EXAMINING THE ASSOCIATION BETWEEN MATERNAL MOBILE DEVICE USE, MOTHER-TO-INFANT ATTACHMENT AND INFANT NEGATIVE AFFECTIVITY

by

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ABSTRACT

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Under the Supervision of Professor Seok Hyun Gwon

Background: With the exponential growth in the development of technology (i.e., mobile phones, laptops, tablets) use worldwide, researchers have classified "problematic mobile device use" to encompass "addiction" or dependency on the device that distracts one from their surroundings. This distraction can be common during parenting and could negatively impact how parents interact or attach to their children. The main purpose of this study is to examine correlations between problematic mobile device use in mothers, maternal attachment to infants, and infant negativity.

Methods: A cross-sectional, correlational design with a convenience sample of mothers with infants (n = 250) from five areas in the north of Jordan. The problematic mobile device use was used to assess if mothers are struggling with the mobile device while spending time with their children. The Maternal Postnatal Attachment Scale was used to assess maternal attachment to her infant during the postnatal period. The infant Negativity Scale was used to assess parental beliefs about their infants' behavior negativity.

Results: Problematic mobile device use in mothers may decrease levels of maternal attachment to infants (B= -155.13, P<0.05), but it was not a significant predictor of infant

negativity (B=.127, p>0.05). Thus, infant negativity did not mediate associations between maternal problematic mobile device use and attachment to infants.

Conclusion: This study has confirmed negative associations between maternal problematic mobile device use and mother-to-infant attachment, pointing to possible contextual variables related to Jordanian culture. Further research is needed to better trace the temporal dynamics between these variables over time and to explore maternal experience embedded within complicated family practices in this Arab Islamic culture.

Permission of use is required

To all moms

and their babies

in the world

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Introduction to the Research

My dissertation study aimed to assess associations between maternal problematic mobile device use, mother-to-infant attachment, and infant negativity (aged 2 to 6 months). This dissertation offers the background and significance of the problem to introduce and describe the issue and its importance. This dissertation includes a review of the literature to articulate the state of science and explain the knowledge gap, justifying this study's research questions, hypotheses, and methodologies. Next, this proposal used the mother-to-infant attachment theory to guide the primary concepts and their associations. Then, I explained clear descriptions and details of the approach and methods of my dissertation study. Finally, I discussed my findings in related to the literature with possible future implications.

This dissertation included six sections. Section I covered the introduction of the problem and my philosophy, Section II offered an in-depth literature review, Section III described details of the methodology to be used. Section IV offered details about the analysis of findings, and Section V discussed Section VI in light of the literature, offering recommendations and implications for this study’s findings. Section V included possible policy implications related to my topic, any suggested programs, policies, or the like are explained only for hypothetical for future research.

Section I: Background and Philosophy

Introduction

This section offered background to explain the problems and their significance using the previous literature and the mother-to-infant attachment theory. It also described the rationale behind conducting my research study. This section included background, research purpose, questions, and study hypotheses. It uses the literature alongside the mother-to-infant attachment theory to explain the phenomenon and how each study variable could be correlated. Based on that, I propose maternal problematic mobile device use as an independent variable (IV), infant negative affectivity as a potential mediator, and mother-to-infant attachment as a dependent variable (DV). Socio-demographic data were controlled. A visual, conceptual model is attached to this section, clarifying how each study variable could be related to each other.

Background

In the United States, the Pew Research Center (2021) reported that 95 % of people (aged 30-49) owned a smartphone. In compared to the 50 or older age group, younger people (aged 18-35) were far more likely to have smartphones in many countries of emerging and advanced economies (Silver, 2019a). During the Corona Virus Disease 19 (SARS-CoV-2) outbreak, 93% of American adults were worried about mobile devices or Internet service outages (Anderson & Vogles, 2020). Across emerging economies, the smartphone was reported to be the most common mobile device, and Jordan was reported to have the second highest number of smartphone users (85%) after Lebanon (86%) (Silver et al., 2019). According to Hiniker et al. (2015), interviewees mentioned that the most common purposes of mobile phone use were texting and calling, emailing, taking

pictures, and using Facebook. Researchers introduce the concept of smartphone addiction to reflect excessive and frequent smartphone use.

According to Johnson (2019) and Merlo et al. (2013), problematic mobile device use refers to "addiction" or dependency on the device. Previous studies reported that smartphone addiction is one mobile phone problem that shares characteristics of substance abuse (Kwon et al., 2013; Lin et al., 2016). When assessing smartphone addiction, the research compared it to substance abuse and internet addiction. Kwon et al. (2013) developed a smartphone addiction scale (SAS) based on internet addiction and the smartphone's characteristics. This scale included six factors 1) daily-life disturbance, 2) positive anticipation, 3) withdrawal (e.g., being inpatient without smartphone use), 4) cyberspace-oriented relationship, 5) overuse (e.g., uncontrollable use), and 6) tolerance (e.g., failing to control smartphone use). Kwon et al. (2013) gave explanations to define each factor. For example, missing planned work due to using a smartphone or thinking about using it may reflect daily life disturbance (Kwon et al., 2013). Positive anticipation may reflect feeling empty when the smartphone is unavailable to use (Kwon et al., 2013). A cyberspace-oriented relationship may reflect a feeling that building a relationship through the smartphone could be more intimate than building real friends (Kwon et al., 2013). The research further discussed smartphone addiction's symptoms and psychological characteristics concerning the diagnostic criteria with each factor. Lin et al. (2016) concluded that the main symptoms of smartphone addiction, "impaired control," were shown by the diagnostic criteria to be similar to those of substance use and addictive disorders. Loneliness was associated with 1) daily life disturbance, 2) positive anticipation, and 3) cyberspace-oriented

relationships on the smartphone addiction scale (Enez Darcin et al., 2016). Social phobia was associated with all six factors of smartphone addiction (Enez Darcin et al., 2016). Moreno et al. (2015) reported that problematic technology (internet use) was associated with depression.

The Center for Internet and Technology Addiction (2017) established a healthcare plan to manage people who complain of smartphone addiction clinically. The American Psychiatric Association's (APA) Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR) (2023) has a criterion to diagnose internet gaming as a possible health problem. However, this criterion does not include smartphones, online gaming, or social media when people have them for general use. According to this criterion, people must "significantly impede or distress" their lives in several aspects (APA, 2023).

Studies introduced the concept of problematic technology use, including smartphone or mobile phone use, to reflect the device use longer than intended regardless of having physical or psychological problems (Merlo et al., 2013). Problematic technology use, including the Internet, smartphone, or mobile phone use, was commonly used in studying how parental technology use may interrupt parent-to-child interaction or relationship (Johnson, 2019; McDaniel, 2021; Sakakihara, Haga, Kinjo, et al., 2019; Sakakihara, Haga, & Osaki, 2019). Given these related characteristics of smartphone use, assessing the type or purpose of smartphone use could help explore why people use this device.

Purposes and associated factors of Smartphone Use

Previous studies assessed personal and psychological characteristics and purposes of smartphone use. People may use mobile phones for multiple purposes such as for work and/or school, social media, communicating with others, looking up information regarding parenting, household, or health, etc. (Johnson, 2019)

In addition, people may use their smartphones in various settings, such as while driving a car, walking, being in a classroom, meeting, and attending the cinema or theatre (Enez Darcin et al., 2016). Younger people who predominantly browse social networking sites on their smartphones may have excessive smartphone usage patterns (Enez Darcin et al., 2016). For young people, there was a correlation between social phobia and smartphone addiction (Enez Darcin et al., 2016). Also, social phobia predicted smartphone addiction scores for all six factors of the SAS (i.e., daily-life disturbance, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance), while loneliness scores predicted only cyber-oriented relationship scores on SAS (Enez Darcin et al., 2016).

Individuals at risk of developing smartphone addiction include those who experience psychological and physical neglect (Hsieh et al., 2016). According to one cross-sectional study conducted in Istanbul, Turkey, which included 147 male and 238 female university students (Aznar-Díaz et al., 2019), people who have smartphone addiction are more likely to 1) be aged 18-21, 22-25, and 30 years or older), 2) have a higher educational level, 3) be unemployed, and 4) use smartphones between 2-3 and at least 3 hours (Aznar-Díaz et al., 2019). In addition, Chen et al. (2017) assessed differences in the associated factors of smartphone addiction between males and females in a cross-sectional study in China. For males, Chen et al. (2017) found that smartphone

addiction was associated with playing smartphone games, poor sleep quality, and anxiety. For females, Chen et al. (2017) found that smartphone addiction was related to multimedia applications, social networking service applications, low sleep quality, depression, and anxiety. Globally, gender roles are not the same across different settings or cultures. For example, Jordanian culture sets most of the childrearing responsibilities on females rather than males, a belief underpinned by the extensive time they spend with them (Ali et al., 2022).

Differences in findings the associated variables with smartphone addiction or problematic smartphone use in previous studies may be related to having diverse demographics of participants (i.e., age, gender, employment) and multi-purposes (i.e., texting, emailing).

Benefits of Mobile Device Use

Although previous studies showed that increased smartphone use or problematic mobile phone use might be associated with negative consequences, it is important to note that other studies offered evidence of its benefits. People may use mobile devices to build interpersonal relationships, gain social support, and entertain themselves (Enez Darcin et al., 2016; Hiniker et al., 2015). In healthcare settings, telehealth has been introduced to exchange information between patients and healthcare teams (Koivunen & Saranto, 2018), gaining better access to health information. Also, sending text messages was used as a creative way to educate patients and their families about health information before and after surgery (Newton & Sulman, 2018).

Mothers commonly use social media during pregnancy and parenting to receive advice and support from other women who have similar experiences (Asiodu et al.,

2015). Chua and Shorey (2022) showed that mobile application-based perinatal interventions could improve the overall health outcomes of parents, including self-efficacy, anxiety, stress, social support, and parent-to-child bonding. A digital educational program aimed to meet the demands of parents of premature infants with a digital education covering subjects like parenting, infant behavior, appearance, and the care environment (Lebel et al., 2021). According to the findings, the participants believed parents should have access to the digital educational program as soon as possible, possibly before enrollment (Lebel et al., 2021). Participants also suggested different subjects be included in these programs, including 1) discharge information, 2) resources accessible in the Nursing Intensive Care Unit or after discharge, and 3) breastfeeding problems (Lebel et al., 2021).

Parenting in Jordanian Culture

Jordan is one country in the Middle East inhabited mainly by Muslims. The religion and Arabic culture aim to rear a child in a safe, warm, and healthy environment. The Jordanian mother's role, particularly if unemployed, is managing family and household work (World Bank, 2018). In comparison to 37% of women in Jordan, roughly 42% of men think that women prefer to stay at home and take care of the family (i.e., children and household) (World Bank, 2018). Although approximately 14% of Jordanian women work, Jordanians overestimated the number of working women in their country to be 70% (World Bank, 2018).

Abuidhail et al. (2017) reported that most Jordanian women-initiated breastfeeding within the first hour of giving birth and tended to decline it over the course of the first six months postpartum. According to Khasawneh et al. (2020), most Jordanian

women know about breastfeeding and have positive attitudes toward feeding their infants. Working mothers have positive attitudes toward breastfeeding and reported that they ended breastfeeding early due to work issues (Altamimi et al., 2017). However, the formula commercials influenced less educated mothers who thought that formula feeding indicated wealth, saying that they did not like breastfeeding (Altamimi et al., 2017). A cross-sectional correlational study included 400 Jordanian mothers who reported that respondents thought maternity leave was insufficient to achieve successful breastfeeding (Altamimi et al., 2017). Regarding mother-to-infant attachment (emotional bond), a Jordanian study used a cross-sectional correlational design on 222 mothers found no difference in attachment between mothers who performed only breastfeeding for their infants compared with those who performed both breastfeeding and formula feeding (Abuhammad et al., 2021). Factors associated with attachment included maternal education, having a person to support in childcare, marital relationship quality, infants' gender, and planning for pregnancy (Abuhammad et al., 2021). According to a cross-sectional study conducted in the north of Jordan and included 164 mothers, most of the mothers used their smartphones for social networking and entertainment (123, 75%) (Ali et al., 2019). The highest duration of use per day was between 0.5 to one hour (53, 32.3%) and three to four hours (47, 28.6%) (Ali et al., 2019).

Parents-to-Child Interactions during Mobile Device Use

Previous studies assessed parents who use mobile devices during their children's interactions. Radesky et al. (2016) reported that parents were overloaded between work and children. While mothers spend their time with children, Radesky et al. (2015) found that mothers in the U.S. with mobile device users tend to perform

fewer verbal and nonverbal interactions, 225 low-income pairs of mother-to-child were included in this study. Child responses to the caregiver of mobile device use included amusing themselves and increasing attention-seeking behaviors (Radesky et al., 2014). Further, studies showed that mothers busy with technology, including smartphones, were less likely to respond to their children (Wolfers, 2021; Johnson, 2019; Johnson, 2017; Mcdaniel & Radesky, 2018). However, Johnson (2019) did not find significant associations between smartphone interference and parent-to-child attachment. Wolfers et al. (2020) reported that having lower maternal sensitivity was associated with using a smartphone for long periods, but lower sensitivity did not correlate with the frequency of use.

Given that mobile device use could offer several benefits for parents, it is essential to consider them while assessing any possible associated variables or issues of interpersonal relationship interruption. Parents may use mobile devices for multiple purposes, including information-seeking, coping, self-distraction, and seeking social support under stress (Wolfers, 2021). In a qualitative study, parents acknowledged using their smartphones to relax and escape or detach from the surrounding stressors (Johnson, 2017). In this study, most participants acknowledged that they prefer face-to-face over communication through technology; smartphone availability and convenience make it easier to decide to communicate frequently (Johnson, 2017). Wolfers (2021) reported that parents use mobile devices to deal with stress; they distract themselves by seeking information and social support.

These studies showed diverse findings regarding smartphones or mobile devices' benefits and any possible related issues. This aspect could increase the

complexity of interpreting and presenting a clear picture of how smartphone use could work and interact with family behavior, particularly during mother-to-infant attachment.

Children's Behavior During Mobile Device Use

According to Bowlby (2008a), parents are a secure base for their children. They are expected to respond to the child's needs (such as feeding, cleaning, and proximity) to support his development (Bowlby, 2008a). Having enough time and a relaxed environment are important for parents to be responsive or sensitive to their child's needs (Bowlby, 2008a). In Jordan, culture sets most of the childbearing responsibilities on mothers (Ali et al., 2022) and it’s crucial to understand the levels of maternal attachment to infants in this parenting environment. Ainsworth (1969) introduced the maternal sensitivity concept to explain how a mother could respond appropriately, accurately, and timely to her child. Ainsworth (1969) demonstrated that being 1) aware of the child's needs, 2) free from any distractions and 3) empathetic is required to be a sensitive mother. Social interaction occurs when a sensitive mother and her healthy infant face each other; each phase begins with initiation and mutual greetings and involves intuitive understanding (Bowlby, 2008a). A mother sensitive to her child's needs tends to understand her child's cues and signals accurately, promptly, and appropriately (Ainsworth, 1969).

In contrast, when a mother is not, she is more likely to be unresponsive (Ainsworth, 1969). Infants of sensitive mothers engaged in interaction by making agitated arm and leg gestures in the direction of their mothers (Bowlby, 2008a). According to Planalp and Braungart-Rieker (2013), parents exhibited less sensitivity for

infants that showed insecure-avoidant. According to the Psychology Unlocked. (2017), insecure-avoidant infants showed no interest when their mothers left them but played with strangers without paying attention to their mothers when they returned. When Putnam et al. (2014) developed a scale (the Infant Behavior Questionnaire) to assess infant temperament, infant negative affectivity was one component of this scale which is a personality trait similar to neuroticism. It is characterized by the intensity and duration of negative emotional reactions such as irritability, fear, and crying (Rothbart, & Bates, 2006). Infants may show behaviors like difficulties in falling asleep or calming down, challenges in facing distress or sudden changes (i.e., startle to loud noise or distress when setting in a confining place), and lower levels of modes when losing objects (Gartstein, & Rothbart, 2003).

Fuertes et al. (2006) found that mothers who regarded their infants' temperament as more challenging at one and three months engaged with them during free play less sensitively and passively at nine months. Gutierrez and Ventura (2021) assessed maternal technology use and mother-to-infant attachment indicators during mother-infant interactions. According to this study, there were associations between having higher technology use during this dyad interaction and higher dimensions of the infant's negativity (Gutierrez & Ventura, 2021). However, infant negative affectivity did not mediate correlations between technology use and mother-to-infant attachment indicators (Gutierrez & Ventura, 2021). This study recruited mothers online via Amazon Mechanical Turk (MTurk) and assessed diverse forms of technology such as Televisions, computers, and phones. Our present study recruited participants in-person and used small incentives to be more engaged and interactive, achieving a higher

response rate. Our study was also limited to the use of technology or mobile devices to assess only mobile phones and tablets. A study reported that parents who use their mobile devices during child interactions tend to report behavioral difficulties in their children (McDaniel & Radesky, 2018).

Previous studies also showed an association between maternal Problematic Internet Use (PIU) and 1) maternal acknowledgment of abuse of their children (aged four months, 1.5 years, or three years) (Sakakihara, Haga, Kinjo, et al., 2019), 2) and not providing enough feeding for them (aged four months or 1.5 years) (Sakakihara Haga, and Osaki, 2019). Studies' results should be taken cautiously since the mother-to-child relationship is a complex area that may have other associated variables. Also, technology use (i.e., smartphone, internet) may have both possible associated benefits and issues when it comes to the family or parenting context.

Mother-to-Infant Attachment and Psychological Status

Mother-to-infant attachment is an integral part of human relationships; it facilitates the processing of the child's development (Bowlby, 2008a). Historically, mothers were considered the primary caregivers who could respond to the child's cues to help them explore and interact with the world (Ainsworth, 1979). Attachments include responses such as sucking, clinging, following, and signaling behaviors of smiling and crying, which develop or mature during the first year of life and work to bind mothers and their infants together (Bretherton, 1992). These behaviors become highly focused on mothers as caregivers during the second six months (Bretherton, 1992). For example, when mothers initiated face-to-face interactions with playful behaviors, infants responded with joy (Bretherton, 1992).

Ainsworth (1979) used the terms affectionate, playful, or interfering with describing maternal behavior while interacting with their infants. Being Affectionate reflects behaviors of kissing, hugging, or caressing (Ainsworth, 1979). Interfering reflects how mothers could interfere or be goal correctors when their infants' locomotor activity is developed (Ainsworth, 1979). Ainsworth (1979) described infants' behaviors like smiling, clinging, embracing, and scrambling as positive responses, while behaviors like crying, restlessness, and pushing away were negative responses. Also, Ainsworth (1979) described when the mother had inept/poor holding behavior of infants; the mother's handling technique of the baby was insensitive to the infant's behavioral cues. In this case, the mother picked her infant up abruptly, handled him roughly without consideration for his comfort, or handled him in a grossly inappropriate way (Ainsworth, 1979). It is essential to explore maternal psychological status that could interrupt their interactions with their children.

Previous studies have associations and null findings regarding correlations between maternal psychological status and mother-to-child attachment or bonding. Ohoka et al. (2014) found that mothers who experienced higher levels of depression reported higher scores on mother-to-infant bonding. Another study showed that there were negative associations between maternal bonding to infants and maternal stress, pain, and postpartum depression and positive associations between partners and social support (Kinsey et al., 2014). According to Kitamura et al. (2015), a lack of affection in mothers was associated with depression, anxiety, and anger. However, Dau et al. (2019) reported that major depression in pregnancy and postpartum had no impact on maternal sensitivity (being responsive to the child’s needs), and parental stress and maternal

sensitivity were not significantly correlated.

Mobile Device Use during Parenting and Psychological Status

The literature has looked at the potential associations of smartphone use with psychological health. These studies had a diverse population, such as college students, fathers, and mothers. Enez Darcin and colleagues (2016) reported that smartphone addiction could be linked to social anxiety and loneliness in college students. Among parents, McDaniel and Radesky (2018) found that technoference (i.e., interruptions due to parental technology use) could increase parenting stress. A further study found associations between smartphone addiction, severe depression, and the possibility of suicide (Okasha et al., 2021). This behavior may affect individuals' interpersonal relationships with others. Song et al. (2018) showed that mothers with smartphone addiction were more likely to exhibit nervousness and anxiety and report issues in interactions with individuals or work performance when they did not have access to a smartphone (Song et al., 2018).

According to Okasha et al. (2021), people who overused their smartphones were more likely to experience psychological problems such as depression, anxiety, sleep problems, and self-risk behaviors, including smoking and suicide. Ruggieri et al. (2020) found that problematic Facebook use in mothers predicts their social anxiety related to using social media, and problematic Facebook use in children predicts their social anxiety related to using social media. Given these related psychological issues, the benefits of mobile devices should be considered. A study indicates that mobile devices help parents cope with stress successfully while protecting against adverse outcomes in parent-to-child interactions (Wolfers, 2021).

Kushlev and Dunn (2019) assessed mental distraction among parents who used

smartphones during childcare time and reported that when parents regularly spent time with their children, they felt less present and less socially connected. A qualitative study with 22 mothers, nine fathers, and four grandmothers reported that parental tension was accompanied by mobile device use because of the feeling of overload between technology device use, working, and caring for children (Radesky et al., 2016). Parents who use smartphones may feel more socially isolated from their surroundings and tend to have a higher perception of boredom in their daily lives (Kim et al., 2021; Kushlev& Dunn, 2018).

Problem Statement

Worldwide, mobile device use including smartphones is escalating. The smartphone addiction concept has been introduced to the literature to reflect the pathological side of smartphone use. Problematic mobile device use may reflect addiction to the device. Kwon and colleagues (2013) have developed a scale to assess smartphone addiction in which they used items of the substance dependence and abuse diagnosis of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). Findings reported that smartphone addiction shares six factors with substance addiction, including 1) daily-life disturbance, 2) positive anticipation, 3) withdrawal, 4) cyberspace-oriented relationship, 5) overuse, and 6) tolerance (Kwon et al., 2013). Lin et al. (2016) used psychiatric interviews to develop a diagnostic criterion to differentiate between smartphone addiction and no smartphone addiction. Results showed overlap between characteristics of substance abuse and behavioral addiction, including 1) maladaptive smartphone use (i.e., excessive use, persistent desire, withdrawal) and 2) functional impairment (i.e., social, school, and job impairment) (Lin et al., 2016).

Further studies investigate the psychological and emotional aspects of technology use. Enez Darcin et al. (2016) reported associations between smartphone addiction, social phobia, and loneliness. The Center for Internet and Technology Addiction (2017) provides a management plan to people who believe smartphone use creates problems in their work lives. It also offers consultation with mental health or professional addiction specialists in internet and technology addiction (behavioral addiction). However, the general use of smartphones was not included in the DSM criteria for internet gaming (APA, 2023*).* It is important to note that smartphones offer benefits to users. According to Johnson (2019) and Merlo et al. (2013), problematic mobile device use refers to "addiction" or dependency on the mobile device.

Assessing mothers' mobile device use and how it is associated with mother-to-infant attachment is complex. Previous studies assessed maternal technology use, concerning maternal sensitivity, mother-to-infant attachment, and infant temperament (negative affectivity). Studies reported that mothers might use mobile devices for multiple purposes; they may gain benefits (i.e., social networking and music) but may be distracted from the real environment. In a qualitative study, mothers said they deliberately use Smartphones as a coping mechanism to relieve stressors and relax (Johnson, 2017). Wolfers et al. (2020) recommended that when studying maternal sensitivity, it’s important to assess the influence of contents that mothers may access on smartphones like playing games, reading news, or communicating with family and friends. Studies assessed parents for technology use during interactions with their children in diverse situations, such as while they spend their time in fast food restaurants (Radesky et al., 2014), playgrounds (Hiniker et al., 2015; Wolfers et al.,

2020), and having structured eating tasks (Radesky et al., 2015). One study assessed maternal technology use during mother-to-infant interaction, mother-to-infant attachment, and infant negative affectivity (Gutierrez & Ventura, 2021). This study evaluated various technology use, such as television watching, phone messaging, and computer use in U.S mothers; and infants aged between 2 to 6 months, surveys were conducted online (Gutierrez & Ventura, 2021). My study focused on only "mobile phones and tablets" technology to assess problematic mobile device use in Jordanian mothers of infants aged 2 to 6 months postnatally, conducting in-person surveys with incentives to be more engaged with a higher response rate. We considered infant negativity as a mediator variable and mother-to-infant attachment as a dependent.

Prevalence

According to the latest report published by the Pew Research Center, adults worldwide hold more smartphones than ever, with ownership rates ranging from 76% in countries of advanced economies to 45% in emerging economies (Silver, 2019a). The smartphone was reported to be the most common mobile device across emerging economies, and Jordan was reported to have the second highest number of smartphone users (85%) after Lebanon (86%) (Silver et al., 2019). Also, Jordan has the second-highest mobile phone ownership among adults (94%) after Vietnam (97%) (Silver et al., 2019).

Jordanian adults aged between 18 and 29 years have reported having the highest smartphone use (93%) compared to other age groups in the country (30-49; 87%, >50; 64%) (Silver et al., 2019). Also, higher educated groups (93%) in Jordan were more likely to use smartphones than lower (76%) (Silver et al., 2019). In this country, seven

in ten adults said that they use Facebook (Silver et al., 2019). In general, Jordanian adults (18-29 years) reported that WhatsApp (89%) and Facebook (84%) were the most popular apps for social media use (Silver et al., 2019). The highest percentage of adults who use the Internet were found in Jordan (87%) and Lebanon (87%) (Silver et al., 2019). According to the World Population Review (2023), the Jordanian population is estimated to be 11.3 million.

