1   **Full title: Work-related smartphone use during off-job hours and work-life conflict: a scoping**

2   **review.**

3   **Short title: Smartphone use and work-life conflict.**

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23   **Work-Related Smartphone Use During Off-Job Hours and Work-Life Conflict: A Scoping**

24   **Review.**

25   **Abstract**

26   Over recent decades the use of smartphones for work purposes has burgeoned both within and

27   beyond working hours. The aim of the study was to conduct a scoping review to explore the

28   association between the use of smartphone technology for work purposes in off-job hours with

29   employees' self-reported work-life conflict. Arksey and O'Malley's methodological framework was

30   adopted. Searches were conducted in PsycINFO, International Bibliography of the Social Sciences

31   (IBSS), Academic Search Complete, ProQuest Central, Web of Science, ProQuest Theses, Emerald,

32   Business Source Complete, ScienceDirect, Scopus, Google Scholar. Articles were eligible that

33   reported on a sample of workers, were published in English between 1st January 2012 and 29th

34   November 2023. The review was conducted and reported using a quality assessment checklist and

35   PRISMA-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for

36   Scoping Reviews). Data charting and synthesis was undertaken narratively, using the framework

37   approach and thematic analysis. Twenty-three studies were identified, conducted in nine countries.

38   Nineteen studies (83%) showed a significant association between increased use of smartphone for

39   work purposes in off job-hours and increased work-life conflict, with small-to-moderate effect sizes.

40   This relationship was mediated by psychological detachment from work, and communication about

41   family demands with one's supervisor. Moderators either strengthened or attenuated the relationship

42   between use of smartphone for work purposes in off job-hours and increased work-life conflict.

43   Findings suggest that smartphone use during off-job hours is likely to impact negatively on work-life

44   conflict, which has implications for employee wellbeing. Managers could play a key role in clarifying

45   expectations about after-hours availability, reduced job pressure, advocating psychological

46   detachment from work in off-job hours where it is appropriate, and create a workplace culture where

47   communication about the interplay between work and home life is encouraged. The protocol is

48   registered on the Open Science Framework (OSF) (https://doi.org/10.17605/OSF.IO/WFZU6).

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Author summary

It is becoming increasingly common for people to use smartphones for work purposes outside of their working hours. We looked at the published evidence and found that there was a relationship between the use of smartphone technology for work purposes in off-job hours and reported difficulties in maintaining boundaries between work and home life (referred to here as 'work-life conflict'). The strength of this relationship varied according to people's ability to 'switch off' from work, and whether they can openly talk to their managers about any impacts of work-related smartphone use (outside of their working hours) on their home lives. We suggest actions that managers can take to prevent or mitigate any potential negative impacts on digital technology during off-job hours on people's lives outside of work.

Introduction

Worldwide, smartphone ownership and use has proliferated. The number of smartphone mobile network subscriptions reached almost 6.4 billion in 2022 and is forecast to exceed 7.7 billion by 2028 (1). In the United Kingdom, the smartphone penetration rate has increased year-on-year and is anticipated to reach 92.4% by 2028 (2). The use of smartphones is now ubiquitous, integrated into people's social and professional lives.

Smartphones go beyond older-design mobile phones by combining telephony with advanced computing capability, large storage capacity and Internet connectivity. In the context of work, smartphones have led to new ways of working, offering convenience in allowing staff to work flexibly from any location, resulting in faster real-time decision-making and the potential for increased workplace productivity (3). However, their perceived impacts on productivity vary according to employment sector and job type (4). Such digital devices can be utilised in diverse ways: communicating information, implementing workplace changes, offering a platform for health and wellbeing interventions (5,6), and/or providing a tool by which to promote autonomy, strengthen relationships with peers as well as superiors, and improve communication and knowledge-sharing (7,8). The proposed benefits of mobile technologies, such as smartphones, are not limited to their use for work activity; it is suggested that using mobile technologies to engage in non-work activities during working hours (known as 'digital leisure') can, to

79   some extent, contribute to employee overall well-being and productivity by means of mental recovery

80   and replenishment (9).

81   While there are many benefits of the proliferation of smartphones, there are several caveats.

82   Smartphone use in the workplace can lead to cyberloafing and cyberslacking (i.e., spending time on

83   non-work-related digital activities at work) (10); distraction from work activities, and impaired work

84   performance (11). Some authors describe the 'dark side' of digital working including 'technostress',

85   overload anxiety and addiction (12,13), resulting in lowered productivity both in the workplace and at

86   home (14). The continuous connectivity to the Internet afforded by smartphones, while offering flexibility

87   to working adults (3), may lead to digital overuse, described as "a widespread social phenomenon

88   sensitive to existing inequalities". (15)

89   Now that many work duties can be dealt with using smartphones in the home, there is a blurring of

90   boundaries between work and non-work domains. According to Work-Family Border Theory (16), the

91   likelihood of two domains (*viz.* work and family/home) with high permeability and flexibility to blend or

92   integrate is high; thus, making an employee vulnerable to work-life conflict. Work-life conflict is a form

93   of inter-role conflict that occurs due to role pressures derived from both home and work domains, which

94   are perceived to be incompatible or in conflict with one another (17). Consequently, there are growing

95   concerns about the immediate and long-term impact of the blurring of boundaries between work and

96   home life on employees' work-life conflict (18).

97   However, there are individual differences in the impacts of mobile phones on the boundaries of work

98   and home life, with some working adults perceiving their use during "off-job hours" to be more

99   problematic than others (19,20). Here, off-job hours are defined as work done, received, or happening

100   away from or while not at one's job. Wright and colleagues (21) found that hours of work-related

101   communication technology use outside of regular work hours can contribute to perceptions of work-life

102   conflict, and that this predicted both job satisfaction and burnout. Further review evidence highlights the

103   importance of addressing work-life conflict given its association with psychological, physical, and

104   behavioural health (22). The decreased segmentation between work and home resulting from

105   smartphone use in off-job hours may, for some, lead to work-home interference, meaning pressures

106   from work and home domains are mutually incompatible (23). Indeed, the mere presence of a

107   smartphone (in the knowledge of its constant connection to information) has been shown to reduce

108   cognitive capacity and lead to smartphone-induced 'brain-drain', that is, where smartphones occupy

109   most or all of our limited cognitive resources (24). Conversely, other studies have highlighted the

110   benefits of smartphone use during off-job hours; increasing opportunities for communication (25) and

111   enhancing work flexibility as workers can bring their work tasks into the home domain (26). Similarly,

112   working mothers report smartphones increasing their sense of empowerment and interdependence

113   when managing work and family commitments that, in turn, engenders a sense of work-life balance

114   (27). This refers to the "individual's perception that work and non-work activities are compatible and

115   promote growth in accordance with an individual's current life priorities" (28), and contrasts to the

116   perspective of conflict or interference between the work and personal domains by acknowledging the

117   potential harmony between both domains.

