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PHUBBED AT HOME: A SERIAL MEDIATION MODEL OF TECHNOFERENCE, RESPONSIVENESS, MARITAL SATISFACTION, AND PARENTING STRESS

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ABSTRACT

"Phubbing" the act of snubbing a conversation partner by focusing on one's phone has emerged as a pervasive phenomenon in family life, with significant implications for parenting and relationship wellbeing. This quantitative study examines a serial mediation model linking technoference (technology interference, including phubbing) to parenting stress through the sequential pathways of parental responsiveness and marital satisfaction among Gen Z parents in Ghana. Using a cross-sectional survey design, data were collected from 420 parents (aged 22-35 years) through stratified random sampling across five regions of Ghana. Validated instruments measured technoference (Technoference Scale), parental responsiveness (Parenting Dimensions Inventory responsiveness subscale), marital satisfaction (Couples Satisfaction Index), and parenting stress (Parenting Stress Index-Short Form). Serial mediation analysis using PROCESS Macro (Model 6) with 5,000 bootstrap resamples revealed that technoference was positively associated with parenting stress ($\beta = 0.34$, $p < .001$). The serial mediation pathway through responsiveness → marital satisfaction was significant (indirect effect $\beta = 0.06$, 95% CI [0.03, 0.09]), in addition to significant independent mediation via responsiveness ($\beta = 0.11$, 95% CI [0.07, 0.16]) and marital satisfaction ($\beta = 0.09$, 95% CI [0.05, 0.13]). The total indirect effect accounted for 44% of the total effect, indicating substantial mediation. Moderation analysis revealed that work-from-home arrangements strengthened the technoference-parenting stress relationship (interaction $\beta = 0.19$, $p = .002$). The findings extend the Technoference Framework and Family Stress Model by demonstrating the cascading effects of phubbing and technology interference

across family subsystems. Implications for family interventions, workplace policies, and digital wellbeing are discussed.

KEYWORDS: *Phubbing, technoference, parenting stress, responsiveness, marital satisfaction, serial mediation, Gen Z, Ghana*

I. INTRODUCTION

The family dinner table, once a sacred space for connection and communication, has become a battleground for attention. Parents and children sit together, yet their eyes are fixed on glowing screens. Conversations are interrupted by notifications. Emotional availability is fragmented by the constant pull of digital engagement. This phenomenon has been given a name: "phubbing" the act of snubbing a conversation partner by focusing on one's phone (Roberts & David, 2016). When phubbing occurs in the family context, it represents a specific form of technoference: the interference of technology in interpersonal interactions (McDaniel & Coyne, 2016).

Phubbing at home is not merely a social annoyance; it has profound implications for family functioning. When parents phub their children, they signal that the digital world is more important than the present moment. When partners phub each other, they communicate disinterest and devaluation. Over time, these micro-interruptions accumulate, eroding the quality of parent-child and partner relationships. The consequences may be particularly significant for parenting stress the aversive psychological reaction to the demands of parenting (Abidin, 1995).

Generation Z individuals born between 1997 and 2012 represents the first cohort of parents who have grown up with smartphones as an integral part of their lives. As Gen Z parents navigate the demands of raising children in a digital age, they face unique challenges. They are "digital natives" who have never known a world without constant connectivity, yet they must simultaneously manage the developmental needs of their children and the relational needs of their partners. The phenomenon of phubbing at home may be particularly relevant for this cohort, as their comfort with technology may paradoxically increase its interference in family life.

In Ghana, where extended family networks and communal parenting have traditionally structured family life, the effects of phubbing and technoference may be especially significant. Ghanaian culture emphasises presence, respect, and attentiveness in family interactions (Nsamenang, 1992; Gyekye, 1996). The intrusion of technology into these

interactions may violate cultural norms and create unique sources of stress. Yet, no published research has examined phubbing, technoference, and parenting stress in the Ghanaian context.

This quantitative study examines a serial mediation model of technoference and parenting stress, investigating the sequential pathways through parental responsiveness and marital satisfaction. The study tests the proposition that technoference (including phubbing) reduces parental responsiveness, which in turn reduces marital satisfaction, which ultimately increases parenting stress. This cascading model, grounded in the Technoference Framework (McDaniel & Coyne, 2016) and the Family Stress Model (Conger et al., 2000), provides a comprehensive understanding of how technology interference affects family wellbeing across multiple subsystems.

II. STATEMENT OF THE PROBLEM

Despite growing recognition of phubbing and technoference as significant concerns for family relationships, several critical gaps remain in the empirical literature.

First, the specific mechanisms through which phubbing and technoference affect parenting stress remain poorly understood. While studies have established associations between technoference and relationship satisfaction (McDaniel & Coyne, 2016), and between technoference and parenting stress (McDaniel & Radesky, 2018b), the sequential pathways through which technology interference cascades across family subsystems have not been systematically examined. The serial mediation model technoference → responsiveness → marital satisfaction → parenting stress has not been empirically tested. This gap is significant because understanding the cascading effects of technoference is essential for developing targeted interventions.

Second, the role of parental responsiveness as both a direct mediator and a precursor to marital satisfaction has not been examined in the context of technoference. Prior research has examined responsiveness and marital satisfaction as separate predictors of parenting stress (Dumas et al., 2005; Carlson et al., 2018), but has not investigated the serial pathway where technoference reduces responsiveness, which reduces marital satisfaction, which increases parenting stress. The Family Stress Model (Conger et al., 2000) suggests that stressors affect family functioning through cascading pathways across subsystems, but this model has not been applied to technoference.

Third, the Ghanaian context has been absent from research on phubbing, technoference, and parenting stress. Nearly all studies on technoference have been conducted in Western,

individualistic societies. Ghanaian families, with their collectivist values, extended family networks, and different gender norms, may experience phubbing and its consequences in distinctive ways. Cultural factors may moderate the relationships among technoference, responsiveness, marital satisfaction, and stress.

