereby young children construct meaning from shared activities with others, most often their parents. It is well-established that

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humans have an innate desire to communicate with others, and that this desire is facilitated and maintained only in the context of social interaction. Parental language is often within the child's zone of proximal development, i.e. through the use of scaffolding to learn language (Bukatko & Daehler, 1995) (these concepts also outlined in the chapter regarding socio emotional development), and by promoting different aspects of speech and language through infant-directed speech.

Infant-directed speech. When talking to infants, parents typically use a unique speech register, generally called 'motherese', baby talk, or infant-directed speech (IDS), in contrast to adult-directed speech (ADS). A number of studies have suggested that the exaggerated acoustic characteristics of IDS might facilitate infants' language development (e.g. Kuhl et al., 1997; Song, Demuth, & Morgan, 2010) by directing their attention to specific aspects of the language. In addition, experimental studies in laboratory settings have demonstrated that infants actually prefer IDS to ADS, and that this preference is, seemingly, governed by its exaggerated acoustic features. In summary, IDS is characterized by a higher pitch, increased pitch variation, exaggerated intonation, reduced rate of speech, elongated vowels, longer pauses between utterances and increased prosodic repetition (Fernald & Kuhl, 1987; Fernald & Simon, 1984; Trainor, Austin, & Desjardins, 2000).

Effects of parental language on children's language development. There are also other aspects of parental language directed at infants that promote language development. For instance, a handful of studies have acknowledged the importance of parental talkativeness and children's lexical development (Hart & Risley, 1995; Hoff, 2003; Hoff & Naigles, 2002; Hurtado, Marchman, & Fernald, 2008; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Pan, Rowe, Singer, & Snow, 2005; Rowe, 2012). Hart and Risley (1995) documented that children whose parents uttered more words had a larger vocabulary size than those whose parents uttered fewer words, adding to the findings of Huttenlocher et al. (1991). With a

sample of 50 parent–child dyads, Rowe (2012) observed the quantity and quality of caregivers' verbal input over time in order to determine those aspects that contributed most to children's vocabulary development. Input based on parent–child interactions was measured when children were 18, 30 and 42 months old and compared to their vocabulary skills on a standardized measurement one year later. After controlling for socio-economic status, input quantity, and children's previous vocabulary skills, the overall results showed that two factors explained additional variances in later vocabulary ability, namely using a diverse and sophisticated vocabulary and using decontextualized language such as narratives. However, for younger children (18 months), Rowe found that input quantity was the factor most predictive of later vocabulary skills. In the third year of life, the *quality* of language interactions, including the use of diverse and sophisticated vocabulary, appears to be more important than quantity (Rowe, 2012). In a prospective longitudinal study, Tamis-LeMonda et al. (2001) examined maternal responsiveness and children's early language achievements. They found that maternal responsiveness at 9 and 13 months predicted all five language milestones (i.e. first imitations, first words, achieving 50 words in expressive vocabulary, engaging in combinatorial speech, and the use of language to talk about the past). Although both timestamps predicted maternal responsiveness, it was a stronger predictor of language achievement at 13 months than at 9 months. Moreover, a literature review by Topping, Dekhinet and Zeedyk (2013) provided strong evidence for the role of parental contingency (talking when the recipient is fully attentive and able to receive and process the information) in children's language development. In the same review, Topping et al. (2013) stated that parental involvement (in early-literacy activities) and parental scaffolding would enhance children's language development. Similarly, others have recognized the importance of conversational turn-taking (taking turns when conversing) in regard to children's linguistic abilities (Bukatko & Daehler, 1995). Turn taking requires some form of joint attention.

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Tomasello and Farrar (1986) found that language input from mothers in joint attention episodes – but not outside them – was related to children's vocabulary knowledge later on. Moreover and also important, these researchers noted that mothers and children talked more and for longer durations in periods of joint attention than outside them.

Regardless, it is very important how caregivers and teachers manage to create an environment in which the child takes active part.

Television exposure and language development. Within the scope of this thesis, what is the status of the association between children's media use and language outcomes? An early study examined preschoolers' viewing *Sesame Street* and their vocabulary development (Rice, Huston, Truglio, & Wright, 1990) at ages 3 and 5 years. This study's results indicated that *Sesame Street* viewing contributed to advancement in children's receptive vocabulary (compared to other television programs), contradicting the result by Linebarger and Walker (2005), although they studied younger children between ages 6 and 50 months. Although, Linebarger and Walker reported smaller expressive vocabulary scores for *Sesame Street* viewing (when compared to nonviewers), they, however, reported that watching *Dora the Explorer, Blue's Clues, Arthur, Clifford* or *Dragon Tales* resulted in greater receptive vocabulary skills and higher expressive language scores (compared to non-viewers). This is seemingly at odds with the study by Chonchaiya and Pruksananonda (2008), who found that watching television at a young age in conjunction with heavy exposure was related to language delays in children ages 15–48 months. In reminder, they did not report on the types of content children watched, which makes it difficult to reflect on their findings. Pagani, Fitzpatrick and Barnett (2013) also examined the amount of television exposure and suggested that heavy TV exposure at 29 months was negatively associated with receptive vocabulary scores at 65 months. Admittedly, it may not be the amount of *children's* TV exposure that negatively impacts their development, but rather that television viewing disrupt

parents' attention (e.g when adult-directed programming is turned on) and detracts from caregiver–child interactions, which eventually leads to language delays (Barr, Lauricella, Zack, & Calvert, 2010). This argument aligns well with the emerging literature studies on the beneficial effects of quality television exposure (co-viewing educational television shows intended for children) on children's language development (e.g. Hudon, Fennell, & Hoftyzer, 2013).

Because we dedicated Studies I and III to addressing facets of quality interaction, such as responsiveness, scaffolding/structuring, intrusiveness and hostility, we found it essential to address facets of quantity interactions in the second paper. Vital to the child's language development is not only how parent–child dyads talk to each other but also how much they talk to each other (Bukatko & Daehler, 1995; Rowe 2012).

We reviewed Rowe's (2012) study on the effects of parental input on children's language development. Rowe reported that frequency of interaction was the most-predictive factor of later vocabulary skills for younger children (18 months), providing us with a specific target audience to study. Apparently, since we know that the amount of parental talk is linked to children's vocabulary growth, it is important to investigate how varied media use can affect the quantity of parent–child interactions. Although research on traditional screen media has shown that TV viewing reduces the quantity of parent–child language interactions (Brody, Stoneman, & Sanders, 1980; Christakis et al., 2009; Courage, Murphy, Goulding, & Setliff, 2010; Kirkorian, Pempek, Murphy, Schmidt, & Anderson, 2009; Lavigne, Hanson, & Anderson, 2015; Mendelsohn et al., 2008; Nathanson & Ramussen, 2011; Pempek, Demers, Hanson, Kirkorian, & Anderson, 2011; Pempek, Kirkorian, & Anderson, 2014; Soderstrom & Wittebolle, 2013), there is a need for further research on the effects of interactive media use related to new handheld devices.

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The Negative Effects of Television Viewing: Exploiting the Displacement Hypothesis

The amount of time spent on various media activities becomes problematic because people have limited time, and the more time young children spend viewing TV, the less time there will be for other activities, including socializing with family members (Pempek et al., 2011; Pempek et al., 2014; Vandewater, Bickham, & Lee, 2006). Maccoby (1951, as cited in Singer & Singer, 2001) specified 'it appears to be a higher privatization of experiences when the TV is turned on; the family may gather around the television but remain silent and isolated in their attention toward it' (p. 428–429). Research has suggested that the decrease in social interactions observed during media exposure is due to displacement, i.e. time spent engaged in one activity comes at the expense of some other activity – presumably, a more enriching and healthy activity, as stated in the displacement hypothesis (Christakis, 2014; Gadberry, 1980; Lee, 2008; Vandewater et al., 2006). The concern becomes especially important when the activity being displaced is essential to positive child developmental outcomes, such as social interactions (Vandewater et al., 2006).

Recently, the American Academy of Pediatrics (2018) recommended time limits for looking at electronic screens for preschool children (ages 2–5) based on these findings. The current guidelines recommend no more than one hour/day of high-quality programming for preschoolers and no screen exposure for children younger than 18 months as this may endanger early development. 'Problems begin when media use displaces physical activity, hands-on exploration and face-to-face social interaction in the real world, which is critical to learning. Too much screen time can also harm the amount and quality of sleep' (American Academy of Pediatrics, 2016, para. 9).

Ameliorating the negative effects of television viewing. The prevailing body of research examining TV exposure and parent–child interactions has indicated that TV viewing reduces the overall quantity and quality of parent–child interactions (Brody et al., 1980;

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Christakis et al., 2009; Courage et al., 2010; Kirkorian, et al., 2009; Lavigne et al., 2015; Mendelsohn et al., 2008; Nathanson & Rasmussen, 2011; Pempek et al., 2011; Pempek et al., 2014; Soderstrom & Wittebolle, 2013). Thus, three crucial elements are particularly important regarding any potential *advantageous* effects of TV exposure, including the impact of foreground TV, the effects of educational, child-directed TV programming, and the effects of co-viewing educational, child-directed TV (Anderson & Hanson, 2017; Anderson & Pempek, 2005; Hirsh-Pasek et al., 2015). In the following section, these factors are considered in greater depth.

The impact of foreground TV. It is pertinent to differentiate between exposure to TV content designed specifically for children (foreground TV) and content designed for adults (background TV) because, in principle, child-directed programming may offer children educational lessons and have a positive effect on their development, while adult-directed TV shows may have negative effects (Anderson & Pempek, 2005; Barr et al., 2010). Background TV is characterized by television shows that are designed and intended for older viewers; young children typically pay little attention to such programs because the content is incomprehensible to them. By contrast, foreground TV takes the child's perspective and includes content designed for children and is presumably comprehensible to them (Anderson & Pempek, 2005) as they reach a certain age. Young children appear to have higher levels of sustained attention in the context of foreground television, although what drives their attention, i.e. whether it is visual and auditory stimuli or cognitive maturity, is unclear (Anderson & Pempek, 2005).

Furthermore, several studies have examined the consequences of background TV. Schmidt, Pempek, Kirkorian, Lund and Anderson (2008) reported that, although children paid relatively low levels of overt attention to TV content, background TV disrupted their play and their degree of focused attention as opposed to when the TV was off. Setliff and

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Courage's (2011) findings converge with those of Schmidt et al. (2008). They examined the effect of background TV on infants' attention during toy play and found that infants' attention to the toys was altered during the presence of background TV compared to when the TV was off. Thus far, the research has indicated that background TV is distracting to children as they attempt to engage in other activities such as toy play. Concerning the effects of background TV on parent–child interactions, Kirkorian et al. (2009) and Pempek et al. (2014) stated that both the quantity and quality of parent–child interactions were diminished during background TV, contrary to when the TV was switched off. Such seemingly negative effects of exposure to background television might stem from the visual and auditory demands of TV, which elicit orientation, consequently distracting ongoing social interactions with parents and others. In an experimental lab-based study with children ages 12–36 months, Pempek et al. (2014) analyzed parent language directed at toddlers during the presence and absence of background television. They concluded that parents talked with their children less when the TV was on (and the content was adult-oriented). The average number of words spoken per minute, was 24.24 when the TV was on and 35.89 when it was off.

Because of the pervasiveness of TV screens in most family households (Common Sense Media, 2017; Swedish Media Council, 2017), parents may deliberately or non-deliberately expose their children to TV shows that are aimed at adults (Rideout, 2013; Setliff & Courage, 2011). In a nationally representative survey of parents of children 6 months to 8 years old, 23% reported that their children were 'often' present in the room as they watched adult-directed TV shows. Additionally, a total of 40% reported that their children were 'sometimes' present in the room whenever they watched adult-directed TV shows (Rideout, 2013). Even though American parents reported that their children spent an average of 58 minutes/day watching TV (Common Sense Media, 2017), whether they considered exposure to background TV when asked about their children's TV watching during a typical day is not

known (Anderson & Pempek, 2005). If exposure to adult-directed programming is not included, this might bias the results of studies that do not distinguish between foreground and background TV exposure. The present work will reflect on the difference between these two concepts and discuss this matter more broadly as it encompasses choices made by the researchers (related to Study III) that may conflict with the above-mentioned distinction between background and foreground TV.

Effects of educational, child-directed TV on parent–child interactions. Distinguishing between background and foreground TV is one thing, but by the same token, not all child-directed (foreground) TV programs are appropriate for children. It has been hypothesized that *educational,* child-directed TV shows such as *Sesame Street* may promote quality interactions as opposed to watching *non-educational,* child-directed TV shows (Lavigne et al., 2015; Pempek et al., 2011). In fact, educational, child-directed TV shows may teach parents ways of interacting with their children, which goes beyond the scope of non-educational, child-directed programming (Lavigne et al., 2015; Pempek et al., 2011). However, findings from studies examining the effects of educational versus non-educational media on parent–child interactions are conflicting (Lavigne et al., 2015; Pempek et al., 2011). Lavigne et al.'s (2015) study showed that the quality of parent–child interactions increased not only during exposure to educational videos such as *Sesame Beginnings* but also during exposure to *Baby Einstein* videos, which are regarded as non-educational (not explicitly promoting parent–child interactions). These findings highlight the notion that the effects of educational and non-educational children's TV shows are complex. Consequently, additional research needs to be conducted in this area. In Studies I and II, we examined the effect of an educational edutainment show on the quality of parent–child interactions. In Study III, however, there was no direct measurement of the type of TV shows being watched (i.e. no distinctions were made between whether it was educational or not and child-oriented or not) when assessing

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the potential impact of TV viewing on children's interactions with their parents. This non-specific measurement has potential flaws, and I will discuss how this could impact the results later on.

Effects of co-viewing educational, child-directed TV shows on parent–child interactions. TV viewing is not always considered a purely solitary activity as it can morph into a social activity through the act of co-viewing. Simply defined, co-viewing is watching TV together (Pempek et al., 2011). Yet, the potential benefits of exposure to educational content derive from combining parental co-viewing with active mediation (Mendelsohn et al., 2008) or, in other words, the discussions parents have with their children about the televised content (Nathanson, 2001). Also, social interactions can stimulate learning, however, they must be high quality; just watching TV together is not enough (Hirsh-Pasek et al., 2015). Although numerous studies have examined parent–child interactions during traditional home-based activities, such as shared reading and TV viewing, far less attention has been given to parent–child interactions during the use of game-based educational apps. This study takes an ecological perspective to examine family factors at the micro level, here, co-viewing and parental scaffolding (among others), on children's media use. Given that parents can comment on what is happening on the screen (by asking questions, labelling objects or actions, repeating words, etc.) while watching TV with their children, this may, in fact, attenuate any potential harmful effects of TV exposure (Kirkorian et al., 2009; Mendelsohn et al., 2010; Pempek et al., 2011), thereby making it easier for children to learn from televised content (Barr, 2019; Reiser et al., 1984; Strouse & Troseth, 2014).

Lemish and Rice (1986) examined the quality of interactions during co-viewing of educational TV between parents and their children from infancy to 3 years old and found that the interactions parents used during co-viewing were quite similar to those used during parent–child shared book reading, as they label objects, ask questions, and describe content.

Furthermore, Pempek et al. (2011) discovered that co-viewing increased the quality of parent–child interactions *immediately* after viewing an educational TV show. This finding was replicated by Lavigne et al. (2015), who demonstrated that the overall quality of parent–child interactions decreased during viewing (in line with Pempek et al., 2011). Nevertheless, one marker of the quality of parent–child interactions (as measured by new words per utterance) increased first *during* co-viewing and subsequently *immediately after* co-viewing an educational, child-directed TV program that claimed to promote verbal interaction compared to non-viewing (free-play sessions) (Lavigne et al., 2015). Another marker of the quality of parent–child interactions (as measured by new words per minute) also increased in this post-viewing session. However, Nathanson and Rasmussen (2011) found the opposite; they claimed that co-viewing children's TV seems to result in less maternal verbal communication and less maternal responsiveness during viewing compared to book reading and toy play. As the educational status of the video materials used in their study was not clearly addressed, comparing the results is challenging. Even though co-viewing educational TV can facilitate parent–child interactions, Mendelsohn et al. (2008) demonstrated that co-viewing and subsequent social interactions during media exposure tend to be limited, particularly among families with a low socioeconomic status.

Research Assessing the Effects of TV Viewing on Parent–Child Interactions

Previous research demonstrating that TV exposure depresses the quality and quantity of parent–child interactions has generally used controlled laboratory experiments (e.g. Kirkorian et al., 2009; Lavigne et al., 2015; Nathanson, & Rasmussen, 2011; Pempek et al., 2011; Pempek et al., 2014), and contributions have mainly been restricted to (1) any immediate outcomes *during* TV viewing (Kirkorian et al., 2009; Lavigne et al., 2015; Nathanson, & Rasmussen, 2011; Pempek et al., 2011; Pempek et al., 2014) or (2) short-term outcomes

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immediately after TV viewing (Lavigne et al., 2015; Pempek et al., 2011). Thus, there is a

gap in the research regarding the long-term effects of TV viewing on the quality and quantity

of parent–child interaction. Beyond the scope of short- or long-term effects, previous research

has also – and to a greater extent – addressed *parent's* interaction qualities compared to

children's interaction qualities; hence, any findings have been, predominantly, related to the

adult's behaviour and contribution to the interactions (Grusec & Davidov, 2007; Loulis &

Kuczynski, 1997; Pardini, 2008). Although randomized controlled trials are more robust and

designed for inferring causal relationships, they have short-term practical value and are

seldom designed to address the long-term effects of TV exposure as assessed *beyond* and

after the viewing context. There is, thus, a need for research examining long-term effects, and

the present thesis adds to the literature by examining prospective associations between

children's TV viewing at age 4 and the quality of their interactions with their parents at age 6.

**Research Assessing the Effects of Co-using Interactive Media on Parent–Child
Interactions**

　　　　Policy makers have repeatedly encouraged parents to co-use or co-play interactive

media content with their children (American Academy of Pediatrics, 2018; Connell et al.,

2015). Co-playing is defined as: 'Social engagement with children while using touchscreen

apps and other interactive media' (Troseth et al., 2016, p. 56). The focus has shifted towards

the context of the media experience (parental co-viewing and active mediation) rather than

the child or the content. To date, only a few studies have examined the impact of parent–child

tablet gaming on parent–child interactions. This lack of research is partly because tablet

computers debuted more recently (in 2010), and it takes years to accumulate research data. In

an observational study using a grounded theory approach, Hiniker, Lee, Kientz and Radezky

(2018) investigated how parent–child pairs (with children ages 4–6) responded to each other

during shared tablet play. Their findings included that, during play sessions with tablets,

parents and children were less likely to engage with each other or respond to appeals for attention than during play sessions with traditional toys. Other studies have looked at the effects of co-playing video games on parent–child relationships. In Sheffield's (2014) study, parent–child relationships among dyads who played video games together were compared to those of parents and children who did not engage in co-playing video games. A slight negative correlation was identified between the frequency of co-play and the quality of the parent–child relationship. However, this differs from the findings of Coyne, Padilla-Walker, Stockdale and Day (2011); these researchers noted that both parent-reported and child-reported connectedness was higher when parents co-played video games with their children. Interestingly, this was particularly true in relation to girls who played age-appropriate games with a parent. Padilla-Walker, Coyne and Fraser (2012) suggested that co-play involves the shared interest of the parent and the child and, thereby, strengthens their relationship. Regularly engaging in co-playing video games by a father and child appeared to improve family functioning, thus indicating stronger relationships (Buswell, Zabriskie, Lundberg, & Hawkins, 2012). The limited body of literature addressing parent–child relationships through game co-playing indicates that co-playing may influence family relationships in positive as well as negative ways.

In addition (and as previously mentioned in the introduction to the thesis), research has examined parent–child interactions around joint tablet use and mainly investigated the effects of traditional versus electronic storybooks, producing somewhat mixed results. Since television, when viewed with a parent, has been proposed as a model for a *talking picture book* (Lemish & Rice, 1986), reading electronic storybooks will be addressed as an interactive activity along with toy play and joint tablet gaming. By way of example, when reading electronic books, parent–child dyads can interact with the environment (i.e. touch on objects and swipe for movement) and manipulate the story (changing it in some way)

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(Lauricella et al., 2014). Thus, children can engage and interact with their parents in ways similar to those used when they engage and interact in playing a traditional game or reading a print storybook. Therefore, I will next summarize research evaluating how parent–child dyads communicate with each other during electronic storybook reading.

Kim and Anderson's (2008) study results indicated that the overall parent-child talk was more complex during the reading of e-books compared to when they read the same book in print format. Moreover, Korat and Or (2010) observed that reading an electronic book yielded more discourse initiated by the child and increased responsiveness to maternal initiations compared to the printed-book context. In a more-neutral finding, Fisch, Shulman, Akerman and Levin (2002) found that reading e-books resulted in the same kinds of interactions observed when printed storybooks were read. Support for this finding was demonstrated by Lauricella et al. (2014), who reported that the quality of parental interactions was similar for many of the same variables following readings of traditional and electronic storybooks. In favour of traditional storybooks, Parish-Morris, Mahajan, Hirsh-Pasek, Golinkoff and Collins (2013) evaluated the form and content of parents and children's dialogue during shared book reading. They demonstrated that traditional books fostered more dialogical and content-focused reading than electronic books did, which showed more behaviour-related speech (commenting on illustrations). Krcmar and Cingel (2014) obtained broadly similar results. A more-recent experimental study showed that parents and children verbalized less and scored lower on collaboration when reading electronic storybooks compared to print storybooks (Munzer et al., 2019). In contrast, when provided with a modified dialogic reading setting with e-books, parents and children talked more and used more utterances and varied language compared to an unmodified reading setting with e-books (Troseth, Strouse, Flores, Stuckelman, & Johnson, 2020).

We may expect a higher level of parental scaffolding during more interactive and cognitively challenging tasks; this may be the case when co-playing a challenging game on a tablet computer. Wood et al. (2016) addressed the question of whether joint tablet gaming facilitates parental scaffolding by conducting an observational study of 104 parent–child dyads. The results demonstrated that mothers provided physical support (related to the functional use of tablet computers), verbal support (related to the content of the game), emotional verbal support (related to promoting encouragement) and emotional physical support (identified as physically touching the child) to a great extent during shared media activities. However, what the researchers considered 'great' is not well-defined because they did not include any experimental pre- and post-test groups as bases for comparison. Still, it will be valuable for future research to extend this work by assessing parent–child interactions during joint tablet gaming. Extant research also supports Wood et al.'s (2016) study by showing that parents use cognitive scaffolds (akin to what they define as verbal support) during children's interactions with tablets (Carr, 2017; Neumann, 2017; Neumann and Neumann, 2016). However, as children grew older, the amount of verbal and physical scaffolding parents provided decreased (Wood et al., 2016). Another study also found differences in scaffolding behaviour related to children's age. Neumann (2017) found a negative association between children's age and the level of technical scaffolding provided by the parent. A possible explanation is that parents provide higher levels of technical scaffolding to the youngest children, who have the fewest technical skills.

It is suggested that younger children require more scaffolding by parents (Carr, 2017; Neumann, 2017). Apparently, active scaffolding can influence toddlers' comprehension of media and potential for learning. Between 1 and 2 years of age, young children are able to learn content from media more readily with a co-viewing parent who explains the material presented (McClure, Chentsova-Dutton, Holochwost, Parrott, & Barr, 2017; Richert, Robb, &

Fender, 2010). We have not distinguished between various scaffolding techniques provided by parents in this work; however, we expect that parental scaffolding, in general, would be high because younger children require more scaffolding, and these strategies appear to facilitate their ability to learn from media.