118   In summary, studies of the influence of smartphone use during off-job hours present contradictory

119   findings, highlighting both dysfunctional aspects (e.g., "usage patterns that are dangerous, distracting,

120   anti-social and that infringe on work-life boundaries") and functional aspects (allowing users "to be

121   efficient, to multitask without disruption to others, and to respond immediately to messages, as well as

122   offering them the freedom to work from anywhere") (29). While there are conceptual differences

123   between the work-life balance and conflict, there is substantial inconsistency and overlap in how these

124   terms are applied in research and practice (30). Therefore, we elect to use "work-life conflict" as an all-

125   encompassing term capturing both the conflict and opportunity between both work and life domains.

126   There is a need to better understand the association between the use of smartphone technology for

127   work purposes in off-job hours and the employees' work-life conflict, to inform recommendations for

128   workers and their employers.

129   *Study aim*

130   The aim of the study was to conduct a scoping review using a systematic approach to map relevant

131   evidence examining the association between the use of smartphone technology for work purposes in

132   off-job hours in relation to employees' self-reported work-life conflict.

133   **Materials and Methods**

134   A scoping review was the chosen method for reviewing the literature as it is well suited to rapidly

135   developing areas of research. The protocol is registered on the Open Science Framework (OSF)

136 (https://doi.org/10.17605/OSF.IO/WFZU6). The review was guided by Arksey and O'Malley's (31)

137 methodological framework, which has six stages including (i) identifying the research question; (ii)

138 identifying relevant studies; (iii) study selection; (iv) charting the data; and (v) collating, summarising,

139 and reporting the results, and (vi) stakeholder engagement. The review reporting aligns with the

140 PRISMA-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for

141 Scoping Reviews) checklist and explanation (32) (Supplementary file S1 Table).

142 *Stage 1: Identify the Research Question*

143 Following an initial literature search, the research question we identified for this review was:

144 "What is the association between the use of smartphone technology for work purposes in off-job

145 hours and employees' self-reported work-life conflict?".

146 The review objectives were: (i) to describe the extent, variety, and nature of the identified studies

147 (including study focus, characteristics, and quality), (ii) synthesise findings (including identification of

148 any mediators and moderators), and (iii) draw conclusions and identify gaps in the evidence to inform

149 future research and practice.

150 *Stage 2: Identifying the Relevant Studies*

151 The following databases were searched to identify applicable studies: PsycINFO, International

152 Bibliography of the Social Sciences (IBSS), Academic Search Complete, ProQuest Central, Web of

153 Science, ProQuest Theses, Emerald, Business Source Complete, ScienceDirect, and Scopus.

154 Google Scholar was also searched for any additional articles that may not have been listed in the

155 selected databases. An example search strategy for PsychINFO is available (Supplementary file S2

156 Text). Search terms and their free-text variants were identified in relation to two facets of the research

157 question: smartphones (*"mobile devices" OR "mobile phone" OR "cell phone" OR "iPhone" OR*

158 *"blackberry" OR "android phone" or "windows phone"*) and work-life conflict (*"work-family conflict" OR*

159 *"work-life balance" OR "work-life interface" OR "work-home interference"*). Since Google Scholar does

160 not have a "recent searches" option, which allows the combination of search queries to conduct an

161 advanced search, we ran three searches; first, using the terms "smartphone" and "work-life conflict",

162 second, using the terms "smartphone" and "work-home interference" and third, using the terms

163 "smartphone" and "work-life balance". We reviewed the titles in the first five pages of each search

164   followed by reviewing the abstracts and the full text against the inclusion/exclusion criteria. To identify

165   additional relevant articles, reference lists of reviewed articles, and articles that cited included studies

166   were searched.

167   Articles included in the study had to meet specific inclusion criteria covering four key domains:

168   research methodology, study sample, specification of predictor and outcomes measure(s), and

169   language restrictions. Specifically, we sought to identify studies that: sampled a working population

170   aged 18 years or over, were published in English between 1st January 2012 and 29th November 2023

171   and quantified the relationship between the use of smartphone technology for work purposes during

172   off-job hours and employees' experiences of work-home interference. Grey literature (including study

173   protocols) was excluded. Studies were excluded from this review if the sample did not include working

174   adults, articles were not in English, or the data were qualitative. To ensure that no study deviated from

175   the overall aim of the current review, we reviewed operational definitions of variables under study and

176   scrutinized scales, or measures used to quantify them. For instance, in the study by Schieman and

177   Young (33), the variable "work contact" was operationalized as the degree to which participants sent

178   or received email, phone calls, or text messages for work-related purposes during off-job hours. Since

179   two of these three tasks (*viz.* text messaging and making a phone call) are possible only on a mobile

180   phone, the study was deemed appropriate for inclusion in the review.

181   *Stage 3: Study Selection*

182   The search strategy identified 1,104 potentially relevant studies: 1,097 articles from database

183   searches and seven from reference list searches. One hundred seventy-two studies were duplicates

184   and were removed, leaving 934 original studies to screen. The identified sources were reviewed using

185   a two-stage review process. See Fig. 1 for a flow diagram of the article selection process. At stage

186   one, titles and abstracts of identified sources ($n = 934$) were screened. Those studies that referred to

187   work-related smartphone use and work-life conflict (or one of their related terms) were included in the

188   full-text review stage. If it was unclear whether a study met inclusion criteria or not at the title and

189   abstract stage, it was moved to the full-text review stage as a precautionary measure. In total, 841

190   studies were excluded at this stage leaving 93 articles to undergo a full-text review (stage two).

191   During this stage, all five specified inclusion criteria were applied. Seventy articles did not meet one or

192   more of the specified inclusion criteria and were excluded. In total, 23 studies met all five specified

193   inclusion criteria and were retained.

194   *[insert Fig.1 here]*

195   Review stages one (title and abstract screening) and two (full-text review) were carried out

196   independently by one of the research team (JS). A random selection of 20% of articles at each stage

197   were independently and blindly assessed by two other reviewers (JH and KT). The degree of inter-

198   rater reliability was quantified using Cohen's Kappa. Strong inter-rater agreement was observed for

199   both stages (stage one, $k = .83$ [95% *CI* .67, .98] and .78 [95% *CI* .61, .95]; stage two, $k = 1$ [95% *CI*

200   1, 1] and .86 [95% *CI* .67, 1.04]).