Significance and Justification for Conducting the Research Study

Mobile device use is rapidly growing across the globe. Jordan was reported to be one of the highest developing countries in mobile device use. Studies have proposed a criterion to assess smartphone addiction; one component was the uncontrollable use of a smartphone to lose interaction with genuine interpersonal relationships (Kwon et al., 2013; Lin et al., 2016). When studying Mother-to-infant attachment, attachment behavior is defined as conduct that has proximity to an attachment figure as a foreseeable outcome and whose evolutionary goal is to shield the child from danger, focusing on responding to the child's crying and engaging in social interaction (Bretherton, 1992). However, studies showed that mothers using technology (i.e., mobile devices) might be less likely to respond to their children's needs on time; they may prioritize responding to their mobile devices over their children's needs (Wolfers, 2021; Johnson, 2019; Johnson, 2017). In addition, there is evidence that parents who use technology during their interaction with children may describe their child as difficult (McDaniel & Radesky, 2018).

My dissertation study assessed associations between maternal problematic mobile device use and mother-to-infant outcomes (mother-to-infant-attachment, infant

negativity) among mothers with infants aged 2-6 months. To my knowledge, there is a lack of research that focuses on mobile device use in Jordan. This country has high rates of mobile device use (Silver et al., 2019), families rear at least one child (Department of Statistics, 2019), and assigning mothers rather than fathers most responsibilities of the childbearing process (Ali et al., 2022). Thus, it's crucial to assess how technology use during parenting may be related to mother-to-infant outcomes, considering various contextual variables in the country. This dissertation study provided knowledge for exploring possible associations between maternal problematic mobile device use and mother-to-infant attachment and how infant negativity could mediate this association. This study may be used in future research to assess the awareness of parents regrading using mobile devices during spending time with children and to explore how Jordanian mothers might regulate their maternal role in a technology-based family environment. Both problematic mobile device use and mother-to-infant attachment are complex phenomena, and assessing their associations is difficult across different settings and cultures. This evidence can be used for future research to explore how infant negativity could be related to these two concepts.

This study can also be used as a guide for future research in educational programs to address mothers' basic needs/skills to have successful parenting necessary for healthy emotional and behavioral child growth and development. In addition, the findings of this dissertation study can be used in these educational programs for mothers to enhance their awareness and knowledge of problematic mobile device use and its effects on infant negativity.

The Mother-to-Infant Attachment Theory of Bowlby-Ainsworth

Problematic mobile device use is a complex phenomenon and studying it in a complicated situation like a mother-to-child interaction needs a grand theory to have a deep understanding. I used the Mother-to-Infant Attachment theory of Bowlby-Ainsworth to guide my research program. Compared to the baby, the mother is better able to intentionally plan or organize her behavior when it comes to infant care (Ainsworth, 1979). Thus, she can benefit from the knowledge and experience to plan her own contribution to the interaction with the baby to leave benefits on the infant's development (Ainsworth, 1979). The attachment involves seeking proximity to the attached figure, but this seeking process is accompanied by unease when proximity cannot be kept or threatened because of losing the figure or emerging other barriers (Bowlby, 2008b). I used this theory to explain a situation where mothers who are psychologically connected to their mobile devices to the extent of not responding to their child's needs could be viewed as a kind of maternal deprivation that could impact infants' behavior negatively. John Bowlby, a British psychoanalyst, focused attention on the study of describing the mother-to-infant attachment process (Bowlby, 2008a; 2008b; Bretherton, 1992). Mary Ainsworth was a student of Bowlby and a developmental psychologist who expanded the mother-to-infant attachment theory and identified individual differences in attachment patterns (Ainsworth et al., 2015). Ainsworth and Bell (1969) described the infant's attachment behavior when the mother and her infant are together, separated, and reunited. In addition, Ainsworth has introduced maternal sensitivity to describe the entire process of how mothers could accurately and promptly respond to their child's needs (Ainsworth et al., 2015; Bretherton, 1992; McLeod, 2008). Also, she contributed to the concept of the attachment figure as a secure base that is considered a window through which a child can

explore the world (Bretherton, 1992).

The Mother-to-Infant Attachment Theory of Bowlby

For initiating the mother-to-infant attachment for the first time, Bowlby (2008a) reported that allowing a mother to feel for her newborn and spend a few hours just interacting with him and feeling he is for her is essential. The reviewed studies in Bowlby's (2008a, p. 5) textbook used a scene of welcoming a new baby for the first moment after birth to describe "Mother-to-infant attachment." In this scene, it is noted that immediately after mothers give birth to their infants and see their faces for the first time, mothers move slowly to touch their heads and body. Then, within a short period, they are expected to cuddle or place them between their breasts, in which infants could find a warm environment while having a long licking of the nipple (Bowlby, 2008a). Attachment behavior involves seeking proximity to the attached figure as a secure base to build a tie/bond (Bowlby, 2008a). Bonds with parents (or parent substitutes) as caregivers are formed during infancy and childhood when they are relied upon for support, comfort, and protection (Bowlby, 2008a).

To date, Bowlby (2008b) has updated new and diverse situations in which a child and his mother are physically apart to describe "detachment." For example, cases include when children are left with their father or their father travels on a trip. Also, children are attached to their worked mothers while they are brought up with nannies or are pregnant and preparing for a new baby (Bowlby, 2008b). In Bowlby's (2008a) textbook, a study of Ainsworth assessed maternal sensitivity and infants' ways of behaving. Findings showed that an infant whose mother is sensitive, approachable, and responsive to him, who accepts his behavior and is cooperative in dealing with him, is far from being a needy and

unhappy child (Bowlby, 2008a). In contrast, mothers who ignore their children, arbitrarily interfere with their activities, do not respond to them, or are insensitive to their children's signals are likely to be unhappy, anxious, or difficult kids (Bowlby, 2008a). This could be because they are preoccupied and worried about other things (Bowlby, 2008a). In highlighting the significant impact that a child's mother has on his development, it is essential to also take into account what has motivated a mother to embrace the parenting manner that she adopts (Bowlby, 2008a).

The Mother-to-Infant Attachment Theory of Ainsworth

Ainsworth (1969) introduced the maternal sensitivity concept to recognize four elements that explain how mothers could respond appropriately to their child, including 1) being knowledgeable and aware of the child's signals, 2) making accurate interpretations behind their meaning, 3) performing appropriate response, and 4) responding to them on time. Also, Ainsworth (1969) documented that being a sensitive mother depends on three elements, including being 1) aware of the child's needs, 2) free from any distortion, and 3) empathetic. A mother sensitive to her child's needs tends to understand her child's cues and signals accurately, promptly, and appropriately (Ainsworth, 1969). In contrast, when a mother is not sensitive to her child's needs, she is more likely to neglect her child and be unresponsive (Ainsworth, 1969).

A Proposed Conceptual Model

Based on the previous literature and the mother-to-infant attachment theory, my study used problematic mobile device use as an independent variable (IV), infant negativity as a potential mediator, and mother-to-infant attachment as a dependent variable (DV).

A mediating effect occurs if (1) the independent variable precedes the mediator, (2) the mediator precedes the dependent variable, (3) the independent variable and mediating variable are associated, (4) when the independent variable is controlled, the mediating variable and the dependent variable are associated (MacKinnon & Luecken, 2008). Given findings from previous studies, maternal technology use is associated with mother-to-infant attachment and infant negativity (Davis et al., 2022). Parents who used their mobile devices in the family environment noticed changes in their children's behavior, describing them as being difficult (McDaniel & Radesky, 2018). Takács (2020) reported that maternal bonding predicted infant temperament at 0-7 days and six weeks. Mothers also reported that mobile devices distracted them from their children, and they felt disconnected (Kushlev & Dunn, 2019). Maternal technology uses interrupted parent-to-child interaction (Mcdaniel & Radesky, 2018). When taken as a whole, infant negativity may be considered a potential mediator affecting the relationship between maternal problematic mobile phone use and mother-to-infant attachment. This mediation model is previously used in Gutierrez & Ventura's (2021) study.

We controlled the socio-demographic data, including maternal age, infant age, mothers' level of education, maternal employment, marital status, family income, and family composition/number of children. In a previous study, Ali et al. (2021) used those maternal characteristics (i.e., mothers ' level of education, age, number of children, employment, and family income) when studying mother-to-infant bonding and smartphone addiction. One cross-sectional study showed that smartphone addiction was associated with age, education, unemployment, and smartphone use hours (Aznar-Díaz

et al., 2019). Another cross-sectional study documented that smartphone-addicted participants were more likely to be under the age of 21, be unemployed, have small family members, and have a high family income (Alotaibi et al., 2022). McDaniel and Radesky (2018) used maternal age, education, marital status, family income, and family composition when they studied parental technology use and child behavior problems. Accordingly, technoference levels in parents were not associated with parent race/ethnicity, educational levels, family income, and child age (McDaniel, & Radesky, 2018). Also, Johnson (2019) did not find associations between smartphone interference in parenting with race, gender, income, education level, and age of the child.

Morris et al. (2022) proposed a mediation model to show how parental technoference (technology-based interference) due to smartphone use could impact child language development. For this model, parental technoference due to smartphone use is used as IV, eye gaze, joint attention, and parental responsiveness are used as mediators to language development outcomes of children (Morris et al., 2022).

Research Purpose

The primary purpose of my study is to assess whether maternal problematic mobile device use is associated with mother-to-infant attachment and infant negativity among mothers of infants aged 2 to 6 months.

The Research Questions

1. Is there a significant relationship between maternal problematic mobile device use, mother-to-infant attachment, and infant negativity among mothers of infants 2-6 months?
2. Is there a mediating effect of infant negativity on the effect of mobile device use on mother-to-infant attachment?

Research Hypotheses

The main hypothesis: mothers who have higher levels of problematic mobile device use tend to have lower levels of postnatal attachment.

Hypothesis #1: mothers who have higher levels of problematic mobile device use tend to have infants with higher levels of negative affectivity.

Hypothesis #2: Infant negative affectivity mediates associations between problematic mobile device use and postnatal attachment.

Research Aims

1. Describe maternal problematic mobile device use, mother-to-infant attachment, and infant negativity among mothers with infants aged from 2 to 6 months in Jordan.
2. Examine associations between maternal problematic mobile device use, mother-to-infant attachment, and infant negativity among these mothers.
3. Test whether infant negativity mediates associations between maternal mobile device use factors and mother-to-infant attachment.

Summary

Mobile device use is growing across the world. The reviewed studies described smartphone addiction as a concept that people are disconnected from the real world or interpersonal relationships since their attention is focused on their mobile devices. The problematic mobile device use concept was used in the literature to describe how parents were struggling in interactions with their children while using their mobile devices. Mother-to-infant attachment is essential to human relationships because it facilitates the child's growth and development. Therefore, studying how maternal mobile device use and problematic mobile device use could impact mother-to-child relationships is crucial.

The Mother-to-Infant Attachment Theory of Ainsworth-Bowlby was used to explain a situation where mothers who are psychologically connected to their mobile devices to the extent of not responding to their child's needs could be viewed as a kind of maternal deprivation. Few studies assessed the association between maternal mobile device use hours and problematic mobile device use, mother-to-infant attachment, and infant negativity. I propose this dissertation study to fill the knowledge gap.

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Section II: Review of the Literature

Communication in the Technology Era

Socialization is an essential aspect of humans' lives. People need to engage with one another to achieve emotional and physical health. There are two ways to communicate with others, face-to-face, and virtual options. Face refers to the social identities others could recognize to identify who we are, involving verbal and nonverbal reactions (Hargie, 2019). Seven categories describe nonverbal behaviors, including 1) body language (i.e., eye movement, hand gestures, facial expressions), 2) paralanguage (i.e., voice pitch, volume, silence), 3) physical contact (i.e., touching), 4) proximity and interpersonal space, 5) physical characteristics (i.e., skin color, attractiveness), 6) adornments (i.e., perfume, clothes, jewelry), and 7) environmental factors and physical settings (i.e., homes, classrooms, streets) (Hargie, 2019). For example, when explaining or conveying a message from teachers to students in classrooms, combining verbal and nonverbal communication helps clarify instructions, reduce fears, and prevent mutual misunderstandings (Wahyuni, 2018). Thus, nonverbal behaviors support and complement verbal ones (Hargie, 2019).

According to Dunlap et al. (2016), face-to-face communication allows people to be more perceptive of other people's perspectives or experience empathy. For instance, a mother can tell if her baby is hungry by noticing the baby's mouth directed toward her breast, and eyes with tears and staring at her consistently. Online conversation is another type of interpersonal communication method in which people use technological devices (e.g., smartphones, computers, and cell phones) to mediate or express what they mean or wish to convey to another person (Wagner, 2015). However, this method can hinder in-

person interactions where verbal and nonverbal cues coincide (Wagner, 2015).

Emotion icons, as one of the features of online communication using technological devices, enable mirroring of the actual social situation, helping exhibit non-verbal or socioemotional behaviors (Dunlap et al. 2016). The mobile phone is one example of a technology device that supports video calls with verbal and observable nonverbal messages. People are enticed to abandon face-to-face conversation in favor of online communication when such cutting-edge elements are introduced to the online environment. The smartphone is a frequently used technology that individuals utilize to access the internet and social networks (Silver, 2019). People commonly integrate this handheld minicomputer device into their daily lives, possibly due to enabling users to multitask simultaneously, such as chatting with others, learning, being entertained, shopping, and receiving news (Silver, 2019).

Adults worldwide hold more smartphones than ever, with ownership rates ranging from 76 % in countries of advanced economies to 45 % in emerging economies (Silver, 2019). In the United States, the Pew Research Center (2021) documented that the highest age groups in smartphone use are 18-29 years (96%), followed by 30-49 years (95%), 50-64 years (83%), and >=65 years (61%). Adults were primarily utilizing smartphones to 1) browse social networking sites (90%) and 2) get access to the internet (67%), respectively (Silver, 2019). According to the most recent Pew Research Center report (2019), 93% of American adults have been worried about mobile phones or Internet service outages since the Corona Virus Disease (COVID-19) outbreak started (Anderson & Vogles, 2020). The smartphone was reported to be the most common mobile device across emerging economies, and Jordan was reported to have the second highest number of smartphone users (85%) after Lebanon (86%) (Silver et

al., 2019). Also, this country has the second highest mobile phone ownership among adults (94%) after Vietnam (97%) (Silver et al., 2019).

Jordanian adults aged between 18 and 29 years have reported having the highest smartphone use (93%) compared to other age groups (30-49; 87%, >50; 64%) (Silver et al., 2019). Also, higher educated groups (93%) in Jordan are more likely to use smartphones than lower (76%) (Silver et al., 2019). A growing body of literature documenting that smartphone overuse could lead to the emergence of a new mental condition known as "Smartphone addiction."

Problematic Mobile Device Use and Smartphone Addiction

According to Johnson (2019), problematic smartphone use refers to smartphone addiction and smartphone dependency. Previous studies conceptualized smartphone addiction as a kind of behavioral addiction with characteristics of excessive and compulsive smartphone use behavior to the extent of interrupting social, physical, and work-life (Alotaibi et al., 2022; Harris et al., 2020; Jung et al., 2016; Kwon et al., 2013; Lin et al., 2016; Selvaganapathy et al., 2017). In addition, the literature uses diverse concepts to define smartphone use or using smartphones to the extent of interrupting personal, social, or academic lives. However, there is no consensus to include the concepts used within the unified definition of smartphone addiction. For example, McDaniel and Radesky (2018) used problematic digital technology use and technoference to describe how technology could interrupt parents' interactions with their children. Eichenberg et al. (2019) used the concept of problematic smartphone use to assess excessive smartphone use in university students. Johnson (2019) used problematic smartphone use and smartphone interference to assess how smartphone use could interrupt parenting and parental attachment. Sakakihara, Haga, & Osaki (2019) used

problematic internet use to describe the impact of mothers' internet use on their children's physical health. Ruggieri et al. (2020) used problematic Facebook use to assess social anxiety among mothers who use Facebook. Finally, Kim et al. (2022) used the concept of smartphone dependency to identify if there are associations between maternal smartphone use and emotional and behavioral problems in preschool children.

To date, the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (2022) has recognized gambling disorder as a kind of behavioral addiction, while it has no criteria for defining smartphone addiction *(*American Psychiatric Association (APA, 2022). Also, the American Psychiatric Association's DSM-5 has proposed a criterion to define gaming on the internet or any other electronic device; people who have internet gaming must have significant impairment in their personal lives (APA, 2022). This criterion excludes general internet use, online gambling, social media, or smartphones (APA, 2022).

The Center for Internet and Technology Addiction (2017) in the United States recognizes internet and smartphone addiction as a psychiatric condition. This center implements a unified health care plan to manage people who complain about this condition. One cross-sectional study was conducted in Granada, Spain, and included 147 male and 238 female university students, assessing risk factors for smartphone addiction (Aznar-Díaz et al., 2019). Results showed that people who have smartphone addiction were more likely to (1) be aged 18-21, 22-25, and 30 years or older), (2) have high levels of vocational training, (3) be unemployed, and (4) use smartphones between 2-3 and at least 3 hours compared to 1) aged 26-29, 2) levels A education, 3) employed, and 4) use smartphones ≤3 hrs (Aznar-Díaz et a., 2019). The time or hours of use was the only variable that significantly explained smartphone addiction, while other variables (i.e.,

gender, age, employment, and study levels) did not significantly explain it (Aznar-Díaz et al., 2019).

Jung et al. (2016) assessed smartphone addiction in university students in South Korea (the mean age was 21 ± 2.41 years old). This study divided smartphone users into two groups; the first one was using smartphones for <4 hours/per day (N=25), and the second was using smartphones for >4 hours/per day (N=25). Results showed that, depending on how long a person used a smartphone, there were significant differences between the two groups in the craniovertebral angle, scapular index, and respiratory functions. A cross-sectional study assessed smartphone addiction in 68 university students (aged 18-29 years) in Malaysia, classifying participants into regular smartphone use (N=34) and heavy smartphone use groups (N=34) (Selvaganapathy et al., 2017). Results showed that while there were no associations between smartphone addiction and craniovertebral angle, there was an association between smartphone addiction and depression. Another cross-sectional study in the United States included 132 parents between 18 and 29 years, assessing problematic smartphone use (Johnson, 2019). According to the findings, smartphone interference during parenting is predicted by problematic smartphone use and gender, income, education level, child's age, stress level, race, depression, and anxiety (Johnson, 2019). A cross-sectional correlational study conducted in Saudi Arabia with 545 undergraduate students reported that those who have smartphone addiction were more likely to have physical complaints (Alotaibi et al., 2022). They tend to have a lower grade point average (GPA), be physically inactive, sleep poorly, be overweight (Body Mass Index (BMI)= 25.0–29.9) or obese (BMI≥30), and have shoulder, eyes, or neck pain Alotaibi et al., 2022).

Mobile Device Use and Psychological Status

The literature discusses the potential associations of smartphone use with psychological health. Enez Darcin and colleagues (2016) reported in a study with college students (N=367) in Istanbul, Turkey; that smartphone addiction could be linked to social phobia and loneliness. McDaniel and Radesky (2018) conducted a study in the Northeastern U.S. states with 337 parents (N=171 mothers and 166 fathers). They found that technoference or interruptions due to parental technology use could increase parenting stress. Selvaganapathy et al. (2017) found that the regular and heavy smartphone users' groups were significantly different in depression.

A further cross-sectional study conducted in Egypt with 1,380 undergraduate university students found associations between smartphone addiction, severe depression, and the possibility of suicide (Okasha et al., 2021). This relationship could be explained by the likelihood that individuals who prefer virtual interpersonal relationships over in-person ones tend to be isolated and escape from the real-world using smartphones (Enez Darcin et al., 2016; Celikkalp et al., 2020; Okasha et al., 2021). This behavior may affect individuals' interpersonal relationships with others. This aspect is critical when the subject of smartphone addiction is a mother who is expected to have a healthy interpersonal relationship with her child to meet their basic needs (i.e., feeding, cleaning, playing).

Mother-to-Infant Attachment and Psychological Status

Mother-to-infant attachment is an integral part of human relationships; it facilitates the processing of the child's development (Bowlby, 2008a). Historically, mothers were considered the primary caregivers who could respond to the child's cues to help them explore and interact with the world (Ainsworth, 1979). Attachments include sucking, clinging, following, and signaling behaviors of smiling and crying

(Bretherton, 1992). They are independently mature during the first year of life and become concentrated on mothers in the following six months (Bretherton, 1992).

Ainsworth (1979) used the terms affectionate, playful, or interfering with describing maternal behavior while interacting with their infants. Being Affectionate reflects behaviors of kissing, hugging, or caressing (Ainsworth, 1979). Interfering reflects how mothers could interfere or be goal correctors when their infants' locomotor activity is developed (Ainsworth, 1979). Ainsworth (1979) described infants' behaviors like smiling, clinging, and scrambling as positive responses, crying, restlessness, and pushing away as negative responses. Also, Ainsworth (1979) described when the mother had inept/poor holding behavior of infants; the mother's handling technique of the baby was insensitive to the infant's behavioral cues. In this case, the mother picked her infant up abruptly, handled him roughly without consideration for his comfort, or handled him in a grossly inappropriate way (Ainsworth, 1979). It is essential to explore maternal psychological status that could interrupt their interactions with their children.

Previous studies have associations and null findings regarding correlations between maternal psychological status and mother-to-child attachment. One study conducted in Japan included 389 reported that there were weak to moderate associations between maternal depression and mother-to-infant bonding (Ohoka et al., 2014). Another study in Pennsylvania included 3005 first-time mothers in their third trimester and at one month postpartum. Results showed that there were negative associations between maternal bonding to infants and maternal stress, pain, and postpartum depression and positive associations between partners and social support (Kinsey et al., 2014). According to Kitamura et al. (2015), a lack of affection in

mothers was associated with depression, anxiety, and anger. This study was conducted in Japan and included 396 fathers and 733 mothers with children aged from 0 to 11 years. An additional study included 36 low-income mothers during their second and third trimesters of pregnancy with 12 months of postpartum follow-up to assess the maternal psychological status and maternal sensitivity (Dau et al., 2019). Findings reported that major depression in pregnancy and postpartum had no impact on maternal sensitivity, and there were no significant correlations between parental stress and maternal sensitivity. Johnson (2019) found that there were significant associations between perceived stress and anxiety in parents and parents-to-child attachment.

Problematic Mobile Device* Use *during Parenting

According to Bowlby (2008a), parents are a secure base for their children. They are expected to respond to the child's needs (such as feeding, cleaning, and proximity) to support his development (Bowlby, 2008a). Having enough time and a relaxed environment are essential for parents to be responsive or sensitive to their child's needs (Bowlby, 2008a). This requirement is especially crucial when the mother takes most of the parenting throughout the early months or years of the infant's life. The previous research focused on mothers' excessive and frequent smartphone use and its association with Parenting (Johnson, 2017; Johnson, 2019; Mcdaniel & Radesky, 2018, Radesky et al., 2014). In addition, researchers assessed smartphone addiction in terms of a mental health issue; individuals with smartphone addiction may use the device to become hooked on them uncontrollably (Harris et al., 2020; Kwon et al., 2013; Lin et al., 2016). Therefore, it is crucial to study smartphone addiction among mothers with a child.

There are studies on internet addiction, problematic Facebook use, and

problematic internet use (Hsieh et al., 2016; Ruggieri et al., 2020; Sakakihara, Haga, & Osaki, 2019; Sakakihara, Haga, Kinjo, et al., 2019). However, few studies have been conducted to assess maternal problematic mobile device use and its association with parenting. A possible reason for this insufficient evidence is that the concept of problematic mobile phone use and smartphone addiction is continuously emerging and may overlap with other similar terms. For example, the previous literature conceptualized smartphone overuse as excessive smartphone use, dependency, addiction, problematic smartphone use, and technology use (Eichenberg et al., 2019; Kim et al., 2022; Kown et al., 2013; McDaniel & Radesky, 2018). Also, the previous literature uses the concept of internet addiction, Facebook maintenance, problematic Internet use, and problematic Facebook use (Hsieh et al., 2016; Northrup & Smith, 2016; Ruggieri et al., 2020; Sakakihara, Haga, & Osaki, 2019; Sakakihara, Haga, Kinjo, et al., 2019). However, few studies used the concept of smartphone addiction with mothers who had children aged five years or younger (Ali et al., 2020; Song et al., 2018).

Song et al. (2018) conducted a descriptive correlational cross-sectional study with 328 Korean mothers with children aged 3 to 5 years to assess how mothers' smartphone addiction could be associated with their parenting behaviors. Results showed that mothers with smartphone addiction were more likely to exhibit nervousness and anxiety and report issues in interactions with persons or work performance when they did not have access to the smartphone (Song et al., 2018). Ali et al. (2020) assessed the association between maternal smartphone addiction and mother-to-child bonding in Jordanian mothers who had infants. Results showed non-significant associations between smartphone use and mother-infant bonding or maternal mental health. However, Ali et al.

(2020) found associations between excessive smartphone use and unhealthy family functioning. Due to the scarcity of studies on maternal smartphone addiction, I reviewed studies on smartphone use, technology use, internet use, and social media use to explain how smartphone use can impact parenting.

Mobile Device Use During Parenting

Given that parents may use their mobile devices for various reasons, including stress management, researching mobile device use in parenting and potential interactions between parents and children is challenging. Previous studies showed that mothers busy on their mobile devices were less likely to respond to their children since they prioritized finishing their online work over childcare (Johnson, 2019; Johnson, 2017; Mcdaniel & Radesky, 2018; Wolfers, 2021). For example, one study used mixed methods of (1) nonparticipant observations, (2) semi-structured interviews, and (3) online surveys to assess caregivers' values about their mobile phone use during caregiving time (Hiniker et al., 2015). Results showed that in 18 of the 56 situations (56%), the adult caregiver did not reply to the child, and more than 80% of survey respondents reported that using a mobile phone during parenting made it harder to pay attention to children (Hiniker et al., 2015). Another study conducted in Germany with five focus group interviews of parents (N=19) assessed how parents use mobile devices to cope with stress (Wolfers, 2021). According to the findings, parents use mobile devices to deal with stress; they distract themselves by seeking information and social support. This study indicates that this device helps parents cope with stress successfully while protecting against adverse outcomes in parent-to-child interactions. In addition, researchers assessed smartphone users' emotions and behaviors, including mothers.