Background and Main Aims

As the above-cited research demonstrates, electronic screen media (and, in particular, TV viewing) can have deleterious effects on the quality and quantity of family social interactions, which are vital for children's socio-emotional and language development. However, with the rapid development and marketing of innovative technologies with more interactive capabilities, there is a need for research assessing their effects on parent–child interactions. Admittedly, since this research field is still in its infancy, more information is needed regarding how parents and children behave during co-use of game-based educational apps. Future studies will be needed in order to keep pace with the emergence of new media technologies and to apply more longitudinal designs.

In Studies I and II, we applied a randomized controlled design to examine how TV co-viewing and tablet gaming (with traditional toy play as a contrast) predicted the quality and quantity of parent–child interactions in a laboratory setting (studying 2-year-olds and their mothers). In Study III, we employed a longitudinal design with a sample of 4-year-olds, retested at age 6. We examined whether (i) the total amount of TV viewing predicted the quality of children's behaviour and interactions towards their parents in a laboratory setting, and (ii) whether TV- viewing and such interactions were concurrently related at ages 4 and 6. In Study I and Study III, the outcome was the quality of parent–child interactions. In Study II, we measured the quantity of parent–child language interactions.

The aim of the current thesis is to examine how traditional media use (such as watching TV) versus interactive media use (such as tablet gaming) may affect parent–child interactions. Based on the prevalent data of previous research, we hypothesized that TV viewing would diminish the quality and quantity of parent–child interactions, whereas tablet gaming would have the opposite effect. The findings of the present inquiry may contribute to a deeper understanding of how various uses of media can have different effects on family

social interactions and, subsequently, shed some light on how potentially harmful effects of TV viewing may be moderated. Thus, the findings may provide a basis for enlightening and educating parents, policy makers, health care professionals and creators of children's e-games and TV shows about the effects of electronic screen use.

Research Hypotheses

Hypotheses for study I. Based on earlier findings (e.g. Lavigne et al., 2015; Nathanson & Rasmussen, 2011; Pempek, et al., 2011; Pempek et al., 2014), we predicted the presence of a negative association between TV viewing and emotional availability in the context of mother–child dyads.

H1: Mother–child dyads will have a lower *emotional availability* score during TV co-viewing than during toy play and joint play on a tablet.

Results from research on electronic storybook reading (Kim & Anderson, 2008; Korat & Or, 2010; Troseth et al., 2020), joint tablet gaming (Carr, 2017; Neumann, 2017; Neumann & Neumann, 2016; Wood et al., 2016) and joint video gaming (Buswell et al., 2012; Coyne et al., 2011; Padilla-Walker et al., 2012) on the quality of parent–child relationships are promising. Using this foundation as a backdrop, we hypothesized that mothers would be more engaged and interactive with their children during tablet gaming (Lauricella et al., 2015), thus providing more joint attention between the dyads (Christakis, 2014; Radesky et al., 2015), which, again, necessitates responsiveness and scaffolding (Christakis, 2014; Hustedt & Raver, 2002; Nathanson & Rasmussen, 2011). Carr (2017), Neumann (2017), Neuman and Neumann (2016) and Wood et al. (2016) also demonstrated that parents frequently used scaffolding behaviour during children's tablet activities. Moreover, since younger children (age 2) are more reliant on their parents to comprehend and understand media content (McClure et al., 2016; Richert et al., 2010), their parents may be more likely to

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engage with – and respond to – them in an attempt to transfer learning (by scaffolding interactions) contrary to older children (Neumann, 2017; Wood et al., 2016).

H2: Mothers will evince more *sensitivity* during shared tablet play than during toy play or TV co-viewing.

H3: Mothers will display a higher *structuring* during shared tablet play than during toy play or TV co-viewing.

There is a paucity of available data on problematic parental discipline during joint tablet gaming, such as intrusiveness and hostility; however, we predicted that mothers would be more hostile and intrusive due to the aroused and engaging experience of games/apps.

H4: Mothers will exhibit less *non-intrusiveness* during joint play with traditional toys than during joint tablet play or TV co-viewing.

H5: Mothers will exhibit less *non-hostility* during free toy play than during joint tablet play or TV co-viewing.

Hypotheses for study II. In line with research showing that TV viewing reduces the quantity of parent–child interactions (e.g., Brody et al., 1980; Christakis et al., 2009; Courage et al., 2010; Kirkorian et al., 2009; Lavigne et al., 2015; Mendelsohn et al., 2008; Nathanson & Ramussen, 2011; Pempek et al., 2011; Pempek et al., 2014; Soderstrom & Wittebolle, 2013), due either to its distractive nature or displacement of time, we expected the same results.

H1: The quantity of parent–child language interactions (number of adult words and number of child vocalizations) will be lower when co-viewing TV than during joint tablet play and toy play.

Although both; tablet gaming and traditional toy play are considered interactive and engaging contexts with the opportunity to increase parent-child interactions, noise-generating

electronic devices will most likely overwhelm human speech. We therefore expected a lower number of parent-child language interactions during tablet gaming.

H2: The quantity of parent–child language interactions (number of adult words and number of child vocalizations) will be higher during toy play than during tablet gaming.

Hypotheses for Study III. The origin of the hypotheses for Study III follows the same line of argument as reported in Study I.

H1: More TV viewing at age 4 will be cross-sectionally associated with less child responsiveness to parents and less child involvement with parents in play and interactions.

H2: More TV viewing at age 4 will predict less child responsiveness and involvement of parents at age 6, in addition to the effect of age 4 responsiveness and involvement.

Method

Participants and Recruitment

Study I and study II. A convenience sample was recruited in the spring/summer of 2013. An article summarizing our research was printed in the local daily newspaper (Midtbø, 2013) in Trondheim, Norway, which gave potential participants insights into our research and provided us with free advertising for our study. Most of the participants were recruited through this article, and the remaining participants were recruited from day-care centres in Trondheim where flyers were posted (after gaining approval from the administrator for each unit). After seeing a flyer or reading about the study in the newspaper, participants contacted the researcher to arrange a date and time to meet. All participants who contacted the researcher and expressed interest in the study fulfilled the inclusion criteria of no reported hearing or vision impairments in mother or child and an adequate level of proficiency in the Norwegian language for mothers. The last inclusion criterion was that all toddlers participating in the study be within 6 months of their second birthday at the time of enrolment.

Study I. Originally, there were 23 participants in the first study. However, as one of the research assistants who coded the data was familiar with one of the mothers, this mother–child dyad was excluded from the analysis. Therefore, the sample consisted of 22 mothers (M_{age} = 33.52 years, SD = 4.14, range 27–43 years) accompanied by their toddlers (14 boys, 8 girls, M_{age} = 24.90 months, SD = 3.56, range 19–30 months). About half of the children (n = 12) lived with at least one sibling at the time of the experiment. In addition, most mothers (n = 21) reported Norwegian as their native language, while one reported Spanish as her native language. The majority of children (n = 21) were living with both their birth mother and biological father. Mothers' educational achievement was generally high, as 4.5% reported having completed high school as their highest attained educational level; 31.8% reported

having a bachelor's degree; and 63.6% reported having a master's degree. Most mothers ($n =$ 21) reported that their children had prior knowledge about and experience with tablet computers at the outset of the study; however, most toddlers ($n = 20$) were unfamiliar with the specific game (City of Friends) and 18 were unfamiliar with the *City of Friends* TV series.

Study II. The sample included 23 children (9 girls and 14 boys, $M_{age} = 24.87$ months, $SD = 3.49$, range 19–30 months) and their mothers ($M_{age} = 33.27$ years, $SD = 4.21$, range 27–43 years). The sample comprised the same participants as Study I, adding back the previously excluded dyad because there were different coders for Study II.

Study III. The data in Study III were from the Trondheim Early Secure Study (TESS), which is a longitudinal study of children's socio-emotional development beginning at preschool age. All children born in 2003 and 2004 living with their parents in the city of Trondheim, Norway, were invited to participate in the TESS. To increase variability in this age-restricted sample, children with social, emotional, and behavioural problems were oversampled.

Recruitment of the TESS participants started at the municipal well-child clinics in Trondheim, which perform mandatory health check-ups for all 4-year-olds. Ahead of their scheduled appointments, a letter of invitation and the Strengths and Difficulties Questionnaire (SDQ) 4–16 version (Goodman, 1997) was sent to the homes of all children age 4. Parents brought the completed SDQ to their child's scheduled appointment for the community health check-up. A majority of the children and parents who were invited appeared for the check-up (97.2%), meaning that, in practice, the sample is a community sample. Parents who could not complete the SDQ because of insufficient proficiency in Norwegian were excluded from the study. Additionally, some parents were not informed about the study and, thus, were also excluded from any further testing.

The SDQ, which was used only as a basis for stratification, is a 31-item measurement of emotional and behavioural problems in children ages 4–18 years. The scores were divided into four strata using the cut-off ranges of 0–4 (44.2% of the population), 5–8 (29.5% of the population), 9–11 (18.5% of the population), and 12–40 (7.8% of the population). Higher scores are indicative of more behaviour difficulties in children. Using a random number generator, 38.1%, 49.1%, 71.4% and 89.2% of the children in strata 1, 2, 3 and 4, respectively, were asked to participate in a comprehensive study (assessing, among other items, children's TV viewing behaviour) within six weeks following the health check-up. Of the 1,250 children and parents selected, 995 (79.5%) attended the subsequent assessment at the university clinic (T1). The dropout rate from the recruiting phase to the interview phase did not differ across the four strata ($x^2 = 5.70$, $df = 3$, NS) or between genders ($x^2 = 0.23$, $df = 1$, NS). Two years later, the families were followed up (T2), and 795 children with parents attended. Figure X shows a flowchart of the sample recruitment. T1 testing occurred during 2007 and 2009, whereas T2 testing occurred during 2009–2011.

The sample was compared with register information from Statistics Norway on all parents of 4-year-olds in Trondheim in 2007 and 2008. Apart from significantly more divorced parents (7.6%) in the sample than in the rest of the population (2.1%), there were no differences in key demographic variables. Moreover, on several important indicators, the population of Trondheim is similar to the average in all of Norway. The average income earned per person is 99.5% of the national average; the employment rate is similar to the national rate; and 80.0% of the households consisted of two parents compared to a national average of 81.4% (Statistics Norway, 2010). In general, parents in the sample had a high educational level (6.7% had completed junior high school; 28.3% had completed senior high school; 39.8% had a bachelor's or other college degree and 24.7% had a master's degree or similar level of education) virtually identical to that of the general population of Norway. The

mean age of the children at the initial assessment (T1) was 4.4 years ($SD = 0.18$) and 6.7

years at follow-up (T2; $SD = 0.25$). Most of the children attended state-sponsored day care

centres at T1 (95.0%), and all were attending school at T2.

Setting and Apparatus

Study I and study II. A laboratory room with a playroom and an adjoining observation

room (separated by a one-way screen on the wall) were used to observe the mother–child

dyads interacting with each other. The sessions took place in the university clinic at the

Department of Psychology at the Norwegian University of Science and Technology (NTNU).

The playroom was arranged to look like an ordinary living room equipped with two chairs, a

small couch, coffee table, bookshelf, curtains in the window and paintings on the wall. A

basket held a set of age-appropriate toys, and there was also a stand with a TV (55-inch), a

DVD recorder, and an Apple iPad (model A1458). Two cameras were used to record each

session, a primary camera (Panasonic analogue surveillance camera) and a secondary

stationary camera (Canon Legria HFM52). The primary camera was installed in the ceiling of

the playroom in front of the room. To obtain an alternate angle, the stationary camera was

positioned on a wall-shelf right next to the television stand at the farther end of the room. The

primary camera was connected to a DVD recording deck that was operated by the researcher

in the observation room. From the observation room, the researcher was able to adjust the

angles of the camera and control the sound levels. Additionally, a highly advanced but

lightweight audio recorder, known as the LENA Digital Language Processor, was placed

inside a pocket that was sewn onto the mother's T-shirt (at chest level) for recording audio

data. The portable digital audio recorder was used because the technology is largely non-

invasive. All interactions were videotaped and recorded for later coding.

Study III. Although conducted in different years, Study III was administered in the same clinic and the same laboratory room equipped with the same furniture as in Study I.

Procedure

Study I and study II. Upon arrival, the dyads were offered a snack and a drink as the researcher explained the procedure. All parents were told that the purpose of the study was to assess family media use and social interactions during media use. No specific outcome measures were disclosed to the participants. The researcher instructed the dyads to behave and interact with each other as they normally would at home. When the mother agreed to participate and all necessary instructions were given, the dyads were escorted to the laboratory room to complete five experimental tasks without the researcher present. Each dyad participated in one 50-minute sequence, divided into 5 sessions, where each session lasted for 10 minutes. The researcher entered the room only to rearrange it, hand over the toys, switch the TV on and off, hand over the tablet, and turn the game on and off. Subsequently, whenever a new session started, the researcher immediately left the room and began to record the session from the adjoining observation room. A stopwatch was used to time the 10 minutes in each of the 5 sessions.

The 5 sessions consisted of: (1) a baseline (free toy play); (2) TV viewing or joint tablet gaming; half of the dyads viewed television first, and half used the tablet first; (3) post-TV/post-tablet (free toy play); (4) joint tablet gaming or TV viewing, depending on what media context the participants were assigned to in the second condition; and (5) post-tablet/post-TV (free toy play). The two post-media toy-play sessions (3 and 5) were used only to neutralize any potential carryover effects of the two media contexts (2 and 4); thus, we used the data only from the very first toy-play session (1) for comparison.

First, all participants completed the baseline session where they were instructed to play with the toys for 10 minutes. During the free toy-play session, the TV and tablet were turned off so that the dyad's attention could be directed towards the specific activity they were asked to do. In addition, the basket containing the toys was removed during exposure to the TV or tablet for the same reason. When the elapsed time had passed, the researcher entered the room, removed the toys and started the TV-viewing session or the tablet-exposure session. In the TV-viewing session, the dyads co-viewed an episode from the *City of Friends* show, whereas in the tablet-exposure session, the dyads played a game on a tablet based on the characters from the show. Moreover, after another 10 minutes of exposure to "City of Friends," the researcher re-entered the room and provided the dyad with the basket containing the toys for the free toy-play session. Afterwards, the dyads were asked to either play the tablet game or watch TV, depending upon which one they completed in the second session. When 10 minutes had passed, the researcher entered the room and started the last post-media session, consisting of free play with traditional toys for another 10 minutes. At the end of the 50 minutes, the researcher gave the dyads a debriefing and mothers were asked to complete a questionnaire regarding demographics and family media use at home. By participating in the study, all subjects had an opportunity to win an iPad after the study was conducted.

Study III. During the health check-up at age 4, the health nurse at the clinic informed parents about the goal of the study and obtained written informed consent. About two weeks later, parents were interviewed using the Preschool Age Psychiatric Assessment (PAPA; Egger et al., 2006), a semi-structured psychiatric interview about the child's (ages 2–6 years) mental health. This interview included questions about media use. Thereafter, a parent (84.8% mothers) and her child visited the university clinic for further testing and observation (T1). The parent was instructed to play with the child for 25 minutes during the videotaping. This sequence was divided into five parts (Eyberg, McDiarmid, Duke, & Boggs, 2005): free

play (10 minutes), child-led play (5 minutes), parent-led play (5 minutes), child clean-up (5 minutes maximum), and child waiting (i.e. not interacting with the parent) as the parent answered a questionnaire. The parent–child interactions in the videotapes were later coded according to the Emotional Availability Scale 4th edition (EAS) (Biringen, 2008). The EAS is further described in the measures section. Retesting took place at the same university clinic two years later (T2), following a similar procedure as T1.

Stimuli

Study I and study II.

TV. During the TV-viewing session, the participants watched a full-length episode of the *City of Friends* series. The episode was titled 'Jumpi's Big Balloon', and the running time was 10 minutes. *City of Friends* is an animated preschool television show originating from Norway, whose mission is to empower, entertain and educate children around the world in the form of edutainment' (*City of Friends,* n.d., para. 1). The show is based on characters with roles as police, firefighters, ambulance drivers, and other civic servants whose jobs are to serve the public. 'We strive to teach children the importance of community, friendship, cooperation, tolerance, problem solving and the understanding of these principles in a multi-cultural and gender-neutral environment' (*City of Friends,* n.d., para. 3).

Tablet. In the tablet session, the mother–child dyads played a game (City of Friends: Rock pocket AS) based on the characters from the show. The game was purchased from Apple's official app store on the Internet and downloaded to the tablet. The producers claim that the series is aimed at children between the ages of 2 and 6 years. Throughout the game, different interactive activities and items could be explored by the dyads by touching the objects on the screen. The dyads conducted multiple missions or activities, i.e. putting out fires, organizing a first-aid kit, flying a helicopter, solving a memory game and exploring

emergency vehicles. The dyads were encouraged to explore the different activities in the game and not to focus on only one activity.

Toys. The toys used in the play sessions were age-appropriate, gender-neutral traditional non-electronic toys. They were purchased specifically for the experiment. They included a small play kitchen, dinnerware and some food, two hand puppets (a dog and a cat), a truck, a doll, a puzzle, crayons in different colours and drawing paper, plastic animals, teddy bears, and a pail with a spade, sifter and rake. The dyads were encouraged to explore all the toys during these sessions.

Study III.

Toys. A basket of age-appropriate, non-electronic toys was provided (e.g. Duplo blocks, drawing materials, trucks, cars, blocks, action figures, dolls).

Measures

In this chapter, I will first review several commonly used instruments for the assessment of parent–child interactions. Notably, the emotional availability scale (EAS) will receive a significant amount of attention as it is an important measure for the thesis. By contrast, other measures will receive less attention; a brief description of their outcome domains and psychometric properties is presented.

In general, parent–child interactions as a construct capture the social interactions between primary caregivers and children, and in turn, are a prerequisite for socio-emotional development, whereas socio-emotional development assesses children's developmental outcomes to a greater degree than the dyadic relationship as a stand-alone. From this perspective, parent–child constructs are more delimited to capture the dyadic nature of the parent–child relationship as our primary interest is the ongoing dyadic interplay between mothers and children.

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Assessing parent–child interactions.

DPICS. The Dyadic Parent–Child Interaction Scale (DPICS) is an observational coding scheme intended for use in laboratory or in-home environments (Aspland & Gardner, 2003). Over the years, it has been revised as the DPICS II and, more recently, as the DPICS-R. Although it was originally developed for use with young children (ages 18–48 months), the age range has expanded to include school-aged children in recent years (Cotter, 2016). The coding sheet comprises a series of 28 categories used to evaluate the quality of parent–child interactions during brief structured tasks in the laboratory or unstructured free play when used in participants' home environments (Alonso, 2015). Moreover, it captures parent and child behaviours simultaneously and addresses the following verbal and physical behaviours: Acknowledgement, Information Description, Behavioural Description, Reflective Statement, Descriptive/Reflective Question, Information Question, Unlabelled Praise, Labelled Praise, Contingent Praise, Indirect Command, Direct Command, Criticism, Smart Talk, Play Talk, Laugh, Whine, Yell, Physical Positive, Destructive, Physical Negative, Compliance, Non-compliance, No Opportunity for Compliance, Answer, No Answer, No Opportunity to Answer, Warning and Time Out (Aspland & Gardner, 2003).

Interrater reliability was examined by Robinson and Eyberg (1981). Their study showed high levels of reliability for parent and child behaviours (a score over 90%), along with adequate concurrent validity from parental reports of child behaviours.

BCS. The Behavioural Coding Scheme (BCS) is an observational measure constructed for use in clinical and non-clinical settings (Aspland & Gardner, 2003). Further, it emphasizes assessing the quality of parent–child interactions and specific parent and child behaviours with children between the ages of 2 and 6 years (Mckee, Jones, Forehand, & Cuellar, 2013). The BCS has identified 10 sets of behaviours to be observed, five in regard to parents and five in regard to children. Parental behaviours include Command, Warning,

Question, Attend and Reward, while child behaviours comprise Compliance, Non-compliance, Inappropriate Behaviour, Appropriate Behaviour and Time Out (Aspland & Gardner, 2003).

The BCS has shown clinically acceptable levels of agreement between raters (over 70%) and has demonstrated sensitivity to changes following parent training interventions (Aspland & Gardner, 2003).

EAS. Emotional availability as a construct and the Emotional Availability Scale (EAS) have emerged from the early definition of emotional availability (EA) by Mahler et al. (1975) and captures the essence of Ainsworth et al.'s (1978) and Bowlby's (1969) theory of attachment between caregiver and child, and how their emotional communication relates to the development and maintenance of an attachment relationship.

The EAS is designed to obtain observational data on parent–child dyads in multiple contexts, including structured or unstructured play either at home or in a laboratory setting. Although the construct can be applied across the entire life span, the EAS has been clinically validated for use with children ages 0–14 years (Biringen & Easterbrooks, 2012). There are six components within the framework of the EAS that are geared towards describing the quality of the relationship between children and their primary caregivers (Biringen et al., 2014). This includes four dimensions assessing the caregivers' side of the relationship and two dimensions assessing the child's side of the relationship. Each dimension is further divided into underlying subscales rated on a 3- or 7-point scale, where a higher score (of 3 or 7) is always indicative of an optimal EA in a dyad (Biringen, 2008). Additionally, the adult dimensions are mutually related to the child dimensions and vice versa, thus implying that the scores from the adult can only be meaningfully assessed by looking at the scores from the child and vice versa.

Adult sensitivity focuses on the physical and emotional presence of an adult during the child's play and exploratory behaviour. The adult has to perceive and interpret the child's signals, and then use the child's emotional state to regulate his or her behaviour. Adult sensitivity comprises 7 subscales: Affect and Clarity of Perceptions comprise response options ranging from 1–7, whereas Timing, Flexibility and Creativity, Acceptance, Amount of Interaction and Conflict Situation comprise response options ranging from 1–3. Briefly summarized, a highly sensitive adult is positive, affective, and responsive when communicating and responds in a prompt, contingent, and accurate way, provides smooth transitions between activities and resolves conflicts in a calm and peaceful way, and is highly flexible, adaptive, and creative in play. *Adult structuring* is presented as verbal guidelines, suggestions, and supportive learning. Furthermore, although parents are structuring the relationship by clarifying rules and demanding respect, they allow the children to be autonomous and to explore. 'Adult structuring provides a framework by an "older and wiser" parent to a child, rather than a peer to another peer' (Biringen et al., 2014, p. 118). Adult structuring comprises seven subscales: Guidance and Suggestion and Successful Attempts are rated on a 7-point scale, and Amount of Structure, Limit Setting, Firm When Pressured, Verbal vs. Nonverbal and Peer vs. Adult Role are rated on a 3-point scale. A highly structuring adult scaffolds a child's learning during play and is successful in their attempts, is watchful of the environment and prevents accidents, and is firm and consistent even under stress. *Adult non-intrusiveness* involves a series of any non-intrusive behaviours, such as the lack of overstimulation, interference, and overprotection. Undermining a child's autonomy is also regarded as an intrusive behaviour. Additionally, because of young children's constantly growing minds and developing skills, the caregiver has to provide the child with age-appropriate materials to adjust to their needs. If parents buy toys for a 4-year-old that are intended for a 1-year-old, that would be considered intrusive as well. Adult non-intrusiveness

consists of the following seven subscales: Follows Child and Non-interruptive range from 1–7, whereas Commands, Talking, Didactic Teaching, Interference and Feels Intrusive range from 1–3. A highly non-intrusive adult follows the child's lead in play situations without interfering or becoming excessively involved, talks *with* the child and not *at* the child (in a lecturing and suppressive way), teaches and listens to the child and does not interfere verbally or physically. *Adult non-hostility* is about the absence of any hostile reactions towards the child manifested by showing impatience, discontent, boredom and/or anger. In addition, it is important to keep in mind that any conflicts with a partner/spouse or siblings in the background will impact the rankings of hostility. *Adult non-hostility* has seven subscales as well as the other dimensions: Lacks Negativity and Lack of Mocking are rated on a 7-point scale, and Lack of Separation Threats, Does Not Lose Cool, Frightening, Silence and Hostile Play Themes are rated on a 3-point scale. A highly non-hostile adult does not show any covert or overt signs of hostility, does not make disrespectful and/or mocking statements, and does not use 'the silent treatment' regularly in parenting. *Child responsiveness* focuses on the quality of the child's emotional and social reactions towards the parent's signalling and has the following subscales: Emotion Regulation and Responsiveness, which are rated on a 7-point scale, and Autonomy Seeking, Positive Positioning, Lack of Role Reversal, Lack of Avoidance and Task Oriented are rated on a 3-point scale. A highly responsive child is responsive to the adult's bid for attention, is explorative and autonomous, does not show any signs of parentified behaviours, and may ignore the parent when engrossed in play. *Child involvement* mirrors the child's attempts to involve the parent in the interaction or the ongoing play activity and includes 7 subscales: Simple Initiative and Elaborate Initiative have response options ranging from 1–7, and Use of Adult, Lack of Overinvolvement, Eye Contact, Verbal Involvement and Body Positioning range from 1–3. A highly involving child engages the adult in his or her play or interactions, uses the adult for emotional and playful

exchanges, and shows no signs of negative involvement of the parents through anxiety, anger and/or distress (Biringen, 2008).