201   *Stage 4: Charting the Data*

202   A database was created in MS Excel and used to share articles between the reviewers, which

203   facilitated data charting and consensus review. A data extraction form was developed as part of the

204   research protocol to standardise the data extraction process. This form was peer-reviewed and

205   piloted prior to its use. Data collected from each article included information related to the study's title,

206   year of publication, authors' names, country, aim(s) of the study, theoretical framework(s) adopted to

207   guide the investigation, hypotheses or research questions, predictors of work-life conflict, design, total

208   sample size, response rate, percentages of male and female participants, other relevant details about

209   the sample (e.g., industry, sector, designation etc.), scales used for measuring variables, and findings

210   of the study.

211   *Stage 5: Collating, Summarizing, and Reporting the Results*

212   We used the framework approach described by Ritchie and Spencer (34), as used by Arksey and

213   O'Malley (31). This involved synthesising and interpreting the data by sifting and charting information

214   based on the key themes identified in the literature. Thematic analysis was conducted by two

215   researchers and any discrepancies in the analysis were resolved through discussion until consensus

216   was reached.

217   For risk of bias (quality) assessment, a study quality assessment checklist was employed to examine

218   the empirical rigour of included studies at study level, and to identify gaps in methodological practice.

219 The quality assessment checklist was an adaptation of Caldwell et al.'s (35) framework of critiquing

220 research. This checklist includes 26 items. The current study only utilised items relevant to

221 quantitative research methods (19 items). A score was given for the presence of each criterion (2 =

222 *fully met*, 1 = *partially met*, 0 = *not met* or *cannot tell)*; and then summed to give an overall rating for a

223 study, with higher scores indicating strong methodological rigour.

224 *Stage 6: Stakeholder consultation*

225 Stakeholder consultation is an optional stage in Arksey and O'Malley framework. The stakeholders

226 were involved in Stage 1 (contributing to identifying the research question through knowledge of gaps

227 in the literature and/or practice) and Stage 5 (interpreting findings) and Stage 6 (considering the

228 implications for practice and/or policy). The overall purpose of the inclusion of stakeholders was to

229 assist in closing the gap between research production (i.e., the review findings) and research use

230 (i.e., how our findings might be implemented in policy and practice). We were guided by design

231 pinciples for engagement of stakeholders in research which focus on three categories of principles:

232 'organisational', 'values' and 'practices' (36). Stakeholders ($n = 8$) included employees and line

233 managers (from micro-small, small, medium and large organisations) and organisational

234 psychologists who were purposively identified through professional networks, and had a direct interest

235 in the process and outcomes of this review. Their involvement was through virtual (video-conferencing

236 or email) direct consultation with the research team to establish research priorities (Stage 1). They

237 then reviewed and verified our interpretation of findings (Stage 5). Finally, they engaged in a

238 brainstorming activity focused on knowledge translation to generate implications of the review findings

239 for workplace policy and practice (Stage 6). This required minimal resources; approximately 2-hours

240 of stakeholder time. At project end, the research team produced lay summaries for the stakeholders,

241 of the scoping review and agreed research implications, to support organisational learning and reward

242 stakeholder engagement.

243

244 **Results**

245 *Overview*

246   The review process yielded 23 studies for inclusion (Table 1 and Supplementary file S3), that were

247   conducted in the USA (37–44), the Netherlands (23,45–47), South Korea (48), Belgium (49), Canada

248   (33,50), the UK (51), Malaysia (52), Sri Lanka (53), and South Africa (54–56). One study (57) did not

249   explicitly report the study location (although they recruited employees from a Scandinavian company).

250   The publication year of studies ranged from 2012 to 2023, with six of the studies published in 2018.

251 **Table 1.** Characteristics of Included Studies

Study	Study aim(s)	Sample (% males, % females, response rate, and other relevant details)	Study design (country, study population, and other relevant details)	Theoretical framework(s)
Brown and Palvia (37)	To explore relationships among work-related mobile device usage while at work, work-related mobile device usage while at home, personal mobile device usage at home, productivity, employer expectations, flexibility of work structure, and work-life conflict.	N = 165 (55%, 45%, 58%, and majority of participants [31%] were mid-level managers)	Cross-sectional design (USA, employed and smartphone users)	Work/family border theory (16)
Derks et al. (45)	To examine the impact of smartphone-use for work-related activities during non-working hours on recovery strategies (psychological detachment, relaxation, mastery, and control activities) adopted by employees.	N = 80 (78%, 22%, N/A, n_1 [smartphone group] = 40, n_2 [control PC-group] = 40, participants were employed in 22 different organisations but, were similar in their workload and job type)	Diary-entry design with control group (The Netherlands, employed and smartphone users). Participants were contacted via email for 6 workdays over a period of 2 weeks.	Effort-Recovery Theory (58)
Derks et al. (46)	The aims of the study were threefold. First, to examine the moderating role of segmentation preference in the relationship between daily work-related smartphone use during off-job hours and daily work-family conflict (WFC). Second, to investigate the moderating role of segmentation preference in the relationship between daily work-related smartphone use during off-job hours and daily family role performance. Third, to examine the mediating role of WFC in the moderated relationship (by segmentation preference) between daily work-related smartphone use during off-job hours and daily family role performance.	N = 71 (56%, 44%, N/A, participants worked in diverse fields, 60% of the participants had a university degree, 63% of participants were living with a partner, and 37% had children living at home)	Diary entry design (The Netherlands, smartphone users who worked at least 4 days a week). Participants were contacted via email for 4 successive workdays within one working week.	Boundary theory (16,59,60)
Ragsdale and Hoover (38)	To examine the impact of work-related cell phone use during non-working hours on (i) emotional exhaustion, (ii) work engagement, and (iii) work-family conflict, and to explore the	N = 313 (48%, 52%, 28%, participants were adults, had a full-time job, owned a cell phone, and worked in diverse	Repeated-measures design (USA, employed full time and smartphone users). Work-related cell	Job Demands-Resources Model (61)