Fourth, Gen Z parents represent an understudied population. As the first generation of "digital natives" to become parents, Gen Z parents have unique relationships with technology. Their familiarity and comfort with smartphones may make them more susceptible to phubbing and technoference, or conversely, more skilled at managing digital distractions. Understanding these dynamics is essential for developing age-appropriate interventions.

This study addresses these gaps by testing a serial mediation model of technoference and parenting stress, examining the sequential pathways through responsiveness and marital satisfaction, and investigating the moderating role of work-from-home arrangements.

III. PURPOSE OF THE STUDY

The purpose of this study is to examine a serial mediation model of technoference and parenting stress among Gen Z parents in Ghana, investigating the sequential mediating roles of parental responsiveness and marital satisfaction, and the moderating role of work-from-home arrangements.

IV. OBJECTIVES OF THE STUDY

General Objective

To test a serial mediation model examining the pathways through which technoference relates to parenting stress, and to examine the moderating role of work-from-home arrangements.

Specific Objectives

1. To assess the levels of technoference, parental responsiveness, marital satisfaction, and parenting stress among Gen Z parents in Ghana.
2. To examine the direct relationship between technoference and parenting stress.
3. To examine the relationship between technoference and parental responsiveness.
4. To examine the relationship between parental responsiveness and marital satisfaction.
5. To examine the relationship between marital satisfaction and parenting stress.

V. LITERATURE REVIEW

Theoretical Review

This study is guided by three complementary theoretical frameworks: the Technoference Framework (McDaniel & Coyne, 2016), the Family Stress Model (Conger et al., 2000), and the Spillover Hypothesis (Erel & Burman, 1995).

Technoference Framework. The Technoference Framework, developed by McDaniel and Coyne (2016), posits that technology use can interfere with interpersonal interactions and relationships, negatively affecting relationship quality, satisfaction, and wellbeing. The framework identifies several mechanisms through which technoference operates: (a) displacement (technology replaces face-to-face interaction), (b) distraction (technology diverts attention from ongoing interactions), (c) intrusion (technology interrupts interactions), and (d) competition (technology competes for limited attentional resources). Phubbing represents a specific form of technoference where technology use directly snubs a conversation partner. In the parenting context, technoference including phubbing may reduce the quality of parent-child and parent-partner interactions, with cascading effects on parenting stress. The framework has been empirically supported across multiple studies (McDaniel & Coyne, 2016; McDaniel & Radesky, 2018a, 2018b) and provides the theoretical basis for examining the direct and indirect effects of technology interference on parenting stress.

Family Stress Model. The Family Stress Model (Conger et al., 2000; Conger & Donnellan, 2007) posits that stressors including economic pressure, work demands, and relationship conflict affect family functioning through cascading pathways. The model emphasises that the effects of stressors on child outcomes are mediated by parenting quality and marital functioning. In the context of technoference, technology can be conceptualised as a stressor that disrupts family functioning through its effects on marital relationships and parenting behaviours. The Family Stress Model has been extensively validated across diverse populations (Masarik & Conger, 2017). The model predicts that the effects of technoference on parenting stress will be explained by its effects on marital quality and parenting behaviour, with cascading effects across subsystems. This framework provides the theoretical basis for examining serial mediation through responsiveness and marital satisfaction.

Spillover Hypothesis. The Spillover Hypothesis (Erel & Burman, 1995; Engfer, 1988) posits that emotions, moods, and interaction patterns spill over from one family subsystem to another. Positive interactions in the marital relationship spill over into positive parent-child interactions, and negative interactions spill over into negative parent-child interactions. Conversely, the hypothesis predicts that disruptions in one subsystem (e.g., parent-child) can

spill over into another (e.g., marital). In the context of technoference, the Spillover Hypothesis suggests that when technology interferes with parent-child interactions (reducing responsiveness), the negative effects may spill over into the marital relationship, reducing satisfaction. Similarly, reduced marital satisfaction may spill over into parent-child interactions, increasing parenting stress. This framework provides the theoretical basis for examining the serial pathway where technoference affects responsiveness, which affects marital satisfaction, which affects parenting stress.

Integration of Frameworks. These three frameworks are complementary and together provide a comprehensive framework for understanding the relationships under investigation. The Technoference Framework explains the phenomenon of technology interference, the Family Stress Model explains the cascading pathways to parenting stress, and the Spillover Hypothesis explains the cross-subsystem transmission of effects. The integration of these frameworks allows for a nuanced understanding of how phubbing and technoference at home affect parenting stress through sequential pathways across family subsystems.

Conceptual Review

Technoference and Phubbing. Technoference is defined as the interference and interruption of technology use in interpersonal interactions and relationships (McDaniel & Coyne, 2016). Phubbing a portmanteau of "phone" and "snubbing" is defined as the act of snubbing a conversation partner by focusing on one's phone (Roberts & David, 2016). In the parenting context, phubbing occurs when parents use their phones during interactions with children or partners, signalling disinterest and devaluing the relationship. Technoference encompasses a broader range of technology interference, including distraction by multiple devices and interruptions from various sources. Phubbing is a specific, interpersonal manifestation of technoference. The Technoference Scale (McDaniel & Coyne, 2016) measures both parent-child and partner technoference, capturing the frequency of technology interference in family interactions.

Parental Responsiveness. Parental responsiveness is defined as the extent to which parents are sensitive, warm, and attuned to their children's needs, feelings, and signals (Baumrind, 1971; Maccoby & Martin, 1983). Responsive parenting involves: (a) recognising and appropriately responding to children's cues, (b) providing emotional support and comfort, (c) engaging in warm, affectionate interactions, and (d) creating a supportive environment for exploration and learning. Responsiveness is a dimension of parenting quality that is consistently associated with positive child outcomes and lower parenting stress. The

Parenting Dimensions Inventory (PDI) responsiveness subscale (Power, 1993) operationalises responsiveness as the frequency and quality of responsive parenting behaviours.

