PARENTAL REPORT OF THE ASSOCIATION BETWEEN SCREEN TIME AND SOCIAL EMOTIONAL DEVELOPMENT OF CHILDREN AGED 18 AND 36 MONTHS OLD IN THE DISTRICT OF GOMBAK, MALAYSIA

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ABSTRACT

The increasing popularity of screen-based media has raised public health concern on potential effects of their excessive usage among developing children. The World Health Organization (WHO) and American Academy of Pediatrics (AAP) call for limitation of screen time to one hour per day for children aged two to five years old and children below the age of two are encouraged for screen time avoidance. This study is aimed to determine the influence of screen-based media on early childhood social emotional development from an ecological techno-subsystem perspective. Divided into two phases, the first phase of study involves translation into Malay language and validation of four instruments used in the second phase of study. The "Ages and Stages Questionnaires: Social-emotional", 2nd edition (ASQ:SE-2) 18-Month and 36-Month intervals are instruments that assess the dependent variable of the study – social emotional development. Other three instruments assess independent variables of the study, namely the "Parent Problematic Digital Technology Use" and "Media and Technology Usage and Attitudes Scale", both of which measure parental media behaviour and "Technology Related Parenting Scale" which measures home media environment. Second phase of this research work is a cross-sectional study that probes into the association of child screen time and other independent variables with social emotional development. Study duration of proposal development to report writing was more than two years from August 2018 to December 2020. Internal consistency and reliability of instruments were tested on 100 and 60 respondents, respectively in the first phase from the district of Gombak, Malaysia. Construct validity through factor analyses for Parental Media Behaviour and Home Media Environment (Malay language) scales were tested on 150 subjects. For second phase of study, cluster sampling technique was used to recruit 600 respondents from five health clinics in Gombak, Malaysia. Data collection was done via self-administered questionnaires distributed to Malaysian parents of children aged 18 and 36 months old brought to primary care health clinics for their routine medical examination. Screen time was measured using Global Time Estimate method. Results from phase I of study shows all instruments display good psychometric properties. Phase II indicates 27.8% children documented exposure to screen-based media within first year of life. Mean screen time per day was found to be 141.7 minutes (SD 131.6). Non-adherence to screen time recommendation was recorded by 82.2% toddlers. The odds of children with excessive screen time to have poor mastery of social emotional development is 2.5 times higher than children adhering to screen time recommendations, with association persisting after adjustment to confounders (adjusted odds ratio 2.50, 95% CI: 1.07 - 5.86). This study contributes by producing cross-culturally adapted questionnaires on developmental screening, parental media behaviour, and home media environment which can be utilized in the local setting. This research work which has identified non-adherence to screen time recommendations as risk factor to early childhood social emotional development is hoped to pave the way for foundation of a national screen time policy which advocates for mindful usage of screen-based media among young children and their families.

Keywords: *screen-based media, screen time, early childhood social emotional development*

ABSTRAK

Penggunaan peranti media elektronik berskrin yang semakin popular, terutama di kalangan kanak-kanak menjadikan ia suatu isu kesihatan awam yang perlu diberi perhatian. Persatuan Kesihatan Sedunia (WHO) dan Akademi Pediatrik Amerika (AAP) menyeru agar masa skrin kanak-kanak berumur dua hingga lima tahun dihadkan kepada tidak lebih daripada satu jam sehari, manakala kanak-kanak di bawah umur dua tahun disarankan agar sama sekali tidak didedahkan kepada penggunaan media elektronik berskrin. Kajian ini bertujuan untuk mengenal pasti pengaruh peranti media elektronik berskrin ke atas perkembangan awal sosioemosi di kalangan kanak-kanak melalui perspektif '*ecological techno-subsystem'.* Fasa pertama kajian melibatkan terjemahan, adaptasi budaya dan uji kesahan empat jenis instrumen yang kemudian digunapakai di fasa kedua kajian. Instrumen-instrumen tersebut adalah "*Ages and Stages Questionnaires: Social-emotional", 2nd edition (ASQ:SE-2)* bagi kanak-kanak berusia 18 dan 36 bulan yang mengukur perkembangan sosioemosi sebagai pemboleh ubah bersandar, "*Parent Problematic Digital Technology Use*" dan "*Media and Technology Usage and Attitudes Scale*" yang mengukur Perilaku Media Ibu Bapa dan "*Technology Related Parenting Scale*" yang mengukur Persekitaran Media Rumah sebagai pemboleh ubah bebas dalam kajian ini. Fasa kedua kajian melibatkan kajian keratan rentas yang mencari hubungan di antara masa skrin dan pemboleh ubah bebas lain dengan perkembangan sosioemosi kanak-kanak. Kajian ini mengambil masa lebih daripada dua tahun bermula dari penghasilan proposal kajian pada Ogos 2018 hingga penulisan laporan kajian yang tamat pada Disember 2020. Uji kebolehpercayaan instrumen dijalankan menggunakan 100 responden, manakala uji keboleh-ulangan instrumen dilakukan menggunakan 60 responden di fasa pertama. Kesahan konstruk bagi skala Perilaku Media Ibu Bapa dan Persekitaran Media Rumah pula diuji menggunakan kaedah analisis faktor ke atas 150 responden. Fasa kedua kajian melibatkan 600 responden dari lima buah klinik kesihatan di daerah Gombak, Malaysia yang dipilih melalui kaedah pensampelan kluster. Proses pengumpulan data dilakukan melalui pengisian borang kaji soal selidik oleh ibu bapa atau penjaga berwarganegara Malaysia dengan anak berumur 18 atau 36 bulan yang dibawa ke klinik kesihatan untuk pemeriksaan kesihatan. Masa skrin kanak-kanak diukur menggunakan kaedah *Global Time Estimate.* Hasil dari analisis data yang terkumpul di fasa pertama kajian mendapati kesemua instrumen mempunyai ciri-ciri psikometrik yang baik. Hasil analisis data dari fasa kedua kajian pula mendapati 27.8% kanak-kanak terdedah kepada media skrin sebelum mencapai usia satu tahun. Min masa skrin yang tercatat adalah 141.7 minit (SD 131.6). Ketidakpatuhan kepada peraturan masa skrin yang ditetapkan tercatat oleh 82.2% kanak-kanak. Kemungkinan kanak-kanak dengan masa skrin berlebihan untuk mengalami perkembangan sosioemosi yang lambat adalah 2.5 kali tinggi daripada kanak-kanak yang patuh kepada peraturan masa skrin (nisbah kebarangkalian terlaras 2.50, 95% CI: 1.07 - 5.86) apabila diuji hubungan kedua pemboleh ubah tersebut dengan pengubahsuaian bagi pemboleh ubah-pemboleh ubah pembaur. Kajian ini berjaya membentuk instrumen-instrumen baru berkait dengan bidang teknologi dan perkembangan kanak-kanak yang diterjemah dan diadaptasi ke dalam Bahasa Melayu dan boleh digunakan di komuniti setempat di Malaysia. Kajian ini menunjukkan masa skrin berlebihan berpotensi memberikan impak negatif kepada perkembangan awal sosioemosi kanak-kanak dan diharap boleh dijadikan asas kepada pembentukan polisi negara yang menyokong penggunaan media skrin secara terhad di kalangan kanak-kanak dan ahli keluarga mereka.

Key words: *media elektronik berskrin, masa skrin, perkembangan awal sosioemosi kanak-kanak*

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LIST OF SYMBOLS AND ABBREVIATIONS

AAP	American Academy of Pediatrics
aOR	Adjusted Odds Ratio
ASQ	Ages and Stages Questionnaire
ASQ:SE-2	Ages and Stages Questionnaire: Social Emotional - Version 2
AVE	Average Variance Extracted
BITSEA	Brief Infant-Toddler Social and Emotional Assessment
BM	*Bahasa Melayu* (Malay Language)
CBCL	Child Behaviour Checklist
CFA	Confirmatory Factor Analysis
CI	Confidence Interval
CITC	Corrected Item-Total Correlation
COVID-19	Coronavirus Disease 2019
CR	Composite Reliability
CVI	Content Validity Index
DVD	Digital Versatile Disc
EFA	Exploratory Factor Analysis
GFI	Goodness-of-fit Index
HME	Home Media Environment
ICC	Intraclass Correlation Coefficient
JKNS	*Jabatan Kesihatan Negeri Selangor* (State Health Department)
KMO	Kaiser-Meyer-Olkin
KK	*Klinik Kesihatan* (Health Clinic)
MCO	Movement Control Order
MLE	Maximum Likelihood Estimation
MTUAS	Media and Technology Usage Scale
NAEYC	National Association for the Education of Young Children
NCDRC	National Child Development Research Centre
NHMS	National Health and Morbidity Survey
NMRR	National Medical Research Registry
PKD	*Pejabat Kesihatan Daerah* (District Health Office)
PMA	Parental Media Addiction
PMB	Parental Media Behaviour
PMD	Parental Media Dependency
OR	Odds Ratio
TLI	Tucker-Lewis Index
TPS	Technology-related Parenting Scale
VCR	Video Cassette Recorder
WHO	World Health Organization

OPERATIONAL DEFINITIONS

Term	Definition
Early childhood development	Early childhood development (ECD) encompasses physical, socio emotional, cognitive, and motor development between 0-8 years of age ((WHO, 2020d).
Emotional regulation	The process by which individuals are able to manage emotional arousal and emotional display, attention processes, and the ability to properly respond and express emotions to others (Calkins & Fox, 2002).
Home media environment	Child access to electronic media at home (Wilkie, 2018).
Media addiction	Unregulated media behaviours to compulsively use screen-based devices compulsively, which is manifested by maladaptive symptoms (Trisha, 2020).
Media habits	Media use, monitoring, consistency, media effects, media knowledge and alternative activities (Gentile & Walsh, 2002).
Media dependency	Reflects anxiety related to being without a phone or the internet and technological dependence (Rosen, 2013).
Problematic parental media behaviour	Parent digital technology use associated with various forms of technological interruption during parenting (McDaniel and Radesky, 2017)
Parental responsiveness	Parents' prompt, contingent, and appropriate reactions to their children (Bornstein, 2008).
Screen-based media	Electronic devices such as television, gaming console, smartphone, tablet, and personal computer including multiple applications with passive or interactive abilities (Klakk, 2020).
Screen time	Viewing electronic media with screen such as television, computer, video games and mobile devices such as mobile phone (Sweetser et al, 2012).
Social emotional development	The emergence of skills such as ability to form close and secure adult and peer relationships; experience, regulate, and express emotions in socially and culturally appropriate ways; explore the environment and learn (Yates, 2008).
Technoference (Technology interference)	Everyday interruptions in interpersonal interactions or time spent together that occur due to digital and mobile technology devices (McDaniel, 2015)

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CHAPTER 1: GENERAL INTRODUCTION

1.1 Introduction

The first chapter of this thesis opens with a section that defines the concept of early childhood development and its relationship with the usage of screen-based media among young children. Definition of child screen time and existing guidelines pertaining to it are highlighted in the subsequent section. Background of the study which encompasses research problem and research gaps are then presented followed by challenges of research on child screen time, research motivation, rationale of research, and public health significance. The chapter moves on by stating the research questions, research hypotheses and research objectives. Summary of the entire chapter concludes it.

1.2 Early Childhood Development

Throughout a human lifespan, early childhood which comprise of children aged zero to eight years old is a phase considered to be the most important. The key domains of child development – physical, social emotional, cognitive language, and motor development strongly influence physical and mental well-being of a child; eventually influencing the young one throughout phases of adolescence and adulthood. Both positive and negative aspects of growing up such as learning competency, economic participation, and criminality are largely influenced by the period of early childhood. These early years of an individual play a vital role in health equity, shaping the developmental trajectory along the years of an individual's life course (WHO, 2018). Early childhood development is largely influenced by experiences underlying social determinants of health. These experiences of a child are comprised of various attributes - from stimulation and support of family to the wider scale of socio-cultural, socio-political, and socio-economical factors. The qualities of environment in which a child grows up in matters most for their milestones' attainment (Irwin, Siddiqi & Hertzman, 2007; Maggi et al, 2010).

1.2.1 Ecological Theory of Child Development

The ecological theory by Bronfenbrenner (1979, 1989) gives an inclusive idea on the impact of environment on a child by placing the child within a system containing different layers or levels of environment linked with one another; namely the microsystem or the immediate circle (family and friends), the mesosystem which is made of links between immediate circle (for example, home-school interaction), exosystem (indirect effects of surrounding towards child development, for example parents' workplace), macrosystem referring to social and cultural ideologies, and the outermost layer being the chronosystem (the influences of time on all layers and child developmental phases).

However, Bronfenbrenner came up with the ecological theory before the era of internet and electronic media revolution. Johnson and Puplampu (2008) thereafter came up with the proposal of ecological techno-subsystem – a modification to Bronfenbrenner's theoretical association of environmental impact on child development. In addition to the original framework, ecological techno-subsystem comprise of non-living elements of technology child interacts with – from inventions of communication and information to entertainment media such as television, computer, and smartphones.

According to Professor Amy Jordan whose research works focus on media role in children, a simultaneous look towards characteristics of a child, his or her home setting, the cultural environment the child lives in, and how media plays an influential role in this context is vital to be explored. The ecological theory undeniably has been a vital part of the developmental psychology along the years, however the role of media in its systems were not written originally; perhaps due to the traditional nature of research works that focus on relationship between human beings. Jordan states that media must be recognized to be playing a critical role in shaping the childhood phase (Jordan, 2014). This thesis looks into the influence of screen-based media on early childhood social emotional development from the perspective of ecological techno-subsystem model.

1.3 Screen-based Media and Early Childhood Development

Based on the hypothesis developed from studies of media impact on human based on observational studies, a mouse model was built to test whether sensory stimulation similar to that of television exposure to mouse would affect the development of brain cells and behaviour of these rodents. The experimental mice in the study were exposed to six hours of excessive sensory stimulation experience from day ten of life which lasted for 42 days. Stimulation was given in the audio form of a "cartoon channel" at 70 deciBel and visual in the form of coloured lights positioned at walls of mice cage. The specific sound level was taken as it marks the typical level of television watching. Mice in the experimental group were found to have decreased anxiety, learning and memory, with increased risk-taking, and motor activity levels (Christakis, Ramirez, & Ramirez, 2012).

Finding from the study show sensory overstimulation, even without social isolation is sufficient to cause damaging consequences to developing brain of a child similar to the impact on the rodents experimented. It is stipulated that even potentially educating television programme may be detrimental due to overstimulation of senses in an early phase of child development (Christakis et al, 2018). Screen-based media however, has continued to evolve throughout the years.

1.3.1 Evolution of Screen-based Media

The percentage of homes with mobile device have rapidly increased, from 52% in 2011 to 98% in 2017 in United States of America (The Common Sense Census: Media Use by Kids Age Zero to Eight, 2017). In a United Kingdom-based survey on 715 families, 75% toddlers between the ages of six months and three years were reported to have been using touchscreen media daily (Bedford et al, 2016), whereas a Korean-based study reports 12% of children aged two to five use smart phone on a daily basis (Chang et al, 2016). Literature states that this routine of screen-based media use is more easily established during the phase of early childhood than later in life (Hamilton et al, 2016).

By completion of the first three months of life, 40% American children were reported to have regularly watched television, DVDs or videos, with the proportion increasing to 90% by 24 months of age. The median age recorded for first media exposure was at nine months old (Zimmerman, Christakis & Meltzoff, 2007). Nearly a quarter of American toddlers aged three and four (21%) were reported to have a tablet of their own (Children and Parents: Media Use and Attitudes Report, 2017). Impact of screen-based media on children largely depends on the amount of time spent by them engaging with these electronic devices, or in other words – screen time.

1.4 Definition of Screen Time

The term "screen time" is defined as viewing electronic media with screen such as television, computer, video games, and mobile devices such as mobile phone. Screen time can be classified to two broad categories of active screen time and passive screen time. The former refers to screen time that involves cognitive or physical engagement of screen-based activities, whereas the latter refers to sedentary screen-based activities. Example of active screen time are games designed with exercise moves as consequence of the play. Passive screen time comprise of screen-based information received passively, such as through television or digital versatile disc (DVD) (Sweetser et al, 2012).

Screen time is made up of different types of screen-based media. Traditional media, also defined as broadcast media such as television, results in passive viewing in which users are not involved in alteration of media content. On the other hand, newer digital media which consists of social and interactive media offers users the option of creating media contents actively on their own. Example of newer media includes smartphones and tablets installed with various applications (Sweetser et al, 2012). In today's media world, both traditional and modern media are merged; giving a highly personalized experience to its users, especially to the younger generation (Christensen et al, 2016).

Screen time is calculated based on total amount of time spent by an individual engaging himself or herself with a screen-based media including television, computer, laptop, game consoles, and mobile devices. To get the average screen time of an individual, screen time on a typical weekday multiplied by five is added to screen time on a typical weekend multiplied by two – sum of which is then divided by seven. For research on young children, child screen time is based on parental reporting. Screen time can also be reported by each type of screen-based media (Kaur, 2019).

1.4.1 Current Recommendations of Screen Time for Children

(i) World Health Organization

The World Health Organization in its 2019 publication, "Guidelines on Physical Activity, Sedentary Behaviour and Sleep for Children under 5 years of Age" states children below the age of two are not encouraged to have any screen time or exposure to screen-based media. Children of this age group are recommended not to be restrained for more than an hour at a time. For children aged three and four years old, screen time is urged not exceed one hour; the lesser the better. When sedentary, children of these age group are encouraged to participate in reading or storytelling sessions with caregivers. At least 180 minutes per day is encouraged to be spent on physical activities, with at least one third of the time spent on moderate to vigorous intensity physical activity (World Health Organization, 2019).

(ii) American Academy of Pediatrics

The American Academy of Pediatrics (AAP) 2016 policy calls for avoidance of screen-based media in children below two-years old and limitation of screen time to not more than one hour per day for children aged between two to five – only if it is classified as "high-quality programming" and co-viewed with parents or caretakers. The policy also urges parents not to be pressured for early media usage for their young children.

Screen time is not recommended during meals and an hour before sleep. Parents are demanded not to use screen-based media as the only tool to calm children. The policy also stresses on nature of media content which are not to be allowed in children, namely fast-paced programmes and applications with distracting or violent elements. Devices contributing to screen time are encouraged to be switched off when not in use. The first AAP Policy in 2010 limits daily screen time for children aged two to five to not more than two hours, which was later revised in 2016 (American Academy of Pediatrics, 2016).

(iii) Other International Recommendations

The Department of Health and Ageing (DoHA) of Australia urge children below the age of two not to be exposed to any screen time at all. Through its publication – "*Get up and Grow*" children between the age of two to five are recommended to limit screen time engagement to not more than an hour, similar to the American Academy Pediatrics 2016 policy call (DoHA, 2011).

The Italian Pediatric Society have recommended no media use for children below two years old. Screen time for children aged two to five is recommended not to exceed an hour per day and not more than two hours per day for children five to eight years old. Media use for children is urged to be prohibited during meals and one hour before bedtime, with no distracting or violent content and not to be used as pacifier to keep children silent in public places (Bozzola, 2018).

The Canadian Sedentary Behaviour Guidelines for Children limits recreational screen time to no more than two hours per day for children five to 17 years old, but no screen time recommendation was given for children below the age of five (Tremblay et al, 2011). Existing guideline or screen time recommendation for children is seen to only slightly differ between countries that implement them, especially in terms of lower and upper limits of child's age, and screen time restriction.

1.5 Background of Study

The long-term effects of less human interaction on the process of learning and developing in children is still a debatable issue. The interruption of personal interactions or time spent together that occur due to screen-based media devices is defined as "technoference" (McDaniel, 2015; McDaniel & Radesky, 2017). Early childhood is a phase much susceptible to technoference as it is children in this age group that greatly rely on social interaction to learn and imitate from adults (Barr, McClure & Parlakian, 2018). Electronic devices have not only shown to be disrupting toddler's emotional regulation (Skalicka et al, 2019), but also delay their developmental milestone attainment by interrupting their process of learning (Radesky et al, 2016).

Technology interference is not only caused by excessive child screen time, but also due to problematic parental media behaviour and weak enforcement of home media rules which make up the environment that a child lives in (McDaniel, 2015; McDaniel & Radesky, 2017). The relationship of problematic usage of screen-based media among parents measured through parental media addiction and media dependency as well as home media environment with early childhood social emotional development are explored in this thesis.

1.5.1 Statement of Research Problem

(i) Child Screen Time

How much screen time is deemed too much for young children? – a burning question that lingers in minds of the 21st century parents. The Malaysian nationwide report, National Health and Morbidity Survey in 2016 reports more than half (52.2%) children below six years old have excessive screen time exposure – defined as any electronic media usage among children below the age of two and screen time exceeding two hours among children aged between 24 to 59 months (NHMS, 2016).

A 2017 Malaysian study conducted by the Clinical Research Centre Perak revealed that two-year-old Malaysians record an average of six hours of screen time exposure per day. The study conducted on 300 children also shows half of the subjects used screen-based media without supervision from adults. However, the study did not probe into impact of excessive screen time towards children (Junus, 2016).

Proliferation of screen-based media activities into human lives is obvious, through broad array of electronic devices such as television, computer, laptop, tablet, iPad, mobile phone and game consoles. Increased availability of these screen-based media has boosted screen time among young children. Excessive child screen time together with problematic parental media behaviour and weak enforcement of media rules at home are scenarios that stand high chances of displacing parent-child interaction, which is fundamental for optimal learning and development to take place in thriving children (Moser et al, 2015).

(ii) Early Childhood Social Emotional Development

Higher level brain functioning that provides the processing information for a child to socially bond and respond can be compromised by inappropriate or inadequate experiences in early life, resulting in poor mastery of social emotional development (Sigman, 2017). As a child embraces adulthood, social emotional competencies are vital for formation of friendship, intimate relationships, parenting, and the ability to work and contribute as a member of the community (National Scientific Council on the Developing Child, 2011).

The importance of this critical domain should not be disregarded and early detection of social emotional developmental delay is essential (Darling-Churchill & Lippman, 2016). However, publications have reported as low as 10% of children below 24 months with risk of developmental delay receive appropriate early intervention (Rosenberg, Zhang & Robinson, 2008).

Detection rate of developmental delay before child enters kindergarten was reported to be as low as 40% in some settings (King & Glascoe, 2003). Based on Malaysian experience, a significant majority of children referred for developmental delay do not get into the national register and even larger number go undetected, which can deter the process of follow-up and early intervention (Singh, 2008; UNICEF, 2014).

1.5.2 Research Gaps

(i) Paucity of Studies

Majority of studies revolving on early exposure to screen-based media and screen time effect on child development are done in high income countries (Cliff, 2018; Madigan, 2019; Rideout, Vandewater & Wartella, 2003). Lack of studies related to screen time among young children in the Asian region also means media content affiliated to the local favourites and their appropriateness towards young audience are less studied on.

Thus far, no exploration has been made on the influence of screen time on early childhood development in Malaysia. In fact, Malaysia's National Health and Morbidity Survey's 2016 report states a need for research work that explores impact of screen time on child health (NHMS, 2016). To the best knowledge of the authors, there exist no guidelines with regards to screen time recommendation in Malaysia, leaving parents and educators without rules pertaining to child usage of screen-based media to abide to.

(ii) Nature of Existing Studies

Many existing studies focus on specific type of screen-based media or content watched, such as television (Chonchaiya & Pruksananonda, 2008; Vandewater et al, 2005), video viewing (Zimmerman, Christakis & Meltzoff, 2007), and computer (Subrahmanyam, 2000). In our study however, screen time impact is based on different types of screen-based media which would enable us to look at the popularity trend among toddlers, and their association towards early childhood social emotional development.

(iii) Research Population

Most of previous studies focus on the effect of screen-based media on adolescents and relatively little has been explored on the impact of media exposure towards children. Of the studies on children, most revolve on school going children – the youngest mostly involving pre-schoolers (Hinkley et al, 2018; Nathanson et al, 2014; Poulain, 2018). Research concerning children below five years old are still not vast, especially in the first few years of life. However, research involving children in this age group is essential as electronic media usage has been reported as young as in the period of infancy (Ahearne et al, 2016; Kilic et al, 2019). Thus, studies pertaining to child screen time in the first few years of life is needed to understand the pattern of screen-based media usage among this group of children. Research questions generated in second phase of our study are based on the identified research gaps.

(iv) Lack of Validated Social Emotional Development Screening Tools

Routine developmental assessment at Malaysian government health clinics is done at the age of 18 and 36 months using Modified Checklist for Austism in Toddlers (M-CHAT), a 23-item parent reported questionnaire on child behaviour and development translated into Malay language (Singh, 2008). However, the existing M-CHAT instrument utilized in health clinics have only been tested on its sensitivity in detecting autism spectrum (Lau C. et al, 2019). The need for a social emotional developmental screening tool in Malay language to be utilized for the Malaysian population is addressed through adaptation and validation of developmental screening tool in this study.

(v) Lack of Validated Tools to Assess Parental Media Behaviour

Though various measurement tools have been developed for the purpose of measuring screen-based media behaviour related constructs among adults, little have been focused in the area of parental media behaviour. Screen-based media perception, usage and its effects on parents is an area vital to be explored.

This is so especially due to the fact that parental characteristics heavily influence temperament, attachment, socialization, cognitive development and language acquisition of young children, which then determines their early childhood development (Clarke-Stewart, 1988). The translation into Malay language and validation of instruments exploring this domain, namely the "Parent Problematic Digital Technology Use" and "Media and Technology Usage and Attitudes Scale" will fill the gap.

(vi) Lack of Validated Tools to Assess Home Media Environment

The importance of having a safe media environment with parents as gatekeepers for developing children is echoed by many studies (Barkin et al, 2006; Nikken & Schols, 2015; Warren, 2001;). A safe media environment is made possible only through parental rules and enforcement strategies for the purpose of screen-based media use among children (Ramirez et al, 2011; Vandewater et al, 2005).

The right instrument to measure how much screen-based media and types of contents that are allowed by parents for their young children, the screen time restrictive measures or media rules applied at home, if any is vital to be explored. This issue is addressed in our study through translation and validation of instrument measuring the variable Home Media Environment, the "Technology Related Parenting Scale" in Malay language which is hoped to fill the gap.

(vii) Inexistence of Child Screen Time Guideline in Malaysia

World Health Organization (2019) and American Academy of Pediatrics (2016) have provided clear recommendations of screen time limitation among children below five years old. However, to the best knowledge of the authors, no such guideline is currently published or is being implemented in Malaysia. Thus, a study that explores this field of study is needed to pave the way for foundation of national screen time policy guidelines for Malaysian children.

1.6 Challenges of Research on Child Screen Time

Varied products and services are related to screen-based media use which contributes to screen time. One of the measurement challenges to obtain epidemiological evidence is its vast usage which is technically hard to be quantified and difficulty to precisely capture the activities of screen time. Lack of diagnostic criteria and universal terminology for problematic usage of screen-based media challenges international communication and research in this area of research (World Health Organization, 2014).

1.7 Research Motivation

Living in an environment saturated with advancement of technology, it is almost impossible to fully abstain children from screen-based media which is widely used in learning processes and is found to be beneficial in certain aspects; largely influenced by the way media is utilized and the age of children involved (Sanders et al, 2019). Hence, the ability to identify facilitating factors of healthy child nurturing with regards to screen-based media usage would help us identify ways to mitigate the harmful effects of it. Much exploration in depth is needed to look into frequency, context and content of electronic media usage and how parental characteristics and home media environment play a role in child's development – especially with regards to the social and emotional domain.

Early intervention is only possible when child developmental issues are picked up on children with high possibility of exhibiting delayed or abnormal development, which is identified through developmental screening (Meisels & Provence, 1989). Facilitating children to develop their full potential during the phase of early childhood is important as it is the solid foundation for human capital development (Machel, 2017). Due to young children's increased accessibility to screen-based media especially mobile devices around the world (Cristia & Seidl, 2015; Paudel, 2017), it is crucial to have research that explores the influence that mobile devices have, if any on children's development.

Malaysian national survey in 2016 records excessive screen time defined as more than two hours screen time per day for children aged 24 to 59 months and any screen time exposure for children aged 0 to 23 months among 52.2% of children below six years old (National Health and Morbidity Survey, 2016). This discovery indicates the need for a local study that delves into it.

1.8 Rationale of Research and Public Health Significance

Research that studies the potential impact of screen-based media towards toddlers is needed. The first few years of a child's life is the critical phase where rapid brain development occur, and a child develops competencies of cognitive, sensory and social emotional development. Findings from research would be able to assist in guiding parents and professionals to approach the issue with informed decisions about screen-based media use among young children. As we live in the era of digital technology and many parents choose to make screen-based media an essential part of a child's life, it is important to ensure that parents do it in a way that harnesses the likelihood of technology to enhance learning and development – having the best interest of their children in mind.

A detailed understanding on the issue of screen-based media over-usage among young children and factors associated with it will assist us to outline the boundaries of safe usage in the context of Malaysian setting where the issue is not rampantly discussed or studied on. Findings of the study is strongly anticipated to help determine how much is deemed too much in terms of screen time. Mindful usage of screen-based media is needed to provide a balance of having face-to-face interaction for positive learning and optimal early childhood development. It is thus hoped this local research that explores on screen time behaviour of Malaysian toddlers at home would be able to rightfully quantify their screen time. Finding the potential predictors of excessive screen time among young children would assist in suggesting specific targets for health promotional activities.

Creating awareness on the potential effects of excessive screen-based media usage in families through this study is essential. Parents and caregivers can be alerted through this study that excessive usage of screen-based media in families may possess harmful effects towards the development of a young child. Educators and caretakers at preschools and early childcare centres, respectively would be able to provide developmentally appropriate playing and learning methods for pre-schoolers and toddlers.

Getting to know effect of screen-based media on children from an ecological perspective would enable researchers to develop intervention studies and strategies targeting the child environment of concern, particularly screen time, parental media behaviour, and home media environment. Risk factors for excessive screen time can be identified from the study and effective strategies for screen time reduction and improved child environment in terms of screen-based media usage in families could be focused on targetted population based on the risk factors recognised.

Outcome of this study is hoped to pave the way for the groundwork of national policy development aimed at creating an enabling environment where active parent-child interaction is prioritized, and lesser screen time is practiced for a healthy early childhood development. Such policy would help in the designing of effective media control instruments for children, such as suitable media applications and tailored family media plan. With the introduction of a national policy that guards children's media time, guideline that suits the sociocultural needs of Malaysia need to be formulated and implemented at early childcare centres and preschools.

Through this study, we would be able to ascertain the association of screen time, parental media behaviour and home media environment with early childhood social emotional development while looking into other independent variables that serve as confounding factors.

1.9 Research Questions

(i) What is the prevalence of excessive screen time among children aged 18 and 36 months old in the district of Gombak, Malaysia?

(ii) Is there an association between sociodemographic factors and child characteristics with early childhood social emotional development in the district of Gombak, Malaysia?

(iii) Is there an association between screen time and early childhood social emotional development in the district of Gombak, Malaysia?

(iv) Is there an association between parental media behaviour with early childhood social emotional development in the district of Gombak, Malaysia?

(v) Is there an association between home media environment with early childhood social emotional development in the district of Gombak, Malaysia?

1.10 Research Hypotheses

1.10.1 Alternative Hypotheses

(i) There is an association between screen time and social emotional development of children aged 18 and 36 months old in the district of Gombak, Malaysia.

(ii) There is an association between sociodemographic factors and child characteristics with early childhood social emotional development of children aged 18 and 36 months old in the district of Gombak, Malaysia.

(iii) There is an association between parental media behaviour and early childhood social emotional development of children aged 18 and 36 months old in the district of Gombak, Malaysia.

(iv) There is an association between home media environment and early childhood social emotional development of children aged 18 and 36 months old in the district of Gombak, Malaysia.

1.11 Research Objectives

1.11.1 General Objective

To determine the association between screen time and social emotional development of children aged 18 and 36 months old in the district of Gombak, Malaysia based on parental reporting.

1.11.2 Specific Objectives

1.11.2.1 Phase I

To translate into Malay language and validate tools used in the study; the second edition of "Ages and Stages Questionnaires: Social-emotional", (ASQ:SE-2), "Parent Problematic Digital Technology Use", "Media and Technology Usage and Attitudes Scale" and "Technology Related Parenting Scale".

1.11.2.2 Phase II

(i) To ascertain the prevalence of excessive screen time among children aged 18 and 36 months old in the district of Gombak, Malaysia.

(ii) To explore the association between sociodemographic characteristics and child characteristics with social emotional developmental among children aged 18 and 36 months old in the district of Gombak, Malaysia.

(iii) To identify the association between parental media behaviour and social emotional development of children aged 18 and 36 months old in the district of Gombak, Malaysia.

(iv) To recognize the association between home media environment and social emotional development of children aged 18 and 36 months old in the district of Gombak, Malaysia.

1.12 Summary of Chapter 1

Early childhood development is largely influenced by experiences gained by a child. The qualities of environment in which a child grows up in matters most for their milestones' attainment, including social emotional development. With the great evolution of screen-based media in the past decade, it is now part of the environment a child grows up in. A safe media environment is essential to provide an optimal surrounding in which a child lives, grows up, learns and receive stimulation from – for his or her optimal milestones' attainment. Hence, this thesis explores the influence of screen-based media on early childhood development from the perspective of ecological techno-subsystem model. How child screen time, parental media behaviour, and home media environment can be impactful factors towards social emotional development of toddlers will be discussed further in the following chapter.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Process of literature search for appraisal is explained in detail in the beginning of the chapter. This chapter further explores the role of screen-based media as a salient risk determinant of early childhood social emotional development focusing on child screen time, parental media behaviour, home media environment, along with covariates of study.

2.2 Literature Search and Article Selection

To acquire adequate information, literature search was done in multiple search engines online, books, reports, reviews, conferences, and unpublished literatures. For online resources, literature search was performed in databases of Pubmed, Science Direct, Scopus, and Google Scholar mainly. Some of the key words used in the literature search are “screen time”, “screen-based media”, “electronic media”, “child development”, “social emotional development”, “social skills”, “emotional understanding”, “emotional regulation”, “parental media habit”, “media addiction”, “media dependency”, “technology interference”, “home media rules”, and “home media environment.

All types of study designs and various types of publications including reviews, editorials, and letter pertinent to research questions were included as part of this literature review. As literature related to child screen time during COVID-19 pandemic which is relatively new were included as part of this literature review, pre-print article was also included. Literature in languages other than English and articles deemed to be of poor quality were excluded.

Studies appraised in this chapter were generally research works on young children, focusing on early childhood phase within the first five years of age or in the stage of pre-school children. Studies that evaluate differences of developmental outcomes based on different types of screen time measurement were attempted to be described.

Attention was given to literature within the past ten years, although relevant studies older than that were included as well. Studies from all parts of the world, especially in the Asian region were delved into to enable comparison with present study in the similar sociocultural setting and screen-bases media exposure of children.

2.3 Child Development

The continuous psychological, biological, and emotional changes that take place from birth till adolescence phase of human being is defined as child development. These changes are found to be predictably sequential (Choo et al, 2019). The attainment of foundational competencies on which subsequent development builds, take place in the first five years of a child's life. Besides children's mastery of linguistic and cognitive competencies, it is during this early phase of life they display remarkable progress in their social, emotional, moral, and regulatory capabilities. These critical domains of early childhood development are interlinked and each of it needs focused attention (Shonkoff & Phillips, 2000). Facilitating children to develop their full potential, especially in the first three years of life impacts positively across the life course. Thus, cost of inaction to battle potential threats in terms of child health and development during this critical period should be taken seriously (Machel, 2017).

If the window of opportunity presented by these early years is missed, it becomes increasingly tough in terms of time and resources to create a successful life-course (Irwin, Siddiqi & Hertzman, 2007). Research papers published in the Lancet Serious "Advancing Early Childhood Development; from Science to Scale" quantifies the cost – displaying children who are not well nurtured in their early formative years may forfeit a quarter of their earning capacity as they reach adulthood. The series delivers roadmap to successful interventions in promoting healthy lives and optimal learning during early childhood (Black et al, 2017; Britto, 2017; Richter et al, 2016).

2.3.1 The Science of Early Childhood Development

Brain cells, or neurons of a baby in its mother's womb are produced at a drastically rapid pace – tens of millions per week. A newborn thus enters the world nearly with all the brain cells one will ever have. However, the cells are in a random mass and not interconnected. The process of connecting them together takes place in a child's first few years of life, the rapid most in the first three years. It is during this critical period competencies of cognitive, sensory, and social emotional development are strived to be attained by children (Sigman, 2017).

Research shows that grey matter component of brain can measure as double as birth within the first year of life – if provided the right stimulation and nurturing. The brain of an infant continues the process of reorganizing itself; purging the unneeded cells and strive to reach a level of 2.5 times more active than brain of an adult merely at three years old (Young, 2002). As the central nervous system forms the centre of human consciousness, it coordinates the immunological, hormonal, and circulatory systems in a person. Systematic differences of individual's life experiences therefore alter the level of resistance towards diseases. This in turn changes bodily functions, impacting on morbidity, and mortality differences (Sigman, 2017).

The process of human experiences and environmental influences that affect one's well-being throughout life is called "biological embedding". The kind of interaction a child obtains from caregivers and the immediate environment in life starts as early as in utero. Clearly, there exist a biological foundation to understand the social processes that create the individual differences in a child's growth and development. How a child responds to the environment, interprets observations, and absorbs learning largely depends on what he or she observes and obtains from caregivers at home, especially parents or guardians (Sigman, 2017).

Neuroscience tells us even identical twins who spent large part of their lives in different environments do not remain identical throughout their lives (Fraga, 2005). Their genome undergoes epigenetic alterations or biochemical modifications of the deoxyribonucleic acid (DNA) influencing gene expression. These epigenetic process takes place throughout one's life, but mostly through adaptive learning which occurs in the period from pregnancy to age three. That is why these first few years of one's life is said to create blueprints for future adaptations and living. The chemical changes of one's DNA dynamically interacts with the environment and results in permanent transformation in gene expression (Van, Bakermans-Kranenburg & Ebstein, 2011).

2.3.2 Learning and Development

When a toddler learns the right way to eat without spilling by seeing how his or her parents does it, the child puts it to practice during meals. The whole scenario is termed "transfer of learning". This transfer is vital for a child to apply the knowledge gained from its environment to be applied in real-life experiences (Barr, 2013). Transfer of learning takes place in the first few years of a child's life and imitation is observed in children as early as six months old. By 18 months old, a child can remember visuals or scenes watched in a book or television for around two weeks, whereas children aged 24 months old can retain their memories for a longer period of one month (Britto et al, 2017).

This "transfer of learning" is better in kids who learn from real-life interactions with people and objects around them compared to learning from information via screen – a phenomenon termed "transfer deficit" (Barr, Muentener & Garcia, 2007). Children between the ages of 12 to 18 months were found to be able to imitate live demonstration better than the same sequence demonstrated via television (Barr & Hayne, 1999). Two-year old kids were able to locate hidden toys in a room with instructions given in person, however failed to do the same when instructions were given via pre-recorded video. The type of media used did not change this finding (Troseth, Saylor & Archer, 2006).

"Transfer deficit" was exhibited by children aged 30 months and 36 months old who were asked to imitate working on puzzles based on video modelling and touchscreen demonstration. The capability of learning from these screen-based media was lesser than the ability for the kids to learn based on live demonstration. Discrepancy of task-performing abilities seen in toddlers receiving information in person versus screen-based media demonstrates the masking of young children's real ability, which in turn may influence their attainment of developmental milestones (Moser et al, 2015). It shows the importance of young children to have human interaction which cannot be replaced by screen-based media.

Interaction with real people, in real time and space makes the learning process more enriching. Early childhood experiences that interfere this process of learning impacts on children's neurological development through alteration of gene expression. Screen-based activities have proven to have the ability to change a growing young child's brain anatomical structure. In fact, abnormal neural tissue and neural function is seen in children with screen dependency disorder – generally referred to children with screen-related addictive behaviour that affects the long-term neurodevelopment of a child (Sigman, 2017). Children of the current era are heavily exposed to environment filled with multiple electronic devices, hence impact of their usage on child development ought to be researched on.

2.4 Domains of Early Childhood Development

2.4.1 Sensory Motor Development

The period of infancy witnesses a dramatic increase in abilities of sensory motor. Motor behaviour comprises every type of movement from involuntary twitches to goal-directed actions. Sensory motor development of motor behaviour bridges the entire lifespan of an individual. It is during the first year of a child's life, he or she learns to reach for objects, grasp, crawl, sit, stand, and walk (Hadders-Algra, 2018).

Caregiving practices in the form of environmental structures and interaction with child facilitates motor development, especially in acquiring the skills of crawling and walking in toddlers. New motor skills bring along new opportunities for learning and playing for them. For example, through walking, they acquire independent mobility in a social context (Adolph & Franchak, 2017; Hadders-Algra, 2018). Sensory information, movement variability, and postural control are important aspects of early childhood sensory-motor development (Dusing, 2016).

2.4.2 Cognitive Language Development

Early childhood cognitive development of a child aged two to four is comprised of the phase 'symbolic function'. During this stage, children master the ability to picturize, understand, remember, and replicate objects in their minds that are not readily available in front of them. Mental images of objects seen by children are stored in their minds for later use. Prior to attaining this stage, infants and toddlers only understood their world as what they were immediately experiencing around them and will not be able to imagine something which is not physically present (Gauvain & Richert, 2016).

Infant cognition or basic abilities of a child in the first year of life can be measured through tasks assessing performance in four specific areas, namely memory, attention, processing speed, and representational competence. Memory and representational competence which are measures of infant information processing system are found to be related to language development (Rose, Feldman & Jankowski, 2009).

In terms of early childhood language development, children's ability to understand, to process, and to produce language prosper through time in an astonishing manner. Young children experience a language explosion between the age of three and six. At the age of three years old, their spoken vocabulary is estimated to be around 900 words (Gauvain, & Richert, 2016).

Parental language and parent-child interactions are inputs shown to be the best predictors of children's language achievement in many publications (Ramírez, Lytle & Kuhl, 2020; Safwat, & Sheikhany, 2014). Mastery of child's language in terms of spoken vocabulary and talkativeness is shown to impact positively on toddler's self-regulation (Vallotton & Ayoub, 2011).