The EAS and developmental outcomes. A large number of studies have applied the EAS to study caregivers' emotional availability on a variety of developmental outcomes for children. Several examples include maternal emotional availability and infant sleep quality (Teti et al., 2010); maternal emotional availability and children's conduct problems in school (Easterbrooks, Bureau, & Lyons-Ruth, 2012); maternal emotional availability and children's depressive symptoms (Easterbrooks et al., 2012); and emotional availability and affect regulation (Biringen et al., 2014). The EAS was developed to assess a wide array of socio-emotional conduct problems and competencies. In light of this, existing research has revealed that children whose mothers demonstrated lower levels of sensitivity and higher levels of intrusiveness and hostility displayed more disorganized attachment forms, which may potentially create externalizing behaviours in youth (Easterbrooks et al., 2012). Other research on emotional availability (EA) and children's functioning has focused on the associations between EA and infant emotion regulation. Din, Riddell and Gordner (2009) studied the relationship between the expression of pain in infants and EA during vaccination. This study pointed out that heightened levels of maternal non-intrusiveness predicted lower infant pain expression both immediately and one minute following the injection. In addition, maternal sensitivity and EAS as a whole were associated with lower infant pain expression both immediately and one minute following the injection. These findings suggest that maternal emotional availability can help infants to regulate their pain-related distress. In another study, Little and Carter (2005) examined a low SES minority group of 45 mother–infant dyads and revealed that more-optimal emotional availability in the dyads was associated with greater infant emotion regulation during an emotionally challenging task. Furthermore, greater maternal hostility was associated with poorer infant emotion regulation

during the task as well as in the post-condition following the task. In conjunction with emotional regulation, research has addressed other socio-emotional concepts linking EA to developmental outcomes. For instance, Harel, Eshel, Ganor and Scher (2002) theorized that emotional availability predicted infant self-recognition. The data reported here showed that optimal emotional availability in mother–child dyads at the age of 12 months predicted greater mirror self-recognition prospectively at the age of 20 months. It is also worth mentioning that, for preschool children, higher EA in mother–child relationships seem to buffer the adverse effects of life stress as operationalized in terms of internalizing and externalizing behaviours at school (Kang, 2005). Meanwhile, researchers interested in EA and it's associations with socio-cognitive understanding have examined the correlation between emotional availability and infants' perceptions of human actions. These researchers have reported that children whose mothers were more emotionally available had more accurate perceptions of human actions as goal-directed than children whose mothers were less emotionally available (Licata et al., 2013). Another investigation showed that early maternal sensitivity and structuring when children were 3 years of age were predictive of more-sophisticated peer play and pretend play and less peer rejection in prekindergarten at the age of 4 (Howes & Hong, 2008).

The EAS and its psychometric properties. The psychometric properties of the EAS have demonstrated good reliability and validity, along with cross-cultural validation. Moreover, the EAS can be used within large-scale national surveys of children's well-being.

Reliability. One study conducted with 52 mother–infant dyads during two home observations over a one-week period reported that both parameters of non-hostility and sensitivity yielded satisfactory intrarater reliability scores; these ranged from .79 for non-hostility and .92 for sensitivity (Bornstein, Gini, Suwalsky, Putnick, & Hayes, 2006). Satisfactory test-retest reliability, ranging from .76 –.96, was found in yet another study of 34

mothers and their 2-year-olds during both home and laboratory visits (a week apart) (Bornstein et al., 2006).

Validity. Several studies have attested to the association between the EAS and caregiver–child attachment (i.e. indicating convergent validity). Altenhofen, Sutherland and Biringen (2013) compared the association between the EA scales and mother-reported attachment. A sample of 114 young children, age 3 years, and their foster caregivers was enrolled for the study. The dyads were observed in several settings (play, clean-up, snack and questionnaires). The results of this study indicated the presence of convergent validity between maternal sensitivity, child responsiveness, child involvement and child attachment. An experimental study conducted in Israel by Ziv, Aviezer, Gini, Sagi and Koren-Karie (2000) of 687 mother–infant dyads (infants' age 12 months) also explored the convergent validity of the EAS compared to attachment security during an observational sequence in a laboratory setting. The authors reported the validity between the EAS and the concept of attachment security to be highly satisfactory; the study also contributed to the cross-cultural applicability of the EAS (Ziv et al., 2000). Others have studied the relationships between the EAS and caregivers' mental health or children's disabilities (Biringen et al., 2014), which may also provide indications of convergent validity. In a study including 45 preschool-aged boys with an autism spectrum disorder (ASD) and their mothers, a negative association between maternal psychological distress and maternal non-intrusiveness was found, indicating that depressed mothers showed comparatively high rates of intrusive behaviour towards their children (Dolev, Oppenheim, Koren-Karie, & Yirmiya, 2009). In another study by Pressman, Pipp-Siegel, Yoshinaga-Itano and Deas (1999) with 24 mother–child pairs enrolled (children ages 21–30 months), a significant correlation between maternal sensitivity and the linguistic abilities of children with deafness and hard-of-hearing (D/HH) disorders

was identified. Lower scores on sensitivity in hearing mothers predicted weaker language gains in D/HH children.

Study I and study III: The rationale for applying EAS. As chronicled in the Introduction, several aspects of parent–child interactions are theorized to promote children's socio-emotional and language development, and the child's contribution to the interaction should also be taken into consideration. The Emotional Availability Scale (EAS) captures these parent and child interactions and was, therefore, our method of choice. The EAS was developed in connection with the theoretical link between early attachment theory (Ainsworth et al., 1978) and emotional availability (Mahler et al., 1975) and used in the present inquiry. Notably, in the early operationalization of the concept of attachment, sensitivity was typically viewed as an individual trait of the mother (Biringen et al., 2014). However, children are not merely passive recipients of parental influences. It is also necessary to consider whether child behaviour contributes to and affects maternal behaviour. Thus, the EAS considers the emotional characteristics of the dyad in a holistic manner (Biringen et al., 2014) and provides two child dimensions in addition to the adult dimensions.

The Emotional Availability Scale (EAS) (Biringen, 2008; Biringen et al., 2014) describes and assesses six dimensions, with four on the adult side, namely sensitivity, structuring, nonintrusiveness, and nonhostility, and two on the child side, responsiveness to adult and involvement of adult. The EAS coding system enables the assessor to move through different levels in the evaluation of parent–child relationships to describe more global patterns of EA (each EA dimension is subdivided into several specific behaviours that are scored separately and added for a total score representing global-relationship quality) and to consider each EA dimension, or to focus more specifically on the basic components of each dimension (the subscales).

Another important aspect of the EAS framework is the parent's ability to structure the child's environment, by guiding and supporting the child's learning. Furthermore, the EAS can be observed across a broad developmental spectrum (Biringen, & Easterbrooks, 2012) (for more detailed information look under 'EAS and developmental outcomes' in the method section under 'Measures' and 'assessing parent-child interactions'). Previous relationship-based assessments are more prone to describe specific dyadic behaviour (like more behaviour-oriented systems such as DPICS) that may be influenced by cultural differences, rather than focusing on general dyadic behaviours. Finally, previous measurements are typically very age-restricted and involve children in a given age range; however, when studying dyads, it may be preferable to include children across a wider age range. Unlike many other tools, the EAS can be viewed as more flexible in application across age groups. The rationale for applying the EAS as an outcome measure is that it provides a comprehensive view of the mother–infant dyadic relationship with fine-grained details including affective states, synchrony, bids and responses, and quality of verbal and nonverbal responses.

Study I. Two independent and certified reliable coders rated all video recordings. Both assessors were postgraduate students in clinical psychology. In addition, both raters were unaware of the purpose of the present study and blind to the randomization of the participants to either the TV or the tablet condition. Furthermore, any transitions between the sessions, as well as when some of the participants had to use the bathroom, etc. were not part of the coding procedure. The interrater agreement was calculated on a sample of 22 cases with 5 conditions, whereas each session lasted for approximately 10 minutes. The interrater agreements were: adult sensitivity = .64, adult structuring = .61, adult non-intrusiveness = .64, adult non-hostility = .58, child responsiveness = .63, and child involvement = .65.

Study III. The EAS was also used in Study III. The videotapes at T1 were scored by six coders, and those at T2 were scored by eight coders (all coders were trained by the developers of the EAS). All coders were unaware of information about the families participating in the study. Furthermore, all coders provided scores of the participants' behaviour related to the EAS. Subsequently, 20% of the tapes were assessed by additional raters, who were blinded to the scores of the first coders. Group-based rating sessions were held regularly to monitor and prevent rater drift. Interrater reliability was quite low at T1, but improvements occurred at T2. At T1 and T2, respectively, the ICC were: adult sensitivity = .67/.71, adult structuring = .51/.70, adult non-intrusiveness = .59/.65, adult non-hostility = .51/.69, child responsiveness = .66/.63 and child involvement = .66/.61.

The amount of *TV viewing* was measured through an interview with the parents asking about children's 'active viewing' (whether the children are highly attentive to the screen or give it a large number of brief glances while engaged in other activities), assessed retrospectively over the last three months. Response options were provided in numbers of hours and minutes per day. *Parental co-viewing* was measured in numbers of hours per day using questions such as: On a typical day, how much time do you spend watching television with your child?

Gender. Gender was coded as 1=boy, 2=girl.

Parental SES was measured as the highest level of occupation among the parents at T1. Leaders and professionals were categorized as high SES, whereas farmers/fishermen, skilled and unskilled workers were categorized as low SES.

Assessing language development. Dyadic language interactions can be assessed in different ways and through controlled laboratory studies and uncontrolled field studies with questionnaires (Topping et al., 2013). However, lab-based measures may lack external validity, whereas home-based measures may lack internal validity. In addition, self-reported

measures might be biased due to subjectivity, and observations may fail to capture a representative amount of behavioural variability due to the limited time frame in which the observation takes place. The following section reviews some of the most widely used evaluation tools for early language development.

MB-CDI. The MacArthur-Bates Communicative Development Inventories (MB-CDI) are a standardized parent-report tool to track early language and communicative development. The inventories target children 8–30 months from 'early signs of comprehension, to their first nonverbal gestural signals, to the expansion of early vocabulary and the beginnings of grammar' (Fenson et al., p. 7). There are two forms; one is designed to evaluate receptive and expressive language, and the other is intended to measure expressive language only. Detailed information about the psychometrics of the MB-CDI can be found in Hutchins (2013) work.

PPVT. The Peabody Picture Vocabulary Test (PPVT) is an individually administered measure of receptive vocabulary developed for use with those ages 2½–90 years. The test is considered interactive as participants respond by pointing to or touching picture options. The examiner speaks a set of words, and the child/adult then selects one of four pictures that best describes the orally presented words. A fairly extensive discussion of its validity and reliability is included in its manual (see, for instance, Hayward, Phillips, Stewart, Norris, & Lovell, 2008).

Adult Word Counts (AWC) and Child Vocalization Counts (CVC). The aforementioned measurements represent a reasonable approach to the study of children's language development. However, for this thesis, the emphasis was on the amount of language input rather than language development scores, although input quantity might be associated with language development indirectly through its impact on vocabulary acquisition (Hart & Risley, 1995; Rowe, Leech, & Cabrera, 2017). With this in mind, we based our transcript on

a study assessing input quantity measures (Sosa, 2016), operationalized by the number of adult words (adult word counts or AWC) and the number of child vocalizations (child vocalization counts or CVC).

Study II. Due to the briefness of the interactions in Study II, we performed manual coding of all data relevant to our hypotheses instead of applying the LENA-generated data derived from the software. Clearly, the LENA data are not trustworthy in the context of short clinical observations (Xu et al., 2009). A hand-coder coded each of the 10-minute blocks (x3) in two separate passes. These included 23 recordings x 30 minutes of spoken adult words and child vocalizations across the three sessions (10 minutes for baseline/free toy play, 10 minutes for the TV-viewing session, and 10 minutes for the tablet-play session). Furthermore, the coder coded the data to align with the criteria for adult word counts and child vocalizations as applicable to the LENA (LENA Research Foundation, 2015). In addition, a second individual coded a random 20% sample to determine reliability. In the first pass, the coder transcribed all the adult words heard during the 10-minute blocks. In the second pass, the coder counted the numbers of words. The same procedure was performed for the child vocalizations.

Adult word counts (ICC=.67) were calculated as the amount of adult speech accessible to the key child during a given amount of time (LENA Research Foundation, 2015). Adults were given 'credit' for any well-formed words, utterances, and syllables they produced in proximity to the child, including 'goo-goo-dah-bah' or other strings of 'baby talk' where the parent is copying the child or producing enjoyable and encouraging sounds. In an effort to be consistent with the LENA parameters for the adult word counts, any adult words heard in the presence of other significant noise (including overlapping speech) were excluded. *Child vocalization counts* (ICC=.67) were calculated as the number of times the child vocalized, including the duration of the particular vocalization, followed by a pause lasting for 300

milliseconds (LENA Research Foundation, 2015). Speech-related utterances were defined as any sounds (produced by the child) identified as babble, words, and protophones, with the exception of fixed signals (e.g. screams, laughs, cries and moans) and body sounds (e.g. breaths, burps and sneezes; Gilkerson, Coulter, & Richards, 2008).

Statistical Analysis

Study I. A power analysis indicated that the minimum number of participants necessary to obtain significant differences with a power of .80, a significance level of .05 and an effect size of $F = .25$ was 21 participants (one group, five repeated measures, and a correlation of .5). All analyses were performed with IBM SPSS statistics version 24.0. Furthermore, six mixed-model analyses were performed for each dependent variable: adult sum, child sum, adult sensitivity, adult structuring, adult non-intrusiveness and adult non-hostility, adjusting for known prognostic variables (e.g. children's age and gender). In addition, we inserted individuals as random effects, the five sessions as categorical covariates, and raters as fixed effects.

Study II. A power analysis indicated that the minimum number of participants necessary to obtain significant differences with a power of .80, a significance level of .05 and an effect size of $F = .25$ was 21 subjects (one group, five repeated measures, and a correlation of .5). We performed two sets of separate mixed-model analyses using IBM SPSS statistics version 24.0. Each analysis addressed the separate study hypothesis based on the two dependent variables of *adult word counts* and *child vocalization counts*. Moreover, a fixed factor represented the five sessions (toy play, TV or tablet, toy play, tablet or TV, and toy play), while a random effect represented the individuals. Categorical covariates consisted of children's gender and age, and maternal education. Prior to performing the statistical

analyses, the assumptions for conducting linear mixed models were tested. None of the assumptions (e.g. normality of the residuals) were violated.

Study III. All analyses were performed using Mplus 7.41. version 8 (Muthén & Muthén, 1998–2017). The cross-sectional associations between TV viewing and child responsiveness and child involvement were assessed using multivariate regressions adjusted for parental SES and gender. The longitudinal associations between TV viewing and child responsiveness and child involvement were also assessed using multivariate regressions adjusted for demographics, child responsiveness and child involvement at T1. Because responsiveness and involvement were expected to correlate, they were entered in the same model. Hence, we conducted one cross-sectional multivariate regression with child responsiveness at T1 and child involvement at T1 as outcome variables, and TV viewing, parental SES and children's gender as predictor variables. At T2, we used child responsiveness and child involvement as the outcome variables and TV viewing, parental SES and children's gender along with child responsiveness and child involvement at T1 as predictor variables. Furthermore, missing values were resolved using full information maximum likelihood estimation (FIML). Because children with higher scores on the SDQ were oversampled (and those with low SDQ scores undersampled), to obtain correct population estimates, the results were weighted back with a factor corresponding to the number of children in the population in a particular stratum divided by the number of participants in that stratum. A robust maximum likelihood estimator was used, which produces the robust standard errors required because of the stratified sampling and is robust to deviation from normality.

Ethics

Undertaking research with children and young people has unique ethical challenges related to informed consent, confidentiality, protection and interactions. To address and overcome these challenges in the best ways possible, we recommended that the participating caregivers inform their children about the procedure and allow them to choose whether or not they wanted to participate. We also informed all participants in advance that those who agreed to take part would always be able to withdraw from the study at any time, and that this decision could be made by a child or caregiver.

Study I and Study II. Approval was obtained from the Norwegian Social Science Data Service prior to the participants' enrolment. Written informed consent was also obtained from the participants before conducting the experiments.

Study III. Written informed consent was obtained from all the parents, and the study was approved by the Regional Committee for Medical and Health Research, Mid-Norway.

Summary of Results

Study I. In Study I, we examined how co-viewing of a child-directed edutainment show and shared tablet play (with toy play as a contrast) influenced the quality of parent–child interactions as measured by the EAS. We hypothesized that mother–child emotional availability would decrease during TV co-viewing as opposed to toy play and joint tablet gaming. Six sets of linear mixed models were applied. We detected no significant differences between TV co-viewing when compared to toy play and shared tablet play: $\Delta^2 = 1.69$, CI [-0.94, 4.32], $p = .21$, $\Delta = -1.86$, CI [–4.49, 0.77], $p = .17$ for the EA adult sum score, and $\Delta = -0.64$, CI [–2.23, 0.94], $p = .42$ and $\Delta = -0.38$, CI [-1.97, 1.20], $p = .64$ for the EA child sum score. Furthermore, we predicted that adult sensitivity and adult structuring would be greater in the tablet context in contrast to the toy-play and the TV-viewing context. Our hypotheses were fully supported: Δ adult sensitivity = 1.29, CI [0.48, 2.09], $p = .002$, $\Delta = -1.19$, CI [-2.00, -0.38], $p = .004$ and Δ adult structuring = 1.24, CI [0.22, 2.26], $p = .017$, $\Delta = -1.09$, CI [-2.11, -0.08], $p = .035$. Lastly, we predicted that adult non-intrusiveness and adult non-hostility would be lower during play with traditional toys than during joint tablet play and TV co-viewing. Our results for non-intrusiveness were not consistent with the idea that parents may become overly involved and intrusive during joint play with traditional toys compared to shared tablet-play and TV co-viewing: Δ adult non-intrusiveness = .12, CI [-0.79, 1.03], $p = .80$, $\Delta = 0.83$, CI [-0.08, 1.75], $p = .073$. However, our results for non-hostility are consistent with the idea that parents may become more hostile during traditional play with their children and, hence, score lower on adult non-hostility during toy play as opposed to shared tablet play and TV co-viewing: Δ adult non-hostility = 0.90, CI [0.39, 1.42], $p = .001$, $\Delta = 0.62$, CI [0.10, 1.14], $p = .019$.

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[2] Estimated differences

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Study II. In Study II, we examined how co-viewing of a child-directed edutainment show and shared tablet play (with toy play as a contrast) influenced the quantity of mother–child language interactions as determined by human coders. Several mixed-model analyses were performed to analyze the participants' speech environment. First, we predicted that the quantity of mother–child language interactions would be lower during TV viewing as opposed to tablet gaming or toy play, and the results confirmed our predictions for all estimates: adult word counts: $\Delta = 0.54$, $p = .001$ and $\Delta = 0.54$, $p = .001$ and child vocalization counts: $\Delta = .13$, $p = .001$ and $\Delta = 0.17$, $p = .001$. Furthermore, we hypothesized that the quantity of mother–child language interactions would be higher during toy play than during tablet play. Surprisingly, our assumptions were not fully met. No significant differences were found between toy play and tablet play: $\Delta = -.001$, $p = .91$ on adult word counts. However, child vocalization counts were, as expected, higher during toy play than during tablet play: $\Delta = -0.15$, $p = .001$.

Study III. The structural equation analyses in Study III examined whether children's amounts of TV viewing at age 4 were related to the quality of their interactions and behaviours towards their parents at age 4 and later at age 6. We expected to find a negative correlation between children's amounts of TV viewing and their responsiveness to and involvement with their parents during play. Our results showed that children's amounts of TV viewing at age 4 were significantly associated with less child involvement with parents at age 4, even after controlling for demographics ($\beta = -0.10$, $p < .005$). However, this association was not observed longitudinally at age 6 ($\beta = -0.5$, $p > .005$). Moreover, children's amounts of TV viewing at age 4 did not predict child responsiveness either concurrently at the age of 4 ($\beta = -0.6$, $p > .005$) or longitudinally at the age of 6 ($\beta = -0.6$, $p > .005$).

Discussion

The aim of this thesis was to examine the effects of various media use (passive versus interactive media use) on the quality of parent–child interactions, as evaluated by means of the EAS (Biringen, 2008). We also evaluated the quantity of mother–child language interactions (AWC and CVC) as assessed by a human listener. The results of the research are summarized as follows:

- Mothers seemed to be more sensitive towards their toddlers during shared tablet play compared to play with traditional toys and TV co-viewing.

- Mothers proved to be more structuring during shared tablet play with their toddlers compared to play with traditional toys and TV co-viewing.

- Mothers seemed to be more hostile towards their children during play with traditional toys than during shared tablet play and TV co-viewing.

- We found no effects of co-viewing a child-directed edutainment TV show on the quality of mother–child interactions compared to toy play and playing a game on a tablet.

- The quantity of mother–child language interactions (including adult word counts and child vocalization counts) decreased during TV co-viewing compared to shared tablet play and play with traditional toys.

- There were no significant effects of toy play and tablet play on adult word counts. However, child vocalizations were more frequent during toy play than during tablet gaming.

- Children's total amounts of TV viewing at age 4 were negatively associated with their involvement with parents in communication and play (*child involvement*) at age 4. However, we found no association between children's total amounts of TV viewing at age 4 and their responsiveness *(child responsiveness)* towards their parents at age 4.

- We found no longitudinal effects of children's total amounts of TV viewing at age 4 on child involvement and child responsiveness at age 6.

The Effects of TV Co-viewing on Parent–Child Interactions

There has been much debate over the potential harms and benefits of children's TV viewing. However, a preponderance of research has been preoccupied with its alleged harmful effects, and one of the most basic of these is that TV viewing can exert deleterious effects on the quality and quantity of parent–child interactions (Christakis et al., 2009; Napier, 2014; Pempek et al., 2014). Yet other research has demonstrated that parental co-viewing can reduce potential negative effects of TV viewing on children's learning through high-quality parent–child interactions (Kirkorian et al., 2009; Lemish & Rice, 1984; Mendelsohn et al., 2010; Pempek et al., 2011; Strouse et al., 2013; Strouse & Troseth, 2014). Thus, positive effects of TV viewing can be amplified when parents watch TV with their children (Bickham, Wright, & Huston, 2001; Takeuchi & Stevens, 2011). Still, it is not the act of co-viewing itself that moderates the effects of TV exposure but rather the high-quality parent–child interactions that may occur during co-viewing (Gutnick, Robb, Takeuchi, & Kotler, 2011).