One cross-sectional study with a random sample of 1,380 undergraduate Egyptian

university students by Okasha et al. (2021) reported that those who overused their smartphones were more likely to experience psychological problems. They may complain of depression, anxiety, sleep problems, and self-risk behaviors, including smoking and suicide (Okasha et al., 2021). However, this cross-sectional correlational study did not specifically explore the associations between smartphone overuse among parents and their functional role in the family environment. A cross-sectional study with 114 Jordanian mothers and their infants found that heavy smartphone use may interrupt family function, indicating that heavy smartphone users may not perform their expected roles effectively in the family (Ali et al., 2020). However, this study did not show an association between smartphone addiction and mother-to-child bonding. In Japan, a cross-sectional correlational study reported that mothers with problematic internet use were more likely to provide inadequate care for their children, especially regarding feeding (Sakakihara, Haga, & Osaki, 2019). Therefore, previous studies have inconsistent findings regarding how mothers who use their smartphones in the family environment could interact with their family members, including children.

Another cross-sectional correlational study conducted in the United States reported that technology devices (i.e., smartphones, mobile phones) interrupted parent-child interactions during the day among more than half of mother participants (171 (55.5%)) (Mcdaniel & Radesky., 2018). In a study conducted in Italy, social anxiety was assessed in 152 couples with children between the ages of 12 and 14 (Ruggieri et al., 2020). According to the findings, problematic Facebook use in mothers predicts their social anxiety related to using social media, and problematic Facebook use in children predicts their social anxiety related to using social media.

The likelihood of couples' relationships being disrupted by technology use was

also evaluated. In a cross-sectional study with 75 heterosexual couples, Northrup and Smith (2016) reported that partners who engage more frequently in Facebook conversation experienced fewer levels of love in their relationship. This finding indicates how using Facebook could shape couples' feelings toward each other. According to a qualitative study that conducted 35 in-depth semi-structured interviews, there are associations between caregivers' use of mobile phones and three types of internal tensions (Radesky et al., 2016). These types include (1) cognitive tensions (being overwhelmed by having multitasking roles in balancing between work and children), (2) tensions in parent-to-child interactions, and 3) emotional tensions (stress-inducing and reducing effects). Finally, a descriptive cross-sectional correlational study with 132 American parents aged between 18 and 29 years assessed associations between problematic smartphone use, smartphone interference in parenting, and parental attachment (Johnson, 2019). Results showed that smartphone interference in parenting was significantly associated with problematic smartphone use (Johnson, 2019).

Kushlev and Dunn (2019) assessed mental distraction among parents who used smartphones during childcare time in Canada and reported that when parents regularly spent time with their children, they felt less present and less socially connected. Ruggieri et al. (2020) reported that having higher levels of problematic Facebook use among mothers predicted their social anxiety concerning social media (N= 152 mothers and their adolescent offspring [12–14 years old]). Johnson (2017) found that parents of smartphone use were more likely to ignore their children's messages to avoid losing their online connection.

A qualitative study with 22 mothers, nine fathers, and four grandmothers reported that parental tension was accompanied by mobile device use because of the feeling of

overload between technology device use, working, and caring for children (Radesky et al., 2016). Thus, parents who use smartphones may feel more socially isolated from their surroundings and tend to have a higher perception of boredom in their daily lives (Kim et al., 2021; Kushlev& Dunn, 2018). As mothers, being psychologically and physically available is essential to meeting children's needs (Bowlby, 2008b). Bowlby (2008b) has defined the "attachment" concept to reflect the psychological bond that ties people together. Among parents who are busy with smartphone use in front of their children, it is essential to note what styles of attachment these parents show.

Results of a cross-sectional study with 497 (120 male and 377 female) students aged (17 – 70 years) by Eichenberg et al. (2019) in Vienna, Germany, showed that participants who had problematic smartphone use (N= 75) were more likely to perform an insecure attachment style.

Adult attachment is classified into secure, insecure-anxious, and insecure-avoidant (Liu et al., 2020). People with insecure-avoidant experiences avoidance or less intimacy in interpersonal relationships, and those with insecure, anxious experience conflicts in dependence and might deny early attachment (Liu et al., 2020). In contrast, securely attached adults experience higher satisfaction in interpersonal relationships and are more able to cope with work and family challenges (Liu et al., 2020).

A meta-analysis with 16 studies (N=1830) examined the associations between parents' adult attachment and child maltreatment and abuse (Lo et al., 2019). Results showed that having insecure attachment styles in parents increased the risk of having failure to pediatric thrive and filicide (the act of killing children by their parents (Lo et al., 2019). A qualitative study with 12 parents (N= 10 females) aged between 26 and 54

years who were smartphone users and had more than one child aged less than 18 years showed that parents who used smartphones tended to be disengaged from their surroundings and leave their children unattended (Johnson, 2017). A family is the most suitable place to rear children. Thus, knowing how maternal smartphone use and smartphone addiction are associated with childcare is crucial.

Mobile Device Use and Child Care

According to Bowlby (2008a), parents are a secure base for their children. They are expected to respond to the child's needs (such as feeding, cleaning, and proximity) to support his development (Bowlby, 2008a). Having enough time and a relaxed environment are important for parents to be responsive or sensitive to their child's needs (Bowlby, 2008a). This requirement is especially crucial when the mother takes most of the parenting throughout the early months or years of the infant's life. Although they may be sitting at the same table, the mother may not always be physically and emotionally available to her child. Johnson (2017) reported that mothers who used smartphones in front of their children directed less attention toward them because they prioritized completing the work on their smartphone over responding to the child's calls. A longitudinal study with a proportionately stratified random sample of 6233 fourth-grade school students in Taiwan found that higher psychological neglect that children experience was significantly linked to higher levels of children's internet addiction (Hsieh et al., 2016). This association may be explained by how smartphone use diverted parents' attention, as they became mentally connected to the mobile device rather than their children (McDaniel & Radesky., 2018 & Kushlev& Dunn, 2018).

Previous studies demonstrated that mothers who used mobile phones during

parenting may have ignored their child's needs, and the child may have responded improperly afterward (Kim et al., 2020; McDaniel & Radesky., 2018; Radesky et al., 2014). For example, Radesky et al. (2014) reported that caregivers who were heavily absorbed in their mobile devices tended to ignore, respond slowly, or not respond to their children's cries for attention by keeping their eyes fixed on the screen. McDaniel and Radesky (2018) documented that children (aged ≤ 5 years) tended to show difficulties in their internalizing and externalizing behaviors when their mothers and fathers used technology devices in front of them. This observation shows examples of internalizing behaviors, including whining, sulking a lot, and feeling hurt easily. Externalizing behaviors include restlessness, hyperactivity, being easily frustrated, and temper tantrums. In South Korea, a descriptive correlational study with 41 mothers of preschoolers (aged 3-6 years) found a significant association between maternal smartphone dependency and child aggression, oppositional, and emotional instability (Kim et al., 2022). Infants may show different responses when they negatively react to others.

Characteristics of negative affectivity in infants is a personality trait similar to neuroticism; it reflects significant positive loadings on sadness, distress at limitations, and fear, and high negative loadings on falling reactivity (Putnam et al., 2014; Peterson et al., 2017). Fuertes et al. (2006) found that mothers who regarded their infants' temperament as more challenging at one and three months engaged with them during free play less sensitively and passively at nine months. Gutierrez and Ventura (2021) assessed maternal technology use and mother-to-infant attachment indicators during mother-infant interactions. According to this study, there were associations between

having higher technology use during this dyad interaction and higher dimensions of the infant's temperament (negative affectivity) (Gutierrez & Ventura, 2021). However, infant negative affectivity did not mediate correlations between technology use and mother-to-infant attachment indicators (Gutierrez & Ventura, 2021).

Along with the behavioral and emotional ones, the physical aspects of mothers' technology use on their children could also be seen. In a cross-sectional correlation study in Japan, Sakakihara, Haga, and Osaki (2019) found that mothers who had problematic internet use (PIU) were more likely to have a boy with a thin body (body mass index <15) aged four months or 1.5 years. This association was not observed in girls. This study suggests that mothers with PIU may not feed their children enough. Sakakihara, Haga, Kinjo, et al. (2019) found a significant association between maternal PIU and maternal recognition of abuse in a child aged four months, 1.5 years, or three years.

What is Not Known?

The reviewed literature assessed the associations between mobile device use, parenting, and children's emotional and behavioral aspects. Previous studies conceptualized smartphone overuse as pathological smartphone use, excessive smartphone use, and problematic smartphone use. A new concept, "smartphone addiction," was used to describe extreme and frequent smartphone use that interferes with social, professional, and academic lives (Kwon et al., 2013). However, it is difficult to find studies that used problematic mobile device use among mothers of children. In Jordan, one study examined smartphone addiction among mothers with infants (Ali et al., 2020). Results showed that nearly one-quarter of mothers (23.5 %, n=164) were addicted to their smartphones, and there were associations between excessive smartphone use and

less healthy family functioning (Ali et al., 2020). Also, this study did not find associations between smartphone use and mother-to-infant bonding. Davis et al. (2022) reported associations between maternal technology use and infant negative affectivity, but the strength of this association depends on infants' age. According to Bowlby (2008a), parents are a secure base for their children to support their development. Historically, mothers were considered the primary caregivers who could respond to the child's cues to help them explore and interact with the world (Ainsworth, 1979).

Previous studies showed diverse findings regarding how maternal technology use could be associated with mother-to-infant relationships. Studies reported that mothers of smartphone use might not perform their roles adequately in the family environment (Ali et al., 2020; Johnson, 2017; McDaniel & Radesky, 2018). They may have feelings of not having enough time to interact with their children during smartphone use, affecting the mother-child interaction (Johnson, 2017; McDaniel & Radesky, 2018). However, both mother-to-infant attachment, smartphone use, and addiction are complex phenomena, and there is a need to study other variables that could be associated with them simultaneously.

To my knowledge, there is no study assessing how many hours mothers spend on mobile device use, considering if mothers could show signs and symptoms of problematic mobile device use or could obtain benefits from mobile device use. Also, no studies examine how infant negativity could mediate associations between problematic maternal mobile device use and mother-to-infant attachment. Therefore, my dissertation study assessed mobile device use hours, problematic mobile devices, mother-to-infant attachment, and infant negativity among mothers who have infants aged 2 to 6 months. My study then examined associations between these variables.

Limitations

The reviewed studies in this paper have several limitations. First, the convenience sampling method restricted the generalizability of the results because of sampling bias. The cross-sectional design limits causal inferences. Using self-report measures may have influenced participants to respond to questions in a more socially acceptable way. In my study, I tried to minimize the limitations that faced the previous studies. I provided detailed explanations to the participants, assuring them that their responses to each question were kept entirely confidential, but they could skip any questions that made them feel uncomfortable or stop participation at any time. I recruited study participants from different sites in North Jordan to reach a more representative sample. Also, I provided a gift for each participant to increase the response rates of participants, researchers were available on-site for any help as well. Finally, this study was limited to mothers, and we did not include fathers. This limitation is acknowledged in Section V.

How This Research Will Add to the State of the Science

The primary purpose of my study is to assess whether mobile device use factors problematic mobile device is associated with mother-to-infant attachment and infant negative affectivity among mothers of infants aged 2 to 6 months. This research can aid health researchers, nursing educators, practice nurses, and nurse administrators in the following ways. Future studies need to consider qualitative studies to further explore mothers' experiences of problematic mobile device use in the family environment, which is expected to have solid interactions between parents and their children. Therefore, identifying preferable methods to be used in qualitative and quantitative studies is essential.

Observational studies may help examine reactions to infants of mothers who use mobile devices during mother-to-infant interactions. Also, a longitudinal study is needed

to track infants' negative affectivity of mothers who use smartphones during parenting. This dissertation study can contribute to the creation of evidence for research on how to raise awareness of problematic mobile device use and the development of an instrument to assess problematic mobile device use among mothers. This study can increase the need for a unified definition of problematic mobile device use regarding its signs, symptoms, and health outcomes, specifically in mother-to-infant dyads.

In nursing practice, once the literature has had additional studies on examining associations between maternal problematic mobile device use and mother-to-infant outcomes (attachment and infant negativity), nurses may need to make an effort to assess problematic mobile device use among mothers of children in different healthcare settings. For example, public health nurses will need to examine mothers' mobile device use when they see a mother client in population health settings. In addition, nurses can use a short scale to assess mothers' mobile device use and problematic mobile device use in maternal and child health centers. Further, nurses could consider holding community workshops to raise public awareness of problematic mobile device use among mothers and its impacts on child health. Finally, the findings of the proposed study can be used as sources for informational sessions about how to use mobile devices in a beneficial way for mothers and children.

Nurses can use Facebook groups to communicate with mothers about their children's health and how to limit the hours of smartphone use for better childcare. Mothers commonly use social media to receive advice and support from other women who have similar experiences during pregnancy and Parenting (Asiodu et al., 2015). Videos about childcare and women's experiences could be used as a guide for women,

simulating reality. These videos could be built and published on social media, including Facebook groups. Also, nurses can consider text message-based nursing interventions to send messages about appropriate care targeting mothers in perinatal periods.

A simple message about postpartum care can be sent during the first six weeks of the postpartum period to provide mothers with health information. According to March of Dimes (2022), instructions about postpartum care include changes in the mother's body after normal vaginal delivery and cesarean section, perineum soreness, after-birth pains, vaginal discharge, swelling, hemorrhoid, constipation, breastfeeding, and physician visits. These messages can also contain information about childcare for maximizing child health outcomes. They could include instructions and guidance about handling a baby, maintaining bonding and warm relationships, interpreting baby languages, messages or cues, swaddling techniques, diaper change, diaper rash, bathing, and sleep patterns. A systematic review of 12 research studies assessed the effectiveness of mobile application-based perinatal interventions in improving Parenting (Chua & Shorey, 2022). Results showed that mobile application-based perinatal interventions could improve the overall health outcomes of parents. This review's outcomes included self-efficacy, anxiety, stress, social support, and parent-to-child bonding.

A qualitative study used one-on-one and group interviews either in person or online (N=15 mothers, five fathers, and nine neonatal nurses), exploring parents' and staff's thoughts regarding creating a digital educational program (Lebel et al., 2021). This program aimed to meet the demands of parents of premature infants with a digital education program that covers subjects like parenting, infant behavior, infant appearance, and the care environment. According to the findings, the participants held the opinion

that parents should have access to the digital educational program as soon as possible, possibly even before enrollment. More than half of the participants believed that having the information presented on a website was preferable, while an equal proportion thought an application was best. Also, in this study, participants suggested extra subjects to be included, including 1) discharge information, 2) resources accessible in the Nursing Intensive Care Unit or after discharge, and 3) breastfeeding problems.

While mobile devices could be used to support parenting, it is vital to acknowledge that mobile device companies witness massive development in mobile phone technologies, making them appeal to be used by people including parents. Thus, future research needs to address parenting-focused interventions to improve mother-to-infant attachment and limit hours of mobile device use. Parenting and family-focused interventions have similar characteristics, including being: 1) action-oriented, 2) theoretically based, and 3) problem-solving-oriented (Prinz, 2016). According to Prinz (2016), parenting-focused interventions that draw from empirical theories like family interaction, social learning, attachment, and cognitive behavioral theories are theoretically grounded. Thus, future research could focus on understanding how using mobile devices in the family environment may be associated with mother-to-infant outcomes (attachment and infant negativity). Interventions targeted parents' unique challenges and worked toward solutions, concentrating on the things that parents actually do at home (Prinz, 2016).

In a family-based technology environment, interventions could focus on limiting hours of parental use of the mobile device to have more time and space to properly respond to children's needs (i.e., feeding, changing the diaper or clothes, soothing. etc.)

that are necessary for their growth and development. In this context, it could be helpful to have more research in Jordan to understand how housewives could regulate their emotions and behaviors to fulfill their maternal role. Thus, parents will be aware of the problem and actively participate in solving any possible related outcomes when it comes to the family or childcare.

Summary

My dissertation study assessed associations between problematic mobile device use and use, mother-to-infant attachment, and infants' negative affectivity among mothers who have infants aged 2 to 6 months. Mobile device use is escalating worldwide, and smartphone addiction is introduced to the literature to reflect the pathological side of smartphone use. People who have problematic mobile device use or smartphone addiction may have physical, psychological, and social adverse health complaints. However, the literature uses diverse concepts describing smartphone overuse, making it challenging to define problematic mobile device use formally. Also, the literature reported that parents could use mobile devices to obtain benefits. Few studies assess maternal mobile device use and problematic mobile device use during parenting. These studies found that mobile device use in mothers might be associated with having fewer verbal and nonverbal interactions with children, inadequate feeding, and difficulties in child behaviors. Depending on the study's findings, this research program will add to the state of science in different ways. The conclusions of my dissertation supported the primary study purpose, maternal problematic device use may be associated with lower levels of maternal attachment to infants. This will call attention to further research to consider policies on the family environment at the societal level. One policy might focus

on programs to educate the public including educating parents about safe mobile device usage and its associations with mother-to-infant attachment and infant negative affectivity. Other policies might consider campaigns to increase public awareness regrading limiting hours of using the mobile device in the family environment. Before building any future policy, literature will have had enough substantial evidence to assess associations between mobile device use and mother-to-infant outcomes, considering different cultures. This policy section is only explained for hypotheticals for any future research.

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Section III: Methodology

Design

My dissertation study assessed problematic mobile device use, mother-to-infant attachment, and infant negativity among mothers who have infants aged 2 to 6 months. Then, associations between these variables were examined. A descriptive correlational cross-sectional design was used to accomplish this primary purpose. This design is appropriate when the researcher wants to determine whether the study variables are correlated at a particular time (Polit & Beck, 2021).

Setting

A convenience sampling method was used to recruit mothers who visited five maternal and child health centers in the Irbid governate, which is located in the north of Jordan. This location was selected given the largest population capacity. According to the most recent record of population estimation, the Irbid governate has the second-largest metropolitan population after Amman; it had about 2,095,700 at the end of 2022 (Department of Statistics, Jan 2023). The selected centers for the study were Alsareeh Health Center, Almazar Health Center, Ibn Seena Health Center, Al-Razi Health Center, and Dahyat Al-Hussein Health Center. These centers provide maternal and child health services with the largest capacity. In addition, mothers usually have a prescheduled appointment visit for their infants' vaccination.

Alsareeh Health Center is located in Alsareeh City in the southeastern area of the Irbid governorate. Almazar Health Center is located in Almazar Alshamali town, in the southwestern area of Irbid. Ibn Seena Health Center is located in downtown Irbid. Alrazi Health Center is located in Bushra town in the eastern region of Irbid. Dahyat Al-Hussein Health Center is located in the southwestern area of Irbid. Figure 1. shows a

map location of the health centers above.

The smartphone was reported to be the most common mobile device across emerging economies, and Jordan was documented to have the second-highest number of smartphone users (85%) after Lebanon (86%) (Silver et al., 2019). In this country, more educated people were more likely to use smartphones (93%) compared to those less educated (76%) (Silver et al., 2019). Jordanian adults reported that WhatsApp (78%) and Facebook (71%) were the most popular social media use (Silver et al., 2019).

To my knowledge, no studies were conducted in Jordan that assessed how the use of technology, including smartphones and the internet, influenced parental attention to their children and how this was associated with relationships between mothers and children (Hiniker et al., 2015; Johnson, 2017; McDaniel & Radesky, 2018; Radesky et al., 2016). There have not been any studies to examine problematic mobile device use and its associations with mother-to-infant attachment and infant negative affectivity.

Participants/Sample and Sample Size

In the current study, a convenience sample of mothers who have infants aged 2 to 6 months in Irbid governate Jordan was recruited. Previous studies assessed maternal attachment and infant temperament or negativity using the same age group of infants (Ali et al., 2021; Condon & Corkindale, 1998; Gutierrez & Ventura, 2021; Putnam et al., 2014). For the current study, 18 predictors include problematic mobile device use, mobile device use frequency, maternal age, infants' age, infants' gender, mothers' level of education, maternal employment, marital status, family income, and family composition/the number of children, receiving support, physical health, mental health,

self-perception of mental health, self-perception of physical health, interruption of childcare due to physical health, interruption of childcare due to mental health, purposes of mobile device use. In this present study, purposes of mobile device use were used from previous studies **(**Hinker et al., 2015; Wolfers et al., 2020; Smith, 2011**).**

The sample size was determined by power analysis using the G* Power 3.1.9.4 program. I selected the number of predictors to be 18, and F tests: Linear multiple regression, fixed model, and R^2 deviation from zero. Using an a priori effect size, a minimum sample size was 150. One approach to calculating the desired sample size is referring to the literature to find similar studies to estimate the effect size (Anderson et al., 2017). For example, Gutierrez and Ventura (2021) assessed associations between maternal technology use and mother-to-infant attachment; this study calculated effect size by referring to Cohen's f^2 (f^2 was ≥ 0.02, ≥ 0.15, and ≥ 0.35 for small, medium, and large effect size respectively), the p-value was <0.05. For Cohen's power analysis, a medium effect size is desirable, and a p-value of 0.05 and a power of 80 are the most commonly used (Chuan & Penyelidikan, 2006). Ali et al. (2021) used the former's values to calculate the sample size in their study of assessing associations between maternal smartphone use and mother-to-infant bonding. My research study used a larger sample size to overcome any dropout or non-response rate.

Inclusion and Exclusion Criteria

Mothers were included if they (1) speak the Arabic language, (2) own a mobile device, (3) have infants who were born full-term and aged between 2 to 6 months as of the data collection date, (4) aged >18 years, and (5) are the primary caregiver for the infants. Participants were excluded if infants had feeding and/or development problems (i.e., autism, cerebral palsy, cleft lip, cleft palate, etc.). The same exclusion criteria were

used in a similar study that assessed maternal technology use, postnatal attachment, and infant negativity (Gutierrez & Ventura, 2021).

Recruitment, Data Collection, and Ethical Considerations

After obtaining the Institutional Review Board (IRB) approval from the UWM, Jordan University of Science and Technology, and the Ministry of Health of Jordan, I visited the health centers and met the charge nurse or health professional there, and I introduced myself, my purpose of research, and recruitment. I asked the charge person if there were any specific days that mothers' visits were expected to reach the highest capacity, considering holidays. I visited each health center based on dates with the highest capacity of appointments.

I conducted surveys using the paper-and-pencil method as not all participants have internet access to the online survey. I determined the eligibility by asking the participants to answer questions related to their eligibility. Before filling out the survey, I explained the study and confidentiality and privacy issues (i.e., no names or other identifiers in the survey) to eligible participants. Also, participants were informed that their participation was voluntary, and they had the right to stop the survey at any time without any penalty, consent forms were explained to them. Eligible participants who showed approval to participate in this study and filled out the vast majority of study variables in the main survey were qualified to receive a blanket for their infant as compensation for their time and effort. I selected a light blanket costing about 2.50$. As an insider researcher, I estimated this price based on my own judgment since this amount is considered a modest incentive in this area of Jordan, and mothers will appreciate this form of compensation for their participation. This light blanket can be

used for multiple purposes that are valuable for mothers and their babies. Mothers can use it to cover their chests during breastfeeding since the Islamic religion prohibits women from exposing their bodies to the public while breastfeeding. Also, this blanket can be used to wrap the baby's body and fix hands, making it easy for mothers to breastfeed their infant and keep their body warm, enhancing the mother-to-infant attachment process.

Theoretical Framework

The Mother-to-Infant Attachment Theory of Ainsworth-Bowlby (Ainsworth, 1969a; 1969b; Bowlby, 2008a; 2008b) mainly guides the present study to explain how maternal mobile device use impacts mother-to-infant attachment and infant negativity. The Incentive Sensitization Theory of Addiction (Robinson et al., 2013) was used to describe the process of smartphone addiction.

Problematic Mobile Phone Use or Addiction

The entire process of mothers becoming addicted to mobile devices was explained by Robinson et al. (2013) Incentive Sensitization Theory. Originally, this theory was developed to provide a theoretical model for drug addiction (Robinson et al., 2013), but new attempts have been made to apply the theory to behavioral Addiction, such as gambling (Thomsen et al., 2014). Behavioral Addiction starts with (1) seeing reward cues, followed by (2) having incentive stimuli (excessive levels of wanting), (3) being motivationally attractive and continuing to use, and finally, (4) reaching Addiction (Thomsen et al., 2014).

Mother-to-Infant Attachment

The mother and child's psychological connection was explained by the Mother-to-

Infant Attachment Theory of Ainsworth (1969a; 1969b) and Bowlby (2008a; 2008b). Any psychological disconnection/separation between the mother and her child that could be related to maternal use of a mobile device and being mentally busy with this device was explained by maternal deprivation. Bowlby (2008a) reported that the attachment between a mother and her infant carries a 1) sense of security and joy when it is successful, 2) jealousy, anxiety, and anger when it is endangered, and 3) depression and grief when it is broken. Bowlby (2008a) reviewed the literature regarding the two-way or reciprocal communication between parents and children and its role in having healthy emotional development in a child (Bowlby, 2008a). Having an intimate emotional bond lies within the attachment framework, where the parents are in a position to build this bond with their children during the childhood stage (Bowlby, 2008a). One main feature of having intimate relationships is building emotionally mediated communication (Bowlby, 2008a). The attachment theory hypothesis focused on how a child is treated by his parents, especially his mother figure, which has a significant impact on child development (Bowlby, 2008a).

Mother-infant attachment is a relationship where the child is expected to build a tie/bond with his mother because she is the primary caregiver and the child's secure base (Bowlby, 2008a; 2008b). Thus, the mother needs to respond to the child's needs (such as feeding, cleaning, and proximity) to support the child's development and enable the child to explore the outside world (Bowlby, 2008a; 2008b). Then children consider her their role model by learning the behavior and following her advice and instructions (Bowlby, 2008a; 2008b).

Ainsworth (1969b) introduced the maternal sensitivity concept to recognize four

elements that explain how mothers appropriately respond to their child, including (1) being knowledgeable and aware of the child's signals, (2) making accurate interpretations behind their meaning, (3) performing appropriate response, and (4) responding to them on time (Ainsworth, 1969b). Being a sensitive mother depends on three elements, including being (1) aware of the child's needs, (2) free from any distortion, and (3) empathetic (Ainsworth, 1969b). A mother sensitive to her child's needs tends to understand her child's cues and signals accurately, promptly, and appropriately (Ainsworth, 1969b). In contrast, when a mother is not sensitive to her child's needs, she is more likely to neglect her child and be unresponsive (Ainsworth, 1969b).