2.4.3 Social Emotional Development

Early childhood social emotional development is the emerging ability of children in their early years 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 family, community, and culture" (Yates et al, 2008). Some of the foundational social and emotional skills and characteristics are expression and management of emotion, empathy, inhibitory control, self-confidence, and the ability to develop and sustain a good relationship with people surrounding the child (Denham, 2006; Yoder, 2014). Social emotional development is also termed social emotional competence. This domain of child development is operationalized as a skill to understand, to deal with, and to respond to one's emotion in social situations (Eisenberg et al, 2004; Smith-Donald et al, 2007). It is in the first five years of a child's life, he or she learns to develop skills that support the ability to effectively handle social situations (Skibbe et al, 2011).

Malik and Marwaha, 2020 classify social-emotional development into child temperament and attachment. Temperament is defined as "an innate attribute that defines the child's approach to the world and his interaction with the environment" whereas attachment is defined as "relationship with others", both of which are heavily influenced by the environment the child grows up in (Malik & Marwaha, 2020). Emotions play bidirectional role of emerging from and forming various aspects of human attachments, communication and socialization (Emde, 1980).

Exchange of emotions is a fundamental element of human interaction. Emotions are deemed to be powerful regulators of one's behaviour. A child's ability to regulate emotion, attention and arousal develops in the perspective of their relationship with caregivers during infancy (Sameroff & Emde, 1989; Sroufe, 1996). Thus, formal and informal human interactions that depicts a child's relationship with people surrounding him or her shapes their social emotional development.

Children with strong social and emotional skills have better ability for emotional adjustment. They experience healthier relationship with caregivers and are found to be able to sustain friendship with peers for a longer term. At the age of school going, they can develop better interpersonal relationship with teachers as well (Jones & Bouffard, 2012; Wang et al, 2019). Emotionality has the capability of influencing development of neurological interconnections among structures underlying higher order cognition in children. Hence, social emotional development is a vital factor that comes along with family, peer, school, and community levels of influences that play a role in school readiness, and academic performance among toddlers (Blair, 2002; Wang et al, 2019).

2.5 Child Characteristics Influencing Early Childhood Development

2.5.1 Biological Factors

Prematurity is one of the factors associated with poor mastery of developmental skills in children as echoed by many studies (Leon, 2018; Ritchie, Bora & Woodward, 2015; Treyvaud et al, 2012; Wolke, 1998). The bio-behavioural synchrony model states repetitive and synchronic maternal-infant interactions after birth establishes the framework for socialization and emotional regulation in infants. This process is mediated by the epigenetic effects of oxytocin and cortisol on central nervous system. However, premature birth and increased risk of stay at intensive unit affect maternal and infant responsiveness which results in impaired infant social interaction, resulting in poor mastery of developmental skills, especially in social emotional domain (Feldman, 2015).

In an Australian prospective longitudinal cohort study, socioemotional functioning of moderate and late preterm (MLPT) infants (32 to 36 weeks gestation) was compared to full-term controls (≥ 37 weeks gestation) infants at corrected age of two years old. The study recorded higher odds of poor performance in social emotional developmental scoring of MLPT children compared to full-term children using the Infant Toddler Social Emotional Assessment (ITSEA), OR 3.9 (95% CI: 1.4 -10.9). Though the study design and sample size (nearly 200 each case and control groups) are strengths of the study, all subjects were recruited from a tertiary centre which may have admitted children who are more ill or with worse prognosis, limiting the generalizability of study findings to a wider population (Cheong et al, 2017).

Another important perinatal event that is said to exert lifelong influence on socioemotional functioning is low birth weight. Studies indicating positive association between low birth weight and poor attainment of developmental skills are vast (Gutbrod et al, 2000; Hayes & Sharif, 2009; Kudayarov & Turdubaeva, 2018). Literature states children with low birth weight are at higher risk of illness, subnormal growth and neurodevelopmental problems (Hack, Klein & Taylor, 1995).

In a review that included studies from south Asia to compare cognitive and motor scores among normal birth weight and low birth weight individuals, 19 articles (N = 5999) were included, and pooled relative risk was calculated. Children born with low birth weight, especially with < 2000g birth weight were discovered to have substantial cognitive and motor impairment compared to children with normal birth weight. Children below ten years old in the study with low birth weight had lower cognitive (Weighted mean differences, WMD -4.56; 95% CI: -6.38 to -2.74) and motor scores (WMD -4.16; 95% CI: -5.42 to -2.89) compared to children with normal birth weight (Upadhyay, 2019).

In a Hungarian study, more than 300 low birth weight children aged two years old were assessed on their developmental level. Extremely low birth weight children stand at nearly four times higher risk of poor social emotional development compared to children with low and very low birth weight (OR 3.92, 95% CI: 1.6 – 9.5). The study has great strengths as it not only incorporated all other developmental domains as part of its outcome, but it also included neonatal risk factors from child's medical record as potential confounders (Nagy & Kenyhercz, 2021).

Some studies have found gender disparities in terms of child development. Boys were reported to be more likely to display externalising behaviours than girls at early age (Moffitt et al, 2001). Emotional understanding and internalising behaviour were found to significantly differ between boys and girls in a cross-sectional study conducted among school children aged four to six in Northern Ireland, indicating importance of gender-sensitive suppleness to be considered for school-based interventions. (Maguire, 2016).

2.5.2 Nutritional Factors

The relation between nutritional status, dietary intake, hemoglobin level, stimulation, and child development was examined in a cross-sectional study of over 1,000 children aged 12–18 months old in Bihar, India. Hemoglobin level and length-for-age z-score (LAZ) were found to be significantly associated with language development and memory score. Whereas dietary diversity and length-for-age z-score (LAZ) were significantly associated with personal-social development (Larson, Martorell & Bauer, 2018). In a randomized study, provision of lipid-based nutrient supplements to infants aged six to 18 months effected their motor, language, socioemotional, or executive functioning. The study also displays no association between socioemotional scores and infant growth, such as length-for-age suggesting that growth measures at this age may not be highly sensitive to nutritional factors (Prado et al, 2016).

Neurodevelopmental outcomes of breastfed children were studies as early as 19th century; with studies proving that breastfed children outperformed their peers who do not receive breast milk in terms of intelligence, language, and motor development (Petryk, 2007). A review which included 17 observational studies on breastfeeding displays evidence that optimal breastfeeding is associated with improved performance in intelligence tests in children, with an increase of intelligence quotient (Horta et al, 2015).

Supporting the notion that breast milk composition promotes healthy neural growth, measure of brain white matter microstructure was uncovered to have a positive association with breastfeeding duration (Deoni, 2013). A French study reveals breastfed premature infants have decreased risk of suboptimal neurodevelopment in an observational cohort study of nearly 3000 very preterm infants born between 22 to 33 weeks of gestation of two population cohort Population 1: n=1463 with aOR=0.63 (95% CI 0.45 - 0.87); Population 2: n=1441 with aOR=0.65 (95% CI 0.47 - 0.89). However, weaknesses of the study are the failure to include some confounders such as baby's ability to suck and calorie intake in the neonatal intensive care unit (NICU) (Rozé et al, 2012).

2.6 Sociodemographic Characteristics Influencing Early Childhood Development

Many studies have explored the fundamental causes of health and well-being disparities, linking socioeconomic and education gradient with it (Lee et al, 2015; Olafsdottir 2007; Parcel, Campbell and Zhong 2012, Victoria et al, 2003). Children with single caretaker, higher parental education and income were associated with higher scoring of well-being among 7,000 kindergarten children in a cross-sectional study conducted in Hong Kong. As the key socio-demographic characteristics of the study population were not markedly skewed towards one direction in compared to the Hong Kong population, association ascertained in the study would be similar to that of the general population (Lee et al, 2015).

In a longitudinal study of more than 5000 children, kids who grew in low-income households have significantly lower cognitive development than their peers. Maternal education was found to be strongly associated with children's cognitive development. Strength of the study lies in the study design and the data collected from two countries that enables the researchers to make comparison of both study settings (Jackson, Kiernan & McLanahan, 2017). Another study that links higher mother's level of education with better child language development is a prospective cohort study conducted in Poland comprising of more than 500 mother-child dyads (Stelmach et al, 2019).

The importance of ethnic differences in exploring child developmental is stressed by a commentary article in the Journal of Child Development, whereby researchers are urged to have access to a large enough study samples to reliably measure diversity of ethnicity and culture and the methodological expertise to model it appropriately depending on the research question which deals with cultural differences (Graham, 2016). Differences in terms of maternal expectation of normal child development is also seen in varied ethnocultural groups or affiliations in a study which included study sample belonging to African Americans, European Americans, Puerto Ricans, non-Hispanics, and West-Indian Caribbeans (Pachter & Dworkin, 1997).

2.7 Social Emotional Developmental Issues

One in four low-income pre-school children were found to be positive for social emotional problems in a study involving children aged three and four years old. However, only one in six of the children identified were found to have been previously referred for appropriate behavioural health services (Brown, 2012). Failure or delay in attaining age-appropriate milestones can be a manifestation of psychosocial disturbance and requires further investigation (Malik & Marwaha, 2020).

Early childhood social-emotional disturbance includes a wide range of issues or diagnosis including autism, attachment disorder, social or generalized anxiety disorder, attention-deficit hyperactive disorder, oppositional defiant disorder, conduct disorder, bullying and post-traumatic stress disorder, among others (Malik & Marwaha, 2020; Ogundele, 2018). Social-emotional competencies in pre-school children are displayed through deeds such as helping, sharing, comforting, and exhibiting empathy and compliance (McDonald, Kehler & Tough, 2018).

Various factors predict delayed social emotional development among toddlers. In a prospective study that began in pregnancy till two-years postpartum, maternal depression (OR 2.46, 95% CI: 1.63 - 3.72), lower self-efficacy of parenting (OR 2.76, 95% CI: 1.51 - 5.06), lack of parent-child engagement (OR 1.43, 95% CI: 1.02 - 1.99), more than 30 minutes to initiate child aged two for night-sleep (OR 1.58, 95% CI: 1.05 - 2.37) and not attending informal play group between 12 to 24 months postpartum (OR 1.43, 95% CI: 1.03 - 1.99) were shown to be predictors of social emotional development delay (McDonald, Kehler & Tough, 2018).

Many publications have portrayed the benefits of early intervention for early childhood developmental disorders (Nelson, 2006; Spittle, 2007). With increased investment in the domain of early childhood development, researchers have presented economic and biological arguments to support the proposal of “antenatal investment hypothesis” which suggests investments to be made during the period of pregnancy itself to yield the highest return (Doyle, 2009). Early intervention is only possible when child developmental issues are picked up on children or identified through developmental screening. Developmental and health screening is the “administration of screening instruments, medical examinations, hearing and vision testing, parent questionnaires or review of records to identify children who may need further diagnostic test by professionals (Meisels & Provence, 1989).

2.8 Social Emotional Developmental Assessment

Social emotional issues and behavioural difficulties are the common reasons for clinical assessment among children aged two to five years old (Keenan & Wakschlag, 2000). Hence, screening of young children for developmental issues is necessary in their early years to effectively detect any underlying issues. The American Academy of Pediatrics' 2016 Guideline recommends standardized developmental screening during child's age of 9-month, 18-month, and 30-month or whenever there is concern from parents or medical personnel at each visit. Autism-specific screening is recommended to take place at 18-month and 24-month of age (American Academy of Paediatrics, 2006).

In Malaysia, the child health programme contains developmental screening on gross motor, speech and language, vision, fine motor, and social skills to be administered at specific age intervals (National Health and Morbidity Survey, 2016). Routine developmental assessment at local health clinics is done at the age of 18 months and 36 months using Modified Checklist for Austism in Toddlers (M-CHAT) – a 23-item parent reported questionnaire translated into Malay language (Singh, 2008). However, the M-CHAT-Malay version is not found to have a good sensitivity across all age intervals for children below five (Lau, C.D.S. et al, 2019). Currently, there exist no instrument in Malay language specifically for social emotional developmental screening.

When it comes to child social emotional development assessment in the clinical setting, there can be many challenges. The main hurdle appears when children, especially toddlers do not respond or talk in the consultation room with nurses or doctors. This lack of response or silence may not only be contributed by developmental deficits, but also due to other factors such as anxiety, anger, or psychological needs such as hunger and sleep. Examining these various possibilities and to be able to exclude developmental disorders is not easy (Srinath, 2019).

A child-friendly space in the clinical setting is vital for optimal cooperation of a child for assessment by medical personnel. Availability of toys, books, and play space would certainly be an added advantage and enable better engagement with a young child, creating an opportunity for a smooth assessment session. Even long waiting period to meet a doctor could intimidate young children, making them irritable and uncooperative during assessment. Spending a short time on proximity with a toddler do not always capture the whole picture of a developing child, especially with regards to the child's social skills and emotional regulation (Srinath, 2019).

In a large sample of healthy children below three-years old in four countries with varied cultural and linguistic characteristics, differences of milestone attainment were identified. Out of the 106 milestones assessed in the study, 81 (76%) were equivalent across the four countries; Argentina, South Africa, India, and Turkey. However, inequivalent milestones' attainment was noticed in terms of fine motor (18%), gross motor (12%), expressive language (23%), receptive language (33%), and self-help domain (78%) in the remaining proportion. The study shows the importance of conducting country-based or region-based studies in the area of child development to assist the drafting of national tools, guide policymaking and service delivery in any country based on the study findings of their local population (Ertem et al, 2018).

Cultural adaptation of existing valid and reliable child development screening instrument is cost effective. Previous research shows parent-completed questionnaires can be feasibly utilized in the setting of clinics (Rydz, 2006) This study describes the translation and cultural adaptation of 18-Month and 36-Month Ages and Stages Questionnaire: Social-Emotional-2 (ASQ:SE-2); an instrument designed to assess social emotional development of children from ages one to 72-months (Squires, Bricker & Twombly, 2015). Measuring social emotional development is challenging as dramatic changes take place across domains of development during the thriving phase of toddlers.

Differentiating between normal and deviant behaviour is not an easy task as most young children display some challenging behaviour such as tantrums and eating or sleeping difficulties during this growing up phase (Wakschlag, Tolan & Leventhal, 2010). Therefore, measuring social emotional development is more of whether function of children is limited as a result of the problematic behaviour demonstrated (Carter, Briggs-Gowan & Davis, 2004). Within the last few decades, instruments of various languages are developed for the purpose of infant and toddler development assessment. For studies of a new setting without an available instrument, a sound and reliable questionnaire is indeed useful. In a systematic review by Pontoppidan et al (2017); time taken for questionnaire administration, usability, strength or problem focused, and psychometric findings of tools were taken into account to determine the most comprehensive measure. ASQ:SE-2 was as the top choice of instrument along with Brief Infant-Toddler Social and Emotional Assessment (BITSEA), and Child Behaviour Checklist (CBCL) based on its characteristics (Pontoppidan et al, 2017). Comparison of the three questionnaires are given in Table 2.1.

Table 2.1 Comparison of ASQ:SE-2, BITSEA and CBCL

Measure	ASQ:SE-2	BITSEA	CBCL
Domains	Self regulation, compliance, communication, adaptive behaviours, autonomy, affect and interaction with people.	Internalizing, externalizing and dysregulation, autism spectrum disorders, other psychopathologies, social emotional competencies.	Emotionally reactive; anxious/depressed; somatic complaints; withdrawn; sleep problems, attention problems; and aggressive behavior.
Age	1 to 72 months (9 sets of questionnaires according to age intervals)	12 to 35 months	18 to 60 months
Year published	ASQ:SE in 2002, ASQ:SE-2 in 2015	2006, revised 2011	1982, revised 2000
Administration time	Less than 10 minutes	5 to 7 minutes	15 minutes

Table 2.1, continued

Measure	ASQ:SE-2	BITSEA	CBCL
Response scale or categories	Four (Often/Always, Sometimes, Rarely/Never, Item of concern)	Three (Agree, Frequently, Primarily)	Three (Not true, Somewhat/ Sometimes true, Very true/Often true)
Strengths- or problems-based	Primarily strengths-based 65%	Primarily problems-based 74%	Problems based 100%
Norm sample	16,424	600	700
Cronbach's alpha	Overall: 0.84 (0.71 – 0.87)	Problem scale: 0.80, Competence scale: 0.69	Domains 0.66-0.92, Total 0.95
Inter-rater reliability	0.91	Parent: 0.61-0.68 Parent-teacher problem scale 0.28, Competence scale 0.59	Parent: 0.61, Teacher: 0.65, Parent-teacher: 0.40
Validity	Agreement with similar measures 0.81-0.95	Agreement with ASQ:SE: 0.55, CBCL: 0.51-0.79, Bayley-III: 0.25-0.51	Agreement with Toddler Behavior Screening Inventory and ITSEA 0.48-0.70
Sensitivity/ specificity	Sensitivity: 0.81, Specificity: 0.84	Autism sensitivity: 0.72-0.93, Specificity: 0.76-0.85	Sensitivity: 0.85-0.89 Specificity: 0.90-0.92

2.8.1 Ages and Stages Questionnaire: Social-emotional-2 (ASQ:SE-2)

The Ages and Stages Questionnaire: Social-emotional-2 (ASQ:SE-2) is aimed to assist monitoring of child social emotional development. ASQ:SE-2 which is to be completed by parents or caregivers who spend at least 15 hours per week with the child assessed stands apart from other instruments as it comes along with a quick guide for users on details of administration. ASQ:SE-2 plays a role of screening as it identifies the need for of further evaluation by a trained professional. Apart from having many sets of questionnaires with short age intervals, it also caters for premature children according to their adjusted age. With strong psychometric properties, ASQ:SE-2 is vastly used in many studies and have been socio-culturally adapted and translated to various languages (Squires, Bricker & Twombly, 2015).

2.9 Environmental Influence on Child Development

A child's development is determined by the interaction of multitude influences; from biological, behavioural, and environmental factors which are all intertwined (National Research Council & Institute of Medicine US, 2004). Young (2002), in her book entitled "From Early Child Development to Human Development" describes inadequate or inappropriate social and emotional experiences in a child's early life can compromise higher level brain functioning that provides the processing information to socially bond and respond (Young, 2002). Social and biological environments contribute in complementary ways in the process of neural differentiation to form the skills of a growing child. The presence of an enabling environment for a young child is of utmost important during the critical years – from birth to eight years old and beyond (National Research Council & Institute of Medicine US, 2004).

2.9.1 The Ecological Model

The increasing popularity and presence of digital technology as part of a child's life has seen an evolution in theoretical models proposed to describe the environmental elements of children with potential developmental impact. Bronfenbrenner's *ecological model* which organized the context of development into nested environmental systems in 1970s offered a new theoretical perspective for research in human development. The model provided a unified but highly differentiated scheme for describing and interrelating structures of immediate and remote environments of individuals that shapes human development throughout one's lifespan (Bronfenbrenner, 1979).

The ecology of human development is defined as "the scientific study of progressive, mutual accommodation between an active growing human being and the changing properties of the immediate settings in which the developing person lives, as this process is affected by relations between these settings, and by the larger contexts, in which the settings are embedded" (Bronfenbrenner, 1979).

Bronfenbrenner structured the contexts of child development into five nested environmental systems, with bidirectional interaction within and between systems. The microsystem refers to the immediate child environment which includes home and school. The following layer of environment is mesosystem which comprises connections between immediate environments, for example parent–teacher interactions. The next outer layer, exosystem includes environmental elements that indirectly affect the child such as parent's workplace. The second outer most layer, macrosystem reflects overarching social ideologies and cultural values, such as the rights of children in a particular setting. Finally, the chronosystem highlights the effect of time on all systems and developmental process (Johnson, 2010).

The *ecological model* (Bronfenbrenner, 1979) however emerged prior to the internet revolution with then only available technology back then being television which was placed in the child's microsystem. With evolving technology revolution in the recent decade, the initial ecological model has seen changes along the years. Johnson and Puplampu, 2008 proposed the *ecological techno-subsystem* model which includes child interactions with digital technologies – an element which was lacking in the older model. The *ecological techno-subsystem* model includes interaction of child with living and non-living elements of communication, information, and recreation technologies in immediate or direct environments (Johnson, 2010).

2.10 Home Media Environment

Home media environment is one of the immediate social environments of a child. In the era of rapidly changing digital technology, electronic media use has become rampant – with increased number of inexpensive choices for families. This puts young children into exposure of various technologies readily available at their homes, influencing their screen time (Paudel et al, 2017; Ray & Jat, 2010).

In the present decade, almost all homes in different parts of the world are equipped with screen-based media (Chang et al, 2018; Lepicnik & Samec, 2013). Media environment not only includes media availability at home and media accessibility to children, but also media rules imposed by caregivers – such as when and how much screen time is allowed. According to the Internet-Cohort for Understanding of Internet Addiction Risk factors/Resue in Early livelihood (I-CURE) study that involves 390 toddlers, almost all homes in the Republic of Korea were equipped with televisions (94.6%), personal computer (90.0%), and smartphones (95.9%). Nearly half of the family in the study owned their own tablet. Being a prospective cohort study that explored various types of media ownership in houses of toddlers aged two to five makes it the first such study in Korea and one of the earliest in Asia (Chang et al, 2018).

Increased availability of screen-based media leads to its increased accessibility among young children at home, with research stating nearly a quarter (21%) of toddlers aged three to four years old possessing their own tablet and 1% having their own smartphone (Children and Parents: Media Use and Attitudes Report, 2017). The number of screen-based media available at home heavily influence child media habits. Toddlers were found to have twice higher daily screen time when they live in a home equipped with a television compared to children who do not (Vandewater, 2019).

Despite recommendations to have children's bedroom free of screen-based media, it was reported more than half (56%) of children aged two to six years old in a survey of 489 children had at least one media device in their bedrooms (Quick et al, 2018). Children in their first two years of life with a television in their bedroom are found to be four times more likely to oppose recommended guideline (Vandewater, 2019). In another study, tolddlers with no bedroom television recorded higher possibility of adherence to AAP's screen time guideline (OR 1.69, 95% CI: 0.64 – 4.49). Having a television easily accessible in a near distant could contribute to this scenario (Asplund et al, 2015).

Engagement with screen-based media in a personal space such as bedroom not only exposes children for more harmful, age-inappropriate contents without adult supervision, it is also shown to displace daily activities of children such as sleeping and reading which later mediates poor school performance (Gentile et al, 2017).

For every additional piece of media equipment in a child's bedroom, there was an increased 22% of likelihood for the child to be spending more than two hours watching television and 14% increased likelihood of at least an hour of computer time per day. The mean number of media devices found to be at home in this study involving children aged six to eight was 5.9 items, with 1.3 items in children's bedroom. The relatively higher number recorded could be due to the age factor of children recruited in the study who are of slightly older than toddlers. School going children may not only be watching television in their room, but also other electronic devices meant for educational purposes such as computer or laptop for accomplishment of school homework (Jago et al, 2013).

The placement of screen-based media such as television and video games in the bedroom continues to be reported as a positive predictor of high screen time among young children. Carson et al (2012) reported this finding in their study that adapted the Ecologic Model of Sedentary Behavior as a base to explore associations between factors within child's home setting and screen time among children aged within five years-old. Surprisingly, having a computer in child's bedroom did not yield a positive correlation with screen time. Usage of computer presumably more for educational purpose and not for entertainment may be a causative to this scenario. One of the advantages of Carson et al's research work is that it provided a foundation for setting-specific recommendations by identifying factors influencing child media habit at home which may differ than other setting such as day care or nurseries. However, major limitation of the study is the recruitment process of study sample which only involves licensed childcare centres, to which only 15% of pre-schoolers in the Canadian region attend, making the finding not representative of the general population. Whilst the questionnaire utilized in the study was adapted from a previous national survey and was pilot tested before administered to participants, the tool was not tested on its psychometric properties; marking another drawback of the study that involved more than 700 children (Carson et al, 2012).

With regards to media availability in child bedroom, it is important to note that previous qualitative work has shown that it is not easy for many children and parents to remove an existing television in child's bedroom. Thus, introduction of electronic devices at bedroom should not be initiated at the first place as a preventive approach of reducing media exposure among children (Jordon et al, 2006). Apart from media availability and media accessibility, rules applied at home with regards to screen-based media usage among children is essential to be explored on.

Higher involvement of children with screen-based media is seen in homes without media rule settings (OR 2.64, 95% CI: 1.84 - 3.78) in a Japanese study among school children (Yamada et al, 2017). This finding is echoed by another study in an American population of more than 600 parents with children aged three to 17 years old. Parents implementation of home media rules and enforcement strategies was significantly associated with reduced child screen time among the young childhood phase or children ranged three to seven years old. Finding from this study which utilized the Technology Related Parenting Scale proposes screen time of the young children may be effectively managed in a home with media rules and enforcement strategies (Sanders, W. et al, 2016).

However, it is worthy to note that there is also research work that contradicts the argument on positive association between home media environment with child screen time. In an Australian study involving nearly 300 pre-schoolers that collected data through direct observation and parent interview, number of television available at homes was not significantly associated with child screen time (Hoyos & Jago, 2010).

A plausible explanation for the finding is that the effect of media availability variable which is weak, as many homes in the study had multiple televisions (47% of families in the sample had three or more televisions). Nevertheless, increased number of family media rules did affect the screen time duration of children in the study (Spurrier et al, 2008). In a systematic review among children below seven years old, no association were found between the presence of bedroom television and number of televisions in household with screen time which may indicate that younger children do not spend as much time involved in independent activities in their bedrooms (Hoyos & Jago, 2010).

2.11 Parental Media Behaviour

The exponential increase in media usage has changed the way human interact with each other, drawing away from the traditional face to face interaction to what is known as new norm of virtual communication via various forms of screen-based media that digital technology has to offer. Thus, the technology climate that influences child's media behaviour includes a vital aspect of parental factor such as media use, media addiction and media dependency, which makes up the parental media behaviour.

Research tells us that more than a quarter parents (27%) fall into the media-centric category with characteristics such as increased parental screen time, parents who use media as a channel to connect with kids, and parents that utilize media to keep their children busy when they want to get their chores done. Nearly seven in ten (69%) parents admit owning a smartphone, whereas 40% parents have their own tablets in a study (Wartella, Rideout & Lauricella, 2014). Media usage has long been investigated upon its impact on adults or parents, but little is known on its effect on parent-child interaction nor child development. Parental media behaviour could impact on a child directly by effecting child screen time, and indirectly by reducing parent-child interaction.

In a Portuguese study of nearly three thousand parents of children aged between three to ten years old recruited from a larger nationwide obesity prevalence study, parental television viewing time was found to be strongly associated with child's television viewing time over weekdays and weekends. This association was stronger for maternal television viewing time compared to paternal television viewing time. Parents with more than two hours of television viewing time per day was found to be 1.5 to 8 times more likely to have children who also exceed two hours of television viewing time per day. Findings of this study indicate the need for family interventions that focus towards reducing parental screen time (Jago et al, 2012).

A cross-sectional study conducted in Japan among school children aged six to 13 years old reports on the association between parental internet use and screen time among their children. The study on more than 1,600 children stated 40% of them spent more than two hours per day of screen time. It further reported child's prolonged screen time was positively associated with parental internet usage of more than two hours per day (OR 2.92, 95% CI: 2.00 - 4.26) (Myruski et al, 2018).

Parents reporting to less self-efficacy and more barriers in the form of opportunities, availabilities, affordability, and time for physical activity are more likely to have higher child screen time, as reported by an Australian population survey involving kindergarten children (Smith et al, 2010). Parental television watching time and perception that their child is spending too much time playing video games were associated with increased child screen time, (ß = 0.37, p-value <0.001) and (ß = 1.06, p-value <0.001), respectively (Barr-Anderson et al, 2011). These discoveries further strengthen the perception that parental role modelling of activities potraying sedentary behaviour is linked with sedentary behaviour in their children as well (Jago et al, 2008; Jago et al, 2013).

The study by Barr-Anderson et al, 2011 however was focused only among American Indian children, justified with the rationale of population risk for obesity. The research work hoped to provide an insight of parental behaviour that can be useful for future targeted health-promotional activities and intervention. On contrary, parents with lesser than two hours of screen time themselves is shown to increase the likelihood of their children to have recommended screen time in another study (Asplund et al, 2015).

Parental media behaviour stands as a stronger predictor of excessive screen time among children compared to child's sex, age, and lifestyle (Yamada et al, 2017). As the beneficial effects of screen-based media is not well established based on available literature, there is a need to infer parent's view or perspective on child media usage. Parents are still facing uncertainties and queries unanswered with regards to the use of new technology in their families. Concern on potential negative effects of technology on children exists among caregivers (Genc, 2014), with one such study reporting 86.4% parents limit children's interactive media use (Guedes, 2019).

Parental screen time and self-efficacy are found to be effective factors in limiting child screen time and ensuring recommendations are adhered to, as reported by Goncalves et al (2019) in their cross-sectional study of children with mean age of four years old conducted in Brazil. There was a positive association between parental screen time with child screen time on both weekdays and weekends, (weekdays = β 0.27, $p < 0.001$, weekends = β 0.24, $p < 0.001$). Reduced parental self-efficacy on the other hand was found to increase child screen time (weekdays = β -0.15, $p = 0.004$, weekends = β -0.16, $p = 0.004$) (Goncalves et al, 2019). In a study comprising of more than 300 school children with mean age of 11 years old, media usage of parents is heavily linked to their children's media behaviour. Both maternal and paternal television or DVD viewing, and computer or games console usage were associated with higher engagement of these screen-based activities in children ($p < 0.01$) (Schoeppe et al, 2017).

2.11.1 Link between Parental Media Behaviour and Child Development

Exploring the connection between parental media use, and children's behaviour and development is a new area of research. Parental mobile technology use in the presence of children is shown to be associated with lower parental responsiveness, sensitivity, and attention, which mediates a change in children's behaviour (Hiniker et al, 2015; Radesky et al, 2015). In a non-participative observational study, 29% parents were found to be almost constantly engaged to their mobile device during meals with their children. Some parents were noticed to be closely engaged to their device, even keeping a gaze on it while answering children's question or giving instruction to them (Radesky et al, 2014).

Parents who took a longer period to respond to child's needs, questions or emotions exhibited provocative behaviour of child (Radesky et al, 2014). This finding is similar to another research work where it was noted when bids for emotional reciprocation is not returned, babies tend to display distress and confusion (Provenzi et al, 2015).

Detnakarintra et al (2020) in their Thailand-based longitudinal study demonstrated bidirectional relationships between mother-child interaction with parenting styles and child screen time. Higher mother-child interaction at 18 months was positively associated with lower child screen time at the age of 24 to 36 months, whereas higher nurturing parenting behaviours at child's three years of age had positive associations with diminished screen time at four-years old. This study was a pioneer work that investigated mother-child interaction during period of early childhood and its relationship with child screen time. Although the data collected for evaluation of mother-child interaction was obtained only once in an office-based setting and not in the real home environment in which child grew up in, the measurement was ascertained by using two different methods; direct observation and interview – thus increasing the reliability of study finding.

The significance of parent-child relationship for early childhood social emotional development has long been discussed by researchers (Kochanska D., 2001; Sroufe, 1996). However, it is important to take note that parent child relationship can be disturbed by parent problematic digital technology usage. Technoference, or technology interference in parenting results in child behavioural difficulties. This scenario is explained by observations of child escalating their behaviour for the purpose of catching the attention from their parents who were connected to their mobile devices in a study on American children below five-years old which utilized the Parent Problematic Digital Technology Use. Failing to be responded to, some children tend to get frustrated and angry. This result remains significant after controlling for parental depression or parental stress levels (McDaniel & Radesky, 2017).

Parental media addiction or media dependency may lead to dysfunctional parent–child interactions which has been shown to be associated with behavioural difficulties in children (Zhao, 2018). Pathological parent-child relationship on the other hand significantly increases the risk of difficult behaviour in children aged four to six years old; with adjusted odds ratios, aOR 2.06 (95% CI: 1.53 - 2.77) for emotional symptoms, aOR 1.83 (95% CI: 1.32 - 2.54) for conduct problems, and aOR 1.69 (95% CI: 1.24 - 2.31) for total difficulties (Grazuleviciene et al, 2017). These findings are coherent with the increasing body of evidence that shows psychosocial factors that leads to poor parent-child relationship in turn impacts negatively on child's mental health.

In a randomized controlled study in which parental distractions in the form of telephone call, engagement with television and computer assignment were stimulated, parents portrayed significant decrease in child supervising ability when distracted with screen-based media. Parent and child dyads in the distraction group were significantly reduced in terms of their engagement with each other, regardless of type of screen-based media used. Toddlers in the study were ensured not to have developmental disabilities to avoid any measurement bias. Although adaptation of behavioural observation method is the strength of the study, only 40 participants aged two to five-years old took part in the study due to feasibility reasons – which may underpower the study. Larger observation-based studies may help test the hypothesis that a significant relationship exists between parental media distraction and negative child behaviour (Boles & Roberts, 2008).

In a study aimed to understand families' mobile device use pattern, diary-writing and semi-structured-interview methods were utilized for data collection. Participants admitted to having felt that they are missing the moments they were supposedly be present with kids and that their engagement with mobile devices made kids feel ignored by parents. Some parents reported that usage of mobile device affected parenting as they realised their gadgets unintentionally turned to be a leverage for taking on parental duties. The study provides a basis for initiatives of developing mobile device operating systems that may be designed to support mindful usage of their device to reduce social tensions and increase familial connectedness through healthy interactions (Oduor et al, 2016).

McDaniel and Radesky are researchers who have explored much on parental digital technology usage through their research works. They state that children receive less parenting support to perform a new skill independently when mobile devices displace parent-child interaction (McDaniel & Radesky, 2018). In a cohort study involving nearly 200 mother-toddler dyads, usage of mobile devices during mealtime was explored on its association with maternal mental representations which reflect on their emotional state, parenting role and child's characteristics. It was found that there was a positive association between active maternal mobile device usage during family meals with the perception that the child is with difficult behaviour (Radesky et al, 2018). When distracted by an electronic media, a parent may be less aware of their child's needs and cues and subjected to delay in responding to it, leading to children experiencing insecure attachment with their parents (McDaniel & Coyne, 2016; Radesky & Christakis 2016).

Maternal mobile device usage was associated with increased negative effect in terms of infant social emotional functioning in a study involving children aged seven to 24 months old. Mothers reporting to greater use of mobile device also portray children with poorer emotional regulation, facing longer recovery of child upon reunion (Myruski et al, 2018). Many publications give the solid evidence that a positive parent-child relationship symbolized by warm and loving interaction is the most important factor in a child's healthy development. Positive parenting involves responding to child's need or wants sensitively. For most parents, communication with their baby takes place through playful interactions which is a huge part of their daily life (Murray, 2014). Heavy parental usage of screen-based media is at risk of displacing effective communication and play with children.

2.11.2 Technology Interference

With the growing popularity of screen-based media usage, researchers have begun to explore the impact of technology-based intrusion on relationship qualities (Przybylski & Weinstein, 2013) and the effect it brings on to families (Derks & Bakker, 2014; McDaniel, 2015; McDaniel & Coyne, 2016). Although mobile devices such as phone was once meant to offer mobility and pleasure of immediate access to each other with the motive of sociability (Leung & Wei, 2000), the same electronic device has been found to display evidence of interfering with human relationships by effecting closeness, interconnection, and quality of conversation between individuals (Przybylski & Weinstein, 2013). Researchers, McDaniel and Radesky have shown the bidirectional associations between technology interference in the form of technology use by father and mother during parent-child activities with child's behavioural activities. Their longitudinal study that took place over the period of half a year was first such follow-up study. Clinically, their study suggested that digital technology use especially mobile devices is seen as a stress-relieving mechanism for parents (McDaniel & Radesky, 2018).

However, as a consequence, it also displaces parent-child interaction or bonding which serves as base for helthy early childhood social emotional development. Technoference is characterized by invasion of parents' daily lives by technology during their time spent with children via various ways such as message notifications or ad-hoc usage (McDaniel & Radesky, 2018).

Parents and caregivers describe the act of multitasking between technology use and parenting as stressful and less effective. The cognitive load of working or retrieving information via technology creates difficulty in reading and responding to children's social signals (Radesky et al, 2016c). Intrusions faced during interaction with a child, difficulties in meeting child's social emotional needs, and absence of learning moments significantly contributes towards dysfunctions of early childhood social emotional development (Da Silva et al, 2019).

2.12 Assessing Screen-based Media Use in Adolescents and Adults

Previous studies have shown various methods of assessing screen-based media usage or media behaviour in adolescents and adults. One of the methods used in research includes the time measurement; with or without focus on the programme one is engagement with in a particular day or duration (Junco R., 2013; Padilla-Walker, L. M., & Coyne, S. M., 2011; Reich S.M. et al 2012, Yogesh, S., Abha, S., & Priyanka, S., 2014). Another method used by researches is the Likert-scale for measuring of certain characteristics of media usage such as smartphone or internet addiction (An, J. et al, 2014; Cheung, L. M., & Wong, W. S., 2011; Demirci, K., Akgönül, M., & Akpinar, A., 2015). There are also studies that utilize the experience sampling method in which real-time information regarding one's thoughts or behaviour is collected (Moreno, M.A. (2012a; Moreno, M.A., 2012b).

The Media Use and Technology Usage and Attitudes Scale is one of the measurement tools that explores technology usage and attitudes. Technology usage element consists of 44 items derived from 11 subscales; namely internet searching, e-mailing, text messaging, media sharing, facebook friendships, online friendships, video gaming, phone calling and television viewing. Whereas the attitude scale is made of 16 items belonging to four subscales; namely positive attitudes toward technology, dependence on technology which is adapted in this study, negative attitudes toward technology and preference for task switching. All 15 subscales of the measurement tool showed strong reliability and validity (Rosen, L. D. et al, 2013).

2.13 Screen-based Media Use in Young Children

The rapid pace of change brought by technology has impacted the society in large. From computers to internet and television to mobile phones; advanced breakthroughs have been revolutionizing families around the world. The way children of the younger generation live, learn, and interact are changing over the years as childhood has been gradually saturated by the advancement of technology (Hutchby & Moran-Ellis, 2001). Viewing of television and video is reported to be apparent even among children below the age of two (Zimmerman, Christakis & Meltzoff, 2007). Interactive screen media is shown to be embedded in daily lives of toddlers (Wartella, Rideout & Lauricella, 2014).

Media is being used for various purposes – such as entertainment, leisure, communication, learning, as well as a source of distraction in the absence of parents (American Academy of Pediatrics, 2016; Wu, 2014). The unprecedented growth and advances in technology provides the access to abundant amount of knowledge and informatics the world has to offer. However, as the term screen time covers multiple technologies with unique concepts of entertainment; the way children receive, process, and respond towards content of the newer media may be different than how it was decades ago (Ashton & Beattie, 2019).

Though research in the past decades have been witnessing more work on impact of television on children's health and development, more recent studies are focusing upon digital platforms such as mobile and interactive media (Radesky & Christakis, 2016). Potential effects of screen-based media on child health have been the interest of researchers worldwide the past 30 years, focusing on child development, obesity, sleep, and aggressive behaviour (Rideout, 2013).

Children born into the ever-changing digital ecosystem enhanced by screen-based media are called "digital natives" as the age of which young children regularly interact with media has shifted tremendously. Infant-directed video materials in market are publicized as an effective learning method for young children (Garrison & Christakis, 2005). Survey indicates more than half parents (56%) believe that these videos can have positive effect on early child development (Rideout, 2007). However, the benefits of screen-based media for children outweighing the risks are yet to be proven. Understanding the association between this new technological affordance and well-being of young children is highly salient as it is associated with eating disorders, disturbed sleep, attention deficit, developmental delay, and eye disorders (Chassiakos et al, 2016).

2.14 Child Screen Time

The term screen time denotes quantity of screen-based media use or time spent watching varied electronic media; television, movies, or DVDs on electronic devices, playing video games on console game player (such as Xbox and Playstation) or handheld game console (such as Gameboy and PSP), using tablet computer such as iPad and usage of smartphone as well (Madigan et al, 2020; Sanders, Parent & Forehand, 2018). Average daily use is reported as duration across weekends and weekdays for all types of devices. Appraisal of child screen time for young children is usually done via parental reporting. Methods of screen time measurement for research data collection include questionnaires, screen time diary, interview, and observation (Madigan et al, 2020).

2.14.1 Child Biological and Demographic Factors as Correlates of Screen Time

As with any outcome of interest, biological and demographic factors play a vital role in determining a child's media behaviour, particularly screen time. In some studies, higher screen time is associated with racial or ethnic minority groups (Fletcher et al, 2014; Zimmerman & Christakis, 2007).

In terms of age, older children are reported to have higher screen time in many studies (Anand & Krosnick, 2005; Certain & Kahn, 2002; Paudel et al, 2017; Ruangdaraganon, 2009; Wang et al, 2018), while some studies report age as insignificant factor that determines likelihood of children presenting with excessive screen time (Smith et al, 2010). In a systematic review of correlates of screen time among children below the age of three, 88% (15 out of 17 studies) reported older children watched more television than younger children (Duch, et al, 2013).

Gender did not show any association with screen time in many studies in the past two decades (Certain & Kahn, 2002; Downing et al, 2017; Schmidt et al, 2009; Tomopoulos, 2007), although some studies report to a mixed finding of either girls with higher screen time (Mozafarian et al, 2017) or boys with higher screen time (Wang et al, 2018; Zhu et al, 2018).

There are also studies that have explored the relationship between firstborn child with screen time, however found to have no significant association between both the variables (Certain & Kahn, 2002; Kourlaba et al, 2009; Tomopoulos et al, 2007). Other familial factor reported is number of siblings, whereby children with lesser than three siblings were found to be associated with higher screen time (Chandra et al, 2016).

Higher body mass of index (BMI) of children is found to be positively associated screen time, supporting the notion that children's active play is displaced by higher usage of electronic media (Dennison, Erb & Jenkins, 2002; Lumeng, 2006; Sourtiji et al, 2019).

All four studies reporting on BMI as a correlate of screen time among toddlers included in a systematic review were found to be positively associated with screen time (Duch et al, 2013). More screen time is associated with more sedentary behaviour which includes unhealthy eating habits and reduced physical activity (Marshall et al, 2004; Wilson et al, 2016).