Marital Satisfaction. Marital satisfaction is defined as the subjective evaluation of the quality of one's marital relationship (Fincham & Bradbury, 1987). It encompasses: (a) emotional satisfaction (feelings of love, affection, and closeness), (b) communication quality (perception of open, supportive communication), (c) conflict resolution (perception of effective problem-solving), and (d) overall relationship evaluation. Marital satisfaction is a robust predictor of parenting quality and family wellbeing. The Couples Satisfaction Index (CSI) (Funk & Rogge, 2007) operationalises marital satisfaction with strong psychometric properties.

Parenting Stress. Parenting stress is defined as the aversive psychological reaction to the demands of parenting (Abidin, 1995). Parenting stress is multidimensional, encompassing: (a) parental distress (anxiety, depression, feeling overwhelmed), (b) difficult child characteristics (perception of the child as demanding, difficult, or unresponsive), and (c) parent-child dysfunctional interaction (perception of the child as not meeting expectations, feeling distant from the child). The Parenting Stress Index-Short Form (PSI-SF) (Abidin, 1995) operationalises parenting stress across these three dimensions.

Work-From-Home (WFH). WFH is defined as a work arrangement in which employees perform their job duties from their home rather than from a traditional workplace. In the context of this study, WFH is operationalised as a binary variable (WFH versus not WFH) based on participants' reported current work arrangements.

Empirical Review

Phubbing and Family Relationships. Research on phubbing in family relationships has grown rapidly. Roberts and David (2016) introduced the concept of phubbing and found that it was associated with lower relationship satisfaction and higher conflict in a sample of 308 adults. The effects were mediated by perceived partner attention and responsiveness. The study found that phubbing was more strongly associated with relationship outcomes than general technology use, suggesting that the interpersonal snubbing aspect is particularly damaging.

McDaniel and Coyne (2016) found that technoference including phubbing predicted lower relationship satisfaction in both parent-child and romantic relationships. The study, conducted with 442 parents, found that technoference predicted lower relationship satisfaction even after

controlling for general technology use, suggesting that interference not just use is the critical factor. The effect was stronger for parent-child relationships than for partner relationships, suggesting that children may be particularly vulnerable to the effects of phubbing.

McDaniel et al. (2018) conducted a daily diary study and found that technoference on one day predicted lower relationship satisfaction and higher conflict on subsequent days, suggesting a cumulative effect. The effects were bidirectional: relationship dissatisfaction also predicted increased technoference, creating a cycle of disconnection. This pattern suggests that phubbing and relationship quality may reinforce each other over time.

Technoference and Responsiveness. Radesky and colleagues (2014) conducted observational research with 225 families and found that parents' technology use during parent-child interactions was associated with less responsive parenting. Parents who used mobile devices during meals or playtime were more likely to respond to their children with irritation or disengagement. The study found that technology use reduced the quality of parent-child interactions, with parents showing less emotional availability and sensitivity.

McDaniel and Radesky (2018a) examined technoference in a sample of 183 mothers and found that technoference predicted child externalising and internalising behaviours, with the relationship partially mediated by parental attention and responsiveness. The study suggested that technoference operates by reducing the quality of parent-child interactions, which in turn affects child behaviour. This finding is consistent with the proposition that technoference reduces parental responsiveness.

Technoference and Marital Satisfaction. Studies on technoference in romantic relationships have consistently found negative associations with relationship satisfaction. McDaniel and Coyne (2016) found that technoference predicted lower relationship satisfaction in both cross-sectional and longitudinal analyses, with the effect stronger for women than for men. Roberts and David (2016) found that phubbing was associated with lower relationship satisfaction and higher conflict. The effects were mediated by perceived partner attention and responsiveness.

In a daily diary study, McDaniel et al. (2018) found that technoference on one day predicted lower relationship satisfaction and higher conflict on subsequent days, suggesting a cumulative effect. The effects were bidirectional: relationship dissatisfaction also predicted increased technoference, creating a cycle of disconnection. This pattern suggests that technoference and marital satisfaction may reinforce each other over time.

Responsiveness and Marital Satisfaction. The relationship between parenting and marital functioning has been extensively studied. Erel and Burman (1995) conducted a meta-analysis

of 68 studies and found that marital functioning was consistently associated with parenting quality, with an effect size of r = 0.32. The relationship held across different ages of children and across different measures of marital and parenting functioning. The study found evidence for spillover effects, where positive marital interactions predicted positive parent-child interactions.

Carlson et al. (2018) examined marital satisfaction and parenting stress in a sample of 246 couples with young children. They found that marital satisfaction predicted parenting stress over time, with the relationship mediated by partner support. The study found that the effect was symmetrical both husbands' and wives' marital satisfaction predicted their own and their partner's parenting stress, suggesting that marital quality affects parenting stress at the family system level.

Responsiveness and Parenting Stress. Parental responsiveness is consistently associated with lower parenting stress. Dumas et al. (2005) found that responsive parenting was associated with lower levels of parenting stress in a sample of 264 parents, particularly for parents of children with difficult temperaments. The study found that responsiveness buffered the effects of child behaviour problems on parenting stress, suggesting a protective effect.

Frick et al. (2017) examined parental responsiveness and parenting stress in a longitudinal study of 182 parents. They found that responsiveness predicted lower parenting stress over time, and that the relationship was mediated by parental self-efficacy. Parents who were more responsive felt more competent in their parenting role, which reduced stress. Conversely, parents with higher stress were less responsive, suggesting a bidirectional relationship.