Our results from Study I and Study III showed no negative effects of television co-viewing on the quality of parent–child interactions, nor were there any positive effects of television co-viewing on the quality of these interactions. The lack of positive effects might be explained by the more passive, non-demanding and less-engaging nature of traditional television viewing (Bickham et al., 2001; Christakis, 2014; Valkenburg & Calvert, 2012) compared to the more interactive use of mobile media devices (Christakis, 2014), which presumably makes dyads less socially engaged and less expressive towards each other.

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With regards to Study II, the quantity of mother–child language interactions (adult word counts and child vocalization counts) was lower during co-viewing of a child-directed TV show compared to shared tablet play and joint toy play. With respect to Study III, our results showed that children who watched more TV at age 4 involved their parents less in their play situations at age 4 (compared to those who watched less TV), but when adding parental co-viewing into the analysis, the results showed no separate significant effect of parental co-viewing on child involvement. Recall that, in Study I, we found no effects of maternal co-viewing on the quality of mother–child interactions. The discrepancy between the results from Study II (regarding co-viewing) compared to those from Studies I and III may be attributed to TV sounds, which may interfere with verbal interactions during shared viewing and reduce the quantity of such interactions (Sosa, 2016). Based on this research, TV noise is likely to displace quantity interaction but not quality interaction. Clearly, the *City of Friends* show is characterized by active dialogue and much talking by the on-screen characters. If we had used a less talkative TV program, it might have given the dyads more opportunities to initiate conversations and, thereby, enhanced the overall word counts. Conversely, perhaps it is appropriate that parents spoke fewer words while watching TV because there was already a constant stream of speech from the TV; if parents talked a lot, it would be like talking over someone else. In addition, it is critical to consider the content of parents' speech and how it fits into the context of the activity.

As a final point, because about half the parents reported that they benefit from using TV as a babysitter when they need to do other chores around the house (Wartella et al., 2013), the beneficial effects of co-viewing might be restricted in real-world situations beyond the laboratory context. If TV is often used as a babysitter and not balanced with co-viewing parents and subsequent quality interactions, it is less likely to have any advantageous effects on parent–child interactions.

The Effects of Co-viewing Educational and Entertainment-based Child-Directed TV Shows on Parent–Child Interactions

One positive side effect of parental co-viewing is children's opportunities to learn from 'curriculum-based' TV shows (Kirkorian, Wartella, & Anderson, 2008). Curriculum-based programs, formerly known as educational child-directed programming, have been found to be related to high-quality parent–child interactions during exposure or immediately following exposure (Lavigne et al., 2015; Lemish & Rice, 1986; Pempek et al., 2011). In the early 1970s, TV producers, psychologists and researchers were brought together to create a program that would be entertaining and informative at the same time, and the result was *Sesame Street* (Fisch, 2004). Previous research has found a positive association between co-viewing *Sesame Street* and the quality of parent–child interactions (Lavigne et al., 2015; Lemish & Rice, 1986; Pempek et al., 2011). However, who is promoting the educational claims of other TV shows and whether these are legitimate is unknown. Additionally, claims of educational benefits should stem from robust scientific data and not from the producers of the shows or from parental perceptions. In recent years, we have learned that many of these claims have no basis in reality or empirical research (Lauricella, Blackwell, & Wartella, 2017).

In Study I, we found no effects of co-viewing an educational edutainment show on the quality of mother–child interactions during viewing. This is in contrast to what has been reported frequently by other studies focussing on educational media (Lavigne et al., 2015; Lemish & Rice, 1986; Pempek et al., 2011), albeit Pempek et al.'s (2011) results were obtained in a post-viewing session. One explanation for not finding a positive relationship here could be that we used an educational edutainment show and not a purely educational TV show, which might not be as closely related as theoretically implied. Kirkorian et al. (2008) reported that beneficial effects derive *only* from educational programming compared to entertainment programming. But what about the effects derived from programming that is

neither wholly educational nor wholly entertainment? Perhaps exposure to purely educational TV shows would have yielded more favourable outcomes because they are designed purposely to promote parent–child interactions (Pempek et al., 2011). Future studies need to consider the potential educational role of edutainment media, given its indistinct role in the current media landscape, and to provide deeper insights into the differences between educational- and edutainment-based TV shows' effects on family social interactions.

Here, we consider another plausible reason why no significant effects of co-viewing an educational edutainment show were found. The parents who took part in the study had a generally high level of education. Therefore, any negative effects of co-viewing edutainment programs (which are less likely to promote parent–child interactions) may have been attenuated since high SES parents are more likely to provide high-quality interactions regardless of whether a TV show is labelled educational, entertaining, or a combination of the two. By considering Vygotsky's (1978) theory on *adult scaffolding*, we may bridge the gap between negative and positive effects of co-viewing. In Study I, mothers appeared to be highly engaged in viewing content with their children and helping them understand the plot by asking questions, commenting on the storyline, and labelling on-screen characters or objects. In regard to the influence of immediate surroundings on the infant's and young child's development, Bronfenbrenner's ecological systems theory is one of the most often accepted explanations. Study I offer unambiguous and significant support for Bronfenbrenner's theory as the quality of the caregiving contexts within the microsystem (i.e. parent–child interactions during shared media activities) is posited to shape any developmental outcomes related to children's media use (Harrison, 2015). Family media ecology is also related to factors at the exosystem level. Both marital status and parents' educational levels indirectly shape children's media consumption (Anand & Krosnick, 2005; Cingel & Krcmar, 2013), including the prevalence of viewing well-designed educational (or

entertainment based) content, parental co-viewing practices and, thereby, the quality of parent–child interactions during joint media engagement.

A weakness of Study III is that we did not control for the type of TV show being watched or whether the viewing comprised background or foreground TV shows, thus confounding the data on viewing time. One might, therefore, presume that a variety of shows is being represented (in addition to adult-directed programming), which may mask a true association between TV viewing (especially if the content is foreground and educational) on the quality of parent–child interactions (as assessed through the emotional availability scales). Nevertheless, we contend that children's *active* TV exposure does not involve any form of background exposure, and for that reason, adult-directed TV shows are less likely to be a part of children's *active* TV watching. Surprisingly, considering that the type of TV show being watched in Study III is most likely to be foreground TV (educational or entertainment-based), there were no significant *single* effects of the total amount of parental co-viewing on the quality of parent–child interactions when children were 4 or 6 years of age, echoing the results from Study I. Recall that we found equivalent effects from watching an educational edutainment show in Study I and a mix of multiple categories (educational, entertainment, edutainment) in Study III. This calls into question whether co-viewing educational programs actually facilitates high-quality parent–child interactions because, if so, we should have found a more positive outcome in Study I compared to Study III. Seemingly, high-quality parent–child interactions may occur independently of whether children's TV shows are considered educational or non-educational (see Lavigne et al., 2015). Clearly, a plausible trigger might just be the presence of co-viewing parents who scaffold children's TV experiences regardless of the type of show presented. Moreover, there may be considerable overlap between educational TV programming and entertainment-based programming. This line of argument corroborates findings showing that entertainment-based TV shows can be just as effective in

regard to children's learning potential as educational TV shows when viewed with parents (Bickham et al., 2001; Lavigne et al., 2015).

However, if it is conceivable that 'high-quality interactions may occur independently of whether children's TV shows are considered educational or non-educational?' (Lavigne et al., 2015), why were more positive effects not identified in Studies I and III? The measurement instrument applied in Study III may be a weakness. Co-viewing was measured as 'time spent watching TV with children'; hence, what the parent and child actually do when they watch TV together is not addressed. Do they sit together in silence, or do they talk? This variable does not address whether active mediation took place. In addition, in theory, this variable can include adult-directed TV shows since we have not controlled for the type of television programs shown, which, in turn, can diminish any positive effects. Moreover, the moderate reliability of the EAS may have further attenuated any real effects of media use on parent–child interactions. In Study I, a weakness may be the actual duration of TV exposure. In earlier research (e.g. Lavigne et al., 2015; Pempek et al., 2011) documenting the positive outcomes of TV co-viewing for parent–child interaction, participants typically watched TV for an average of 30 minutes; in our study, they watched for only 10 minutes. It is possible that prolonged exposure will be more representative of interactions during TV viewing, and that quality will increase with time exposure. Finally, Study I considered TV watching versus toy play. The contrast in Study III is less TV and not other play themes. Differences could, therefore, be difficult to detect in Study I due to the less potent contrasts used.

In conclusion, children's TV shows merit greater attention, and future studies should more extensively address the impact of co-viewing educational versus less-educational TV shows on parent–child interactions.

The Effects of Tablet Gaming on Parent–Child Interactions

Although ample data exist on how TV viewing may have both positive and negative implications for optimal parent–child interactions, comparatively little is known about the effects of tablet gaming, with a few exceptions. Hiniker et al. (2018) showed that parent–child dyads were less engaged and responsive towards each other during joint tablet play compared to play with analogue toys, while Carr (2017), Neumann (2017), Neumann and Neumann (2016) and Wood et al. (2016) demonstrated that parents used a large number of scaffolding techniques during a joint tablet activity. Essentially, the question becomes: How does interactive, touchscreen use affect parent–child interactions compared to the more-passive use of TV or play with traditional toys? The results of Study I showed that adult caregivers were more sensitive and structuring in the tablet context compared to the toy-play and TV-viewing contexts, contradicting the findings of Hiniker et al. (2018) with respect to responsiveness. However, the children in their study were older (4–6 years), and that may explain why parents showed lower levels of responsiveness towards their children. Not surprisingly, it appears that parents display varying amounts of sensitivity, structuring and flexibility toward their children depending on their ages and developmental stages. Moreover, especially for the youngest children, having meaningful engagement with a tablet activity is largely dependent upon parental support (Carr, 2017; Neumann, 2017).

In addition, our results from Study I showed that adult caregivers were more hostile towards their children during an unstructured play situation (play with traditional toys) than during more-structured situations such as joint tablet play and TV co-viewing. The results of Study II showed that adult word counts did not decrease in the tablet context compared to the toy-play context, even though child vocalization counts decreased during tablet exposure. Our overall results demonstrate a tendency towards more-favourable outcomes for interactive media use in contrast to more-traditional media use. As highlighted previously, Wood et al.

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(2016) also showed that significant benefits may accrue from tablet games and that parents employ diverse scaffolding techniques to encourage and support their children during joint tablet use, adding to the findings of Carr (2017), Neumann (2017) and Neumann and Neumann (2016). The results presented herein spur new questions related to the effects of interactive media use, such as: What is it about tablet gaming that makes it so appealing? As a starting point, the *passivity hypothesis* highlights the notion that TV viewing has a more static nature, where consumers are digesting content in a passive way that requires little cognitive effort and active participation (Valkenburg & Calvert, 2012). Due to the many interactive applications easily accessible on mobile media devices, joint gaming on tablet computers is presumably making parents more engaged and interactive with their children (Lauricella et al., 2014), thus facilitating social interactions to a greater extent than when passively watching TV together. Second, it is also likely that the interactive aspects of joint gaming afford more joint attention between the members of the dyads (Christakis, 2014; Radesky et al., 2015), which again necessitates responsiveness and scaffolding (Christakis, 2014; Hustedt & Raver, 2002; Nathanson & Rasmussen, 2011). Third, in regard to the device's *portability* (Christakis, 2014), parents may be more likely to snuggle up on the couch with their children when using a tablet computer than when they are just sitting in the same room watching TV (Blanchard & Moore, 2010), hence resulting in increased physical proximity between parents and children and, thereby, more-optimal interactions. Fourth, tablets other features, such as 3-dimensionality, tailorability, flexibility and progressiveness (Christakis, 2014), signify interactive opportunities not applicable to linear TV viewing, thereby offering new areas for promoting learning and making the tablet device (through the use of interactive apps) more participatory for parents (Gutnick et al., 2011; Wood et al., 2016). Finally, the level of quality interactions might also depend on the content of the specific game/app. Very few studies have investigated the diversity of content, so further

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research should explore different types of games and tablet activities designed for various ages.

Disentangling the media form from the media content. It is difficult to disentangle the effects of tablet *content* (the City of Friends game) from the effects of the *nature* of tablets and their physical features. Typically, parents are teaching children how to use the device during shared use, but they are also helping them understand the content presented on the device (Neuman & Neuman, 2014; Troseth et al., 2016; Wood et al., 2016). Therefore, our findings might not be a result of the specific content presented per se or the subsequent parental scaffolding based on the content but rather a result of parental scaffolding techniques related to the functional use of the device. Clearly, simply figuring out how to use the device may add a challenge and, thus, lead to scaffolding by the parent.

Although an intuitive user interface (touch-and-swipe actions) should reduce the technical demands of the tablet device and increase attention to content, Wood et al. (2016) found that the types of scaffolding offered by parents during shared tablet use were predominated by physical support (teaching the child how to operate and navigate the tablet) and verbal support (helping children to understand content), although these declined as children grew older. Furthermore, older parents provided more verbal and physical support than younger parents did. Interestingly, even though the tablet is regarded as an intuitive device, parents still provide a significant amount of physical support (i.e. teaching children how to use the device; Wood et al., 2016). This finding, however, hardly explains any long-term effects of scaffolding because children are quick learners. More research is needed to distinguish between the *types* of scaffolding that parents provide during shared tablet use to better understand the difference between the nature of the technology and the content, and how the nature of parental scaffolding changes over time.

Joint tablet gaming may resemble traditional toy play. Christakis (2014) hypothesized that there would be minor differences between a traditional toy-play context and a tablet-play context. Shared tablet play may resemble play with traditional toys as both contexts provide opportunities for parents to interact with their children (Christakis, 2014). Our results seem to lend some support to this idea, demonstrating that parental sensitivity and structuring were greater during shared tablet play than play with traditional toys. However, the advantages of tablet gaming might exceed those of traditional toy play because it also provides parents with new opportunities to learn and engage with their children (Gutnick et al., 2011; Wood et al., 2016) compared to the more familiar and traditional context of toy play, and it may also add more challenges. Having said that, because we did not obtain any parental reports regarding children's familiarity with the analogue toys in Study I and Study II, any prior experiences with them might have influenced family verbal interactions. Traditional analogue toys are likely to be more familiar to parents and children than tablet games, making the latter novel and, thereby, more engaging as an activity. For instance, if parents and children were given a complex, age-appropriate, novel science toy (comparable in novelty and complexity to a tablet game), parental interaction with and support of their children around such toys might have matched or exceeded the interaction and support parents' expressed during use of the tablet game. Additionally, the results of Study I imply that mothers are more hostile towards their children during play with traditional toys compared to joint tablet play and television co-viewing. The reason for this outcome is likely to be that children are freer to misbehave (move around the room) in an unstructured situation, such as playing with traditional toys, potentially making their mothers more frustrated, angry and hostile in their attempts to discipline their children. Moreover, familiarity with the toys may have made the toy-play situation less challenging and less interesting for the children, leading them to misbehave more. Future research should aim at

matching complexity, challenge, and novelty between contexts to reduce the variability these differences create.

In addition to their benefits, mobile media devices have their share of impediments. Some research has claimed that parents perceive there to be great educational value related to children's use of mobile media devices and may, therefore, be more prone to withdraw from shared tablet use (Judge, Floyd, & Jeffs, 2015). It is fair to assume that parental co-use and high-quality interactions are scarce when children engage with a tablet computer outside the laboratory (Rideout, 2013), which is further strengthened by the Swedish Media Council, which gather statistics on young children's media use. In fact, Swedish parents of children ages 0-8 years reported being present with their children as they played games or used apps 44 % of the time (Swedish Media Council, 2017); that it's less than half the time they used to play games. Even though our results showed immediate positive implications for joint tablet gaming, they may not be generalizable to the natural setting of the family home. Nevertheless, parental co-use and active mediation might be related to socio-economic status (e.g. see Mendelsohn et al., 2008), and future research should aim to obtain information from parents on characteristics of parental co-viewing among different SES groups.

Short-term Effects of Media Use on Parent–Child Interactions

Ample research exists on the immediate and short-terms effect of TV exposure on parent–child interactions, and a comprehensive amount of research shows negative effects of TV viewing on family social interactions (Napier, 2014). Our findings detected no negative effects of TV exposure on the quality of mother–child interactions as measured by means of parental and child EA in Study I. In Study III, however, we found negative effects of parent–child interactions as measured by means of child EA and negative effects of TV exposure on the overall quantity of mother–child language interactions in Study II. The results found in

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Study II and Study III are consistent with previous research (Napier, 2014). The divergent results as reflected in the short-term outcomes of Study I and Study III might be due to the different designs, i.e. the controlled laboratory design versus the observational design. In the controlled laboratory design, the type of media content was identified, and parents were asked to co-view the TV show with their children, while no questions regarding media content were assessed through the interview rounds in Study III, and parents were not asked specifically to co-view the TV shows with their children. Exposure to a specific educational edutainment show (e.g. *City of Friends*) as shown in Study I might not affect child involvement in the same negative way as overall child-oriented TV exposure as measured in Study III. Nonetheless, it is more likely that the observational study (Study III) mimicked the dyads' viewing habits at home to a greater extent than the laboratory experiment did. Hence, the observational design implies greater external validity vis-à-vis naturalistic parent–child behaviour. Conspicuously, because we measured overall EA child scores in Study I (and did not differentiate between child responsiveness and child involvement), any positive scores on child responsiveness may have equalized any negative scores of child involvement. However, an additional analysis was performed splitting the two dimensions, and no effects of child involvement were evident.

In summary, if we combine the results from Studies II and III, there are, indeed, negative short-term effects of children's TV viewing on the involvement of their parents in communication and play, children's amount of speech directed towards their parents and parents' amount of speech directed towards their children. However, when adjusting for parental co-viewing in Study III, the independent effects of parental co-viewing on child involvement are not significant. Nonetheless, because media content is confounded with the context (the co-viewing and interactive behaviour of parents), it was not possible to distinguish between the independent effects of each (Christakis, 2009).

With respect to the results from Study I and Study II evaluating the effects of interactive media use on mother–child interactions, the findings illustrate that there are, indeed, positive short-term effects of shared tablet play on the quality and quantity of mother–child interactions. Mothers were more sensitive and structuring during joint tablet play (compared to toy play and TV viewing) in Study I, and there was no decrease in adult word counts during joint tablet play (compared to traditional toy play) in Study II, which is also a positive result as the opposite was hypothesized.

Long-term Effects of Children's TV Viewing on Parent–Child Interactions

Surprisingly, no studies assessing the long-term effects of TV viewing on the quality of parent–child interactions have been conducted. As a result, we employed a prospective community study to investigate whether the amount of TV viewing in two birth cohorts of children (born in 2003 and 2004) was negatively or positively related to their responsiveness towards their parents and their involvement of parents in play. Short-term effects may fade as soon as TV exposure ceases and may have no further negative consequences. Negative long-term effects may include parents' ability to be optimally sensitive and responsive to their children's needs and bids for attention.

In Study III, we found no long-term effects of children's total amounts of TV viewing at age 4 on their behaviour and interaction with their parents at age 6. However, other results may have appeared if we had reported the parental contributions (parental EA) together with the children's contributions (children's EA). The reason for not doing so was because we lacked additional information regarding amounts of parental TV viewing. Future studies must aim to replicate these findings but assess parents' amounts of TV viewing as well (Coyne et al., 2017) and the relationship between TV viewing and parental EA.

Strengths and Limitations

Overall, although the present research is limited by several methodological issues, it has provided a thorough contribution to the field of psychology, education and media. In addition, applying the Emotional Availability Scale in this sense is novel and interesting in the field of digital media research.

An important strength of Study I and Study II is the within-person design, which allows for more straightforward inferences about the potentially causal effects of media usage on mother–child interactions. One clear advantage is that we did not have to match the participants in the different groups; therefore, the conditions were always equivalent with regard to individual variances (Langdrigde, 2004). For instance, any factor that might have influenced the quality of mother–child interactions (e.g. sleep) was the same across all conditions. Additionally, randomizing participants to the two experimental conditions must be acknowledged as an advantage as it minimizes potential systematic variations (Langdridge, 2004). For instance, if all participants were exposed to the TV condition first (without counterbalancing for order effects), this may have changed their responses to the tablet condition and vice versa.

However, several caveats should be considered when evaluating these findings. First and foremost, the knowledge of being videotaped and audiorecorded could have resulted in artificially improved mother–child interactions due to social desirability (the tendency of people to behave in ways they feel are more socially desirable; Langdridge, 2004). Furthermore, real-world behaviours and events can be challenging to study in controlled experimental settings because it is difficult to compare experimental findings with normal situations. Clearly, this may influence the ecological validity of the study design and the generalizability of the findings (Langdridge, 2004). Another important limitation that pertains to Study I and Study II is that the sample was also quite homogeneous (based on the mothers'

educational attainment) and comprised only toddler-age children. Thus, it is unclear to what extent these effects can be generalized to families with older children and families from more-diverse socio-economic contexts. However, we aimed to obtain data from younger children as social interaction is of substantial significance to their developing minds. In addition, age-group selection was based on the child's ability to remain focused throughout the required amount of time following the laboratory procedures. Furthermore, measuring the effects of only one game and only one TV show is perhaps not representative of the diversity of all shows and games, and we might have obtained different results with other and perhaps more-complex games. However, young children's attention spans are limited, so long-running experiments for children might not be a worthwhile alternative. Further, because of the lack of evidence-based research to confirm that a particular TV show or a particular game or app labelled educational is, indeed, educational, concerns may be raised about which shows or apps researchers might select to obtain construct validity. In addition, our results may have been altered due to demand characteristics in Studies I and II. One might assume that volunteers are especially motivated to participate and that they will attempt to cooperate with the researcher in the best possible way. Thus, by guessing the purpose of the experiment and behaving accordingly, they might have influenced the outcomes, possibly improving interaction quality and quantity in our studies.

Another limitation to consider is that the media device (namely, TV versus tablet computer) was confounded with how the device was used (namely, passive viewing versus digital interaction). In this way, it is possible that improvements in the quality of mothers' behaviours were due to physical features of the tablets, such as the touchscreen, swipe navigation or increased physical proximity between parents and children. Because mothers and children were not asked to play interactive games on a TV or view TV programs on tablet computers, the current set of data cannot conclusively indicate that the changes in

mothers' behaviours were due to the extent to which the media required interactive participation. However, in the present studies, we were mainly interested in how these media devices are *typically* used in family homes (in 2013 when this study was conducted), and our research mirrors this use. Tablet computers were typically used for playing games and engaging with apps (facilitating their interactive use), whereas the TV set was typically used for passive watching. Nevertheless, because parents are less prone to co-use new technology such as tablet computers, there might be less interactive co-use of tablet computers in children's natural environments. Moreover, there might be a strong selection in regard to which parents facilitate the interactivity of the device (sitting down with the child, playing together, explaining content and asking contingent questions) and which do not.

The ultimate strength of Studies I and III is the standardized coding format measuring emotional availability in dyads, exerting a substantial advantage in maintaining validity. However, the reliability scores in Study III, particularly during T1, were quite low, thereby, having the potential to deflate the associations that we found and make it difficult to detect other potential associations.