Mobile Device Use and Mother-Child Interaction

According to Bowlby (2008a), parents are a secure base for their children. They are expected to respond to the child's needs (such as feeding, cleaning, and proximity) to support his development (Bowlby, 2008a). Having enough time and a relaxed environment are essential for parents to be responsive or sensitive to their child's needs (Bowlby, 2008a). This requirement is especially crucial when the mother takes most of the parenting throughout the early months or years of the infant's life. Although they may be sitting at the same table, the mother may not always be physically and emotionally available to her child. Johnson (2017) reported that mothers who used smartphones in front of their children directed less attention toward them because they prioritized completing the work on their smartphone over responding to the child's calls. A longitudinal study with a proportionately stratified random sample of 6233 fourth-grade school students in Taiwan found that higher psychological neglect that children experience was significantly linked to higher levels of children's internet addiction (Hsieh

et al., 2016). This association can be explained by how smartphone use diverted parents' attention, as they became mentally connected to the mobile device rather than their children (McDaniel & Radesky., 2018).

Previous studies demonstrated that mothers who used smartphones during parenting may have ignored their child's needs, and the child may have responded improperly afterward (McDaniel & Radesky., 2018; Radesky et al., 2014). For example, Radesky et al. (2014) reported that caregivers who were heavily absorbed in their mobile devices tended to ignore, respond slowly, or not respond to their children's cries for attention by keeping their eyes fixed on the screen.

Mobile Device Use and Infant Behavior

McDaniel and Radesky (2018) documented that children (aged ≤ 5 years) tended to show difficulties in their internalizing and externalizing behaviors when their mothers and fathers used technology devices in front of them. This observation showed examples of internalizing behaviors, including whining, sulking a lot, and feeling hurt easily. Externalizing behaviors included restlessness, hyperactivity, being easily frustrated, and temper tantrums. In South Korea, a descriptive correlational study with 41 mothers of preschoolers (aged 3-6 years) found a significant association between maternal smartphone dependency and child aggression, oppositional, and emotional instability (Kim et al., 2022).

For infants, characteristics of negative affectivity is a personality trait similar to neuroticism (Putnam et al., 2014). This trait reflected significant positive loadings on sadness, distress at limitations, and fear, as well as high negative loadings on falling reactivity (Putnam et al., 2014). Fuertes et al. (2006) found that mothers who regarded

their infants' temperament as more challenging at one and three months engaged with them during free play less sensitively and passively at nine months. Gutierrez and Ventura (2021) assessed maternal technology use and mother-to-infant attachment indicators during mother-infant interactions. According to this study, there were associations between having higher technology use during this dyad interaction and higher dimensions of the infant's temperament (negative affectivity; Gutierrez & Ventura, 2021). However, infant negativity did not mediate correlations between technology use and mother-to-infant attachment indicators (Gutierrez & Ventura, 2021).

Study Variables

Based on the previous literature, this present study used maternal problematic mobile device use as an independent variable (IV), infant negativity as a mediator, and mother-to-infant attachment as a dependent variable (DV). Figure 2 shows the proposed conceptual model. Table 1 explains the directions of relationships between the main study variables based on the previous literature. The controlled sociodemographic data included maternal age, infant age, infant gender, mothers' level of education, maternal employment, marital status, family income, and family composition/number of children. Also, given the previous literature, additional variables were controlled, including receiving support, physical health, mental health, self-perception of mental health, self-perception of physical health, interruption of childcare due to physical health, interruption of childcare due to mental health, and purposes of mobile device use. In a previous study, Ali et al. (2021) controlled maternal characteristics (i.e., mothers ' level of education, age, number of children, employment, and family income, mental health)

when studying mother-to-infant attachment and smartphone use factors.

One cross-sectional study showed that smartphone addiction might be associated with age, education, unemployment, and smartphone use hours (Aznar-Díaz et al., 2019). Another cross-sectional study documented that smartphone addiction was predicted by being under the age of 21, being unemployed, having small family members, and having a high family income (Alosaimi et al., 2022). McDaniel and Radesky (2018) used maternal age, education, marital status, family income, and family composition to study parental technology use and child behavior problems. Morris et al. (2022) proposed a mediation model to show how parental technoference (technology-based interference) due to smartphone use could impact child language development. For this model, parental technoference due to smartphone use is used as IV, eye gaze, joint attention, and parental responsiveness are used as mediators to language development outcomes of children (Morris et al., 2022). In this study, technoference reflects technology-based interference. Children of mothers of mobile phone use might show behavioral difficulties (McDaniel and Radesky, 2018). A study found associations between technology use during mother-to-infant interaction and the infant's temperament (negative affectivity; Gutierrez & Ventura, 2021). However, infant negative affectivity did not mediate correlations between technology use and mother-to-infant attachment indicators (Gutierrez & Ventura, 2021). Davis et al. (2022) found that infants' age mediates associations between maternal technology use and negative affectivity; associations were stronger in younger infants than older ones. Johnson (2019) found that smartphone interference in parenting was significantly associated with problematic smartphone use. However, there were no significant associations

between smartphone interference and parent-to-child attachment (Johnson, 2019). Lower maternal sensitivity was associated with using a smartphone for long periods, but lower sensitivity did not correlate with the frequency of use (Wolfers et al., 2020). Infants who were securely attached to their parents showed more positive affect and less negative affect when compared with those who were insecurely attached (Nam & Beyer, 2016).

Study Hypotheses

The main hypothesis: mothers who have higher levels of problematic mobile device use tend to have lower levels of postnatal attachment.

Hypothesis #1: mothers who have higher levels of problematic mobile device use tend to have infants with higher levels of negative affectivity.

Hypothesis #2: Infant negative affectivity mediates associations between problematic mobile device use and postnatal attachment.

Measurement

Maternal characteristics

The sociodemographic characteristics are categorical measures. They include mothers ' education level, employment, marital status, maternal age, family income, family size, infants' age, infants' gender, and the number of children. Also, this section has other categorical variables related to mental and physical health, including receiving support, physical health status, mental health status, self-perception of mental health status, self-perception of physical health status, interruption of childcare due to physical health status, interruption of childcare due to mental health status, purposes of mobile device use.

Frequency of Mobile Device Use

I assessed the mobile device use frequency by asking mothers, “How often do you use your mobile device in general?” and “How often do you use your mobile device while spending time with your infant?” their answers were rated on a scale from 1 (never) to 7 (always).

Mobile devices in this study refer to small handheld devices that have the telephone feature and can be used by touching their screens or keyboards (i.e., phones and tablets) (Ayers et al., 2014). To address the frequency of mobile device use, Wolfers et al., 2020 used the question “How often do you use your smartphone in general?” on a scale from 1 (never) to 5 (very often).

Problematic Mobile Device Use

After working with a methodologist, the 4-items of Distraction in Social Relations and Use of Parent Technology (DISRUPT) measure, created by McDaniel (2021), were adapted. Also, Aday and Cornelius’s (2006, p74, p369) textbook was used to guide the adaptation process of this scale.

This scale is used in this study for two reasons. First, this instrument is a quick, simple self-report survey. Second, this instrument is reliable and valid to assess the tendency of problematic mobile device use in parenting during interactions with their children. This measure has a 5-point Likert scale ranging from (1) to (5) with an overall score ranging from 5 to 20. The averaged items reflect the overall DISRUPT score for a parent. Higher scores indicate levels of parental agreement on struggling with the mobile device while spending time with children. The content validity for this scale was assessed by two experts before conducting the study.

Mother-to-Infant Attachment

The Maternal Postnatal Attachment Scale was used to assess maternal attachment to her infant during the postnatal period, in particular during the first 12 months (Condon & Corkindale, 1998; Condon, 2015). This scale has 19 items with three factors, including 1) quality of attachment, 2) absence of hostility, and 3) pleasure in interaction. They had an internal consistency of about 0.78 (Condon & Corkindale, 1998). Also, the scale's internal consistency (α), as determined by Gutierrez and Ventura (2021), was 0.78 for the quality of attachment, 0.73 for the absence of hostility, and 0.68 for pleasure in interaction. The 19 items are rated on a 5-point Likert scale from (1= low attachment) to (5= high attachment) (Condon, 2015). A higher score indicates higher attachment. The Likert points are calculated by having the total items' scores ranging from 19 to 95. Reverse items should be taken into account during calculations. For those that do not have the exact 5 points, it is recommended to represent a score (1) as a low attachment and (5) as a high attachment to ensure equal weight. For example, question four has four Likert points instead of five, and their options are given scores of 1; 2.3; 3.6; and 5.

Infant Behavior of Negative Affectivity

The 37-item revised, very short form of the infant behavior questionnaire was used to assess infant behavior (IBQ-RVS) *(*Gartstein & Rothbart, 2003; Putnam et al., 2014*).* This scale has three subscales including 1) negativity or negative affectivity, 2) orienting/regulatory capacity, *3)* and positive affectivity/surgency. Mothers were asked to report their infant's behaviors including infant negativity to meet the main purpose of this study. Their responses were rated on a 7-point Likert-type scale ranging from (1=Never)

to (7=always). This scale was used in our study because of conciseness and high reliability. A study reported a high internal consistency of IBQ RVS subscales *(*α = 0.78 for negative affectivity; α = 0.75 for orienting/regulatory capacity, and α = 0.77 for positive affectivity/surgency*) (*Putnam et al., 2014*).* In addition, the subscale's internal consistency (α), as determined by Gutierrez and Ventura (2021), was 0.84 for negative affectivity, 0.76 for orienting/regulatory capacity, and 0.86 for positive affectivity/surgency. The total scores are computed, and high-low scores are compared to the mean and standard deviation.

Translation

The scales used were in English, and our target population was Arabic speakers. We considered translating the scales into Arabic. We followed the team translation method of the TRAPD model with five steps 1) Translation, 2) Review, 3) Adjudication, 4) Pretesting, and 5) Documentation) (Survey Research Center, 2016). Two individual translators initiated the translation and produced two parallel versions of the scale (version A). Then reviewers reviewed the previous version to refine it and produce the final version (version B). The adjudicator decided whether the final copy was ready to go to the pretesting. Additional adjudication was further discussed to produce the final version of the scale (version C). The translators were instructed to use conceptual equivalence and cultural equivalence, not word-by-word techniques, and to translate into the natural and acceptable language of the target culture.

Data Management Plan

The software Statistical Package for the Social Science (SPSS, ver. 23) was used to analyze the data. All study variables were defined in a codebook. I cleaned the

data and evaluated the DVs for enough variability to ensure data accuracy. Before beginning the study, all study variables' frequencies and distributions were assessed as an additional measure of safety. The SPSS file was saved on a secure server and encrypted. The UWM's One Drive housed online data, which only be accessible to approved users. I had a unique user ID and password to gain access to this data. Following the IRB's guidelines, the data will be discarded within five years of data collection.

Data Analysis Plan

The primary purpose of the present study was to assess whether problematic mobile device use was associated with mother-to-infant attachment and infant negativity among mothers of infants aged 2 to 6 months. Based on that, the present study has three research hypotheses; I referred to each hypothesis separately to have a complete data analysis plan. The Statistical Package for the Social Sciences (SPSS) 23 was used to perform the data analysis.

The main hypothesis: mothers who have higher levels of problematic mobile device use tend to have lower levels of postnatal attachment.

Hypothesis #1: mothers who have higher levels of problematic mobile device use tend to have infants with higher levels of negativity.

Hypothesis #2: Infant negativity mediates associations between problematic mobile devices and postnatal attachment

To test the first two hypotheses, the Pearson correlation *r*-test and multiple regression model were used. The Pearson correlation *r*-test was used to assess the magnitude and direction of the relationship between study variables; at least an

interval or ratio scale was used to measure variables (Polit & Beck, 2021). Multiple regression was used to test the study hypothesis and assess correlations, controlling other variables and making the analysis more practical.

Controlling variables

A multiple linear regression model was used to control the sociodemographic variables. This test is helpful in controlling the covariates that have differences between the groups being compared (Polit & Beck, 2021). A simultaneous multiple regression was used, predictors were entered into the equation at the same time. The IVs included maternal frequency of mobile device use, maternal problematic mobile device use, mothers ' level of education, maternal age, infant age, infant gender, employment, family size/number of children, marital status, family income, receiving support, physical health status, mental health status, self-perception of mental health status, self-perception of physical health status, interruption of childcare due to physical health status, interruption of childcare due to mental health status, purposes of mobile device use. The DVs include mother-to-infant attachment and infant negative affectivity.

Levels of measurement for dependent variables in multiple linear regression should be interval or ratio, and predictors can be categorical or interval or ratio (Polit & Beck, 2021). Typically, categorical variables were coded as dichotomous dummy variables, where a value of 1 indicates that an attribute is present, and a code of 0 indicates that it is absent (Polit & Beck, 2021). All nominal and ordinal variables were dummy-coded in SPSS before the regression analysis. Violation of assumptions regarding normality, linearity, multicollinearity, and homoscedasticity were tested. Any further steps related to the assumption violations or possible multicollinearity

were consulted with the statistical expert.

Hypothesis #2: Infant negative affectivity mediates associations between problematic mobile device use and postnatal attachment.

Variable name	Variable type
infant negativity	Mediator
Problematic mobile device	IV
Postnatal attachment	DV

To test hypothesis #2, hierarchical multiple regression was employed to determine which independent factors were important in the model and influenced by levels of problematic mobile device use and use hours. This test involved entering predictors in a series of steps to evaluate the most important IVs once the confounding variables have been eliminated (Polit & Beck, 2021).

The mediation analysis steps of Denis's (2018, p.127) textbook were followed to assess our mediation model. The mediation path was Problematic mobile device use (IV) predicting mother-to-infant attachment (DV) diminishes or goes to zero after the inclusion of the infant's negative affectivity (mediator/other IV).

The two IVs included problematic mobile device use and infant negative affectivity and were entered into two equations separately and two models were built. For the first model (Block 1 of 2), problematic mobile device use and the controlled variables were entered in the IV. Then, the mother-to-infant attachment was entered into the DVs, followed by selecting next to build the second model. For Block 2 of 2, in the IVs, problematic mobile device use was kept, and infant negative affectivity was entered. In the DVs, the mother-to-infant attachment was kept. After adding the infant

negativity to the model, we observed what happens to the regression equation. If the regression coefficient between the IV and DV decreases, then we expect partial mediation and if it goes to zero then we will expect a full mediation (p-value will increase).

Limitations

The employed design and methodology for this study had some limitations. First, utilizing a convenience sample restricted the findings' ability to be generalized. I used the convenience sampling method of mothers who were located in the north of Jordan considering the state of problem in the area, but it could have sampling bias. Fathers were not included, given a cultural norm that Jordanian mothers were expected to play most of the parenting role in the first few years of a child's life. Second, because a cross-sectional design was used, causal inferences could not be drawn. I statistically controlled the possible related variables in the analyses. Third, collecting self-reports could predispose respondents to provide more socially acceptable information. The participants received detailed explanations from the researchers regarding how their answers to each question were handled in the strictest confidence. Finally**,** the conceptual model used was not without limitations. These limitations included having possible bidirectional relationships on study variables as displayed in Table 2. Our study was a cross-sectional type and could not be able to hold all possible limitations since they need longitudinal or experimental designs (possible cause-effect) to discover the kind of relationships.

Summary

The primary objective of the present study was to assess the association between

maternal problematic mobile device use, mother-to-infant attachment, and infant negativity among mothers who have infants aged 2 to 6 months. To achieve this objective, a cross-sectional correlational study and a convenience sample of mothers residing in the north of Jordan were used. All eligible participants were asked to fill out the study variables in the main survey using the paper-pencil method. Before that, they were asked to approve to participate, explaining the informed consent. Frequencies, mean, median, mode, standard deviation, and histograms were used to describe the sample the multiple regression model was used to assess associations and control confounding variables, and hierarchical regression was used to test the study hypotheses. This study had limitations, including (1) a convenient sample, (2) a cross-sectional correlational design, and (3) self-report measures.

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Table 1

Measures and Analytic Methods

Aims	Variables	Unit of Measurement	Analytic Methods
#1: Assess maternal problematic mobile device use, mother-to-infant attachment, and infant negativity among mothers with infants aged from 2 to 6 months in Jordan.	(1) Problematic Mobile Device Use	The adapted four items of the Social Relations and Use of Parent Technology (DISRUPT) of McDaniel (2021).	Mean, standard deviation, and histograms.
	(3) Infants' negative affectivity	The 37-item revised very short form of the infant behavior questionnaire *(IBQ-RVS) (*Gartstein & Rothbart, 2003; Putnam et al., 2014)	
	(4) Mother-to-infant attachment	The 19 items of Maternal Postnatal Attachment (Condon & Corkindale, 1998; Condon, 2015).	
#2: Assess associations between maternal problematic mobile device use, mother-to-infant attachment, and infant negativity among these mothers.	(1) Problematic Mobile Device Use	The adapted four items of the Social Relations and Use of Parent Technology (DISRUPT) of McDaniel (2021).	The Pearson correlation *r* test and multiple regression model.
	(3) Infants' negative affectivity	The 37-item revised very short form of the infant behavior questionnaire (IBQ-RVS) (Gartstein, & Rothbart, 2003; Putnam et al., 2014).	
	(4) Mother-to-infant attachment	The 19 items of Maternal Postnatal Attachment *(*Condon &	

		Corkindale, 1998; Condon, 2015).	
#3: Explore whether infant negativity mediates associations between maternal mobile device use factors and mother-to-infant attachment.	(1) Problematic mobile device use	The adapted four items of the Social Relations and Use of Parent Technology (DISRUPT) of McDaniel (2021)	Multiple regression and hierarchical regression
	(3) Infants' negative affectivity	The 37-item revised very short form of the infant behavior questionnaire (IBQ-RVS) (Gartstein & Rothbart, 2003; Putnam et al., 2014).	
	(4) Mother-to-infant attachment	The 19 items of Maternal Postnatal Attachment (Condon & Corkindale, 1998; Condon, 2015).	
Note: the controlled variables in studying the above relationships were maternal frequency of mobile device use, mothers ' level of education, maternal age, infant age, infant gender, employment, family size/number of children, marital status, family income, receiving support, physical health status, mental health status, self-perception of mental health status, self-perception of physical health status, interruption of childcare due to physical health status, interruption of childcare due to mental health status, purposes of mobile device use.			

Table 2

How the Study Variables Are Correlated

Study Variables	Kind of the Relationships from the Literature
Maternal mobile device use and infant negativity	**Bidirectional** 1- Children of mothers of mobile phone use might show behavioral difficulties (McDaniel and Radesky, 2018). Parents may use the mobile device to escape from the stress of child difficulties, then they withdraw from parent-child interaction (McDaniel, & Radesky, 2018). A study found associations between technology use during mother-to-infant interaction and the infant's temperament (negative affectivity; Gutierrez & Ventura, 2021). 2- A study showed child behavioral difficulties – particularly externalizing – were associated with later higher levels of parent stress, which in turn were linked with higher downstream technology use during parent-child activities (McDaniel, & Radesky, 2018). 3- Previous studies demonstrated that mothers who used smartphones during parenting may have ignored their child's needs, and the child may have responded improperly afterward (Kim et al., 2020; McDaniel & Radesky., 2018; Radesky et al., 2014). 4- Davis et al. (2022) found that infants' age mediates associations between maternal technology use and negative affectivity; associations were stronger in younger infants than older ones. The negative effect was noted to be the highest in the free play and the mobile-phone disruptions phase compared to the control conditions (Rozenblatt-Perkal et al., 2022).
Infant temperament or negativity and attachment	**Bidirectional** 1. Infants' temperament (full-term with 2-12 months) has an effect on (a predictor) attachment (Abuhammad et al., 2021). 2. Maternal attachment did influence (a predictor) infant temperament (Takács et al., 2020). Infants who were securely attached to their parents showed more positive affect and less negative

	affect when compared with those who were insecurely attached (Nam & Beyer, 2016).
Maternal mobile device use and attachment	**Bidirectional** 1. Higher technology use was significantly associated with lower mother-to-infant attachment quality, and higher motherhood hostility (Gutierrez & Ventura, 2021). There were no significant associations between smartphone interference and parent-to-child attachment (Johnson, 2019). Lower maternal sensitivity was associated with using a smartphone for long periods, but lower sensitivity did not correlate with the frequency of use (Wolfers et al., 2020). 2. Parents may use the mobile device to escape from the stress of child difficulties, then they withdraw from parent-child interaction (McDaniel, & Radesky, 2018). 3. Parental tension was accompanied by mobile device use because of the feeling of overload between technology device use, working, and caring for children (Radesky et al., 2016). 4. Johnson (2017) reported that mothers who used smartphones in front of their children directed less attention toward them because they prioritized completing the work on their smartphone over responding to the child's calls.
Infants' negativity, attachment, and mobile device use	**Infants' temperament as a mediator** 1. This was tested in a previous study. Infant negativity (2-6 months) did not mediate correlations between technology use and mother-to-infant attachment indicators (Gutierrez & Ventura, 2021).

Figure 1

The Estimated Locations of the Selected Health Centers in Irbid, Jordan.

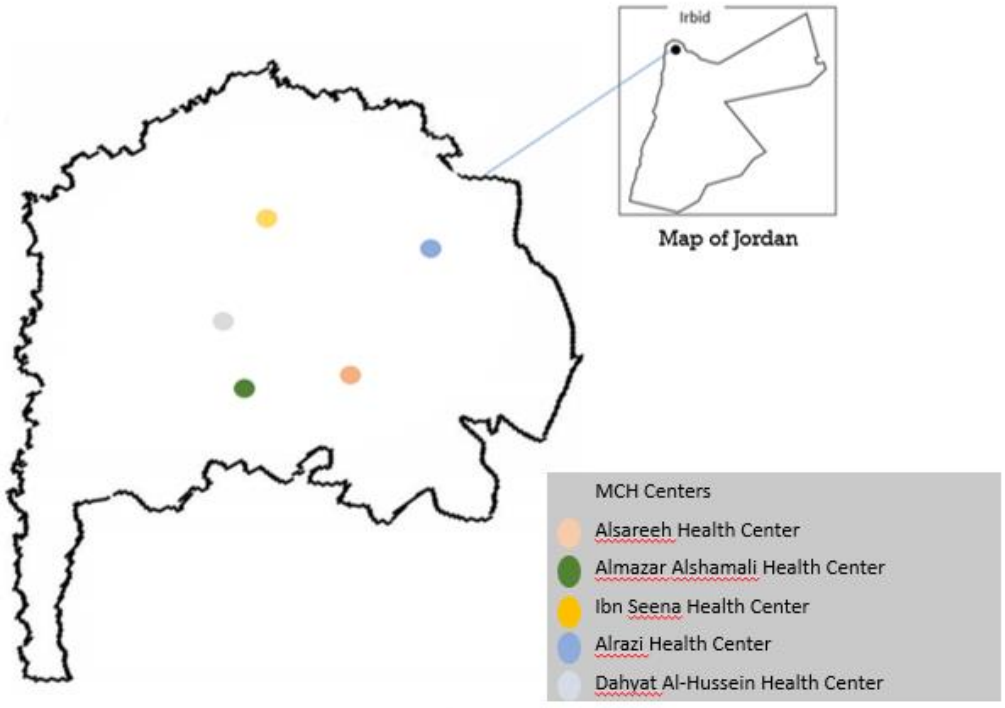
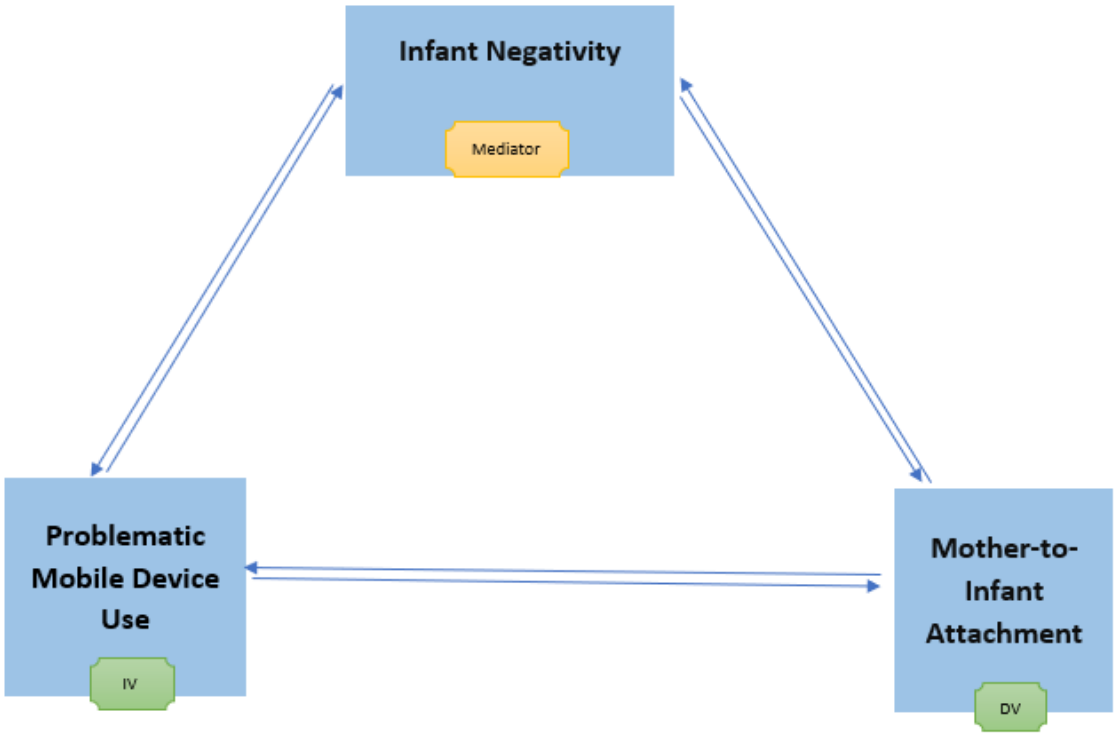


Figure 2

A Conceptual Model of Problematic Mobile Device Use and Mother-to-Infant Relationships



Note: In our current study, Problematic Mobile Device Use was considered an independent variable (IV), Mother-to-Infant Attachment was a dependent variable (DV), and Infant Negativity was a mediator. Please note that there could be possible bidirectional associations between study variables, and we only study one pathway (one limitation of this study). Also, mothers might experience further contextual factors such as having mixed emotions (i.e., depression, stress, or anxiety) or copying with mobile device use that may be associated with the attachment.