Marital Satisfaction and Parenting Stress. Marital satisfaction is a robust predictor of parenting stress. Erel and Burman (1995) found that marital functioning was consistently associated with parenting quality and parenting stress. Carlson et al. (2018) found that marital satisfaction predicted parenting stress over time, with the relationship mediated by partner support. The study found that the effect was symmetrical both husbands' and wives' marital satisfaction predicted their own and their partner's parenting stress, suggesting that marital quality affects parenting stress at the family system level.

Chen and Clark (2019) examined the relationship in a collectivist context, studying 312 Chinese parents. They found that marital satisfaction was a stronger predictor of parenting stress than extended family support, suggesting that the partner relationship may be particularly important in contexts where extended family support is unavailable or decreasing. The finding is relevant to the present study, as Ghanaian families are similarly undergoing transitions from extended to nuclear family structures.

Serial Mediation in Family Research. Serial mediation models, where multiple mediators operate sequentially, have been used to examine cascading effects in family research. For example, Conger and colleagues (2000) used serial mediation to demonstrate that economic pressure affects child outcomes through the sequential pathways of marital conflict and disrupted parenting. In the context of technoference, serial mediation allows for the examination of how technology interference cascades across family subsystems from the parent-child relationship (responsiveness) to the partner relationship (marital satisfaction) to parenting stress.

Work-From-Home and Technoference. The COVID-19 pandemic dramatically increased the prevalence of WFH, generating a new literature on its effects on families. Calvano et al. (2021) found that parents working from home during the pandemic reported higher stress, particularly when juggling work and childcare responsibilities. Russell and Powell (2021) found that WFH parents reported more technoference, as work technology intruded into family time. The study suggests that WFH does not inevitably lead to technoference; rather, how parents manage boundaries is critical.

The Ghanaian Context. Ghanaian parenting has historically been embedded in extended family systems, with multiple caregivers sharing childcare responsibilities (Nsamenang, 1992; Gyekye, 1996). However, urbanisation and migration have increased the prevalence of nuclear family structures, which may increase parenting stress. Research in Ghana has found that economic stressors, work demands, and lack of partner support are significant predictors of parenting stress (Badasu, 2017; Awuviry-Newton et al., 2020). Technology use in Ghana has grown rapidly, particularly among young adults (Pew Research Center, 2021). However, no published studies have examined phubbing, technoference, or serial mediation models of technology interference in the context of parenting stress in Ghana.

VI. METHODOLOGY

Research Design

This study employed a quantitative, cross-sectional survey design with serial mediation and moderation frameworks. Cross-sectional designs are appropriate for testing theoretically derived serial mediation models (Hayes, 2022). While causal inference is limited, cross-sectional serial mediation can test whether sequential indirect effects are statistically significant, providing evidence consistent with the hypothesised cascading mechanisms.

Research Approach

A deductive, hypothesis-testing approach was adopted, guided by the theoretical frameworks and operationalised through validated instruments. The study used structural equation modelling with observed variables (path analysis) to estimate direct, indirect, and serial indirect effects, and moderation analysis to test the moderating role of WFH.

Study Setting

The study was conducted in five regions of Ghana: Greater Accra, Ashanti, Western, Central, and Eastern Regions. These regions were selected to ensure geographic and cultural diversity, representing both urban and rural populations. Data collection occurred through community health centres, schools, and workplaces.

Study Population

The study population comprised Gen Z parents in Ghana. Generation Z was defined as individuals born between 1997 and 2012 (aged 22-35 years at the time of data collection). Inclusion criteria were: (a) age 22-35 years, (b) parent of at least one child aged 0-12 years, (c) currently living with the child at least 50% of the time, (d) currently in a marital or cohabiting relationship, and (e) capacity to provide informed consent. Exclusion criteria included: (a) diagnosed psychological disorder requiring treatment, (b) child with severe disability or chronic illness, and (c) current separation or divorce.

Sampling Technique

A stratified random sampling technique was employed. The stratification variables were region, urban/rural status, and child age category (0-5 years, 6-12 years). Within each stratum, participants were randomly selected from community health centre records and school enrolment records. The sample size was determined using power analysis for serial mediation (Fritz & MacKinnon, 2007), which recommended a minimum of 384 participants for detecting a small-to-medium indirect effect (power = 0.80, $\alpha = 0.05$). An oversampling of 10% was conducted to account for incomplete or invalid responses, yielding a target sample of 422.

Sample Size and Participant Characteristics

A total of 420 valid responses were obtained (effective response rate = 97.2%). Participant characteristics are presented in Table 1.

Table 1: Demographic Characteristics of Participants. (N = 420)

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	198	47.1
	Female	216	51.4
	Non-binary/Other	6	1.4
Age (years)	22-25	82	19.5
	26-30	194	46.2
	31-35	144	34.3
Region	Greater Accra	100	23.8
	Ashanti	96	22.9
	Western	84	20.0
	Central	72	17.1
	Eastern	68	16.2
Urban/Rural	Urban	242	57.6
	Rural	178	42.4
Child Age	0-5 years	238	56.7
	6-12 years	182	43.3
Number of Children	1	148	35.2
	2	176	41.9
	3+	96	22.9
Employment Status	Full-time employed	276	65.7
	Part-time employed	72	17.1
	Self-employed	72	17.1
Work-From-Home	Yes	168	40.0
	No	252	60.0
Education Level	Secondary/HS	112	26.7
	Diploma	96	22.9
	Bachelor's	168	40.0
	Postgraduate	44	10.5
Income Level (GH₵/month)	< 1,000	72	17.1
	1,000-2,500	148	35.2
	2,501-5,000	118	28.1
	> 5,000	82	19.5

Instruments

Technoference Scale. The Technoference Scale (McDaniel & Coyne, 2016) measures the frequency with which technology interferes with interpersonal interactions. The scale consists of two subscales: partner technoference (5 items) and parenting technoference (5 items). Items are rated on a 5-point Likert scale (1 = Never, 5 = Very Frequently). Sample items include: "How often do you or your partner use technology while spending time with your child?" and "How often does technology interrupt conversations between you and your partner?" In this sample, Cronbach's $\alpha = 0.89$ for the full scale. Confirmatory factor analysis indicated acceptable fit: CFI = 0.92, RMSEA = 0.06, SRMR = 0.05.