2.14.2 Child Behavioural Factors as Correlate of Screen Time

Low level of physical activity is described to be related to child screen time in many studies (de Araújo et al, 2018; Yamada, Sekine & Tatsuse, 2018). In a cross-sectional study of 2734 school-going children, screen time was associated with lower likelihood of achieving healthy zones for physical activity denoted by muscular strength, cardiorespiratory endurance, and fundamental movement skills (Hardy et al, 2018). Even specific eating factors are associated with child screen time as described by Pearson et al (2018) whereby children who had their breakfast while viewing television on three or more days a week had increased odds of having higher screen time (Pearson et al, 2018).

A nationwide study encompassed of more than 13,000 students aged six to18 years old explored the association between eating habits assessed using food frequency questionnaire and media behaviour. Findings indicate high level of unhealthy eating habits was associated with television watching time of more than 2 hours (aOR 1.66, 95% CI: 1.51 - 1.84), $p<0.001$; computer usage of more than 2 hours per day (aOR 1.79, 95% CI: 1.49 - 2.14), $p<0.001$; and screen time of more than 4 hours per day (aOR 1.96, 95% CI: 1.71 - 2.25), $p<0.001$. Despite having a large sample with wide age range of children being the strength of the study, its design being cross-sectional did not allow for conclusion about causation to be made (Mozafarian et al, 2017).

2.14.3 Child Non-parental Care as Correlate of Screen Time

Participation of child in a non-parental care programme or arrangement while parents are away at work did not show any positive association with screen time in some studies (Lumeng, 2006; Tomopoulos, 2007; Zimmerman & Christakis, 2005). However, some researchers reported otherwise with children in parental care found to have larger possibility of screen time compared to children receiving non-parental care (Carson & Kuzik, 2017; Chandra et al, 2016; Matarma et al, 2016).

In Martama et al's two-year follow up study where screen time difference was recorded at child's age of 13, 24, and 36-month, increase in screen time was found to be larger (67 minutes) compared to children who were sent for caregiving outside the home (59 minutes), p = 0.019 (Matarma et al, 2016). The longitudinal study gives an in-depth insight on association between home-based setting and screen-based media habits of young children in comparison to those who receive non-parental care in the form of day care, nursery, or preschool.

2.14.4 Family Factors as Correlate of Child Screen Time

In terms of family factors, there are inconsistencies in findings that report on screen time association with parental educational level. Although some studies report of no association between screen time with maternal education (Dennison & Erb & Jenkins, 2002; Tomopoulos et al., 2007; Vandewater, 2005; Zimmerman, Christakis & Meltzoff, 2007) and screen time with paternal education (Certain & Kahn, 2002; Zimmerman & Christakis, 2005), opposing results were described by some studies. One such study is by Schmidt et al who found toddlers of mothers with lower education attainment had higher hours of television viewing time (Schmidt, 2009).

In a two-year follow-up study among toddlers, children of higher educated parents were found to have smaller surge in screen time (Matarma et al, 2016). Mothers with full time employment show 95% higher odds of prolonged screen time (Yamada, Sekine & Tatsuse, 2018). Both the study findings may imply contradiction as highly educated parents may lead to higher portion of employment as well. The studies however differ greatly in terms of sample age, whereby Matarma et al, 2016 included toddlers aged 13 to 36 months old whereas Yamada, Sekine & Tatsuse (2018) recruited school-going children which may attribute to the contrasting finding as well.

Children of single mothers were found to be associated with higher screen time among children aged 18 months old (Chandra et al, 2016), in consistent with findings of an Australian longitudinal study by Byrne et al (2011) among children aged four to five and eight to nine years old and a Norwegian study involving youths aged 11 to 16 years old (Langoy et al, 2019). These findings depict increased screen time among single-parent households of children falling into wide ranges of age.

2.14.5 Environmental Factors as Correlate of Child Screen Time

Literature tells us less-structured environment with reduced regulation and supervision imposed on young children tend to be a host for obesogenic behaviours. This is evidently seen especially among pre-schoolers during weekends or holidays. Apart from reduced physical activity and unhealthy eating habits, the term 'obesogenic behaviours' includes increased screen time (Brazendale K. et al, 2017). During holidays, children are with higher possibility of being exposed to unsupervised and free indulgence with screen-based media (Franckle, Adler & Davison, 2014; Von Hippel et al, 2007). Concern regarding effects of school closure on child screen time has always been a heated topic of discussion, now added with the home isolation measures due to the COVID-19 pandemic (Lee, 2020; Liu, 2020).

Being quarantined in homes and institutions during the pandemic impacts on the lifestyle changes among young children, including on the time spent engaged with screen-based media. Children ought to spend their time on screens for the purpose of completing online home-schooling activities, socializing with friends, or playing entertainment-based games as a replacement of outdoor activities (WHO, 2020b). Some researchers have reported significant increase in screen time during the lockdown period of pandemic compared to baseline, before the social isolation measures for disease prevention was implemented (Duan et al, 2020; Pietrobelli et al, 2020; Xiang, Zhang & Kuwahara, 2020).

Xiang, Zhang, & Kuwahara (2020) in their natural experimental longitudinal study among 2426 children aged six to 17 years in five schools in Shanghai, screen time was measured twice; before and after the declaration of Public Health Emergency. Nearly a quarter of the children were found to be engaged in long periods of screen time for leisure. In comparison to 7.3% children reporting to leisure screen time of more than two hours per week before the pandemic, more than four folds (30.9%) were reported for the same during the period of pandemic. It was also reported that there was a statistically significant decrease in children with less than two hours screen time per day during the pandemic (Xiang, Zhang & Kuwahara, 2020). Pombo et al, 2020 stated more than half (56.7%) of 2159 children below 13 in their study reported to have “more screen time” and 14.6% reported to have “much more screen time” during the pandemic.

A longitudinal study conducted in Italy with 41 children and youth with obesity showed significant increase in screen time during the pandemic compared to the baseline. Baseline data was obtained from 13th May to 30th July 2020, and a repeated interview was conducted three weeks after lockdown. Change in screen time in hours per day was reported to be mean (SD): 4.85 (2.40), $p<0.001$ (Pietrobelli et al, 2020).

Another study conducted in China Duan et al, 2020 have reported children spending ≥5 hours on internet during pandemic as higher compared to pre-pandemic period, from 10.12% to 29.58% (Duan et al, 2020). In Canada, a study explored change in movement behaviour of children (five to 11 years old) and youths (12 to 17 years old) by inquiring in child viewing of television, computer usage, engagement with social media and playing video games for which answers were recorded in the form of frequency-based 5-point Likert scale. Data collection was done via online survey a month after WHO declared COVID-19 as global pandemic. The study reported only 16.5% children and 6.6% youth were meeting the screen time guideline (Moore et al, 2020).

2.15 Screen Time and Child Development

Numerous publications investigate potential health impacts, especially in terms of child development caused by electronic media usage. One such study is a prospective cohort that focused on early media exposure. Children were assessed of their media usage at six months old, and a reassessment which was done at 14 months old display lower cognitive development ($ß = -0.15$, P=0.02) among children with early exposure of electronic media. Differences of media content did not influence the study finding. Strength of this study is usage of media diaries as an instrument to quantify duration and content of media exposure. Nevertheless, underestimation of duration is also possible as the diary only probes on child's one typical day, reported by parents (Tomopoulos, 2010).

In a study conducted on over 500 pre-schoolers aged between two to six years old in German, a significant association was found between excessive screen time and behavioural difficulties, which includes emotional and conduct problems. Usage of mobile phone increased the likelihood of children developing characteristics of hyperactivity or inattentiveness by more than three times (OR 3.36, $p < 0.05$) (Poulain et al, 2018).

In another study, frequent television exposure among young children showed developmental delay compared to those who were not. Various degrees of possibility scores were recorded in different developmental domains; with language development (OR 3.3, 95% CI: 1.5 - 7.3) cognitive development (OR 3.9, 95% CI: 1.4 - 5.9) and motor development (OR 3.7, 95% CI: 1.5 - 9.3). Though the control group in this study was matched in terms of their age with the exposed group, type of caretakers differed in both. This difference in characteristic opens the possibility for distortion of study result as child stimulation by parents from caretakers. As this study recruited its respondents from a paediatric clinic of a Taiwanese hospital, it is also subjected to inclusion bias. Children in the control group may have predisposing conditions related to television exposure, giving rise to presence of exposure influences in the control group (Lin et al, 2015).

In a cross-sectional study conducted on nearly thousand children aged two to five years old recruited from preschools, childcare centres, and child activity groups, mothers were enquired on child's electronic media behaviours. Children were evaluated using Adaptive Social Behaviour Inventory (ASBI) that is made up of three subscales; 'express', 'comply' and 'disrupt' that tests child social skills such as being open, calm and bullying tendency respectively (et al, 2018).

Multiple linear regression model portrayed that the average screen time was inversely associated with subset of compliant scores, ß=-0.35 (95% CI: -0.26 to -0.14) and expressive score, ß=-0.23 (95% CI: -0.43 to -0.02). The same study displayed outdoor play time was positively associated with children's social skills. However, limitation of the study is the design being cross-sectional that was not able to identify screen time as causality of poor social skills of the respondents, and usage of ASBI which utilizes same items in instrument for screening of children with wide age range, unlike ASQ with different sets of questions according to age interval (Hinkley et al, 2018).

In a prospective cohort study of more than 16,000 children aged between two to nine years old recruited from eight European countries, psychological and social well-being of children was investigated as outcome variable with child screen time as the exposure variable. The independent variable of electronic media usage time was categorised to five levels, from zero score indicating no media usage at all and highest score of five indicating more than three hours of media usage per day. Children's well-being was evaluated using two validated parental questionnaires that includes emotional problems, self-esteem, peer problems, family and social functioning subscales. Probability of emotional problems and poorer family functioning increases by 1.2 to two-fold for every additional hour of screen time. The author of this study has pin-pointed that social interaction and parent-child discussions during screen time are potential measures to decrease negative effects of screen time on child well-being (Hinkley et al, 2014).

Duch et al in a longitudinal study of 119 children measured screen time as the key exposure using 24-hour recall method, and child's language development as the key outcome using the communication subscale of ASQ-3. Children in the study with more than two hours of television viewing were found to have lower communication scores, ($ß=-1.49$, $P=0.008$). Mean screen time reported was 3.5 hours. One of the limitations of the study was the sample size that prevented more detailed analysis of adult-directed media impact on child's communication scoring (Duch et al, 2013).

The nationally representative Longitudinal Study of Australian Children (LSAC) data was used to investigate the association between television viewing and electronic game usage with child's self-regulation. The two main exposures were assessed on 4,000 children who were recruited via birth cohort of LSAC and baseline assessment was done on two-year old children. Outcome in the form of self-regulation level was measured two to four years later. It was found that a decrease of 11.4 minute per day of mean total media exposure causes a unit increase in self-regulation scoring (Cliff et al, 2018).

There are also contradicting studies that goes against the notion that screen time leaves a negative impact on child development. One such study is a prospective cohort that explored television viewing among toddlers. Findings did show a lower cognitive ability among children with more television exposure during infancy, however the association did not persist when adjusted for some variables; namely child, maternal and family characteristics (Schmidt, 2009). A qualitative study conducted in the year 1985 evaluated potential impacts of playing video games on 20 families that were followed through for a period of six months. These families found the activity of video game playing to be helping them in development of interpersonal relationships and social skills. However, limitation of the study is the inexistence of objective measurement of development attainment level of children (Mitchell, 1985).

Reports have shown association of screen-based media viewing in the phase of early childhood with various domains of child development; language (Duch et al, 2013 & Ruangdaraganon, 2009), social skills (Cheng et al, 2010) cognitive (Christakis et al, 2018; Nathanson et al, 2014) and emotional (Skalicka et al, 2019) among others. Also reported are impact of media use in young children on inattention or hyperactivity (Tong, Ye & Yan, 2018; Xie et al, 2020). Passive and interactive media only enables toddlers less than 30 months to learn if co-viewing or teaching of content by caregivers exist through their daily interactions. Any digital media that does not involve caregivers is unlikely to serve the purpose of educating young children (Radesky & Christakis, 2016).

Not many studies have examined the effect of computer usage time on mastery of social skills among children. A study on children aged 11 to 17 years old suggested that frequent computer game players meet their friends more often outside of schooling hours ($r=0.20$, $p < 0.05$), indicating measure of sociability was positively correlated to computer games (Cowell, Grady & Rhaiti, 1995).

How family dynamics are impacted due to computer usage is also an interesting area of research as it also influences child development and well-being. In a study where 20 families with home computer game sets were interviewed, the respondents shared their opinion that the game sets brought the family members together for shared play and interaction, indicating a positive impact (Mitchell, 1985). However, in the current era where computers and game consoles have increased in numbers, there is higher tendency of them being placed in private places such as bedroom, giving an isolated experience to the user. Thus, findings of the study which was conducted three decades ago may not be applicable anymore. There is possibility for children of this age to socialize in ways not possible before, but also to be engaged more to gadgets and lose the opportunity of having 'real' human interactions.

Heft and Swaminathan (2002) observed computer as the focus of social interaction amongst preschool children, with computer seen as an encouraging tool to interact with peers. In another study on children aged six to 12 years old, gender discrepancy was observed. Girls who spent more time with computer activities were noted to have lesser internalizing behaviour which was the other way around for boys. Higher computer usage also showed better reading and problem-solving skills among girls and not boys (Hofferth, 2010). Toddlers who had access to computer were reported to have obtained significantly higher scores in cognitive assessment (Li & Atkins, 2004).

2.15.1 Hypotheses Linking Screen Time and Child Development

Technology use was associated both with transient changes in child's mood or temperament as well as with long-term changes in behaviour or brain function (Bavelier, Green & Dye, 2010). Gentile et al, 2017 tested on two hypotheses that explain the effect of screen-based media on young children's behaviour and development, namely the displacement hypothesis and the content hypothesis.

According to the displacement hypothesis, children who spend a significant amount of time with electronic gadgets tend to spend lesser time for other prosocial activities such as spending time with family and friends, leading to lesser human interaction that reduces opportunity of learning (Anderson, D.R. & Subrahmanyam K., 2017; Gentile et al, 2017). In an observational study through which children aged one to three-year old were observed for one hour of play session, the quality and quantity of parent-child interaction were discovered to be significantlty decreased in the existence of background television (Kirkorian H.L., 2009). Zhao J. et al, 2018 have demonstrated that excessive screen time is associated with poor psychosocial well-being in preschool children, greatlty contributed by reduced parent-child interaction in their study conducted on over 20,000 kindergarten students in Shanghai aged three and four years old.

On the other hand, the content theory claims that the nature of media content a child is engaged with may lead to alteration of behaviour or skills acquisition (Gentile et al, 2017). For example, children's television show 'Dora the Explorer' was found to be associated with an increase in vocabulary and expressive language skills in two-year olds, while exposure to 'Teletubbies' was associated with a decrease in both measures (Linebarger & Walker D, 2005). However, relatively few studies have studied the impact of media content on early childhood. This could be contributed by the lack of standardized, scalable, systematic, and cost-effective measurement tool that accurately captures child exposure to different types of media content in a household. Evaluation regarding impact of different types of media content or programme children are engaged with on child development, is thus difficult to be explored by (Barr R.et al, 2020).

Following section displays tables with studies that explore association between different types of screen-based media and child development (Table 2.2, Table 2.3, Table 2.4, and Table 2.5). Table 2.6 and Table 2.7 potrays the association of onset age of exposure to screen-based media and screen time with child development, respectively.

Table 2.2: Summary of studies on association between television viewing and child development

Author, year and country	Study title	Design, sample size, age group	Major findings
Lin et al, 2015 (Taiwan)	Effects of Television Exposure on Developmental Skills among Young Children	Case control, n = 150 (15 to 35 months old)	Cognitive, language and motor delays in young children were significantly associated with television viewing time
Christakis et al., 2009 (USA)	Audible Television and Decreased Adult Words, Infant Vocalizations, and Conversational Turns: A Population-Based Study	Prospective cohort, n = 329, (2 to 48 months old)	Audible television is associated with decreased exposure to discernible human adult speech and decreased child vocalizations.
Cheng et al, 2010 (Japan)	Early television exposure and children's behavioural and social outcomes at age 30 months	Prospective cohort, n = 316 (4 to 30 months old)	Daily television exposure at age 18 months was associated with hyperactivity–inattention in 30 months old children
Chonchaiya and Pruksananonda, 2008 (Thailand)	Television viewing associates with delayed language development	Case control case, n = 56; control, n = 110 (15 to 48 months old)	Children who had language delay has earlier onset age of television watching and spent more time watching television than normal children (3.05+/-1.90 h/day vs. 1.85+/-1.18 h/day; p-value<0.001).
Foster and Watkins, 2010 (USA)	The Value of Reanalysis: TV Viewing and Attention Problems	Prospective cohort, n = 1159 (Baseline = 1 to 3 years old; follow-up = 7 years old)	Association between television watching (at ages 1 and 3) with risk of attention problems measured at age 7 is significant; only for 7 or more hours of television viewing per day. Modest levels of television viewing do not appear to be detrimental to toddlers.
Schmidt et al., 2009 (USA)	Television viewing in infancy and child cognition at 3 years of age in a US cohort	Prospective cohort, n = 872, (6 to 24 months old)	Association of television exposure with cognitive abilities did not persist when adjusted for child, maternal and household characteristics

Table 2.2, continued

Author, year and country	Study title	Design, sample size, age group	Major findings
Pagani et al, 2010 (Canada)	Prospective Associations Between Early Childhood Television Exposure and Academic, Psychosocial, and Physical Well-Being by Middle Childhood	Prospective cohort, n = 1314 (Baseline = 29 months old; follow-up = 10 years old)	Television exposure at 29 months corresponds to decreases in classroom engagement and math achievement and increase in victimization by classmates at 53 months old.
Schmidt et al., 2009 (USA)	Television Viewing in Infancy and Child Cognition at 3 Years of Age in a US Cohort	Prospective cohort, n = 872 (Baseline = 0 to 2 years old; follow-up = 3 years old)	Television viewing in infancy is not associated with language or visual motor skills at 3 years of age
Tomopoulous et al., 2010 (USA)	Infant Media Exposure and Toddler Development	Prospective cohort, n = 253 (6 to 14 months old)	Duration of media exposure at 6 months old was associated with lower cognitive development at 14 months old.
Mistry et al, 2007 (USA)	Children's Television Exposure and Behavioral and Social Outcomes at 5.5 Years: Does Timing of Exposure Matter?	Prospective cohort, n = 2707 (30 months to 5.5 years old)	Sustained television viewing of >2 hours daily in early childhood is associated with behavioural problems. Findings however did not find any association between television viewing with poor social skills at 5.5 years of age.
Zimmerman and Christakis, 2007 (USA)	Associations Between Content Types of Early Media Exposure and Subsequent Attentional Problems	Prospective cohort, n = 560 (Baseline = 0 to 3 and 4 to 5 years old; follow-up = 5 to 8 and 9 to 10 years old)	Viewing of educational television <3years old was not associated with attentional problems, but entertainment television before age 3 was associated with attentional problems. Television viewing at ages 4 to 5 was not associated with subsequent problems.
Ruangdaraganon et al, 2009 (Thailand)	Television viewing in Thai infants and toddlers: Impacts to language development and parental perceptions	Prospective cohort, n = 260 (6 months to 2 years old)	There was no association between delayed language development and television viewing time.

Table 2.3: Summary of studies on association between computer / laptop usage and child development

Author (year) and country	Study title	Design, sample size, age group	Major findings
Li & Atkins, 2004 (USA)	Early Childhood Computer Experience and Cognitive and Motor Development	Randomized Controlled Trial, n = 122 (38 to 61 months old)	Children with access to computer scored better on measures of school readiness and cognitive development
Fish et al, 2008	Early Childhood Computer Experience and Cognitive Development among Urban Low-Income Pre-schoolers	Cross sectional, n = 200 (2.5 to 8.5 years old)	Early computer use at home have a positive influence in young children's cognitive and verbal development.
Heft and Swaminathan, 2002 (UK)	The effects of computers on the social behaviour of preschoolers.	Observational, n = 14 (3 to 5 years old)	Computer as a focus of social interaction
Janisse et al, 2014 (USA)	Impact of Classroom Computer Availability on Preschoolers' Social Interactions	Quasi-experimental, n = 66 (3 to 5 years old)	Children in classrooms with computer were more likely to display socially interactive behaviours, to be more verbal and to display more affect than those without computer
Fairlie & Kalil, 2016 (USA)	The Effects of Computers on Children's Social Development and School Participation: Evidence from a Randomized Control Experiment	Randomized control experiment n = 1123 (middle and high school children)	Computer usage at home positively associated with socialization. No evidence of negative effects of home computers on school participation and engagement.
Fiorini, 2010 (Australia)	The effect of home computer use on children's cognitive and non-cognitive skills	Cohort, n = 5107 (Infants till 7 years old)	Computer time indicate positive effect on cognitive skills.
Castles et al, 2013 (Australia)	Computer use and letter knowledge in pre-school children: A population-based study	Longitudinal, n = 1539	Higher usage of computer in pre-school children is positively associated with emerging literacy development.

Table 2.4: Summary of studies on association between smartphone / tablet / iPad usage and child development

Author (year) and country	Study title	Design, sample size, age group	Major findings
Hosokawa & Katsura, 2018 (Japan)	Association between mobile technology use and child adjustment in early elementary school age	Cross-sectional, n = 1642 (6 year old)	Regular usage of mobile devices (more than an hour per day) was associated with a higher likelihood of behaviour problems.
Dempsey, Lyons & McCoy, 2020 (Ireland)	Is Early Mobile Phone Ownership Shaping Child Development? A longitudinal study of wellbeing among adolescent girls and boys in Ireland	Longitudinal n = 8,500 (Baseline at 9 year old, followed up at 13 years old)	No relationship was found between early mobile phone ownership and children's socio-emotional development. But, girls who receive mobile phones earlier fare poorly on their behavioural adjustment.
Axford, Joosten & Harris, 2018 (Australia)	iPad Applications That Required a Range of Motor Skills Promoted Motor Coordination in Children Commencing Primary School	Non-randomised controlled trial, n = 53 (5 to 6 years old)	30 minutes daily use of specific iPad applications improved children's occupational performance in daily task
Li, Mendoza & Milanaik, 2017 (USA)	Touchscreen Device Usage in Infants and Toddlers and its Correlations with Cognitive Development	Cross-sectional, n = 65 (Below 3 years old)	Children who played "non-educational games" with touchscreen devices scored low in cognitive development test
Lin, 2020 (Taiwan)	Prolonged touch screen device usage is associated with emotional and behavioral problems, but not language delay, in toddlers	Cross sectional, n = 161 (18 to 36 months old)	Higher usage of touch screen media is related with social and emotional problems, however did not have significant effect on language development
Lee et al, 2015 (Korea)	Relationships Among Preschoolers' Smartphone Addiction Tendency, Their Problem Behaviors, and Parenting Efficacy of Their Mothers	Cross-sectional, n = 83 (4 to 6 years old)	Smartphone addiction was positively correlated with hyperactive-distractible behaviour among pre-schoolers (r=.228, p=.038)

Table 2.4, continued

Author (year) and country	Study title	Design, sample size, age group	Major findings
Taylor et al, 2018 (UK)	Investigating the association between children's screen media exposure and vocabulary size in the UK	Cross-sectional, n = 131 (6 to 36 months old)	Time spent engaging with mobile touchscreen devices was not associated with vocabulary scores.

Table 2.5: Summary of studies on association between game console usage and child development

Author (year) and country	Study title	Design, sample size, age group	Major findings
Lobel, 2017 (Netherlands)	Video Gaming and Children's Psychosocial Wellbeing: A Longitudinal Study	Longitudinal, n = 194 (7 to 11 years old)	Increased video gaming frequency was associated with an increase in internalizing problems, such as anxiety and depressive symptoms
Hastings et al, 2009 (USA)	Young Children's Video/Computer Game Use: Relations with School Performance and Behavior	Cross-sectional, n = 70 (6 to 10 years old)	Time spent engaged with video games was negatively related to school performance and positively related to externalizing behaviour and aggression.

Table 2.6: Summary of studies on association between onset age of screen-based media exposure and child development

Author (year) and country	Study title	Design, sample size, age group	Major findings
Tomopoulous et al, 2007 (USA)	Media Content and Externalizing Behaviors in Latino Toddlers	Prospective cohort, n = 75 (Baseline = 21 months old, follow up = 33 months old)	Educational media was associated with aggressiveness and externalizing problems, non-educational media was associated with aggressive behaviour
Tomopoulos et al, 2010 (USA)	Infant Media Exposure and Toddler Development	Longitudinal, n = 259 (6 to 14 months old)	Media exposure at 6 months was associated with lower cognitive and language development at 14 months

Table 2.7: Summary of studies on association between screen time and child development

Author (year) and country	Study title	Design, sample size, age group	Major findings
Madigan et al, 2019 (USA)	Association Between Screen Time and Children's Performance on a Developmental Screening Test.	Cohort, n = 2441 (24 to 60 months)	Higher screen time at 24 and 36 months were significantly associated with poorer performance on general developmental screening tests at 36 months
Hutton et al, 2019 (USA)	Associations Between Screen-Based Media Use and Brain White Matter Integrity in Preschool-Aged Children.	Cross-sectional, n = 47 (3 to 5 years old)	Non-adherence to AAP recommended screen time is associated with (1) lower measures of microstructural organization and myelination of brain white matter tracts that support language skills and (2) lower scoring of cognitive test
Taylor, Monaghan & Westermann, 2018 (UK)	Investigating the association between children's screen media exposure and vocabulary size in the UK	Cross-sectional, n = 113 (6 to 36 months old)	Exposure to screen media such as TV, DVDs, and mobile touchscreen devices did not predict child’s vocabulary scores.
Przybylski & Weinstein, 2017 (USA)	Digital Screen Time Limits and Young Children's Psychological Well-Being: Evidence From a Population-Based Study	Cross-sectional, n = 19957 (2 to 5 year old)	Screen time was not associated with child psychological well-being when ethnicity, age, gender, household income, and caregiver educational attainment were adjusted.
Raman et al, 2017 (USA)	Screen Exposure During Daily Routines and a Young Child's Risk for Having Social-Emotional Delay	Cross-sectional, n = 210 (12 to 36 months old)	Children identified at risk for social-emotional delay are 5.8 times more likely to have ≥5 daily routines done with a screen as compared to children not at risk for delay
Duch et al, 2013 (USA)	Association of Screen Time Use and Language Development in Hispanic Toddlers: A Cross-Sectional and Longitudinal Study	Cross-Sectional and Longitudinal Study, n = 119 (Toddlers)	Watching more than 2 hours of television per day was associated with low scores in the communication domain

2.16 Theoretical Framework

2.16.1 History of Ecological Theory

The term ecology was devised to be recorded in 1873 by Ernest Haeckel, a German zoologist and evolutionist. Ecology was defined as the study of organism-environment interrelatedness. Another early research of the same era by Schwabe and Bartholomai of Germany in 1870s that investigates neighbourhood influences on children's development is also an evident of human development study in relation to the environment (Tudge et al, 1997). Decades later, the world came to know of Bronfenbrenner who has been described as a pioneer who made outstanding contributions and influenced the work in the domain of ecology of human development. Bronfenbrenner's ecological theory is a highly differentiated conceptual scheme that describes the interrelating structures and processes that shape the course of human development as depicted by Figure 2.1 (Bronfenbrenner, 1995).

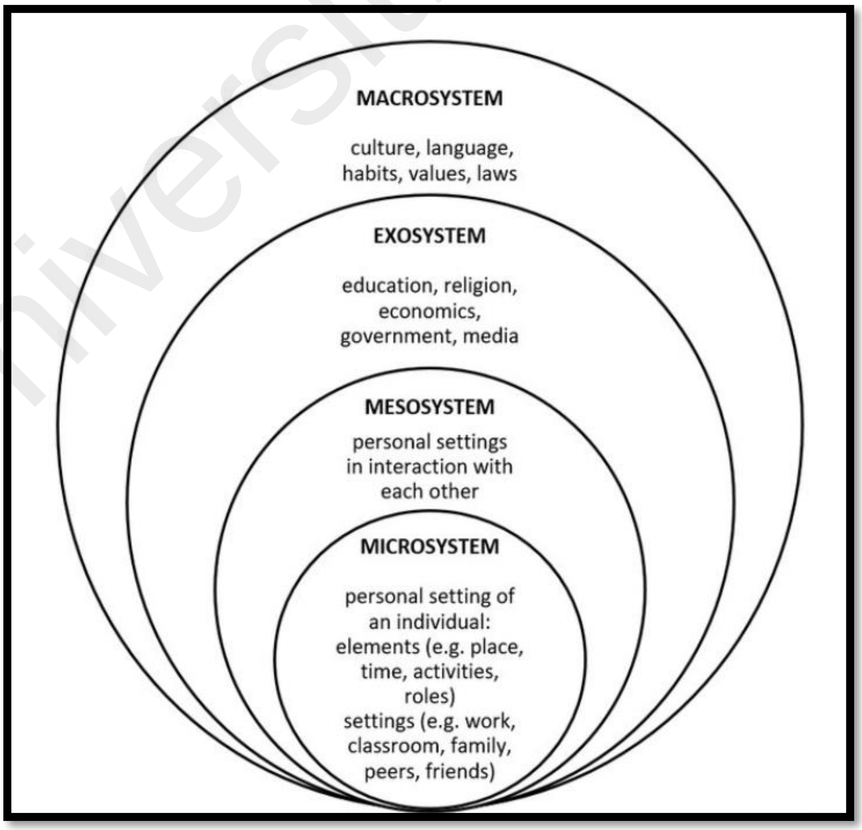

Figure 2.1: Bronfenbrenner's Ecological System Model (Egan & Cowan, 1979)

2.16.2 The Ecological Techno-subsystem Theory

Despite widely used, the Bronfenbrenner's (1977) ecological system model emerged prior to technology revolution. Thus, to illustrate the influence of increasing complexity and accessibility of screen-based media in childhood, the ecological techno-subsystem was proposed by Johnson & Puplampu (2008). From an ecological perspective, the techno-subsystem facilitates bidirectional interaction between the child and the microsystem. This ecological techno-subsystem theory not only takes into consideration of the nature of child's screen-based media usage, but also frames along his or her immediate environmental factors that play a vital role in shaping the childhood developmental process (Johnson & Puplampu, 2008). Thus, using an ecological approach to study the effect of screen time on childhood development would also mean to include parental media behaviour and home media environment factors that fundamentally shape early childhood development.

Theoretical framework of this study is based on The Ecological Techno-subsystem Theory as illustrated in Figure 2.2 which is adapted from the Ecological Systems Theory by Bronfenbrenner (1989). The theory displays a comprehensive framework of environmental influences in a child's development by placing the child within a system of relationships influenced by multiple layers or levels of environment. The proximal most layer, the microsystem refers to immediate environment such as parental factors. This is followed by mesosystem that refers to interactions between the immediate environments. The third outer layer is exosystem made of indirect external factors such as parent's work environment. Next is the macrosystem, made up of social ideologies and cultural values that the child is brought up in. The last outer layer is chronosystem which highlights the effect of time on all systems or in other words how transitions effect the child (Johnson & Puplampu, 2008).

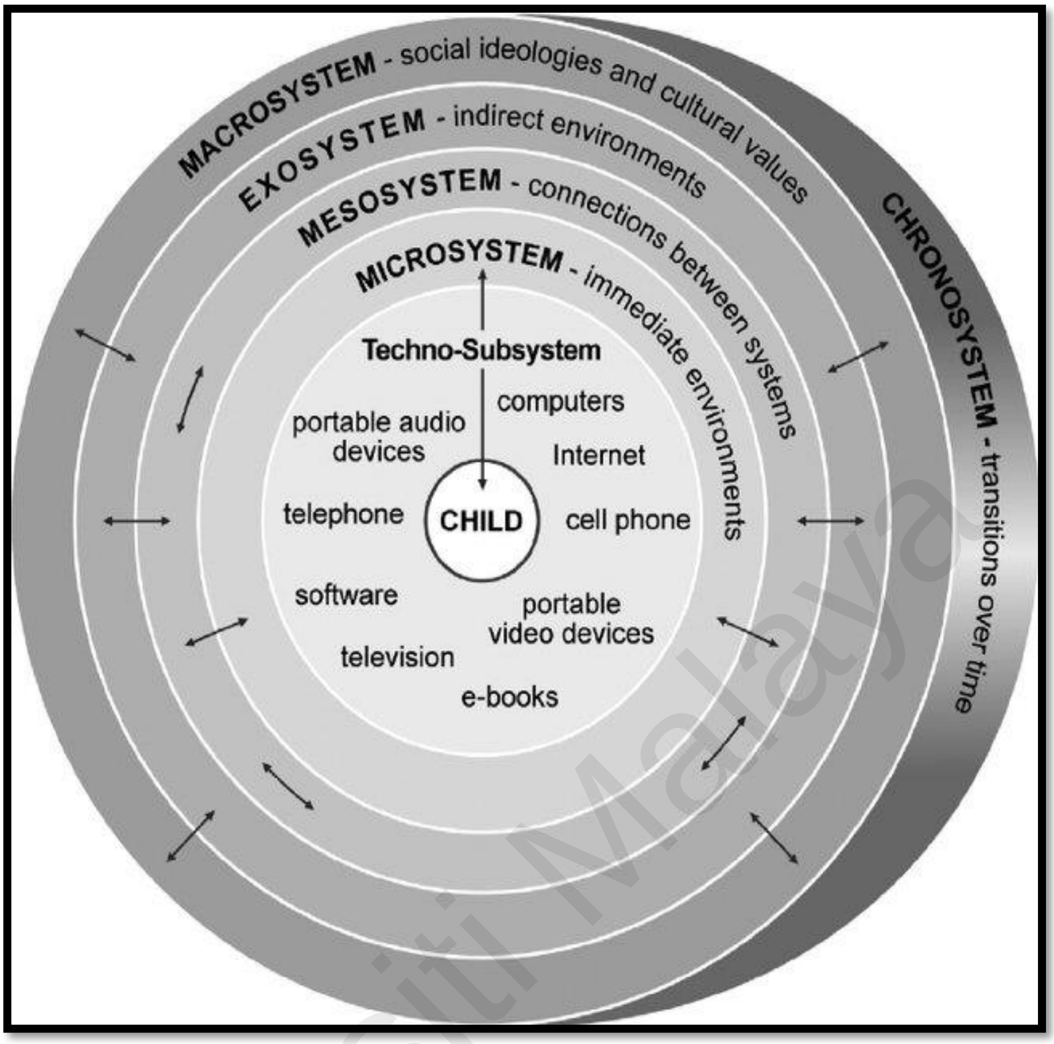

Figure 2.2: Theoretical framework adapted from Ecological Techno-subsystem Theory (Johnson & Puplampu, 2008).

2.17 Conceptual Framework

The conceptual framework of this study displayed in Figure 2.3 describes the variables included in the study and how they are inter-connected. The key independent variable in the study – screen time is sought if associated with the key dependant outcome, child social emotional development. Every layer of a child's environment depicted by the Ecological Techno-subsystem Theory in the previous section is grouped as independent variables of the study. Arrows in the conceptual framework highlight the relationship between independent variables and the dependant variable of the study.

The conceptual framework shows child social emotional development as main dependant variable or outcome of the study. Independent variables of the study are divided into three main groups. The first group is sociodemographic characteristics which includes ethnicity and religion from the macrosystem layer; parent's education level, parent's employment status, parent's marital status, and monthly household income as part of the exosystem layer. The second group of independent variables is child characteristics which include age, gender, birth weight, prematurity, history of exclusive breastfeeding, non-parental care at home, and whether child is sent to nursery or early childcare centre of the microsystem layer. The final group displays screen-based media usage as independent variables; namely child screen time, parental media behaviour, and home media environment of the techno-subsystem layer.

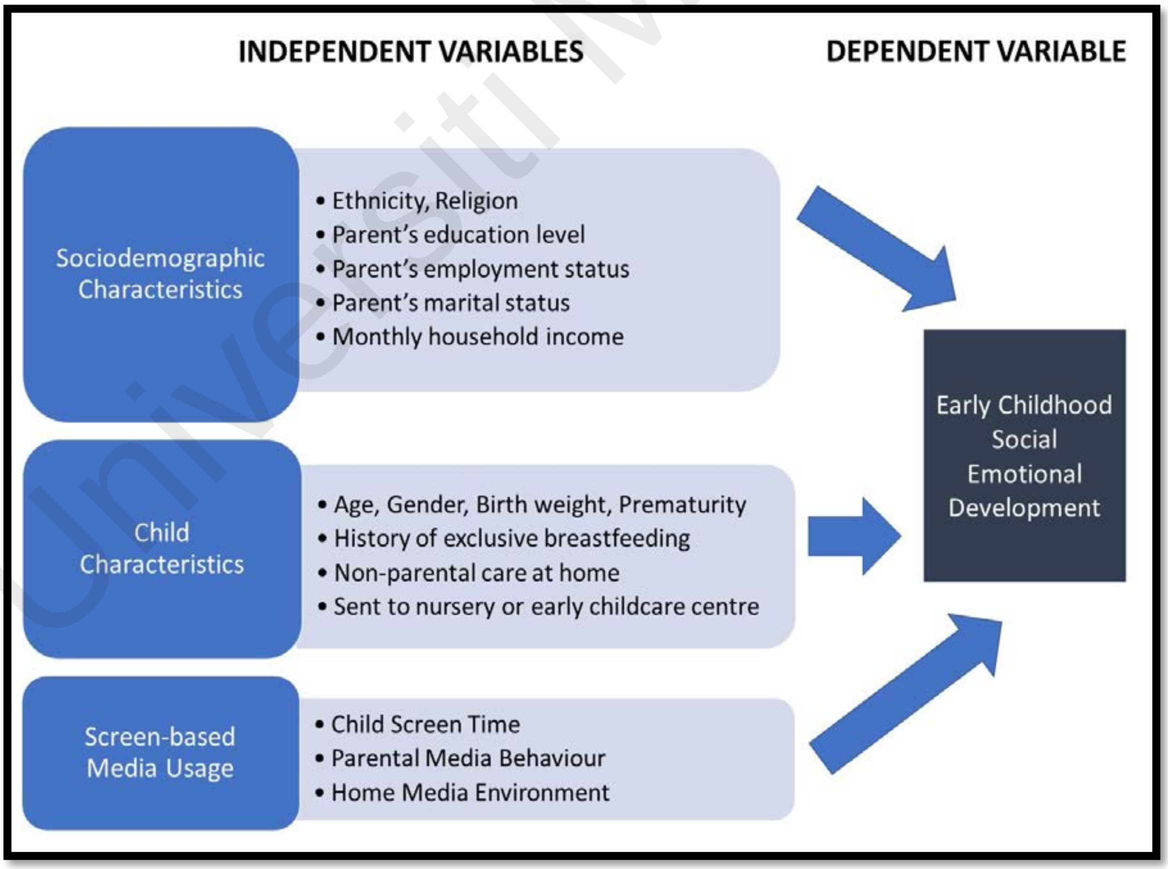

Figure 2.3: Conceptual framework based on the Ecological Techno-subsystem Theory

2.18 Summary of Chapter 2

Best effort has been taken to include all relevant articles or information from various sources related to the topic of research in this literature review. Literatures explored is hoped to give a clear picture on the impact of technology seen in the ecological perspective on early childhood development. Research shows various influences of screen-based on young children, depending on multifactorial aspect including type of scree-based media, duration of screen time, types of screen-based media children are engaged with, and whether it hinders active parent-child interaction. While both positive and negative effects of screen-based media on children is seen, most research points towards negative influences of screen time on developing children, especially in terms of language and social-emotional development. Most studies hail from high income countries, however as many Asian studies possible identified through literature search has been included in the literature review as it could closely resemble the local culture and type of media programmes children engage themselves with.

Literature on parental media behaviour shows a large number of parents reported to be media-centric in the current era and that parental factors heavily influence child screen time. Parents with technology interference in daily lives during their time spent with children is revealed to face difficulties in meeting child's social emotional needs. Diminished child learning moments significantly contributes towards dysfunction of early childhood social emotional development.

Increased accessibility of screen-based media among young children has resulted in research on family media rules and enforcement strategies, with mixed findings on its effect on child screen time. With literatures on subject of concern reviewed in this chapter, the following third chapter of thesis would journey through methodology adapted for planning and implementation of this research work.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter explains the method used for research development and execution of this study. The first section describes the research design utilized, duration of which the research was conducted and the research area in which it took place. This is pursued by planning and implementation of instruments' cross-cultural adaptation and validation as the first phase of this research, followed suit by the cross-sectional study as second phase. The chapter further describes data management and analyses methods adapted in the study. Chapter closes with ethical statements concerned with this research work. An outline of sections included in this methodology chapter is described in Figure 3.1.