A weakness of Study III is that we did not measure which TV programs were being watched during the interview rounds and whether this moderated the effect on parent–child interactions. Another limitation is that causal direction cannot be established for the association observed between the amount of TV viewing and child involvement: The cause and effect might be the other way around. For example, parents who put their 4-year-old children in front of the TV more often may differ in many ways from parents who do it less often. Parenting style may predict parents permitting their child to watch more TV as well as how they interact with their child and their child's affect and engagement with them in return. In addition, our results may have been biased by parental self-reports. When parents are asked to report how much TV their children watch, they typically underestimate the amount

of time due to social desirability as participants often answer in a way that they believe portrays themselves in a good light (Langdridge, 2004). However, a major strength regarding the study design is the large and representative community sample and the prospective design we employed. Moreover, given the prospective design, the effects of TV viewing on parent–child interactions could be examined both concurrently and longitudinally.

Conclusion

This project aimed to develop an overarching framework to explore how media use influences parent–child interactions during media exposure, as well as to study its long-term effects. This thesis has shown that there are more negative effects of passive TV use on parent–child interactions compared to the interactive use of tablet computers. Our findings indicated that the number of parent–child language interactions decreased during TV co-viewing as opposed to joint gaming on a tablet computer and play with traditional toys. In addition, we found that children who viewed more TV at the age of 4 were less likely to involve their parents in play and interactions at age 4 compared to children who viewed less TV. No longitudinal effects were found at the age of 6. However, we did not detect any negative effects of TV co-viewing on the quality of parent–child interactions.

We also found that mothers were more sensitive and structuring during joint gaming on a tablet compared to play with toys and TV co-viewing. In addition, we found no differences between the number of adult word counts during tablet play and toy play; hence, mothers' word counts were not influenced by the presence of electronic noises from a tablet computer.

Future research should further elucidate the social and educational benefits of TV viewing and using tablet computers. Parents typically view watching videos and playing games on a tablet as activities that children can do alone; furthermore, they do not necessarily believe that TV and tablets can be educational in the same ways that books are. Therefore, parents need more information regarding the benefits of TV co-viewing and joint tablet play so that they can identify the most optimal ways to use traditional and interactive media for educational purposes. In addition, future research should certainly confirm the educational objectives (or lack of educational objectives) of so-called educational media. Undoubtedly, future investigations are necessary to validate the kinds of conclusions that can be drawn from this study (but also other studies examining educational media materials).

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Papers

Paper I

Development and Aging

Parent–child interactions during traditional and interactive media settings: A pilot randomized control study

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Parent–child interactions are pivotal for children's socioemotional development, yet might suffer with increased attention to screen media, as research has suggested. In response, we hypothesized that parent–child play on a tablet computer, as representative of interactive media, would generate higher-quality parent–child interactions than toy play or watching TV. We examined the emotional availability of mothers and their 2-year-old child during the previous three contexts using a randomized crossover design (*n* = 22) in a laboratory room. Among other results, mothers were more sensitive and structuring during joint gaming on a tablet than when engaged in toy play or watching TV. In addition, mothers were more hostile toward their children during play with traditional toys than during joint tablet gaming and television co-viewing. Such findings provide new insights into the impact of new media on parent–child interactions, chiefly by demonstrating that interactive media devices such as tablets can afford growth-enhancing parent–child interactions.

Key words: Parent–child interactions, emotional availability, toy play, TV viewing, tablet, shared media use, joint attention.

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INTRODUCTION

The use of electronic media has increased dramatically among children in recent years (Silva, 2015). However, because parents arguably remain the most important socializing agents in young children's lives (Grusec & Davidov, 2007), questions have emerged regarding whether media exposure, by altering parent–child interactions, might indirectly affect child development. Research on media use and parent–child interactions has highlighted the potential adverse effects of TV exposure (Brody, Stoneman & Sanders, 1980; Christakis, Gilkerson, Richards *et al.*, 2009; Courage, Murphy, Goulding & Setliff, 2010; Kirkorian, Pempek, Murphy, Schmidt & Anderson, 2009; Lavigne, Hanson & Anderson, 2015; Mendelsohn, Berkule, Tomopoulos *et al.*, 2008; Nathanson & Rasmussen, 2011; Pempek, Kirkorian & Anderson, 2014). Nevertheless, research assessing the impact of new platforms such as mobile media devices and their potential benefits for quality parent–child interactions remains scarce. In response, we applied an experimental design to examine the possible effects of interactive computer tablet use – more specifically, joint tablet play – on interactions between mothers and their toddlers, compared to the effects of joint play with traditional toys and passively watching a child-oriented edutainment TV show.

A growing body of literature has reported lower-quality parent–child interactions when parents watch TV with their children than when the TV is off (Kirkorian *et al.*, 2009; Nathanson & Rasmussen, 2011; Pempek, Demers, Hanson, Kirkorian & Anderson, 2011; Pempek *et al.*, 2014). As part of quality care, high-quality parent–child interaction is pivotal to establishing secure attachments and is thus essential for the socioemotional development of children (Balbernie, 2013; Zeanah, Berlin & Boris, 2011). Anything that interferes with that process, including the use of screen media, can pose developmental disadvantages.

As such, it is critical to study factors, including parent–child interaction and media use, that might bear implications on further child development.

Parent–child interactions and children's socioemotional development: emotional availability

Researchers have highlighted a wide range of parenting and parent–child interaction constructs as being important to children's emotional, cognitive, and social development. Despite their differences, many of these constructs commonly stress the importance of sensitive, consistent parenting, which occurs when parents structure environments appropriate for children, set behavioral boundaries for them, afford them age-appropriate autonomy, and refrain from unnecessary intrusion, harshness, and hostility (Biringen, Derscheid, Vliegen, Closson & Easterbrooks, 2014). Coined by Mahler, Pine, and Bergman (1975) and developed by Ainsworth, Blehar, Waters, and Wall (1978), *emotional availability* (EA) refers to the quality of the relationship between a child and his or her caregiver. Biringen *et al.* (2014) further developed those authors' seminal contributions by arguing that four aspects on the parents' side of the relationship – adult sensitivity, adult structuring, adult non-intrusiveness, and adult non-hostility – as well as two on the children's side – child's responsiveness and child's involvement - adequately capture the parent–child interaction.

Adult sensitivity refers to the physical and emotional responsiveness of a parent to a child's physical and emotional signals. Research has suggested a link between parental responsiveness and children's later social development (Howe, 1995). By contrast, *adult structuring* refers to a parent's ability to guide, scaffold, and support a child's learning toward a higher level of understanding. The parent also operates the structure of

that relationship by setting rules for and demanding respect from the child. Meanwhile, *adult non-intrusiveness* refers to the ability of a parent to follow a child's lead during play without interfering or becoming overly involved in play. The aspect thereby reflects the parent's capacity to respect the child's autonomy and personal space. Lastly, *adult non-hostility* refers to the absence of a parent's covertly or overtly hostile responses toward the child, including raising his or her voice, appearing bored, or being impatient with the child.

On the child's side, *child responsiveness* refers to the child's emotional and social responsiveness to the parent's initiative behavior and involves both affected and appropriate behavioral responsiveness toward the parent. In contrast, *child involvement* refers to the child's ability to involve the parent in his or her play and interactions.

The role of context in parent–child interactions

Although researchers have claimed that parental sensitivity remains stable across different contexts (Ainsworth *et al.*, 1978; Bigelow, MacLean, Proctor, Myatt, Gillis & Power, 2010), studies have shown that different contexts can give rise to different interaction styles (Crain-Thoreson, Dahlin & Powell, 2001; Soderstrom & Wittebolle, 2013). More specifically, research has shown that the quality of parent–child interactions depends on the situation or type of activity (Courage *et al.*, 2010; Crain-Thoreson *et al.*, 2001; Fisch, Shulman, Akerman & Levin, 2010; Gros-Louis, West & King, 2016; Kirkorian *et al.*, 2009; Lauricella, Barr & Calvert, 2014; Lavigne *et al.*, 2015; Nathanson & Rasmussen, 2011; Pempek *et al.*, 2011; Wooldridge & Shapka, 2012). In the following subsections, we summarize the expected cognitive and communicative effects of the three situations we investigated - joint tablet play, toy play, and watching a film on TV -and their potential impacts on parent–child EA.

Joint tablet play. Research has shown that the demands of media devices likely influence how parents communicate with their children during shared media activities (Lauricella *et al.*, 2014). However, the cognitive engagement that joint tablet play requires might differ from the more passive watching of TV and could yield a more verbally rich communication style in which parents ask questions, provide labels, and repeat content to maximize the learning outcome for children. According to Vygotsky (1978), parents typically scaffold and assist their children's learning to a greater extent during more challenging tasks, which corresponds to Biringen *et al.*'s (2014) concept of adult structuring. Provided that the difficulty of the tablet game is age appropriate and that the task is engaging, scaffolding could be high, and certainly higher, during joint tablet play than during passive TV viewing. In their observational study, Wood, Petovski, Pasquale, Gottardo, Evans and Savage (2016) provided initial evidence that this speculation holds true by examining parental scaffolding during parent–child tablet use, and noted that parents provided a great deal of scaffolding when engaged with mobile technology.

Other aspects of parent–child activity are attention focusing and joint attention (i.e., paying attention to the same phenomenon), processes that aid responsiveness (Hustedt & Raver, 2010; Nathanson & Rasmussen, 2011). Moreover, because joint gaming

could give rise to more joint attention, given the interactive and collaborative nature of the platform task (Radesky, Schumacher & Zuckerman, 2015), joint tablet play could facilitate maternal sensitivity and structuring.

Toy play. Toy play offers an opportunity for parents to actively engage with their children, and such engagement is predictive of several positive outcomes (Nathanson & Rasmussen, 2011). To illustrate, Nathanson and Rasmussen (2011) showed that shared toy play elicited more maternal descriptions/affirmations and contingent responses compared to shared TV-viewing. However, the extent to which parents engage and interact with their children during joint play varies considerably, as does the communication style they adopt (Nathanson & Rasmussen, 2011). Researchers have found support for the idea that some parents become excessively involved in toy play by making comments that interrupt, redirect, or seek to control their child's behavior, which lowers the quality of the interactions (Nathanson & Rasmussen, 2011). Furthermore, because the context of toy play is less structured (Ginsburg, 2002) than joint tablet play, toy play could provide more opportunities for children to misbehave, thereby triggering non-optimal parent responses (Nathanson & Rasmussen, 2011). In support of that view, Hoff-Ginsberg (1991) found that among other kinds of activities, toy play situations had the highest frequency of behavioral directives from mothers, which represent non-optimal interaction styles in joint and free play situations. Moreover, Gros-Louis *et al.* (2016) reported that mothers were less responsive to children's utterances during toy play than during puppet play or book reading. Consequently, free toy play could reduce the likelihood of quality interactions between parents and children.

TV. Although not without dispute, researchers have typically defined TV as a passive medium, which can reduce the time available to engage in cognitively stimulating activities such as social interactions (Lee, 2008; Pempek *et al.*, 2011; Vandewater, Bickham & Lee, 2006) and explorative play (Schmidt, Pempek, Kirkorian, Lund & Anderson, 2008; Courage *et al.*, 2010). Accordingly, TV might function as an audiovisual distractor that alters parent–child interactions in family homes (Anderson & Pempek, 2005; Kirkorian *et al.*, 2009). A substantial body of literature supports the contention that TV viewing implies lower-quality parent–child interactions (Kirkorian *et al.*, 2009; Nathanson & Rasmussen, 2011; Pempek *et al.*, 2011, 2014), albeit with some exceptions (e.g., Lavigne *et al.*, 2015; Lemish & Rice, 1986; Strouse & Troseth, 2014). Therefore, we expected lower-quality interactions during parent–child TV viewing.

Overview of the study

Questions regarding media's negative effects on parent–child interactions are plentiful, and ample research shows the disadvantageous effects of TV viewing on the quality of parent–child interactions. However, we wanted to know what effects new media such as tablets would have. How do tablets form and influence family social interactions during joint tablet gaming? Since social interactions vary across contexts and types of activities, to investigate the impact of new interactive media on

the quality of parent–child interactions we examined the EA of parents and children using a randomized crossover design with five sessions, in the following order: free toy play, TV viewing or tablet play, free toy play, tablet play or TV-viewing, and free toy play.

Because we found theoretical support *only* for the EA adult sub-factors, we did not include any EA child sub-factors in our analyses. However, because researchers have shown that TV viewing reduces the quality of all types of family interactions and children's interactions with parents (Brody *et al.*, 1980; Kirkorian *et al.*, 2009), our hypotheses addressed children's overall EA (both sub-factors added together). Also, researchers have proposed that caregivers tend to be more intrusive and hostile in unstructured play situations with their children than in structured ones (Hoff-Ginsberg, 1991; Nathanson & Rasmussen, 2011). Consequently, it is reasonable to assume that adult non-intrusiveness and non-hostility will be lower during toy play, as opposed to joint play on a tablet computer and TV-viewing.

Hence, five hypotheses emerged from our review of theoretical and empirical literature. First, we predicted that mothers and children would have lower overall EA when watching TV together than when engaging in free toy play or joint tablet play. Second and third, we hypothesized that adult sensitivity and adult structuring would be greater during an interactive tablet task than during free toy play and TV viewing. Fourth and fifth, we expected that non-intrusiveness and non-hostility would be lower during free toy play than during joint tablet play and TV-viewing.

METHOD

Participants and recruitment

The Norwegian Social Data Service approved the study prior to the enrollment of participants. We recruited participants primarily via a local daily newspaper, and announced the study in fliers posted at daycare centers in Trondheim, Norway, where we conducted our study. Inclusion criteria required participants to be Norwegian-speaking, with a child 2 years old (+/– 6 months), and to have no reported hearing or vision impairments. The motivation for including two year olds (and not older children) was to compare our results with those of Lavigne *et al.* (2015) and Pempek *et al.* (2011).

Although our initial sample consisted of 23 mother–child dyads, one dyad was ineligible for the study due to the mother's pre-existing relationship with two raters. We therefore excluded that dyad from further analysis, which left a sample of 22 mothers (M_{age} = 33.52 years, SD = 4.14, range 27–43 years) and one for each of their children (14 boys, 8 girls, M_{age} = 24.90 months, SD = 3.56, range 19–30 months). A total of 12 toddlers had one or more siblings. Most mothers (n = 21) reported that their first language was Norwegian, whereas one identified Spanish as the first language in her family. The majority (n = 21) of the children lived with both biological parents. The mothers' education ranged from 1 "Did not complete primary school" to 5 "higher university degree" (M = 4.62, SD = 0.59). Most mothers (n = 21) reported that their children were familiar with the use of tablets; only two toddlers were familiar with the specific app game we used in our

experiment (i.e., *City of Friends*), and the minority of the children were unfamiliar with the *City of Friends* TV show we used (n = 4).

Setting and apparatus

We used two rooms for the experiment: a playroom and an adjoining observation room separated by a one-way screen. We arranged the playroom to resemble an ordinary living room in a typical household. A basket containing a set of age-appropriate toys was available for the three play sessions.

Procedure

The dyads participated by completing one 50-minute visit at the laboratory, consisting of five sessions: (1) free toy play (baseline); (2) either TV or tablet; (3) free toy play; (4) either tablet or TV; and (5) free toy play. We only used the toy play at the baseline (free toy play) context (1) in our hypotheses. It is not unreasonable to expect interactions between parent and child to have effects on later interactions. Thus, interactional patterns during, for instance, tablet use may influence interactions also immediately following the tablet use. The two post-experimental, media-free, toy play contexts ((3) and (5)) were therefore used to neutralize any carryover effects derived from the two media contexts. Furthermore, due to order effects (seeing the same toys three different times and their novelty wearing off), it is not appropriate to treat the 1st toy play the same as the 2nd and 3rd.

We informed all mothers that the purpose of the study was to assess family media use and family communication patterns around media use, but did not inform them about any specific outcome measures. The experimenter underscored to the mothers the importance of behaving and interacting with their children as they normally would at home. Once we obtained the written informed consent from the mother and issued instructions, the experimenter left the mother–child dyad in the playroom and began to record the sessions in the observation room. During TV viewing and tablet play, we temporarily removed the toys so the dyad would focus on the media content. For the same reasons, we turned off the TV and tablet during toy play.

We assigned dyads to spend the first 10 min during toy play interacting with the toys from the basket. After 10 min of toy play, the experimenter entered the room, removed the toys, and assigned the dyad to one of two experimental sessions. Prior to laboratory observations, we used a randomly ordered list of all participants to assign every other participant to one of the two conditions. In the first session, the experimenter turned the TV on and the participants completed an entire episode from the series *City of Friends*. In the other session, the experimenter turned the tablet on and instructed the dyad to play a game involving characters from *City of Friends*. In both sessions, the experimenter left the room once the activity commenced. After 10 min of exposure to the media materials, the experimenter re-entered the room, turned off the TV or tablet, returned the basket of toys to the dyad, and left the room, at which point another toy play session (i.e., first post-experimental session) began. After another 10 min, the experimenter again re-entered the room, removed the basket of toys, introduced the dyad to the second experimental session with the other media not used during the

first experimental session, and again left them alone for 10 min. In the last condition, we again instructed the dyad to play with the toys for another 10 min in the final toy play session (i.e., second post-experimental session). At the end of 50 min, we asked the mother to complete a short questionnaire about demographics and media use at home, after which the experimenter debriefed the mother. By participating in the study, all participants had an equal chance to win a new iPad.

Stimuli

During TV viewing, the mother–child dyads watched a complete 10-min episode of the animated TV series *City of Friends* – namely, "Jumpi's Big Balloon" – which presented a novel TV concept to most of the children ($n = 18$). According to its producers, *City of Friends* targets children aged 2–6 years and represents educational entertainment (edutainment), which seeks to both entertain and educate viewers. The TV show had audio content in Norwegian.

During joint tablet play, the dyads played the game *City of Friends: Rock Pocket AS*, which involves characters from *City of Friends* and was novel to most of the participating children ($n = 19$). The game is appropriate for children aged 2–6 years, according to its producers, and contains interactive activities that the dyads could explore by touching virtual objects with their fingers. For example, the dyads extinguished a fire, solved a memory puzzle, played with emergency vehicles, flew a helicopter, and put first aid equipment in its corresponding outlines. We encouraged the mothers to explore all the different activities in the game. As with the TV show, the app game also had audio content in Norwegian.

During toy play, the dyads used the same set of traditional, non-electronic 3D toys for all three sessions. We encouraged the mothers to play with all the toys, which had been purchased in different toyshops. The toys were age appropriate and gender neutral to the children participating in the study and consisted of a diner-kit with an oven and some food, a truck and a doll, a puzzle, two hand puppets (a dog and a cat), crayons in different colors with drawing paper, plastic animals, teddy bears, and a pail with an accompanying spade, sifter, and rake.

Measures

Emotional availability. We used Biringen, Robinson and Emde's (1998) Emotional Availability scale (EAS) to examine the quality of parent–child interactions in all laboratory sessions. The four caregiver components in the EAS are adult sensitivity, adult structuring, adult non-intrusiveness, and adult non-hostility, whereas the two child components are the child's responsiveness to the adult and the child's involvement with the adult. Users measure each component according to the sum of seven subscales, using either a seven-category (i.e., two subscales) or three-category scale (i.e., five subscales), ranging from low to high parenting quality. On all scales, higher scores indicate a more optimal EA in the dyad.

Adult sensitivity (ICC = 0.64) comprises "affect" and "clarity of perceptions," both judged on a seven-point scale, and "timing," "flexibility," "acceptance," "amount of interaction," and "conflict

situations," all judged on a three-point scale, whereas *adult structuring* (ICC = 0.61) consists of "guidance and suggestions" and "successful attempts," both rated on a seven-point scale, and "amount of structure," "limit setting," "firm when pressured," "verbal versus non-verbal," and "peer versus adult role," all rated on a three-point scale. Next, *adult non-intrusiveness* (ICC = 0.64) comprises the categories "follows child" and "non-interruptive," rated on a seven-point scale, and "commands," "talking," "didactic teaching," "interferences," and "feel intrusive," rated on a three-point scale. *Adult non-hostility* (ICC = 0.58) encompasses the dimensions "lacks negativity" and "lack of mocking," both judged on a seven-point scale, and "lack of separation threats," "does not lose cool," "frightening," "silence," and "hostile play themes," judged on a three-point scale. *Child responsiveness* (ICC = 0.63) consists of "emotion regulation" and "responsiveness," both coded on a seven-point scale, and "autonomy seeking," "positive positioning," "lack of role reversal," "lack of avoidance," and "task-oriented," all coded on a three-point scale. Lastly, *child involvement* (ICC = 0.65) includes "simple initiative" and "elaborate initiative," judged on a seven-point scale, and "use of adult," "lack of overinvolvement," "eye-contact," "verbal involvement," and "body positioning," all judged on a three-point scale.

Two experienced EAS coders, blind to all information about the families and naïve to the hypotheses, both coded all instances of the target behavior. Transitions between conditions were not coded (please note that these were very brief). The coding started immediately after the experimenter left the room and the dyads started the task. We report information about inter-rater reliability in the Measures subsection above.

Demographic information. Mothers completed a questionnaire about demographic information, including their gender, age, occupation, and native language, as well as their participating child's age, gender, number of siblings, media habits, and status of living with both biological parents or not.

Statistical analysis

We calculated sample size by assuming an effect size of $f = 0.25$ for one group with five repeated measurements and correlation of 0.5. The total sample size was 21 participants, for 80% power with a significance level of $\alpha = 0.05$.

We used linear mixed models with individuals as random effects, the five conditions as categorical covariates, and raters as fixed effects. The dependent variables were the following dimensions of the EAS, each run one at a time: adult sum, child sum, adult sensitivity, and adult structuring. We adjusted all analyses for child's age and gender (Vittinghoff, Glidden, Shiboski & McCulloch, 2012). Statistical analyses were performed with SPSS version 24 (IBM, Armonk, NY).

RESULTS

In all, we evaluated 22 mother–child dyads in three conditions with two raters. Table 1 presents descriptive statistics for the 220 recorded values of EA dimensions in the different conditions. The variance components (reported as SD) in the mixed models are shown in Table 2. Concerning demographic variables, no

significant results emerged when we tested the effects of children's age and gender on the dependent variables.

We hypothesized that the overall EA adult and child sum scores would be lower for TV viewing than for toy play and joint tablet play. However, as Figs. 1 and 2 reveal, no such statistically significant difference emerged. For the EA adult sum: toy play versus TV $\Delta_{\text{EA Adult}} = 1.69$, CI (–0.94 to 4.32), $p = 0.21$, tablet versus TV $\Delta_{\text{EA Adult}} = -1.86$, CI (–4.49 to 0.77), $p = 0.17$. For the EA child sum: toy play versus TV $\Delta_{\text{EA Child}} = -0.64$, CI (–2.23 to 0.94), $p = 0.42$, tablet versus TV $\Delta_{\text{EA Child}} = -0.38$, CI (–1.97 to 1.20), respectively.