Appendix

This Appendix has five sections.
Section 1. Screening questionnaire
Section 2. General characteristics
Section 3. DISRUPT
Section 4. Maternal Postnatal Attachment
Section 5. Infant Behavior Questionnaire-Revised Very Short Form

Section One

Section 1. Screening Questionnaire

Before filling out the main page of Appendix, please note that you may not be qualified to fill it. Please answer these questions to check if you can continue to the next page. Please end the survey if you answer "no" to a, b, c questions and "Yes" to d question.

	Yes	No
a. Do you speak and read Arabic?		
b. If you are the infant (2-6 months old)'s primary caregiver, do you describe your relationship with the infant as "their mother"?		
c. Do you own a mobile device (phones and tablets)?		
d. Are your infants aged between 2 to 6 months?		
e. Are you aged at least 18 years?		
f. Does your infant have any developmental or feeding problems?		

Before moving to each section as below, please note that Mobile devices refer here to mobile phones or tablets.

Section Two

Section 2. General Characteristics

Part One

Instructions: for the following questions, please circle the number that you feel best to describe your answer to the question at present. Questions 11 and 12 ask you to record numbers. Please do so.

1. **During spending time with your infant, could you please indicate why you use your mobile device use? (Select all that apply)**

Purposes of mobile device use	
a. Text messaging	
b. Take a picture/photo	
c. Send a photo or video	
d. Access the internet	
e. Send or receive an email	
f. Play a game	
g. Play Music	
h. Download an app	
i. Record video	
j. Use social networking sites	
k. Watch a video	
l. Post a photo or video online	
m. Online banking	
n. Access twitter	
o. Video call or video chat	
p. Audio call	
q. Check the time	
r. Not use	
s. Other (Please specify:_____)	

2. **"How often do you use your mobile device while playing with your infant?"**

1	2	3	4	5	6	7

Never	Rarely	Occasionally	Sometimes	Often	Very often	Always

3. **"How often do you use your mobile device while feeding your infant?"**

1 Never	2 Rarely	3 Occasionally	4 Sometimes	5 Often	6 Very often	7 Always

4. **"How often do you use your mobile device while comforting your infant?"**

1 Never	2 Rarely	3 Occasionally	4 Sometimes	5 Often	6 Very often	7 Always

5. **"How often do you use your mobile device while changing the diaper or clothes for your infant?"**

1 Never	2 Rarely	3 Occasionally	4 Sometimes	5 Often	6 Very often	7 Always

6. **"How often do you use your mobile device while bathing your infant?"**

1 Never	2 Rarely	3 Occasionally	4 Sometimes	5 Often	6 Very often	7 Always

7. **"How often do you use your mobile device in general?"**

1 Never	2 Rarely	3 Occasionally	4 Sometimes	5 Often	6 Very often	7 Always

8. **What is the highest grade or year of school you completed?**

Never attended school or only attended kindergarten	1
Grades 1 through 8 (Elementary)	2
Grades 9 through 11 (Some high school)	3
Grade 12 or GED (High school graduate)	4

College 1 year to 3 years (Some college or technical school)	5
College 4 years or more (College graduate)	6
Refused	7

9. Are you?

Married	1
Divorced	2
Widowed	3
Separated	4
Never Married	5
A member of an unmarried couple	6
Refused	9

10. Could you select what best category described your household income (JD/month)?

<=366	1
>366	2
Do not Know	3

Refused	4

11. What is your age? RECORD NUMBERS OF AGE IN YEARS_____.

12. What is your infant's age? RECORD NUMBERS AGE IN MONTHS_____

2	3	4	5	6

13. What is your infant's gender?

Male	1
Female	2
Not identified	3

14. How many children in total do you have? SELECT NUMBERS_____

1	1
2	2
3	3
>=4	4

15. Are you currently…? (If more than one, say "select the category which best describes you")

Employed for wages	1
Self-employed	2
Out of work for 1 year or more	3
Out of work for less than 1 year	4

A Homemaker	5
A Student	6
Retired	7
Unable to work	8
Refused	9

16. Which one of the following do you say is your nationality?

Jordanian	1
Palestine	2
Syrian	3
Others (Please specify:_____)	4

17. In general, does anyone help you with childcare?

Yes	1
No	2
Refused	3

18. During the past two weeks, did you have any physical health problems, including physical illness and injury?

Yes (**move to question 14a**.)	1
No	2
Do not Know	3
Refused	4

14a. Did your physical problems keep you away from caring for your child, such as bathing, soothing, or feeding?

Yes	1
No	2
Do not Know	3
Refused	4

19. During the past two weeks, did you have stress/depression and emotional problems?

Yes (**move to question 15a.**)	1
No	2
Do not Know	3
Refused	4

15a. Did your mental health keep you away from caring for your child, such as bathing, soothing, or feeding?

Yes	1
No	2
Do not Know	3
Refused	4

20. Please select the best answer that applies to your health status.

	Excellent	Very good	Good	Fair	Poor	Not sure	Refused
a. In general, how do you rate your physical health?	1	2	3	4	5	6	7
b. In general, how do you rate your mental health, which includes stress, depression, and problems with emotions?	1	2	3	4	5	6	7

Section 3. DISRUPT

Section Three

The adapted four items of Distraction in Social Relations and Use of Parent Technology (DISRUPT) of McDaniel (2021)
Instructions: For each of the following four statements, please circle the number that you feel best to describe your answer to the statements during the time I spend with my child. Please note that there are no wrong or right answers. Here are the statements.

1.	How often do you think about what you could be doing on your phone or mobile device or the messages/notifications you might receive?	**1** Never	**2** Rarely	**3** Sometimes	**4** Often	**5** Always
2.	How easy or difficult is it for you to stay away from checking your phone or mobile device?	1 Very easy	2 Easy	3 Neither easy nor difficult	4 Difficult	5 Very difficult
3.	How often do you feel you use your phone or other mobile device too much?	1 Never	2 Rarely	3 Sometimes	4 Often	5 Always
4.	How true is the following statement to you? "There are times that I could play with or interact with my child, but I am on my mobile phone or device instead"	1 Definitely false	2 Somewhat false	3 Neither true nor false	4 Somewhat true	5 Definitely true

Working with the committee members, this version is adapted. The original copy of DISRUPT scale is taken from McDaniel, B. T. (2021). The DISRUPT: A measure of parent distraction with phones and mobile devices and associations with depression, stress, and parenting quality. *Human Behavior and Emerging Technologies*, *3*(5), 922-932.

Section Four

Section 4. Maternal Postnatal Attachment

Maternal Postnatal Attachment Scale of Condon (2015)
Instructions: These questions are about your thoughts and feelings about your baby. Please tick one box only in answer to each question.

PM1 When I am caring for the baby, I get feelings of annoyance or irritation:

- ☐ Very Frequently
- ☐ Frequently
- ☐ Occasionally
- ☐ Very rarely
- ☐ Never

PM2 When I am caring for the baby I get feelings that the child is deliberately being difficult or trying to upset me:

- ☐ Very Frequently
- ☐ Frequently
- ☐ Occasionally
- ☐ Very rarely
- ☐ Never

PM3 Over the last two weeks I would describe my feelings for the baby as:

- ☐ Dislike

☐ No strong feelings towards the baby

☐ Slight affection

☐ Moderate affection

☐ Intense affection

PM4 Regarding my overall level of interaction with the baby I:

☐ Feel very guilty that I am not more involved

☐ Feel moderately guilty that I am not more involved

☐ Feel slightly guilty that I am not more involved

☐ I don't have any guilty feelings regarding this

PM5 When I interact with the baby I feel:

☐ Very incompetent and lacking in confidence

☐ Moderately incompetent and lacking in confidence

☐ Moderately competent and confident

☐ Very competent and confident

PM6 When I am with the baby I feel tense and anxious:

☐ Very frequently

☐ Frequently

☐ Occasionally

☐ Almost never

PM7 When I am with the baby and other people are present, I feel proud of the baby:

☐ Very frequently

☐ Frequently

☐ Occasionally

☐ Almost never

PM8 I try to involve myself as much as I possibly can PLAYING with the baby:

☐ This is true

☐ This is untrue

PM9 When I have to leave the baby:

☐ I usually feel rather sad (or it's difficult to leave)

☐ I often feel rather sad (or it's difficult to leave)

☐ I have mixed feelings of both sadness and relief

☐ I often feel rather relieved (and it's easy to leave)

☐ I usually feel rather relieved (and it's easy to leave)

PM10 When I am with the baby:

☐ I always get a lot of enjoyment/satisfaction

☐ I frequently get a lot of enjoyment/satisfaction

☐ I occasionally get a lot of enjoyment/satisfaction

☐ I very rarely get a lot of enjoyment/satisfaction

PM11 When I am not with the baby, I find myself thinking about the baby:

☐ Almost all the time

☐ Very frequently

☐ Frequently

☐ Occasionally

☐ Not at all

PM12 When I am with the baby:

☐ I usually try to prolong the time I spend with him/her

☐ I usually try to shorten the time I spend with him/her

PM13 When I have been away from the baby for a while and I am about to be with him/her again, I usually feel:

☐ Intense pleasure at the idea

☐ Moderate pleasure at the idea

☐ Mild pleasure at the idea

☐ No feelings at all about the idea

☐ Negative feelings about the idea

PM14 I now think of the baby as:

☐ Very much my own baby

☐ A bit like my own baby

☐ Not yet really my own baby

PM15 Regarding the things that we have had to give up because of the baby:

☐ I find that I resent it quite a lot

☐ I find that I resent it a moderate amount

☐ I find that I resent it a bit

☐ I don't resent it at all

PM16 Over the past three months, I have felt that I do not have enough time for myself or to pursue my own interests:

☐ Almost all the time

☐ Very frequently

☐ Occasionally

☐ Not at all

PM17 Taking care of this baby is a heavy burden of responsibility. I believe this is:

☐ Very much so

☐ Somewhat so

☐ Slightly so

☐ Not at all

PM18 I trust my own judgement in deciding what the baby needs:

☐ Almost never

☐ Occasionally

☐ Most of the time

☐ Almost all the time

PM19 Usually when I am with the baby:

☐ I am very impatient

☐ I am a bit impatient

☐ I am moderately patient

☐ I am extremely patient

Preliminary Factor Structure
Items in brackets( ) are reverse scored
Quality of attachment: 3 4 5 6 (7) (10) (14) 18 19
Absence of hostility: 1 2 15 16 17
Pleasure in interaction: all reversed (8 9 11 12 13)
To ensure equal weighting of all questions it is recommended that response options be recoded to represent a score of 1 (low attachment) to 5 (high attachment) for every question. For example:
Question PM4 would be scored as: 1; 2.3; 3.6; 5
Question 8 would be (reverse) scored as: 5; 1

Condon, J. (2015). *Maternal Postnatal Attachment Scale* [Measurement instrument] Retrieved from: http://hdl.handle.net/2328/35291

Section Five

Section 5. Infant Behavior Questionnaire-Revised Very Short Form

Maria A. Gartstein
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Infant Behavior Questionnaire – Revised
Very Short Form

INSTRUCTIONS: Please read carefully before starting:
As you read each description of the baby's behavior below, please indicate how often the baby did this during the LAST WEEK (the past seven days) by circling one of the numbers in the left column. These numbers indicate how often you observed the behavior described during the last week.

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

The "Does Not Apply" (X) column is used when you did not see the baby in the situation described during the last week. For example, if the situation mentions the baby having to wait for food or liquids and there was no time during the last week when the baby had to wait, circle the (X) column. "Does Not Apply" is different from "Never" (1). "Never" is used when you saw the baby in the situation, but the baby never engaged in the behavior listed during the last week. For example, if the baby did have to wait for food or liquids at least once but never cried loudly while waiting, circle the (1) column.

Please be sure to circle a number for every item.

1. When being dressed or undressed during the last week, how often did the baby squirm and/or try to roll away?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

2. When tossed around playfully how often did the baby laugh?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

3. When tired, how often did your baby show distress?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

4. When introduced to an unfamiliar adult, how often did the baby cling to a parent?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

5. How often during the last week did the baby enjoy being read to?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

6. How often during the last week did the baby play with one toy or object for 5-10 minutes?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

7. How often during the week did your baby move quickly toward new objects?

1	2	3	4	5	6	7	NA
Never	Very Rarely	Less Than Half the Time	About Half the Time	More Than Half the Time	Almost Always	Always	Does Not Apply

8. When put into the bath water, how often did the baby laugh?

1	2	3	4	5	6	7	NA
Never	Very Rarely	Less Than Half the Time	About Half the Time	More Than Half the Time	Almost Always	Always	Does Not Apply

9. When it was time for bed or a nap and your baby did not want to go, how often did s/he whimper or sob?

1	2	3	4	5	6	7	NA
Never	Very Rarely	Less Than Half the Time	About Half the Time	More Than Half the Time	Almost Always	Always	Does Not Apply

10. After sleeping, how often did the baby cry if someone doesn't come within a few minutes?

1	2	3	4	5	6	7	NA
Never	Very Rarely	Less Than Half the Time	About Half the Time	More Than Half the Time	Almost Always	Always	Does Not Apply

11. In the last week, while being fed in your lap, how often did the baby seem eager to get away as soon as the feeding was over?

1	2	3	4	5	6	7	NA
Never	Very Rarely	Less Than Half the Time	About Half the Time	More Than Half the Time	Almost Always	Always	Does Not Apply

12. When singing or talking to your baby, how often did s/he soothe immediately?

1	2	3	4	5	6	7	NA
Never	Very Rarely	Less Than Half the Time	About Half the Time	More Than Half the Time	Almost Always	Always	Does Not Apply

13. When placed on his/her back, how often did the baby squirm and/or turn body?

1	2	3	4	5	6	7	NA

Never	Very Rarely	Less Than Half the Time	About Half the Time	More Than Half the Time	Almost Always	Always	Does Not Apply

14. During a peekaboo game, how often did the baby laugh?

1	2	3	4	5	6	7	NA
Never	Very Rarely	Less Than Half the Time	About Half the Time	More Than Half the Time	Almost Always	Always	Does Not Apply

15. How often does the infant look up from playing when the telephone rings?

1	2	3	4	5	6	7	NA
Never	Very Rarely	Less Than Half the Time	About Half the Time	More Than Half the Time	Almost Always	Always	Does Not Apply

16. How often did the baby seem angry (crying and fussing) when you left her/him in the crib?

1	2	3	4	5	6	7	NA
Never	Very Rarely	Less Than Half the Time	About Half the Time	More Than Half the Time	Almost Always	Always	Does Not Apply

17. How often during the last week did the baby startle at a sudden change in body position (e.g., when moved suddenly)?

1	2	3	4	5	6	7	NA
Never	Very Rarely	Less Than Half the Time	About Half the Time	More Than Half the Time	Almost Always	Always	Does Not Apply

18. How often during the last week did the baby enjoy hearing the sound of words, as in nursery rhymes?

1	2	3	4	5	6	7	NA
Never	Very Rarely	Less Than Half the Time	About Half the Time	More Than Half the Time	Almost Always	Always	Does Not Apply

19. How often during the last week did the baby look at pictures in books and/or magazines for 5 minutes or longer at a time?

1	2	3	4	5	6	7	NA

Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

20. When visiting a new place, how often did your baby get excited about exploring new surroundings?

1	**2**	**3**	**4**	**5**	**6**	**7**	**NA**
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

21. How often during the last week did the baby smile or laugh when given a toy?

1	**2**	**3**	**4**	**5**	**6**	**7**	**NA**
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

22. At the end of an exciting day, how often did your baby become tearful?

1	**2**	**3**	**4**	**5**	**6**	**7**	**NA**
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

23. How often during the last week did the baby protest being placed in a confining place (infant seat, play pen, car seat, etc.)?

1	**2**	**3**	**4**	**5**	**6**	**7**	**NA**
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

24. When being held, in the last week, did your baby seem to enjoy him/herself?

1	**2**	**3**	**4**	**5**	**6**	**7**	**NA**
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

25. When showing the baby something to look at, how often did s/he soothe immediately?

1	**2**	**3**	**4**	**5**	**6**	**7**	**NA**
Never	**Very**	**Less**	**About**	**More**	**Almost**	**Always**	**Does**

	Rarely	**Than Half the Time**	**Half the Time**	**Than Half the Time**	**Always**		**Not Apply**

26. When hair was washed, how often did the baby vocalize?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

27. How often did your baby notice the sound of an airplane passing overhead?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

28. When introduced to an unfamiliar adult, how often did the baby refuse to go to the unfamiliar person?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

29. When you were busy with another activity, and your baby was not able to get your attention, how often did s/he cry?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

30. How often during the last week did the baby enjoy gentle rhythmic activities, such as rocking or swaying?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

31. How often during the last week did the baby stare at a mobile, crib bumper or picture for 5 minutes or longer?

1	2	3	4	5	6	7	NA
Never	**Very**	**Less**	**About**	**More**	**Almost**	**Always**	**Does**

	Rarely	**Than Half the Time**	**Half the Time**	**Than Half the Time**	**Always**		**Not Apply**

32. When the baby wanted something, how often did s/he become upset when s/he could not get what s/he wanted?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

33. When in the presence of several unfamiliar adults, how often did the baby cling to a parent?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

34. When rocked or hugged, in the last week, did your baby seem to enjoy him/herself?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

35. When patting or gently rubbing some part of the baby's body, how often did s/he soothe immediately?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

36. How often did your baby make talking sounds when riding in a car?

1	2	3	4	5	6	7	NA
Never	**Very Rarely**	**Less Than Half the Time**	**About Half the Time**	**More Than Half the Time**	**Almost Always**	**Always**	**Does Not Apply**

37. When placed in an infant seat or car seat, how often did the baby squirm and turn body?

1	2	3	4	5	6	7	NA

Never	Very Rarely	Less Than Half the Time	About Half the Time	More Than Half the Time	Almost Always	Always	Does Not Apply

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Section V: Data Analysis

Descriptive Results

The primary objective of the present study was to assess the association between maternal problematic mobile device use, mother-to-infant attachment, and infant negativity among mothers who have infants aged 2 to 6 months. To achieve this objective, a cross-sectional correlational study and a convenience sample of mothers residing in the north of Jordan were used. Frequencies, mean, median, mode, standard deviation, and histograms were used to describe the sample, and the Pearson correlation *r* test and multiple regression model were used to assess associations and control confounding variables, and hierarchical regression was used to assess the most important independent factors in the model.

Cleaning the Data

During the initial stage of data preparation within the SPSS framework, comprehensive data-cleaning procedures were applied to both categorical and continuous variables. The process entailed an exhaustive evaluation of any instances of misclassification or inconsistencies in coding, and univariate descriptive statistics such as outliers, means, standard deviations, and missing values. The investigation extended to evaluating multivariate assumptions encompassing normality, linearity, multicollinearity, homoscedasticity, and the independence of errors. Before that, categorical variables were dummied to properly assess the former assumptions. The refinement process was guided by established methodologies outlined in the statistical Meyers et al., (2017)' textbook and was further enriched by consultations with a statistical expert.

The Socio-demographic Characteristics

Table 3 presents the detailed sociodemographic characteristics of mothers and their infants. Table 4 shows these characteristics after the dummying process. This study included a

sample of 250 mothers with their infants aged from two to six months. The mothers aged between 18 and 46 years (N=249), their mean age is about 29.32 years (SD=5.83). Their infants were aged between two and six months (mean =3.53, SD=1.24). Most of the mothers in this study were married (96.8%), with few of them divorced and separated (3.2%). The income distribution of families varies; about half of them (53.9%) earn less than or equal to 366 Jordanian Dinner (JD), while 46.1 percent earn more than this amount. Infant genders are nearly distributed equally, with 48.2 percent of the sample being male and 51.8 percent being female. Mothers had one to more than four children; almost three-quarters had fewer than three children (75.5%), and the remaining had four or more (24.5%).

Regarding maternal employment, more than three-quarters of mothers (86.3%) did not work at the time of the study, and only 13.7% did (as shown in Table 4). In particular, 78.3 percent described themselves as homemakers (as shown in Table 3). Having a college graduate represents the highest educational level (54.9%). The vast majority of mothers in this study were Jordanian (75.1%), and few of them were Syrian and Palestinian (24.9%) nationalities.

Table 3

Sociodemographic Characteristics

Measures	Categories	% (N)
Maternal age: Min =18 Max=46, Mean =29.32, SD=5.83, N=249. Infant Age: Min=2, Max=6, Mean=3.53, SD=1.24, N=250	-	-
Marital status	Married	96.8(242)
	Divorced	2.0(5)
	Widowed	0
	Separated	1.2(3)

	Refused (No answer)	0
Household income	<=366	41.8(104)
	>366	35.7(89)
	Do not Know	7.2(18)
	Refused (No answer)	15.3(38)
Infant gender	Males	48.2(118)
	Females	51.8(127)
	Not identified	0
Number of children	1	28.9(72)
	2	23.3(58)
	3	23.3(58)
	>=4	24.5(61)
Maternal employment	Employed for wages	7.2(18)
	Self-employed	6.4(16)
	Out of work for 1 year or more	0.8(2)
	Out of work for less than 1 year	0.8(2)
	A Homemaker	78.3(195)
	A Student	5.2(13)
	Retired	0.0
	Unable to work	0.8(2)
	Refused (No answer)	0.4(1)
Maternal education levels	Grades 1 through 8 (Elementary)	7.2(18)
	Grades 9 through 11 (Some high school)	6.0(15)
	Grade 12 or GED (High school graduate)	31.2(78)

	College 1 year to 3 years (Some college or technical school)	12.8(32)
	College 4 years or more (College graduate)	41.2(103)
	Refused (No answer)	1.6(4)
Nationality	Jordanian	74.2(184)
	Palestine	3.2(8)
	Syrian	21.4(53)
	Others	1.2(3)

Table 4

Sociodemographic Characteristics after Dummying

Measures	Categories	% (N)
Marital status	Married	96.8(242)
	Divorced and separated	3.2 (8)
Household income	<=366	53.9(104)
	>366	46.1(89)
Infant gender	Males	48.2(118)
	Females	51.8(127)
	Not identified	0
Number of children	1-3	75.5 (188)
	>=4	24.5 (61)
Maternal employment	Current work	13.7(34)
	Not work currently	86.3(214)
Maternal education levels	High school or less	45.1 (111)
	College Education	54.9 (135)
Nationality	Jordanian	75.1(184)
	Palestine and Syrian	24.9 (61)

Table 5 displays data on psychosocial and physical health including receiving support in infant care, perceptions of their physical and mental health, and interruptions in daily lives. Table 6 shows them after the dummying process. According to Table 6, mothers who acknowledged that they received help in infant care represent 42.7 percent of the participants, while 57.3% did not. Also, mothers' perceptions of their physical and mental health were assessed. More than one-third of mothers (36.8%) reported physical health problems, 35.1 percent report mental health problems, and a few mothers reported that these issues interfere with their daily activities (35.1% for physical and 30.7% for mental health interference) (as shown in Table 6). However, perceptions of health were generally favorable, with about half of participants rating their physical health as excellent and very good (50.8%), and more than half of them rating their mental health the same (60.8%) (Table 5).

Table 5

Data on Psychosocial and Physical Health

Measures	Categories	% (N)
Receiving any help in infant care	Yes	42.3(105)
	No	56.9(141)
	Refused (No answer)	0.8(2)
Physical health problems	Yes	36.0(89)
	No	61.9(153)
	Do not know	0.4(1)
	Refused (No answer)	1.6(4)
Physical health interference	Yes	13.2(33)
	No	24.4(61)
	Do not know	2.0(5)
	Refused (No answer)	60.4(151)
Mental health problems	Yes	37.7(93)

	No	58.7(145)
	Do not know	0.4(1)
	Refused (No answer)	3.2(8)
Mental health interference	Yes	10.8(27)
	No	24.4(61)
	Do not know	2.0(5)
	Refused (No answer)	62.8(157)
Physical health perception	Excellent	17.2(43)
	Very good	33.6(84)
	Good	25.6(64)
	Fair	19.6(49)
	Poor	3.2(8)
	Not sure	0
	Refused (No answer)	0.8(2)
Mental health perception	Excellent	32.4(81)
	Very good	28.4(71)
	Good	17.6(44)
	Fair	14.0(35)
	Poor	4.0(10)
	Not sure	1.2(3)
	Refused (No answer)	2.4(6)

Table 6

Data on Psychosocial and Physical Health after Dummying

Measures	Categories	% (N)
Receiving any help in infant care	Yes	42.7 (105)
	No	57.3(141)
Physical health problems	Yes	36.8 (89)
	No	63.2(153)
Physical health interference	Yes	35.1 (33)

	No	64.9 (61)
Mental health problems	Yes	39.1 (93)
	No	60.9(145)
Mental health interference	Yes	30.7 (27)
	No	69.3 (61)

Data on Mothers' Mobile Device Use

Tables 7 and 8 show data on purposes and frequencies of mobile device use. As shown in Table 7, the highest percentage of purposes of mobile device use includes 1) using social network sites, followed by 2) taking a picture/photo, 3) accessing the internet, 4) video call or video chat, 5) audio call, and 6) text messaging. The lowest percentage of mobile device use includes 1) use for others, 2) sending or receiving an email, 3) online banking, and 4) accessing Twitter. Participants specified "others" as listening to the Quran or news.