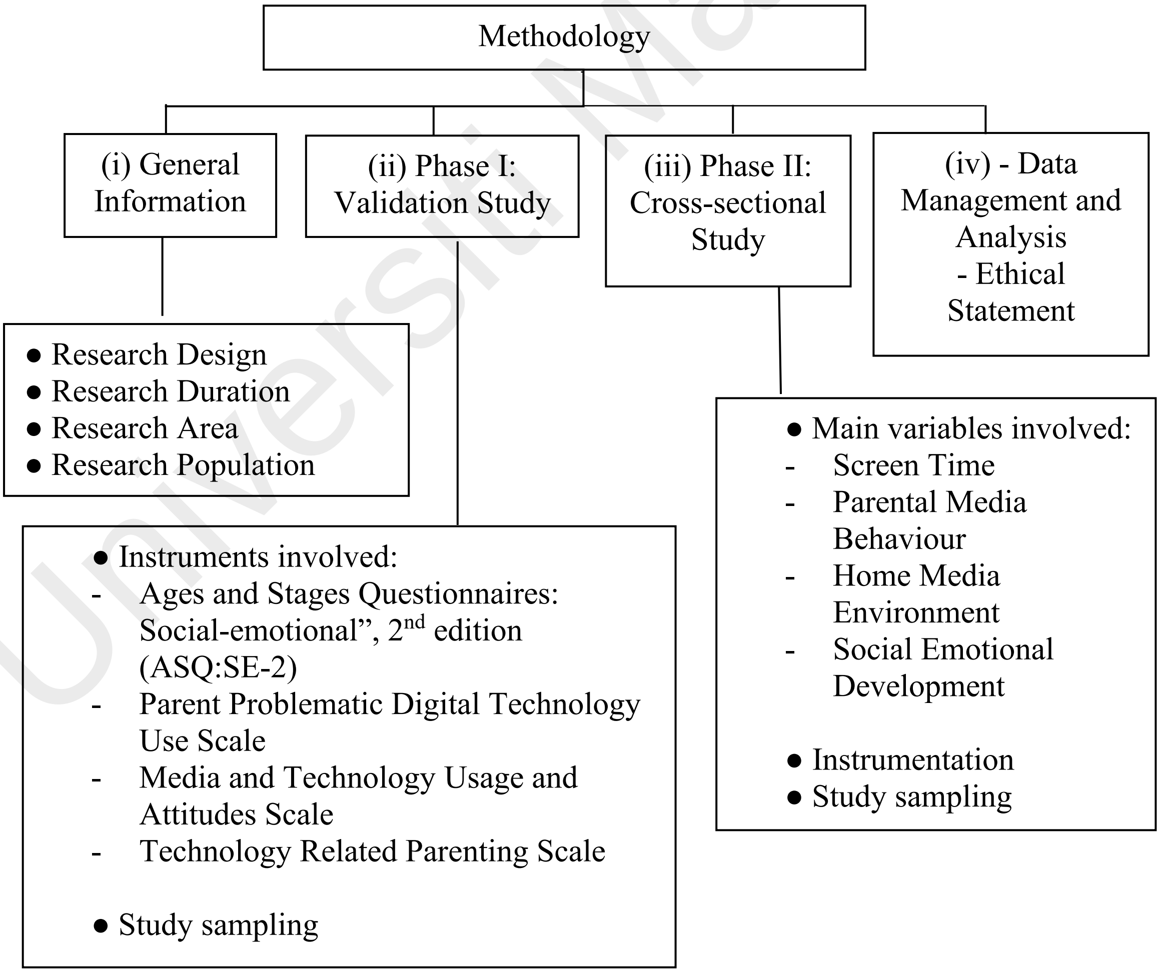

Figure 3.1: Outline of sections in the methodology chapter

3.2 Research Design

This research has two phases. Phase I is a validation study that involves validation of instruments translated from English to Malay language (*Bahasa Melayu*) which are used to measure the key variables in the study. A cross-sectional study is conducted in the second phase of this research. Data collection is done at single point of time, giving us a snapshot of study variable characteristics. The study design fulfils the purpose of determining prevalence of screen time as the key independent variable of the study. Apart from that, the quantitative method gives researchers the ability to assess relationships among variables of interest; namely screen time, parental media behaviour, home media environment, other independent variables, and child social emotional development as the main outcome variable in this study (Salazaar, Crosby & DiClemente, 2015).

3.3 Research Duration

Research project started with proposal development from August to November 2018. After obtaining faculty agreement and ethical approvals in early 2019 and permission to use study sites from related local health departments by June 2019, data collection for Phase I and II of study took place from August 2019 to January 2020. Data entry and data analysis were done from February to April 2020. Report writing was completed by December 2020, altogether taking up more than two years for entire work.

3.4 Research Area

Both phases of study were conducted in Gombak, a district located in the state of Selangor, Malaysia. As the most populous state in Peninsular Malaysia, Selangor state is located in west coast region of peninsular Malaysia and contributes to highest number of internet users in the country (MCMC, 2016). Nearly all school children (97%) in this state were recorded to be internet users in 2014 (CyberSecurity Malaysia, 2015).

With the high number of internet users in both the general population and the child population in Selangor, an exploration of these populations would greatly assist in achieving the objectives of this study which delves into screen-based media usage among young children. Location of Selangor state in Malaysia is shown in Figure 3.2 and location of Gombak district in the state of Selangor is shown in Figure 3.3.

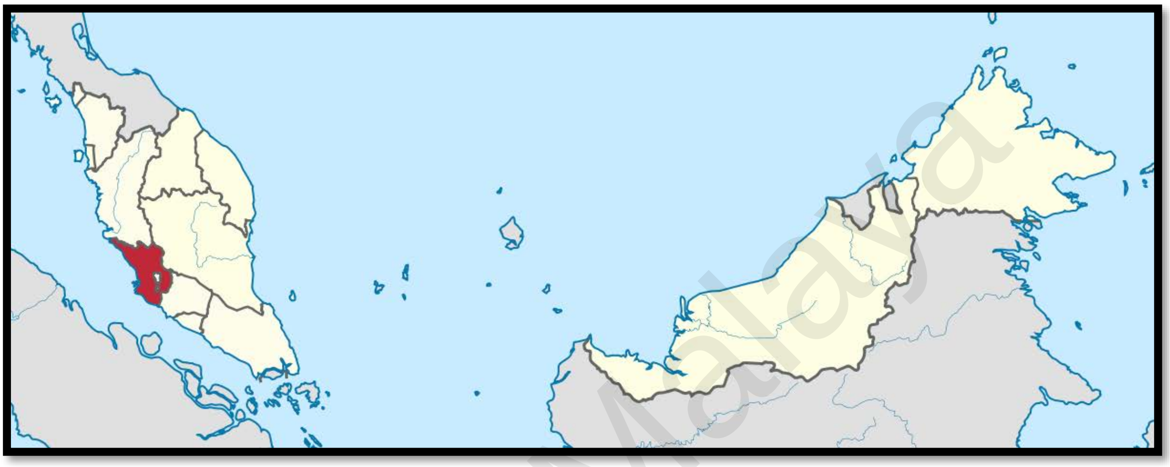

Figure 3.2: The state of Selangor highlighted in Malaysia map
Picture source: Wikipedia
Retrieved from https://en.wikipedia.org/wiki/Selangor

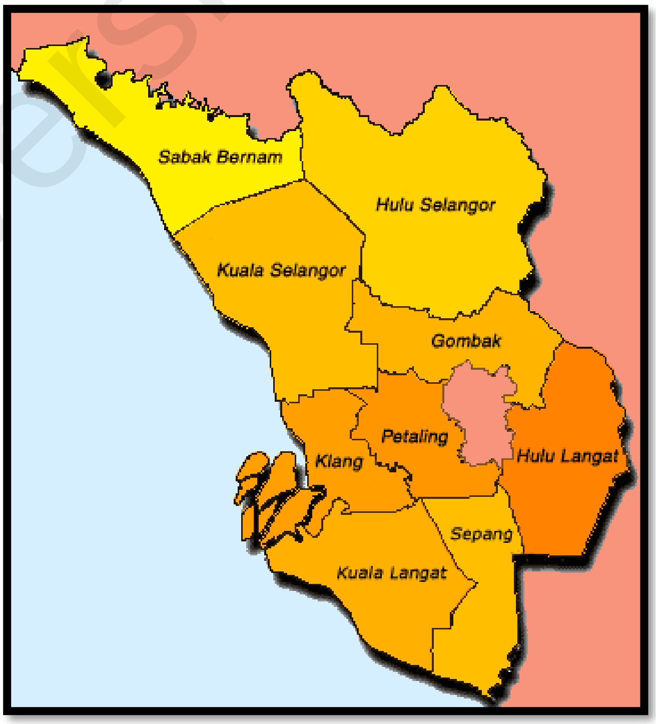

Figure 3.3: Gombak district in the state of Selangor
Picture source: Wikipedia
Retrieved from https://en.wikipedia.org/wiki/Selangor

Gombak, one of the nine districts in Selangor was specifically chosen as it closely represents the nation's sociodemographic characteristics as summarized in Table 3.1 (Department of Statistics Malaysia, 2018).

Table 3.1: Comparison between sociodemographic characteristics of study area with Selangor and Malaysia

Area	Ethnicity (%)				Age (%)			Gender	
	Malay	Chinese	Indian	Others	0-14	15-64	≥65	M	F
Malaysia (country)	67.4	24.6	7.3	0.7	27.6	67.3	5.1	51.4	48.6
Selangor (state)	57.1	28.5	13.5	0.8	25.1	71.3	3.6	51.7	48.3
Gombak (district)	62.8	23.5	12.1	1.5	25.6	70.9	3.5	51.4	48.6

3.5 Research Population

This research involves children aged 18 months and 36 months old with parents as their proxy or respondents who attend government health clinics in the research area, the district of Gombak. In Malaysia, children at these age groups attend health clinics for vaccination and routine developmental assessment at 18 and 36 months old, respectively.

3.6 Phase I: Validation Study

The key variables involved in the study are identified as Child Screen Time, Early Childhood Social Emotional Development, Parental Media Behaviour, and Home Media Environment. Child Screen Time was measured using Global Time Estimate method - which will be discussed later in this chapter. To assess other unobservable variables, suitable questionnaires that operationalizes them were identified. Through content analysis, review of previous research works and content judgement by two public health specialists, the following questionnaires were finalised to be used in this study:

(i) Second edition of "Ages and Stages Questionnaires: Social-emotional", (ASQ:SE-2) to assess child social emotional development,

(ii) "Parent Problematic Digital Technology Use" that assesses parental media addiction,

(iii) "Media and Technology Usage and Attitudes Scale" that assesses parental media dependency, and

(iv) "Technology Related Parenting Scale" to assess home media environment

3.7 About the Instruments

3.7.1 Ages and Stages Questionnaires: Social-emotional", 2nd edition (ASQ:SE-2)

ASQ:SE-2 is a referenced instrument designed to assess social emotional development of children aged one month to 72 months which assist in screening and early detection of social emotional difficulties. The first edition of ASQ:SE became available in 2002 (Squires, Bricker, & Twombly, 2002).

It was originally developed to complement the Ages and Stages Questionnaire Third Edition (ASQ-3), a general development screening – encompassing of gross motor, fine motor, communication, personal-social skills, and problem-solving skills measurement (Squires & Bricker, 2009). ASQ:SE-2 on the other hand focuses exclusively on child social emotional behaviour, revised from the first edition in terms of its normative sample, psychometric properties, and improvement of existing items. The second version also has increased sensitivity to autism and other socio-emotional delays by addressing of assessment deficiencies. Items in the questionnaires are provided with four choices of frequency-based answers; "rarely" or "never", "sometimes", "often" or "always", and "item of concern" scored 0, 5 or 10 depending on whether item assessed is weakness-based or strength-based in terms of child's behaviour. "Item of concern" is always scored 5. Total score is classified into three zones, namely "no or low risk", "monitor", and "refer" (Squires, Bricker & Twombly, 2015).

For the purpose of this study, score outcome is categorized dichotomously into "normal" and "poor mastery". Scores in "no or low risk" and "monitor" zones are categorized as "normal". Scores falling into the "refer" zone which is above the cut-off value, determined based on the population scoring is categorized as "poor mastery". Cut-off scoring used in this study is stated in the next chapter. Children in the "poor mastery" category is referred for further assessment with a medical officer.

The tool contains different sets of questions designed for age-appropriate development, making up nine sets for varied age intervals. Two sets of questionnaires were used in this study:

(i) 18-Month Questionnaire (used to assess children 15 to 21 months old) and

(ii) 36-Month Questionnaire (used to assess children 33 to 42 months old)

ASQ:SE-2 assesses seven components of social emotional development; namely compliance, self-regulation, communication, autonomy, affect, adaptive behaviours, and social interaction. ASQ:SE-2 18-Month Questionnaire consists of 34 items (four of which are general concerns of parents), whereas the 36-Month Questionnaire consists of 38 items (five of which are general concerns of parents) (Squires, Bricker, Twombly, 2015).

Child behavioural problems may emerge during infancy and early detection is only possible with existence of high-quality measuring tools. ASQ:SE-2 used in this study has shown to be one of the most comprehensive and psychometrically sound measure widely used around the world in many different languages. The tool is accredited by World Health Organization, American Academy of Pediatrics, and American Academy of Neurology among other top organizations. The psychometric properties of ASQ:SE are proven in languages other than English around the world (Velikonja et al, 2016). Details of original ASQ:SE-2 English version's validity tested on a norm sample of 16,424 American respondents is shown in Table 3.2 (Squires, Bricker, Twombly, 2015).

Table 3.2: Psychometric properties of ASQ:SE-2

Measure	ASQ:SE-2
Cronbach's alpha	Overall: 0.84 (0.71-0.87)
Intraclass correlation	0.91
Validity	Agreement with similar tools: 0.81 – 0.95
Sensitivity / Specificity	0.81/ 0.84

3.7.2 Parent Problematic Digital Technology Use Scale

The scale developed by McDaniel and Radesky (2017) is used to measure parental media addiction. The scale consists of three items, indicating how a person cannot resist checking his or her mobile phone for notifications, cannot stop thinking about calls or messages and perceive to be using too much mobile phone. Its psychometric properties testing in an American population showed internal consistency reported for parents by gender is Cronbach's alpha = 0.74 for mothers and 0.78 for fathers. Items are scored on agreement-based scale and scores are averaged to produce a total score, higher score indicating higher level of media addiction (McDaniel & Radesky, 2017).

3.7.3 Media and Technology Usage and Attitudes Scale

The scale is comprised of 15 subscales, 11 measuring media and technology usage and the remaining 4 measuring media and technology attitude, of which the media dependence subscale of three items was adapted to be used in our study to measure parental media dependency. The items in the subscales can be used separately as they are internally reliable (Cronbach's alpha 0.80 – 0.87) and externally valid, tested on its psychometric properties in American population. The items with frequency-based scoring delves into the anxiousness of an individual without hand phone or internet accessibility and how technology-dependant one is. Items scored are summed and averaged to produce a total score, higher score indicating higher level of media dependence (Rosen, 2013).

3.7.4 Technology Related Parenting Scale

Home media environment is assessed via "Technology Related Parenting Scale". Eight items in the tool describe on existing media rules and ways they were enforced at home, with each item scored 0 to 2 on scale of truth – "not true", "somewhat true" and "very true". Items of the scale tested whether there is limitation set by parents in terms of amount of time spent by children with electronic media, whether there is limit on what and when the media can be accessed, whether there are consequences for non-compliance, and whether password or parental control measures are equipped in their electronic devices (Sanders, 2016).

These rules would eventually influence the home-residing child's media habits. Higher score depicts safer home environment with regards to electronic media usage. The tool displays external internal consistency (Cronbach's alpha 0.87) and validity - demonstrating good to acceptable fit in the measurement model using Comparative Fit Index, CFI, Root Mean Square Error of Approximation, RMSEA and Standardized Root Mean Square Residual, SRMR (Sanders, 2016).

Permission to adapt and use the instruments were obtained from the original authors, and documents for approval are attached in the Appendix section. Appendices F, G and H shows documents pertaining to permission to translate and adapt ASQ:SE-2, letter of agreement and amendment of agreement with Brookes Publishing, respectively.

Appendices I, J and K refer to approval to adapt and translate Parent Problematic Digital Technology Use Scale, Media and Technology Usage and Attitudes Scale, and Technology Related Parenting Scale, respectively. Figure 3.4 shows the steps involved in the process of cross-cultural adaptation of instruments (Sharmini K.S., 2016; Sullivan, 2011; Tsang, S., Royse, C. F., & Terkawi, A. S., 2017).

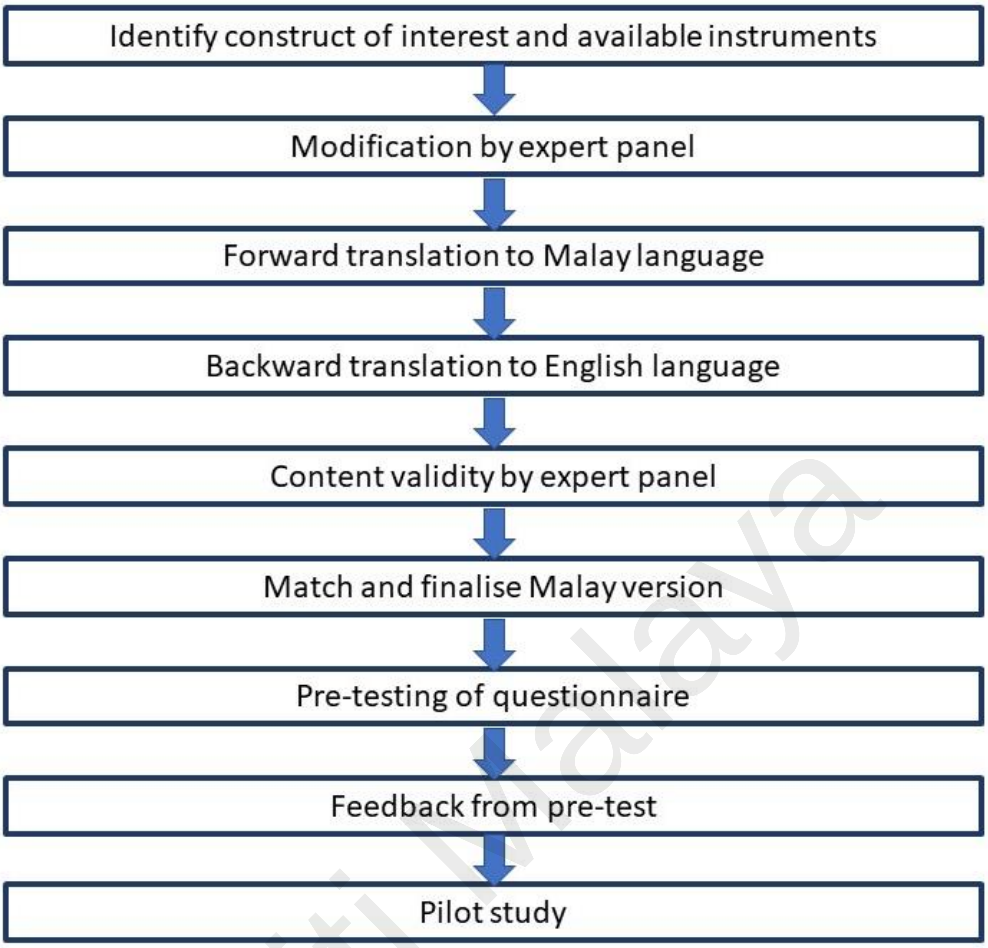

Figure 3.4: Flow chart of Phase I study implementation

3.8 Modification of Instruments

As suitable instruments were identified, suggestion for amendments or improvement of items were received from a panel of experts consists of four people – namely a development paediatrician, a clinical psychologist, and two public health medicine specialists. The instruments were checked on its relevance, clarity and suitability in the Malaysian context, with amendments suggested according to the sociocultural norms of the local setting (Sullivan, 2011). The modifications made to each instrument based on expert panel judgement is described in the following section.

3.8.1 Modifications for Ages and Stages Questionnaire Social Emotional-2 (ASQ:SE-2)

The instrument of which two different sets of age interval used in this study are described below based on behavioural areas and number of items in each of it. Table 3.3 and Table 3.4 reflect the suggestions for modification of 18-Month and 36-Month Questionnaires, respectively with modified items in bold italic. All items were suggested to include gender-neutral pronoun (e.g. he/she or her/his or himself/herself).

Table 3.3: Original and modified items of ASQ:SE-2 18 Month Questionnaire

No.	Item
1.	Does your child look at you when you talk to him?
2.	When you leave, does your child stay upset and cry for more than an hour?
3.	Does your child laugh or smile when you play with her?
4.	Does your child look for you when a stranger comes near?
5.	Is your child's body relaxed?
6.	Does your child like to be hugged or cuddled?
7.	When upset, can your child calm down within 15 minutes?
8.	Does your child stiffen and arch his back when picked up?
9.	Does your chid cry, scream, or have tantrums for long periods of time?
10.	Is your child interested in things around her, such as people, toys, and foods?
11.	Does your child do things over and over again and get upset when you try to stop him? For example, does he rock, flap his hands, spin, or ______? (Please describe) ***Does your child do things over and over again and get upset when you try to stop him/her? For example, does he/she rock, flap his/her hands or spin his/her body? If there are any other things done repetitively, please list them.***
12.	Does your child have eating problems? For example, does she stuff food, vomit, eat things that are not food, or ________ (Please describe)
13.	Does your child have trouble falling asleep at naptime or at night?
14.	Do you and your child enjoy mealtimes together?
15.	Does your child sleep at least 10 hours in a 24-hour period? ***Does your child get 10 hours of sleep (in total) during a 24-hour period?***
16.	When you point at something, does your child look in the direction you are pointing?
17.	Does your child gets constipated or get diarrhoea? ***Does your child often have constipation or diarrhoea?***
18.	Does your child let you know how he is feeling with gestures or words? For example, does he let you know when he is hungry, hurt or tired?
19.	Does your child follow simple directions? Example, does she sit down when asked?

Table 3.3, continued

No.	Item
20.	Does your child like to play or be with family or friends?
21.	Does your child check to make sure you are near when exploring new places, such as a park or a friend's home?
22.	Does your child like to hear stories or sing songs?
23.	Does your child hurt himself on purpose?
24.	Does your child like to be around other children? For example, does she move close to or look at other children?
25.	Does your child try to hurt other children, adults or animals (For example, by kicking or biting)?
26.	Does your child try to show you things by pointing at them and looking back at you?
27.	Does your child make sounds or use words or gestures to let you know he wants something (for example, by reaching)?
28.	Does your child play with objects by pretending? For example, does your child pretend to talk on the phone, feed a doll or fly a toy airplane?
29.	Does your child wake three or more times during the night?
30.	Does your child respond to her name when you call her? For example, does she turn her head and look at you?
31.	Has anyone shared concerns about your child's behaviour? If "sometimes" or "often" or "always", please explain: ____________________________________

Table 3.4: Original and modified items of ASQ:SE-2 36-Month Questionnaire

No.	Item
1.	Does your child look at you when you talk to her?
2.	Does your child like to be hugged and cuddled?
3.	Does your child talk or play to adults he knows well?
4.	Does your child cling to you more than you expect?
5.	When upset, can your child calm down within 15 minutes?
6.	Does your child seem too friendly with strangers?
7.	Does your child settle herself down after exciting activities?
8.	Does your child move from one activity to the next with little difficulty? (for example, from playtime and mealtime)
9.	Does your child seem happy?
10.	Is your child interested in things around him such as people, toys and food?
11.	Does your child do what you ask her to do?
12.	Does your child seem more active than other children his age?
13.	Does your child stay with activities she enjoys for at least 5 minutes? (other than watching shows/videos, or playing with electronics)?
14.	Do you and your child enjoy mealtimes together?

Table 3.4, continued

No.	Item
15.	Does your child have eating problems? For example, does he stuff food, eat things that are not food or__________? (Please describe)
16.	Does your child sleep at least 8-hours in a 24-hour period? ***Does your child get 8-hours of sleep (in total) in a 24-hour period***
17.	Does your child use words to tell you what she wants or needs?
18.	Does your child follow routine directions? For example, does he come to the table or help clean up his toys when asked?
19.	Does your child cry, scream, or have tantrums for long periods of time?
20.	Does your child check to make sure you are near when exploring new places, such as park or a friend's home?
21.	Does your child do things over and over and get upset when you try to stop him? For example, does he rock, flap his hand, spin, or ____? (Please describe). ***Does your child do things over and over again and get upset when you try to stop him/her? For example, does he/she rock, flap his/her hands or spin his/her body? If there are any other things done repetitively, please list them.***
22.	Does your child hurt himself/herself on purpose?
23.	Does your child stay away from dangerous things, such as fire and moving cars?
24.	Does your child destroy or damage things on purpose?
25.	Does your child use words to describe his/her feelings and the feelings of others. For example, does he/she say "I'm happy", "I don't like that" or "She's sad?"
26.	Can your child name a friend?
27.	Do other children like to play with your child?
28.	Does your child like to play with other children?
29.	Does your child try to hurt other children, adults, or animals (for example by kicking or biting)?
30.	Does your child show an unusual interest in or knowledge of sexual language and activity?
31.	Does your child try to show you things by pointing at them and looking back at you?
32.	Does your child pretend objects are something else? For example, does he/she pretend banana is a phone?
33.	Does your child wake three or more times during the night? ***Does your child wake up three or more times during the night?***
34.	Is your child too worried or fearful? If "sometimes" or "often" or "always", please describe: ____
35.	Has anyone shared concerns about your child's behaviour? If "sometimes" or "often" or "always", please explain: ______________________________

3.8.2 Modifications for Parent Problematic Digital Technology Use Scale

Item 1 was suggested for amendment as displayed in Table 3.5.

Table 3.5: Original and modified items of Parent Problematic Digital Technology Use Scale

No.	Item
1.	When my mobile phone alerts me to indicate new messages, I cannot resist checking them. ***When my mobile phone alerts me to indicate new messages, I cannot resist checking my phone.***
2.	I often think about calls or messages I might receive on my mobile phone.
3.	I feel like I use my mobile phone too much.

3.8.3 Modifications for Media and Technology Usage and Attitudes Scale

Items 1 and 3 were suggested for amendment as displayed in Table 3.6.

Table 3.6: Original and modified items of Media and Technology Usage and Attitudes Scale

No.	Item
1.	I get anxious when I don't have my cell phone. ***I get anxious when I don't have my mobile phone.***
2.	I get anxious when I don't have the Internet available to me.
3.	I am dependent on my technology. ***I am dependent on my electronic gadgets.***

3.8.4 Modifications for Technology Related Parenting Scale

Items 2 and 5 were suggested for amendment as displayed in Table 3.7.

Table 3.7: Original and modified items of Technology Related Parenting Scale

No.	Item
1.	I set limits on the amount of time.
2.	I set limits on when it can be accessed. ***I set limits when electronic media can be accessed.***
3.	I set limits on the type of content allowed.
4.	I don't have rules for screen time.
5.	I use consequences if they access when not allowed. ***I use consequences if these are accessed when not allowed.***
6.	I use passwords on these devices.
7.	I remove the devices if possible (e.g., video game controllers, tablets, power cords).
8.	I place limits using parental control features on these devices.

3.9 Translation

The English version original tools underwent translation into Malay language or *Bahasa Melayu*, the national language of Malaysia. Malay language is used by the general population and is well understood by people of various background in the study setting. The instruments were forward translated by the principal investigator who has excellent academic qualification and mastery of the language and two public health medicine specialists; for whom Malay language is their native language (WHO, 2018c). The translators are deemed to be the best people who are aware of the concepts intended to be measured and will be able to provide translation that most closely resembles original version (Tsang, 2017). Backward translation to English was done by a professional linguist who is blinded from the original version of the tools and is independent of the study. Discrepancies during the translation was discussed over and replacement with most suitable words or phrases were done accordingly. Terms that are controversial to the local sociocultural setting were avoided. All instruments translated were evaluated by expert panel on relevance and clarity. For ASQ:SE-2, back translation was reviewed by the original questionnaire developer (Tsang, Royse & Terkawi, 2017; WHO 2018c). Original and translated questionnaires are attached as Appendix L.

3.9.1 Modified and Translated Items

(i) ASQ:SE-2 18-Month Questionnaire

In item No.14, an example was added to state a clearer intention of the statement asking if the parent and child enjoy mealtimes together. Item No.30 was initially translated as, "Does your child respond when his or her name is called? Example, by turning his/her head and looking at you?". It was however stressed by questionnaire developer that this item is asking if the child responds to his name when the parent calls him or her. It is not asking if child responds to his or her name when anyone other than parent calls their name. The item was then revised as stated in Table 3.8.

(ii) ASQ:SE-2 36-Month Questionnaire

Item No.7 was corrected with the plural of "activities" in Malay. Item No.16 was included with the phrase “not necessarily consecutively” to question the child’s sleeping duration in a day. For item No.17, “*menggambarkan*” was replaced with “*memberitahu*” - the former means "express" and the latter means “to tell”. The developer states, intention of item is to ask about parent child interaction and not if child uses words to express (to anyone) what he or she wants. Modified and translated items are in Table 3.9.

Table 3.8: Modified and translated items of ASQ:SE-2 18 Month Questionnaire

No.	Item
1.	Does your child look at you when you talk to him/her?
	Adakah anak anda memandang anda ketika anda bercakap dengannya?
2.	When you leave, does your child stay upset and cry for more than an hour?
	Apabila anda meninggalkan anak anda, adakah dia merajuk dan menangis selama lebih dari satu jam?
3.	Does your child laugh or smile when you play with her/him?
	Adakah anak anda ketawa atau senyum ketika anda bermain dengannya?
4.	Does your child look for you when a stranger comes near?
	Adakah anak anda mencari anda jika ada orang yang tidak dikenali datang dekat kepadanya?
5.	Is your child’s body relaxed?
	Adakah badan anak anda dalam keadaan istirahat?
6.	Does your child like to be hugged or cuddled?
	Adakah anak anda suka dipeluk atau didakap?
7.	When upset, can your child calm down within 15 minutes?
	Apabila anak anda merajuk, bolehkah dia kembali tenang seperti biasa dalam masa 15 minit?
8.	Does your child stiffen and arch his/her back when picked up?
	Adakah anak anda mengeraskan badan dan melentukkan bahagian belakang badannya apabila mahu didukung?
9.	Does your child cry, scream, or have tantrums for long periods of time?
	Adakah anak anda menangis, menjerit atau meragam untuk tempoh waktu yang lama?
10.	Is your child interested in things around him/her, such as people, toy, and food?
	Adakah anak anda berminat terhadap persekitarannya seperti orang, barang mainan atau makanan?

Table 3.8, continued

No.	Item
11.	Does your child do things over and over again and get upset when you try to stop him / her? For example, does he/she rock, flap his/her hands, spin, or _____________? (please describe)
	Adakah anak anda melakukan sesuatu berulang kali dan merajuk jika anda cuba menghalangnya? Contohnya, menggerakkan badan ke depan dan belakang, mengibas-ngibas tangan, memusingkan badan, atau __________? (Sila jelaskan)
12.	Does your child have eating problems? For example, does he/she stuff food, vomit, eat things that are not food, or ________ (Please describe)
	Adakah anak anda mempunyai sebarang masalah makan? Contohnya, adakah dia memasukkan makanan ke dalam mulut secara banyak dan berterusan sebelum sempat ditelan, mengalami muntah, makan sesuatu yang bukan makanan atau _______________________? (Sila jelaskan)
13.	Does your child have trouble falling asleep at naptime or at night?
	Adakah anak anda menghadapi kesukaran untuk tidur pada waktu siang atau malam?
14.	Do you and your child enjoy mealtimes together?
	Adakah anda dan anak anda sama-sama menikmati waktu makan, Contohnya ketika anak disuap?
15.	Does your child sleep at least 10 hours in a 24-hour period?
	Adakah anak anda tidur sekurang-kurangnya 10 jam (tidak semestinya berterusan) dalam tempoh 24 jam?
16.	When you point at something, does your child look in the direction you are pointing?
	Apabila anda menunding jari ke arah sesuatu, adakah anak anda menolehkan pandangan ke arah tersebut?
17.	Does your child gets constipated or get diarrhoea?
	Adakah anak anda mengalami kesukaran untuk buang air besar atau mengalami cirit-birit?
18.	Does your child let you know how he / she is feeling with gestures or words? For example, does he / she let you know when he / she is hungry, hurt or tired?
	Adakah anak anda meluahkan perasaannya menggunakan aksi atau perkataan? Contohnya, adakah dia memberitahu anda apabila dia lapar, sakit atau letih?
19.	Does your child follow simple directions? For example, does he/she sit down when asked?
	Adakah anak anda mampu mengikut arahan mudah daripada anda? Contohnya, adakah dia duduk apabila disuruh?
20.	Does your child like to play or be with family or friends?
	Adakah anak anda suka bermain atau berada di samping ahli keluarga atau kawan-kawannya?

Table 3.8, continued

No.	Item
21.	Does your child check to make sure you are near when exploring new places, such as a park or a friend's home?
	Adakah anak anda memastikan bahawa anda berada dekat dengannya ketika berada di tempat baru seperti taman atau rumah teman?
22.	Does your child like to hear stories or sing songs?
	Adakah anak anda suka mendengar cerita atau menyanyi lagu?
23.	Does your child hurt himself/herself on purpose?
	Adakah anak anda dengan sengaja mencederakan dirinya?
24.	Does your child like to be around other children? For example, does he / she move close to or look at other children?
	Adakah anak anda suka berada di samping kanak-kanak lain? Contohnya adakah dia bergerak mendekati mereka atau memandang mereka?
25.	Does your child try to hurt other children, adults or animals (for example, by kicking or biting)?
	Adakah anak anda cuba mencederakan kanak-kanak lain, orang dewasa atau haiwan (Contohnya, dengan menendang dan menggigit)?
26.	Does your child try to show you things by pointing at them and looking back at you?
	Adakah anak anda cuba menunjukkan sesuatu dengan menunding jari ke arah objek tersebut dan kemudian menoleh kepada anda?
27.	Does your child make sounds or use words or gestures to let you know he / she wants something (for example, by reaching)?
	Adakah anak anda mengeluarkan bunyi, menggunakan kata-kata atau melakukan aksi untuk memberitahu anda bahawa dia mahukan sesuatu (contohnya, dengan mencapai sesuatu)?
28.	Does your child play with objects by pretending? For example, does your child pretend to talk on the phone, feed a doll or fly a toy airplane?
	Adakah anak anda bermain secara olok-olok menggunakan mainan? Contohnya, berpura-pura bercakap melalui telefon, menyuap anak patung atau menerbangkan kapal terbang mainannya?
29.	Does your child wake three or more times during the night?
	Adakah anak anda bangun tiga kali atau lebih pada waktu malam hari?
30.	Does your child respond to his / her name when you call him / her? For example, does he / she turn his / her head and look at you?
	Adakah anak anda memberi tindak balas apabila anda memanggil namanya? Contohnya, adakah dia menolehkan kepala dan memandang ke arah anda?
31.	Has anyone shared concerns about your child's behaviour? If "sometimes" or "often" or "always", please explain: ________________________________
	Pernahkah sesiapa mengesyaki sesuatu yang membimbangkan tentang perilaku anak anda? Jika jawapan anda "kadang-kadang", "kerap" atau "sentiasa", sila jelaskan: ________________________________

Table 3.9: Modified and translated items of ASQ:SE-2 36-Month Questionnaire

No.	Item
1.	Does your child look at you when you talk to him/her?
	Adakah anak anda memandang anda ketika anda bercakap dengannya?
2.	Does your child like to be hugged and cuddled?
	Adakah anak anda suka dipeluk atau didakap?
3.	Does your child talk or play to adults he/she knows well?
	Adakah anak anda bercakap atau bermain dengan orang dewasa yang dikenalinya dengan baik?
4.	Does your child cling to you more than you expect?
	Adakah anak anda mahu berdampingan dengan anda lebih dari apa yang anda jangkakan?
5.	When upset, can your child calm down within 15 minutes?
	Apabila anak anda merajuk, bolehkah dia kembali tenang seperti biasa dalam masa 15 minit?
6.	Does your child seem too friendly with strangers?
	Adakah anak anda kelihatan terlalu peramah dengan orang yang tidak dikenalinya?
7.	Does your child settle himself/herself down after exciting activities?
	Adakah anak anda mampu menenangkan dirinya selepas aktiviti-aktiviti yang menyeronokkan?
8.	Does your child move from one activity to the next with little difficulty? (for example, from playtime and mealtime)
	Mampukah anak anda berpindah dari satu aktiviti ke aktiviti yang lain tanpa banyak kesukaran (contohnya, dari waktu main ke makan)?
9.	Does your child seem happy?
	Adakah anak anda kelihatan gembira?
10.	Is your child interested in things around him/her, such as people, toys and food?
	Adakah anak anda berminat terhadap persekitarannya seperti orang, barang mainan atau makanan?
11.	Does your child do what you ask him/ her to do?
	Adakah anak anda melakukan apa yang anda suruh?
12.	Does your child seem more active than other children his/her age?
	Adakah anak anda kelihatan lebih aktif berbanding anak-anak lain yang sebaya dengannya?
13.	Does your child stay with activities he/she enjoys for at least 5 minutes? (other than watching shows / videos, or playing with electronics)?
	Adakah anak anda mampu melakukan aktiviti kegemarannya secara berterusan selama lebih dari 5 minit (aktiviti selain daripada menonton persembahan / video / bermain media elektronik)?
14.	Do you and your child enjoy mealtimes together?
	Adakah anda dan anak anda sama-sama menikmati waktu makan, Contohnya ketika anak disuap?

Table 3.9, continued

No.	Item
15.	Does your child have eating problems? For example, does he stuff food, vomit, eat things that are not food or__________? (Please describe)
	Adakah anak anda mempunyai sebarang masalah makan? Contohnya, adakah dia memasukkan makanan ke dalam mulut secara banyak dan berterusan sebelum sempat ditelan, mengalami muntah, makan sesuatu yang bukan makanan atau ________________? (Sila jelaskan)
16.	Does your child sleep at least 8-hours in a 24-hour period?
	Adakah anak anda tidur selama sekurang-kurangnya 8 jam (tidak semestinya secara berterusan) dalam tempoh 24 jam?
17.	Does your child use words to tell you what she wants or needs?
	Adakah anak anda menggunakan kata-kata untuk memberitahu anda apa yang dia mahukan?
18.	Does your child follow routine directions? For example, does he come to the table or help clean up his toys when asked?
	Adakah anak anda mengikut arahan yang diberikan secara rutin atau biasa? Contohnya, adakah dia akan datang menghampiri meja atau mengemas kembali mainan apabila disuruh?
19.	Does your child cry, scream, or have tantrums for long periods of time?
	Adakah anak anda menangis, menjerit atau meragam untuk tempoh waktu yang lama?
20.	Does your child check to make sure you are near when exploring new places, such as park or a friend's home?
	Adakah anak anda memastikan bahawa anda berada dekat dengannya ketika berada di tempat baru seperti taman atau rumah teman?
21.	Does your child do things over and over and get upset when you try to stop him? For example, does he rock, flap his hand, spin, or ____? (Please describe)
	Adakah anak anda melakukan sesuatu berulang kali dan merajuk jika anda cuba menghalangnya? Contohnya, menggerakkan badan ke depan dan belakang, mengibas-ngibas tangan, memusingkan badan, atau_____________? (Sila jelaskan)
22.	Does your child hurt himself/herself on purpose?
	Adakah anak anda dengan sengaja mencederakan dirinya?
23.	Does your child stay away from dangerous things, such as fire and moving cars?
	Adakah anak anda menjauhi diri daripada perkara berbahaya seperti api atau kereta yang sedang bergerak?
24.	Does your child destroy or damage things on purpose?
	Adakah anak anda memusnahkan atau merosakkan benda dengan sengaja?

Table 3.9, continued

No.	Item
25.	Does your child use words to describe his/her feelings and the feelings of others. For example, does he/she say “I’m happy”, “I don’t like that” or “She’s sad?”
	Adakah anak anda menggunakan kata-kata untuk menggambarkan perasaannya dan perasaan orang lain? Contohnya, adakah dia berkata “Saya gembira”, “Saya tidak suka”, atau “Dia sedih”?
26.	Can your child name a friend?
	Bolehkah anak anda menamakan seorang kawan?
27.	Do other children like to play with your child?
	Adakah kanak-kanak lain suka bermain dengan anak anda?
28.	Does your child like to play with other children?
	Adakah anak anda suka bermain dengan kanak-kanak lain?
29.	Does your child try to hurt other children, adults, or animals (for example by kicking or biting)?
	Adakah anak anda cuba mencederakan kanak-kanak lain, orang dewasa atau haiwan (contohnya, dengan menendang dan menggigit)?
30.	Does your child show an unusual interest in or knowledge of sexual language and activity?
	Adakah anak anda menunjukkan minat atau pengetahuan yang luar biasa terhadap perbualan atau aktiviti seksual?
31.	Does your child try to show you things by pointing at them and looking back at you?
	Adakah anak anda cuba menunjukkan sesuatu dengan menunding jari ke arah objek tersebut dan kemudian menoleh kepada anda?
32.	Does your child pretend objects are something else? For example, does he/she pretend banana is a phone?
	Adakah anak anda berpura-pura menggunakan suatu objek sebagai benda lain? Contohnya, menggunakan pisang sebagai telefon?
33.	Does your child wake three or more times during the night?
	Adakah anak anda bangun tiga kali atau lebih pada waktu malam hari?
34.	Is your child too worried or fearful? If “sometimes” or “often” or “always”, please describe: ____
	Adakah anak anda sangat bimbang atau takut? Jika jawapan anda “kadang-kadang”, “kerap” atau “sentiasa”, sila jelaskan: ________________________
35.	Has anyone shared concerns about your child’s behaviour? If “sometimes” or “often” or “always”, please explain: ____________________________
	Pernahkah sesiapa mengesyaki sesuatu yang membimbangkan tentang perilaku anak anda? Jika jawapan anda “kadang-kadang”, “kerap” atau “sentiasa”, sila jelaskan: ________________________________

Modified and translated items of the other three instruments are stated in Tables 3.10, 3.11 and 3.12 as follow.

Table 3.10: Modified and translated items of
Parent Problematic Digital Technology Use Scale

No.	Item
1.	When my mobile phone alerts me to indicate new messages, I cannot resist checking my phone.
	Apabila telefon bimbit saya memberi notifikasi pesan baru, saya tidak mampu bertahan tanpa memeriksa pesan baru tersebut.
2.	I often think about calls or messages I might receive on my mobile phone.
	Saya kerap memikirkan tentang paggilan atau pesanan yang mungkin saya terima melalui telefon bimbit saya.
3.	I feel like I use my mobile phone too much.
	Saya merasakan penggunaan telefon bimbit saya adalah sangat berlebihan.

Table 3.11: Modified and translated items of
Media and Technology Usage and Attitudes Scale

No.	Item
1.	I get anxious when I don't have my mobile phone.
	Saya berasa gelisah jika tidak mempunyai telefon bimbit di sisi.
2.	I get anxious when I don't have the internet available to me.
	Saya berasa gelisah jika tidak mempunyai akses internet.
3.	I am dependent on my electronic gadgets.
	Saya bergantung kepada alat teknologi media saya.

Table 3.12: Modified and translated items of Technology Related Parenting Scale

No	Item
1.	I set limits on the amount of time.
	Saya menetapkan batas masa yang dibenarkan.
2.	I set limits on when electronic media can be accessed.
	Saya menetapkan batas tentang bila penggunaan media elektronik dibenarkan.
3.	I set limits on the type of content allowed.
	Saya menetapkan batas kepada kandungan media yang ditonton.
4.	I don't have rules for screen time.
	Saya tidak menetapkan sebarang peraturan untuk masa skrin.
5.	I use consequences if these are accessed when not allowed.
	Saya mengambil tindakan ke atas anak jika mereka menggunakan media elektronik ketika tidak dibenarkan.
6.	I use passwords on these devices.
	Saya menggunakan kata kunci bagi media elektronik.
7.	I remove the devices if possible (e.g. video game controllers, tablets, power cords)
	Saya mengeluarkan peralatan media elektronik daripada punca elektrik atau menutupnya apabila tidak digunakan.
8.	I place limits using parental control features on these devices.
	Saya menghadkan penggunaan media elektronik dengan fitur kawalan ibu bapa.