	moderating role of cell phone attachment in these relationships.	fields, and majority of the participants were married or cohabiting, had children, and held a university degree)	phone use and cell phone attachment were assessed at time 1 (T1), and emotional exhaustion, wok engagement, and work-family conflict were assessed at time 2 (T2). The time gap between the two surveys was one week.	
Derks et al. (47)	To examine the impact of daily smartphone use for work-related purposes during after work hours on daily work-home interference, and to explore the moderating role of supervisor expectations, social norms set by colleagues, and daily work engagement in these relationships.	N = 100 (75%, 25%, N/A, 85% of participants lived with a partner, 67% of participants had children living at home, 72% of participants held a university degree, and participants worked in a diverse range of white-collar sectors)	Diary-entry design (The Netherlands, employed full time, organisation provided smartphone users). Participants were contacted via email for 4 successive workdays within one working week.	Boundary theory (16,59), Equity theory (62,63), and Social Learning theory (64)
Derks and Bakker (23)	The aims of the study were sixfold. First, to examine the negative impact of daily recovery (psychological detachment and relaxation) on daily work-home interference (WHI). Second, to investigate the positive relationship between daily WHI and daily burnout symptoms (exhaustion and cynicism). Third, to examine the mediating role of reduced daily WHI in the negative relationship between daily recovery and daily burnout symptoms. Fourth, to examine the positive relationship between work-related smartphone during non-working hours and daily WHI. Fifth, to investigate the moderating role of intensive smartphone use in the negative relationship between daily recovery and daily WHI. Sixth, to examine the moderating role of smartphone use in the positive relationship between daily WHI and daily burnout symptoms.	N = 69 (31.9%, 68.1%, N/A). Majority of the participants (71%) were "highly educated" (p. 420; the level of education [undergraduate or postgraduate degree] was not specified).	Diary-entry design (The Netherlands, full-time employees using a company-provided smartphone). Participants were contacted via email for 5 successive workdays in a working week.	Effort-Recovery theory (58)

Carlson et al. (39)	To examine the impact of work-related mobile device use during family time by job incumbents on their work-to-family conflict (WFC) and the impact of job incumbents' WFC on spouses' family-to-work conflict (FWC), job satisfaction, and job performance via relationship tensions between job incumbents and spouses.	N = 344 pair (job incumbents – 61%, 39%, N/A; spouses – 39%, 61%, N/A, couples were married for an average of 13 years, 68% of couples had children living at home)	Matched-pairs, cross-sectional design (USA, married, full-time employees who used a mobile device for work and non-work purposes)	Work-family crossover model (65), Family Systems Theory (66), and Work-home resources model (67)
Yun et al. (48)	To explore the impact of the attributes of office-home smartphone (OHS; work overload, flexibility, autonomy, and productivity) on employees' levels of work-life conflict, stress, and user resistance to OHS. In addition, to examine the impact of segmentation culture on work-life conflict.	N = 300 (65%, 35%, 40%, majority of the participants were single [54%], did not have children [62%], and worked in manufacturing or sales [31%])	Cross-sectional design (South Korea, smartphone users)	Role boundary theory (59)
Ferguson et al. (40)	To explore the impact of mWork on job incumbent's turnover intentions via two pathways: (i) mWork leading to work-family conflict, which further leads to burnout and reduced organizational commitment, and (ii) mWork leading to work-family conflict for job incumbent, which further leads to spousal resentment towards the incumbent's organisation and reduced commitment towards the incumbent's organisation.	N = 344 pairs (job incumbents – 39%, 61%, NR; spouses – 61%, 39%, NR, couples were married for an average of 13 years and 68% of couples had children living at home. The sample was heterogenous in terms of industry/sectors, and salary scales.)	Matched-pairs, cross-sectional design (USA, married, employed full time, and mobile device users)	Conservation of resources theory (68), and Family Systems Theory (69)
Gadeyne et al. (49)	To examine the moderating roles of integration preferences, organizational integration norms, and work demands in the relationship between work-related use of information and communication technological (ICT) devices (smartphones and PCs/laptops) and work-to-home conflict.	N = 467 (15%, 85%, N/A, majority of the participants [92%] were cohabiting with partners and working as clerks [52%]. Participants had an average of two children living in their households.	Cross-sectional design (Belgium, employed parents with at least one child under the age of 12 years, smartphone users).	NR
Schieman and Young (33)	To examine the impact of work contact on work-to-family conflict, and to investigate the moderating roles of job pressures and job resources (job autonomy, some/full schedule control, and challenging work) in these relationships.	N = 5729 (52%, 48%, 40%, 48% of participants were married or living with a partner, and 40% had children younger than 18	Cross-sectional design (Canada, employed, and live in non-institutional residence)	Border theory (16,70), and Job Demands-Resources model (61)

		years of age living in the household)		
Harris (41)	The aims of the study were threefold. First, to examine the impact of work-life balance on stress, life satisfaction, and job satisfaction. Second, to examine the impact of smartphone intrusion on work-life balance. Third, to explore the moderating role of organisation's attitude towards smartphone use in these relationships.	N = 202 (57.1%, 41.9%, N/A, 35% of participants reported having a company-provided smartphone)	Cross-sectional design (USA, paid employees, smartphone users)	Spillover Theory (71)
Burney (42)	To explore the effects of personal smartphones, company-sponsored smartphones, and both on levels of work-life balance of managerial employees in the property construction industry.	N = 162 (11.73%, 88.27%, N/A, 54.32% of participants were married, 65.43% had children living at home, 32.1% of participants used personal smartphones for work, 23.46% of participants used company-issued smartphones for work, and 44.44% of participants used both for work)	Sequential explanatory mixed-methods design (USA, managers in property management, smartphone users [personal, company, or both])	Work-Family Border Theory (16) and Spillover Theory (72)
Ward and Steptoe-Warren (51)	To explore the impact of using BlackBerry (BB) devices for work-related purposes during non-working hours on employee's work-family conflict and wellbeing; and to examine job control and psychological detachment from work as mediators.	N = 86 (75.6%, 24.4%, 39.13%, 61.63% of participants were senior managers, and 38.37% of participants were junior managers)	Cross-sectional design (UK, employed in a leading communications service company, possessed a company-issued BB device for work purposes)	Conservation of Resources Theory (73)
Wei and Teng (52)	To study the impact of work-related smartphone outside of official working hours on work-life conflict and work engagement, and to examine the moderating role of the employment sector (public vs. private) in these relationships.	N = 229 (42.4%, 57.6%, N/A, majority of the participants had an undergraduate degree [69.4%], held managerial positions [53.3%], and worked in private sector [72.1%])	Cross-sectional design (Malaysia, employed, smartphone users)	NR