Table 7 *Purposes of mobile device use*	
Purposes	**%** (250)
1. Text messaging	32.0%
2. Take a picture/photo (2)	46.0%
3. Send a photo or video	23.6%
4. Access the internet (3)	**40.4 %**
5. Send or receive an email	8.0%
6. Play a game	14.8%
7. Play Music	14.8%
8. Download an app	12.4%
9. Record video	18.0%
10. Use social networking sites (1)	**58.8%**
11. Watch a video	20.8%
12. Post a photo or video online	10.8%
13. Online banking	10.4%
14. Access Twitter	11.2%
15. Video call or video chat	38.8%

16. Audio call	31.2%
17. Check the time	24.0%
18. Not use	6.4%
19. Other (i.e., listening to Quran or news)	2.0%

Table 8 presents data (mean values and standard deviations (SD) on frequencies of maternal mobile device use during diverse interactive sessions between a mother and her infant. This table explains how often mothers used their mobile devices during key interaction periods with their infants including playing, feeding, comforting, changing the diaper, bathing, and generally. Their responses were rated on a Likert scale ranging from never (1) to always (7).

Table 8 shows variations in frequency and the differences in standard deviations across caregiving activities. The highest overall frequency of mobile device use was reported in general (mean 3.33, SD 1.51) compared to periods of infant interaction. The highest frequency of mobile device use during interactions with infants was found during 1) comforting followed by 2) playing, 3) feeding, 4) changing the diaper, and 5) bathing. For simplified further analysis, the initial five items in Table 8, representing the frequency of mobile device usage during infant interactions, were utilized to reflect the "frequency of maternal mobile device use during infants' interaction". The sixth item was employed to only indicate the overall frequency of use (use in general).

Table 8

Frequencies of Mobile Device Use during Infants' Interaction, N=246

	Mean	SD
1) During playing with infants	2.09	1.44
2) During feeding your infants	1.96	1.53
3) During comforting infants	2.23	1.76

4) During changing the diaper or clothes for infants	1.65	1.34
5) During bathing infants	1.45	1.12
In general,	3.33	1.51

Descriptive Statistics and Reliability

Descriptive examinations were conducted on the continuous variables (as shown in Table 9). Three items of the Disrupt scale and 15 items of the mother-to-infant attachment scale were used in this analysis. The choice to include these items in the Disrupt and mother-to-infant attachment scales was determined by the outcome of the Cronbach alpha test, with the guidance of a statistical expert throughout the process. The reliability of the instruments used in the study was evaluated by measuring their internal consistency through Cronbach's alpha correlation coefficients, as shown in Table 9.

Initially, for the Disrupt scale, comprising all four items, Cronbach's alpha was 0.63, indicating a moderately acceptable level of internal consistency among the items. Before that, two experts assessed this adapted scale with a Content Validity Index of 75 % and 100%, indicating quite relevant to highly quite relevant items. Items numbered one, two, and three of the Disrupt scale exhibited a slightly higher Cronbach's alpha of 0.67, suggestive of improved consistency when the fourth item is omitted. For the 19 items of the mother-to-infant attachment scale, Cronbach's alpha was reported at 0.63. The 15 items of the mother-to-infant attachment (items numbered 15, 16, 17, and 18 were excluded), showed an enhanced alpha value of 0.71, implying that the selected items form a more internally consistent scale. Also, frequencies of mobile device use during infants' interactions yielded Cronbach's alpha of 0.670. Finally, the infant negativity scale achieved the highest alpha value of 0.73, indicating a good level of internal consistency. This value was almost the same across different age groups (0.73 in early

months (2-4) and 0.72 in late months (5-6)), infant ages were estimated only in the whole months, and extra days or weeks were not included.

For the continuous variables as shown in Table 9, outliers were detected, as evidenced by the presence of extreme minimum and maximum values. Furthermore, the average scores for continuous variables appeared reasonable. Additionally, the variables were assessed for any breaches of the assumptions necessary for the statistical methods selected to address the research inquiries in this study. To accomplish this, histograms, normal Q-Q plots, boxplots, skewness, and kurtosis were examined for all continuous variables, a judgment reinforced by working with a statistical expert and using Meyers et al., (2017)' textbook as an additional guide.

The DISRUPT Scale

The normality of the DISRUPT scale was assessed using the Kolmogorov-Smirnov test, which yielded a significant result ($p<0.001$). In large studies, it could be useful to refer to the histogram/graphs to understand normality (Meyers et al., 2016). The histogram displays a symmetrical bell-shaped curve, indicating normal distributions. The normal Q-Q plot demonstrated that the observed values were in close alignment with the straight line, further supporting the variable's normality. The skewness value fell within acceptable limits (0.368).

The Mother-to-Infant Attachment

Upon examining the distribution of the data through both graphical and statistical methods, indicating that the postnatal attachment scale deviates from normality. The Q-Q plot indicates the presence of heavier tails than those found in a normal distribution because it clearly deviates from the linearity expected in a normal distribution, especially in the tails. Conversely, a quantitatively confirmed leftward skew is indicated by the histogram, which lacks the symmetrical bell-shaped curve typical of normal distributions (skewness value = -1.20).

Further statistical examination using the Kolmogorov-Smirnov test supports the graphical analysis. With a p-value of less than 0.001, the test result is statistically significant, robustly rejecting the null hypothesis of normality for the data. In combination, these graphical observations and statistical tests confirm that the mother-to-infant attachment scale is not normally distributed. This skewness is expected since this study compromised participants who are mothers, achieving higher scores on attachment with their infants.

Frequency of Mobile Device Use during Infants' Interaction

The analysis of data on mobile device use frequency shows it does not follow a normal distribution. Graphical methods, like Q-Q plots, reveal deviations from expected normality, particularly at the distribution's tails, indicating it has heavier tails than a normal distribution. Additionally, the histogram shows a rightward skew, not the symmetrical bell shape typical of normal distributions, a finding supported by a skewness value of 1.43. Statistical tests, specifically the Kolmogorov-Smirnov test, with a p-value less than 0.001, significantly reject the hypothesis of normality, supporting the graphical observations. This skewness is expected since most mothers in this study are housewives at the time of the study, having at least one child. Their lifestyle and daily routines often revolve around managing household tasks and caring for children.

The Infant Negativity Scale

Both visual and statistical indicators suggest a normal distribution for the infant negativity scale. The histogram shows a reasonably symmetric shape, and this observation is supported by a skewness coefficient of 0.230. The Q-Q plot corroborates this, with data points aligning closely with the expected normal line. Additionally, the Kolmogorov-Smirnov test yields a p-value >0.05, failing to reject the null hypothesis of normality. Consequently, the data

are considered normally distributed.

Maternal Age

The distribution of maternal age appears to be normal, as indicated by both visual and statistical analyses. The histogram presents a symmetric distribution, further confirmed by a skewness value of 0.314. The Q-Q plot confirms the normal distribution, showing a close alignment of data points with the standered normal line. Moreover, the Kolmogorov-Smirnov test, with a p-value >0.05, does not provide enough evidence to violate the normality assumption. Thus, it is appropriate to conclude that the maternal age data follow a normal distribution.

Infant Age

The analysis begins with the Kolmogorov-Smirnov test, which produces a p-value of less than 0.001. However, this test is not enough to reject the null hypothesis of normality, this is followed by further examination. The histogram indicates a symmetric distribution, supported by a skewness value of 0.358. This symmetry is further verified by the Q-Q plot, where data points closely match the expected normal distribution line, supporting the failure to reject the hypothesis of normality. Therefore, the infant age data are considered to follow a normal distribution. Mothers were asked to fill their infant ages in whole months, mothers who reported 2.5, 3, and 20 days or alike was recorded as 2, 3, etc to be lined within the inserted categories.

Table 6 shows the descriptive statistics for the maternal and infant ages along with the main study variables. The mean for the DISRUPT was 2.63(SD=0.93), for the mother-to-infant attachment was 60.96 (SD=7.64), for the frequency of mobile device use was 9.46 (4.91), and for the infant negativity was 3.94 (SD=1.02). The observed range of values fell within acceptable limits.

Table 9

The Descriptive Statistics for the Main Variables, N=211						
Scales	Mean (SD)	Theoretical Ranges	Observed Ranges	Skewness	N	Reported Cronbach's Alpha
The DISRUPT	2.63(0.93)	1 to 5	1 to 5	0.368	211	0.67
The Mother-to-Infant Attachment	60.96 (7.64)	15 to 75	30.9 to 73.6	-1.20	211	0.71
Frequency of Mobile Devices during infants' interactions	9.46 (4.91)	5 to 35	5 to 25	1.43	211	0.67
The Infant Negativity	3.94 (1.02)	1 to 7	1.75 to 7	0.230	211	0.73
Maternal Age	29.17(5.59)	-	18 to 44	0.314	211	-
Infant Age	3.54 (1.23)	-	2 to 6	0.358	211	-

Correlations between Study Variables

A regression test was run to assess correlations between all study variables (as shown in Table 10). The test was used to have a more uniform result as this study compromised variables of diverse levels including continuous, ordinal, and categorical variables, the last two formers include diverse group levels as well. In the model, the problematic mobile device use alongside other remaining variables were entered into the model as independent variables and mother-infant attachment as a dependent one. The interruption of childcare due to mental and physical health are two conditional questions, which were not included in this model to prevent any decrease in the sample size when they were added.

Mother-to-infant attachment was significantly correlated with problematic mobile device use (r = -.224, P<0.01), frequency of mobile device uses in general (r = -.232, P<0.01), frequency of mobile device uses during interaction with infants (r = -.430, P<0.01), physical

perception (r = .153, P<0.05), and income (r =.206, P<0.01). Mother-to-infant attachment was marginally correlated with infant gender (r =.129, P=.060) and maternal age (r =.-.131, P=0.059). Problematic mobile device use was significantly correlated with frequency of mobile device use in general (r = .244, P<0.01), frequency of mobile device use during interaction with child (r = .266, P<0.01), and mental perception (r = -.245, P<0.01). Infant negativity was significantly correlated with maternal age (r = .207, P<0.01) and number of children (r =.192, P=0.01). Frequency of mobile device use during interaction with infants was significantly correlated with the Frequency of mobile device use in general (r = .454, P<0.01), purpose of mobile device use (social networking) (r = -.203, P<0.01), income (r = -.164, P<0.05), and work status (r = -.164, P<0.05). The frequency of mobile device use in general was marginally correlated with the purpose of mobile device use (social networking) (r = -.135, p=.052). Maternal age was significantly correlated with number of children (r =.480, P<0.01), work (r =.188, P=0.01), nationality (r = -.267, P<0.01). Maternal age was marginally correlated with education (r =.136, P=.052). Infant age was significantly correlated with the number of children (r = .165, P<0.05) and work (r = -.194, P=0.01). Maternal education was significantly correlated with the number of children (r = -.176, P<0.05), work (r =.255, P<0.01), and nationality (r = -.398, P<0.01). Marital status was significantly correlated with mental perception (r = -.143, P<0.05). Infant gender was significantly correlated with maternal mental health (r = -.171, P<0.05) and physical perception (r =.138, P<0.05). The number of children was significantly correlated with physical health (r =.171, P<0.05) and work (r = -.178, P<0.05). The number of children was marginally correlated with mental health (r = .131, p=.058) and income (r = -.134, p=.054). Work status was significantly correlated with nationality (r = -.254, P<0.01), support (r =.217, P<0.01), and income (r =.386, P<0.01). Nationality was significantly correlated with

physical perception (r = -.166, P<0.05), mental perception (r = -.158, P<0.05), and income (r = -.328, P<0.01). Support was significantly correlated with physical perception (r = .142, P<0.05). Physical health was significantly correlated with mental health (r =.355, P<0.01). Mental health was significantly correlated to physical perception (r = -.195, P<0.01) and mental perception (r =-.330, P<.01). Mental perception was significantly correlated with physical perception (r =.465, P<.01)

Table 10

Associations between Study Variables

	Attach	Disrupt	Neg	Frq5	FrqG	MAge	FAge	Pur	Edu	Mart
Attach	1	-.224**	-.053	-.430**	-.232**	-.131*	.059	.111	-.024	-.020
Disrupt		1	.094	.266**	.244**	.038	.056	.011	-.009	-.097
Neg			1	-.002	.043	.207**	.018	.036	.091	.123
Frq5				1	.454**	-.020	.047	-.203**	-.065	.053
FrqG					1	-.016	-.007	-.135	.021	-.037
MAge						1	.084	.013	.136*	-.078
FAge							1	-.032	-.123	-.018
Pur								1	-.047	-.124
Edu									1	-.026
Mart										1

Continued_of **Table 10**

Associations between Study Variables

	Gen	Child	Work	Nation	Sup	PH	MH	Mper	Phper	Inc
Attach	.129*	-.060	.064	.060	.085	.033	.077	.031	.153*	.206**
Disrupt	-.088	.042	-.031	-.027	-.068	-.049	.037	-.245**	-.106	-.024
Neg	.097	.192**	-.009	-.058	.024	.058	.095	-.008	.001	.007
Frq5	-.037	.071	-.164*	.048	.014	.005	-.013	-.085	-.011	-.164*
FrqG	-.110	.122	-.056	.037	-.062	.070	-.006	-.098	-.126	-.011
MAge	-.042	.480**	.188**	-.267**	.016	.103	.118	.040	-.092	-.060

	Gen	Child	Work	Nation	Sup	PH	MH	Mper	Phper	Inc
FAge	-.086	.165*	-.194**	.040	.055	.073	.067	-.092	-.070	.048
Pur	.054	.044	.102	-.078	.080	-.074	-.119	.016	.076	.129*
Edu	.026	-.176*	.255*	-.398*	.080	-.046	-.005	.163*	.051	.325*
Mart	-.066	.088	-.070	.085	.120	.119	.120	-.143*	.015	.040
Gen	1	.025	.070	.053	-.086	-.102	-.171*	.084	.138*	.055
Child		1	-.178*	.109	-.091	.171*	.131*	-.048	-.118	-.134*
Work			1	-.254**	.217**	.031	.025	.056	-.090	.386**
Nation				1	-.098	.006	-.066	-.158*	-.166*	-.328**
Sup					1	.040	.057	.065	.142*	.122
PH						1	.355**	-.127*	-.008	.079
MH							1	-.330**	-.195**	-.019
Mper								1	.465**	.089
Phyper									1	-.013
Inc										1

*Denotes significance at p <0.05 (1-tailed), ** significance at p =<0.01 (1-tailed), Yellow font * Marginal significance at p ~0.05-0.06 (1-tailed). Attach= mother-to-infant attachment, Disrupt=problematic mobile device use, Neg=infant negativity, Frq5=mobile device frequency during infant interaction, FrqG= mobile device frequency in general, MAge=mothers 'age, FAge=infants 'age, Pur= purpose of use "social networking", Edu= education, Mart=marital status, Gen=gender, Child= numbers of children in the family, Work=the current work status, Nation=nationality, Sup=support, PH=physical health, MH=mental health, Mper=Mental perception, Physical perception, Inc=income.

Coding categories: Pur: "0" =no, "1" = Yes; Edu: "0"= High school or less, "1" = College education; Mart: "0" = Divorced and separated, "1" = Married; Gen: "0" = Female, "1"= Male; Child: "0" = <4, "1" = >=4; Work: "0" = Not work currently, "1" =Work currently; Nation: "0" = Jordanian, "1" =Palestine and Syrian; Sup: No= "0", Yes= "1"; PH: No= "0", Yes= "1" ; MH: No= "0", Yes= "1"; Mper: ranged from "Poor"(low) to "Excellent" (high); Physical perception: : ranged from "Poor"(low) to "Excellent" (high); Inc: "0" = <=366, "1" =>366.

Multivariate Assumptions

The multivariate regression model has been thoroughly assessed against key assumptions. In order to assess these assumptions, the following procedures based on Meyers et al., (2017)' textbook were followed: 1) assess univariate and multivariate distributions of the quantitative variables, 2) assess linearity using scatter and residual plots, 3) check homoscedasticity to assess levels of variability across the study variables, 4) examine the independence of error through residual plots and Durbin-Watson test. After finalizing univariate analysis for this study, it was found that maternal age, infant age, problematic mobile device use, and infant negativity are considered to follow the normal distribution, skewness is only limited to mother-to-infant attachment and mobile device frequency. This skewness is expected since our sample comprised participants in the stage of becoming a mother during the perinatal period and most of them were housewives. To enhance the data distribution, data transformations were performed. When assessing assumptions of the simultaneous regression, problematic mobile device use (Disrupt) was regressed on mother-to-infant attachment. The control variables were 16, including maternal age, infants' age, infants' gender, mothers' level of education, maternal current work status, marital status, family income, family composition/the number of children, receiving support, physical health, mental health, self-perception of mental health, self-perception of physical health, and social networking as the purpose of mobile device use, frequency of use in general, and nationality.

To support linearity assumptions, the data distribution appears oval-shaped or elliptical in the pairwise plots and the data values follow the diagonal line in the residuals plot (Meyers et al., 2017). For this study, pairs of variables have some degree of linear relationship. The scatter matrix was used to assess pairwise relationships between six different continuous variables

(Maternal age, Infant age, Disrupt, Mobile device frequency, Mother-to-infant attachment, and Infant negativity). Points on the plot result form between an oval or near-circular shape to elliptical, suggesting varied degrees of linearity. However, it was difficult to draw the linearity of plots between infant age and all continuous variables because data points appear as vertical and horizontal lines. Originally, infant age was recorded in whole months rather discreetly, representing it as ordinal variables with limited collapsed categories. Later, we agreed to consider it as continuous for more practical analysis. Given the nature of pairwise plots, this interpretation is more about relationships on an ordinal variable with fixed categories rather than continuous ones. Based on Meyers et al., (2017)' textbook, it is helpful to identify such complex associations using the regression model. Referring to the residuals for this study, results showed a non-systematic pattern, which would suggest that relationships were linear.

Also, the residual analysis indicates homoscedasticity, with a random dispersion of residuals that suggests a consistent variance of errors across predictions with no discernible patterns. The Durbin-Watson statistic of 2.01 signals no autocorrelation, supporting the independence of residuals. The Durbin-Watson value is close to two indicating no autocorrelation (Durbin, & Watson, 1951, 1971).

Multicollinearity appears negligible, as evidenced by VIF values below the threshold of 10. The analysis detected ten potential outliers. This is calculated by using 17 predictors (Disrupt alongside the 16 controlled variables) at a significance level of 0.05, the cutoff value for the Mahalanobis distance, based on the chi-square distribution, is approximately 27.587 (Turney, 2023). These findings collectively affirm the model meets the multivariate assumptions above. When infant negativity was added to test mediations, the previous assumptions were nearly the same, the analysis detected six outliers.

Analysis of Research Questions

Multiple regression was run to answer research questions, in which search for a possible correlation between problematic mobile device use, mother-to-infant attachment, and infant negativity. In the first stage, the simultaneous regression was run to assess problematic mobile device use with mother-to-infant attachment. The final 16 control variables include maternal age, infants' age, infants' gender, mothers' level of education, maternal current work status, marital status, family income, family composition/the number of children, receiving support, physical health, mental health, self-perception of mental health, self-perception of physical health, nationality, frequency of use in general, and purpose of social networking mobile device use. Since Jordan is the home country of diverse refugees, the nationality variable was entered into the model. Working with statistical consultation, an agreement was reached to include the former 16 controlled variables in the final model to make the analysis more practical.

This study has 19 purposes and only “social networking” is included in the regression model since it represents the highest purpose of mobile device use in this study, simplifying the analysis. Also, the frequency of mobile device use during infants’ interaction and interruption of childcare due to maternal health were excluded from the model. Both the frequency of mobile device use during infants’ interaction and the problematic mobile device use during infants’ interaction show statistically significant when added to the model. This may make it difficult to determine the independent effect of correlated variables on the dependent variable. Also, interruption of childcare due to mental and physical health are two conditional questions that were only answered if mothers acknowledged that they had health problems, they were left unanswered if mothers acknowledged they did not. Thus, they were not included in the final model to prevent any decrease in the sample size when they were added.

Regressing the problematic mobile device alongside the former 16 variables on mother-to-infant attachment, the analysis output showed a significant result, $F(17, 145) = 2.478$, $P<0.05$, suggesting that problematic mobile device use and the controlled variables predict mother-to-infant attachment. They contribute 22.5% of the variance of the mother-to-infant attachment ($R=.474$, Adjusted $R^2 = .134$). This output supports the main study hypothesis.

The former 16 predictors were used as controlled variables to test the hypothesis main study hypothesis and hypothesis 2, a hierarchical multiple regression was used. In the first step, problematic mobile device use alongside the 16 controlled variables were entered into the model as independent variables and mother-to-infant attachment was entered as a dependent variable. In the second step, infant negativity was entered into the model as an independent variable.

The Main Study Hypothesis

The main hypothesis of this study is that mothers who have higher levels of problematic mobile device use tend to have lower levels of postnatal attachment. To test this hypothesis multiple regression analysis was performed, the independent variable was problematic mobile device use, and the dependent one was mother-to-infant attachment. The former 16 controlled variables were included in the model alongside the problematic mobile device use as independent variables. Controlling these variables, the problematic mobile device use significantly contribute to the model ($B= -155.13$, $p<0.05$) (as shown in Table 11), supporting the main hypothesis that "mothers who have higher levels of problematic mobile device use tend to have lower levels of postnatal attachment".

Hypothesis 1

According to hypothesis 1, mothers who have higher levels of problematic mobile device use tend to have infants with higher levels of infant negativity. A multiple regression analysis

was performed to test this hypothesis, problematic mobile device use and the former 16 controlled variables were entered as independent variables, and infant negativity was entered as dependent variable. This study supports a positive correlation between problematic mobile devices and infant negativity. However, this relationship was not found to be statistically significant (B=0.127, p>0.05) (as shown in Table 12). Thus, not supporting hypothesis 1.

Hypothesis 2

According to hypothesis 2, infant negativity mediates associations between problematic mobile device use and postnatal attachment. Similar steps were followed in the main hypothesis. Partial mediation may exist if the regression coefficient between the independent and dependent variables decreases, a full mediation may exist when the coefficient goes to zero (p-value will increase) (Denis's, 2018). This study found that problematic mobile device use was significantly contributing to the model (B= -155.13, P<0.05) (as shown in Table 11), and this contribution slightly increased, remaining significant after adding infant negativity (B= -153.23, P<0.05). However, the relationship between the problematic mobile device and infant negativity was not statistically significant (as shown in Table 12). Thus, the results did not yield support for hypothesis 2.

Table 11

Hierarchal Regression on Problematic Mobile Device Use and Mother-to-Infant Attachment

Predictors	B	Std. Error	Beta	t	P value
Model 1					
Constant (β_0)	4355.502	886.770		4.912	.000
Problematic Mobile Device Use	-155.133	72.023	-.184	-2.154	.033*
Frequency of Mobile Device Use in General	-82.971	43.992	-.160	-1.886	.062
Purpose of Use (social networking)	84.975	133.815	.053	.635	.527

Maternal Age	-12.656	14.702	-.091	-.861	.391
Infant Age	37.178	53.831	.058	.691	.491
Education	-42.519	147.325	-.027	-.289	.773
Marital status	-524.474	469.092	-.095	-1.118	.266
Gender	109.320	132.586	.069	.825	.411
Number of Children	52.608	184.976	.030	.284	.777
Current Work Status	63.087	211.561	.029	.298	.766
Nationality	271.200	175.511	.150	1.545	.125
Support	43.402	135.716	.027	.320	.750
Physical Health	-45.814	141.051	-.028	-.325	.746
Mental Health	238.869	147.877	.149	1.615	.109
Mental Perception	-45.963	55.406	-.083	-.830	.408
Physical Perception	143.061	70.318	.196	2.034	.044*
Income	390.259	153.025	.247	2.550	.012*
Model 2					
Constant (β_0)	4368.166	891.596		4.899	.000
Problematic Mobile Device Use	-153.230	72.714	-.181	-2.107	.037*
Frequency of Mobile Device Use in General	-82.560	44.188	-.159	-1.868	.064
Purpose of Use (social networking)	87.099	134.597	.055	.647	.519
Maternal Age	-12.183	14.884	-.088	-.818	.415
Infant Age	37.150	54.031	.058	.688	.493
Education	-39.449	148.412	-.025	-.266	.791
Marital status	-507.675	475.881	-.092	-1.067	.288
Gender	113.810	134.356	.072	.847	.399
Number of Children	55.494	186.043	.031	.298	.766
Current Work Status	60.470	212.621	.028	.284	.777
Nationality	271.228	176.165	.150	1.540	.126
Support	44.228	136.264	.028	.325	.746
Physical Health	-45.415	141.586	-.028	-.321	.749
Mental Health	241.692	148.882	.151	1.623	.107
Mental Perception	-45.431	55.655	-.082	-.816	.416
Physical Perception	143.019	70.580	.196	2.026	.045*
Income	390.087	153.596	.247	2.540	.012*
Infant Negativity	-14.886	61.222	-.020	-.243	.808

a. Dependent Variable: Mother-to-Infant Attachment

*Denotes p-values < .05

$Model\ 1: y = \sqrt{\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_{17} x_{17} + \varepsilon}$

$Model\ 2: y = \sqrt{\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_{18} x_{18} + \varepsilon}$

Where y =the Mother-to-Infant Attachment, x=the listed predictors.

Table 12

Multiple Regression of Problematic Mobile Device Use and Controlled Variables on Infant Negativity

	B	Std. Error	Beta	t	P value
(Constant)	.859	1.285		.668	.505
Problematic Mobile Device Use	.127	.104	.109	1.214	.227
Frequency of Mobile Device Use in General	.029	.064	.040	.448	.655
Purpose of Use (social networking)	.146	.193	.067	.752	.453
Maternal Age	.031	.021	.165	1.477	.142
Infant Age	-.002	.078	-.002	-.022	.982
Education	.202	.213	.093	.952	.343
Marital status	1.134	.679	.149	1.669	.098
Gender	.298	.191	.137	1.557	.122
Number of Children	.195	.268	.080	.728	.468
Current Work Status	-.172	.306	-.058	-.562	.575
Nationality	-.004	.253	-.002	-.016	.987
Support	.052	.196	.024	.264	.792
Physical Health	.025	.204	.011	.122	.903
Mental Health	.189	.214	.086	.882	.380
Mental Perception	.036	.080	.048	.453	.652
Physical Perception	-.001	.102	-.001	-.013	.990
Income	-.016	.221	-.007	-.072	.943

a. Dependent Variable: Infant Negativity

References

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Section IV: Discussion

The main purpose of this study was to assess correlations between maternal problematic mobile device use, maternal attachment to infants, and infant negativity. It mainly focused on whether maternal problematic mobile device use may be associated with lower levels of maternal attachment to infants, possibly mediated by infant negativity. A multiple regression analysis was employed to examine these correlations. This section discusses the findings presented in the data analysis section, interpreting their implications in the light of the broader context of existing research. This approach aims to critically analyze how these findings advance our understanding of the topic, evaluating a possible influence on the field. This section will also shed light on the strengths and limitations of the study and suggest directions for future research.