3.10 Content Validity

Content validity is defined as the ability of the selected items in instrument to reflect the variables of the construct in a measure. Besides addressing the degree to which items of an instrument sufficiently represents the content domain, it also answers the question to what extent the selected sample in an instrument is a comprehensive sample of the content (Rubio et al, 2003; Zamanzadeh et al, 2015). Content validity is vital in the process of instrument validation as it can provide information on the representativeness and clarity of items and help investigators improve an instrument through achieving recommendations from the expert panel (Yaghmale, 2003).

Individuals in the expert panel are defined as expertise in the field of study invited to review and critique an assessment tool. The minimum number of acceptable experts is two (Yusoff, 2019). In this study, a panel of experts consists of four people conducted the content validity – namely a development paediatrician, a clinical psychologist, and two public health medicine specialists.

Measurement aim and target population were taken into consideration. Experts were requested to evaluate whether the items of each scale covered all important aspects or if there were missing components. Panel of experts state their agreement towards the items in the instrument. Comments were taken into consideration for amendments (Halek, Holle & Bartholomeyczik, 2017).

3.10.1 Content Validity Index

Item-content validity index (I-CVI) of each instrument is shown in Table 3.13. For three to five experts as it is in our study, the acceptable cut-off score of CVI is 1.0 (Polit, Beck & Owen, 2007).

Table 3.13: Item Content Validity Index (I-CVI) for instruments tested in validation study

Instruments	Items	Experts				I-CVI
		1	2	3	4	
ASQ:SE-2 18-Month	Q 1-34	Agreeable	Agreeable	Agreeable	Agreeable	1.00
ASQ:SE-2 36-Month	Q 1-37	Agreeable	Agreeable	Agreeable	Agreeable	1.00
Parent problematic digital technology use	Q 1-3	Agreeable	Agreeable	Agreeable	Agreeable	1.00
Media and Technology Usage and Attitudes Scale	Q 1-3	Agreeable	Agreeable	Agreeable	Agreeable	1.00
Technology Related Parenting Scale	Q 1-8	Agreeable	Agreeable	Agreeable	Agreeable	1.00

3.11 Pre-test

After Malay language version questionnaires were matched and finalised, a pre-test was conducted on ten people to assess the feasibility of respondent recruitment and administration of questionnaires in terms of level of comprehension and time taken to complete the questionnaire (Perneger, 2015). Among other parents, respondents of the pre-test included early childhood educators and health professionals who were able to give a rational judgement on the questionnaires involved in the study based on their fieldwork experience. According to feedbacks given, the whole questionnaire takes around ten to fifteen minutes to be completed. Questionnaire was deemed to be relevant and comprehensible even by parents with low academic qualification of primary school. None of the questions was regarded to be socio-culturally inappropriate. The tool is concluded to be parent-friendly and takes a relatively short time to be completed.

3.12 Pilot Study

After pre-testing, the questionnaires underwent reliability and validity testing through a pilot study. Quality criteria proposed for measurement properties of health status questionnaire by Terwee et al (2007) was used. Findings of the pilot study are discussed in the next chapter.

3.12.1 Study Sampling

For pilot study to test reliability and validity of the four instruments stated in the previous sections, few health clinics in the district of Gombak were selected as health sites – namely *Klinik Kesihatan Rawang* and *Klinik Kesihatan Selayang Baru*. Simple random sampling technique was utilized and data was collected via questionnaire administration to respondents. Data collection process is described further in following sections. A summary of the population involved, stage and methods used for assessment and sample recruited in each stage of instrument validation is presented in Table 3.14.

Table 3.14: Summary of the population involved, methods used for assessment, and sample size recruited in each stage of instrument validation

Instruments	Methods used for assessment	Minimum sample size required	Sample size recruited in this study
●ASQ:SE-2 18-Month and ●ASQ:SE-2 36-Month	Internal consistency	100 (Yurdugul, 2008)	100
	Test-retest reliability	30 (Bujang & Baharum, 2017)	60
	Construct validity -Establishment of cut-off scoring -Comparison of scoring with different population -Convergent validity	Not available	100

Table 3.14, continued

Instruments	**Methods used for assessment**	**Minimum sample size required**	**Sample size recruited in this study**
●Parent Problematic Digital Technology Use Scale, ●Media and Technology Usage and Attitudes Scale and ●Technology Related Parenting Scale	Internal consistency	100 (Yurdugul, 2008)	100
	Test-retest reliability	30 (Bujang & Baharum, 2017)	60
	Construct validity - EFA - CFA	 100 150 (Awang, 2015)	 100 150

With regards to minimal sample size required for factor analysis Hair et al (2010) states minimum sample size to conduct CFA depends on the model complexity and basic measurement model characteristics, 100 being the minimum required sample for five or less latent constructs, within each latent of three or more measuring items. Hence, considering limitation of time and financial resource with less than five constructs in the instruments of concern in our study, 150 sample recruited in our study is deemed adequate (Awang, 2015).

3.12.2 Internal Consistency

Internal consistency reflects extend to which the individual items in the questionnaire are inter-correlated and whether they are consistent in measuring the same construct, estimated using Cronbach's alpha. Nunnally and Bernstein (1994) proposed a criterion of 0.70 to 0.90 as a measure of good internal consistency. Value of 0.96 and above is a sign of redundancy (Terwee et al, 2007).

3.12.3 Test of Reliability and Agreement

Test-retest reliability reflects the extent to which the answers of respondents remain relatively consistent during repeated administration (Terwee et al, 2007). Test-retest reliability was measured using Intraclass Correlation Coefficient (ICC), which can be used to describe the relative extend to which two continuous measurements taken by the same rater on different occasions are reliable (Barton & Peat, 2014).

ICC Value of 0.70 and more is accepted as good reliability (Terwee, 2007; Tsang, Royse & Terkawi, 2017). For ASQ:SE-2, level of agreement was measured using Cohen's Kappa for the binary outcome (Barton & Peat, 2014). In this study, a retest was done between one to two weeks (Marx, 2003) on 60 respondents (Terwee et al, 2005)

3.12.4 Construct Validity

Construct validity refers to the extent to which scores of an instrument is consistent with theoretically derived hypotheses concerning concepts that are being measured. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were utilized to test the construct validity of Parental Media Behaviour and Home Media Environment instruments. CFA allows us to test the hypothesis that there is a relationship between observed variables and the latent constructs underlying them (Suhr, 2006). The construct is valid if its fitness indexes achieved the three Model Fit categories namely Absolute Fit, Incremental Fit and Parsimonious in Table 3.15 (Awang et al, 2018).

Table 3.15: The three categories of model fit and their level of acceptance

Name of category	Name of index	Level of acceptance
Absolute Fit Index	RMSEA	RMSEA < 0.08
	GFI	GFI > 0.90
Incremental Fit Index	AGFI	AGFI > 0.90
	CFI	CFI > 0.90
	TLI	TLI > 0.90
	NFI	NFI > 0.90
Parsimonious Fit Index	Chisquare/df	Chi-Square/ df < 3.0

However, as factor analysis attempts to constrict the questionnaire into few dimensions through smaller number items, the technique was not used for ASQ:SE-2 which involves scoring and requires the study to retain all items from the original version. To determine construct validity of ASQ:SE-2 Malay Language version, it was necessary to establish optimal cut-off scoring; whereby individuals above the determined cut-off score are classified as "poor mastery" and needs further follow-up. There is no absolute score that separates children who are typically developing from those who are not (Squires, Bricker, Twombly, 2015).

Finding the optimal cut-off score requires examining alternatives that maximize identification of individuals who truly need further assessment (true positive), while minimizing misidentification of individuals who do not need further assessment (false positive). To determine the accuracy of tentative cut-off score, thus the validity of ASQ:SE-2 Malay Language version, two methods were used. The Receiver Operating Curve of total scores and the formula given by developer of questionnaire for studies in new settings were used. According to this formula (Median + 1.5 semi-interquartile ranges), scoring obtained from target population yields the new cut-off score of referral zone for the translated and culturally adapted version of ASQ:SE-2. Cut-off scoring for children in the monitoring zone is taken as score above 65th percentile (Squires, Bricker & Twombly, 2015).

Secondly, ASQ:SE-2 scoring of both age interval in the Malaysia sample was compared to findings of a Korean study – one of the few Asian studies using with ASQ:SE scorings available. Mean scores of the Korean sample was compared with the mean scores of the Malaysian sample used in our study to investigate differences in performance on the instruments. The additional items included in the second version of instrument was excluded for optimal comparison and independent t-test was used to determine if statistical differences in mean scores of both populations exist (Heo, & Squires, 2012).

3.12.4.1 Convergent Validity

Convergent validity of 'Parental Media Behaviour' and "Home Media Environment' scales were evaluated through an assessment of item factor loadings and their statistical significance, assessment of the factors' average variance extracted (AVE). Convergent validity is indicated by an item factor loading ≥ 0.5, $p < 0.05$ and AVE ≥ 0.5 (Hair et al, 2009).

For ASQ:SE-2 Malay Language version, convergent validity was analyzed using the correlates of child biological criteria; namely prematurity (gestational age below 37 weeks) and birth weight (below 2500 gram) as applied by Kerstjens et al (2009). Theoretically, perinatal risk events (Montagna & Nosarti, 2016) are shown to exert lifelong influence on socioemotional functioning, whereas higher maternal education and socioeconomic status are deemed to be protective factors to early childhood development (Donald, 2019). Another correlation was tested between the item "*Do you have any worries about your child*?" with child social emotional development scored using ASQ:SE-2 to determine convergent validity.

Kendall's τ (tau) coefficient statistics was used to analyze these correlations as it uses ranks or ordinal data and does not require interval data, without assumption that the variables are normally distributed (Barton & Peat, 2014). The relationship or correlation between the two variables is denoted by 'r', varying between −1 and +1. Zero implies no correlation and 1 means a perfect or complete correlation. The sign of the 'r', either positive or negative shows the direction of correlation. A positive 'r' denoting the variables as positively related and negative 'r' meaning they are inversely related. The strength of the correlation (Akoglu, 2018).

3.12.4 Floor and Ceiling Effect

Floor and ceiling effects tests the possibility of having abnormally high or low values of instrument scoring. To be positively rated, only a maximum of 15% of respondents may achieve the lowest or highest possible score of an instrument (Terwee et al, 2007).

3.13 Phase II: Cross-sectional Study

Phase II of the study is aimed to determine the prevalence of screen time among young children and to determine the association between screen time, parental media behaviour and home media environment with early childhood social emotional development.

3.13.1 Study Sampling

Study subject comprise of children aged 18-months (ranged between 15 to 21 months) and 36-months (ranged between 33 to 42 months) old who undergo routine vaccination and developmental assessment at 18-month and 36-month, respectively at the local health clinics. Recruitment of these subject from both age intervals enables administration and validation of ASQ:SE-2 18-Month and 36-Month Questionnaires. Parent or guardian of subjects act as proxy or study respondent with following criteria:

3.13.1.1 Inclusion Criteria

(i) Malaysian nationality of above 18 years of age.

(ii) Parent or guardian with children aged 15 to 21 months or 33 to 42 months old who spend at least 15 hours a week with child assessed.

3.13.1.2 Exclusion Criteria

(i) Parent or guardian of children with congenital abnormalities.

(ii) Parent or guardian with sensorineural disability or is undergoing any form of psychiatric treatment at the time of data collection.

(iii) Parent or guardian refusing participation in the study.

3.13.2 Sample Size Calculation

The minimum sample size required for the study was calculated using Epi-Info version 6 software based on data obtained from previous studies. Assuming a two-sided significance level (alpha) of 0.05 and power of 85%, sample size was calculated. The first study used for sample size calculation is by Raman et al, 2017 which explores the association between number of daily routines of children aged one to three years old involving electronic screen devices and social emotional development.

Second study involves investigation of association between television viewing and developmental skills of 15 to 35 months old children (Lin et al, 2015). Another study included for sample size calculation was by Chonchaiya & Pruksananonda, 2008 which has television viewing of children aged 15 to 48 months as the study exposure and language delay as the study outcome. Whereas, the final study is by Poulain T. et al, 2018 which looks into the association of mothers' media use with emotional problems among two- to nine- year-old children.

The computed sample size by scorings of previous studies plugged into Epi-Info sample size calculator yielded value of 104 to 602 as the required minimum sample size (Table 3.16). Based on the highest computed sample size, a total of 600 respondents were recruited in this study. It is also justified by literature which states sample size of at least 500 is able to produce statistics that are nearly representative of the true values in the targeted population for logistic regression analysis (Bujang et al, 2009; Bujang et al, 2018). Sample size obtained from Epi-Info calculation is summarised in Table 3.16 with details of previous studies from which scorings were taken.

Table 3.16: Calculation of sample size using OpenEpi software based on fimdings of previous studies

Study	Exposure and Outcome	Percent of exposed with outcome	Percent of unexposed with outcome	Ratio of unexposed to exposed in sample	Sample Size
Raman et al, 2017	*Exposure:* Screen Exposure During Daily Routines *Outcome:* Risk of social emotional delay	15.8%	3.1%	1.0 (OR: 5.8)	**218**
Lin et al, 2015	*Exposure:* Television viewing *Outcome:* Child motor development	30.7%	16.0%	1.0	**320**
Lin et al, 2015	*Exposure:* Television viewing *Outcome:* Child language development	49.3%	24.0%	1.0	**144**
Lin et al, 2015	*Exposure:* Television viewing *Outcome:* Child cognitive development	33.3%	13.3%	1.0	**178**
Chonchaiya & Pruksananonda, 2008	*Exposure:* Television viewing *Outcome:* Language delay	60.7%	28.2%	2.0 (OR: 3.9)	**104**
Poulain T. et al, 2019	*Exposure:* Mother's media use *Outcome:* Child emotional problems	-	58.9%	2.4 (OR: 1.8)	**602**

3.13.3 Sampling Technique

Cluster sampling technique is used to determine study sites, whereby respondents were recruited from five health clinics from each administrative zone or '*mukim*' under the administration of Gombak District Health Office; namely *Klinik Kesihatan Kuang, Klinik Kesihatan Rawang, Klinik Kesihatan Selayang Baru, Klinik Kesihatan Gombak Setia,* and *Klinik Kesihatan AU2* (*Pejabat Kesihatan Daerah Gombak, 2018*). The health clinics were chosen randomly as study sites and random days of visit were alternated in to recruit respondents; till adequate number of respondents needed is achieved in each health clinic. Respondents from each clinic were recruited based on the appointment list of children coming in for routine vaccination at 18 months old and medical examination at 36 months old, respectively (Salazaar, Crosby & DiClemente, 2015). Location of health clinics involved as study sites in the district of Gombak is depicted in Figure 3.5.

Figure 3.5: Location of health clinics involved as study sites under the administration of Gombak District Health Office (Source: Google Maps)

Figure 3.6 further describes how study population of children aged 18 and 36 months brought to health clinics in the district of Gombak were recruited into the study. Each cluster is made of an administrative zone, termed *mukim.* The yellow-filled circles represent health clinics chosen as study sites from which respondents were recruited.

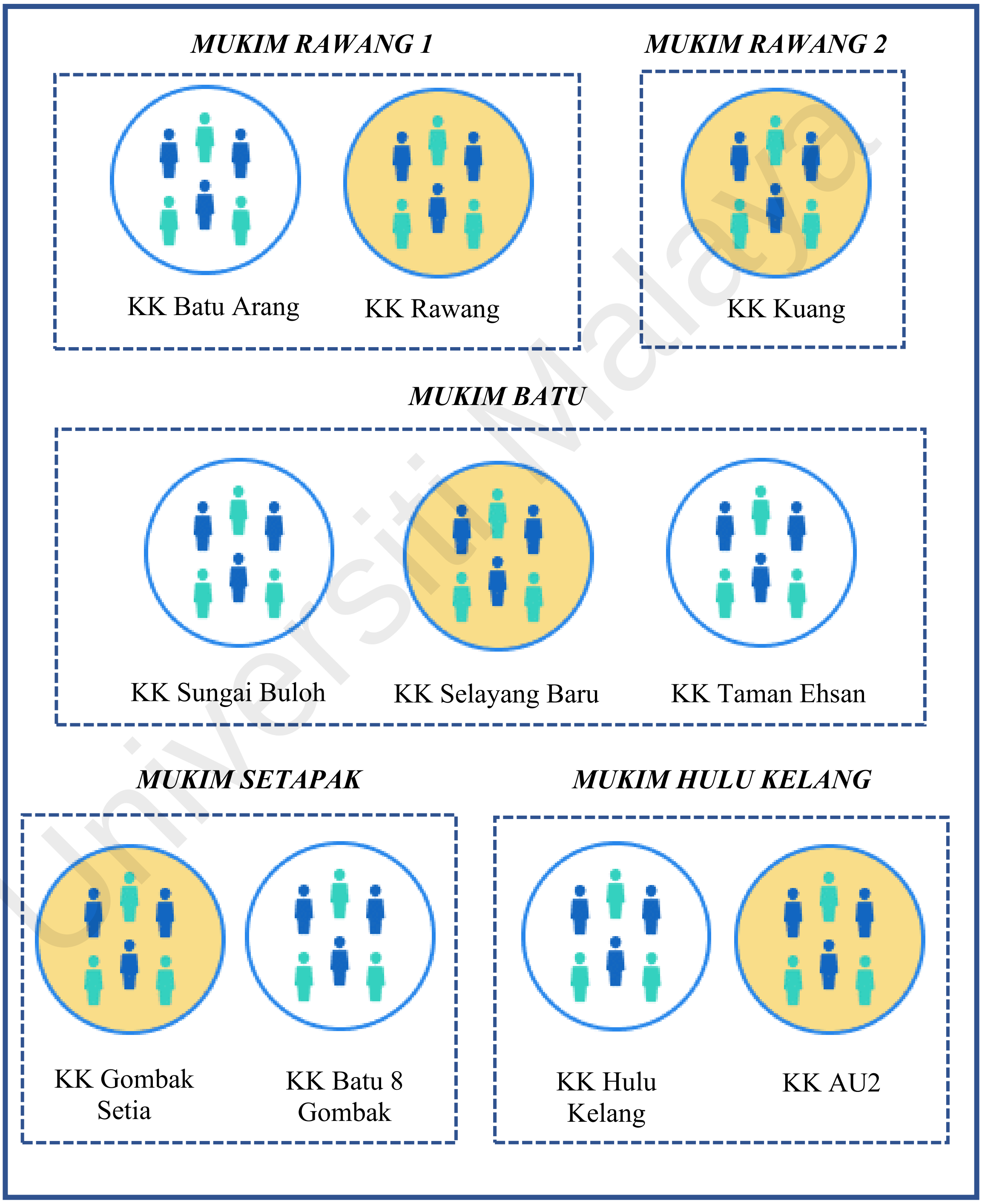

Figure 3.6: Cluster sampling

Number of respondents recruited from each clinic is decided based on the clinic population, with their actual live birth 2019 number as a reference that depicts children's attendance to clinic as displayed in Table 3.17.

Table 3.17: Actual live birth 2019 in each health clinic involved as study site

Health clinics	**Actual live birth 2019**		**Number of**
(Klinik Kesihatan, KK)	N	%	**respondents**
KK Gombak Setia	1423	18.46	112
KK Rawang	1589	20.61	124
KK Kuang	878	11.39	68
KK Selayang Baru	2788	36.17	216
KK AU 2	1031	13.37	80
Total	**7709**	**100%**	**600**

3.14 Study Variables

3.14.1 Dependent Variable

Early childhood social emotional development

3.14.2 Independent Variables

(i) Sociodemographic

- Ethnicity
- Religion
- Parent's education level
- Parental employment status
- Parents' marital status
- Monthly household income

(ii) Child characteristics

- Age
- Gender
- Birth weight

- Prematurity
- History of exclusive breastfeeding
- Non-parental care at home
- Sent to nursery or early childcare centre

(iii) Screen-based Media Usage

- Child screen time
- Parental media behaviour
- Home media environment

3.15 Operational Definitions

3.15.1 Ethnicity

Categorized into Malay, Chinese, Indian and Others.

3.15.2 Religion

Categorized into Islam, Christian, Buddhist, and Hindu.

3.15.3 Parent's Education Level

Categorized into no formal schooling, primary school, secondary school, and diploma and above.

3.15.4 Parental Employment

Respondent to fill parent's occupation; categorized during data analysis.

3.15.5 Parents' Marital Status

Categorized as married, divorced, widow or single.

3.15.6 Monthly Household Income

Defined as combined income of both parents per month.

3.15.7 Child's Age

Calculated from date of birth in months.

3.15.8 Child's Gender

Classified to male and female.

3.15.9 Birth Weight

Normal if weight is 2.5 kg and above, low birth if weight is lesser than 2.5 kg.

3.15.10 Prematurity

Normal if born at 37 weeks of gestation and more, premature if born in lesser than 37 weeks of gestation.

3.15.11 History of Exclusive Breastfeeding

Feeding of only breast milk without any additional liquid or food for the first six months of child's life.

3.15.12 Non-parental Care at Home

Existence of a caretaker to take care of the child when parents are away at work.

3.15.13 Nursery or Early Childcare Centre

Child being sent to a nursery or early childcare centre.

3.15.14 Child Screen Time

Child screen time is the average time spent by children watching television, using computer or laptop, using mobile phone, tablet and video consoles during a typical day. Screen time is measured using the Global Time Estimate method by first summing up typical weekday screen time multiplied with five and typical weekend screen time multiplied by two and then dividing the sum with seven. Average screen time derived is classified as excessive screen time if the value is one hour and more for children aged two and above, and any screen time for children below two-years old. Table 3.18 summarizes the classification of screen time according to AAP 2010 used in this study (AAP, 2016).

Table 3.18: Screen Time Classification by AAP 2010 and WHO 2019 Guidelines

Child's age	Excessive Screen Time	
	Yes	No
15-21 months	Presence of any screen time	No screen time exposure
33-42 months	One hour and more of screen time	Less than one hour of screen time

In terms of measurement of screen time among young children, varied approaches are used by researchers worldwide. This includes global time estimates, time diaries, media diaries, video or direct observation and electronic monitoring systems. Some studies also adapt the responses in the forms of Likert-scale or categorized nominal answers. The advantage of global time estimate is that it is relatively easy to administer, quick for the purpose of data collection and inexpensive. It also captures the exact amount of time spent by children engaging themselves with screen-based media in any typical weekday or any typical weekend. The method has widely been used in existing research works, including major nationally representative surveys such as the Kaiser Family Foundation Surveys (Rideout, 2007) and other studies (Asplund, 2015; Carson & Kuzik, 2017; Chandra et al, 2016).

3.15.15 Parental Media Behaviour

Measured through parental media addiction using the adapted Parent Problematic Digital Technology Use Scale and parental media dependency using the adapted Media and Technology Usage Scale, with three items in each subscale. Total scores range from four to 24, higher score indicating higher problematic parental media behaviour (McDaniel & Radesky, 2017; Rosen, 2013).

3.15.16 Home Media Environment

Measured using five items measuring Home Media Environment (HME) using the adapted Technology Related Parenting Scale. Each item was measured on the scale of one to three, with one of the items reverse coded. The scores range from five to 15, a higher score indicating a safer media environment for children in terms of home media rules and enforcement strategies implemented by parents or caretakers at home (Sanders, 2016).

3.15.17 Early Childhood Social Emotional Development

Measured using ASQ:SE-2 Malay Language version. Scoring above the cut-off value denotes child with poor mastery of social emotional development, whereas child below the cut-off value is deemed to be with normal development. Cut-off value is determined using the formula determined by the questionnaire developer which is Median + 1.5 semi-interquartile ranges and by the ROC obtained from pilot study (Squires, Bricker & Twombly, 2015).

3.16 Study Instrument

The questionnaire used as the survey instrument (attached as Appendix III); consists of four main sections as follow:

(i) Section A: Child details (8 items)

Obtains information on child gender, date of birth and expected date of delivery (if born premature), birth weight, gestational age at birth, presence of other caretakers beside parents at home, whether child is sent to a nursery, and duration of exclusive breastfeeding.

(ii) Section B: Socio-demographic details (7 items)

Obtains information on race, religion, parents' education level, parents' employment status, parents' marital status, and monthly household income.

(iii) Section C: Child media characteristics (5 items)

Enquires electronic media availability at home, age of first exposure to electronic media, screen time, media content engaged with, and child media habits.

(iv) Section D: Parental media behaviour (6 items)

Delves into parent's media addiction and media dependency which are assessed using the "Parent Problematic Digital Technology Use Scale" and "Media and Technology Usage and Attitudes Scale".

(v) Section E: Home media environment (8 item)

The "Technology Related Parenting Scale" is used to assess home media rules and ways they were enforced at home.

(vi) Section F: Child social emotional development

Assessed using the second edition of "Ages and Stages Questionnaires: Social-emotional", (ASQ:SE-2) that contains 33 items for 15 to 21 months old children and 37 items for 33 to 42 months old children.

3.17 Data Collection

3.17.1 Pre-data Collection

Prior to commencement of data collection at field, the Family Medicine Specialist (FMS) or Medical Officer in Charge (MOIC) of each clinic involved in this study were liaised with by the principal investigator. The clinic heads were briefed about the nature and purpose of the research. Copies of ethical approval and permission letter to use their respective health facility from the State Health Department and District Health Office were given. They were also informed that children identified to have social emotional developmental issues that need further assessment will be referred to their clinic's Maternal and Child Health (MCH) unit.

Recruitment of research assistance was done to expedite the process of data collection. Five research assistants were recruited for this study. They comprised of a medical graduate, two pharmacy graduates who were waiting for placement post completion of bachelor's degree and two biomedical graduates. They were briefed thoroughly on the research aim and questionnaire to ensure they have a good understanding of the research project. Each one of them were personally coached on ways of engaging themselves with health personnel at health clinics and ways to distribute questionnaire to potential respondents in the healthcare facilities without creating disturbance to the patients or disruption of the ongoing activities in the clinics.

3.17.2 During Data Collection

Data was collected via self-administration of questionnaires by parents. Questionnaires were distributed to parents at the study sites by the principal investigator and her research assistants. Parents with children who fulfil the inclusion criteria approached in the waiting area of health clinics were invited to take part in the study willingly without force. If agreeable to participate in the study, respondents were briefed about details of the study based on the patient information sheet.

Written informed consent is then taken from the respondent after having them read on the study details and confidentiality terms. Those require further explanation about the research details were given adequate information. The questionnaires distributed by research assistants at sites were collected from research assistants by the principal investigator on weekly basis.

3.17.3 Post-data Collection

Collected questionnaires were scored by the principal investigator based on the ASQ:SE-2 Guide and cut-off scoring determined in this study. Children found to have above cut-off scoring which indicates need for referral to a medical doctor for further assessment were referred to the officer in charge of each health clinic. Referral letter with details of children screened to have possible social emotional developmental issues based on scoring of ASQ:SE-2 was given to the Family Medicine Specialist (FMS) or Medical Officer in Charge (MOIC) of each clinic. The referred children will then be seen by Medical Officer for developmental assessment and is then referred to a Paediatrician if any developmental delay or behavioural issues and parental concerns are identified to emerge (Squires, Bricker, Twombly, 2015).

3.18 Data Management and Analysis

Data management and analysis were done systematically to assist in obtaining useful information which can be interpreted for supportive data in decision makings. Data collected from the respondents in the form of questionnaires were analysed using the Statistical Package for Social Sciences (SPSS) Software Version 25 and SPSS Analysis of Moment Structure (AMOS) Software Version 24. Each respondent is coded with separate identity numbers as to ensure no bias occurs during data handling and data entry. Great care has been taken during data collection with the placement of research assistants at study sites, who can clarify with respondents in case of incomplete questionnaires as to minimize issue of missing data.

3.19 Statistical Analysis

3.19.1 Phase I

Statistical analysis of research data was worked upon using the Statistical Package for Social Sciences (SPSS) software version 24. For validation study, socio-demographic factors of respondents were summarized using descriptive statistics. Reliability and validity testing were run using SPSS Version 24. For Confirmatory Factor Analysis, AMOS graphics was used.

3.19.2 Phase II

Socio-demographic factors, child characteristics, media availability, media content engaged with, child media habits, child screen time, parental media behaviour, home media environment, social emotional developmental level, and prevalence of excessive screen time among children in the study were summarized using descriptive statistics. Figures such as bar charts were used to explain to explain some of the study findings of this section for better understanding.

To determine the association between sociodemographic characteristics, screen time, parental media behaviour, and home media environment with social emotional development, bivariate analysis method was used to explore the associations between independent variables and the dependant variable – giving the values of unadjusted odds ratio (OR) and 95% confidence intervals (CI). The method helps in determining how independent variables of the study influence the dependant variable and to assess the strength of the relationship between both (Bertani et al, 2018).

Potential confounders are identified based on previous literature and expert opinion, from which multivariable logistic regression analysis is conducted to assess the association between excessive screen time and social emotional development, identifying factors associated with delayed early childhood social emotional development after adjusting for potential confounding factors (Alexopoulos, 2010). The dependant variable gives a binary outcome. Although explanatory variables in the multivariable logistic regression model can be continuous or categorical, logistic regression is best suited to measure explanatory variables that are binary, which is utilized in this study. The assumptions for model building are met. Block-wise method was used to enter explanatory variables into the regression model. This method provides a reliable, stable model and invaluable information about inter-relationship between the explanatory variables. Nature of the study and importance level of each explanatory variable classified into blocks guides the selection into model (Barton & Peat, 2014).

3.20 Research Ethics and Approvals

Research ethical approval was obtained from the Medical Research and Ethics Committee (MREC) and National Institute of Health (National Medical Research Register ID: NMRR-18-3444-44236) as attached in Appendix B. Permission to use health facilities involved in the study were obtained from the Selangor State Health Department and Gombak District Health Office to enable data collection at the health clinics.

Approval letters from Selangor State Health Department is attached as Appendix C. Approval letters and letter of study extension from Gombak District Health Office are attached as Appendix D and Appendix E, respectively. Contents of the informed consent forms were explained and given adequate time to be read by potential study respondents; after which is signed in agreement to participate in the study (Appendix L). Children identified with poor mastery of social emotional development in this study were referred for further evaluation by medical doctor.

Parents were informed beforehand that assessment using ASQ:SE-2 is not for the purpose of diagnosis, rather as a screening tool and that there is a possibility that they will later be notified by health clinic in case further assessment for their child arises due to participation in the study.

Confidentiality of the information shared by the study respondents are protected. Personal details are assured of not for publication in any form unless with the written permission granted by the respondent. No access is allowed from persons other than the principal investigator and the research team to breach the confidentiality of information obtained. Primary data collected from respondents is anonymised and saved as password protected computer files. A backup copy of data obtained through the study was saved in a hard disc belonging to the principal investigator, secured in a locked filing cabinet.

3.21 Summary of Chapter 3

This chapter started by providing general information in terms of study design, study duration and study population. The research work comprises of validation study as its first phase and cross-sectional study as its second phase, carried out from August 2018 to December 2020. This research which involves children aged 18 months and 36 months old as its study population was conducted in the district of Gombak, Malaysia.

The second section of the chapter provided details of the validation study highlighting the major phases in validation of instruments used in the study; from content validity, translation, reliability, and validity testing. Four instruments validated are namely the second edition of “Ages and Stages Questionnaires: Social-emotional”, (ASQ:SE-2) to assess child social emotional development, “Parent Problematic Digital Technology Use” that assesses parental media addiction, “Media and Technology Usage and Attitudes Scale” that assesses parental media dependency, and “Technology Related Parenting Scale” to assess home media environment.

For content validity, item-content validity index (I-CVI) of each instrument was at acceptable level. Modified and final versions of translation for each instrument were also included in this chapter. Methods and population size for reliability analyses and construct validity of the cross-culturally adapted measurement tools were described.

The chapter then moved into second phase – featuring study sites involving five health clinics. Inclusion criteria for respondents are Malaysian nationality of above 18 years of age who are either parent or guardian of children aged 15 to 21 months or 33 to 42 months old, and have spent at least 15 hours a week with child assessed. A total of 600 respondents were recruited in this second phase of study. Cluster sampling technique is used to determine study sites, and respondents were recruited through simple random sampling from each clinic. Data was collected via self-administration of questionnaires. Data analyses was done using SPSS and SPSS AMOS. Research ethical approval was obtained from the Medical Research and Ethics Committee (MREC) and National Institute of Health (National Medical Research Register ID: NMRR-18-3444-44236).

CHAPTER 4: RESULTS

4.1 Introduction

This chapter shows the findings and interpretation of data collected in this research. The first section describes findings from Phase I, focusing on the reliability and validity of each the four instruments validated in this study. Internal consistency, reproducibility, and construct validity of each instrument is displayed.

This is followed by presentation of study findings from Phase II whereby description of sociodemographic details, child characteristics, and child media habits were displayed. Association of independent variables with social emotional development were explored on thereafter. The final section displays multivariable logistic regression models linking excessive screen time and social emotional development adjusted for other independent variables.

4.2 Phase I

There are four instruments validated before being utilized in the second phase of this study namely; second edition of "Ages and Stages Questionnaires: Social-emotional" (ASQ:SE-2), "Parent Problematic Digital Technology Use", "Media and Technology Usage and Attitudes Scale", and "Technology Related Parenting Scale". Reliability and validity of each instrument are presented in the following section.

4.3 ASQ:SE-2 (Malay language)

Sociodemographic characteristics of study sample used for internal consistency and validity testing of ASQ:SE-2 is shown in Table 4.1. In terms of mean age of study – 18-Month sample yields a value of 18.16 (SD 2.00) months and for 36-Month sample it is 37.88 (SD 3.01) months. Gender distribution is almost equal for both sets of questionnaires.

Majority of study respondent are of Malay ethnic, comprising more than 60% for both instruments tested followed by Chinese and Indians. Only a small portion of parents are made up of those without formal schooling or with primary education. Children from low-income group based on Malaysian Household Income Survey classification is made up of 6% and 13% among the 18-Month and 36-Month study population, respectively (Department of Statistics Malaysia, 2016). Children with prematurity and low birth weight were recorded by less than 10% children in both age groups.

Table 4.1: Sociodemographic characteristics of study population in frequency, n and percentage, % (n=100)

Variables		18-Month Questionnaire (n=100)	36-Month Questionnaire (n=100)
Gender	Male	51 (51%)	47 (47%)
	Female	49 (49%)	53 (53%)
Ethnicity	Malay	62 (62%)	76 (76%)
	Chinese	18 (18%)	11 (11%)
	Indian	18 (18%)	9 (9%)
	Others	2 (2%)	4 (4%)
Mother's education	No formal schooling	0 (0%)	1 (1%)
	Primary school	1 (1%)	1 (1%)
	Secondary school	62 (62%)	47 (47%)
	Diploma and above	37 (37%)	51 (51%)
Father's education	No formal schooling	2 (2%)	1 (1%)
	Primary school	3 (3%)	0 (0%)
	Secondary school	64 (64%)	63 (63%)
	Diploma and above	31 (31%)	36 (36%)
Household income	< RM 1000	1 (1%)	0 (0%)
	RM 1001 – RM 3000	5 (5%)	13 (13%)
	RM 3001 – RM 6000	86 (86%)	69 (69%)
	RM 6001 – RM 9000	5 (5%)	14 (14%)
	> RM 9000	3 (3%)	4 (4%)
Prematurity	Yes (< 37 weeks)	6 (6%)	8 (8%)
	No (≥ 37 weeks)	94 (94%)	92 (92%)
Birth weight	< 2500 gram	9 (9%)	10 (10%)
	≥ 2500 gram	91 (91%)	92 (92%)

4.3.1 Internal Consistency

Internal consistency of ASQ:SE-2 18-Month and 36-Month intervals tested on 100 respondents shows good and acceptable level, respectively (Table 4.2).

Table 4.2: Internal consistency of ASQ:SE-2 18-Month and 36-Month

Questionnaire	Cronbach's Alpha	Level of internal consistency
ASQ:SE-2 18-Month	0.731	Good
ASQ:SE-2 36-Month	0.686	Acceptable

(Nunnally & Bernstein, 1994; Ursachi, Horodnic & Zait, 2015)

4.3.2 Test of Reliability and Agreement

Test-retest reliability of ASQ:SE-2 18-Month and 36-Month Questionnaires total scores run on 60 respondents using Intraclass Correlation Coefficient, ICC **(**two-way mixed model of absolute agreement) shows excellent level of reliability (Table 4.3).

Table 4.3: Test of reliability of ASQ:SE-2 18-Month and 36-Month using ICC

Questionnaire	Intraclass coefficient (95% CI)	Level of reliability
ASQ:SE-2 18-Month	0.922 (0.759 – 0.965)	Excellent
ASQ:SE-2 36-Month	0.970 (0.922 – 0.986)	Excellent

(Nunnally and Bernstein, 1994)

As ASQ:SE-2 scoring is interpreted by a binary outcome based on child's indication for referral. The level of agreement between first test and retest is tested with Cohen's Kappa on 60 respondents. Findings in Table 4.4 shows a moderate level of agreement for 18-month interval and substantial agreement for 36-month interval (Barton and Peat, 2014).

Table 4.4: ASQ:SE-2 18-Month and 36-Month intervals' referral on Kappa

ASQ:SE-2 Questionnaire	Referral in test	Referral in retest	Proportion in agreement	Kappa	p-value
18-Month Interval	16.7%	6.7%	0.90	0.526	<0.001
36-Month Interval	13.3%	8.3%	0.95	0.743	<0.001

4.3.3 Floor or Ceiling Effect

Floor or ceiling effect is deemed to be present when lowest possible score or highest possible score achieved is ≥15%. Table 4.5 summarizes this finding.

Table 4.5: Floor or ceiling effect of ASQ:SE-2
18-Month and 36-Month Intervals

ASQ:SE-2 Questionnaires	Lowest possible score achieved (%)	Highest possible score achieved (%)	Presence of floor or ceiling effect
18-Month	2.0	0.0	No
36-Month	0.0	0.0	No

(Terwee et al, 2006)

4.3.4 Validity

(i) Establish new cut-off scores

Range of scores, medians, interquartile ranges, receiver operating characteristic (ROC) cut-offs and percentages identified for referral by ASQ:SE-2 are displayed in Table 4.6.

Table 4.6: Cut-off scores of ASQ:SE-2 Malay Language version

ASQ:SE-2 Age Interval	N	Score range	Median	Median + 1.5 semi-interquartile ranges	ROC cut-off score	Cut-off determined	Referral (%)
18-Month	100	0-140	30	55.5	52.5	50	14%
36-Month	100	10-150	50	80.0	85.0	85	13%

(ii) Comparison of scoring between different populations using ASQ:SE

Comparison of ASQ:SE-2 Malay Language scoring was compared with Korean samples that used ASQ:SE. Analyses were made by excluding the additional questions in the former as the latest edition. Comparison of scores is shown in Table 4.7 and Table 4.8 for 18-Month and 36-Month intervals, respectively.

Table 4.7: ASQ:SE 18-Month scoring in Korean and Malaysian samples

Sample	N	Mean	SD	T
Korea	265	29.36	21.17	0.179(n.s)
Malaysia	100	29.80	20.30	

*** p<0.05, ** p<0.01, *** p<0.001**

Table 4.8: ASQ:SE 36-Month scoring in Korean and Malaysian samples

Sample	N	Mean	SD	T
Korea	250	40.18	25.15	2.871*
Malaysia	100	48.42	21.86	

∗ p<0.05, ∗∗ p<0.01, ∗∗∗ p<0.001

(iii) Correlates with child biological factors

Children with prematurity, born at a gestational age of below 37 weeks was associated with poor mastery of social emotional development, with clinical and statistical significance in both age intervals. The same also is found for low birth weight, with children born less than 2500 gram to be associated with deviant scores on social emotional development, with clinical and statistical significance in both age intervals.

Parent's positive response to be worried of their child's development yields statistically positive association with poor scoring of social emotional development, with highest strength compared to prematurity and birth weight. Results are summarized in Table 4.9 and Table 4.10.

Table 4.9: ***Kendall's τ (tau)*** **correlations between child biological factors and parental concern with social emotional developmental scoring for 18-Month interval of ASQ:SE-2 Malay Language Version (n=100)**

Criterion	Poor mastery of social emotional development	Prematurity (< 37 weeks)	Birth weight (< 2500 gram)	Parental concern
Poor mastery of social emotional development	1.00	0.262**	0.276**	0.476**
Prematurity (< 37 weeks)	0.262**	1.00	0.803**	0.130
Birth weight (Less than 2500 gram)	0.276**	0.803**	1.00	0.161
Parental concern	0.476**	0.130	0.161	1.00

∗p<0.05, ∗∗p<0.01, ∗∗∗p<0.001, n.s.=not statistically significant.

Table 4.10: *Kendall's τ (tau)* correlations between child biological factors and parental concern with social emotional developmental scoring for 36-Month interval of ASQ:SE-2 Malay Language Version (n=100)

Criterion	Poor mastery of social emotional development	Prematurity (< 37 weeks)	Birth weight (< 2500 gram)	Parental concern
Poor mastery of social emotional development	1.00	0.215*	0.268**	0.244*
Prematurity (< 37 weeks)	0.215**	1.00	0.516**	0.064
Birth weight (Less than 2500 gram)	0.268**	0.516**	1.00	0.039
Parental concern	0.244**	0.064	0.039	1.00

∗$p<0.05$, ∗∗$p<0.01$, ∗∗∗$p<0.001$, n.s.=not statistically significant.

4.4 Sociodemographic Characteristics of Subjects for Reliability Testing of Parental Media Behavior and Home Media Environment (Malay language) Scale

Sociodemographic characteristics of study sample used for internal consistency and Exploratory Factor Analyses of Parental Media Behaviour and Home Media Environment (Malay language) scale is shown in Table 4.11. Mean age of study sample is 28.04 (10.14) months. Gender distribution is almost equal. Around two-third of respondents are Malays (61%), followed by Chinese (19%), and Indians (14%). Only a small portion of parents are made up of those without formal schooling or with primary education. Children from low-income group based on Malaysian Household Income Survey classification is made up of 13% respondent. In terms of biological factors, children with prematurity and low birth weight were recorded by less than 10% and lesser children.