Bowen and Zhang (54)	The aims of the study were threefold. First, to examine the antecedents and consequences of work-family conflict (WFC). Second, to explore the role of cross-boundary work contact on WFC. Third, to investigate the inter-relationships between WFC and family-work conflict (FWC).	N = 690 (81%, 19%, N/A, 35% of participants were architects)	Cross-sectional design (South Africa, employed construction professionals)	Job Demands-Resources model (74), and Boundary theory (59,75)
van Zoonen et al. (57)	To examine the mediating impact of boundary spanning communication on the relationship between work-related smartphone use during non-working hours, and work-life conflict and organisational identification.	N = 367 (54.9%, 45.1%, 54.4% [T1], 49.3% [T2], 32.7% of participants had a university degree, 37.6% graduated from an applied university, and 53% of participants had at least one child living at home)	Longitudinal design (NR, knowledge workers in a large Scandinavian telecommunications company, smartphone users, time gap between two administrations was 1 year – the first survey measured employees' work-related smartphone use after hours and the second survey measured boundary spanning communication, work-life conflict, and organisational identification)	Boundary theory (59), Work-family border theory (16), and Structurational perspective on identification (76)
Bowen et al. (55)	To examine the construct validity and internal consistency of modified versions of scales originally developed by Schieman and Young (33) to assess smartphone use (work contact), work-family conflict, working conditions, psychological distress, and sleep problems.	N = 630 (82%, 18%, N/A, 88% of participants were married or living with a partner, 49% of participants had children living at home, and 58% of participants were partners or directors).	Cross-sectional design (South Africa, employed construction professionals)	NR
Bowen et al. (56)	To explore the impact of work contact (including, using a smartphone technology in non-working hours) and work–family conflict on psychological distress and sleep problems.	N = 630 (82%, 18%, N/A, 88% of participants were married or living with a partner, 49% of participants had children living at home, and 58% of participants were partners or directors).	Cross-sectional design (South Africa, employed construction professionals)	Job Demands-Resources model (74), and Boundary theory (59,75)

Fender (43)*	The aims of the study were multifold*. Firstly, to examine the moderating role of after-hours electronic communication (AEC) expectations in the relationship between work extending communication (WEC), and receptive electronic communication (REC) behaviour and electronic tethering (ET). Secondly, to examine the positive relationship between REC behaviours and ET. Thirdly, to examine the positive relationship between REC behaviours and work-to-family conflict. Fourthly, to examine the moderating role of work-to-home segmentation preferences in the relationship between work-to-family conflict, and psychological and physiological strain, job satisfaction and affective organizational commitment. Fifthly, to investigate the moderating role of ET instrumentality in the relationship between ET, and psychological and physiological strain, job satisfaction and organizational commitment.	N = 285 (57%, 43%, NA, 45% of participants had an undergraduate degree, and 61% of them had a managerial role)	Cross-sectional design (USA; employees with cell/smartphones that organizations could use to contact them)	Role Theory (77); Field theory of unfreezing-movement-refreezing (78); General Adaptation Syndrome (79); Transactional theory of stress (80); Job Demands-Control model (81); Control model of stress (82); Person-Environment Fit model (83); Conservation of Resources Theory (73)
Mansour et al. (50)	The aims of the study were threefold. Firstly, to examine the positive relationship between work intensification and use of smartphone and/or tablet for business purposes outside working hours. Secondly, to examine the relationship between the use of smartphone and/or tablet for business purposes outside working hours and work-family conflict (WFC). Thirdly, to examine the mediating role of the use of smartphone and/or tablet for business purposes outside working hours in the relationship between work intensification and WFC.	N = 388 (33%, 67%, NR, 33.2% of participants had 11-20 years of work experience, 76.8% of participants lived with their partner and children, 45.9% of participants had 2 children, 61.1% of participants worked in the private sector, and 39.8% of participants had a senior management position)	Cross-sectional design (Quebec Province, Canada, accounting professionals who lived with children)	Conservation of resources theory (84); Job demands-resources model (74,85,86)

Alwis and Hernvall (53)	The aims of the study were: (i) to examine the impact of segmentation preference on perceived intensity of information and communication technologies (ICTs) at work and work-life conflict, and; (ii) to examine the mediating role of perceived intensity of ICTs at work in the relation between segmentation preference and work-life conflict.	N = 225 (52.9%, 47.1%, 23%, 55.6% of participants were married, 59.6% had a child living at home, 68.9% had elderly dependents at home, and 48.5% had an executive position)	Cross-sectional design (Sri Lanka, employees working in a diverse range of industries were recruited)	Boundary theory (87)
Moore (44)	The aim of the study was to examine the association between after-hours communication (cell phone and computer exchange and Facebook use), and work-life balance and job satisfaction.	N = 153 (24.2%, 75.2%, NR)	Cross-sectional design (USA, participants worked in a diverse range of industries)	Not mentioned

252   *The study by Fender (43) examined ten hypotheses. Due to practical reasons, hypotheses related to this review are mentioned in the table. For a more

253   details, readers are directed to the section, "CHAPTER 3 – RESEARCH MODEL AND HYPOTHESES" (p. 65) in Fender (43).

254

Study designs and settings

256 Across the included studies, a variety of research designs were employed: diary-entry (n = 4) (23,45–

257 47), repeated measures (n = 1) (38), cross-sectional (n = 17) (33,37,39–44,48–56) and longitudinal

258 (n=1) (57) designs. Data in all the studies were collected using convenience sampling. Except for

259 seven studies that specifically recruited employees from the construction (42,54–56),

260 telecommunications (51,57), or accounting (50) sectors, participants in other studies were recruited

261 across sectors. Samples across studies was heterogenous in terms of participants' designations or

262 job roles.

263 *Study focus*

264 Of the 23 included studies, 13 (23,37,38,41–43,45–47,49,51,52,57) clearly operationalised and

265 measured the impact of work-related smartphone use during off-job hours. Two studies (39,50)

266 examined the use of mobile devices (a smartphone or an internet-enabled tablet) for work-related

267 purposes during off-job hours; one study (48) explored the impact of distinct attributes of smartphone

268 use for work (namely, work overload, autonomy, flexibility, and productivity); and seven studies

269 (33,40,44,53–56) examined the impact of work-related use of information and communication

270 technology (ICT) devices outside working hours. The operationalisation and measurement of

271 smartphone technology and work-life conflict in included studies, and additional study variables, are

272 shown in Supplementary file S3 Table.

273 *Operationalisation of smartphone use*

274 When reviewing the operationalisation of smartphone use there was a variety of conceptual and

275 measurement approaches. Having reviewed the 23 included studies, we have therefore categorised

276 the operationalisation of their independent variable into two thematic areas. First, the structural use of

277 smartphone technology, which we define as the *functional use* (e.g., time spent answering work

278 emails) of this form of technology to conduct work related tasks in off-job hours. Second, the

279 psychosocial use of smartphones for work purpose, which we define to be *perceptual use*, relating to

280 employees' feelings, emotions, or perceptions regarding using a smartphone for work related

281 purposes during off job hours (e.g., pressure to respond to work emails during off job hours). Using

282 this categorisation system, we observed that nine studies (33,39,40,49,51,54–57) included in this

283   review examined functional use, six studies (23,44,48,50,52,53) examined perceptual use, and five

284   studies (38,41,43,46,47) investigated both functional and perceptual use. In the case of three studies

285   (37,42,45), it was not clear whether they assessed functional or perceptual aspects of work-related

286   smartphone use in off-job hours. It is important to highlight here that among the five studies that

287   measured both the perceptual and functional aspects, only two studies (41,43) distinguished between

288   the two.