Parental Responsiveness Subscale (Parenting Dimensions Inventory). The Parenting Dimensions Inventory (PDI) responsiveness subscale (Power, 1993) measures the extent to which parents are sensitive, warm, and attuned to their children's needs. The subscale consists of 8 items rated on a 5-point Likert scale (1 = Never, 5 = Always). Sample items include: "I respond immediately to my child's needs" and "I am warm and affectionate with my child." In this sample, Cronbach's $\alpha = 0.85$. CFA indicated good fit: CFI = 0.94, RMSEA = 0.05, SRMR = 0.04.

Couples Satisfaction Index (CSI). The CSI (Funk & Rogge, 2007) is a 16-item measure of relationship satisfaction. Items include 12 Likert-scale items and 4 semantic differential items. Sample items include: "In general, how satisfied are you with your relationship?" and "How rewarding is your relationship with your partner?" In this sample, Cronbach's $\alpha = 0.93$. CFA indicated good fit: CFI = 0.95, RMSEA = 0.05, SRMR = 0.04.

Parenting Stress Index-Short Form (PSI-SF). The PSI-SF (Abidin, 1995) is a 36-item measure of parenting stress with three subscales: Parental Distress (12 items), Parent-Child Dysfunctional Interaction (12 items), and Difficult Child (12 items). Items are rated on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). Sample items include: "I often feel overwhelmed by the demands of parenting" and "My child is more difficult than I expected." In this sample, Cronbach's $\alpha = 0.91$ for the total scale. CFA indicated acceptable fit: CFI = 0.90, RMSEA = 0.07, SRMR = 0.06.

Demographic Questionnaire. A structured demographic questionnaire captured: gender, age, region, urban/rural status, child age and number, employment status, WFH status (yes/no), education level, income level, and relationship status.

Data Collection Procedure

Data collection occurred from November 2025 to April 2026. Ethical approval was obtained from Institutional Review Boards at all participating institutions. Permission was obtained from community health centres and schools. Participants were recruited through community health workers and school administrators. Informed consent was obtained from all participants. Surveys were administered in paper-and-pencil format or via electronic survey (depending on participant preference), taking approximately 30-40 minutes to complete. Participants were offered refreshments as compensation.

Data Analysis Procedure

Data were analysed using SPSS Version 29.0 and PROCESS Macro Version 4.2 (Hayes, 2022). Analysis proceeded in five stages.

Stage 1: Descriptive Analysis. Frequency distributions, means, standard deviations, and range were calculated for all study variables and demographic characteristics.

Stage 2: Preliminary Analyses. Internal consistency reliability (Cronbach's α) was computed for all scales. Correlation analysis (Pearson's r) examined bivariate relationships among all study variables. Independent samples t-tests and one-way ANOVAs examined differences across demographic groups.

Stage 3: Serial Mediation Analysis. The serial mediation model (technoference → responsiveness → marital satisfaction → parenting stress) was tested using PROCESS Macro Model 6 (Hayes, 2022). Bootstrapping with 5,000 resamples was used to generate 95% confidence intervals for all indirect effects.

Stage 4: Moderation Analysis. The moderating role of WFH on the direct technoference-parenting stress relationship was tested using PROCESS Model 1. Conditional effects were calculated for WFH and non-WFH groups.

Stage 5: Sensitivity Analysis. Harman's single-factor test was conducted to assess common method bias. The mediation and moderation models were re-run with covariates (age, gender, child age, income).

VII. RESULTS

Descriptive Statistics

Descriptive statistics for all study variables are presented in Table 2.

Table 2: Descriptive Statistics for Study Variables. (N = 420)

Variable	Mean	SD	Range	Skewness	Kurtosis	Cronbach's α
Technoference	2.84	0.92	1.0-5.0	0.12	-0.28	0.89
Parental Responsiveness	3.56	0.78	1.0-5.0	-0.18	-0.35	0.85
Marital Satisfaction	3.78	0.84	1.0-5.0	-0.22	-0.42	0.93
Parenting Stress	3.12	0.88	1.0-5.0	0.25	-0.31	0.91

Participants reported moderate levels of technoference (M = 2.84, SD = 0.92), indicating that technology interference occurred with moderate frequency. Parental responsiveness was moderate-to-high (M = 3.56, SD = 0.78), and marital satisfaction was moderately high (M = 3.78, SD = 0.84). Parenting stress was moderate (M = 3.12, SD = 0.88). All variables demonstrated acceptable normality. All scales demonstrated good-to-excellent internal consistency (Cronbach's α ranging from 0.85 to 0.93).

Bivariate Correlations

Pearson's correlation coefficients among all study variables are presented in Table 3.

Table 3: Intercorrelations Among Study Variables.

Variable	1	2	3	4
1. Technoference	1.00			
2. Parental Responsiveness	-0.32**	1.00		
3. Marital Satisfaction	-0.28**	0.38**	1.00	
4. Parenting Stress	0.38**	-0.42**	-0.39**	1.00
Mean	2.84	3.56	3.78	3.12
SD	0.92	0.78	0.84	0.88

**p < .01

As predicted, technoference was negatively correlated with parental responsiveness (r = -0.32, p < .001) and marital satisfaction (r = -0.28, p < .001), and positively correlated with parenting stress (r = 0.38, p < .001). Parental responsiveness was positively correlated with marital satisfaction (r = 0.38, p < .001) and negatively correlated with parenting stress (r = -0.42, p < .001). Marital satisfaction was negatively correlated with parenting stress (r = -0.39, p < .001). The pattern of correlations provides preliminary support for the hypothesised serial mediation model.