Table 4.11: Sociodemographic characteristics of study population (n=100) in mean (SD) or frequency, n (percentage, %)

Variables		Mean (SD) / n (%)
Gender	Male	51 (51%)
	Female	49 (49%)
Age (mean, SD)		28.04 (10.14)
Ethnicity	Malay	61 (62%)
	Chinese	19 (19%)
	Indian	14 (14%)
	Others	6 (6%)
Mother's education	No formal schooling	1 (1%)
	Primary school	1 (1%)
	Secondary school	62 (62%)
	Diploma and above	36 (36%)
Father's education	No formal schooling	2 (2%)
	Primary school	0 (0%)
	Secondary school	73 (73%)
	Diploma and above	25 (25%)
Household income	< RM 1000	1 (1%)
	RM 1001 – RM 3000	12 (12%)
	RM 3001 – RM 6000	58 (58%)
	RM 6001 – RM 9000	23 (23%)
	> RM 9000	6 (6%)
Prematurity	Yes (< 37 weeks)	7 (6%)
	No (≥ 37 weeks)	93 (94%)
Birth weight	Low (< 2500 gram)	10 (10%)
	Normal (≥ 2500 gram)	90 (90%)

4.5 Parental Media Behaviour Scale (Malay Language)

This scale comprised of both Parent Problematic Digital Technology Use Scale and Media and Technology Usage and Attitudes Scale representing media addiction subscale and media dependency subscale, respectively. The reliability of subscales is tested first before proceeding to test the overall six items in the scale.

4.5.1 Internal Consistency

(i) Parent Problematic Digital Technology Use Scale (Parental Media Addiction Subscale)

The inter-item correlation coefficients and the corrected item-total correlation (CITC) values for the three items in the Malay language version of the Parent Problematic Digital Technology Use Scale is presented in Table 4.12.

The highest correlation for each item with at least one other item in the construct ranged between 0.387-0.656. Hence the items correlate adequately in the construct. Since the highest value is less than 0.85, lack of discriminant validity is unlikely (Hair, 2010). The Cronbach's Alpha value is 0.734 (>0.7); indicating the internal consistency is good. The minimum CITC value was 0.430, which is more than 0.3 (Hair, 2010).

Table 4.12: Inter-item correlation between the items in Malay language version of Parental Media Addiction Subscale

Items	Q1	Q2	Q3	CITC
PMA1	1.000	0.656	0.387	0.621
PMA2	0.656	1.000	0.396	0.640
PMA3	0.387	0.396	1.000	0.430

(ii) Media and Technology Usage and Attitudes Scale (Parental Media Dependency Subscale)

The inter-item correlation coefficients and the corrected item-total correlation (CITC) values for the three items in the Malay language version of the Media and Technology Usage and Attitudes Scale is presented in Table 4.13.

The highest correlation for each item with at least one other item in the construct ranged between 0.501-0.632. Hence the items correlate adequately in the construct. Since the highest value is less than 0.85, lack of discriminant validity is unlikely (Hair, 2010). The Cronbach's Alpha value is 0.839 (>0.7); indicating the internal consistency is good. The minimum CITC value is 0.600, which is more than 0.3 (Hair, 2010).

Table 4.13: Inter-item correlation between the items in Malay language version of Parental Media Dependency Subscale

Items	Q1	Q2	Q3	CITC
Q1	1.000	0.772	0.501	0.715
Q2	0.772	1.000	0.632	0.817
Q3	0.501	0.632	1.000	0.600

(iii) Parental Media Behaviour Scale (Overall items of instrument)

The inter-item correlation and the corrected item-total correlation (CITC) values for all six items in Parental Media Behaviour Scale is presented in Table 4.14. The highest correlation for each item with at least one other item in the construct ranged between 0.396-0.772, suggesting sufficient relationship between the items. Since the highest value is less than 0.85, lack of discriminant validity is unlikely (Hair, 2010). Cronbach's Alpha value is 0.814, indicating good internal consistency between items. The minimum CITC value is 0.456, which is more than 0.3 (Hair, 2010).

Table 4.14: Inter-item correlation between the items in Malay language version of Parental Media Behaviour Scale

Items	Q1	Q2	Q3	Q4	Q5	Q6	CITC	Cronbach's Alpha if item deleted
Q1	1.000	0.656	0.387	0.404	0.327	0.213	0.538	0.795
Q2	0.656	1.000	0.396	0.454	0.332	0.338	0.605	0.780
Q3	0.387	0.396	1.000	0.367	0.235	0.338	0.456	0.810
Q4	0.404	0.454	0.367	1.000	0.772	0.501	0.669	0.756
Q5	0.327	0.332	0.235	0.772	1.000	0.632	0.631	0.773
Q6	0.213	0.338	0.338	0.501	0.632	1.000	0.544	0.793

4.5.2 Test-retest Reliability

Test-retest reliability of Parental Media Behaviour subscales and the overall instrument run on 60 respondents using Intraclass Correlation Coefficient, ICC **(**two-way mixed model of absolute agreement) indicate excellent level of test-retest reliability (Nunnally and Bernstein, 1994). Finding is shown in Table 4.15.

Table 4.15: Test-retest reliability of Parental Media Behaviour scale and subscales

Scales	ICC	95% CI	Level of reliability
Parental Media Addiction Subscale	0.980	0.967 – 0.988	Excellent
Parental Media Dependency Subscale	0.988	0.980 – 0.993	Excellent
Parental Media Behaviour Scale	0.988	0.980 – 0.993	Excellent

4.5.3 Floor or Ceiling Effect

Floor or ceiling effect of Parental Media Behaviour Scale is summarized in Table 4.16.

Table 4.16: Floor or ceiling effect of Parental Media Behaviour scale and subscales

Scales	Lowest possible score achieved (%)	Highest possible score achieved (%)	Presence of floor or ceiling effect
Parental Media Addiction Subscale	7.0%	1.0%	No
Parental Media Dependency Subscale	8.0%	1.0%	No
Parental Media Behaviour Scale	4.0%	1.0%	No

4.5.4 Validity

4.5.4.1 Assessment of Construct Validity

Exploratory Factor analysis of Parental Media Behaviour Scale on 100 respondents with sociodemographic characteristics as presented in Table 4.11 shows the six measuring items fall into two components, denoting the subscales Parental Media Addiction and Parental Media Dependency. Total Variance Explained from these components 71.262% (>60% requirement) with KMO 0.694 (>0.6) and Bartlett's Test significant (Awang, 2015). For Confirmatory Factor Analysis (CFA), the minimum sample size of 150 respondents was recruited (Awang, 2015).

Demographic profile of participants who were part of the Confirmatory Factor Analysis for testing of construct validity is described in Table 4.17. Distribution of children's gender was slightly more of the female. In terms of age, more children were in the 18-month group compared to the ones in 36-month group. This may be contributed by the number of parents who bring children at the former age for vaccination which is relatively more than the latter where the child is brought in only for routine medical examination as vaccination is completed and many of them defaulted the scheduled appointment.

Table 4.17 shows nearly 90% of respondents in the validation study is comprised of Malay ethnicity, more than 5% are Chinese and the remaining made up of Indian and others. Almost all fathers were grouped equally into secondary school or diploma and above academic qualification. Whereas, for mother's education level, more than 60% are with diploma and above level of education. Nearly 50% of respondents are classified into the B40 group with household income less than RM3000.

Table 4.17: Sociodemographic characteristics of respondents used to test construct validity of Parental Media Behaviour and Home Media Environment Malay Language Scales through CFA (n=150)

Variable	Frequency, n	Percentage, %
Gender		
Male	66	44
Female	84	56
Age		
18 Months	85	56.7
36 Months	65	43.3
Ethnicity		
Malay	134	89.3
Chinese	10	6.7
Indian	5	3.3
Others	1	0.7
Father's education level		
No formal education	1	0.7
Primary school	1	0.7
Secondary school	69	46.0
Diploma and above	79	52.6
Mother's education level		
No formal education	0	0.0
Primary school	2	1.3
Secondary school	53	35.3
Diploma and above	95	63.4
Household income		
<RM1000	1	0.7
RM1000 – RM3000	72	48.0
RM3001 – RM6000	48	32.0
RM6001 – RM9000	20	13.3
>RM9000	9	6.0

In the initially tested model using CFA, the six items in Parental Media Behaviour Scale were put into two constructs as shown in Figure 4.1, indicating its subscales. However, the model did not fit well (Chi-square/df > 3, AGFI < 0.9, TLI < 0.9 and RMSEA > 0.08), hence construct validity was not achieved. Modifications were made to the model to achieve targeted fitness indices for a good fit well.

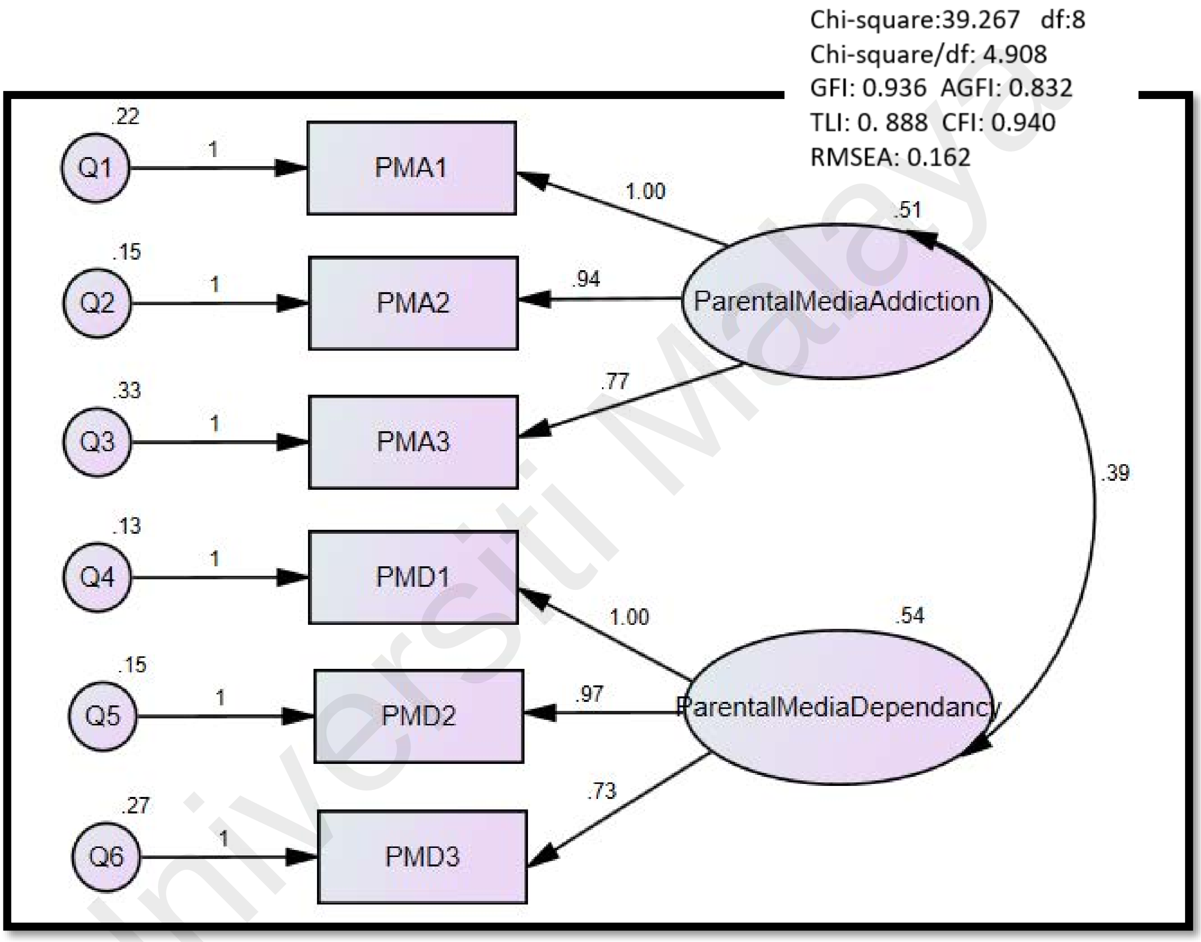

Figure 4.1 Two factor model of Parental Media Behaviour construct

GFI: Joreskog's Goodness of Fit Index
AGFI: Adjusted Goodness of Fit Index
TLI: Tucker-Lewis Index
CFI: Comparative Fit Index
RMSEA: Root Mean Square Error of Approximation

After several modifications, a single factor model as shown in Figure 4.2 was found to be with a good fit. One assumption in using maximum likelihood estimation (MLE) is multivariate normality. If the critical ratio for this value is less than 1.96, assumption of multivariate normality can be assumed (Awang, 2015). In testing the assumption of multivariate normality, critical ratio for multivariate kurtosis was 11.188 (more than 1.96). However, a cross-validation using 1000 bootstrap resamples gave a p-value of 0.208 (more than 0.05). Hence, the model "correctness" is acceptable, we do not reject the null hypothesis that the model is correct (Awang, 2015).

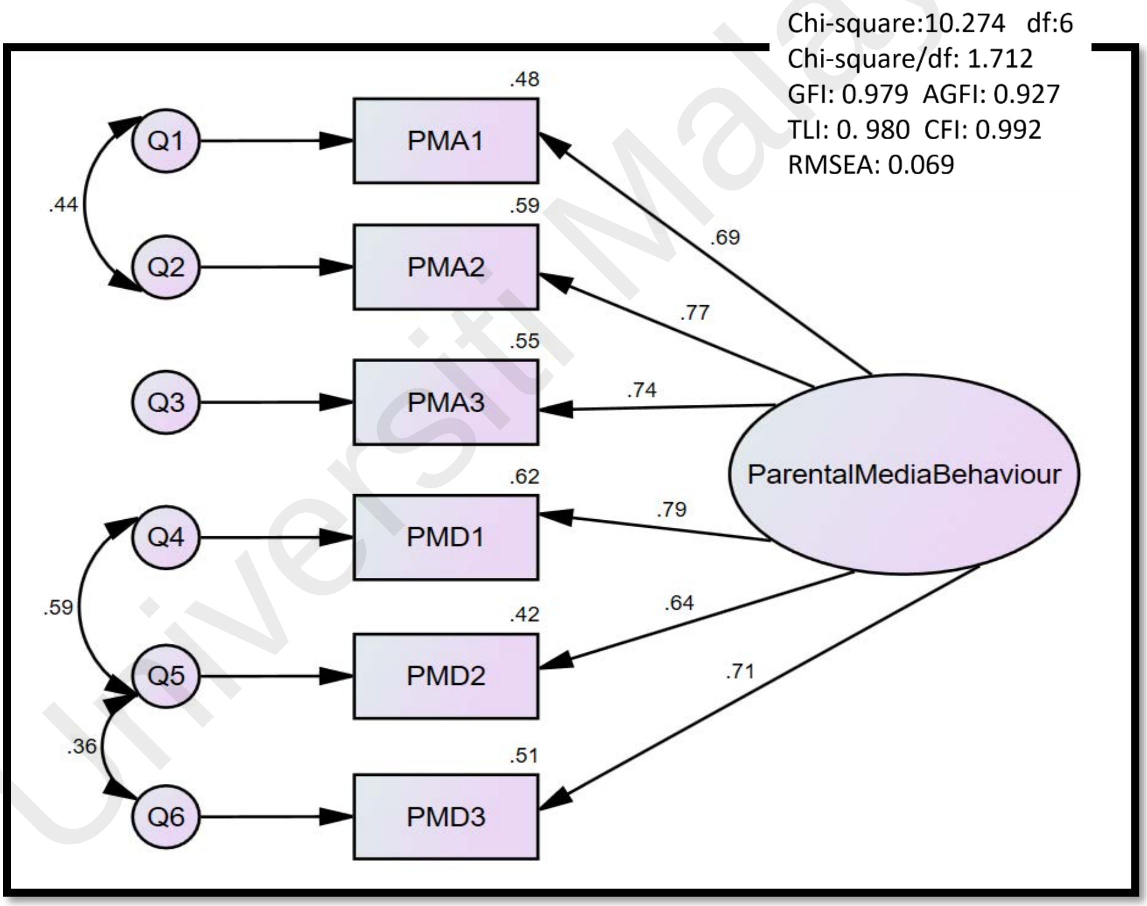

Figure 4.2 Single factor model of Parental Media Behaviour construct

GFI: Joreskog's Goodness of Fit Index
AGFI: Adjusted Goodness of Fit Index
TLI: Tucker-Lewis Index
CFI: Comparative Fit Index
RMSEA: Root Mean Square Error of Approximation

The fitness indexes in Figure 4.2 have met the threshold values as stated in Table 3.15. The Absolute Fit category namely RMSEA is 0.069 (achieved the threshold of less than 0.08), the Incremental Fit category namely AGFI is 0.927 (achieved the threshold of greater than 0.90), and the Parsimonious Fit category namely the ratio of Chisq/df is 1.712 (achieved the threshold of less than 3.0). Thus, the measurement model of all latent constructs has achieved the requirement for Construct Validity (Awang, 2015).

Convergent validity was further evaluated through an assessment of item factor loadings and their statistical significance, assessment of the factors' average variance extracted (AVE). Convergent validity is indicated by an item factor loading ≥ 0.5, $p < 0.05$ and AVE ≥ 0.5 (Hair et al, 2009) and the correlation coefficient of any two constructs should not exceed 0.85 (Kashif et al, 2017; Mohamad et al, 2018; Noor et al, 2015; Yusof et al, 2017). The minimum factor loading of this construct is 0.64 (Table 4.18) None of the correlation values (at the double-headed arrows of Figure 4.2), is greater than 0.85. Thus, multi-collinearity does not arise. CR should exceed its threshold value of 0.7 (Fornell & Larcker, 1981). AVE of 0.53 (>0.5) and CR of 0.92 (>0.7) were calculated according to the following equations given by Fornell and Larcker (1981):

$$\mathrm{CR} = \frac{\left(\sum_{i=1}^{n} \lambda_i\right)^2}{\left(\sum_{i=1}^{n} \lambda_i\right)^2 + \left(\sum_{i=1}^{n} e_i\right)}, \qquad \mathrm{AVE} = \frac{\sum_{i=1}^{n} \lambda_i^2}{\sum_{i=1}^{n} \lambda_i^2 + \sum_{i=1}^{n} e_i},$$

Table 4.18: Factor loadings in the Parental Media Behaviour scale

Items	Unstandardized Estimate	S.E.	C.R.	P	Standardized Estimate
Q1	1.000				0.694
Q2	1.006	0.093	10.857	<0.001	0.768
Q3	0.993	0.128	7.741	<0.001	0.744
Q4	1.088	0.136	8.013	<0.001	0.789
Q5	0.872	0.129	6.745	<0.001	0.644
Q6	0.897	0.121	7.444	<0.001	0.712

4.6 Home Media Environment Scale (Malay Language)

Home Media Environment is based on the Technology Related Parenting Scale which is comprised of eight items. This section describes the reliability and validity testing of Home Media Environment (Malay language) scale.

4.6.1 Internal Consistency

Cronbach's Alpha value is 0.74, indicating good internal consistency. The highest correlation for each item with at least one other item in the construct (Table 4.19) ranged between 0.251-0.821, suggesting some items have insufficient relationship (<0.3). As highest value is <0.85, lack of discriminant validity is unlikely (Hair, 2010). Items Number 5, 6, and 8 has low value of correlation (<0.3); indicating the items do not fit well into the scale. These three items do not correlate adequately in the construct.

Table 4.19: Inter-item correlation between the items in Malay language version of Home Media Environment scale (8 Items)

Items	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Q1	1.000	0.821	0.748	0.540	-0.005	-0.024	0.400	0.248
Q2	0.821	1.000	0.723	0.422	0.077	0.016	0.555	0.251
Q3	0.748	0.723	1.000	0.478	-0.043	-0.053	0.426	0.174
Q4	0.540	0.422	0.478	1.000	-0.088	-0.081	0.187	0.078
Q5	-0.005	0.007	-0.043	-0.088	1.000	0.282	0.123	0.031
Q6	-0.024	0.016	-0.053	-0.081	0.282	1.000	0.281	0.057
Q7	0.400	0.555	0.426	0.187	0.123	0.281	1.000	0.070
Q8	0.248	0.251	0.174	0.078	0.031	0.057	0.070	1.000

The CITC value for items 5, 6 and 8 as shown in Table 4.20 is lesser than the required 0.3 (Hair, 2010). Cronbach's Alpha increases if for deletion of items 5, 6, and 8. Item 5 explores if parents take action against their children if screen time rules are not obeyed, "I use consequences if these are accessed when not allowed". This did not correlate with items 1 to 4 that explores on screen time rules and restrictions. Even in homes where rules are present, children in our study may be deemed too young for punishment.

Items 6 and 8 question on the usage of password and setting of parental control features which do not correlate with other items. Item 6 sounds "*I use passwords on these device*" and Item 8 is "I place limits using parental control features on these devices". Thus, the three items were deleted after thoughtful consideration on its relevancy to the scale. Cronbach's Alpha after the deletion increased to 0.85.

Table 4.20: Corrected item-total correlation and Cronbach's Alpha if item deleted of Malay language version of Home Media Environment scale (8 Items)

Item	CITC	Cronbach's Alpha if item deleted
Q1	0.724	0.646
Q2	0.778	0.636
Q3	0.648	0.665
Q4	0.395	0.721
Q5	0.080	0.771
Q6	0.105	0.766
Q7	0.513	0.696
Q8	0.215	0.750

Item 5 explores if parents take action against their children if screen time rules are not obeyed, "I use consequences if these are accessed when not allowed". This did not correlate with items 1 to 4 that explores on screen time rules and restrictions. Even in homes where rules are present, children in our study may be deemed too young for punishment. Items 6 and 8 question on the usage of password and setting of parental control features which do not correlate with other items.

Item 6 sounds "I use passwords on these device" and Item 8 is "I place limits using parental control features on these devices". Thus, the three items were deleted after thoughtful consideration on its relevancy to the scale. Cronbach's Alpha after the deletion increased to 0.85.

4.6.2 Test-retest Reliability

Test-retest reliability of Home Media Environment scale run on 60 respondents using Intraclass Correlation Coefficient, ICC (two-way mixed model of absolute agreement) indicate excellent level of test-retest reliability (Nunnally and Bernstein, 1994). Finding is shown in Table 4.21.

Table 4.21: Test-retest reliability of Home Media Environment scale

Scale	ICC	95% CI	Level of reliability
Home Media Environment	0.975	0.958 – 0.985	Excellent

4.6.3 Floor or Ceiling Effect

The Home Media Environment (Malay Language) scale did not display floor or ceiling effect (Table 4.22).

Table 4.22: Floor or ceiling effect of Home Media Environment scale

Scale	Lowest possible score achieved (%)	Highest possible score achieved (%)	Presence of floor or ceiling effect
Home Media Environment	0.0%	3.0%	No

4.6.4 Validity

Exploratory Factor analysis of Home Media Environment Scale on 100 respondents with sociodemographic characteristics as presented in Table 4.10 show the five items fall into one component. Total Variance Explained from these items 63.82% (>60% requirement) with KMO 0.791 (>0.6) and Bartlett's Test significant (Awang, 2015). Demographic profile of the 150 sample for Confirmatory Factor Analysis for testing of construct validity is described in Table 4.17 previously.

4.6.4.1 Assessment of Construct Validity

In the tested model using Confirmatory Factor Analysis, the five items in Home Media Environment Scale were put into a single construct as shown in Figure 4.3. The single factor model was found to be with a good fit. The fitness indexes have met the threshold values as stated in Table 3.15. The Absolute Fit category namely RMSEA is 0.033 (achieved the threshold of less than 0.08), the Incremental Fit category namely AGFI is 0.953 (achieved the threshold of greater than 0.90), and the Parsimonious Fit category namely the ratio of Chisq/df is 1.162 (achieved the threshold of less than 3.0). Measurement model of all latent constructs has achieved the requirement for Construct Validity (Awang, 2015).

In testing the assumption of multivariate normality, critical ratio for multivariate kurtosis is 10.480 (>5). However, a cross-validation using 1000 bootstrap resamples gave a p-value of 0.408, which is more than 0.05. Hence, the model "correctness" is acceptable, we do not reject the null hypothesis that the model is correct (Awang, 2015).

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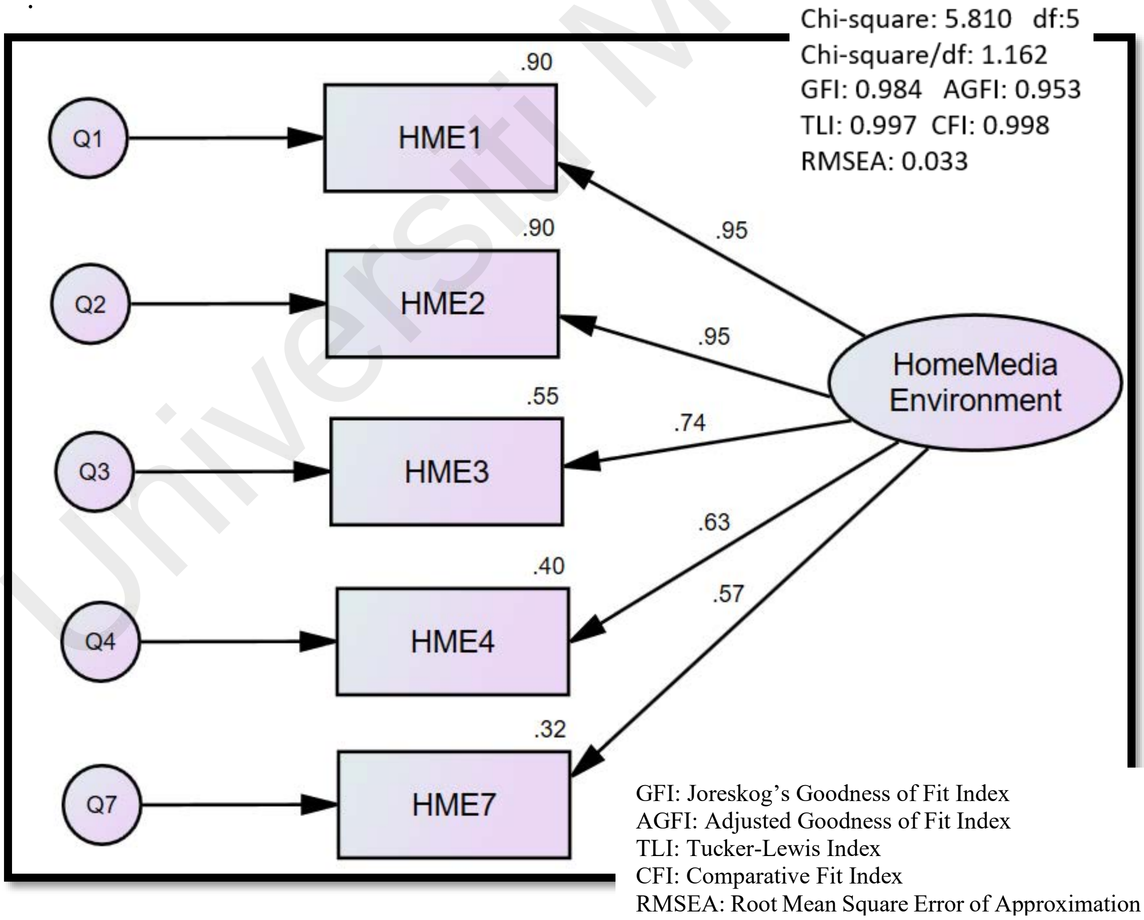

Figure 4.3 Single factor model of Home Media Environment construct

Convergent validity was further evaluated through an assessment of item factor loadings and their statistical significance, assessment of the factors' average variance extracted (AVE). Convergent validity is indicated by an item factor loading ≥ 0.5, $p < 0.05$ and AVE ≥ 0.5 (Hair et al, 2009). The minimum factor loading of this construct is 0.57 (Table 4.23). CR should exceed its threshold value of 0.7 (Fornell & Larcker, 1981).

Table 4.23: Factor loadings in the Home Media Environment scale

Items	Unstandardized Estimate	S.E.	C.R.	P	Standardized Estimate
Q1	1.000				0.951
Q2	0.996	0.045	21.906	<0.001	0.949
Q3	0.749	0.062	12.143	<0.001	0.740
Q4	0.488	0.052	9.377	<0.001	0.635
Q7	0.568	0.071	7.978	<0.001	0.568

The AVE value of 0.615 (>0.5) and CR of 1.15 (>0.7) were calculated according to the following equations given by Fornell and Larcker (1981):

$$\mathrm{CR} = \frac{\left(\sum_{i=1}^{n}\lambda_i\right)^2}{\left(\sum_{i=1}^{n}\lambda_i\right)^2 + \left(\sum_{i=1}^{n}e_i\right)}, \qquad \mathrm{AVE} = \frac{\sum_{i=1}^{n}\lambda_i^2}{\sum_{i=1}^{n}\lambda_i^2 + \sum_{i=1}^{n}e_i},$$

4.7 Phase II

Phase II of this research involves a cross-sectional study that delves into prevalence of excessive screen time, parental media behaviour, home media environment, and their relationship with early childhood social emotional development. Variables of interest are displayed into form of tables for easier understanding. A total of 638 people were approached to take part in this study, of which 38 eligible parent or caretaker refused, mostly due to time constrain. Thus, response rate of our study is 94%.

4.7.1 Missing Data Analysis

To minimise the issue of missing data, assistant researchers who were placed in the study sites strive to ensure the questionnaires distributed were fully completed by respondents, failing which they are approached again. Some respondents identified with incomplete questionnaires were also contacted to get their answer. Finally, during data entry missing data were identified through the SPSS Command - Missing Value Analysis. Number of missing cases by variables are summarized in Table 4.24.

For Ages and Stages Questionnaires that assess child social emotional development, two respondents had two items unanswered, one respondent with an item ticked on two boxes. For these three respondents, child's total score can be taken as the sum of other answered items based on the questionnaire developer's scoring system whereby adjusting the total score will not change interpretation of scoring classification as below or above cut-off (Squires, Bricker & Twombly, 2015). However, there was one respondent who had omitted three questions from the 36-Month Questionnaire for which final total score was calculated based on formula given by questionnaire developer:

$$\frac{\text{Total score of items answered}}{\text{Number of items answered}} = \text{Average Score}$$

$$\text{Total score of items answered} + (\text{average score x number of unanswered items}) = \text{Final Total Score}$$

Table 4.24: Descriptive statistics of missing cases by variables

No.	Variables	Number of cases	Percentage (%)
1.	Exclusive breastfeeding duration	3	0.5
2.	Father's education level	1	0.2
3.	Mother's education level	2	0.3
4.	Household income	6	1.0
5.	Parental Media Dependency		
	Question 3	2	0.3
6.	Home Media Environment		
	Question 3	1	0.2
	Question 4	1	0.2

The missingness mechanism was determined as missing completely at random (MCAR) based on a significant Little's (1988) test, $\chi2$ (df) = 2.697 (2), p 0.260. Since p-value is >0.05 and not significant, we do not reject the null hypothesis and MCAR is assumed. As missing data involves altogether 15 cases (1 respondent with 2 missing data on father and mother's education level), making up 2.5% of all cases (<5%). According to Piggott T.D, 2001; when a data has only few missing observations, the assumption of MCAR is more likely to apply; there is a greater chance of the complete cases representing the population. Complete case analysis requires the assumption of MCAR data, and enough complete cases to estimate the desired model; both of which are met in our study. Hence, imputation is not done.

4.8 Test of Normality

For continuous variables in the study; namely screen time, parental media behaviour and home media environment – normality test was run. Visually, the Q-Q plots showed points that do not fall along the linear line, displaying feature of data not normally distributed. Histograms and box plots did not visually indicate normal distribution. Skewness and kurtosis z-values did not fall between the range of -1.96 to 1.96. The Shapiro-Wilk test p-value was not above 0.05. Thus, the variables do not meet the assumption of normality.

4.9 Sociodemographic Characteristics of Respondents

The study respondents comprise of 600 respondents; more than three quarter of which is made up of mothers. The study finding shows a mixed population of all races and religion, majority of Malays around 80%, followed by Chinese and Indian. More than half fathers reported to have secondary school as their highest education level whereas 55% mothers are with diploma and above. Mean household income of respondents is RM4184.12. Table 4.25 summarizes the sociodemographic characteristics.

Table 4.25: Socio-demographic characteristics of respondents (n=600)

Variables	Frequency, N	Percentage, %
Respondents		
Father	121 / 600	20.2
Mother	479 / 600	79.8
Ethnicity		
Malay	493 / 600	82.1
Chinese	54 / 600	9.0
Indian	46 / 600	7.7
Others	7 / 60	1.2
Father's education level*		
No formal education	8 / 598	1.3
Primary school	13 / 598	2.2
Secondary school	310 / 598	51.8
Diploma and above	268 / 598	44.7
Mother's education level*		
No formal education	3 / 599	0.5
Primary school	8 / 599	1.3
Secondary school	258 / 599	43.1
Diploma and above	329 / 599	55.0
Parental employment		
Both parents working	285 / 600	47.5
Either one parent working	315 / 600	52.5
Household income*		
≤RM1000	10 / 594	1.7
RM1001 – RM3000	258 / 594	43.4
RM3001 – RM6000	240 / 594	40.4
RM6001 – RM9000	57 / 594	9.6
>RM9000	29 / 594	4.9
Marital status		
Married	586/600	97.7
Divorced	8/600	1.3
Widow	2/600	0.3
Unmarried	4/600	0.7

*Sample size differs due to missing data

4.10 Child Characteristics

Male and female children are comprised almost equally amongst the study sample. Children in the 18-month group consist of those aged between 15 to 21 months old whereas children in the 36-month group consist of those aged between 33 to 42 months old according to the age limits for the child social emotional development assessment using ASQ:SE-2.

Children with low birth weight (<2500 gram) and prematurity (<37 weeks of gestation) make up 6.2% and 5.5% of study sample. Children who were exclusively breastfed for six months and those who were not is almost equal. Nearly one in three (27.7%) children in the study were sent to nursery or childcare centre. Whereas only one in 20 children (5.3%) in the study had non-parental care at home while parents are away for work. Characteristics of children recruited in the study are summarized in Table 4.26.

Table 4.26: Child characteristics (n=600)

Child characteristics (N=600)	Frequency, N	Percentage, %
Gender		
Male	289 / 600	48.2
Female	311 / 600	51.8
Age		
18 months (15 to 21 months)	300 / 600	50.0
36 months (33 to 42 months)	300 / 600	50.0
Birth weight		
Less than 2500 gram	37 / 600	6.2
2500 gram and more	563 / 600	93.8
Prematurity		
Yes (Less than 37 weeks)	33 / 600	5.5
No (37 weeks and more)	567 / 600	94.5
Exclusive breastfeeding 6 months*		
Yes	289 / 597	48.4
No	308 / 597	51.6
Child sent to nursery		
Yes	166 / 600	27.7
No	434 / 600	72.3
Non-parental care at home		
Yes	32 / 600	5.3
No	568 / 600	94.7

* Sample size differs due to missing data

4.11 Early Childhood Social Emotional Development

Table 4.27 describes social emotional developmental scoring by both age groups in the study using the ASQ:SE-2 Questionnaires. Children who scored above cut-off value, indicating a need for referral makes up 46 (15.3%) children in the 18-month group and 37 (12.3%) children in the 36-month age group. Around quarter of children in both age groups are in the monitoring zone, and the rest within the normal pace of social emotional development.

Table 4.27: ASQ:SE-2 scoring based on cut-off values

ASQ:SE-2 scoring	Frequency, n	Percentage, %
18-Month Questionnaire		
Above cut-off (Above 50)	46 / 300	15.3
Close to cut-off (40 – 50)	82 / 300	27.3
Below cut-off (Below 40)	172 / 300	57.3
36-Month Questionnaire		
Above cut-off (Above 85)	37 / 300	12.3
Close to cut-off (60 – 85)	76 / 300	25.3
Below cut-off (Below 60)	187 / 300	62.3

4.12 Screen-based Media Availability

At least one television is owned by almost every household with toddlers. The availability of desktop was not prevalent, with only 17.5% families owning one to two units. Figure 4.4 shows portion of media availability at homes by number of units. The ownership of smartphone records the highest among families with more than half respondents stating they have more than two handphones per family. Console games are infamous among families with toddlers in this study (Table 4.28).

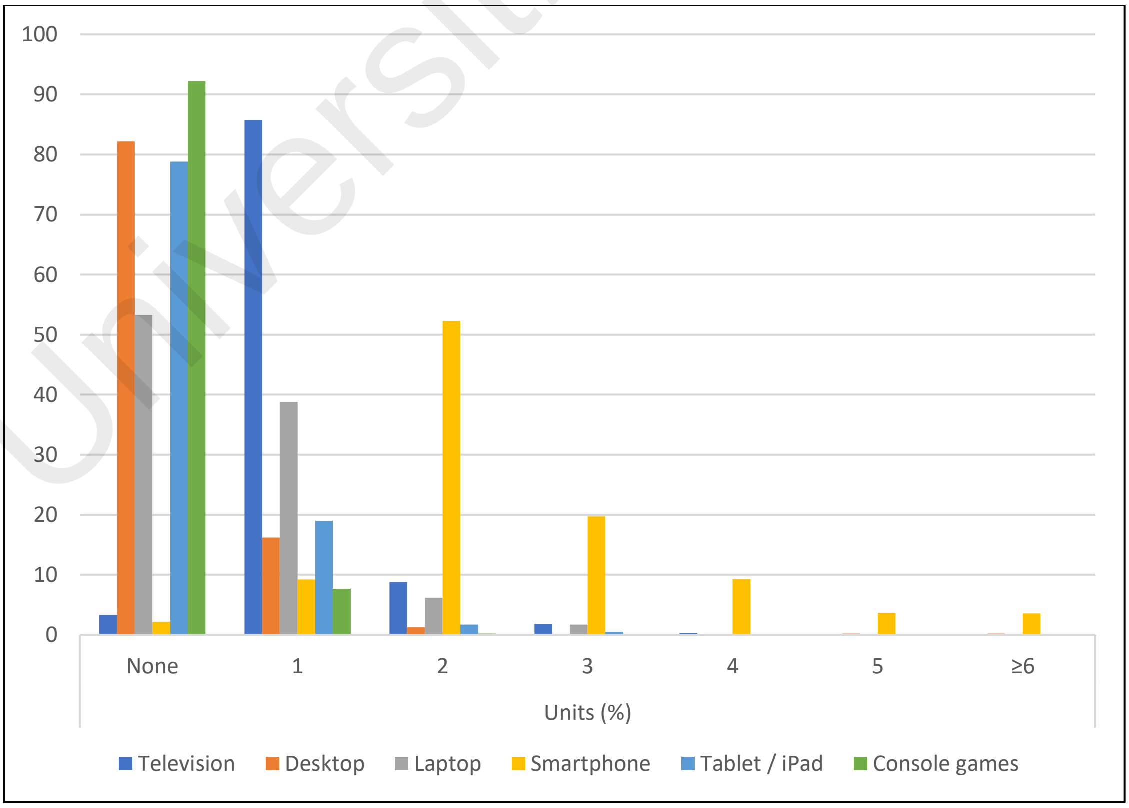

Figure 4.4 Availability of screen-based media (in units per household)

Table 4.28: Screen-based media availability by types and number of units

Screen-based media	Units (%)							
	None	1	2	3	4	5	≥6	Mean (SD)
Television	3.3	85.7	8.8	1.8	0.3	0.0	0.0	1.1 (0.46)
Desktop	82.2	16.2	1.3	0.0	0.0	0.2	0.2	0.21 (0.52)
Laptop	53.3	38.8	6.2	1.7	0.0	0.0	0.0	0.56 (0.67)
Smartphone	2.2	9.2	52.3	19.7	9.3	3.7	3.6	2.53 (1.30)
Tablet / iPad	78.8	19.0	1.7	0.5	0.0	0.0	0.0	0.24 (0.5)
Console games	92.2	7.7	0.2	0.0	0.0	0.0	0.0	0.08 (0.28)

4.13 Screen-based Media Accessibility

A total of 524 (87.3%) children in the study were reported to have access to any form of screen-based media. The earliest exposure was stated as newborn by four respondents. Screen-based media exposure was recorded by 6.5% children before they reached the age of 6 months, 27.8% recorded exposure before the age of 12 months and 76.2% before reaching the age of two. Figure 4.5 shows portions of age of first exposure to different types of screen-based media in the study.

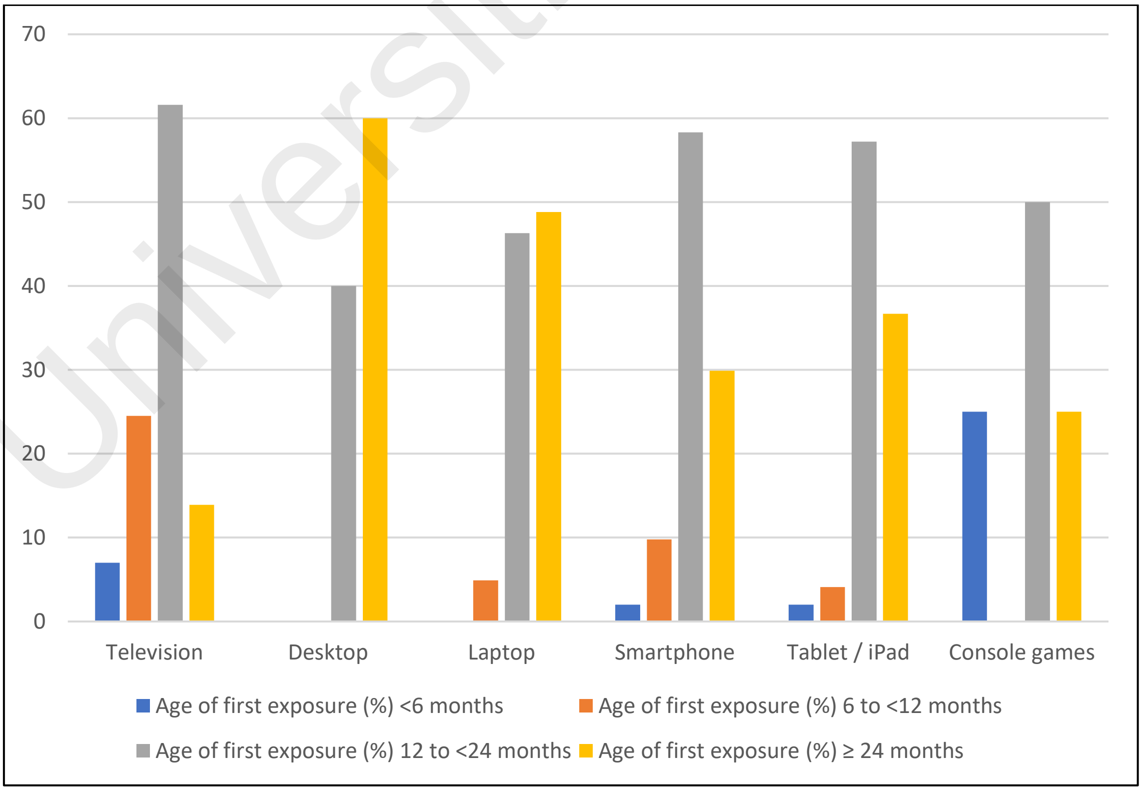

Figure 4.5 Age of first exposure by types of screen-based media

The mean age of first exposure to screen-based media is recorded to be 12.16 months (SD 6.04). For the 18-Month group, mean age of first exposure is 10.21 months (SD 3.61), whereas for the 36-Month group, mean age of first exposure to screen-based media is 13.85 months (SD 7.10). Table 4.29 summarizes age of first exposure to different types of screen-based media.