289   *Operationalisation of Work-Life Conflict*

290   For work-life conflict, the most frequently examined outcome was work-family conflict (n = 11) (33,38–

291   40,43,46,50,51,54–56), followed by work-home interference (n = 3) (23,45,47), work-life balance (n =

292   3) (41,42,44), work-life conflict (n = 5) (37,48,52,53,57), and work-to-home conflict (n = 1) (49).

293   Regarding measurement of work-life conflict, except for one study[11], other studies used standardised

294   scales with established psychometric properties. The most frequently used measure to quantify work-

295   life conflict was the scale developed by Carlson et al. (88), followed by the SWING scale (89).

296   *Risk of Bias Quality Assessment*

297   The results of quality assessment are presented in Table 2 and reflected on in the discussion. Most

298   studies were homogeneous in terms of their methodological quality (total score range: 21-36, M =

299   29.87, SD = 4.15). The least commonly met or partially met criteria included: the identification of

300   ethical issues and how these were addressed, identification of the research methodology and its

301   justification, and identification of and rationale behind the adopted research design.

302 **Table 2.** Evaluation of Included Studies Using a Study Quality Checklist

Quality Assessment Criteria	Study Number																						
	37	45	46	38	47	23	39	48	40	49	33	41	42	51	52	54	57	55	56	43	50	53	44
Title reflects content	2	2	2	1	2	2	2	1	2	2	2	1	2	2	2	2	2	2	2	2	1	2	2
Authors credible	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Abstract summarises the key components of the study	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2	2	2	1	1
Rationale for research clearly outlined	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1
Literature review is comprehensive and up to date	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	1	2	1
Aim of the study clearly stated	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	1	2
Ethical issues identified and addressed	1	0	1	0	2	0	2	0	0	0	0	0	2	2	1	2	0	1	0	0	0	0	0
Methodology identified and justified	0	1	1	1	1	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
Study design is clearly identified and rationale for choice of design evident	1	2	2	1	2	2	1	1	1	1	1	0	0	1	1	1	1	2	1	2	0	1	0
Study hypothesis stated and key variables clearly defined	2	2	2	2	2	2	2	2	2	2	0	2	2	2	2	2	2	2	0	2	2	1	1
Population clearly defined	2	2	2	2	2	2	2	1	2	2	2	2	2	0	2	2	2	0	1	1	2	1	0
Sample is adequately described and reflective of the population	2	1	2	0	2	2	2	1	2	1	2	2	2	0	0	2	1	1	2	1	2	2	2
Is there a control group? Are samples matched?	2	1	2	2	2	1	1	2	2	2	2	1	2	1	1	2	2	2	2	0	0	0	0
Method of data collection valid and reliable	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2
Method of data analysis valid and reliable	2	2	2	2	2	2	2	2	2	2	2	1	2	2	1	2	2	2	2	1	2	2	1
Results presented in an appropriate and clear manner	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	2	1
Discussion is comprehensive	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1
Results are generalizable	2	1	1	1	1	1	2	2	2	2	2	1	1	1	1	2	2	2	2	1	1	1	1
Conclusion is comprehensive	2	2	2	1	2	2	2	2	2	2	2	1	2	2	1	2	2	2	2	2	1	2	1
Total Score	22	32	35	28	36	33	34	29	33	32	31	26	33	29	27	35	32	32	29	28	24	26	21

303

Key themes

305 Three key themes were identified using principles of framework analysis (34) involving synthesis of

306 findings: (i) Relationship between Work-Related Smartphone Use During Off-Job Hours and Work-

307 Life Conflict, (ii) Mediators and Moderators of the Relationship between Work-Related Smartphone

308 Use During Off-Job Hours and Work-Life Conflict, and (iii) Relationship between Work-Related

309 Smartphone Use During Off-Job Hours and Workers' Wellbeing, Attitudes and Behaviours. Themes (i)

310 and (ii) directly relate to the research question and objectives (i) and (ii). The third theme relates to

311 objective (iii) and was identified following synthesis of findings from the review, and highlights the

312 diversity of outcome measures in the included studies.

313 (i) Relationship between Work-Related Smartphone Use During Off-Job Hours and Work-Life Conflict

314 Of the 23 studies, 19 (23,33,37–44,46,47,50–56) observed a significant association between

315 increased use of smartphone for work purposes in off job-hours and increased work-life conflict

316 (Supplementary file S4 Table). A comparison of effect sizes with regards to the operationalisation of

317 work-related smartphone use in off-job time (functional, perceptual, both, or unclear; Table 1) and the

318 quality of included studies (Table 2) revealed that there was little difference in the degree of the

319 relationship observed (i.e., the effect sizes across studies ranged from small-to-moderate;

320 Supplementary file S4 Table). Studies that did not observe a statistically significant finding did not

321 notably differ with regards study quality, sample size or other study characteristics.

322 (ii) Mediators and Moderators of Work-Related Smartphone Use During Off-Job Hours and Work-Life

323 Conflict:

324 When reviewing these 23 studies, we observed that a large proportion investigated a wider variety of

325 dependent variables beyond work-life conflict. A key finding from this review is the variety of variables

326 that have been tested and explored in seeking to understand the postulated association between

327 work-related smartphone use during off job hours and work type conflict. Many of the included studies

328 explored the contributory role of potential moderators or mediators within this association

329 (33,38,41,46,47,49,51,52,57). An overview of those studies that tested the role of a third variable as a

330 potential mediator or moderator within the association between work related smartphone use during

331 off-job hours and self-reported work-life conflict is provided (Supplementary file S5 Table).

332   The mediators identified in our sample of studies included: psychological detachment from work (i.e.

333   detachment from work, when not at work)[14] and communication about family demands with one's

334   supervisor (57). Specifically, the frequency and duration of BlackBerry usage outside of working hours

335   was negatively associated with psychological detachment, which was further negatively associated

336   with work-family conflict (51). Regarding the second mediator, smartphone use after working hours

337   was positively associated with communication about family demands with supervisor, which was

338   further negatively associated with work-life conflict (57). Job control (i.e., a person's ability to influence

339   what happens in their work environment) (51) and communication about work demands with one's

340   family members (57) did not appear to significantly mediate the relationship between smartphone use

341   and work-life conflict. Moderators found to strengthen the relationship between work-related

342   smartphone use in off-job time and work-life conflict included: supervisor expectations (47) and job

343   pressure (33). Moderators found to attenuate the strength of the relationship included: low

344   segmentation preference (46) (i.e., the degree to which one prefers to separate various aspects of

345   work and family from each other by creating boundaries around the work and family domains), cell

346   phone attachment (38), daily work engagement (i.e., the degree of personal investment in one's work

347   role) (47), job autonomy (i.e., the degree to which one has control over *how* to get the job done) (33),

348   full schedule control (i.e., the degree to which one has control over *when* and *where* to get the job

349   done (33), challenging work (33), and organisation's attitude towards smartphone use (41). Variables

350   that were not found to moderate the relationship included: norms set by colleagues (47), integration

351   preference (i.e., preference for how one coordinates their personal and professional lives in a

352   complementary way and fulfills both sets of responsibilities) (49), integration norms (i.e., norms

353   observable within the organisation for how other coordinate their personal and professional lives in a

354   complementary way and fulfill both sets of responsibilities) (49), work demands (49), and some

355   schedule control (33). See Figure 2 for key mediators and moderators.