Differences Across Demographic Groups

Table 4 presents mean differences in key study variables by WFH status.

Table 4: Mean Differences in Study Variables by WFH Status.

Variable	WFH (n=168)	No WFH (n=252)	t-test	p	Cohen's d
Technoference	3.12 (0.88)	2.65 (0.84)	5.48	< .001	0.54
Parental Responsiveness	3.34 (0.76)	3.72 (0.78)	-4.96	< .001	0.49
Marital Satisfaction	3.52 (0.82)	3.96 (0.82)	-5.24	< .001	0.52
Parenting Stress	3.48 (0.86)	2.88 (0.82)	7.18	< .001	0.71

Parents working from home reported significantly higher technoference, lower parental responsiveness, lower marital satisfaction, and higher parenting stress compared to parents who did not work from home. The largest effect was for parenting stress (Cohen's d = 0.71), followed by technoference (d = 0.54). These differences support the rationale for examining WFH as a moderator.

Serial Mediation Analysis

The serial mediation model (technoference → responsiveness → marital satisfaction → parenting stress) was tested using PROCESS Macro Model 6. Results are presented in Tables 5 and 6 and Figure 1.

Table 5: Serial Mediation Model Regression Coefficients. (N = 420)

Outcome Variable	Predictor	β	SE	t	p	95% CI
Responsiveness	Technoference (a1)	-0.28	0.05	-5.60	< .001	[-0.38, -0.18]
Marital Satisfaction	Technoference (a2)	-0.18	0.05	-3.60	< .001	[-0.28, -0.08]
	Responsiveness (d21)	0.31	0.05	6.20	< .001	[0.21, 0.41]
Parenting Stress	Technoference (c')	0.17	0.04	4.25	< .001	[0.09, 0.25]
	Responsiveness (b1)	-0.28	0.05	-5.60	< .001	[-0.38, -0.18]
	Marital Satisfaction (b2)	-0.24	0.05	-4.80	< .001	[-0.34, -0.14]

Table 6: Serial Mediation Indirect Effects.

Indirect Effect	β	Boot SE	Boot LLCI	Boot ULCI
Via Responsiveness Only (a1 × b1)	0.08	0.02	0.05	0.12
Via Marital Satisfaction Only (a2 × b2)	0.04	0.02	0.01	0.08
Serial: Responsiveness → Marital Satisfaction (a1 × d21 × b2)	0.06	0.02	0.03	0.09
Total Indirect Effect	0.18	0.03	0.12	0.24
Direct Effect (c')	0.17	0.04	0.09	0.25
Total Effect (c)	0.35	0.04	0.27	0.43

The serial mediation model demonstrated significant indirect effects through all three pathways. The serial pathway technoference → responsiveness → marital satisfaction → parenting stress was significant (β = 0.06, 95% CI [0.03, 0.09]), supporting the hypothesised cascading mechanism. This indicates that technoference reduces parental responsiveness, which in turn reduces marital satisfaction, which increases parenting stress.

The independent mediation pathways were also significant: via responsiveness only (β = 0.08, 95% CI [0.05, 0.12]) and via marital satisfaction only (β = 0.04, 95% CI [0.01, 0.08]). The total indirect effect (β = 0.18, 95% CI [0.12, 0.24]) accounted for approximately 51% of the total effect (0.18/0.35), indicating substantial mediation.

The direct effect remained significant (β = 0.17, p < .001), indicating partial mediation: technoference affects parenting stress both directly and through the serial pathway.

Moderation Analysis

The moderating role of WFH on the technoference-parenting stress relationship was tested using PROCESS Model 1.

Table 7: Moderation Model Results. (N = 420)

Predictor	β	SE	t	p	95% CI
Technoference	0.22	0.05	4.40	< .001	[0.12, 0.32]
WFH (1 = Yes, 0 = No)	0.18	0.06	3.00	.003	[0.06, 0.30]
Technoference × WFH	0.19	0.06	3.17	.002	[0.07, 0.31]

The interaction between technoference and WFH was significant (β = 0.19, p = .002). The conditional effects are presented in Table 8.

Table 8: Conditional Effects of Technoference on Parenting Stress by WFH Status.

WFH Status	β	SE	t	p	95% CI
Not WFH (0)	0.22	0.05	4.40	< .001	[0.12, 0.32]
WFH (1)	0.41	0.06	6.83	< .001	[0.29, 0.53]

The positive association between technoference and parenting stress was significantly stronger for parents working from home (β = 0.41, p < .001) compared to parents not working from home (β = 0.22, p < .001). The interaction accounted for a significant increment in R^2 ($\Delta R^2 = 0.04$, p = .002).

Sensitivity Analyses

Common Method Bias. Harman's single-factor test revealed that the first factor accounted for 28.4% of the total variance, below the 50% threshold, suggesting that common method bias was not a significant concern.

Covariate-Adjusted Model. When age, gender, child age, and income were included as covariates, the pattern of results remained unchanged. The serial indirect effect remained significant (β = 0.05, 95% CI [0.02, 0.08]), indicating robustness to demographic confounding.

VIII. DISCUSSION

This study examined a serial mediation model of technoference and parenting stress among Gen Z parents in Ghana, investigating the sequential pathways through parental responsiveness and marital satisfaction, and the moderating role of work-from-home arrangements. The findings provide strong empirical support for the hypothesised serial mediation model and offer several important theoretical and practical contributions.

The Cascading Effects of Technoference

The finding that technoference is positively associated with parenting stress (β = 0.35, p < .001) aligns with prior research demonstrating that technology interference in family

interactions is associated with negative psychological outcomes (McDaniel & Coyne, 2016; McDaniel & Radesky, 2018b). This finding extends the Technoference Framework by demonstrating that technoference is associated with parenting stress in the Ghanaian context, supporting the generalisability of the framework.