Hypotheses

The main purpose of this study is to examine correlations between problematic mobile device use in mothers, maternal attachment to infants, and infant negativity. The following hypotheses were tested to meet this purpose and ultimately concluded that problematic mobile device use in mothers may decrease levels of maternal attachment to infants. However, infant negativity did not mediate associations between maternal problematic mobile device use and attachment to infants.

Main Hypothesis

The main hypothesis anticipated that mothers who have higher levels of problematic mobile device use tend to have lower levels of postnatal attachment. Results from this study reported that when levels of maternal problematic mobile device use increase, the maternal attachment to infants decreases. This is consistent with other researchers' findings. According to Johnson (2019), problematic smartphone use was found to be significantly negatively related to

perceptions of parental attachment. Additionally, other research on attachment supported this, suggesting that parents who use smartphones felt less engaged with their children, lost interest in them, failed to notice their requests for attention, and reacted negatively to their children when their phone use was interrupted (Kushlev & Dunn, 2019; Radesky et al., 2014; Radesky et al., 2016). Our current findings are sensible since mothers acknowledged that they used the device for multiple purposes, indicating "accessing social networking sites" with the highest percentage of use. Also, they acknowledged that they used the device during interactive activities with infants including 1) comforting them, 2) playing with them, 3) feeding them, 4) changing the diaper or clothes for them, and 5) bathing them. This may often serve as an unintentional source of distraction.

Also, results from an experimental study that showed excessive technology use or technoference in parents might lead to decreased parental attention, with possible changes in infant negativity behaviors (Stockdale et al., 2020). When parents were asked about their beliefs of technoference, they expressed lower levels of infant negativity, but observations of their behavior using videotape recordings indicated a higher level of negativity (Stockdale et al., 2020). Stockdale et al. (2020) indicated that it was unclear if phone-based distractions uniquely and negatively impacted children's development and recommended the inclusion of a younger, age-restricted sample study to follow up and assess long-term effects.

Hypothesis 1

This hypothesis stated that mothers who have higher levels of problematic mobile device use tend to have infants with higher levels of negativity. According to the present study, the greater the problematic mobile device use, the greater the reported behavior of negativity. However, this relationship was not significant. Findings from other studies collectively point to a

complex association between parental mobile device use, parent-child interactions, and behaviors of children. While some studies identified a positive correlation between mobile device use and infants' behavior including negativity, others reported negligible or even negative correlations. For instance, two studies included mothers with their infants in the US and assessed the behavior of negativity, their findings revealed that maternal technology use during infant feeding and care had positive associations with infant negativity (Davis et al., 2022; Gutierrez & Ventura, 2021). However, one study reported that the effect of maternal technology use on infant negativity was small (Gutierrez & Ventura, 2021).

According to Myruski et al. (2018), maternal device use did not significantly predict infant behavior, caregivers did not show facial expression when they used mobile devices during infant interactions. Also, Konrad et al. (2021) reported no significant differences in behavior negativity in children during maternal smartphone use and non-use. However, habitual mobile phone use by mothers was linked to lower levels of negativity in children (Konrad et al., 2021). Together, the nuanced findings from studies highlight the complexity of drawing direct correlations between maternal mobile phone use, mother-to-infant interaction, and behavior of infant negativity. They suggest that while excessive mobile device use by parents may introduce challenges in parental interaction with children, it does not invariably lead to negative outcomes in infant behavior of negativity. Given our study's setting and culture, interpretations for the non-significant relationship between problematic mobile device use and infant negativity are further discussed under Hypothesis 2.

Nevertheless, it is crucial to note that this area of research underscores the importance of considering a range of other multifaceted factors, including the nature of phone use, parental attachment styles (Zhang et al., 2022), infant feeding practices (Vik et al., 2021), and maternal

emotional regulations including mothers' negative affectivity (Hampson et al., 2010). In this regard, Vik et al. (2021) found that parental phone use was associated with fewer daily family meals as well as an increase in negative feeding practices such as emotional control and forcing children to eat. Hampson et al. (2010) reported that the feeding habits of infants can be predicted independently by the mother's attribute of negative affectivity. Zhang et al. (2022) noticed that greater levels of negative affect in adults (e.g., depression, anxiety, loneliness) were correlated with greater levels of attachment anxiety and avoidance.

More than three-quarters of mothers were housewives at the time of the current study which is expected concerning Jordanian culture. Thus, there is a need to understand how mothers self-perceive or regulate the " infant needs including behaviors of negativity " when engaged with their mobile devices under this family dynamic. A similar perspective was explored in a qualitative Snyder et al. (2021)'s study, in comparison with working parents, managing "infants' care needs" were more frequently perceived by stay-at-home parents as barriers to interacting with a child (active play). Also, parents may perceive any disruptions in infant interactions as normal aspects of daily living (Konrad et al., 2021).

Other studies reported that correlations between technology use and infant interactive behavior including negativity were not always direct (McDaniel et al., 2018; Tharner et al., 2022). In particular, McDaniel et al. (2018) indicated that higher levels of externalizing behaviors in infants were linked to increased interference from technology, but this relationship happened through elevated levels of parenting stress. Tharner et al. (2022) did not find significant associations between the duration of smartphones and maternal, infant, or dyadic interactive behaviors. This might indicate the ability of the infants to cope with the parental habitual mobile device use. Myruski et al. (2018) offered similar explanations and recommended

more research on this area. Inoue et al. (2021) noticed that mothers habitually use Smartphones while breastfeeding, but also, they kept watching their infants with little negative emotions or problems towards children. Consistent with this observation, Konrad et al. (2021) reported that even though mothers showed expressionless faces while using the phone device (interruption), they were frequently checking in with their infants.

It is noteworthy to acknowledge that infants might also attempt to discover what's new in the surrounding environment, possibly engaging in using the mobile device handled by their mothers' hands. Researchers delve in-depth to explore possibilities of transferring technology use from mothers to children. According to Schwarzer et al. (2022)' study, higher media use in children was correlated with mothers' high screen times. Technology devices are designed for easy use, children can effectively utilize touchscreen devices, easily unlocking them and swiping the screen to navigate where they want. They might begin using mobile devices as early as one to 12 months old (Kılıç et al., 2019). This finding might point to possible permission given by mothers to their children to be employed by the device (Kılıç et al., 2019), possibly used as a pacifier to calm children. Letting children use mobile devices in this situation may introduce a new approach parents may adopt/follow to balance their parental responsibilities while being in a home technology environment. While a study reported that parents acknowledged that they were using their mobile devices or smartphones to relax and escape or detach from the surrounding stressors (Johnson, 2017), further one reported that parents were overwhelmed by having multitasking roles in balancing between work and children (Radsky et al., 2016). Also, when the caregiver is using the mobile device, children may respond by amusing themselves and increasing attention-seeking behaviors (Radesky et al., 2014). This suggests more research to learn about the home setting and contents of media that children might be exposed to. Research

should focus on raising parental understanding of the potential threats associated with being online connected, such as cyberbullying, privacy concerns, and hacking of personal data, to better protect their children. Additionally, parent education sessions are necessary to be integrated into future research to promote outside activities (i.e., playing, shopping), establish boundaries for mobile device use, and serve as role models for their children, if they see their parents do, they will follow them.

This diversity in results and perspectives reflects variations in study designs, methodologies, and contextual factors that influence the observed correlations. Overall, findings highlighted that maternal technology use might not necessarily have associations with negativity, but limitations related to each study should be considered.

Hypothesis 2

According to hypothesis 2, infant negativity mediates associations between problematic mobile device use and postnatal attachment. The results of the present study did not yield support for this hypothesis. Given the previous research findings, variations suggest that the relationship between these variables is not uniform across different settings and populations.

Consistent with a previous study, the effect of maternal technology use on attachment may be not mediated by infant negativity, as researchers acknowledged that its effect in the model was small (Gutierrez & Ventura, 2021). According to Myruski et al. (2018), the use of the mobile device by mothers did not significantly predict their infant's behavior, this happened when mothers reached a stage of lack of responsiveness and attention withdrawal while using the device. As stated in the previous section, it is noteworthy to acknowledge that most participants in the present study were housewives, their responsibilities may evolve around managing home and childcare which is a part of Jordanian culture. Parents might search for a way of regulating

these daily duties or keeping their children busy while finalizing their daily work. As documented by Kılıç et al. (2019), they might give their children consent to use mobile devices while performing household chores or daily duties. Also, other studies reported no direct correlation between technology use and infant interactive behavior including negativity (McDaniel et al., 2018; Tharner et al., 2022). This suggests that the relationship between parental technology use and child behavior, including negativity or difficult conduct, may be more complex and mediated by other factors such as the parent's stress levels and their ability to manage that stress.

As located at the center of the Middle East, factors related to this study setting and population should be considered. The case of Jordan, one of the highest home countries of refugees coming from the neighbors' borders (The UNHCR, n.d), indicates how this dynamic impacted parenting and family context in terms of psycho-emotional well-being. For example, Syrian refugees live in critical times when family separation occurs during 1) fleeing from their home country, 2) working in Jordan, and 3) being separated related to work or travel that increased due to the conflict in the area (Chandler et al., 2020). This is particularly critical for mothers because they may be more susceptible to stress related to reproductive and childbearing health issues. Syrian refugees who live in Lebanon, Turkey, and Jordan, experienced sexual and gender-based violence, decreased modern contraceptive use, irregular menstrual cycle, unplanned pregnancies, preterm birth, and infant morbidity (Samari, 2017). According to Lusby et al. (2016), a study on 242 infants, in which revealing how the link between infants' negativity and brain activity changes from negative to positive as they age from 3 to 12 months, influenced by their mothers' depression. This emphasizes the need to consider both maternal emotional and psychophysiological vulnerabilities throughout infancy, especially those who live in a country

like Jordan.

The current study involved participants from communities rooted in Islamic Arab culture, where it is common for families to have at least one child, potentially adding extra burden on the emotional-financial aspect of parents. This aspect draws attention back to possible correlated variables in the present findings. Accordingly, the present study found that mothers with more children experienced increased infant negativity, shedding light on the need for mothers to balance caregiving roles and cope with related stresses. Also, the current study found that families with more children tend to have lower incomes, indicating a further need to explore how parental psychoemotional regulation is impacted. Cultural expectations in Jordan place a significant burden on mothers, as highlighted by Ali et al. (2022), with societal norms dictating that mothers, rather than fathers, should primarily be responsible for childrearing, a belief underpinned by the extensive time they spend with them (Ali et al., 2022).

Furthermore, within this cultural framework, the cultural practice of polygamy, where a man may marry up to four women, all of whom may cohabit and live together under the same ceiling further complicates the domestic responsibilities. In particular, they are still viewed as female responsibilities rather than males (Ali et al., 2022). Together, it is particularly important to pay close attention to the psychoemotional well-being including satisfaction of spouses or women coming from this culture, especially considering how they navigate a complex household dynamic where mothers not only manage most domestic and childcare but also may have another job or share their husbands with other wives. Given a technology atmosphere, having lower paternal and maternal spousal satisfaction and permissive parents are examples of variables that may contribute to increasing the likelihood of exposing children to the internet in the family (Lee & Kim, 2023). A deeper understanding of this familial structure is essential.

Control Variables

According to the findings of this study, there were significant relationships between mother-to-infant attachment and frequency of mobile device uses in general, frequency of mobile device uses during interaction with infants, physical perception, and income. Also, the mother-to-infant attachment was marginally correlated with maternal age (r = -0.131, P=0.059) and infant gender (r =0.129, P=0.06).

Key findings from other studies suggest that problematic mobile device use by mothers could potentially interfere with the establishment of a parent-child attachment (Gutierrez, & Ventura, 2021; Johnson, 2019). This may be attributed to the reduction in direct, face-to-face interactions and non-verbal communication cues between the mother and infant (Kushlev & Dunn 2019; Krapf-Bar et al., 2022; Radesky et al., 2014; Radesky et al., 2016). Ventura et al. (2019) reported that infants whose mothers generally use little technology while feeding were notably less responsive to their mothers during times of digital media use compared to normal conditions. This suggests that the use of digital media by mothers may reduce the quality of some, but not all, elements of their interaction during feeding, indicating the need for more research with bigger and more varied groups.

Taken together, previous research indicates that mobile device use may distract mothers from responding promptly and sensitively to their infants' needs, possibly affecting the infants' perception of their mother's availability and responsiveness, essential components of secure attachment formation. Notably, when utilized properly, mobile devices can show promising results. For example, a systematic review showed that mobile application-based perinatal interventions could improve parent-to-child bonding (Chua, & Shorey, 2022). Wolfer et al. (2020) found no correlation between low maternal sensitivity ratings and frequency of usage,

while mothers who used their smartphones for longer periods had lower ratings. Recommendations made by Wolfer et al. (2020) directed more research on assessing contents that mothers access while using their devices, possibly impacting their sensitivity to their child's needs.

The findings of the present study revealed that mothers who reported higher levels of attachment to their infants perceived higher levels of physical health. This study did not delve in-depth to assess examples of what mothers perceive about physical health. Other studies collectively emphasize the critical role of early physical and emotional interactions, such as Skin-to-Skin contact (SSC) and breastfeeding, in establishing a strong foundation for mother-infant attachment and the subsequent developmental benefits for the child. For example, Bigelow and Power (2020) focused on the short- and long-term effects of SSC on mothers and their full-term children. They highlighted how SSC immediately after birth can enhance maternal attachment behaviors, increase breastfeeding initiation and duration, and improve infant physiological outcomes. Long-term benefits for the child include better emotional regulation and social development (Bigelow & Power, 2020).

The previous study underscores SSC's role in promoting a positive mother-infant relationship, which is crucial for the child's development (Bigelow & Power, 2020). Also, Bigelow et al. (2014) study explored how breastfeeding and SSC contribute to mother-infant interactions over the first three months. Findings suggest that these practices are linked with more sensitive and responsive mothering. The study illustrates that mothers who engage in SSC and breastfeeding tend to have a better understanding of their infants' cues and are more responsive to their needs, fostering a secure attachment and promoting healthy emotional and social development in infants.

Findings in the present study on income showed a positive correlation with attachment. Mothers with higher family incomes seemed to have higher levels of attachment to their infants. Studies that have looked at the connection between attachment and income have found evidence to support the findings of this study. For example, Johnson (2019) found similar results, with a possible negative correlation between attachment and anxiety. These points draw attention back to the findings of this current study, in which attachment was not associated with maternal emotional aspects. Similarly, Dau et al. (2019) reported that major depression in pregnancy and postpartum had no impact on maternal sensitivity (being responsive to the child's needs), and parental stress and maternal sensitivity were not significantly correlated.

Mothers who participated in our current study have at least one child. This may point to a possible coping mechanism, parents' resilience, or the potential for compensatory behaviors by parents in terms of their psycho-emotional well-being who are aware of limited income concerning the children they have. A strong belief rooted in Islamic culture is that children are the adornments of this worldly life, a good child will continue to pray for their parents after death. Also, families do, in fact, often have at least one kid, but in the future, parents have the hope that the children may assist the family with domestic and financial duties, especially as parents age. Notably, this current study asked mothers if they had stress, depression, and any emotional problems with only a single question.

Bowlby's theory emphasizes that while the attachment process is crucial for survival and emotional development, it is also fraught with complex emotional experiences. These experiences can shape an individual's ability to manage emotions, cope with stress, and build relationships throughout their life (Bowlby, 2008). Bowlby noted that infants show attachment behavior more prominently in stressful situations, seeking proximity and extra contact with their

attachment figure (the mother) for comfort and security (Bowlby, 2008). This can evoke mixed emotions in the mother as well, who may feel both a strong sense of love and protectiveness as well as stress or anxiety about her child's dependence on her for comfort and security. Also, Mary Ainsworth, an important contributor to attachment theory, identified different patterns of attachment (secure, avoidant, ambivalent, and disorganized) that describe how infants react to separation and reunion with their caregivers (Psychology Unlocked, 2017). Each pattern reflects different emotional dynamics between mother and infant, ranging from confidence and comfort in the relationship to fear, avoidance, ambivalence, or fear-avoidance, thus illustrating the complexity and mixed emotions involved in attachment relationships (Psychology Unlocked, 2017).

Finally, the present study found that older mothers tended to have higher levels of attachment than younger. Branjerdporn et al., (2020) noticed that younger mothers experienced pleasure in interaction with their babies than the older ones. In our study, older mothers were more likely to have a higher number of children. Thus, they were more likely to balance their maternal-emotional role to meet each child's needs. Also, mothers who gave birth to male infants reported higher scores on attachment to them than females. According to our findings, those who had male infants acknowledged that they tended to have lower mental health and higher physical perception scores. This study was recruited from Arab communities where a trend of son’s preference is still embedded within this culture, possibly restricting females’ roles in society as grow up. Previous studies explored the implications of a cultural preference for sons over daughters on various aspects of health and well-being in developing countries, highlighting gender-based health disparities that stem from this preference (Ali et al., 2022; Le, & Nguyen, 2022). Further examination of the varied effects of son preference revealed that it

disproportionately affected children from disadvantaged backgrounds, including those in rural areas, those born to mothers with lower education levels, and those from poorer families (Le, & Nguyen, 2022).

Le and Nguyen (2022) provided strong evidence of the negative impact that son preference in developing countries has on health disparities between sons and daughters. Specifically, daughters showed height-for-age and weight-for-age z-scores that were 0.135 and 0.098 standard deviations lower, respectively, than those of their male peers (Le, & Nguyen, 2022). Discrimination against women also extends to household management, affecting how family roles are assigned to a member of each family.

According to Ali et al. (2022), a study within Jordanian families confirmed enduring gender role stereotypes but there were indications of shifting attitudes toward sons' involvement in housework across different age groups, suggesting a move towards recognizing the value of shared household responsibilities. This shift appeared in decision-making regarding limiting the number of children, and exchanging visits between relatives and the family, although this stereotype did not extend to all family matters since men were still in charge of decisions related to expenses in the finances (Ali et al., 2022). Furthermore, there was considerable support for prioritizing education for girls rather than early marriage (Ali et al., 2022).

Strengths and Limitations

The current study is a cross-sectional design. While this kind of study is valuable for understanding associations at a specific point in time, it comes with several limitations. When considering a study conducted in Jordan among mothers with infants aged between two to six months, it could be crucial to take into consideration limitations related to the following: 1) causality, 2) nonrepresentative sample, 3) self-report measures, 4) cross-sectional designs, and 5)

cross-cultural limitations.

A major limitation of cross-sectional studies is their inability to establish causality (Polit, & Beck, 2021). Because the study captured associations at a certain point in time, it could not account for changes in maternal mobile device use, mother-infant attachment, or infant negativity over time. This is especially important for infants aged between two and six months old because of how quickly their growth and development changes throughout this time. Thus, the conceptual model might not represent the true nature of relationships between study variables, and this may need additional longitudinal study. For example, maternal emotional status might be influencing attachment and then mothers might use the device to escape from stress as a coping mechanism. Also, mothers who had infant males in our study tended to have lower mental health. Thus, this model might not assess additional unmeasured variables.

It's challenging to determine whether maternal mobile device use has a possible direct effect on mother-to-infant attachment and infant negativity. These variables were collected simultaneously from only Jordanian mothers with infants, with approximately equal infant gender distribution. A larger more diverse sample extended to include fathers may be required because mothers who have male infants in the selected sample's reported higher scores on the attachment scales. This may limit generalizability suggesting that it may not be entirely representative of the entire Jordanian population or both parents within a family unit. Also, this study relied on self-reported measures, requiring mothers to answer questions about their mobile device use, as well as attachment and behaviors related to their infants, predisposing to recall bias or social desirability.

Due to cultural differences around mother-infant attachment, parenting practices, controlling behaviors of infants, and mobile device usage patterns, these study's findings may not

apply to other countries or regions. These constructs are complex and multifaceted and may need additional observational or qualitative studies to capture the nature of the construct in-depth. The current study was done in Jordan, in which Arab Muslims from Jordan alongside other refugees represent most population residing in the area, practicing parenting within a family compromise of at least one child with diverse customs. In particular, the cultural practice of polygamy is still embedded within this cultural framework, where a man may marry up to four women (Department Of Statistics (DOS), 2019). All of whom, along with possibly grandparents may cohabit and live together under the same ceiling, further complicating the domestic responsibilities. Notably, these tasks are still seen as female responsibilities rather than males (Ali et al., 2022).

Although the study is subject to several limitations, it is noteworthy to acknowledge its strengths. The recruitment of participants in the north of Jordan, but diverse regions were reached. Nonetheless, this approach to data collection also stands as a strength, especially since the study concentrates on the northern area of Jordan, bordered by Syria, Iraq, and Palestine. This area boasts two direct land border crossings with Palestine and Syria (UN-Habitat., 2022). It's important to explore data on this specific area where diverse refugees may cross the border. Also, this study was collected through an in-person survey with incentives for each participant who completed the survey. The researcher was available onsite and showed motivation to answer any questions and offer any further help. This method increased the response rate as meets the sample size expectation.

The present study was collected from the north region of Jordan within the Irbid Governorate, but diverse areas were reached. About three-quarters of the participants in this survey acknowledged that they came from Jordan. The nearly remaining one-quarter of them

reported that they came from Syria and Palestine. Few of them answered their nationality as "others" without disclosing additional information. This diversity can be considered as a strength. Irbid Governorate was home to various nationalities, though they were not equally distributed. Within this Governorate, there were three available camps for Palestinian refugees, but Syrian refugees coexist with the local community without any camps for them there (UN-Habitat, 2022). Because of access to more infrastructure services, Iraqi refugees are primarily found in Irbid Qasaba's major centers (UN-Habitat, 2022). Furthermore, the nearly equal gender distribution of infants among the recruited participants may be considered a limitation, but it also served as a significant strength. This balanced representation ensured that the study captured the perspectives of both infants males and females equitably, thus accurately reflecting the demographic characteristics of a broader population. This is particularly relevant for assessing a trend of sons' preferences in families inhabiting developing countries, as was the case in the north of Jordan. Additionally, infant ages were required to be recorded in the whole months in this study, but extra days or weeks were not entered. A more precise measurement of age is necessary to better assess the reliability of the infant negativity scale in the early period, particularly around two months.

Last, to my knowledge, this study was the first of its kind to examine behaviors and attachment related to infants from the mothers' perspective, assessing possible correlations with problematic mobile device use in certain border areas in Jordan. Specifically, while the cultural norms of polygamy, preference for sons, and assigning women the main roles of household and childcare management might be seen as limitations in this study, they also represent a significant strength, as they provide insights into exploring findings on this certain culture.

A large body of attachment research examines children's attachment relationships with

both parents (Johnson, 2019; Vik et al., 2021). Studies have diverse concepts describing problematic mobile device use, they study them in diverse terms such as smartphone use and smartphone interference (Johnson, 2019), technology use (Gutierrez, & Ventura, 2021), techno-ference, mobile devices (Kılıç et al., 2019), and digital media use (Ventura et al., 2019). However, research has lacked the mother's perspective of attachment to the early age of infancy with limited types of mobile devices. This study targets a specific group of mothers with infants aged between two to six months, with the average infant age being approximately 3.53 months, and focuses particularly on the impact of mobile devices, only limited to tablets and mobile phones. Therefore, this research offers invaluable insights into a previously underexplored aspect of attachment theory within this specific demographic context in a frontier area within the Jordanian culture.

Implications

The findings of the current study have implications for future research to develop guidelines for mothers while using mobile devices in front of their infants. It provided further two-sided directions for research including 1) setting limits to maternal mobile device use as a possible distraction when engaging with infants may occur, and 2) using mobile devices in proper ways to support infants' health, delivering educational programs through this device to improve mother-infant attachment. For example, a systematic review of 12 research studies assessed the effectiveness of mobile application-based perinatal interventions in improving Parenting (Chua & Shorey, 2022). Results showed that mobile application-based perinatal interventions could improve the overall health outcomes of parents. This review's outcomes included self-efficacy, anxiety, stress, social support, and parent-to-child bonding.

Within these directions, the present study points to possible correlated variables

embedding within the Jordanian culture, this underscores the need for further research into considering these variables while assessing the direct associations between problematic mobile device use on mother-infant attachment. Also, it is noteworthy to acknowledge that mobile devices may be used for multiple purposes, this further complicates the former direct correlations. Understanding the mechanisms underlying correlations between problematic mobile device use and attachment will furnish the area to offer pathways that help in creating more effective strategies to support the maternal role in the family environment. As a part of this, it will be useful to explore the barriers and facilitators of caring for infants in which mobile device use has become an integral part of our lives. This could potentially leave a significant contribution to improving child growth development, which begins as early as the infancy period through strengthening parents' or mothers' attachments to infants.

The findings of the present study could be beneficial in creating public health programs that aim to teach mothers how to balance their use of mobile devices so that their advantages outweigh any potential drawbacks. Before that, further research needs to explore the facilitators and barriers mothers experience during the use of their mobile devices in front of their infants. Also, assessing their awareness about using mobile devices during parenting and balancing their household and any additional responsibilities including childcare is essential. By filling these research gaps, educational programs for mothers as parents could be based on mother-infant attachment to further support healthy mother-to-infant attachment, considering contexts in which mobile device use may either serve or interrupt the attachment.