We also hypothesized that EA adult sensitivity and structuring would be higher for joint tablet play than for toy play and TV viewing. Figures 3 and 4 illustrate the impact of interactive context on sensitivity and structuring, and, as shown, the results supported our hypotheses. EA adult sensitivity: toy play versus tablet $\Delta_{\text{EA Adult Sensitivity}} = 1.29$, CI (0.48 to 2.09), $p = 0.002$, tablet versus TV $\Delta_{\text{EA Adult Sensitivity}} = -1.19$, CI (–2.00 to –0.38), $p = 0.004$. EA adult structuring: toy play versus tablet $\Delta_{\text{EA Adult Structuring}} = 1.24$, CI (0.22 to 2.26), $p = 0.017$, tablet versus TV $\Delta_{\text{EA Adult Structuring}} = -1.09$, CI (–2.11 to –0.08), $p = 0.035$, respectively. The effect of both toy play and TV viewing were negative compared to joint tablet play, which implies that adult sensitivity and structuring were higher during joint tablet play than in the two play situations. Lastly, we hypothesized that EA adult non-intrusiveness and non-hostility would be lower (note that lower scores are considered non-optimal) during free toy play as opposed to shared tablet play and television co-viewing. Our results show that EA non-intrusiveness did not vary significantly across conditions. EA adult non-intrusiveness: toy play versus tablet $\Delta_{\text{EA Adult Non-Intrusiveness}} = 0.12$, CI (–0.79 to 1.03), $p = 0.80$, toy play versus TV $\Delta_{\text{EA Adult Non-Intrusiveness}} = 0.83$, CI (–0.08 to 1.75), $p = 0.073$ (see Fig. 5). However, with regards to non-hostility, the results supported our hypothesis, showing that non-hostility is in fact lower during joint toy play than during joint gaming on a tablet computer and television co-viewing. EA adult non-hostility: toy play versus tablet $\Delta_{\text{EA Adult Non-Hostility}} = 0.90$, CI (0.39 to 1.42), $p = 0.001$, toy play versus TV $\Delta_{\text{EA Adult Non-Hostility}} = 0.62$, CI (0.10 to 1.14), $p = 0.019$ (Fig. 6). This illustrates that mothers are more likely to act hostile toward their children during less structured activities such as free toy play.

DISCUSSION

We wanted to identify the extent to which new electronic media – specifically, tablets – affect the quality of parent–child

Table 2. *The variance components (reported as SD) in the mixed models*

Dependent variable	Between dyad	Within dyad
EA adult sum	5.18	6.11
EA child sum	3.12	3.68
EA adult sensitivity	1.38	1.87
EA adult structuring	1.67	2.37
EA adult nonintrusiveness	1.98	2.12
EA adult nonhostility	0.59	1.20

interactions. Given the paucity of research on how electronic media affect children's development, we investigated whether the EA of the mother and child differed during joint tablet play, toy play, and TV viewing by way of a randomized crossover design. We hypothesized and found support for the idea that mothers are more sensitive and structuring during joint gaming on a tablet than during toy play or TV viewing. Such findings provide new insights into the relationship between media exposure and parent–child interactions, primarily by illustrating that interactive media devices such as tablet computers can bear a positive impact on parent–child interactions. Although a substantial body of research has documented that TV viewing is associated with lower-quality parent–child interactions, because the quality of parent–child interaction was as good during TV viewing as during toy play, our results indicate that TV viewing might not be as detrimental to parent–child interactions as previously reported.

TV VIEWING AND EMOTIONAL AVAILABILITY

Although we hypothesized that the EA of parents and children would be lower as they watched an edutainment TV series than during toy play and joint tablet play, we found no support for that hypothesis. Interestingly, our result does not mirror findings from studies showing that TV reduces the quality of parent–child interactions (Kirkorian *et al.*, 2009; Nathanson & Rasmussen, 2011; Pempek *et al.*, 2011, 2014). It is possible that our unexpected finding stems from the way in which parents communicate while watching TV with their children; the negative effects of watching TV can decrease when parents and children watch TV together, provided that parents verbally elaborate what is happening on the screen (Kirkorian *et al.*, 2009; Mendelsohn, Brockmeyer, Dreyer, Fierman, Berkule-Silberman & Tomopoulos, 2010; Pempek *et al.*, 2011). The absence of any negative effects of watching TV could stem from the fact that parents are more prone to scaffold children's learning from the screen during a child-oriented edutainment show such as *City of Friends*, which

Table 1. *Means and standard deviations of EA variables in Toy play, Tablet and Television (N=22+22=44 because of two raters)*

Mean (SD)	Toy play	Tablet	Television
Adult sensitivity	24.89 (2.14)	26.18 (1.85)	24.57 (2.75)
Adult structuring	24.05 (3.14)	25.27 (2.28)	23.95 (3.40)
Adult non-intrusiveness	25.25 (2.95)	25.48 (2.54)	24.56 (3.47)
Adult non-hostility	27.18 (1.40)	28.14 (1.03)	27.14 (1.58)
Child responsiveness	25.27 (2.68)	25.64 (2.25)	24.86 (3.00)
Child involvement	25.00 (2.21)	24.43 (2.56)	24.70 (3.10)
EA adult sum	101.36 (7.60)	105.07 (6.66)	100.22 (9.94)
EA child sum	50.27 (4.55)	50.07 (4.58)	49.57 (5.90)

Fig. 1. Adult sum (adults' overall emotional availability scores). Estimated marginal mean from a linear mixed model. P-values and estimated differences (Δ) corresponding to the relevant hypotheses are marked in the figure.
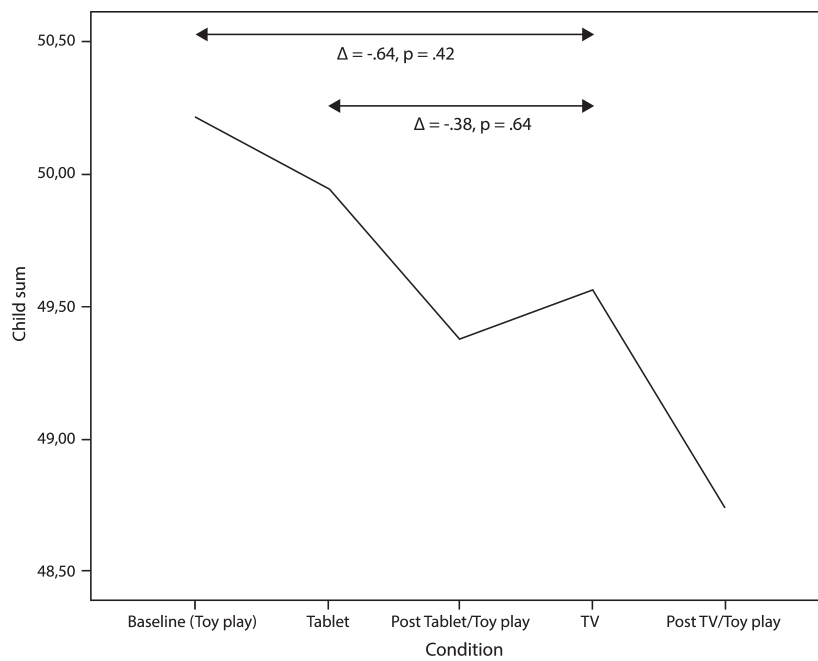
Fig. 2. Child sum (children's overall emotional availability scores). Estimated marginal mean from a linear mixed model. P-values and estimated differences (Δ) corresponding to the relevant hypotheses are marked in the figure.
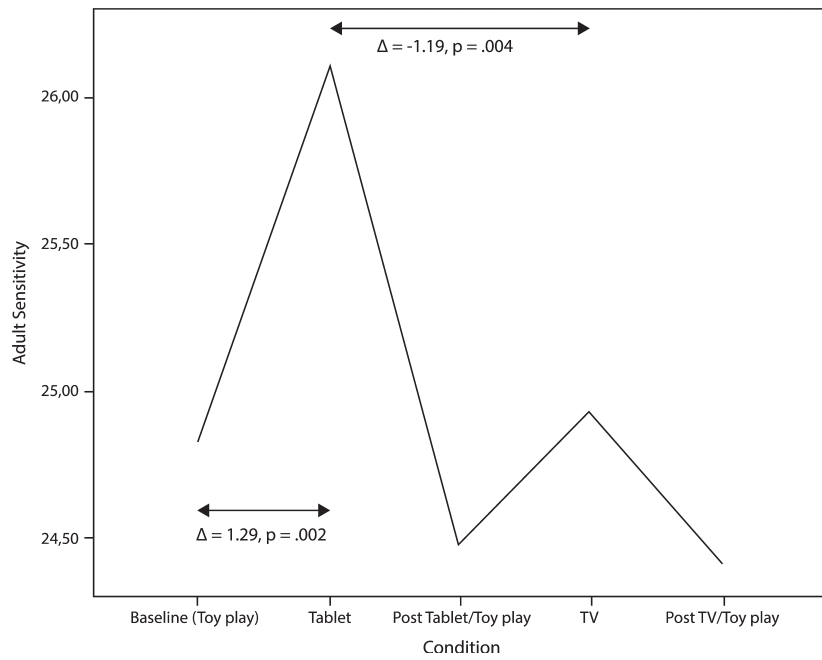
Fig. 3. Adult Sensitivity (adults' overall sensitivity scores). Estimated marginal mean from a linear mixed model. P-values and estimated differences (Δ) corresponding to the relevant hypotheses are marked in the figure.
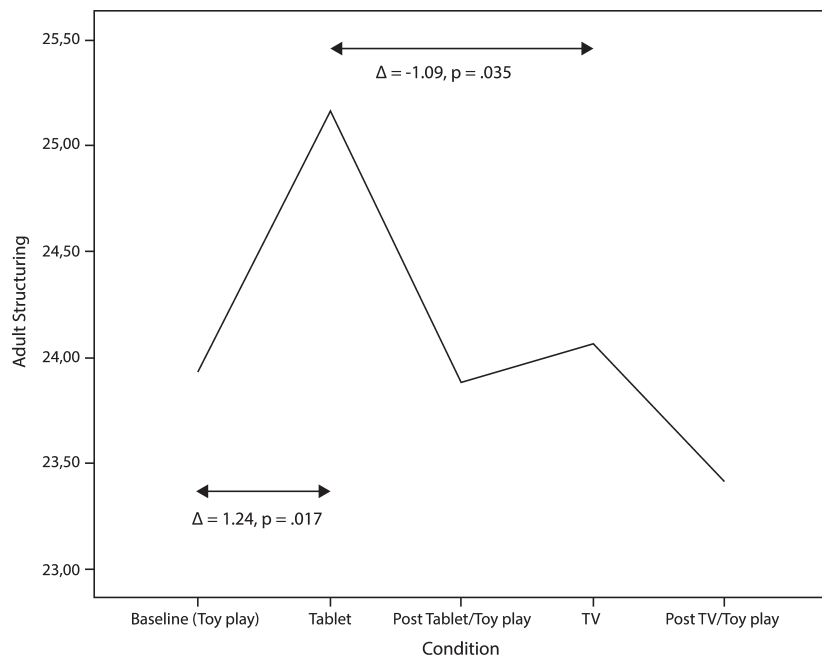
Fig. 4. Adult Structuring (adults' overall structuring scores). Estimated marginal mean from a linear mixed model. P-values and estimated differences (Δ) corresponding to the relevant hypotheses are marked in the figure.

Fig. 5. Adult Non-intrusiveness (adults' overall non-intrusiveness scores). Estimated marginal mean from a linear mixed model. P-values and estimated differences (Δ) corresponding to the relevant hypotheses are marked in the figure.
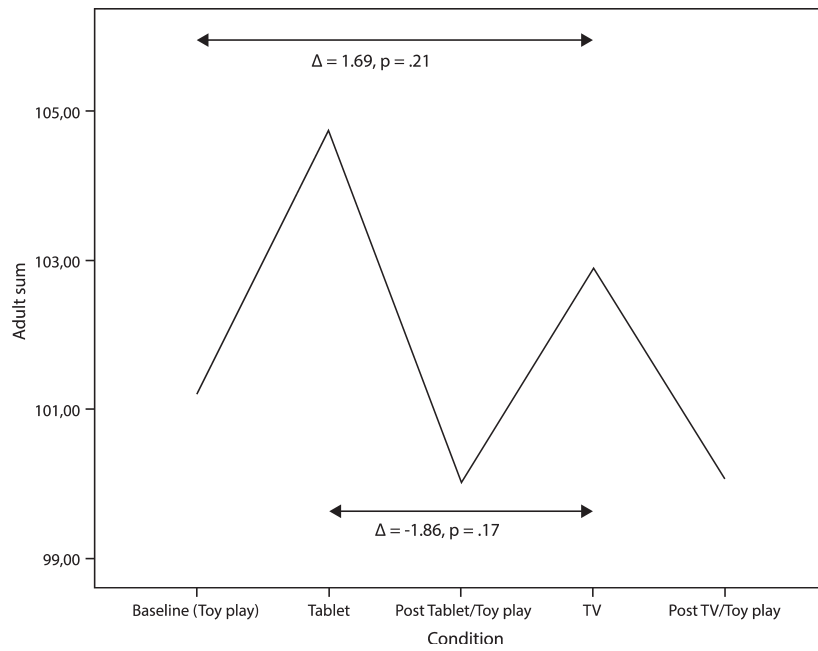

Fig. 6. Adult Non-hostility (adults' overall non-hostility scores). Estimated marginal mean from a linear mixed model. P-values and estimated differences (Δ) corresponding to the relevant hypotheses are marked in the figure.
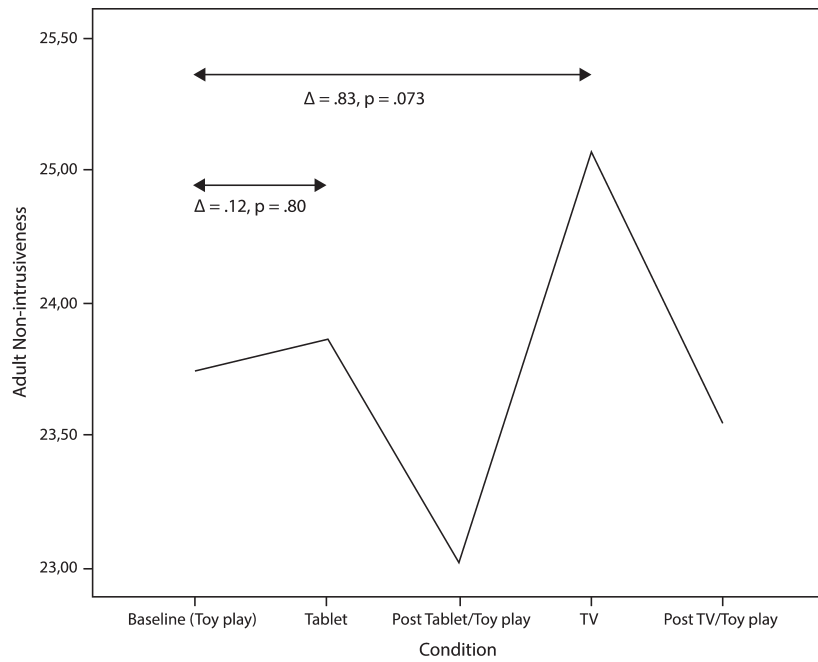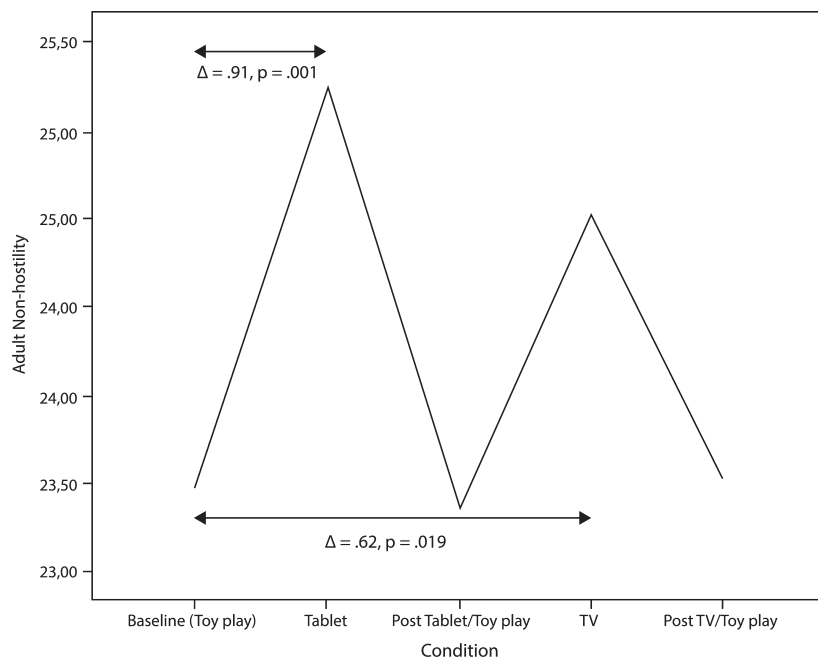
we used, than during non-educational entertainment shows. In that case, parent–child interactional quality might improve as they watch edutainment TV, which could closely relate to the value of educational TV (Lemish & Rice, 1986; Nathanson & Rasmussen, 2011). However, this theoretical implication does not resonate with the findings of Pempek *et al*. (2011), who demonstrated that co-viewing an educational child-oriented TV show actually reduced the quality of parent–child-interactions compared to free-play. Such divergent findings stress the need for more research on potential moderators in how TV viewing affects parent–child interactions, especially when it comes to assessing the impact of edutainment TV. Even so, our findings suggest that at least some forms of TV viewing might not impede parent–child interactions.

Tablet use and adult sensitivity

Our second hypothesis predicted that adult sensitivity would increase during joint tablet play as opposed to toy play and TV viewing, and we found support for that hypothesis. Both highly interactive and dynamic, joint gaming on a tablet requires reciprocal cooperation within parent–child dyads, which likely affords joint attention that, in turn, is a prerequisite of sensitivity (Hustedt & Raver, 2010; Nathanson & Rasmussen, 2011). Toy play, however, is less structured (Ginsburg, 2002) and gives the child an opportunity to be more autonomous and to explore their surroundings, thereby making room for more divergent attention. Research has shown that parents typically use responsive communication while focusing on a single activity or the same object (Krcmar & Cingel, 2014; Nathanson & Rasmussen, 2011) such as a tablet computer. Therefore, it seems more likely that parents will score higher on adult sensitivity in settings that provide more joint focus. Arguably, this is because TV is more passive by nature (i.e., it does not require an immediate response by the parent-child dyad) and interactions are commonly restricted during TV-viewing (Nathanson & Rasmussen, 2011). TV-viewing may prompt more divergent and less joint attention. For instance, parents may be more prone to be preoccupied by other thoughts and not processing the TV-content with the child, and therefore the dyads are not necessarily mutually engaged in the activity together.

Indirect evidence for joint attention as the feature at work comes from the studies of Nathanson and Rasmussen (2011) and Gros-Louis *et al*. (2016), who showed that maternal responsiveness was higher during book reading than during toy play, TV viewing, and puppet play. Joint gaming could resemble book reading due to the highly structured situation and the joint focus typically fostered. In turn, those shared features could explain why both joint tablet play and book reading promote adults' sensitivity and other related constructs (Fisch *et al*., 2010).

Tablet use and adult structuring

Our third hypothesis predicted that mothers would score higher on adult structuring during joint gaming on a tablet than during toy play and TV viewing. Our support for that hypothesis concurs with the findings of Wood *et al*. (2016), who demonstrated that parents use diverse scaffolding strategies to encourage and support their children while using tablets. Although Wood *et al*. (2016) did not compare tablet use to toy

play and TV viewing, their results showed that shared tablet use can have beneficial effects upon the quality of parent-child interactions, as the present study also indicates. Two features of tablet gaming might explain this positive effect. First, the interactive nature of tablet tasks requires active participation and collaboration (Lauricella *et al*., 2014), as was the case while the dyads played *City of Friends*. Presumably, these characteristics make the game cognitively challenging and necessitate guidance from parents. As other authors have reported, parents are more engaged and interactive with their children while reading electronic storybooks than while reading traditional storybooks, primarily as a consequence of the interactive nature of the electronic device (Lauricella *et al*., 2014).

Second, the tablet computer could enhance adult structuring given the novelty of the platform task (Lauricella *et al*., 2014). Novel media contexts might provoke more joint engagement and thus higher-quality interactions between mothers and children, which contrasts toy play's familiar, predictable setting. Moreover, the complexity and design of tablet computers (e.g., touchscreens) might give parents more opportunities to scaffold learning related to how the child operates the device due to its advanced formal features.

Taken together, our findings concur with Vygotsky's (1978) theory, which suggests that parents scaffold learning more during more challenging tasks (e.g., tablet use) in order to maximize children's learning and help them understand the platform (Radesky *et al*., 2015). From a broader perspective, one might speculate that the heightened level of structuring fostered during tablet gaming could also promote child learning (Radesky *et al*., 2015; Wood *et al*., 2016).

Toy play and adult non-intrusiveness and non-hostility

Our last two hypotheses implied that adult non-intrusiveness and adult non-hostility would decrease during free toy play as compared to joint tablet play and television co-viewing. Recall that lower scores for non-intrusiveness and non-hostility are regarded as non-optimal, thus indicative of more intrusive and hostile behavior than higher scores. Our hypothesis was only partially supported, lending support to adult non-hostility being decreased in the free toy play setting as opposed to during tablet and TV-viewing. However, the findings did not support our first hypothesis, predicting that adult non-intrusiveness would be lower in the toy play condition than in the tablet or TV-conditions. Subsequently, our results do not support related research on parental behavior during toy play. Nathanson and Rasmussen (2011), suggested that parents may become overly involved and directive during toy play with their children. The discrepancy between our findings and the line of argument as made by Nathanson and Rasmussen (2011) could have arisen because our 10-minute observation period may have been too short to observe any effects. One might speculate that the longer the exposure the more established the interaction becomes, and established interactions might have a stronger propensity to elicit significant effects.

In our final hypothesis, we predicted that adult non-hostility would be lower during free toy play than during joint gaming on a tablet and television co-viewing; a proposition that was supported, and which also accords well with the findings of others

(Hoff-Ginsberg, 1991; Nathanson and Rasmussens, 2011). Although Hoff-Ginsberg (1991) and Nathanson and Rasmussen (2011) did not compare toy play with tablet play, they investigated other interactive settings (as we did), such as book reading. Although the mechanisms responsible for this change in non-hostility need to be explored in detail, we offer one possibility here. The context of free play almost inevitably imposes little structure on the child, at least compared to TV and tablet use, thus providing more opportunities for children to explore the room and 'misbehave'; behavior that at least some mothers may try to control by increased hostility.

Limitations

Our findings require interpretation in the context of some limitations. First, we employed a convenience sample, which could restrict the generalizability of our findings. Furthermore, the sample was recruited with an incentive of possibly winning an iPad. This might recruit parents who are interested in technology and use it with their family, which could also limit the generalizability. Second, we acknowledge that the relatively small sample size can be regarded as a limitation.

Third, we observed participants in a laboratory setting, which could compromise the ecological validity of our findings. Fourth, we cannot overlook the fact that the mothers knew they were being taped and their focus was on enhancing quality interactions with their children. In that sense, it is possible that social desirability prompted mothers to be more attentive to their children than they would be in unsupervised situations. However, the way this could have affected the results is equivocal. Possibly, the mothers were aware of the current skepticism concerning the impact of new technology (but also old technology, TV in particular) on children's development and parent-child interaction. As a result, the mothers may have wanted to prove the researchers right by being more active in toy sessions compared to tablet/TV sessions. Along the same lines, the mothers may also have wished to prove they were good parents irrespective of the condition, thus being more active during the tablet play, and possibly also when watching TV, than they would have been when not observed. Hence, we cannot rule out the possibility that social desirability may have affected the results, but the direction and extent of the influence is uncertain.

Fifth, we derived our findings from how the devices were used in our experiment (passive versus interactive use). Nevertheless, the range of application is subject to change depending on how the device is used. Joint tablet play facilitates the interactivity of the platform, not its passivity, which is more likely when, for example, watching a movie on a tablet. Subsequently, our conclusions depend on the interactive aspects of tablet use in joint gaming, and not tablet use in general; the same applies to the passive use of TV (i.e., co-viewing a child-oriented edutainment TV show, not the interactive use of TV when, for example, playing video games). Generalizability to other types of games on tablets or less educational entertainment TV is also less certain.