356

357

358

359

360   [insert Fig.2 here]

361   (iii) Relationship between Work-Related Smartphone Use During Off-Job Hours and Workers'

362   Wellbeing, Attitudes and Behaviours

363   In addition to work-life conflict, included studies examined the association between work-related

364   smartphone use during off-job hours and several aspects of employees' wellbeing (both negative and

365   positive aspects), attitudes, and behaviours (Supplementary file S6 Table). Regarding negative

366   aspects of wellbeing, three studies reported low to moderate positive associations between work-

367   related smartphone use during off-job hours, and measures of job stress (41), psychological distress

368   (33), psychological and physiological strain (43), and sleep problems (56). In one study, job autonomy

369   and challenging work attenuated the relationship between increased work-related us of smartphone in

370   off-job hours and sleep problems; whereas, in contrast, job pressure amplified this observed

371   association (33), albeit to a minimal extent. The use of smartphones to attend to work-related matters

372   during nonworking hours hindered engagement in recovery activities (such as, relaxation, mastery,

373   and control/autonomy) (45), and fostered the intrusion of personal life into work life and vice-versa

374   (41).

375   Unexpectedly, the association with positive aspects of well-being (such as, life satisfaction (41), job

376   satisfaction (41,44), and work engagement (38,52)) was similar in degree and direction to the

377   association between work-related smartphone use during off-job hours and the negative aspects of

378   wellbeing mentioned above. This challenges the assumption that positive and negative aspects of

379   wellbeing are at opposite ends of a spectrum. In one study, the frequency of smartphone use for work

380   during personal time was associated with increased life satisfaction and job satisfaction (41) albeit

381   weakly. However, in the same study, increased perceived work life to personal life smartphone

382   intrusion was associated with decreased job satisfaction (41). A positive, but weak, relationship

383   between smartphone use for work-related purposes during off-job time and work engagement was

384   found in two included studies (38,52), in contrast to what might be expected in the wider literature.

385   This relationship was positively moderated by employees' cell phone attachment in one study (38).

386   Regarding employees' attitudes towards their work or job, work-related smartphone use during off-job

387   time was found to promote affective organisational commitment (43) and organisational identification

388   (57). The relationship with the latter was partly mediated by communication about family demands

389   with supervisors (57). Lastly, regarding employee behaviour, work-related smartphone use during off-

390   job time was found to enhance job performance (43) and family role performance (46). Work-related

391   smartphone use during off-job time reinforced communication about family demands with a

392   supervisor, as well as communication about work demands with family members (57).

393

394   **Discussion**

395   To our knowledge, this is the first scoping review to map the published evidence examining the

396   association between the use of smartphone technology for work purposes in off-job hours in relation

397   to employees' self-reported work-life conflict. In doing so, we also unpack potential mediators and

398   moderators of this relationship, as well as related outcomes of off-job hours smartphone technology

399   use in relation to worker wellbeing, attitudes, and behaviours.

400   Overall, most of the studies identified a significant association between increased use of smartphone

401   for work purposes in off job-hours and increased work-life conflict with small-to-moderate effect sizes.

402   They highlight the heterogenous manner in which home and life domains are considered, including its

403   focus (e.g., family vs home life) and the nature of the overlap between both domains (i.e., where they

404   interfere or harmonise) (30). Additionally, the included studies highlight a negative psychological and

405   behavioural impact on employees of increased use of smartphone for work purposes in off job-hours,

406   including job stress and strain, and sleep disturbances. As such, our review findings emphasise the

407   'dysfunctional aspect' of smartphone use during off-job hours (infringement on work-life boundaries)

408   as described by Middleton and Cukier (29) and lend support to the Work-family Border Theory (16).

409   This theory purports the vulnerability of individuals to work-life conflict due to the high likelihood of

410   work and family/home lives integrating. Having an awareness of the strong association between use

411   of smartphone for work purposes in off job-hours and work-life conflict is important, both to employees

412   and employers, since work-life conflict has been shown to predict job satisfaction and burnout (21)

413   both of which, in turn, predict turnover intentions (90).

414   In this review, we found that the relationship between use of smartphone for work purposes in off job-

415   hours and work-life conflict was mediated by psychological detachment from work, and communication

416   about family demands with one's supervisor. The first key mediator, psychological detachment,

specifically in the digital era (i.e., the creation of boundaries around information and communication technology), has been associated with lower levels of work presenteeism and higher levels of family-life satisfaction (91). The second key mediator highlights the important role of the line manager (and employee communication with them) in this process. It is well established that managers contribute to the development of policy relating to work-life balance, play a pivotal role in translating work-life balance policies into practice (92). Drawing on Boundary Theory (59), smartphone use can make boundaries between work and life more permeable, and employees may need to communicate any concerns relating to this to their line managers to reduce work-life conflict. Such discourse between the employee and their manager(s) relies on organisations establishing a psychologically safe work environment, in which employees feel safe to speak up about concerns (e.g., the impact of work connectivity in off-job hours on family life). Studies have demonstrated that psychological safety in the workplace is an important predecessor for interpersonal communication (93). Having open conversations with line managers about after-hours connectivity may help employees to establish clear expectations, reduce stressors associated with connectivity, and ultimately reduce work-life conflict (57).

This review identified key moderators of the relationship between increased use of smartphone for work purposes in off-job hours and increased work-life conflict. Moderators that strengthened this relationship were supervisor expectations and job pressure. High after-hours availability expectations (i.e., from managers / supervisors) has been associated with low psychological detachment from work, and it has been recommended that the introduction of 'availability' policies and discouragement of work-related smartphone use outside regular work hours may help employees to achieve successful boundary control and subsequent psychological detachment (94). This is important given the known relationship between psychological detachment, workload (i.e., job pressure) and wellbeing (e.g., Sonnentag and Bayer (95)).