As stated previously, mobile device use has become an integral part of our lives and there is evidence that if it is used probably for educational purposes, it will improve maternal health including attachments. On a higher organizational level, the results of the present study could

direct future research to influence policymaking, incorporating mobile device use into interventional programs that promote a healthy relationship between mothers and their infants while living in the family. For example, health centers could assess mother-infant attachment, directing mothers to use their mobile devices in proper ways that improve attachment. Mobile application-based perinatal interventions were found to improve parenting including mother-to-infant bonding (Chua & Shorey, 2022).

Healthcare providers could encourage mothers to use interventional programs that are accessible through websites or mobile device applications to receive information about supporting maternal and infant health such as information related to postpartum care, postpartum depression, baby blues, vaccinations, baby baths, baby warming, and breastfeeding. Also, policies that direct these programs may not only be focused on delivering this information, but also on giving mothers and parents advice on what to do if they encounter difficulties related to maternal or childcare. For example, future research needs to consider that these technology programs may direct mothers to search for medical consultation if they notice any signs and symptoms of health concerns in infants such as fever, yellowish skin, or persistent crying.

Due to the exponential growth in the development of technology, it is noteworthy to categorize the forms of technological devices within the family context based on generations. Embedding age groups in future research could be more effective to further refine and direct future policies. For example, Kılıç et al. (2018) noticed that Tablets were the most common mobile devices used among children. The present study offered information specifically on mobile phones and tablets in mothers. This point highlights the future research to study associations of infant- attachment with both mother and father concerning other technological devices, such as laptops, televisions, and other types of advanced phones, combining that use of

children. This enables compare diverse technological devices on their possible impact on fathers, mothers, and infants. This study asked mothers who had infants were all within a restricted age range, suggesting the need for future policies to classify mothers, fathers, and infants into more specific age categories. This could be applied based on future studies exploring these variables in a broader age spectrum. By examining a wider range of ages, researchers could analyze how outcomes of using diverse technical devices based on generations may be further impacted. This approach sheds new light on exploring how technology used within the family environment impacts each member, specifically how technology use in parents may be transferred to their infants or children.

Conclusion

In conclusion, this research has confirmed negative associations between maternal problematic mobile device use and mother-to-infant attachment. However, infant negativity did not serve as a mediator in the relationship between problematic mobile device use and mother-to-infant attachment. These findings highlight the complexity of the associations among these variables, specifically when it comes to Jordanian culture. This point indicates the need for further exploration into potential mediating factors to understand the mechanism behind how problematic device use may be linked with mother-to-infant attachment.

Additionally, limitations of this study should be considered while interpreting the results, providing the interrelationships among variables at certain points of time, and limiting the ability to draw firm conclusions regarding causality. Future research should incorporate longitudinal designs to better trace the temporal dynamics between these variables over time. Moreover, contextual factors that have emerged as significant should be considered in interpreting the results and in the design of future studies.

Together, this study highlights the necessity for future research to adopt qualitative approaches that can more accurately explore maternal experience embedded within complicated family practices considerate of the broader environmental and cultural dynamics. Also, further longitudinal studies can be helpful to trace changes over time. Thus, to my knowledge, the present study was the first of its kind, not only enriching our understanding of the specific associations between variables of maternal problematic mobile device use, mother-to-infant attachment, and infant negativity but also laying the groundwork for a future stage for more comprehensive research that aims to understand the complexities of their associations within an example of varied cultural contexts in Jordan.

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Section IV: A Policy Implication

Introduction

My research program focuses on assessing whether problematic mobile device use is associated with mother-to-infant attachment and infant negativity among mothers of infants aged 2 to 6 months. This section offers a brief background about problematic mobile device use and literature reviews to understand whether problematic mobile device use during parenting and to explore interventional programs or policies conducted in the area. Also, the facilitators and barriers to implementing possible interventional programs are reviewed. Parenting intervention programs and previous studies are used to explain how a possible policy would be applied. However, our study data doesn't support any specific policies at present since policies mentioned in this section are only explained as hypotheticals for potential future research.

Background

According to the latest report published by the Pew Research Center, adults worldwide hold more smartphones than ever, with ownership rates ranging from 76 % in countries of advanced economies to 45 % in emerging economies (Silver, 2019). Furthermore, according to the latest report that has been published by the Pew Research Center, during the COVID-19 pandemic, most Americans (90%) acknowledged that the internet was an essential part of their daily life (Mcclain et al., 2021). Also, the Pew Research Center (2019) reported that social media use was higher among people with higher education levels (76%) compared to those with lower education levels (65%) in the United States.

Among the technology devices, the smartphone was reported to be the most common mobile device across emerging economies, and Jordan was documented to have the second-highest number of smartphone users (85%) after Lebanon (86%) (Silver et al., 2019). Also, this country has the second highest mobile phone ownership among adults (94%) after Vietnam

(97%) (Silver et al., 2019). Jordanian adults aged between 18 and 29 years have reported having the highest smartphone use (93%) compared to other age groups (30-49; 87%, >50; 64%) (Silver et al., 2019). Also, higher educated groups (93%) in Jordan were more likely to use smartphones than lower (76%) (Silver et al., 2019). About seven in ten adults in Jordan and Lebanon said that they use Facebook (Silver et al., 2019). Also, Jordanian adults reported that WhatsApp (78%) and Facebook (71%) were the most popular social media use. The highest percentage of adults who use the internet was found in Jordan (87%) and Lebanon (87%) (Silver et al., 2019). According to the World Population Review (2023), the Jordanian population is estimated to be 11,321,271.

In the literature, the concept of smartphone addiction has been introduced to reflect the excessive and heavy use of the device (Kwon et al., 2013; Lin et al., 2016). The Center for Internet and Technology Addiction (2017) established a healthcare plan to clinically manage any person who complains of smartphone addiction. The American Psychiatric Association's (APA) Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR) (2023) has a criterion to diagnose internet gaming. However, this criterion does not include Smartphones, online gaming, or social media when people have them for general use. According to this criterion, people must "significantly impede or distress" their lives in several aspects (APA, 2023). Studies have proposed a criterion to assess smartphone addiction; one component was the uncontrollable use of a smartphone to lose interaction with genuine interpersonal relationships (Kwon et al., 2013; Lin et al., 2016). Mother-to-infant attachment is one interpersonal relationship in which parents are in a position to respond to their child's needs on time to support his development (Bowlby, 2008a). In the technology context, studies showed that mothers of technology use (i.e., smartphones) might be less likely to respond to

their child's needs on time; they may prioritize responding to their mobile device calls over their child's needs (Wolfers, 2021; Johnson, 2019; Johnson, 2017). However, another study reported that parents might use mobile devices for coping and social support purposes (Wolfers, 2021). These studies showed diverse findings regarding smartphone benefits and any possible related issues. This aspect could increase the complexity of interpreting and clearly show how smartphone use could work and interact with family behavior, particularly during mother-to-infant attachment. If substantial evidence is available, it could be essential to identify possibilities to formulate a policy to make a change or improve health care for mothers and their children. This paper is built to fill this gap.

Literature Review

Mobile phone Use during Parenting

According to Bowlby (2008a), parents are a secure base for their children[1]. They are expected to respond to the child's needs (such as feeding, cleaning, and proximity) to support his development (Bowlby, 2008a). Having enough time and a relaxed environment are essential for parents to be responsive or sensitive to their child's needs (Bowlby, 2008a). This requirement is especially crucial when the mother takes most of the parenting throughout the early months or years of the infant's life. The previous research focused on mothers' excessive and frequent smartphone use and its impacts on parenting (Johnson, 2017; Johnson, 2019; Mcdaniel & Radesky, 2018, Radesky et al., 2014).

According to the reviewed literature, two studies assessed how smartphone addiction impacted parenting among mothers (Ali et al., 2020; Song et al., 2018). One study found that mothers with smartphone addiction were likelier to exhibit nervousness and anxiety and report issues in interactions with people or work performance when they had no smartphone access

(Song et al., 2018). Another study reported that excessive smartphone use was linked to unhealthy family functioning (Ali et al., 2020). This study did not show an association between smartphone addiction and mother-to-child bonding. However, another study reported that parents might use mobile devices for multiple purposes, including information-seeking, coping, self-distraction, and seeking social support while under stress (Wolfers, 2021). In a qualitative study, parents acknowledged using their smartphones to relax and escape or detach from the surrounding stressors (Johnson, 2017). In this study, most participants admitted that they prefer face-to-face over communication through technology; smartphone availability and convenience make it easier to decide to communicate frequently (Johnson, 2017).

In addition, there is evidence that parents of technology use during their interaction with children may describe their child as difficult (McDaniel & Radesky, 2018). Two studies assessed children's health-related issues of mothers who use technology, including the internet, during parenting (Sakakihara, Haga, and Osaki, 2019; Sakakihara, Haga, Kinjo, et al., 2019). In a cross-sectional correlation study that was conducted in Japan, Sakakihara, Haga, and Osaki (2019) found that mothers who had problematic internet use (PIU) were more likely to have a boy with a thin body (body mass index <15) aged four months or 1.5 years. This association was not observed in girls. This study suggests that mothers with PIU may not feed their children enough. Also, Sakakihara, Haga, Kinjo, et al. (2019) found a significant association between maternal PIU and maternal recognition of abuse in a child aged four months, 1.5 years, or three years.

Another study conducted in the United States reported that technology devices (i.e., smartphones, mobile phones) interrupted parent-child interactions during the day among more than half of mother participants (171 (55.5%) (Mcdaniel & Radesky., 2018). Johnson (2017) found that parents of smartphone users were more likely to ignore their children's messages to

avoid losing their online connection. Radesky et al. (2016) noticed parental tension was accompanied by mobile device use and the feeling of overload between technology device use, working, and caring for children (Radesky et al., 2016). Wolfers et al. (2020) found that using smartphones for a long time in mothers was associated with less sensitivity toward their child, while the frequency of use was not associated with less sensitivity. This study indicated that it might be helpful to study what kinds of smartphone content impacted maternal sensitivity. In this regard, exploring possible virtual programs that could improve parenting and mother-to-infant attachment could be crucial.

Developing A Program to Improve Mother-to-Infant Attachment.

In future research, the present study will call the attention of healthcare administrators and health policymakers to consider a policy in healthcare for programs to use mobile devices to exchange health information with women. Mobile devices have become an integral part of human beings and offer many benefits that could help people in their lives. The smartphone is a frequently used technology that individuals utilize to access the internet and social networks (Silver, 2019). Hiniker et al. (2015) reported that the most common purposes of mobile phone use during parenting are texting and calling, followed by email, picture-taking, and Facebook. Among undergraduate students, Alotaibi et al. (2022) reported that individuals use smartphones for multitasking, such as social networking, entertainment, web surfing, education, map navigation, shopping, and gaming.

In healthcare settings, telehealth has been introduced to exchange information with patients, and there is a need to assess how this concept could be applicable in practice (Koivunen & Saranto, 2018). Nurses can utilize a smartphone as a valuable tool to share health information with mothers. Nurses can use Facebook groups to communicate with mothers about their

children's health and how to limit the hours of smartphone use for better childcare. Also, mothers commonly use social media to receive advice and support from other women who have similar experiences during pregnancy and parenting (Asiodu et al., 2015). According to Newton and Sulman (2018), using text messaging services to enhance communication in pediatric tonsillectomy patients is a creative way to educate patients and families while lowering anxiety and worry levels before and after surgery. Ali et al. (2021) reported that maternal smartphone use might not be associated with mother-to-infant bonding. This study may indicate to assess contents and methods delivered to mothers through a smartphone and impacted mother-to-infant relationships.

For maternal health, mothers commonly use social media to receive advice and support from other women who have similar experiences during pregnancy and parenting (Asiodu et al., 2015). Videos about childcare and women's experiences could be used as a guide for women, simulating reality. These videos, including Facebook groups, may be built and published on social media. Also, nurses can consider text message-based nursing interventions to send messages about appropriate care targeting mothers in prenatal or postpartum periods.

A systematic review of 12 research studies assessed the effectiveness of mobile application-based perinatal interventions in improving parenting (Chua & Shorey, 2022). Results showed that mobile application-based perinatal interventions could improve the overall health outcomes of parents. In this review, effects may include self-efficacy, anxiety, stress, social support, and parent-to-child bonding. A qualitative study used one-on-one and group interviews either in person or online (N=15 mothers, five fathers, and nine neonatal nurses), exploring parents' and staff's thoughts regarding creating a digital educational program (Lebel et al., 2021). This program aimed to meet the demands of parents of premature infants with a digital education

program covering subjects like parenting, infant behavior, appearance, and the care environment (Lebel et al., 2021). According to the findings, the participants believed parents should have access to the digital educational program as soon as possible, possibly before enrollment (Lebel et al., 2021). In addition, more than half of the participants believed that having the information presented on a website was preferable, while an equal proportion thought that an application was best. Participants also suggested different subjects be included, including information on discharge, resources accessible in the Nursing Intensive Care Unit or after discharge, and breastfeeding problems (Lebel et al., 2021).

While smartphones could be used to support parenting, it is vital to consider parenting-focused interventions to improve mother-to-infant attachment. Prinz (2016) used the term parenting-focused interventions in the context of preventing child maltreatment. Parenting or family-focused interventions share common attributes, such as being 1) theoretically driven, 2) action-focused, and 3) problem-solving orienting (Prinz, 2016). Prinz (2016) explained that parenting-focused interventions are theoretically driven when they are based on empirical theories such as family interaction, social learning, attachment, and cognitive behavioral theories. In addition, these interventions focused on the actual things that parents do at home, addressing specific challenges of parents and working toward solutions (Prinz, 2016).

Process of Implementing Parenting-Focused Programs. Parenting-focused interventions were applied to manage parental behaviors to prevent child maltreatment (Prinz, 2016). Similarly, once enough research and substantial evidence have been reached in my area of specialty; these interventions may be helpful. Future research could suggest new attempts to apply parenting-focused interventions in the area of maternal smartphone use and mother-to-infant attachment. In the first step, a pilot study could be built to assess the feasibility and

acceptability of parenting-focused interventions delivered or mediated through smartphones during the perinatal period. When studying the formats and contents of prenatal classes, Terrell et al. (2021) 's study introduced the affordability, accessibility, and discretion benefits of online forms. However, respondents in this study found that face-to-face classes were more important than online prenatal courses; they were perceived as not interesting, limited the involvement of partners in the prenatal education experience, and only contained shallow and quickly out-of-date content (Terrell et al., 2021). Another study found that the most commonly preferred method of prenatal education was face-to-face (47.5%, N= 86), followed by a combination of face-to-face and online (37.0%, *N*= 67); the online form exclusively was less common (6.6%, *N*= 12) (Kovala et al., 2016).

Silva-Jose et al. (2022) assessed how to improve future online prenatal fitness program delivery; women suggested that these programs should contain 1) flexible alternatives, 2) clear instructions, and 3) certified exercise professionals. Kim et al. (2022) compared an internet-based intervention program using Zoom video conferences versus standard face-to-face groups among pregnant women. The groups were not significantly different in feasibility, accessibility, satisfaction, susceptibility, self-efficacy, and barrier (Kim et al., 2022). Another study explored the experience of pregnant women when they attended online prenatal physical exercise during COVID-19; they reported feeling safe, connected to other women, and available for scheduling (Silva-Jose et al., 2022). It is important to explore to identify how parenting programs could be implemented to have promising outcomes. According to Prinz (2016), attributes of parenting or family-focused interventions include 1) theoretically driven, 2) action-focused, and 3) problem-solving orienting.

Theoretical-Driven Parenting Programs. One attribute of parenting-focused programs

is being theoretically driven. In my area of specialty, attachment, and family interaction theories will help me understand how maternal mobile device use during parenting impacts mother-to-infant attachment. Wolfers et al. (2020) found that using smartphones for a long time in mothers was associated with less sensitivity toward their child, while the frequency of use was not associated with less sensitivity. This study indicated that it might be helpful to study the contents of smartphone use on maternal sensitivity. A study assessed antenatal education and found that it decreased childbirth fear and increased childbirth-related self-efficacy but did not impact parental attachment (Serçekuş & Başkale, 2016). This study suggested increasing or introducing content in the educational program about parental attachment. Balasoiu et al. (2021) assessed maternal prenatal care education in women who gave birth; participants who attended the prenatal classes acknowledged the value of discussing newborn care and the importance of breastfeeding topics.

Almoajel and Almarqabi (2016) assessed online health information-seeking behavior among pregnant women; topics of fetal development, pregnancy stages, and pregnancy-related changes were the most commonly searched. Terrell et al. (2021) reported that pregnant women were most commonly asked about topics of pain management during labor, breastfeeding techniques, and labor/birth/delivery. Also, women searched commercial sites, YouTube, Facebook, and Twitter, to gain content about health-related information (Almoajel & Almarqabi, 2016).

Action Focus and Problem-Solving. Then, the basic things parents of mobile device users do at home or in front of their children will be assessed. The cognitive behavioral theory will help change parenting behaviors to improve attachment to their children. According to Doyle et al. (2022), evidence-based parenting programs can be used to change or modify

parenting practices. For example, the theory of change is used when specialists teach parents to change their children's behavior to be healthy (e.g., child nutrition, activity, and violence against others) (Doyle et al., 2022). A study compared the relationship between online and in-person antenatal classes in pregnant women during the COVID-19 pandemic (Ciochon et al., 2022). The groups statistically differ based on anxiety and depression levels, but the lowest levels were observed in in-person classes.

Facilitators of Implementing Parenting Programs

If substantial evidence supports my program of study, future research could consider how evidence-based parenting interventions will be delivered to the target population through mobile phone devices. Facilitators of parenting programs may include 1) accessibility and availability of the smartphone, 2) its convenience, 3) methods of delivering parenting programs, 4) soft entry places, and 5) health insurance issues. First, it could be helpful to explore the prevalence of mobile phone use, including Facebook, text messages, the internet, or WhatsApp. Jordan has the second-highest mobile phone ownership among adults (94%) after Vietnam (97%) (Silver et al., 2019). About seven in ten adults in Jordan use Facebook (Silver et al., 2019). Also, Jordanian adults reported that What's Up (78%) and Facebook (71%) were the most popular social media use. The highest percentage of adults who use the internet was found in Jordan (87%) and Lebanon (87%) (Silver et al., 2019).

Another facilitator of delivering interventional programs through mobile device use is its convenience. This device is easy to carry, has the features of a computer and laptop, and has applications that are easy to download. Also, the concept of telehealth is used in healthcare settings as a network between patients and healthcare professionals (Koivunen & Saranto, 2018). For example, mobile applications can be used by patients and healthcare professionals for a

variety of purposes, including diagnosis, information, communication, prevention, and treatment (Pires et al., 2020). In Jordan, future research should consider contents that could be delivered using telehealth to support and strengthen mother-to-infant attachment.

Third, future research needs to study how maternal mobile device use during parenthood will be embedded in a broader parenting support program. Doyle et al. (2022) reported that there is a need to deliver evidence-based parenting practices in flexible methods with assistance available through both telehealth and online delivery in addition to more conventional in-person services. Most adults already own smartphones, making delivering evidence-based parenting support programs easy. Jordanian adults aged between 18 and 29 years have reported having the highest smartphone use (93%) compared to other age groups (30-49; 87%, >50; 64%) (Silver et al., 2019). Also, higher educated groups (93%) in Jordan are more likely to use smartphones than lower (76%) (Silver et al., 2019).

Fourth, future research could identify the purposes of smartphone use and if virtual interventional programs could be effective. Most people rely on smartphones to access the internet because this device is so convenient (Silver, 2019). A systematic review included 31 research articles by Corralejo, and Domenech Rodríguez (2018) found that technology or web-based parenting programs have improved parenting knowledge and behaviors. Most of the interventions were assessed among white American families. In Jordan, one study reported that the main purpose of smartphone use among mothers of infants was social networking and entertainment (75%, n=164) (Ali et al., 2021)

Fifth, to reach a large population, Doyle et al. (2022) recommended using "Soft entry" places or points where families are already visiting to receive universal services, including education or primary health care. Examples of these programs or entry points in the United

States include 1) Women, Infants, and Children (WIC) Programs, 2) Head Start Programs, 3) Berks Community Action Programs, and 4) The Healthy Families America (HFA). WIC was established to protect the health of limited-income women, infants, and children up to age five years who are at risk for malnutrition (The USDA Food and Nutrition Service: U.S. Department of Agriculture, 2022). Head Start programs aim for most U.S. children, from birth to 5 years, to offer comprehensive services to help them succeed in academic and personal life (the U.S. Department of Health and Human Services, 2022). Berks Community Action Programs (n.d.) help fathers accomplish their goals by providing classes through seminars and workshops regularly each month. The model of a nationally known, evidence-based home visiting program is conducted for families that are overloaded and at risk of bad childhood experiences, including child abuse (The Healthy Families America (HFA), n.d.).

The former programs could be used as soft entry places in the United States, but the situation is different in Jordan. This country has limited financial resources to have diverse programs supporting parenting and children. One soft entry point that may be considered is referring to health insurance that could cover parents and children. Hospitals and maternal and child health centers may be helpful places parents and their children visit to receive universal services. Jordan is the home country of the original inhabitants, alongside refugees from other countries such as Syria and Palestine, and it could be helpful to explore how this diverse population receives their health insurance. According to the Department of Statistics (DSO; 2015), in this country, health insurance is covered through seven sectors, including 1) the Ministry of Health, 2) Royal Medical Services, 3) university hospitals, 4) the United Nations Relief and Works Agency (UNRWA), 5) special arrangements, 6) private sector, and 7) outside Jordan.

It would be helpful to embed parental programs that could support mother-to-infant attachment in these health insurances to reach more people with diverse needs. For example, employees who work in the governmental sector are covered by the Ministry of Health, Royal Medical Services, and university hospitals (DSO, 2015). Palestine refugees in the Near East receive their insurance through UNRWA (DSO, 2015). The special arrangements cover people who have Syrian nationality or have a clear reason for entering Jordan, as their country may have an armed conflict (DSO, 2015). In addition, there are medical exemption cases that need to be included. They have a national number; without health insurance, they can obtain medical insurance for specific periods (DSO, 2015). Finally, employees who work outside Jordan should be taken into consideration while implementing parental support programs.

Barriers to Implementing Parenting Programs

Barriers to implementing parenting programs that should be taken into consideration may include 1) funding resources, 2) health needs or disparities, and 3) health insurance issues. According to Doyle et al. (2022), research supports the effectiveness of evidence-based parenting programs. However, barriers should be taken into consideration when translating research into practice. Barriers to implementing evidence-based parenting programs include finding the available funding resources alongside meeting diverse parents' needs (Doyle et al., 2022). In my area of specialty, when virtual evidence-based parenting programs will be implemented to improve mother-to-infant attachment, it is crucial to identify resources for funding health insurance coverage. In Jordan, it could be helpful to assess the coverage of health insurance companies.

Doyle et al. (2022) reported that policymakers need to determine how much is spent in the government budget to improve evidence-based parenting practices. In this assessment,

deciding on funding sources and challenges for health insurance in this field could be helpful. Health insurance in Jordan faces difficulties related to coverage and financial costs. According to the DSO (2015), examples of the most significant problems in health insurance coverage were 1) lack of coverage for all community members, 2) insufficient funds and high cost, 3) armed conflict in areas around Jordan, and 4) the continuous growth in the population size. Sources of funding health insurance in Jordan are diverse. A premium payment is deducted from the monthly salary of the insured people (DSO, 2015). Those who receive governmental insurance take their payment from the tax funds (DSO, 2015). Private institutions may partially cover health insurance for those who work in the private sector (DSO, 2015). For other non-Jordanians, such as Palestine refugees, their payment is covered by international organizations such as UNRWA (DSO, 2015).

Another barrier to implementing a policy of evidence-based parenting programs is different parents' needs and practices. Doyle et al. (2022) reported that providing parenting support in a one-size-fits-all manner makes it difficult to expand the reach of evidence-based parenting programs; parents should be provided with a program that matches their needs. In addition to the indigenous population, Jordan is the home country of refugees from nearby countries such as Syria and Palestine. Future research should take into consideration insured and uninsured people with diverse needs to implement any possible supporting parenting programs.

According to Terrell et al. (2021), women who were marginalized and viewed as missing from prenatal educational settings include indigenous women, immigrants, and women with disabilities. Prenatal health promotion requires it to be delivered promptly, evidence-based, inclusive, and culturally safe to meet the needs of varied populations of expectant women (Terrell et al., 2021). In the case of Jordan, it could be helpful to address the indigenous

population's needs alongside other people from outside areas, such as Syrian and Palestine refugees.

According to Liu et al. (2021), uninsured people in Jordan represent more than one-quarter, and there is a need to address inequities related to health insurance coverage. The essential indicators of non-health insurance were marital status and socioeconomic factors such as wealth, education, and internet access (Liu et al., 2021). Dator et al. (2018) reported that the financial issue is the most common barrier to accessing health insurance for Syrian refugees in Jordan. Also, they found that the health needs of the refugees were related to chronic diseases, communicable diseases, emotional and mental health problems, and physical impairment (Dator et al., 2018)

Summary

Mobile devices have become widely used. People use it mainly for social networking and internet access. They have benefits in their daily life, such as education, shopping, communicating with health care providers, or socialization. Previous studies reported that mothers who are busy with mobile device use might conduct few verbal and nonverbal interactions with their children. The literature reported diverse findings regarding maternal mobile device use in relation to mother-to-infant attachment or bonding. However, mothers might use mobile devices to gain the benefits of coping and escaping from stress. Also, studies suggested understanding the contents that may affect maternal sensitivity or response to their children during mobile device use. Online parent intervention programs and parent classes might be one content that mothers need to access to learn parenting skills or requirements to improve mother-to-infant attachment. Before implementing these programs, a number of barriers and facilitators should be taken into account. Barriers to parenting programs may include 1) funding

resources, 2) health needs or disparities, and 3) health insurance issues. Facilitators of parenting programs may include 1) accessibility and availability of the smartphone, 2) its convenience, 3) methods of delivering parenting programs, 4) soft entry places, and 5) health insurance issues. However, these programs or policies were explained in this section only for hypotheticals for potential future research, our study data doesn't support any specific policies or alike at the present.

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