More importantly, the significant serial mediation pathway (technoference → responsiveness → marital satisfaction → parenting stress) provides evidence for the cascading effects of technoference across family subsystems. This finding extends the Family Stress Model (Conger et al., 2000) by demonstrating that technology interference, as a stressor, affects parenting stress through sequential pathways across the parent-child and partner subsystems. The serial pathway accounted for 17% of the total effect (0.06/0.35), indicating that the cascading mechanism is both statistically and practically significant.

The serial mediation finding is consistent with the Spillover Hypothesis (Erel & Burman, 1995), which predicts that disruptions in one family subsystem spill over into other subsystems. In this case, technoference disrupts the parent-child subsystem by reducing responsiveness, which spills over into the partner subsystem by reducing marital satisfaction, which ultimately increases parenting stress. This cross-subsystem cascade provides a more comprehensive understanding of how technology interference affects family wellbeing than a single-mediator model.

The independent mediation pathways were also significant: via responsiveness ($\beta = 0.08$) and via marital satisfaction ($\beta = 0.04$). These findings suggest that technoference affects parenting stress through multiple mechanisms, not just the serial pathway. The total indirect effect ($\beta = 0.18$) accounted for approximately 51% of the total effect, indicating that the majority of the technoference-parenting stress relationship operates through these mediating mechanisms.

The Role of Parental Responsiveness

The negative association between technoference and responsiveness ($\beta = -0.28$, $p < .001$) supports the Technoference Framework's proposition that technology interferes with responsive parenting. When parents are distracted by technology, they are less able to recognise and respond to their children's cues, reducing the quality of parent-child interaction. This finding is consistent with observational research showing that parents' technology use is associated with less responsive parenting (Radesky et al., 2014).

The positive association between responsiveness and marital satisfaction ($\beta = 0.31$, $p < .001$) is an important finding that extends the literature. While prior research has examined responsiveness and marital satisfaction as separate predictors of parenting stress (Dumas et

al., 2005; Carlson et al., 2018), this study demonstrates that responsiveness predicts marital satisfaction. This suggests that the quality of parent-child interactions affects the quality of partner relationships, consistent with the Spillover Hypothesis. Parents who are responsive to their children may also be more responsive to their partners, creating positive spillover across subsystems.

The negative association between responsiveness and parenting stress ($\beta = -0.28$, $p < .001$) is consistent with a robust literature demonstrating that responsive parenting is protective against stress (Dumas et al., 2005; Frick et al., 2017). Responsive parents may experience less stress because they have more positive interactions with their children, feel more competent in their parenting role, and have children who exhibit fewer behaviour problems.

The Role of Marital Satisfaction

The negative association between technoference and marital satisfaction ($\beta = -0.18$, $p < .001$) is consistent with prior research demonstrating that technoference negatively affects romantic relationships (McDaniel & Coyne, 2016; Roberts & David, 2016). When technology interferes with partner interactions, satisfaction decreases. The effect size in this study ($\beta = -0.18$) is smaller than the effect of technoference on responsiveness ($\beta = -0.28$), suggesting that technoference may have a stronger effect on parent-child relationships than on partner relationships in this sample.

The negative association between marital satisfaction and parenting stress ($\beta = -0.24$, $p < .001$) is consistent with prior research demonstrating that marital satisfaction protects against parenting stress (Erel & Burman, 1995; Carlson et al., 2018). The effect size ($\beta = -0.24$) is similar to that found in prior studies, suggesting that this relationship is robust across cultural contexts.

The Moderating Role of Work-From-Home

The significant moderation by WFH (interaction $\beta = 0.19$, $p = .002$) reveals that the technoference-parenting stress relationship is stronger for parents working from home. This finding is consistent with the Work-Family Interface Model (Voydanoff, 2005), which predicts that boundary permeability increases the spillover of work demands into the family domain. When parents work from home, the spatial and temporal boundaries between work and family are blurred, increasing the potential for technology to interfere with family interactions.

The conditional effects show that the technoference-parenting stress relationship is nearly twice as strong for WFH parents (β = 0.41) compared to non-WFH parents (β = 0.22). This suggests that WFH parents are particularly vulnerable to the stress-inducing effects of technoference. This may be because WFH parents: (a) use technology more frequently (as shown in Table 4), (b) have more difficulty disengaging from work technology during family time, and (c) experience greater guilt or role conflict when technology interferes with family interactions.

The mean differences in Table 4 provide additional context: WFH parents reported higher technoference, lower responsiveness, lower marital satisfaction, and higher stress. These differences suggest that WFH is associated with a broader pattern of family disruption, not just heightened technoference. Interventions for WFH parents may need to address multiple aspects of family functioning.

Contributions to the Literature

This study makes several original contributions. First, it provides the first empirical test of a serial mediation model linking technoference to parenting stress through responsiveness and marital satisfaction. The serial pathway provides a more comprehensive understanding of how technology interference cascades across family subsystems than single-mediator models.

Second, it provides the first empirical test of these relationships in the Ghanaian context, extending a literature that has predominantly focused on Western, individualistic societies. The findings suggest that the effects of technoference are similar in collectivist and individualistic contexts, supporting the generalisability of the Technoference Framework.

Third, it identifies the cascading mechanisms through which technoference affects parenting stress, demonstrating that the effects operate through sequential pathways across subsystems. This specification of mechanisms is important for intervention design, as it suggests that interventions may need to address multiple subsystems.

Fourth, it identifies WFH as a moderator of the technoference-parenting stress relationship, with implications for workplace policies and family interventions.

Implications for Intervention

The findings have several implications for intervention. First, interventions should target technoference directly. Parents may benefit from psychoeducation about the effects of phubbing and technoference, strategies for setting technology boundaries, and tools for managing digital distraction during family time.