Sixth, since we did not obtain parental reports based on the dyad's familiarity with the toys used in the experimental procedures, the parent-child interactional outcomes in the toy play condition might be influenced by prior knowledge of the toys,

possibly reducing the quality of the interactions. Also, the toys available during toy play were not related to the concept of "City of Friends." If we had included characters from the City of Friends in the toy play condition (and matched the levels of difficulty and complexity between situations), this could have improved the similarity between the conditions and thereby minimized the influence of potential confounding variables.

Seventh, many adults do not interact with their children when they use a tablet (Harrison, 2015; Judge, Floyd & Jeffs, 2015); instead, the child is left with a "baby-sitter." The tablet condition may therefore represent a less valid replication of everyday interaction (as opposed to the toy play condition). Lastly, the duration of the play/tablet/tv conditions was fixed and relatively brief. It could be argued that this is not similar to naturalistic play/tech use at home. However, mimicking activities at home would result in longer exposure to some activities than others, which again could cause an effect due to the prolonged exposure per se, and not to the specific activity measured.

In future studies, researchers should perform more systematic research in order to separate the content of media from their form (their range of application). They should also seek to obtain more data on children's interactions during media use. By contrast, most research to date has focused on parents' interaction when examining the quality of parent–child interactions.

Conclusion

This pilot investigation points to some tentative conclusion regarding parent-child interactions during three different parent-child activities. Our results indicate that maternal sensitivity and structuring with toddlers is higher during joint gaming on a tablet computer than during toy play or TV viewing. Importantly, mothers are more hostile toward their children in less structured situations (joint toy play) than structured situations (i.e., joint gaming on a tablet and television co-viewing). In addition, we did not find evidence indicating that exposure to a child-oriented TV show disrupts family social interactions. Intriguingly, our study found that television co-viewing did not compromise the quality of parent-child interactions as compared to joint toy play and joint gaming on a tablet, as we initially expected. Overall, our findings indicate that maternal emotional availability might improve in interactive media contexts (e.g., engagement with a tablet computer), as opposed to more predictable, familiar, traditional contexts (e.g., toy play and exposure to screen media). The present findings suggest that tablet computers could be introduced to children as long as parents co-use the technology with their children. A valuable next step would be to have professionals and health care practitioners educate parents about the value of co-using technology with their children, and to have fruitful discussions about the media content.

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Paper II

Parent–Child Language Interaction While Using Touchscreen Tablets: A Randomized

Crossover Study

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This paper is awaiting publication and is notincluded in NTNU Open

Paper III

Development and Aging

Young children's television viewing and the quality of their interactions with parents: A prospective community study

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Television is one of the most commonly viewed forms of media by children throughout the world. Excessive television viewing can influence the quality of children's relationships and interactions with their parents. We examined the emotional availability (EA) of children toward their parents by assessing *child responsiveness* and *child involvement*, using a cross-sectional and longitudinal design. We employed a large and representative community sample of Norwegian 4-year-olds ($n = 995$) who were followed up at 6 years old ($n = 795$). The results illustrate that, when viewing excessive amounts of television, children are less likely to be involved with their parents in ordinary toy-play. We argue in favor of the displacement hypothesis, stating that time-demanding technologies are negatively related to the quality of parent–child relationships because spending more time watching television will leave less time for developing nurturing social relationships.

Key words: Parent–child relationship, parent–child interactions, emotional availability, toy play, TV viewing.

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INTRODUCTION

Preschoolers and young school-age children in the United States spend approximately 80 minutes watching television each day (Rideout, 2014). However, in the Scandinavian countries, Dannish preschoolers (age 3+) are the most avid television viewers, as they watched 158 minutes per day in 2016 compared to Swedish preschoolers (age 3+) who watched 148 minutes per day in 2016. Daily viewing time for Norwegian preschoolers is not stated, however, for Norwegian school-age children (12+), the daily viewing time is reported to be 167 minutes per day (Harrie, 2017). Television viewing may not only undermine the quality of parents' interactions with their children while they are watching (Napier, 2014), but in addition, negative spillover effects might be seen in other settings (Valkenburg & Calvert, 2012). High-quality parenting is fundamental for optimal child health and development (Pianta & Stuhlman, 2004). Of note, given the reciprocal nature of the parent–child relationship, children might elicit both growth-enhancing and growth-limiting behaviors in their parents (Karraker & Coleman, 2005). It is therefore important to examine whether children's extended television viewing has detrimental effects on their behavior toward their parents. Additionally, given that research has shown an increase in visual attention to television among children from infancy to school age (Anderson, Lorch, Field, Collins & Nathan, 1986), we aimed at obtaining data from children within the age range that possesses the ability to remain focused during screen viewing, making it more likely that we measured what was intended, namely, active TV viewing and not passive TV viewing.

Only a minimal number of studies have been devoted to children's contributions to the interactional parent–child relationship (e.g., Brody, Stoneman & Sanders, 1980; Christakis, Gilkerson, Richards *et al.*, 2009; Kirkorian, Pempek, Murphy, Schmidt & Anderson, 2009). Therefore, in this inquiry we assessed whether two aspects of the quality of children's behaviors toward their parents were associated with the amount of television viewing they engaged in, namely *child responsiveness* and *child involvement*. Child responsiveness concerns the child's affective responses toward the parent, whereas child involvement includes the child's ability to engage with the parent (Biringen, Robinson & Emde, 1998).

To the extent that the impact of TV viewing on children's behavior toward their parents has been researched, only immediate effects have been addressed. If the negative effects of television watching wore off rapidly after the viewer's attention was diverted elsewhere, we would be less concerned than if prolonged effects were seen. As it turns out, such long-term effects on the quality of the child's behavior toward her or his parents have, to the best of our knowledge, not been studied. We therefore raise the fundamental question: is television viewing cross-sectionally and longitudinally associated with impaired quality of children's responsiveness to their parents' communication and the involvement of parents in their children's play and activity? We address this by examining a large and representative community sample of Norwegian 4-year-olds who were followed up when they were 6 years old.

Despite the ubiquitous entry of new digital media devices, children still spend a substantial amount of time watching television, which, in fact, outpaces the use of newer media phenomena. Overall, new media has not replaced old, traditional media (Rideout, 2013). Furthermore, the viewing patterns of children have been changing drastically during the last couple of years, moving towards watching more digital media; YouTube, streamed shows etc. However, at the time of the present study, watching regularly scheduled programming on a TV set still reigns supreme in children's media lives, with live television viewing occupying a total of 68% of children age 0–8 television habits in the US (Rideout, 2013). In Sweden, 61% of children age

5–8 are using television every day, whilst only 24% are playing games on a touchscreen device. This illustrates the superior role of television.

Children's contribution to the parent–child interactional outcomes

Ample research has been devoted to studying the effects of parenting styles on children's developmental outcomes without recognizing the important impact of children's behavior on parenting practices (Pardini, 2008). However, progress has been made on bridging the gap between unidirectional causality and bidirectional causality in research during the past several decades (Johnston & Masch, 2001; Steinsbekk, Belsky & Wichstrøm, 2016; Tiberio, Capaldi, Kerr, Bertrand, Pears & Owen, 2016).

As previously outlined, compelling evidence shows that television viewing influences the quality of parent–child interactions in a negative way (Napier, 2014). Yet the basic research model, namely, how television viewing affects *parental* interactions with their children, has been the most studied outcome, and little is known about how television viewing affects *children's* interactions and behavior toward their parents. Given that research has shown the importance of a two-way directionality of interactions, we advocate the theoretical framework of a transactional model and predict that spending a large amount of time watching television will be associated with less child responsiveness and involvement of parents.

Previous research on the effects of TV viewing on the quality of child interactions

Passive television viewing. It is widely believed that children's TV viewing is an exclusively passive activity, as cited in the *passivity hypothesis*: TV captures and holds children's attention, thus resulting in a passive reception of content requiring little mental effort by the viewer (Valkenburg & Calvert, 2012). Consequently, television exposure is believed to reduce the number of high-quality parent–child interactions (Pempek, Demers, Hanson, Kirkorian & Anderson, 2011; Pempek, Kirkorian & Anderson, 2014; Vandewater, Bickham & Lee, 2006) and the learning of social, cognitive, and emotional skills believed to take place during parent–child interactions. Accordingly, television should not only induce passivity in the viewer when watching, but such passivity may generalize to other settings, as indicated in another study (Valkenburg & Calvert, 2012). Therefore, we expected that substantial amounts of television viewing would be concurrently correlated with and prospectively predict lower child involvement of parents. Also, children who spend time watching television displaces this time from the time they would spend on other, perhaps, more nurturing activities (engaging with parents and peers), a theoretical concept known as the *displacement hypothesis* (Vandewater *et al.*, 2006).

Active television viewing. However, some have argued that conceiving of television viewing as a purely passive activity under all circumstances does not actually capture what is happening when children are watching. Instead, it has been heavily debated that children selectively engage their attention when television is comprehensible and engaging to them, and that this selectivity represents active involvement on the part of the child (Lorch & Anderson, 1979; Anderson, Lorch, Field & Sanders 1981). Active involvement can also be seen when parents and children watch television together. Research suggests that positive effects of television viewing on parent–child interactions may be observed when parents watch television with their children if they co-view actively and help them to understand, for example, the plot of a story by providing relevant comments, descriptions and feedback (Lavigne, Hanson & Anderson, 2015; Pempek *et al.*, 2011), thus enhancing quality interactions (Lemish & Rice, 1986). Based on these alleged positive implications, we expected that there would at least be no adverse effects of television coviewing on children's behavior and interactions toward their parents.

Aims of the current study

This study aimed to extend prevailing knowledge about the relationship between television viewing and the quality of the parent–child relationship. We do this by examining both cross-sectional and longitudinal relationships between TV viewing and children's interactions with parents. Based on the presented rationale, we hypothesized that: (1) more time devoted to television viewing at ages 4 would be cross-sectionally related to less child responsiveness and child involvement of the parent; and that (2) more television viewing at age 4 would predict less child responsiveness and involvement at age 6, even after adjusting for age 4 responsiveness and involvement.

METHOD

Trondheim Early Secure Study (TESS) is a representative cohort study with the aim of detecting risks and protective factors in child development (Viddal, Berg-Nielsen, Wan, Green, Hygen & Wichstrøm, 2014). For more detailed information regarding recruitment, procedures, and operationalization, see Wichstrøm, Berg-Nielsen, Angold, Egger, Solheim and Sveen (2012); only a brief outline will be presented here.

Participants and recruitment

A representative sample of two birth cohorts of children born in 2003 or 2004 and their caregivers living in Trondheim, Norway, were invited to participate in the Trondheim Early Secure Study (TESS). An invitation letter together with a questionnaire tapping emotional and behavioral problems, the Strengths and Difficulties Questionnaire (SDQ) 4–16 version (Goodman, 1977), was sent to the parents in addition to a reminder about the regularly scheduled health check-ups for 4-year-olds (N = 3,456), and the majority (n = 3,358) attended. To increase sample variability, children who scored higher on the SDQ questionnaire (associated with more behavioral difficulties) were oversampled. The inclusion criteria included that participants were proficient in Norwegian, and consequently, 176 were not eligible for further testing. Additionally, 166 parents missed being informed about the study at the initial health check-up, leaving a total of 3,016 potential participants. After providing information about the

study, the health nurse obtained written informed consents from 2,475 parents (82.1% consent rate). The SDQ scores were divided into four strata (0–4/44.2% of the population, 5–8/29.5% of the population, 9–11/18.5% of the population, and 12–40/7.8% of the population), and a random number generator was used to select a given number of participants from each stratum (0.37, 0.48, 0.70, and 0.89) that would be invited for further assessments. Following these procedures, 1,250 children and their families were asked to participate in further testing at the university, of which 995 (79.6%) attended. Two years later (T2), 795 families participated. In all, 953 had usable data at T1 (485 boys) and 737 at T2 (382 boys). The mean age of the children at T1 was 4.4 years (SD = 0.18) and 6.7 years at T2 (SD = 0.25). In general, parents had a high educational level (17.2% had some education beyond high school, whereas 58.3% had a college degree). T1 was conducted during the fall of 2007 until the summer of 2009. T2 was conducted during the fall of 2009 until the summer of 2011.

Procedure

The study was approved by the Regional Committee for Medical and Health Research Ethics, Mid-Norway. One parent of each child was interviewed about his or her child's TV viewing habits. A few weeks later, the same parent (84.4% female; 95.5% biological parent) came with her/his child to the university clinic for observation; the parent and child were videotaped following four different sequences consisting of free play, child-initiated play, parent-initiated play, and child clean-up. In total, the sequences lasted 25 minutes. The recordings were later analyzed by trained coders (see section below). Retesting was conducted two years later (T2) following the same procedures as at T1. The dyads were told that they were to play together for about half an hour and that different instruction would be given to them about who should decide what they were going to do.

Setting and materials

A laboratory room was furnished with similarity to a living room with toys. A variety of toys including crayons/paper, dolls and figures, Lego, cars, building blocks was used during the toy play sequences.

Measures

Emotional availability scales. We used Biringen's Emotional Availability (EA) Scales manual, 4th edition (Biringen, 2008), to assess child-interactional outcomes. The EA scales encompasses the emotional quality of the relationship between the mother and the child, with four dimensions measuring the adult' side of the relationship – *adult sensitivity* – *adult structuring* – *adult non-intrusiveness* and *adult non-hostility*, and two dimensions measuring child qualities – *child responsiveness* – *child involvement*. Each major dimension is again further subdivided into smaller items, rating each of these items on a three or seven-point scale, where a higher scoring (of 3 or 7) is always indicative of an optimal EA in dyad (Biringen, 2008). Additionally, the scales were summed, thus intentionally giving more weight to the

seven-point scales than the three-point scales. Nonetheless, in the present inquiry we will only report on the two dimensions capturing the child's side of the relationships. C*hild responsiveness* refers to the child's ability to respond to the parent in an affectively positive way and comprises the following two items of child behavior: "Positive affect/emotion regulation/organization of affect and behavior," that is the child shows clear signs of enjoyment when engaging with the parent; the child shows emotions that are well regulated; and the child displays organized behavior when interacting with the parent, and "Emotional responsiveness," that is the child responds to the parent's initiative in a happy, affective, and engaging way), which are coded on a seven-point scale. Furthermore, five subscales are coded on a three-point scale: "Age-appropriate autonomy-seeking" – the child's engages in an exploratory behavior; "Physical positioning" – the child positions his/her body toward the parent and seeks physical contact; "Lack of role reversal/over-responsiveness" – the child shows no signs of role reversal, taking care of the parent, or acting more like an adult than a child; "Lack of avoidance" – the child shows no lack of under-responsiveness and avoidance; and "Task-oriented/concentrate" – the child is deeply focused upon a certain activity or an object together with the parent. The intraclass correlations for child responsiveness were (ICC = 0.66 at T1 and 0.63 at T2). *Child involvement* describes the degree to which the child involves the parent in play and interactions; it comprises of two items: "Simple initiative," that is the child initiates and engages the parent for a brief amount of time, and "Elaborate initiative," that is the child involves the parent in a positively elaborated interaction, which are rated on a scale ranging from 1–7. "Use of adult" – the child reaches out to the parent for emotional comfort or playful exchanges, The five remaining items: "Lack of over-involvement" – the child shows no signs of over-involving behavior, "Eye contact" – the child shows involvement through nonverbal language, "Verbal involvement" – the child communicates through his or her verbal language, and "Body positioning" – the child positions his or her body toward the parent, are rated on a scale ranging from 1–3 (ICC for child involvement = 0.66 at T1 and 0.61 at T2). Higher scores represent more healthy relationships, whereas lower scores represent less-healthy and more-complicated relationships.

Six trained coders who were blind to all information about each family were used to code instances of the participants' behaviors with regard to the EA Scales at T1, whereas eight trained coders assessed participants' behaviors with regard to EA Scales at T2. Twenty percent of the tapes were recoded by blinded raters for reliability checks. Coders were trained and certified after reliability checks by the developers of the EAS. To avoid rater drift, regular meetings were held with master coders reviewing tapes and codings.

TV. TV viewing was assessed by means of the following questions during an interview with the parents (at T1 and T2) concerning the child's viewing practices (where children are overtly attentive to the screen) during the previous three months: "On a typical day, how much time does your child spend watching TV?" and "How much time does your child spend watching TV each week?" The answers were coded in hours per

day. Parental coviewing was assessed by means of the following question: "On a typical day, how much time do you spend sitting next to the child watching television?"

SES. Parental socioeconomic status was measured as the highest level of occupation among the participating parents at T1 and T2 (International Labour Office, 1990) and was categorized as: leader (5.7%), professional higher level (25.7%), professional lower level (39.0%), formally skilled worker (26.0%), farmer/fisherman (0.5%), and unskilled worker (3.1). Professionals and leaders were categorized as being of "high" SES, whereas farmers/fishermen and skilled and unskilled workers were categorized as being of "low" SES.

Statistical analysis

Data analysis was performed using Mplus 7.41., version 8 (Muthén & Muthén, 1998–2017). The cross-sectional associations between TV viewing and child behavior were examined with multivariate regression while adjusting for demographics. The predictive value of TV viewing on later child behavior was also assessed with multivariate regression, this time using both child responsiveness and involvement at age 6 as dependent variables and TV viewing, responsiveness, involvement, and demographics at age 4 as predictors. In all analyses, missing values were handled using full information maximum likelihood estimation (FIML). To obtain accurate population estimates, the results were weighted back with a factor corresponding to the number of children in the population in a particular stratum divided by the number of participants in that stratum. A robust maximum likelihood estimator was used, which also produces the robust standard errors needed because of the stratified sampling.

RESULTS

Means and standard deviations for all study variables as well as correlations are depicted in Tables 1 and 2. When referring to T1 and T2, T1 stands for "time 1," which occurred at age 4, whereas T2 constitute of "time 2," which occurred at age 6. Children at age 4 (T1) spend an average of 92 minutes each day watching television. Parents spend 32 minutes of that time sitting next to the child to watch a TV-show (see Table 1). On a daily basis, children at age 6 (T2) spend 70 minutes on television viewing. Moreover, parents are sitting next to the child to watch television with them, approximately 26 minutes of that time (see Table 1). Concerning child responsiveness (CR) and child involvement (CI), the maximum scoring when summing the two scales separately, are 29, indicating that a scoring of 25.65 (CR T1) and 24.79 (CR T2), 26.09 (CI T1) and 24.98 (CI T2) (see Table 1) are relatively high scorings, associated with more optimal child responsiveness and child involvement. At age 4 (T1), children's TV viewing was significantly associated with less child involvement concurrently at age 4 (see Table 2), an association that remained when demographics (gender and parental SES) were adjusted for (Table 3). However, no longitudinally associations were obtained from the ages of 4 to 6 (see Table 2 and 4): Age 4 (T1) TV-viewing did not predict child involvement at age 6 (T2). Furthermore, no association between TV viewing

and child responsiveness was detected: Age 4 (T1) TV-viewing did not predict neither child responsiveness concurrently at age 4 (T1) (see Tables 2 and 3) or longitudinally at age 6 (T2) (see Table 2 and 4); and parent–child coviewing was not associated with child responsiveness and/or child involvement at neither 4- or 6 years of age (see Tables 2–4).

DISCUSSION

Because television viewing is a predominantly passive and time-consuming activity, one may speculate that it will impact children's ability to involve their parents in play and other daily activities and be responsive to their communicative bids. In a large community study, we found that more television watching among 4-year-olds was associated with them involving their parents less in ordinary play, but this effect was seen neither at age 6, nor prospectively from ages 4 to 6.

TELEVISION VIEWING AND CHILD INVOLVEMENT AT FOUR YEARS OF AGE

We hypothesized that children who spent more time watching television at age 4 would be less proficient in engaging their parents in play, a prediction that was supported. One plausible explanation for the association is time displacement. The displacement hypothesis suggests that excessive television viewing may replace the time that otherwise would have been spent engaging in social interactions (Pempek *et al.*, 2011, 2014; Vandewater *et al.*, 2006). In addition, it has been theorized that time-demanding technologies will be negatively related to the quality of parent–child relationships because time is a limited and schedule-driven resource, and spending more time watching TV means investing less time engaging in social relationships (Kraut, Patterson, Lundmark, Kiesler, Mukophadhyay & Scherlis, 1998). Thus, it may be that those 4-year-olds who spend a large amount of time watching TV have had fewer opportunities to receive training in the social involvement of parents. A related explanation might be that screen media makes children more

Table 1. *Means and standard deviations (SD) for all study variables (n = 703–1036)*

	Mean (SD)
1. SES T1	4.48 (0.95)
2. SES T2	4.51 (0.95)
3. TV viewing T1	0.92 (0.57)
4. TV co-viewing T1	0.34 (0.32)
5. TV viewing T2	1.10 (0.87)
6. TV co-viewing T2	0.26 (0.32)
7. CI T1	26.09 (2.84)
8. CR T1	25.65 (1.42)
9. CI T2	24.98 (3.28)
10. CR T2	24.79 (3.29)

Notes: Amount of TV-viewing is reported in hours. SES = Socioeconomic Status; T1 = Testing at time one (4 years of age); T2 = Testing at time 2 (6 years of age); TV-viewing = Children's TV-viewing, not controlled for the presence/ co-viewing of parents; TV co-viewing = Parental co-viewing together with the child; CI = Child Involvement, CR = Child Responsiveness.

Table 2. *Correlations among all study variables (n = 703–1036)*

	1	2	3	4	5	6	7	8	9	10	11
1. Gender											
2. SES T1	–0.04	–									
3. SES T2	–0.6	0.57**	–								
4. TV viewing T1	–0.9**	0.01	0.00	–							
5. TV co-viewing T1	0.01	0.00	–0.1	0.36**	–						
6. TV viewing T2	0.04	–0.3	–0.1	0.09**	–0.0	–					
7. TV co-viewing T2	0.03	–0.3	–0.2	–0.1	0.13**	0.05**	–				
8. CI T1	0.09*	0.12**	0.12**	–0.10*	–0.5	0.04*	0.09**	–			
9. CR T1	0.06	0.15**	0.14**	–0.6	–0.2	0.00	0.05	0.83**	–		
10. CI T2	0.11**	0.06	0.07	–0.6	–0.2	–0.8	–0.4	0.16**	0.13*	–	
11. CR T2	0.09*	0.07	0.07	0.05	0.01	–0.6	–0.3	0.14**	0.12*	0.82**	–

Notes: SES = Socioeconomic Status; T1 = Testing at time one (4 years of age); T2 = Testing at time 2 (6 years of age); TV-viewing = Children's TV-viewing, not controlled for the presence/co-viewing of parents; TV co-viewing = Parental co-viewing together with the child; CI = Child Involvement, CR = Child Responsiveness. $*p < 0.05$, $**p < 0.01$.

Table 3. *All study variables predicting child responsiveness and child involvement at T1 (n = 816–953)*

	Child Responsiveness T1			Child Involvement T1		
Predictors at age 4	B	SE B	β	B	SE B	β
Child responsiveness	NA					
Gender	0.26	0.21	0.05	0.43	0.21	0.07*
SES	0.45	0.12	0.16**	0.38	0.12	0.13**
TV-viewing	–0.34	0.24	–0.6	–0.51	0.25	–0.10*
TV co-viewing	–0.9	0.35	–0.0	–0.14	0.38	–0.02

Notes: Child Responsiveness and Child Involvement at age 4: $*p < 0.05$, $**p < 0.01$. NA = not applicable. N varies due to different response rate for the different variables. SES = Socioeconomic Status; TV-viewing = Children's TV-viewing, not controlled for the presence/co-viewing of parents; TV co-viewing = Parental co-viewing together with the child.

passive in general, and that this passive state pertains to other contexts (Valkenburg & Calvert, 2012), thus making them less socially active and socially competent. Alternatively, based on the opposite causality, passive children might be drawn to watch more TV, or children whose parents are less involved in their play and interactions may find other ways to amuse themselves, namely, watching television. Yet additional third variables can impact the variables as well and create a relationship between them. For instance, genetics, temperament, personality, attachment style, and the accessibility of television sets in the household may affect both child involvement and TV viewing.