Table 4.29: Age of first exposure to different types of screen-based media

Screen-based media	**Age of first exposure (n, %)**			
	<6 months	6 to <12 months	12 to <24 months	≥ 24 months
Television	34 (7.0)	120 (24.5)	267 (61.6)	68 (13.9)
Desktop	0 (0.0)	0 (0.0)	6 (40.0)	9 (60.0)
Laptop	0 (0.0)	2 (4.9)	19 (46.3)	20 (48.8)
Smartphone	9 (2.0)	43 (9.8)	257 (58.3)	132 (29.9)
Tablet / iPad	1 (2.0)	2 (4.1)	28 (57.2)	18 (36.7)
Console games	2 (25.0)	0 (0.0)	4 (50)	2 (25.0)

4.14 Child Screen Time

With the maximum recorded overall screen time of 900 minutes per day, mean screen time for all children in the study is 141.71 (SD=131.49). Mean screen time of children in the 18-month group is 101.58 (SD=112.18). Mean screen time of children in the 36-month group is 181.84 (SD=137.27). A portion of 87.2% children reported to any type of screen-based media exposure**.** Excessive screen time according to the definition of WHO and AAP was recorded by 82.2% toddlers. Mean screen time per day on a typical weekday and on a typical weekend is presented in Table 4.30. Television scored the highest for type of screen-based media children spend time with the most both on weekdays and weekends, followed by smartphone. All types of screen-based media show statistical difference in their mean usage time between a typical weekday and a typical weekend.

Table 4.30: Mean screen time by type of screen-based media on a typical weekday and a typical weekend

Screen-based media	Screen time in minutes (Mean, SD)		t-test
	Weekday	Weekend	
Television	89.36 (94.33)	91.88 (103.04)	0.820**
Desktop	0.75 (8.57)	0.85 (10.75)	0.831**
Laptop	1.23 (9.26)	1.63 (10.93)	0.977**
Smartphone	45.64 (60.62)	49.77 (65.49)	0.830**
Tablet / iPad	4.06 (22.66)	4.83 (25.92)	0.921**
Console games	0.95 (10.70)	0.90 (11.58)	0.924**

**significant at p<0.001

Television recorded to have highest maximum screen time of twelve hours, both on a typical weekday and weekend, followed by smartphone with screen time of around eight hours on a typical weekday and weekend. Other types of screen-based media had maximum usage of around two to four hours on a typical day (Table 4.31).

Table 4.31: Maximum time spent on different types of screen-based media by typical weekday and typical weekend

Screen-based media	Maximum time spent (minutes)	
	Weekday	Weekend
Television	720	720
Desktop	180	240
Laptop	120	240
Smartphone	570	480
Tablet / iPad	240	240
Console games	180	240

4.15 Media Content

Majority respondents stated to have always used screen-based media for the purpose of educational activities for their toddler, accounting to more than half of the study sample. Same goes for passive entertainment-based programmes such as watching YouTube, engaging to digital stories and music applications which scored 56.4% respondents stating they always opt for it.

For active entertainment-based programmes such as shooting and adventurous games, nearly half of the respondents (47.8%) have recorded a “Never” answer. Table 4.32 gives a detailed view on frequency of different types of screen-based media activities by toddlers.

Table 4.32: Frequency of different types of screen-based media activities (n=524)

Activities	Frequency (%), n=524			
	Never	Seldom	Often	Always
Education	9.3	20.4	14.7	55.6
Passive entertainment	9.0	19.6	15.0	56.4
Action entertainment	47.8	14.1	8.8	29.3
Social media	93.1	4.8	1.5	0.6

Figure 4.6 shows frequency of media activities children in the study are engaged with using all types of screen-based media.

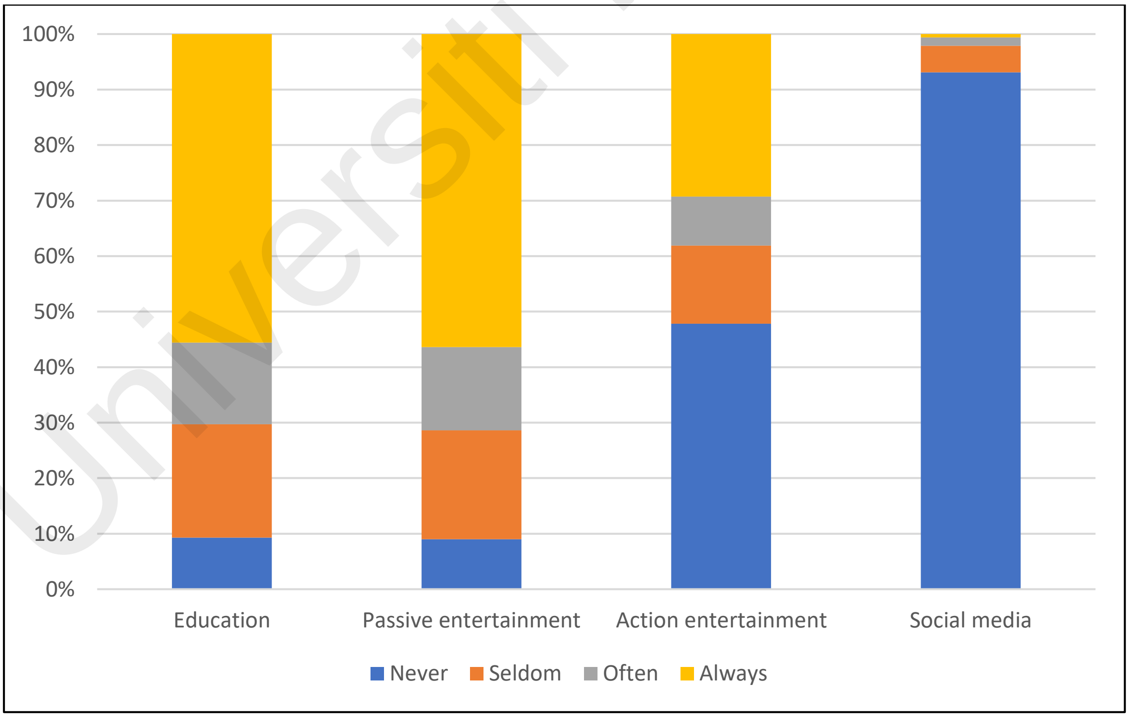

Figure 4.6: Frequency of different types of media activities engaged with using screen-based media

4.16 Child Media Habits

A huge proportion of parents (58.6%) indicated that they always accompany their toddlers while the young ones use any type of electronic media. Media content watched by kids is also monitored or in other words checked on its suitability for viewing of children by 71.6% parents with a small number of respondent (2.5%) admitting to have never monitored their child's electronic media activities. Less than 10% parents reported using electronic media during their kids' mealtime and less than 3% reported using electronic gadgets to aid their toddlers for sleep (Table 4.33).

More than half respondents stated to have never used electronic media to calm their toddlers during tantrums, with only 9.5% and 8.4% stating often and always to the statement. Many also did not report often or always using electronic media as a form of distraction when they are busy with chores. However, more than a quarter respondent stated child always throws a tantrum when electronic gadgets are taken away. Findings on child media behaviour revolving on the seven statements are given in Table 4.33.

Table 4.33: Child media habits (n = 524)

Statements	Percentage (%), n = 524			
	Never	Seldom	Often	Always
Parents accompany child while using electronic media	4.6	13.5	23.3	58.6
Parents monitor media content watched by their children	2.5	6.3	19.7	71.6
Usage of electronic media during child's mealtime	58.0	23.1	10.7	8.2
Usage of electronic media to aid child to sleep	81.1	11.8	4.4	2.7
Usage of electronic media to calm down child during tantrums	51.9	30.2	9.5	8.4
Usage of electronic media as a form of distraction when parents are busy with chores	39.7	34.5	16.0	9.7
Child throws a tantrum when electronic gadgets are taken away from him / her	33.8	28.6	9.2	28.4

4.17 Bivariate Analysis

The characteristics of subjects based on social emotional development level are presented in Table 4.34. Results indicate that the normal group differed significantly from the poor mastery group for several parameters. Mother's education level above diploma significantly has higher possibility of children with poor mastery of social emotional development (p = 0.041). Children who were exclusively breastfed for six months were significantly protected, with lesser children in the poor mastery of social emotional development group (33.8% compared to 66.3%, p=0.005). Compared to children without social-emotional difficulties, children with poor mastery of social emotional development had a higher prevalence of excessive screen time (91.4% vs 80.7%, p=0.020). Parental media behaviour and home media environment variables do not show statistical significance in differences of mean between both groups.

Table 4.34: Characteristics of subjects based on social emotional development in n (%) or mean (SD)

Variables	Social emotional development		p-value (Chi-square test)
	Poor mastery (n=81)	Normal (n=519)	
Gender of parent			0.275
Father	20 (24.7%)	20 (24.7%)	
Mother	61 (75.3%)	61 (75.3%)	
Ethnicity			0.999
Malay	67 (82.7)	67 (82.7)	
Chinese	7 (8.6%)	7 (8.6%)	
Indian	6 (7.4%)	6 (7.4%)	
Others	1 (1.2%)	1 (1.2%)	
Religion			0.909
Islam	67 (82.7%)	67 (82.7%)	
Christian	2 (2.5%)	2 (2.5%)	
Buddhist	6 (7.4%)	6 (7.4%)	
Hindu	6 (7.4%)	6 (7.4%)	
Others	0 (0%)	0 (0%)	
Father's education level			0.755
Below diploma	46 (56.8%)	46 (56.8%)	
Diploma and above	35 (43.2%)	35 (43.2%)	
Mother's education level			**0.041***
Below diploma	45 (55.6%)	45 (55.6%)	
Diploma and above	36 (44.4%)	36 (44.4%)	

Table 4.34, continued

Variables	Social emotional development		p-value
	Poor mastery (n=81)	Normal (n=519)	(Chi-square test /t-test)
Parental employment			0.406
One parent working	46 (56.8%)	269 (51.8%)	
Both parents working	35 (43.2%)	250 (48.2%)	
Household income			0.924
> RM3000	58 (72.5%)	370 (72.0%)	
≤ RM3000	22 (27.5%)	144 (28.0%)	
Parents' marital status			0.179
Married	78 (96.3%)	508 (97.9%)	
Divorced	3 (3.7%)	5 (1.0%)	
Widow	0 (0.0%)	2 (0.4%)	
Unmarried	0 (0.0%)	4 (0.8%)	
Gender of child			0.635
Male	41 (50.6%)	248 (47.8%)	
Female	40 (49.4%)	271 (52.2%)	
Age			0.189
18 months	46 (56.8%)	254 (48.9%)	
36 months	35 (43.2%)	265 (51.1%)	
Birth weight			0.136
≥ 2500 gram	73 (90.1%)	490 (94.4%)	
< 2500 gram	8 (9.9%)	29 (5.6%)	
Prematurity			0.063
No (≥ 37 weeks)	73 (90.1%)	494 (95.2%)	
Yes (< 37 weeks)	8 (9.9%)	25 (4.8%)	
Exclusive breastfeeding for six months			**0.005****
Yes	27 (33.8%)	262 (50.7%)	
No	53 (66.3%)	255 (49.3%)	
Child sent to nursery or childcare			0.220
No	54 (66.7%)	380 (73.2%)	
Yes	27 (33.3%)	139 (26.8%)	
Non-parental care at home			0.050
No	73 (90.1%)	495 (95.4%)	
Yes	8 (9.9%)	24 (4.6%)	
Excessive screen time			**0.020***
No	7 (8.6%)	100 (19.3%)	
Yes	74 (91.4%)	419 (80.7%)	
Parental Media Behaviour, mean (SD)		15.58 (4.78)	0.100
Home Media Environment, mean (SD)		11.15 (3.09)	0.498

*p-value significant at <0.05
**p-value significant at <0.01
***p-value significant at <0.001

4.18 Binary Logistic Regression

4.18.1 Factors Associated with Early Childhood Social Emotional Development

Binary logistic regression method is utilized to test the association between all independent variables with poor mastery of social emotional development among toddlers. Table 4.35 shows association of socio demographic characteristics associated with poor mastery of social emotional development. Only the variable mother's education level was significant at $p<0.05$. The odds of mother with education level of diploma and above to have children with poor mastery of social emotional development is 1.6 times more compared to a child of mother with education level of below diploma, OR 1.63 (95% CI: 1.02 – 2.61), p-value = 0.042.

Presence of non-parental care yielded p value<0.25. However, the associations of the variables with outcome were not statistically significant as confidence intervals cross null. Other variables did not yield a significant association with outcome of study. Sociodemographic characteristics associated with poor mastery of social emotional development is displayed in Table 4.35.

Table 4.35: Sociodemographic characteristics associated with poor mastery of social emotional development among toddlers in Gombak, Selangor

Factors	B	Wald	Crude OR (95% CI)	p-value
Ethnicity				
Malay (ref)				
Chinese	-0.054	0.016	0.95 (0.41 – 2.18)	0.900
Indian	-0.047	0.011	0.95 (0.39 – 2.34)	0.920
Others	0.058	0.003	1.06 (0.13 – 8.94)	0.960
Religion				
Islam (ref)				
Christian	-0.156	0.042	0.86 (0.19 – 3.83)	0.838
Buddhist	0.185	0.159	1.20 (0.49 – 2.99)	0.690
Hindu	0.040	0.008	1.04 (0.42 – 2.56)	0.931
Others	-19.34	0.000	0.00	0.999
Mother's education				
Diploma and above	0.487	4.103	1.63 (1.02 – 2.61)	**0.042****
Below diploma (ref)				

Table 4.35, continued

Factors	**B**	**Wald**	**Crude OR (95% CI)**	**p-value**
Father's education				
Diploma and above	0.075	0.098	1.08 (0.67 – 1.73)	0.754
Below diploma (ref)				
Parents employment				
One parent working	-0.200	0.690	0.82 (0.51 – 1.31)	0.405
Both parent working (ref)				
Household income				
≥ RM 3000	-0.026	0.009	0.98 (0.58 – 1.65)	0.924
< RM 3000 (ref)				
Parent's marital status				
Single parent	0.574	0.752	1.78 (0.49 – 6.51)	0.386
Not single parent (ref)				
Caretaker				
No	-0.815	3.646	0.44 (0.19 – 1.02)	**0.073***
Yes (ref)				
Nursery				
No	-0.313	1.494	0.73 (0.44 – 1.21)	**0.228***
Yes (ref)				

*p-value significant at< 0.25
**p-value significant at <0.05

Table 4.36 shows child characteristics associated with poor mastery of social emotional development. Exclusive breastfeeding for six months is shown to play a role of protective factor for early childhood social emotional development. Odds of children without six months of exclusive breastfeeding to have poor mastery of social emotional development is two times higher than children who receive exclusive breastfeeding for the first six months of their life, OR 2.02 (95% CI 1.23 – 3.31), p-value 0.004.

The variables age, birth weight, and prematurity yielded p value<0.25. However, the associations of the variables with social emotional development were not statistically significant as confidence intervals cross null. Nevertheless, independent variables with non-significant associations will be included in the multivariable logistic regression model of following section based on biological and plausible associations shown by the variables in previous literatures (Hosmer & Lemeshow, 2000).

Table 4.36: Child characteristics associated with poor mastery of social emotional development among toddlers in Gombak, Selangor

Factors	B	Wald	Crude OR (95% CI)	p-value
Gender				
Male	-0.113	0.225	0.89 (0.56 – 1.42)	0.635
Female (ref)				
Age				
18 months	0.316	1.718	1.37 (0.86 – 2.20)	**0.188***
36 months (ref)				
Birth weight				
< 2500gram)	0.616	2.166	1.85 (0.82 – 4.20)	**0.162***
≥ 2500 gram (ref)				
Prematurity				
Yes (< 37 weeks)	0.773	3.303	2.17 (0.94 – 4.98)	**0.087***
No ((≥ 37 weeks, ref)				
Exclusive breastfeeding 6 months				
No	0.702	7.733	2.02 (1.23 – 3.31)	**0.004****
Yes (ref)				

*p-value significant at< 0.25
**p-value significant at <0.05

Table 4.37 shows variables associated with poor mastery of social emotional development. The variables excessive screen time was significant at p<0.05. The odds of children with excessive screen time to have for poor mastery of social emotional development is 2.52 times higher compared to children who adhere to screen time recommendations of WHO and AAP, OR 2.52 (95% CI: 1.13 – 5.64), p-value 0.012.

Table 4.37: Screen-based media characteristics associated with poor mastery of social emotional development among toddlers in Gombak, Selangor

Factors	B	Wald	Crude OR (95% CI)	p-value
Excessive screen time				
Yes	0.925	5.075	2.52 (1.13 – 5.64)	**0.012****
No (ref)				
Parental media behaviour (continuous)	**0.039**	2.480	1.04 (0.99 – 1.09)	**0.118***
Home media environment (continuous)	**-0.025**	0.466	0.98 (0.91 – 1.05)	0.496

*p-value significant at< 0.25
**p-value significant at <0.05

4.19 Multivariable Logistic Regression

4.19.1 Association between Child Screen Time and Social Emotional Development Adjusted for Confounders

Multivariable logistic regression method is used to assess the association of main independent variable of the study, screen time with the dependant variable, early childhood social emotional development when adjusted for identified confounders. The dependant variable gives a binary outcome. Although explanatory variables in the multivariable logistic regression model can be continuous or categorical, logistic regression is best suited to measure explanatory variables that are binary, which is utilized in this study. The assumptions for model building are met. Block-wise method was used to enter explanatory variables into the regression model. This method provides a reliable, stable model and invaluable information about inter-relationship between the explanatory variables. Nature of the study and importance level of each explanatory variable classified into blocks guides the selection into model (Barton & Peat, 2014).

Table 4.38 displays association between non-adherence to screen time recommendation and poor mastery of social emotional development adjusted for confounders by layers of child environment using multivariable logistic regression models. In the first model, only screen time variable was entered as an independent variable. In Model 2, child characteristics which includes child's gender, age, birth weight, prematurity and history of exclusive breastfeeding were added as second block with screen time in first block. Whereas in Model 3, sociodemographic factors such as parental education, parental employment, marital status, household income, existence of non-parental care, and parent's marital status were entered as second block with screen time as first block. In Model 4, first block entered was screen time, followed by child characteristics as second block, and sociodemographic characteristics as third block. In Model 5, parental media behaviour variable was added to the fourth block.

In Model 6, home media environment variable was added to Model 5. Excessive screen time, no exclusive breastfeeding of child's first six months of life, and mother's education above diploma show significant association with poor mastery of social emotional development (Table 4.38) upon adjusting for other explanatory variables.

Table 4.38: Association between excessive screen time and poor mastery of social emotional development adjusted for confounders

Variables		B	S.E.	Wald	df	Sig.	OR (95% CI)
Model 1							
	Screen time	0.92	0.41	5.08	1	0.02	2.52 (1.13 – 5.64)
Model 2	Screen time	0.95	0.42	5.25	1	0.02	2.59 (1.15 – 5.86)
	Exclusive breastfeeding	0.68	0.26	6.94	1	0.01	1.97 (1.19 – 3.25)
Model 3	Screen time	0.91	0.42	4.65	1	0.03	2.49 (1.09 – 5.72)
	Mother's education	0.85	0.32	7.15	1	0.01	2.33 (1.25 – 4.33)
Model 4	Screen time	0.90	0.43	4.36	1	0.04	2.45 (1.06 – 5.69)
	Exclusive breastfeeding	0.60	0.27	4.83	1	0.03	1.82 (1.07 – 3.12)
	Mother's education	0.75	0.33	5.22	1	0.02	2.11 (1.11 – 4.00)
Model 5	Screen time	0.87	0.43	4.06	1	0.04	2.38 (1.02 – 5.55)
	Exclusive breastfeeding	0.60	0.27	4.79	1	0.03	1.82 (1.07 – 3.12)
	Mother's education	0.78	0.33	5.38	1	0.02	2.13 (1.12 – 4.04)
Model 6	Screen time	0.92	0.44	4.43	1	0.04	2.50 (1.07 – 5.86)
	Exclusive breastfeeding	0.58	0.28	4.43	1	0.04	1.79 (1.04 – 3.06)
	Mother's education	0.77	0.33	5.61	1	0.02	2.17 (1.14 – 4.11)

Model 1: Consist of first block (screen time)
Model 2: Consist of first block (screen time) and second block (child characteristics)
Model 3: Consist of first block (screen time) and second block (child characteristics and sociodemographic characteristics)
Model 4: Consist of first block (screen time), second block (child characteristics) and third block (sociodemographic characteristics)
Model 5: Consist of first block (screen time), second block (child characteristics), third block (sociodemographic characteristics) and fourth block (parental media behaviour)
Model 6: Consist of first block (screen time), second block (child characteristics), third block (sociodemographic characteristics), fourth block (parental media behaviour) and fifth block (home media environment)

4.20 Summary of Chapter 4

Findings from first phase of research being validation study shows ASQ:SE-2 Malay language version of selected age intervals possess good and acceptable level of internal consistency ASQ:SE-2 18-Month (Cronbach's Alpha of 0.731) and 36-Month (Cronbach's Alpha 0.686), respectively and excellent reproducibility with Intraclass Correlation Coefficient (ICC) of 0.922 and 0.970 for 18-Month and 36-Month Questionnaires, respectively shows excellent level of reliability. The Parental Media Behaviour and Home Media Environment Scales in Malay language show excellent level of internal consistency and reproducibility. Construct validity of both the scales were tested using Confirmatory Factor Analysis.

In summary of findings from Phase II of study, some significant results are highlighted. Child of mother with education level diploma and above to have poor mastery of social emotional development is higher compared to a child of mother with secondary school and lower level of education, OR 1.63 (95% CI 1.02 – 2.61). Exclusive breastfeeding for six months serves as protective factor for social emotional development compared to children who are not exclusively breastfed, OR 2.02 (95% CI 1.23 – 3.31). Children with excessive screen time are found to be at higher risk of having poor mastery of social emotional development OR 2.52 (95% CI 1.13 – 5.64).

The association between excessive screen time and poor mastery of social emotional development persist upon adjustment for confounders – child characteristics, sociodemographic characteristics, parental media behaviour and home media environment. Odds of children with excessive screen time to be referred for poor mastery of social emotional development is 2.5 times higher compared with children who adhere to screen time recommendations according to the WHO and AAP Guidelines, Adjusted OR 2.50 (95% CI: 1.07 – 5.86).

CHAPTER 5: DISCUSSION

5.1 Introduction

This chapter commences with discussion on the results of first phase of the research, by end-product of each instrument adapted and validated and justification with regards to methods used for validation of the instruments. The utilization of each instrument in the local population based on their reliability and validity measurements are discussed further. Reasoning behind item retention and item removal, if any, are discussed.

Secondly, the chapter moves into the discussion with regards to findings on second phase of research. Findings on screen-based media availability, screen-based media accessibility, media content and child media behaviour were examined. Findings from cross-sectional study which displays association between independent variables with early childhood social emotional development is discussed.

The association between sociodemographic characteristics, child media characteristics, parental media behaviour, and home media environment with social emotional development were scrutinized. Further, results from multivariable logistic regression model that links child screen time and early exposure to screen-based media with early childhood social emotional development were discussed upon.

Finally, the chapter displays public health implications of study findings. Strengths and limitations of the study were discoursed, with steps taken to minimize limitations stated. The chapter closes with public health policies that could be initiated and potentially developed based on this research findings and future research recommendations resulting from this.

5.2 Validation of "Ages and Stages Questionnaires: Social-emotional", 2nd edition (ASQ:SE-2) 18-Month and 36-Month (Malay Language)

5.2.1 Translation and Cross-cultural Adaptation

In the process of instrument translation, modifications to words or phrases in Malay language were made not only based on expert opinion, but also based on questionnaire developer's comments on back translation provided to the instrument by an independent linguist, taking optimal efforts to retain the original meaning of each item. Several rounds of revisions were requested by the questionnaire developer to ensure the original meaning or intention of items are not affected in any way while giving consideration to the sociocultural adaptability of the questionnaire.

Item number 14 of both 18-Month and 36-Month Questionnaires, "Do you and your child enjoy mealtimes together?" was translated as *"Adakah anda dan anak anda menikmati waktu makan bersama?",* back translated as "Do you and your child enjoy having meals together?". Questionnaire developer commented that the back translation was not asking the same question as intended in the original. The original version is asking about the experience of feeding or eating together – exploring if child is very fussy during feeding or having tummy problems, difficulty chewing and swallowing, or if the child takes in limited choices of food items. This can be very stressful for both the parent and child. In this case, the parent may answer that feeding/mealtime is "rarely" an enjoyable experience. Thus, revision to translation was made as *"Adakah anda dan anak anda sama-sama menikmati waktu makan, contohnya ketika anak disuap?"* adding on an example on how mealtime experiences are like for the parent to ensure clarity of the item.

Item number 4 of 18-Month Questionnaire, "Does your baby look for you when a stranger comes near?" was initially translated as "*Adakah anak anda mencari anda jika dia didekati oleh orang yang tidak dikenalinya?",* back translated as "Does your child look for you when is being approached by strangers?" However, questionnaire developer commented that, "being approached" is not quite the same as the original, "when a stranger comes near". "Being approached" would mean that the stranger appears to be coming toward the baby or parent with some intention, whereas question is asking only if baby looks for parent if a stranger "comes near". The stranger may not be approaching the parent or child, they might just be in front, to the side, behind and have no intention of communicating with parent or child. Thus, translation was revised as "*Adakah anak anda mencari anda jika ada orang yang tidak dikenali datang dekat kepadanya?",* translated as "Does your child look for you when a stranger comes near him or her?".

Item 24 of 18-Month Questionnaire sounds, "Does your child like to be around other children? For example, does she move close to or look at other children?" However, the back translation *"*Does your child like to be in the company of other children. Example, does he/she approach or observe other children?" was deemed to be of too high of reading level in English. Questionnaire developer wanted to ensure that the Malay translation provided simple descriptions. The terms "move close to or look at other children" was used so the parent knows exactly what "approches" or "observes" means. Thus, it was revised as *"Adakah anak anda suka berada di samping kanak-kanak lain? Contohnya adakah dia bergerak mendekati mereka atau memandang mereka?",* back translated as "Does your child like to be in the company of other children. Example, does he or she go close to them or look at them?"

Similar to previous items, Item number 30 of 18-Month Questionnaire was asked to be translated in a way that shows the child responds to his or her name when the parent calls him her. Questionnaire developer stressed that it was not asking if child responds to his or her name when anyone other than parent calls their name. It was then revised as, *"Adakah anak anda memberi tindak balas apabila anda memanggil namanya?*

Contohnya, adakah dia menolehkan kepala dan memandang ke arah anda?", back translated as "Does your child respond when you call his/her name? Example, by turning his/her head and looking at you?" Each word and phrase in the translation has gone through vigorous process to ensure cross-cultural adaptation is conceptually equivalent.

5.2.2 Reliability and Validity

Cost-effective and quick screening of child development aids early intervention of developmental disorders and parent-completed screening instruments may greatly assist professionals in making early diagnosis and subsequent follow-ups. The first phase of this study was aimed at translating and validating the Malay Language version of the ASQ:SE-2 in a sample of multi-ethnic population in a rural district in Malaysia. The ASQ:SE-2 was chosen due to its in-depth question, yet items that use simple language, and exclusive focus on social emotional development. The instrument is specified to cater for the developmental measures of toddlers by age intervals, increasing its specificity and is also suitable for children born prematurely (Squires, Bricker & Twombly 2015).

The Malay Language version of this instrument has shown to be potentially useful among toddlers in Malaysia since it manifested an acceptable reliability as well as adequate construct validity. Internal consistency for ASQ:SE-2 18-Month is at good level with Cronbach's Alpha of 0.731 and acceptable level for 36-Month with Cronbach's Alpha 0.686). The finding is similar to the original version of the instrument, ranging 0.71-0.87 across age intervals (Nunnally & Bernstein, 1994; Ursachi, Horodnic & Zait, 2015). For test-retest Intraclass Coefficient Coefficient (ICC) of 0.922 and 0.970 for 18-Month and 36-Month Questionnaires, respectively shows excellent level of reliability. The original version of ASQ:SE-2 reports ICC of 0.91 across intervals, similar to findings in this study. Cohen's Kappa shows a moderate level of agreement for 18-Month interval and substantial agreement for 36-Month interval for test-retest (Barton and Peat, 2014).

5.2.3 Comparison of Validation Methods

Comparison can be made in terms of methods used to test construct validity of ASQ:SE-2 utilized in the adaptation and translation of the tool into other languages worldwide. In this study, apart from content validity by experts in the field, validity of ASQ:SE-2 Malay language was determined by establishment of optimal cut-off scoring, comparison of normative data from different population, and testing correlates of biological factors. These techniques were adapted from previous studies (Heo & Squires, 2012; Kerstjens et. al, 2009). Accuracy of tentative cut-off score and thus, validity of ASQ:SE-2 Malay Language version was determined using The Receiver Operating Curve (ROC) of total scores and the formula given by the questionnaire developer for studies in new settings (Median + 1.5 semi-interquartile ranges). New cut-off score for the translated and culturally adapted version of ASQ:SE-2 is deemed to be valid for usage of population concerned (Squires, Bricker & Twombly, 2015).

To further determine its construct validity, comparison of ASQ:SE-2 Malay Language scoring was made to the Korean sample using ASQ:SE first edition by excluding the additional questions included in the second edition. The mean scoring of 18-Month interval of both populations showed no statistically significant difference (Kay & Heo, 2012). The differences seen on mean scoring of three-year olds of these two populations may be contributed by cultural differences that impact on parenting style, stimulation given, and the environment the child grows up in (Cole, Bruschi & Tamang, 2002; Raver, 2004). Differed findings between both populations can also be influenced by other factors such as parental educational level and family income (Hosokawa & Katsura, 2017; Jackson, Kiernan, & McLanahan, 2017). This shows the importance of tailored cut-off scoring for different settings to determine the classification of poor mastery of social emotional development that indicates the need for further evaluation and diagnosis of children involved in the screening programme.

Methods utilized in this study is similar with that reported for cross-cultural adaptation of ASQ:SE in other parts of the world, let it be the first or second edition. In a Korean study, three main steps were involved in testing of ASQ:SE validity in the local population. Optimal cut-off scoring for referral was determined, two existing instruments of developmental screening in Korea namely he Kongju Early Developmental Assessment System (KEDAS) and the Child Behavior Checklist for 1.5–5 (CBCL 1.5/5) were used to test convergent validity, and finally ASQ:SE scoring in Korean population was compared to the US normative data (Heo & Squires, 2012). In the validation of Dutch version of 48-Month ASQ:SE, construct validity was assessed using the biological and environmental criteria namely child's gender, prematurity, mother's age and educational level, and family income (Kerstjens et al, 2009).

5.2.4 Utilization of Instrument

The good psychometric properties displayed by ASQ:SE-2 Malay Language 18-Month and 36-Month intervals shows that they can be utilized in Malaysia as a parent assessed developmental screening. The validated parent-friendly developmental screening instrument ASQ:SE-2 adapted into the local sociocultural of Malaysian setting is hoped to increase the rate of screening, diagnosis, and early intervention of developmental disorders.

5.3 Validation of Parental Media Behaviour Scale (Malay language)

5.3.1 Reliability of "Parent Problematic Digital Technology Use Scale" (Parental Media Addiction Subscale)

For inter-item correlation coefficients, the highest correlation for each item with at least one other item in the construct ranged between 0.39 to 0.66. Hence the items correlate adequately in the construct. With highest value of below 0.85, of lack of discriminant validity is unlikely. In this study, Cronbach's Alpha value of 0.73 indicates good internal consistency (Hair, 2010), with finding similar to the reporting of original instrument, whereby Cronbach's alpha of 0.74 for mothers and 0.78 for fathers were reported (McDaniel & Radesky, 2017). Test-retest reliability gave ICC of 0.96, indicating good reliability of the subscale (Nunnally & Bernstein, 1994). Test-retest reliability however was not reported for the original instrument to be compared with.

5.3.2 Reliability of "Media and Technology Usage and Attitudes Scale" (Parental Media Dependency Subscale)

For inter-item correlation coefficients, the highest correlation for each item with at least one other item in the construct ranged between 0.50 to 0.63. Hence the items correlate adequately in the construct. Since the highest value is less than 0.85, lack of discriminant validity is unlikely. The Cronbach's Alpha value is 0.84 (>0.7); indicating the internal consistency is good (Hair, 2010). Finding in this study is comparable to the original instrument which has reported items in its subscales with Cronbach's alpha ranging between 0.80 to 0.87 (Rosen, 2013). Test-retest reliability with ICC value of 0.98 indicates subscale's good reliability (Nunnally & Bernstein, 1994).

5.3.3 Validity of Parental Media Behaviour Scale (Malay language)

Since there is a well-established theory behind both the Parental Media Addiction and Parental Media Dependency subscales of existing tools which were cross culturally adapted, confirmatory factor analysis (CFA) was used to test the construct validity of Parental Media Behaviour Scale (Malay language) comprising of both subscales. Attempts of testing CFA of the scale as a two-factor model comprising of Parental Media Addiction and Parental Media Dependency subscales resulted in a model that did not fit well.

Thereafter, Parental Media Behaviour Scale (Malay language) was tested as a single-factor model which yielded a good fit. All six items in the scale were shown to appropriately belong to the same construct. The fitness indexes as displayed in Figure 4.2 met the threshold values (Table 3.15), whereby the Absolute Fit category namely RMSEA is 0.069 (achieved the threshold of less than 0.08), the Incremental Fit category namely AGFI is 0.927 (achieved the threshold of greater than 0.90), and the Parsimonious Fit category namely the ratio of Chisq/df is 1.712 (achieved the threshold of less than 3.0). Thus, the measurement model of all latent constructs has achieved requirements for construct validity (Awang, 2015).

Convergent validity was evaluated through an assessment of item factor loadings and factors' average variance extracted (AVE). Convergent validity is indicated by an item factor loading ≥ 0.5, $p < 0.05$ and AVE ≥ 0.5 (Hair et al, 2009) and the correlation coefficient of any two constructs should not exceed 0.85 (Kashif et al, 2017; Mohamad et al, 2018; Noor et al, 2015; Yusof et al, 2017). The minimum factor loading of this construct is 0.64 and none of the correlation values is greater than 0.85, thus multi-collinearity does not arise. CR should exceed its threshold value of 0.7 (Fornell & Larcker, 1981). AVE is 0.528 (>0.5) and CR is 0.92 (>0.7) displaying good construct validity of the Parental Media Behaviour scale in Malay language.

5.3.4 Utilization of Parental Media Behaviour Scale (Malay language)

Efforts to measure screen-based media usage among adolescents and adults have been ongoing since technology immersed in the daily lives of human-kind decades ago. From measurement of social media addiction (Van den Eijnden, Lemmens, & Valkenburg, 2016) to assessment of media and technology usage (Rosen et. al, 2013) and addiction scales pertaining to internet and digital media use (Kesici & Tunç, 2018; Samaha et. al, 2018), instruments have been gaining popularity in terms of its usage and adaptation to other cultures and languages. Having proven its internal consistency with overall Cronbach's Alpha of 0.814 and excellent test-retest reliability of ICC 0.977 and tested on its construct validity through CFA, the scale is deemed suitable to be used among the local Malaysian population.

5.4 Validation of Home Media Environment Scale (Malay Language)

5.4.1 Reliability and Validity

The original instrument from "Technology Related Parenting Scale" that contained 8 items had the highest correlation for each item with at least one other item in the construct ranged between 0.251-0.821, suggesting some items have insufficient relationship (<0.3). Items Number 5, 6 and 8 had low value of correlation (<0.3); indicating the items do not fit well into the scale. Item 5 explores if parents take action against their children in terms of consequences if screen time rules are not obeyed, it sounds "I use consequences if these are accessed when not allowed". This did not correlate with items 1 to 4 that explores on screen time rules and restrictions. Even in homes where rules are present, children in our study may be deemed to be too young to be inflicted with punishment.

Items 6 question on the usage of password, whereas Item 8 inquire on setting of parental control features by parents in their electronic gadget. Item 6 sounds "I use passwords on these device" and Item 8 is "I place limits using parental control features on these devices". The most probable assumption would be that most parents in this study do not set password or parental control features as children below the age of three as our sample are believed or presumed not be able to access or operate the electronic devices on their own without parental assistance. It is however unsure if the mobile devices are kept within reach and can be accessed by these children at home.

These three items were deleted after thoughtful consideration on its relevancy to the scale. Cronbach's Alpha value increased to 0.852 from 0.740, indicating good internal consistency (Hair, 2010). This finding is similar to the original instrument with Cronbach's alpha of 0.87 (Sanders, 2016). Excellent test-retest reliability was displayed by the scale with ICC of 0.975 (Hair, 2010). Measures of test-retest reliability however was not reported in the original version of instrument.

For construct validity testing of 5-itemed Home Media Environment Scale (Malay language) using CFA, the single factor model as shown in Figure 4.3 was found to be with a good fit. The fitness indexes have met the threshold values as stated in Table 3.15, namely The Absolute Fit category namely RMSEA is 0.033 (achieved the threshold of less than 0.08), the Incremental Fit category namely AGFI is 0.953 (achieved the threshold of greater than 0.90), and the Parsimonious Fit category namely the ratio of Chisq/df is 1.162 (achieved the threshold of less than 3.0). Measurement model of all latent constructs has achieved the requirement for Construct Validity. In testing the assumption of multivariate normality, critical ratio for multivariate kurtosis is 10.480 (>5). However, a cross-validation using 1000 bootstrap resamples gave a p-value of 0.408, which is more than 0.05. Hence, the model "correctness" is acceptable, the null hypothesis that the model is correct is not rejected (Awang, 2015).

Convergent validity was further evaluated through an assessment of item factor loadings and their statistical significance, assessment of the factors' average variance extracted (AVE) and construct reliability (CR). Convergent validity is indicated by an item factor loading ≥ 0.5, $p < 0.05$, AVE ≥ 0.5 and CR ≥ 0.6 (Hair et al, 2009). A CR of below 0.6 indicates that the items do not consistently measure the hypothesized latent construct and an AVE below 0.5 indicates that more error remains in the items than variance explained by the latent factor structure imposed on the measure (Hair et al, 2006).

The minimum factor loading of this construct is 0.568 with CR of 1.15 and AVE of 0.615 (Fornell & Larcker, 1981), meeting the criteria for good convergent validity. Previous research supports the use of 'Technology Related Parenting Scale' across child development stages, from early childhood of three years old up to adolescence stage of 17-years old as well – supporting discriminant validity and concurrent validity of the tool across the wide range of age group (Sanders et al, 2016).

5.4.2 Utilization of Home Media Environment Scale (Malay language)

The importance of having a safe media environment with parents as gatekeepers for developing children is echoed by many studies (Barkin et. al, 2006; Nikken & Schols, 2015; Warren, 2001). A safe media environment is made possible only through parental rules and enforcement strategies for the purpose of technology use among children (Ramirez et al, 2011; Vandewater, 2005). The right instrument to measure how much screen-based media and types of contents that are allowed by parents for their young children, the restrictive measures or media rules applied at home is vital to be explored.

Parental media rules or mediation strategy which includes ways of supervising children's screen-based media use is the key strategy to prevent negative effects of technology on children (Barkin et al, 2006; Jago et. al, 2015; Nikken & Schols, 2015). These studies are an exemplary of how useful exploring the parental strategies can be, even amongst toddlers as young as two years old. As such, the 'Home Media Environment' Malay language instrument adapted and validated in this study is ought to be useful to identify home media rules, restrictions, and whether it stands as an effective method in mitigating effects of screen-based media on young children – especially in the local Malaysian population. Currently, to the best of authors' knowledge, there exist no measurement tool in Malay language that explores this construct.

5.5 Phase II: Cross-sectional Study

5.5.1 Prevalence of Excessive Screen Time

Findings from this study show 82.2% toddlers have recorded non-adherence to screen time recommendations by WHO and AAP. This is in accordance with other studies that also show that these guidelines are not met by young children (Chandra et al 2016; Chang et al, 2018; Ruangdaraganon et al, 2009; The Common Sense Census: Media Use by Kids Age Zero to Eight, 2017; Zimmerman, Christakis & Meltzoff, 2007).

Study finding is also echoed by a 2016 publication of Malaysian research work part of the South East Asian Nutrition Surveys (SEANUTS), 27% pre-schoolers aged four to six years old included in the study were recorded to have more than two hours of screen time per day. It was the first nationwide study in Malaysia that reported on physical activity of pre-schoolers and environmental factors, barriers, and motivators associated to it (Lee et al, 2016). However, not much was touched upon factors associated with child screen time and impact on it upon young children in the study. Findings of this study further adds knowledge on prevalence of excessive screen time which is not widely explored in children below the age of three previously in Malaysia.