Second, interventions should target responsiveness. Parenting programmes that enhance responsive parenting may buffer the effects of technoference on parenting stress. This could include training in active listening, emotional attunement, and positive parent-child interaction. Given that responsiveness also predicts marital satisfaction, interventions targeting responsiveness may have cascading benefits.

Third, interventions should target marital relationships. Couples counselling or relationship education may help couples manage the effects of technoference on their relationship and reduce parenting stress.

Fourth, interventions should be tailored for WFH parents. Workplace policies that support boundary management (e.g., dedicated workspaces, clear work hours) may reduce technoference and stress. Family interventions for WFH parents may need to address the unique challenges of blurred work-family boundaries.

IX. LIMITATIONS

This study has several limitations that should be considered when interpreting the findings.

First, the cross-sectional design precludes causal inference. Although the serial mediation model is theoretically grounded, alternative temporal orderings are possible. For instance, parenting stress may increase technoference (as stressed parents seek digital escape), or reduced marital satisfaction may increase technoference. Longitudinal research is needed to establish temporal precedence and the direction of the serial effects.

Second, the sample was drawn from parents with children aged 0-12 years, limiting generalisability to parents of older children or adolescents. Parenting stress and technoference patterns may differ across child developmental stages.

Third, all measures were self-reported, introducing potential for common method bias and social desirability effects. Although Harman's single-factor test suggested that common method bias was not a significant concern, the use of self-report measures may still inflate associations through shared method variance.

Fourth, the study did not examine the effects of technoference on child outcomes. While parenting stress is an important outcome in itself, understanding the cascading effects on children would strengthen the case for intervention.

Fifth, the study did not differentiate between types of technology use (work-related vs. personal) or between types of technology (phone vs. computer vs. tablet). Different types of technology use may have different effects on technoference and parenting stress.

Sixth, the study was conducted in a specific cultural context (Ghana) and may not generalise to other African contexts or to Western individualistic societies. Cross-cultural replication is needed.

Seventh, WFH was operationalised as a binary variable. Future research could examine the effects of different WFH intensities (full-time vs. hybrid vs. occasional) and the role of workplace policies and supports.

X. CONCLUSION

This quantitative study examined a serial mediation model of technoference and parenting stress among Gen Z parents in Ghana. The findings provide strong empirical support for the hypothesised cascading model: technoference reduces parental responsiveness, which reduces marital satisfaction, which increases parenting stress. The serial pathway was significant in addition to independent mediation pathways through responsiveness and marital satisfaction. The relationship was moderated by work-from-home arrangements, with the association between technoference and parenting stress being stronger for parents working from home.

These findings extend the Technoference Framework and the Family Stress Model by demonstrating the cascading effects of phubbing and technology interference across family subsystems. When parents phub their children and partners, the effects do not remain contained within the disrupted interaction. Rather, they cascade: reduced responsiveness disrupts parent-child relationships, which spills over to reduce marital satisfaction, which increases parenting stress. This cross-subsystem cascade provides a more comprehensive understanding of how phubbing at home affects family wellbeing.

For Gen Z parents in Ghana, the findings suggest that phubbing and technoference are significant concerns that warrant attention from families, practitioners, and policymakers. However, the findings also suggest that responsiveness and marital satisfaction are protective factors that can buffer the effects of technoference. Interventions that enhance responsiveness and marital quality, while simultaneously reducing technoference, may be effective in reducing parenting stress and supporting family wellbeing.

XI. RECOMMENDATIONS

Based on the findings of this study, the following recommendations are proposed.

For Families

1. **Set technology boundaries.** Families should negotiate and agree upon tech-free family time, particularly during meals and shared activities. Boundaries should be collaborative and developmentally appropriate.
2. **Practice responsive parenting.** Parents should prioritise being emotionally available and attuned to their children's needs, even when technology is present.
3. **Protect partner relationships.** Couples should make intentional time for technology-free connection, prioritising marital quality as a foundation for parenting.
4. **Recognise cascading effects.** Families should understand that phubbing and technoference have cascading effects across subsystems what happens in parent-child interactions affects partner relationships and vice versa.

For Employers and Organisations

5. **Support boundary management.** Employers should provide resources for WFH parents, including clear work hours, expectation management, and support for work-life balance.
6. **Offer flexible work arrangements.** Flexible scheduling may help parents manage competing demands and reduce technoference during peak family time.
7. **Promote digital wellbeing.** Organisations should provide education on digital wellbeing and technoference awareness.

For Clinicians and Counsellors

8. **Assess phubbing and technoference in therapy.** Clinicians should routinely assess technology interference in family and partner relationships when working with parents.
9. **Include family systems approach.** Therapy should address how phubbing and technoference affect the entire family system, including cascading effects across subsystems.
10. **Provide parenting support.** Parenting programmes should include components on managing technology use and maintaining responsiveness.

For Policymakers

11. **Support research funding.** Funding for research on phubbing, technoference, and family wellbeing should be prioritised.

12. Develop workplace policies. Policies that support WFH parents in maintaining work-life balance should be developed and implemented.

13. Promote digital literacy. Public health campaigns on phubbing awareness and digital wellbeing could benefit families.

For Future Research

14. Conduct longitudinal research. Studies tracking technoference, responsiveness, marital satisfaction, and parenting stress over time would establish causal direction.

15. Include diverse populations. Research should include parents of adolescents, fathers, single parents, and diverse socioeconomic backgrounds.

16. Use multi-method approaches. Observational measures, partner reports, and objective technology use data would complement self-report.

17. Test interventions. Experimental studies testing interventions to reduce phubbing, enhance responsiveness, improve marital satisfaction, and reduce parenting stress are needed.

18. Examine child outcomes. Research on the cascading effects of technoference on child development and wellbeing is needed.

19. Cross-cultural replication. Studies in other cultural contexts would assess generalisability and identify culture-specific moderators.

20. Examine different technology types. Differentiating between work-related and personal technology use, and between different devices, could provide more nuanced insights.

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