However, parental coviewing was not associated with *less* child involvement of parents in play and interactions. Neither was it associated with *more* child involvement of parents in play and interactions. The lack of any potential beneficial effects of parental coviewing can be attributed to weaknesses of the study design, that is, not controlling for the type of TV shows being watched. If the dyads were mostly watching noneducational entertainment shows, the advantages of coviewing might be restricted and explain those null findings

(Kirkorian, Wartella & Anderson, 2008). Also, parental coviewing doesn't necessarily mean that parents are engaged in viewing the content together with their children, actively mediating and scaffolding children's TV experiences. Future studies must separate between assessing only coviewing behavior and coviewing combined with active mediation because coviewing practices are less likely to be beneficial when not combined with interactions or discussions around the content (Pempek *et al.*, 2011).

TELEVISION VIEWING AND CHILD INVOLVEMENT AT SIX YEARS OF AGE

Our hypotheses that more television viewing at ages 4 and 6 should both predict less child involvement with parents at age 6 were not supported, in contrast to the findings regarding child involvement at age 4. Why is there a discrepancy from preschool to school age? It is worth noting that the present finding might be attributed to the effect of age and gaining more social skills merely as a result of aging (Biringen, Derscheid, Vliegen, Closson & Easterbrooks, 2014) and neurological maturation, regardless of the amount of TV viewing. One might argue that developing social skills has a greater impact on family social relations than the amount of television viewing per se and that practicing social communication diminishes at the expense of TV viewing. Another plausible explanation might be related to leisure activities. Children at age 6 might be more preoccupied with sports, hobbies, homework, and the use of digital media than children at age 4 and depend on the involvement and assistance of their parents to accomplish their activities for example, homework. Thus, children need to involve their parents in their leisure activities to a greater extent at the age of 6 than at the age of 4 (when homework has not yet commenced), leaving more room for greater active involvement of parents in play and interaction.

As it seems, the effects of television viewing on child involvement are age specific and do not pertain to child involvement in a measurement conducted two years later. Therefore, no long-terms effects of television viewing on the quality of child interactions emerged in the present study.

Table 4. *All study variables predicting child responsiveness and child involvement at T2 (n = 646–737).*

Predictors at age 4	Child Responsiveness T2			Child Involvement T2		
	B	*SEB*	*β*	*B*	*SEB*	*β*
Child involvement	0.15	0.09	0.13	0.20	0.09	0.18*
Child responsiveness	–0.1	0.10	–0.1	–0.2	0.10	–0.2
Gender	0.41	0.29	0.06	0.59	0.29	0.09*
SES	0.17	0.15	0.05	0.14	0.15	0.04
TV-viewing	–0.38	0.24	–0.6	–0.30	0.25	–0.5
TV-coviewing	0.31	0.48	0.03	0.00	0.50	0.00

Notes: N varies due to different response rate for the different variables. SES = Socioeconomic Status; TV-viewing = Children's TV-viewing, not controlled for the presence/co-viewing of parents; TV co-viewing = Parental co-viewing together with the child. *$p < 0.05$.

Television viewing and child responsiveness at four and six years of age

Finally, we predicted that children's television viewing at age 4 would be negatively related to their responsiveness at ages 4 and 6, but these expectations were not met. If children are highly responsive toward their parents in most situations, an hour and twenty minutes of television viewing each day is not likely to make them less responsive in general, and their overall responsiveness will likely moderate any negative effects of responsiveness (toward their parents) related to television viewing. With regard to these findings, we must tentatively conclude that children's total amount of television viewing does not affect child responsiveness at the ages of 4 and 6, respectively. However, it is hardly disputable that the idea of causation is indispensable because of the problems associated with confounding variables that could influence the association and the possibility for our results to be related to the effects of parents' behavior on children's behavior and not the other way around. Perhaps an increasing amount of television viewing is indeed associated with less-responsive children, yet parental coviewing and parental scaffolding during viewing are moderating any potentially negative effects, hence creating the current nonsignificant findings. Therefore, our results must be interpreted with caution.

Limitations

The strengths of this study are the large sample size combined with the longitudinal design. However, despite these strengths, several weaknesses must also be outlined. First, some of our analyses were cross-sectional, most notably pertaining to TV viewing and involvement association at age 4, and this precludes any causal inferences. After all, it might be that children who are less involving of their parents in play are more prone to be watching television than children who are not less involving of parents in play, that is, that there is a common third factor causing the associations, such as shared genetics, attitudes toward child rearing, or parental personality, to mention a few. Second, parental self-reports in interview settings might not be the best

way to collect data on children's media use because social desirability may lead parents to underestimate the total amount of television viewing. Third, not controlling for the type of TV program/series viewed by the child alone or together with their parents (whether it was educational/interactive or noneducational) may be considered a weakness because educational TV shows may promote quality interactions (Lavigne *et al.*, 2015; Kirkorian *et al.*, 2008; Lemish & Rice, 1986; Pempek *et al.*, 2011) as opposed to merely entertainment-based programming (Kirkorian *et al.*, 2008). The quality of parent-child interactions relies heavily on the particular content of the media. For example, "interactive characters" on TV, like Dora the Explorer and Daniel Tiger, who ask children to engage in activities and respond to questions, might influence how children behave towards their parents. However, our results indicated that parents who coview television with their children have children whose behavior is not less responsive and involving toward their parent, regardless of the type of content being watched. Furthermore, the parent's co-viewing practices may be more diverse when it comes to digital media vs TV, and co-viewing is much less accomplished during the use of digital media (Harrison, 2015). So, in one way, the specific results of this study might be a bit "dated" since (these children were tested around 2007–2009 (first time) were digital media was less common, whereas today this is very common in society. However, Rideout (2013) reported that childrens' (age 0–8) television viewing is still dominated by watching live television shows, and not programs recorded earlier on a DVR, downloaded or streamed, or accessed on demand, thus making our studys finding quite relevant in today's media society as well. Still, there is, also usually reported, a big difference in digital media and TV watching in the ages of pre-school and school-age children. But, to the best of our knowledge, current data on preschoolers' use of digital media is not available, which makes it difficult to see the significance of online television use among young children as compared to more traditional use of television (i.e., watching traditional television). Online surveys have been working on data including children age 12+ (Denmark) and children age 9–19 (Sweden) (Harrie, 2016). Furthermore, due to the lack of standardized instruments to report such data in the northern countries (Harrie, 2016), we rely heavily on the data by Rideout (2013), although involving an American population. As can be seen from this study, there is no reported difference between preschoolers and school-age children in digital media and TV-watching. Rideout (2013) has been studying children in the age group of 0–8, including both categories at once. Had there been a significant difference between these two groups, we truly believe that they would have split the groups. Additionally, it is likely that the children also were involved in computers (e.g., about almost all Swedish 5–9 year old children would use computers at home in 2010) but since we did not have a variable measuring parental co-use of computer-based technologies, we decided to refrain from using this variable. However, this might be considered a flaw in our study design. Lastly, although we collected data related to the *total* amount of television viewing from caregivers, our data might be biased given that we cannot account for viewing in nonparental caregiving situations such as day care. Future studies should endeavor to measure children's *total* amount of television viewing in daycare settings as well.

Moreover, a two-year follow-up might be considered a long time. Future studies should implement a short-term prospective design to capture any potential short-term effects. In addition, it should be acknowledged that the reliabilities of the child behavior measures were moderate, and this may have deflated the association.

CONCLUSION

An abundance of research has implied that TV viewing reduces the quality of parental interactions compared to when the television is turned off. We hypothesized that more time devoted to television viewing at ages 4 and 6 would be cross-sectionally related to less child responsiveness and child involvement of the parent, and that more television viewing at age 4 would predict less child responsiveness and involvement at age 6, even after adjusting for age 4 responsiveness and involvement. This study indicates that TV viewing at age 4 is cross-sectionally associated with a lower quality of *children's* involvement with their parents in play and interactions at age 4. However, we did not find a significant longitudinal association between the amount of TV-viewing at age 4 and child involvement at age 6. Neither did we detect any cross-sectional and longitudinal associations between the amount of TV-viewing at age 4 and child responsiveness at age 4 and later at age 6. A weakness of our research involves the uncertainty related to our findings, given that the results were not replicated two years later and did not pertain to child responsiveness. Accordingly, the findings should be replicated in future studies.

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Appendix

Vil du være med på en undersøkelse på NTNU om familier og mediebruk?

Vi er en gruppe forskere ved NTNU som søker deltakere til et forskningsprosjekt om familier og mediebruk. Vi søker barn mellom 1 ½ til 2 ½ år i samvær med deres mor for en undersøkelse som tar ca 1 og ½ time. Undersøkelsen utføres ved ett besøk på NTNU Dragvoll. Vi dekker reiseutgifter til og fra Dragvoll. Undersøkelsen starter nå i midten av juni måned 2013 og vedvarer til utpå høsten, og vi tilpasser dager/tidspunkter etter når det måtte passe dere. Alle deltakere vil være med i en trekning hvor de kan vinne premier, deriblant et nettbrett.

I denne undersøkelsen ønsker vi å finne ut:

Er det å se på TV og spille nettbrett sammen med barnet positivt? Hva har dette å si for sosial samhandling mellom foreldre og barn, og for mors barnerettede tale?

Mye av den barnerettede underholdningen som blir vist til små barn på TV i dag, sies å være bra for barns sosiale og språklige utvikling, samt læring. Samtidig hevder forskning at barnerettede tv-programmer som sees sammen med foreldre vil kunne påvirke kommunikasjonen mellom foreldre og barn på en positiv måte. Bruk av nettbrett er fremdeles nytt, men veldig vanlig blant barn og voksne i dag. Dette trengs det mer forskning på. Vi vil undersøke dette i to ulike mediesettinger: (1) En tv-setting hvor mor og barn vil se en kort filmsnutt på et fjernsynsapparat og (2) en nettbrett-setting, hvor mor og barn i fellesskap vil gjennomføre et spill. Alt medieinnhold som blir vist i denne sammenheng er barnevennlig og «myntet» på små barn. Innholdet er basert på den populære animasjonsserien Vennebyen.

Vi håper at dere vil delta og bidra til utvikling av ny og spennende forskning! ☺

Hvis dere ønsker å delta og/eller få nærmere opplysninger om studien, ta kontakt med doktorgradsstipendiat Silje Skaug på tlf: 73 59 74 65 eller på mail: silje.skaug@svt.ntnu.no.

_____

Hva innebærer studien for dere?

Innledningsvis i studien skal du og barnet ditt leke fritt med lekene dere får utdelt. Deretter vil dere få se en video med Vennebyen på fjernsynet. Umiddelbart etter dette er det igjen litt tid med frilek. Deretter får du og barnet ditt spille et spill på nettbrett (også dette er basert på Vennebyen). Til slutt er det igjen satt av tid til frilek. Helt til slutt ønsker vi at du svarer på et kort spørreskjema som angår familien- og barnets medievaner i hjemmet. Tilsammen vil dette ta ca 1 time, men sett gjerne av litt mer tid i tilfelle man må ta pauser underveis.

Hva skjer med data om dere?

Data fra videoopptak og lydopptak vil kun bli brukt i forskningssammenheng, slik som beskrevet i dette skrivet. Under studien vil data bli oppbevart innelåst. Etter at dataene er analysert vil de ikke kunne bli knyttet til navn, og navn vil heller ikke bli gjenkjent og/eller publisert i den sammenheng. Etter at studien er avsluttet, vil opptakene bli destruert etter en gitt tid. For at rådata skal kunne brukes til mer enn denne studien, eller for at andre forskere skal kunne gå inn for å verifisere konklusjoner, er det vanlig å beholde dataene i 5 år. Det er viktig å påpeke at studien ikke vil volde noen smerte, ubehag eller risiko for de påmeldte. Tvert i mot, tror vi at det er mer nærliggende å anta at dere vil oppleve studien som et positivt innslag, hvor dere sammen med egne barn får muligheten til å gjøre noe hyggelig og sosialt sammen. I studien er vi heller ikke interessert i dere som konkrete enkeltindivider og det er ikke noen spesielle svar vi er ute etter å finne. Det er mer den samlede helheten av alle deltakerne vi er interessert i, og hvilke typer interaksjoner som typisk oppvises her.

Frivillig deltakelse

Det er frivillig å delta i studien. Dersom du ønsker å delta, undertegner du samtykkeerklæringen på siste side. Som deltaker har du rett til å få innsyn i hvilke opplysninger som er registrert om deg. Som deltaker har du også rett til å få informasjon om utfallet/ resultatet av studien. Om du nå sier ja til å delta, kan du senere trekke tilbake ditt samtykke. Du kan når som helst og uten å oppgi noen grunn trekke ditt samtykke til å delta i studien. Dersom du senere ønsker å trekke deg eller har spørsmål til studien, kan du kontakte stipendiat Silje Skaug på tlf: 73 59 74 65 eller på mail: silje.skaug@svt.ntnu.no. Dersom du trekker deg fra studien, kan du kreve å få slettet innsamlede opplysninger.

Samtykkeerklæring

Jeg har lest informasjonen ovenfor og samtykker til at mitt barn og jeg deltar i studien om medier og sosial interaksjon og barnerettet tale.

_Sted_____Dato_____

Navn_____

NTNU og Trondheim kommune inviterer alle foreldre til
4-åringer til å være med på en undersøkelse av førskole
barns mentale helse:

Tidlig trygg
i Trondheim

TRONDHEIM
KOMMUNE

NTNU

Trondheim

Tidlig trygg i Trondheim?

Mer enn hvert 4. barn vil få sosiale eller følelsesmessige vansker før eller senere. Det er nødvendig å skaffe mer kunnskap om hvordan man kan forebygge at det skjer.
Vi ønsker bl.a. å vite mer om:

- Noen barn får lett mange lekekamerater mens andre er mer alene. Hvor tidlig oppstår det og hva kan gjøres?
- Noen barn kan ikke følge regler eller blir fort sinte mens andre tilpasser seg, hvorfor?
- Noen barn er mer engstelige mens andre er nesten ikke redd for noen ting, er det noe vi kan gjøre med det?

Dette er eksempler på noen av mange spørsmål vi ønsker å få svar på. For å gi god hjelp til barn og foreldre er slik kunnskap avgjørende. Det vi imidlertid vet, er at jo tidligere problemer blir oppdaget, desto lettere er det å hjelpe slik at de ikke blir verre etter hvert som barnet vokser til. Derfor vil vi kartlegge barns utvikling allerede fra 4-års alder og vi ønsker å gjenta undersøkelsen annethvert år opp mot ungdomsalder for å følge utviklingen over tid. På den måten kan vi fange opp tidlige tegn på vanskeligheter som ellers ville først blitt tydelige i senere barnealder eller ungdomstid.

Hvem kan være med?
Alle foreldre til 4 åringer i Trondheim vil bli spurt om å delta.

Frivillighet
Deltagelse i undersøkelsen er frivillig. Har man gitt sitt samtykke til å være med, kan m
også når som helst trekke seg uten begrunnelse og be om å få sine data slettet.

Hva har man igjen for å være med?
- Anledning til grundig gjennomgang av ens eget barns utvikling med erfarne fagfolk.
- Mulighet for tilbakemelding på intervju og spørreskjema når resultatene foreligger.
- Alle som deltar i den videre undersøkelsen vil få utgifter dekket til reise, evt. til barnevakt av småsøsken.
- Alle gis kompensasjon for tapt arbeidstid kr. 300.

De som deltar i undersøkelsen, er med i en loddtrekning om en valgfri ferie for familien til en verdi av kr. 40 000.

Hvordan foregår undersøkelsen?

1. Hos helsesøster

Med denne brosjyren vil dere få et enkelt spørreskjema med 33 spørsmål om barnets styrker og svakheter i utviklingen. Når dere kommer til 4-års konsultasjon, vil dere få resultatet av spørreskjema og mer informasjon om undersøkelsen. *Men bare ¼ vil få være med videre i undersøkelsen, de blir tilfeldig trukket ut. De resterende ¾ er ferdige* undersøkelsen Tidlig trygg i Trondheim *etter 4-års konsultasjonen.*

2. På NTNU eller hjemme

For de som er trukket ut, følger et detaljert intervju av en forelder på det stedet som passer dere best om barnets utvikling fra fødsel og frem til nå. Barns utvikling må se sammenheng med det miljøet det vokser opp i. Derfor vil vi også spørre om forhold familie og barnehage. Varighet ca. 3 timer.

3. På NTNU

- på en tid som måtte passe dere. En forelder og barnet møter sammen til utfylling av spørreskjema om bl.a. barnets helse, temperament, intelligens, observasjon av barnet med video-opptak, tilknytning og samspill, og spørreskjema til forelderen om stress, helse, hvordan de er og hvordan de har det. Avslutningsvis blir det en samtale om ba med forelderen. Varighet til sammen ca. 3 timer.

For å følge utviklingen ønsker vi å invitere tilbake til en ny undersøkelse når barnet har begynt i 1. klasse og videre hvert annet år gjennom ungdomsskolen (i alt 6 ganger). Vi vi da avidentifisere alle opplysninger, slik at det ikke går an å gjenkjenne enkeltpersoner. Ni barna blir gamle nok til å avgjøre om de vil være med (16 år), vil vi be om samtykke fra barna.

4. I barnehagen
Vi vil be om tillatelse til at den i barnehagen som kjenner barnet best, fyller ut spørreskjema om barnets mentale helse og sosiale ferdigheter, slik de ser det.

Sikkerhet
- Undersøkelsen er godkjent av Regional komité for medisinsk forskningsetikk.
- Alle opplysninger vil bli avidentifisert.
- Opplysningene lagres etter retningslinjer fra Datatilsynet.
- Alle forskere har taushetsplikt etter helsepersonelloven.
- Data anonymiseres ved prosjektslutt i år 2020.

Kontaktpersoner/ forskningsassistenter:

Disse personene ville dere møte hvis dere kommer til videre undersøkelser. De er alle erfarne profesjonelle i arbeid med barn og familier. Forskningsassistentene er tilknyttet hver sin bydel. Kontakt dem hvis mer informasjon ønskes om forskningsprosjektet før dere møter hos helsesøster.

Anne Qvam Sveberg	918 97 560	bydel	Midtbyen
Beate Brøttemsmo Ørndahl	918 97 841	"	Østbyen
Anikken Ulvan	918 97 851	"	Lerkendal
Monica Steen	918 97 855	"	Heimdal
Tove Sliper	918 97 795	"	Heimdal

Prosjektansvarlige

prosjektleder Lars Wichstrøm,
professor, Psykologisk institutt, NTNU

prosjektmedarbeider Turid S. Berg-Nielsen
førsteamanuensis, Psykologisk institutt, NTN

prosjektmedarbeider Ragnhild Onsøien
psykologspesialist/rådgiver hos Rådmannen
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prosjektmedarbeider Elisabet Solheim
Ph.D stipendiat/psykolog, Psykologisk inst. N

Samtykkeerklæring

Jeg er blitt informert skriftlig og muntlig om undersøkelsen

"Tidlig trygg i Trondheim"

Jeg er også blitt informert om formålet med undersøkelsen. Jeg er kjent med at dataene om meg og mitt barn blir behandlet strengt fortrolig og at undersøkelsen er godkjent av Datatilsynet. Undersøkelsen er forelagt Den regionale komité for medisinsk forskningsetikk. Jeg er videre kjent med at det ikke er satt noen spesiell tidsbegrensning for hvor lenge avidentifiserte opplysninger om meg og mitt barn kan lagres. Jeg eller barnet mitt kan på et senere tidspunkt be om å bli slettet fra registeret uten å oppgi grunn.

Jeg samtykker i at mitt barn og jeg deltar i undersøkelsen.

Barnets navn:………………………………………………………………………………………
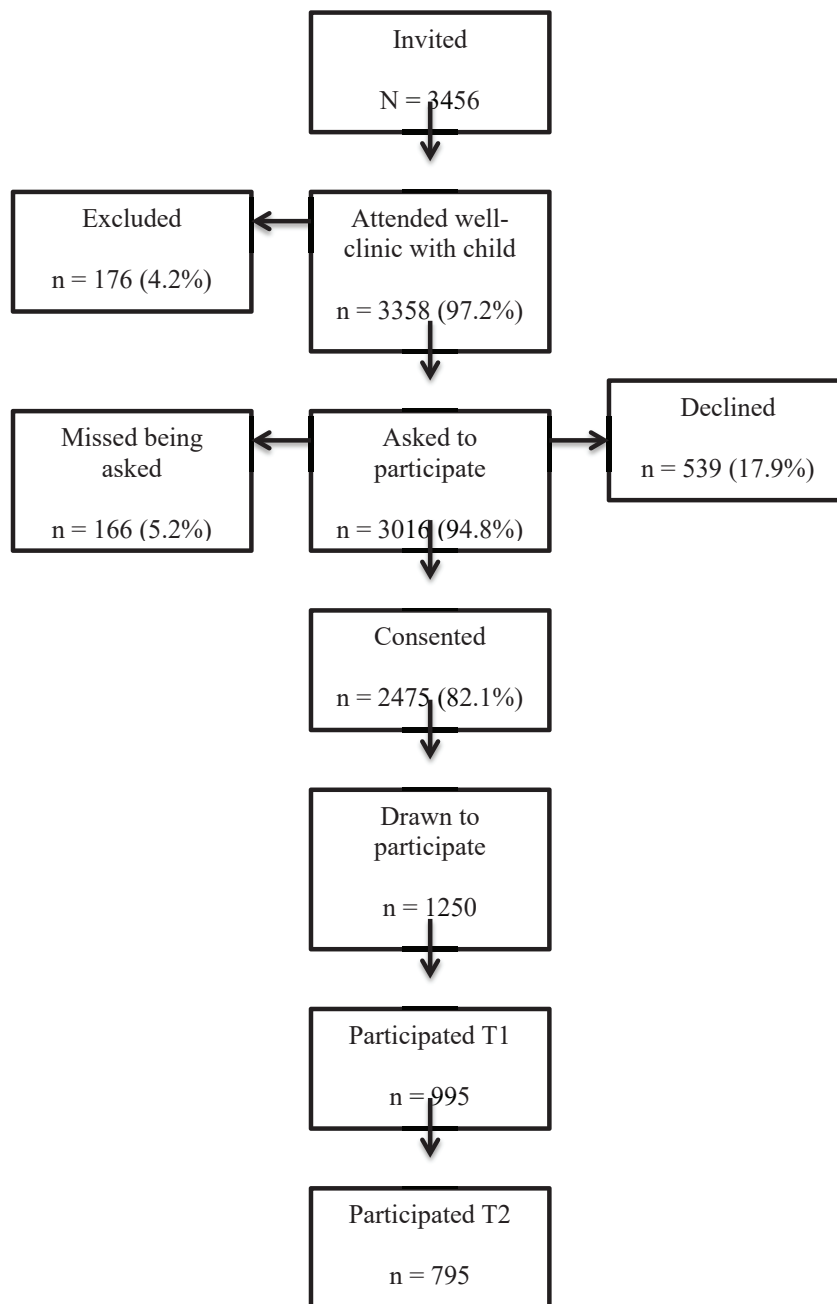
Trondheim, …………….. (dato)

………………………………………………………
Underskrift foresatt

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Figure X. Flowchart of sample recruitment for Paper III