Mean screen time recorded in this study is 141.7 minutes (SD 131.6) or more than 2 hours per day, which approximates other studies such as reported by Bernard et al, 2017 (2.4 ± 2.2, mean ± SD) hours per day and Duch et al, 2013b (3.29 ± 2.63, mean ± SD) and hours per day among toddlers and 2.05 hours per day among children below six as reported in the Kaiser Family Foundation Survey (Rideout, Vanderwater & Wartella, 2003). Findings on excessive screen time among young children shows how much technology has become integrated in the lives of children as young as 15 months old in this sample. This study adds to the literature on time spent by children on each type of screen-based media on weekdays and weekends.

Exposure to any type of screen-based media was reported by 84.7% children below two years old in this study, higher than what was reported among children of the same age category in the Malaysian National Health and Morbidity Survey (NHMS) 2016, which was 74.4%. Increased availability of screen-based media in Malaysian families since the latest NHMS could have contributed to this difference. This is evidenced by finding of Malaysian Communications and Multimedia Commission (MCMC) survey which records a surge in smartphone penetration in the nation from 68.7% in 2016 to 78.0% in 2018 (Malaysian Communications and Multimedia Commission, 2018). Meanwhile, MCMC also reports smartphone usage to access internet for the year 2020 has reached a near-saturation level at 98.7% compared to 89.4% in 2016 (Malaysian Communications and Multimedia Commission, 2020).

There are some differences in terms of methodology when this study is compared to previous published literature. Many studies focus on specific type of screen-based media or content watched, such as television (Chonchaiya & Pruksananonda, 2008; Vandewater et al, 2005), video viewing (Zimmerman, Christakis & Meltzoff, 2007) and computer usage (Subrahmanyam, 2000). In this study however, screen time impact is based on all types of screen-based media including television, computer, laptop, tablet, iPad, and mobile phone. This enables us to look at the popularity trend of different types of screen-based media including the trending mobile touch screen media among toddlers and the influence they bring towards their social emotional development.

5.5.2 Prevalence of Social-emotional Delays among Toddlers

Social emotional issues and behavioural difficulties are the common reasons for clinical assessment among children aged two to five years old (Keena & Wakschlag, 2000). Prevalence of possible delayed social emotional development was found to be 13% (n=210/1579) among two-year olds in a prospective cohort study (McDonald et al, 2018).

This is similar to findings of second phase of this study whereby 15.3% and 12.3% of children aged 18-months and 36-months, respectively were detected to have poor mastery of social emotional development. Of all the mental health problems reported among Malaysian children, 8.3% is contributed by emotional problems (National Health and Morbidity Survey, 2019).

According to Malaysian National Health and Morbidity Survey (NHMS) 2016, the percentages of developmental delay covering all domains according to age groups was 4.0% (95% C1: 2.80 - 5.81) for children aged 12-23 months and 2.9% (95% CI: 2.25 - 3.66) for children aged 24-59 months (National Health and Morbidity Survey, 2016). However, numbers reported by NHMS 2016 are confirmed cases of developmental delay, unlike the prevalence of poor social emotional competency detected in this study as part of a screening process. Hence, that may explain the low numbers recorded in the national level survey.

Some studies have reported lower level of socio emotional issues among young children. For instance, Briggs-Gowan et al (2001) found prevalence of social emotional problems recorded using at least one of the two different instruments used in a study was 8.6% among children aged one and two-years old. A similar prevalence was recorded by a study conducted in German pre-schoolers whereby 8.5% of three-year olds were found to have poor social skills (Biermann, Franze & Hoffmann, 2020). The differences in prevalence of socio-emotional disorders recorded in other parts of the world could be contributed by cultural indifferences and varied types of measurement methods used for socio-emotional assessment namely, the Ages and Stages Questionnaire: Social emotional (ASQ:SE), Brief Infant and Toddler Social and Emotional Assessment (BITSEA), Child Behavior Checklist (CBCL) and the MacArthur Communicative Development Inventories (MCDI) (Da Silva et al, 2019).

5.5.3 Association of Child Characteristics and Sociodemographic Factors with Social Emotional Development of Toddlers

(i) Exclusive Breastfeeding

Exclusive breastfeeding is positively associated to child development in many studies (Dewey et. al, 2001; Lechner & Vohr, 2017; Rozé et al, 2012), echoing finding of this study whereby six months exclusive breastfeeding is noted to serve as a protective factor for child, with children who do not receive exclusive breast milk at higher risk for poor mastery of social emotional development OR 2.02 (95% CI: 1.23 - 3.31). The bioactive component of breast milk has distinguished itself to be an individual-specific biofluid that is a perfectly adapted nutritional supply, which contributes to their optimal growth and development (Mosca & Giannì, 2017; Victora et al, 2016). Apart from other environmental factors, child nutritional status that includes exclusive breastfeeding is shown to be an important factor in the context of child development (Walker et al, 2011).

(ii) Prematurity and Low Birth Weight

Theory states the immature nervous system of children with low birth weight or premature is susceptible to injury and abnormal development due to widespread alterations in brain connectivity and reduced mother child interaction in the early phase of birth (Ball et al, 2015; Feldman, 2015), supported by many studies (Hayes & Sharif, 2009; Kirk et al, 2017; Montagna & Nosarti, 2016).

However, findings from this study did not yield a significant association between low birth weight and prematurity with social emotional development. One possible explanation behind this scenario is data collected in this study did not comprise of large number of children with extreme low birth weight or extreme prematurity, which requires long hospitalization and decreases their biological vulnerability for poor mastery of social emotional development. Children with extreme prematurity with developmental issues will also be more likely under follow-up of tertiary hospitals.

(iii) Mother's education

In terms of sociodemographic factors, mother's education level above diploma was found to be significantly associated with poor mastery of social emotional development of children in this study, which persist even upon adjusting for confounders. This contradicts finding of previous studies whereby higher mother's education was found to be a social advantage or protective factor for child social emotional development (Marryat et al, 2015; Noonan & Fairclough, 2018). Lower maternal education was also found to be a significant predictor to lower acquisition of other developmental domains, such as cognitive development in some studies (Jackson, Kiernan & McLanahan 2017; Schmidt, 2009) and language development (Sentenac, 2020).

In this study, the odds for a child of mother with education level diploma and above to have poor mastery of social emotional development is 1.6 times more compared to a child of mother with secondary school and lower level of education, OR 1.63 (95% CI: 1.02 – 2.61), p-value 0.042. One possible explanation for difference in our finding is that we believe higher educated mothers are mostly career women who are occupied with their job in the local population. The lesser time spent at home with children, the lesser the stimulation for skills development received by the child.

Women's employment rate in Malaysia has seen a marked increment in the past decade, from 46.4% in 2009 to 55.6% in 2019 (Department of Statistics Malayia, 2020). The higher the education level, the higher is women's labour force participation ratio (Khazanah Research Institute, 2017). Maternal employment contributes to lesser time spent together by mother-child dyad (Kizuki et al, 2018) and eventually lesser opportunity for mother-child interaction which in turn influences social emotional development attainment of children (Wan et al, 2013).

5.5.4 Screen Time and Early Childhood Social Emotional Development

Based on outcome of this study, children with non-adherence to screen time recommendation by WHO and AAP is with 2.50 times higher odds of having poor social emotional development, aOR 2.50 (95% CI: 1.07 – 5.86). This is akin to discoveries of other studies on the negative influence that excessive screen time can have on children's social and emotional development, focusing on children's levels of aggression, empathy development, emotional stability and self-regulation (Lillard & Peterson, 2011; Radesky & Christakis, 2016b; Raman et el, 2017; Skalicka et al, 2019; Twenge & Campbell, 2018).

A recent JAMA Paediatrics publication of a 3-wave study work shows greater child screen time recorded at 24 months and 36 months old was associated with poorer performance on developmental screening tests at 36 months and 60 months old, respectively. (Madigan et al, 2019). With 27.8% and 6.5% children recording exposure before the age of 12 months and 6 months, respectively our study clearly shows non-adherence to WHO and AAP recommendations of no screen-based media exposure before the age of two. This finding is consistent with studies recording early media exposure, recorded within the first year of a child's life (Linebarger et al, 2005; Rideout et al, 2003; Ruangdaraganon et al, 2009; Zimmerman, Christakis & Meltzoff, 2007).

It is difficult to make comparison between this study to many existing studies that explores the association between screen time and child development, due to the differences in terms of screen time measurement and reporting of child developmental domain. Some studies report on overall screen time, whereas some report based on specific type of screen-based media viewing time and its influence on child development. Examples of study findings focusing on any specific type of screen-based media includes usage of computer (Segev et al, 2015), Television / DD/ video viewing skills (Hinkley et al, 2018), mobile devices, such as smartphones, and tablets (Hosokawa & Katsura, 2018) which were associated with poorer acquisition of developmental skills.

One of the studies that is in parallel to the finding of this work is a case control study documented children who watched television two-hours or more per day in infancy were six times more likely to experience delay in language acquisition (Chonchaiya, & Pruksananonda, 2008). The same also discovered that every additional hour of television viewing negatively impacted cognitive outcomes at ages six and seven, with cognitive development measured using four different instruments, showing the impact of screen-based media exposure in a developing child's life (Zimmerman & Christakis, 2005).

There are also reported findings of studies that contradict negative influences of screen time on young children. One such example is a 2017 large-scale cross-sectional study comprising of nearly 20,000 children aged two to five-year old that shows no support for harmful links between digital screen use and young children's psychological well-being. Data collection in the study was done via telephone interview. However, eligibility of caregiver interviewed to provide information on child well-being was not clearly stated and could create misinformation bias if the caregiver included in the study is someone who does not spend much time with the child or has limited knowledge about the child's characteristics. Furthermore, the study did not assess child's developmental skills specifically, but rather used a generalized approach of looking into child's psychological well-being (Przybylski & Weinstein, 2017).

Contradicting finding of this research work, a prospective cohort study conducted in Thailand, children engaged to television viewing for two-hours and more in their first year of life were not associated with language delay at the age of 24 months old. However, the study only recorded 8% of the sample with developmental delay, limiting the power to find associations, a study limitation acknowledged by the authors themselves (Ruangdaraganon et. al, 2009).

In another study, delayed language development was not found to be associated with time spent on watching television in a longitudinal birth cohort study conducted in Thailand. However, only 16 (7.9%) children with delayed language development in the study, hence the number may not have been adequately powered to identify any association between language mastery and television viewing time. The study also did not record the type of television programme children in the study were exposed to (Ruangdaraganon et al, 2009), as stressed by the content theory that links association between screen time and child development (Gentile et al, 2017).

Going against the findings of this study is one that explored the association of television viewing among children below the age of two with language skills at the age of three. The study did not find a significant association between early television viewing and the competencies tested. However, it is noteworthy that the study had recorded an average television viewing time of 1.2 hours per day, relatively lower than similar studies (Zimmerman, Christakis & Meltzoff, 2007).

Hence, effect on child development that may emerge due to higher exposures to television may not have been recorded (Schmidt et. al, 2009). It supports the notion of displacement theory whereby child's relatively lower screen time most probably did not displace other prosocial activities, hence not effecting child developmental competencies (Gentile et al, 2017).

5.5.5 Parental Media Behaviour and Social Emotional Development

No significant association was found between parental media behaviour and child social emotional development in this study. It sheds the light that the current study did not determine parents' pattern of screen-based media usage and media behaviour which includes media addiction and media dependency specifically in the presence of children; rather it was evaluated on a general basis - which could have been a reason to the finding.

It is also possible that parental media behavior did not have a direct impact on child social emotional development. However, parental media usage has received focus due to its influence on many family activities such as mealtime and play time which plays a huge role in social emotional development of children, as portrayed in previous studies (Davidov & Grusec, 2006; Johnson et. al, 2013; McDaniel & Radesky, 2017). Readesky et al have found increased focus of parents on their mobile devices results in lesser conversation and responsiveness toward children in their notable research works (Radesky et al, 2014; Radesky et al, 2015).

As literature reveals, active interaction and imitation are processes vital for learning and acquisition of competencies in children in early years of thriving (Denham et al, 2012; Haven et al, 2014; Malik & Marwaha, 2020). However, not many studies have explored on the impact of problematic media behaviour of parents on development of children. One notable study was a longitudinal study by McDaniel and Radesky that ascertained higher technology use during parent-child interactions influences externalizing and withdrawal behaviours of children below five years old who were followed up for six months (McDaniel & Radesky, 2018).

5.5.6 Home Media Environment and Social Emotional Development

Home media environment which was hypothesised to be associated with social emotional development was found to have no significant association through this study. One of the possible explanations for this finding could be the level of effective implementation in terms of media rules. Chances of having portion of parents who have established media rules at home but are not adhered to by young children is certainly there, contributing to increased child screen time and displacement of other activities. This is further influenced by the age of study sample who are children below three years old and are most likely not given stern punishment if rules concerning screen-based media usage is not obeyed.

Another plausible reason is that home media environment does not associate directly on child social emotional development, but is mediated by screen time. Research suggests that the use of parental control devices as a form of media rules enforcement may improve the efficacy of intervention efforts to reduce child screen time (Maniccia et al, 2011). These efforts put forth by parents which includes introduction of media rules at home results in wiser usage of screen-based media among children in most of previous studies (Collier et. al, 2016; Sanders, Parent, & Forehand, 2018; Sanders et al, 2016b).

5.6 Strength and Limitations of Phase I

5.6.1 Validation of Ages and Stages Questionnaire-2 (ASQ:SE-2) Malay Language

Strength of this study is being the pioneer work of social emotional development screening instrument culturally adapted and validated to be used in Malaysia. The Malaysian child health programme contains developmental screening on gross motor, speech and language, vision, fine motor and social skills to be administered at specific age intervals (National Health and Morbidity Survey, 2019b). The adapted ASQ:SE-2 Malay language questionnaire which underwent comprehensive measures of reliability, reproducibility and validity testing is appropriate for usage during two points of child development assessment, at 18 and 36 months old in the local health clinic setting.

The major limitation of this ASQ:SE-2 Malay language validation study is inability to determine concurrent validity of the instrument with a gold standard due to inexistence of a developmental screening focused on social emotional domain utilized in Malaysia currently. Having conducted the study in health clinics, study sample may have failed to include children under follow up of hospitals for developmental issues. Having limited numbers of children with social emotional which do not reflect the exact prevalence could mean to affect the cut off scoring utilized in the study.

5.6.2 Validation of Parental Media Behaviour Scale (Malay Language)

The scale which includes elements of parental media addiction and parental media dependency definitely create a new scope of emerging research on the domain of parenting and family health studies, especially in Malaysia. The six-itemed scale is a valid and reliable instrument that explores parental media habit in a quick and inexpensive way and provides an insight on problematic parental media behaviour.

The limitation of the instrument however is the exclusion of other domains that could contribute to problematic parental media behaviour. This includes duration or frequency of screen-based media usage. It is important to explore the pattern of parents' media usage in a day as it could also include work-related screen-based media usage at workplace which is not in the presence of their children.

Future studies may include parental belief and perception on screen-based media usage at home, among parents and children – especially through qualitative studies to understand the domain of research. Level of technology interferences during parent-child interaction and factors associated with it can be further explored as well. In future, validation comprising a larger, diverse population with attempts to include children with risk of developmental issue or with documented social emotional difficulties is needed.

5.6.3 Validation of Home Media Environment Scale (Malay Language)

This valid and reliable short scale is a strong tool to explore home media rules and parental mediation strategies utilized in the local setting, an instrument not pre-existing on the current situation. Furthermore, effectiveness of home media rules by parents was not tested upon children as young as this study sample, but only on youths. In the past, notable studies on parenting strategies aimed to mitigate youth screen time through rules imposed at home were found to result in successful reduction of youth screen time (Collier et al, 2016; Sanders, Parent & Forehand, 2018).

Limitation of the scale however is the deletion of items signifying consequences of not following the home media rules at home as the question was not suitable to the very young age group of our study sample. Thus, testing of the tool in elder children may yield different results of validation, probably with items covering more constructs. The authors acknowledge that the scale does not provide media-specific rules or strategy of screen time mitigation, but rather views home media rules as a whole – encompassing rules implied upon all types of screen-based media available at home.

5.7 Strengths and Limitations of Phase II

Major strength of this study lies in it being a pioneer work in Malaysia that explores the relationship between screen-based media usage and social emotional development among toddlers, seen from the ecological perspectives – exploring on the influences of child screen time, parental media behaviour and home media environment. Although not a treatment-based study, the findings of our study could be utilized in the planning and development of intervention programmes aimed at reducing screen time among young children in the developing phase. With the added knowledge on family media usage patterns, focused intervention can be strategically planned and implemented.

Secondly, this study did not only explore average screen time of children, but also probed into usage of specific type of screen-based media, on weekdays and weekends. This is certainly an added advantage in comparison to study that looks only into specific screen-based media (Li, Mendoza & Milanaik, 2017; McCarrick & Li, 2007; Mistry et al, 2007) or only on weekday screen time (Segev et al, 2015). Thirdly, as a study that involves sample from health clinics in a district closely characterizing the Malaysian population in terms of sociodemographic features, the study respondents hail from various religious, race, socio-economic background as well as parent's educational background. Study sample that reflects the characteristics of Malaysian population holds high level of representativeness of Malaysian toddlers.

Despite the advantages, we acknowledge the limitations of our study. Reliance of screen time on parental reporting may be subjected to recall bias and underestimation or overestimation influenced by parental perception. We could not deny that social desirability may have caused biases in reporting. However, other more reliable method such as direct observation and diary recording was not opted as they require high parental effort and cooperation. Whereas screen time tracking applications is not applicable for all types of screen-based media.

To minimise anticipated measurement bias, respondents were assured that their anonymity would be guaranteed in all stages of research. A detailed explanation of the study and the importance of gathering accurate data through information provided in the questionnaire was also stressed in the respondent information sheet to help to reduce measurement bias. Further, the questionnaire was given to be administered only by a parent or guardian who is familiar with the developmental skills of his or her child. As the guideline given by ASQ:SE2-2 developer, it is required for the assessor of child to have at least 15 to 20 hours of contact with the child every week, for at least one month.

Secondly, there may be other potential factors contributing to poor mastery of social emotional development apart from what has been taken into consideration in this study; such as parental depression, parental stress, and parent-child interaction due to limitation of time and resource. However, parents who are currently receiving any psychiatric treatment are not recruited as part of the study.

Further, due to the setting of study site in busy government health clinics which can be chaotic at peak hours, chances of respondent error in answering the questionnaire could have occurred. To reduce this potential error, attempts are made to engage with respondents while they wait to be called in for their child's appointment and not when they are about to leave the clinic. This step is believed to give ample of time for respondents to think and answer the questions in a calm situation. Though the questionnaire was long, it was designed in clear formatting, distinct sections, clear instruction and simple words in a language best understood by the local Malaysian population. This attempt is believed to have helped minimize the occurance of respondent error in the study.

As this study was conducted in government health clinics, sample may not be representative of children who are under follow-up of private clinics or the general hospital for their health development assessment. Children of the general population who have defaulted government health clinics' follow-up, especially at 36-months old where there is no scheduled vaccination also would have not been part of the sample.

Although there were respondents from the high-income group, majority of 82% of study population with household income of below RM6000 fall into low and middle-income group. Hence, in future the validation study of ASQ:SE-2 Malay language version can be replicated in different parts of the country on population of varied socio-demographic characteristics.

The authors do realize that this study design will not be able to establish a temporal relationship between screen-based media usage and social emotional development of children. However, this cross-sectional study does not provide details about child developmental changes over time and precludes in determining the directionality of effects. Future longitudinal research that examines child's screen time exposure and changes over time will be helpful to identify its influence on child social emotional development. Exploration of screen-based media usage pattern in young children and their families could be enhanced by conducting qualitative studies on child and parental media habits.

5.8 Public Health Implications of Research

Early intervention is only possible when child developmental issues are picked up on children with high possibility of exhibiting delayed or abnormal development, which is identified through developmental screening. Screening of social emotional issues stands at advantage of picking up children with overall developmental issues as well. ASQ:SE-2 18-Month and 36-Month Malay language Questionnaires can be utilized in local health clinics for developmental assessment for the age intervals of concern. At both the age intervals – 18 months and 36 months old, children are brought to the government health clinics for routine vaccination and medical examination, respectively.

In order to exploit fully the less explored area of research, the adapted and validated tool 'Parental Media Behaviour' Malay language scale in this study is hoped to understand parent's media practices, level of media addiction and media dependency experienced and subsequently how they are associated with child's social emotional development. This measure is hoped to provide an insight of parent's problematic media behaviour and effect of it on child development.

The validated 'Home Media Environment' Malay language scale can be utilized to evaluate the existing home media rules and their enforcement strategies among Malaysian families with young children, filling the gap in knowledge. The tool can be utilized in future research to discover effective ways of mitigating child screen time. As outlined in the introduction of this writing, this research has presented findings on influence of screen-based media on early childhood social emotional development, answering the call for a need of survey on effects of screen time on children's health as stated in Malaysian Health and Morbidity Survey 2016 (NHMS, 2016). This pioneer work in Malaysia have provided a great insight on this field of research which is less explored on in the local population.

Screen-based media use in children seen in ecological perspective would not only spark awareness among parents and community in large but would also greatly benefit in development of screen time policy and guidelines for nurseries and childcare centres. The consequences of excessive screen time on child social emotional development displayed in this study would pave the way for family-based intervention programmes and public health policies related to screen-based media usage among children. The importance of safe media environment revealed in this study would enable policy makers to strive for a nurturing and stimulating environment for children of the younger generation to thrive in.

5.9 Recommendations

Based on findings of this study, situational analysis of excessive screen time prevalence in Malaysia can be done. Further, effect of early exposure of screen-based media towards early social emotional development in Malaysian toddlers can be illustrated. Findings of this study can serve as the base to foundation of national policy with regards to screen-based media usage in families of young children. Recommendations can be made with respect to utilising the research findings towards mindful usage of screen-based media among children and parents of young children.

5.9.1 Development of Screen Time Guideline for Young Children

A guideline especially focusing on children below the age of five tailored according to the Malaysian context ought to be developed based on current evidence of research, theory and practice. These recommendations are based on the existing guidelines by WHO (WHO, 2019) and American Academy of Paediatrics (AAP, 2016), backed by findings from this study Usage of electronic media for children below the age of two should be avoided altogether, at home and at early childcare centres or pre-schools. For older children, guiding principles that can be included as foundation of policy development are as follows:

(i) Guiding Principle I: Screen Time Restriction

For children between the age of two to five sent to early childcare centres or pre-schools, screen time should be restricted on a daily of weekly basis. This takes into account the usage of screen-based media such as television, computer or laptop for education and entertainment purposes. Screen time at early childcare centres or pre-schools should consider any screen time that the child may have at home, giving a sum of not more than an hour per day in average.

(ii) Guiding Principle II: Monitoring of Media Content

Content of media children are engaged with should not merely be a one-way communication tool, but help children imagine, explore and express. Based on the media content viewed, children should be given the opportunity to learn and question. The content should be free of inappropriate elements of sexual or violent content, considering religious and cultural sensitivity. Screen-based media programmes are encouraged to be viewed together with caregivers or educators who engage in an active conversation with children while media is played and not to be viewed by children in isolation.

(iii) Guiding Principle III: Developmentally Appropriate Media for Learning

Usage of screen-based media for early education should be appropriately matched with child's abilities, needs, interests and developmental stage. It should not displace time for interactive play or physical activities.

(iv) Guiding Principle IV: Development of Family Media Plan

A personalized screen-based media use for each family is to be tailored according to the characteristics of a family according to its size, ages of children, lifestyle adapted and cultural values. Home media rules such as setting up of specific times of a day or week as screen-free time, screen-based media safety and privacy, areas of the house where media use is not allowed are to be made clear by caregivers.

For example, implementing rules of no screen-based media usage during meals and an hour before bedtime as per recommendation by AAP. A structured schedule or routine for screen time assist in self-regulation and gives space for children to engage themselves with screen-free activities such as interactive play, physical activities and interaction with caregivers.

5.9.2 Incorporating Child Media Habits into Child Development Assessment

To spark awareness among parents on the potential health impacts of screen-based media among young children and for the purpose of developmental surveillance, queries pertaining to child media habits should be incorporated into current developmental assessment in health clinics. Primary care physicians and nurses would get the opportunity to educate parents on screen-based media usage, with some general advices as follows:

(i) Parents are to be informed that screen-based media usage is not recommended for children below two-years old. Screen time should not exceed an hour per day for children aged two to five-years old.

(ii) Parents are encouraged for co-viewing, by being present and viewing together screen in use by children to promote active parent-child interaction and reduce the risks associated with screen time.

(iii) Parents can conduct self-assessment of child's screen habits and develop their own personalised family media plans.

(iv) Parents and adult family members should model healthy screen use by choosing healthy alternatives which stimulates children's social emotional skills.

(v) Parents are educated on importance of active parent-child interaction and age-appropriate stimulation activities that should not be displaced by screen time.

5.9.3 Primordial Prevention of Media Addiction among Adolescents

Robust interventions to address and curb the issue of media addiction among adolescents is needed to ensure they do not grow up to have problematic media behaviour as they enter the phase of parenthood. Preventing problematic parental media behaviour among the future generation is vital as it greatly influences child health and family functioning as well.

Evaluation of school and community interventional programmes' effectiveness could bring forth evidence-based policy among targeted group in a particular setting. Screening with proper assessment tools and diagnostic criteria would assist in identifying adolescents with problematic media behaviour or internet addiction. Psychosocial difficulties involved in treatment of those with issues should be recognized and addressed as well.

5.9.4 Parental Disengagement from Technology

Many factors contribute to parental media addiction and dependency, which includes continual connection to technology and social or work pressures to respond quickly through mobile devices. To decrease parental problematic media behaviour and increase sensitivity and responsiveness during parent-child interaction, development of technology or applications that aids parental disengagement from technology would help parents to create boundaries between their digital lives and their time with children.

5.9.5 Inter-agency Collaboration

(i) Collaboration between Department of Social Welfare (Jabatan Kebajikan Masyarakat) under the Ministry of Women, Family and Community Development (MWFCD) with Ministry of Health would pave the way in promoting healthy screen habits and assist in conducting assessment of existing screen time policies in early childcare centres and nurseries nationwide.

(ii) Collaboration between Ministry of Education and Ministry of Health would enable integration of health promotion programmes and intervention strategies pertaining to mitigation of child screen time into the existing health and developmental assessment by School Health team for children in the stages of pre-school and lower primary school.

5.9.6 Evidence-based Intervention Programmes for Enforcement of Screen Time Mediation Strategies for Parents of Young Children

Development of evidence-based programmes to help parents practice mediation strategies and parenting skills to reduce screen time and practice mindful usage of screen-based media by young children is beneficial. Family-based interventions could result in benefits for both children and adults and enhance effectivity of the programmes. These interventions can be implemented through collaborations with other agencies such as Ministry of Women, Family and Community Development, the National Child Development Research Centre and non-governmental agencies such as Focus on the Family Malaysia. An example is a pilot study that displayed a novel one-session intervention as a promising approach in managing child screen time. The session includes psychoeducation about positive and negative effects of children's media use, highlighting the importance of media management at home. Parenting skills such as strategies in setting consistent boundaries for media use, providing effective instructions, and positive reinforcement were instilled. Parents were also provided with information about setting parental controls or passwords for electronic devices and tips to overcome challenges of restricting screen time among young children (Sanders, Parent & Forehand, 2018).

5.9.7 Developmental Screening for Early Intervention of Developmental Disorders

There is strong evidence of research that suggests effective early identification of developmental delays and timely early intervention can alter a child's long-term trajectory positively (Scherzer, 2012). Early identification is only possible through optimal developmental surveillance that could be carried out both by parents or professionals.

The developmental screening at specific age intervals aids referral for further developmental screening assessment and diagnosis when red flags are apparent (Choo, 2019). Having said that, social and emotional competencies are recognized as critical element to child's overall development and well-being by developmental specialists across multiple area including expertise of medicine, education and child welfare (American Academy of Paediatrics, 2011; Cooper, Masi & Vick, 2009; Isakson et al, 2009). Hence, utilization of ASQ:SE-2 as a parent-administered developmental screening tool would assist in early identification of social emotional difficulties.

5.10 Summary of Chapter 5

This chapter discusses study findings and its interpretation. The Malay Language version of ASQ:SE-2 is potentially useful to be used as a screening tool among toddlers in Malaysia since it manifested an acceptable reliability as well as adequate construct validity. Having proven its internal consistency, excellent test-retest reliability and tested on its construct validity through CFA, the Parental Media Behaviour Malay Language Scale is deemed suitable to be used among the local Malaysian population. As for Home Media Environment Malay Language Scale, good internal consistency was displayed after deletion of three items. Besides excellent test-retest reliability of the scale, it was also tested on its construct validity through CFA.

Phase II of this study show 82.2% toddlers have recorded non-adherence to screen time recommendations by WHO and AAP. Children with non-adherence to screen time recommendation by WHO and AAP is with 2.50 times higher odds of having poor social emotional development, aOR 2.50 (95% CI: 1.07 – 5.86). The overall findings indicate the negative implication of excessive screen time brought upon social emotional development of children aged 18 and 36 months in the study.

The chapter highlighted comparison of study findings with other studies in various settings. Studies sharing similar finding as this were stated and probable reasons or justifications for contradictory findings from previous studies was explored on. The chapter further pointed out strengths and limitations of the study. Major strength of this study is being the pioneer work of social emotional development screening instrument culturally adapted and validated to be used in Malaysia. The study did not only explore average screen time of children, but also probed into usage of specific type of screen-based media, on weekdays and weekends. Study sample that reflects the characteristics of Malaysian population holds high level of representativeness of Malaysian toddlers.

Limitation of study includes potential recall bias, inability to include some identified potential confounders, respondent error and under-representation of children who are not under follow-up with the government health clinics in study sample. Though the study design utilized will not be able to establish a temporal relationship between screen-based media usage and social emotional development of children, this pioneer study is hoped to inspire future longitudinal research of the domain in Malaysia.

In terms of public health implications, this study would be able to pave the way for development of screen time policies and help in development of family-based intervention programmes related to screen-based media usage among children. The chapter closes with recommendations based on the study findings; namely development of screen time guideline, incorporating child media habits into child development assessment, primordial prevention of media addiction, promoting parental disengagement from technology, inter-agency collaboration, evidence-based intervention programmes and developmental screening for early intervention tailored to local settings.

CHAPTER 6: CONCLUSION

6.1 Introduction

This chapter summarizes overall study findings that has answered all research questions and achieved all research objectives, followed by the conclusion remark.

6.2 Research Summary: First Phase

In the first phase of this study, four different instruments were tested on their psychometric properties, namely the ‘ASQ:SE-2’, ‘Parent Problematic Digital Technology Use Scale’, ‘Media and Technology Usage and Attitudes Scale’ and ‘Technology Related Parenting Scale’.

6.2.1 ASQ:SE-2 18-Month and 36-Month Questionnaires (Malay Language)

The tool is found to have good psychometric properties. Internal consistency and test-retest correlation were good, supporting the reliability of the scale. The scale also portrayed good content validity and construct validity.

ASQ:SE-2 which has documented vast utility as screening instrument in various setting worldwide will now be able to provide assessment of social emotional development for Malaysian toddlers through our adaptation and translation, especially on the two important age intervals of 18-month and 36-month which are the vital developmental screening points.

6.2.2. Parental Media Behaviour Scale (Malay Language)

Overall, the six-itemed Parental Media Behaviour Scale (Malay Language) is found to have good psychometric properties. Internal consistency and test-retest correlation were good, supporting the reliability of the scale.

The scale also demonstrated acceptable measurement model fit where there was sufficient evidence to sustain the construct validity of the scale. The results provided justification for the use of the scale to assess parental media addiction and parental media dependency among parents in Malaysia.

6.2.3 Home Media Environment Scale (Malay Language)

Overall, the Home Media Environment Scale (Malay Language) is found to have good psychometric properties. Internal consistency and test-retest correlation were good, supporting the reliability of the scale.

The scale also demonstrated acceptable measurement model fit where there was sufficient evidence to sustain the construct validity of the scale. The results provided justification for the use of the scale to assess effective strategies and parenting rules implemented to shape a safe home media environment for Malaysian toddlers.

6.3 Research Summary: Second Phase

A total of 600 respondents with children aged 18 and 36 months were recruited into this cross-sectional study conducted in few health clinics located in Gombak district of Selangor, Malaysia. Sociodemographic particulars, child characteristics including prenatal risk factors such as prematurity, birth weight and nutritional factor in terms of history of exclusive breastfeeding were collected.

Ecological perspective of screen-based media usage on child social emotional development was explored by examining child screen time, parental media behaviour which includes media addiction and media dependency and home media environment variables that serve as child's immediate environment.

6.3.1 Screen Time among Toddlers

In this study, excessive screen time as per definition of WHO and AAP was recorded by 82.2% toddlers which indicates that three out of four Malaysian toddlers do not adhere to the recommendations of screen time for young children by WHO and AAP.

This study has contributed greatly by discovering types of screen-based media utilized by young Malaysian children which has not been explored in depth prior to this for the age group concerned. Type of screen-based media toddlers are engaged with the most in this study is television, with maximum recorded television viewing time on a typical weekday reaching 12 hours per day and hitting nine hours per day for smartphone usage on a typical weekday. One in four toddlers are exposed to television (31.5%) and one in ten are exposed to smartphone (11.8%) within their first year of life.

In terms of media availability, almost all homes in our study are equipped with at least a unit of television (85.7%), more than half respondents having two units of smartphones (52.3%) and around one in four owning a laptop (38.8%). More than half parents claimed screen-based media was utilized for the purpose of educational (55.6%) and passive entertainment (56.4%) programmes or activities. Television scored the most viewed screen-based media, followed by smartphone.

6.3.2 Early Childhood Social Emotional Development

Understanding young children's well-being as a complex continuity is only possible by looking into various factors that influence early childhood development, a phase that constantly changes – physically and mentally. A good understanding on the dynamics and dimensions of child media habit and media environment a child grows up in – especially parental and home factors is very much needed before theories and research findings are put to practice or converted into policies.

Based on the information gained from the study participants via structured questionnaires; all sociodemographic characteristics except maternal education did not show a statistically significant association with social emotional development. In terms of child characteristics, children who were not exclusively breastfed for the first six months of their life were significantly associated with poor mastery of social emotional development.

After adjustment of potential confounders, excessive screen time persists to have significant association with poor mastery of social emotional development through the data analysis performed. Children who adhere by recommendations of screen time outperform their peers of the same age in terms of social emotional achievement. Children who are not exclusively breastfed for six months and children of mothers with higher education level are at increased risk of social emotional developmental delay according to this study.

6.4 Future Research

6.4.1 Screening of Early Childhood Development

(i) ASQ:SE-2 18-Month and 36-Month Malay version questionnaires can be tested on a larger population to test variation between gender, culture and other sociodemographic factors. Further, the instrument can be administered together with other developmental assessment instrument to determine its convergent validity.

(ii) Attempts of testing the instrument's (ASQ:SE-2) predictive validity can be made by retrieving data on the number of study sample referred to hospitals for paediatric assessment and diagnosis of developmental disorder in future research works.

(iii) Future studies could consider the inclusion of recruiting both parents as respondents to have multiple-raters of ASQ:SE-2 in determining child social emotional development.

(iv) ASQ:SE-3 screening instrument could be cross-culturally adapted and utilized to assess child's overall developmental in other domains namely sensory motor and cognitive language in this population to look into impact of screen-based media usage on young children in those areas of development as well.

6.4.2 Parental Media Behaviour

(i) Most findings that brings forth evidence suggesting link between disruption of parent child interaction due to problematic parental media behaviour such as media addiction or dependency come from observational studies or self-reporting, just as this. More longitudinal and experimental studies exploring this area of research such as the work of McDaniel and Radesky (McDaniel & Radesky, 2018) is needed to establish causation between parental media behaviour and child development.

(ii) Parental media behaviour can further be explored in depth, looking into elements such as parental sensitivity, parenting coordination, parental modelling of screen-based media usage and coparenting in the digital world that could strike the balance between media usage and quality parent-child interaction. Factors causing increased parental media addiction or dependency ought to be determined, such as work or social pressure, parenting stress or social acceptability to be active in social media.

(iii) Finding out the amount of time spent by parents in the presence of their children is another research gap that needs to be filled. A study was noted to have explored on it via self-reporting method (Blackman, 2015). However, future studies could adopt technology such as tracking app to monitor duration of screen-based media usage especially mobile devices such as phone to increase the accuracy of measurement.

6.4.3 Home Media Environment

(i) Though current study uses validated instrument to explore on home media environment, qualitative studies in future would be able to help us understand better social situation of media use at home. Let it be on media availability, accessibility, location of the screen-based media at home and establishment of rules and practices regarding the use of it – qualitative studies would be able to explore the elements to greater extent.

(ii) Parental anxieties and concerns on screen-based media usage among young children is critical to determine the extent of their effort for media regulation at home. Longitudinal and experimental studies on effectiveness of different types of home media rules and enforcement strategies would facilitate parental mediation strategies in cutting down screen time and to adhere to screen-based media usage recommendations by WHO and AAP, such as avoiding screen time during mealtimes and an hour before sleep.

6.4.4 Screen Time and Child Development

(i) Most of existing studies that links screen time with child development are observational in nature, this temporality of association cannot be ascertained. Thus, more longitudinal studies are needed to investigate children's engagement with electronic media and its influence over time to reaffirm this finding.

(ii) Future longitudinal research should examine difference in susceptibility of children to poor social emotional mastery based on type of activity they are engaged with. For example, exploring the differences in effect of exposure to educational-based media activities versus entertainment-based media activities on child's development. Another example is exploring effect of different child media habits such as co-viewing with active interaction versus children who are not accompanied by parents during screen time on child development. Those studies would help researchers in identifying when and for whom screen time is particularly problematic in terms of early childhood development.

(iii) More research involving children in the first few years of life should involve researcher- observation method to measure the duration and patterns of screen-based media usage accurately, minimizing measurement bias.

6.5 Conclusion Remark

Overall, study findings suggest excessive screen time negatively influence attainment of social emotional development of among children aged 18 and 36 months old. Excessive screen time among toddlers and early exposure of screen-based media is linked to paucity in active parent-child interaction and hindrance in the process of learning and development which consequently leads to delayed attainment of social emotional milestones.

As UNICEF puts it, Malaysia has made significant strides forward for one third of its population made up of children through reduction of child poverty, eradication of diseases and protection from harm (UNICEF, 2020). But a lot more is needed to be done to stop the joy of childhood from being stolen from young children. Apart from parents' responsibility to ensure children in their first few years of live are provided a thriving and developmentally stimulating environment to grow up in; it is also a shared duty of researchers and policy makers to do the same as they are the ones capable of disclosing what the future holds for young future-makers through research efforts.

Early childhood is the critical period in which child's habits are cultivated. Facilitating children to develop their full potential in their early years gives high rates of return in later phases of life. Thus, cost of inaction to battle potential threats during this vital phase should be taken seriously. Advocating quality care for young children in a conducive learning environment at homes and early childcare centres with mindful usage of screen-based media is crucial to ensure children of the younger generation achieve their ideal level of development.

Providing parental care with protection from threats of technology and being emotionally supportive and responsive towards every need of young children is certainly an uphill task. Nevertheless, collaborative efforts to create a developmentally stimulating environment for toddlers to grow in is not impossible.

In conclusion, the study has greatly contributed towards understanding the pattern of screen-based media usage among young children and parents, in the Malaysian context besides highlighting the importance of this issue to be given attention to in a timely manner. Eventually, the findings from this study and further research related to it in the future will be able to assist parents, educators and policy makers to create a safe media environment for developing children to thrive in.

6.6 Personal Reflection

The author believes the two-letter title she carries along brings with it a backbreaking obligation to humankind. Medicine is not all about viciousness of disease. Rather, it fights to right everything in between birth and death for attainment of a healthy life – and this thesis is just another effort towards achieving it. In a fast-moving digital world in which toddlers are trapped, it is the author's desire to witness young children achieving their optimal level of development in an enabling environment.

This Doctor of Public Health journey was a tiring, yet fruitful one. There was so much learnt, read, appraised, and gained throughout the years of coursework and research – especially in the domain of child health. This study has seen the growth of the author as a researcher and has greatly helped in building her time management and communication skills. May this writing resulted from years of hard work and preseverence be beneficial in bringing a positive change to the dynamics of toddlers and technology.

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LIST OF PUBLICATIONS

Article type	Title	Journal, Publication date	Status
Review	"Screen-based Media and Young Children: Review and Recommendations"	Malaysian Family Physcian Journal, June 2021 (Accessible at https://e-mfp.org/article/screen-based-media-and-young-children-review-and-recommendations/)	Published
Poem	"Disconnect to Reconnect"	Journal of Paediatrics and Child Health, October 2020 (Volume 56, Issue 10, Page 1638) Accessible at http://dx.doi.org/10.1111/jpc.15061	Published
Original research	Translation, Cross-cultural Adaptation and Validation of Malay Language Version of a Social Emotional Development Screening Instrument for Toddlers	Journal of Health and Translational Medicine University of Malaya (JUMMEC), 2020	Accepted with minor revision
Systematic review	Child Screen Time during COVID19 Pandemic	To be confirmed	Manuscript drafted

LIST OF PRESENTATIONS / CONFERENCES / AWARDS

Type	Title	Presentation / Conference / Award (Year)	Award / Status
Oral presentation	Disconnect to Reconnect	University level Three-minute Thesis Competition (28th April 2021)	1st Runner-up (Science Category)
Poster presentation	Screen Time and Social Emotional Development	13th National Conference for Clinical Research 2020 (24th to 26th August 2020)	Top 20 Best e-Posters
Oral presentation	Early Exposure to Screen-based Media and Social Emotional Development	2nd World Conference on Children and Youth Virtual (23rd and 24th July 2020)	Best Overall Presenter
Oral presentation	Electronic Media and Early Childhood Social Emotional Development	51st Asia Pacific Academic Consortium of Public Health (APACPH) Conference at Bangkok, Thailand (22nd November 2019)	Presented
Poster presentation	Electronic Media and Early Childhood Social Emotional Development	51st Asia Pacific Academic Consortium of Public Health (APACPH) Conference at Bangkok, Thailand (22nd November 2019)	Presented
Oral presentation	Screen Time and Early Childhood Social Emotional Development	Junior Pitch-it Challenge at the University Malaya Research Carnival, Kuala Lumpur (15th November 2018)	1st Prize Winner