In our included studies, moderators that attenuated the strength of the relationship between use of smartphone for work purposes in off-job hours and work-life conflict include low segmentation preference, cell phone attachment, daily work engagement, job autonomy, full schedule control, challenging work, and organisation's attitude towards smartphone use. Low segmentation preference refers to the tendencies of individuals to separate their working and non-working roles. Employees with higher segmentation appeared to have less problems (e.g., work-life conflict) caused by work

446   connectivity behaviour using smartphones in off-job hours (46). Other research found that segmentation

447   norms of the team moderate the relationship between work-family segmentation preferences and work-

448   related ICT use at home (96), although norms within the organisation (i.e., integration norms / norms

449   set by colleagues) were not found to be significant moderators in the studies included in this review

450   (47,49). Cell phone attachment (i.e., valuing and being physically attached to a cell phone) has been

451   found to buffer the negative effects of use of smartphone for work purposes in off-job hours on work-

452   life conflict (38). These factors demonstrate the key role of individual preferences in whether

453   smartphone use during off-job hours leads to work-life conflict, and the impact it may (or may not) have.

454   This review resulted in recommendations for employers and line managers (Fig.3) which were

455   developed with stakeholder input during review Stage 6.

456

457   *[insert Fig.3 here]*

458

459   *Limitations of included studies*

460   The limitations of included studies mainly relate to the study design and the measurement of

461   smartphone use for work-related purposes during off-job time. Most of the studies (19/23) relied on

462   cross-sectional designs, and there was only one study that explored changes over time in a

463   longitudinal design. This inhibits the establishment of causal relations among variables (97). Of the

464   remaining studies, four adopted a diary-entry design (23,45–47), one adopted a time-separated

465   design (57), and one adopted a repeated measures design (38). Although diary studies could be used

466   for examining intra-individual changes across time, which is a component of longitudinal design (97),

467   the included diary studies did not specifically provide evidence for intra-individual changes in

468   participants, which deters the examination of causal relations. Also, the inclusion of only two

469   measurement points in studies with a time-separated (57) or repeated-measures design (38) limit the

470   determination of temporal relations among variables (98,99). Importantly, our review demonstrates

471   that papers focused on smartphone use operationalised the concept in different ways, with few

472   studies measuring both functional (e.g., time spent answering emails) and perceptual (i.e., perceiving

473   pressure to respond to email) aspects of smartphone use during off-job hours. Regarding the

474   measurement of smartphone use for work-related purposes during off-job time, almost all the studies

475   used standardised measurement scales to assess work-life conflict (or the construct used to

476   operationalise this). However, the use of self-report survey instruments increases vulnerability to

477   recall bias. None of the included studies assessed the time spent on smartphones for work-related

478   purposes during off-job time using objective data (e.g., recording screen time, such as the average

479   minutes or hours using a smartphone). In addition, two of the included studies (42,45) used single-

480   item self-constructed scales to assess the work-related use of smartphones thereby, inhibiting the

481   determination of their internal consistency.

482   *Review strengths and limitations*

483   Regarding study strengths, this scoping review involved stakeholder consultation which is an optional

484   stage in the Arksey and O'Malley (31) framework. The review utilised pre-defined inclusion and

485   exclusion criteria, a comprehensive and timely search strategy (searches up to date as of November

486   2023), pre-testing of all screening and data characterisation forms and quality appraisal. While quality

487   appraisal is not an essential component of (or consistently included in) scoping reviews its inclusion

488   addresses a known limitation of the scoping review method (100). It was conducted and reported

489   using a published methodological framework, quality assessment checklist and PRISMA-ScR

490   reporting guidelines. At least two researchers were involved in each stage; there was independent

491   and blind assessment of a random 20% of abstracts and full texts, with high inter-rater reliability. In

492   terms of limitations, although we searched many databases which captured relevant papers in the

493   social sciences (e.g., in the fields of psychology, business and management), the review may have

494   missed some published studies through exclusion of databases in other disciplines (e.g., biomedical),

495   grey literature, study protocols, and studies published in a language other than English. We

496   intentionally excluded qualitative studies due to the nature of our research question and study aims,

497   however, a qualitative or mixed-methods review may provide additional insights into this subject area.

498   *Review implications for research and practice*

499   Studies in this review were conducted in nine countries although one third were conducted in the USA

500   and there was only one study from the UK. There is scope for further research in other geographical

501   regions, particularly those countries with the highest number of smartphone users (China: 974 million,

502   India: 659 million (101) and the highest smartphone penetration rates (France: 82.6%, UK: 82.2%,

503   Germany, 81.9% (102)) .

504   In this review, most studies found a significant association between increased use of smartphone for

505   work purposes in off job-hours and increased work-life conflict. Findings from the review suggest that

506   organisations should provide training for line managers about work-life conflict (or work-life balance)

507   and the potential negative effects on employees of smartphone use for work purposes during off-job

508   hours. Future research could focus on the co-creation of such line manager training with managers and

509   other stakeholders (e.g., employer and employee representatives, professional bodies, trade unions).

510   This training could be implemented and evaluated with managers from diverse employment settings

511   and sectors, to explore outcomes for managers' knowledge and skills, and employees' perceptions of

512   work-life conflict. Based on review findings, implications for practice were generated in collaboration

513   between the study team and the interprofessional stakeholder group. While employers may wish to

514   advocate for reduced use of smartphone for work purposes in off job-hours to reduce the risk for work-

515   life conflict, should this be challenging due to the nature of the job role or individual preferences, then

516   enhancing skills for psychological detachment may be one approach to reducing or managing work-life

517   conflict. The most appropriate mechanisms for achieving this could be explored in future evidence-

518   reviews or qualitative research. Line managers should seek to reduce unnecessary job pressure and

519   regularly review workloads to reduce unnecessary work-related smartphone use during off-job hours.

520   Managers could review their leadership styles, aim to lead by example, and create a positive workplace

521   culture in which they can have open conversations with employees about their (and the organisation's)

522   expectations of availability outside of working hours, as well as their own and employees' segmentation

523   preferences. More research is needed to explore the outcomes of open conversations in the workplace,

524   and psychological safety climate, on individual and organisational outcomes.

525   Enhancing employees' job autonomy and imparting full personal control over work schedules may help

526   to reduce negative impacts of smartphone use during off-job hours. This may help employees to

527   manage or prevent work-life conflict where it is, or could be, experienced.

528   **Acknowledgements**

531 **Competing interests**

532 The authors declare that they have no competing interests.

533 **Author's contribution**

534 JH, JS, and HB conceived of the study. JS, JH, HB, and KT participated in the design of the study.

535 JS, JH, HB and KT undertook the literature review process. HB and JS drafted the manuscript. All

536 authors read, reviewed, and approved the final manuscript.

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832

833 **Supporting information captions**

834 **S1 Table.** PRISMA checklist.

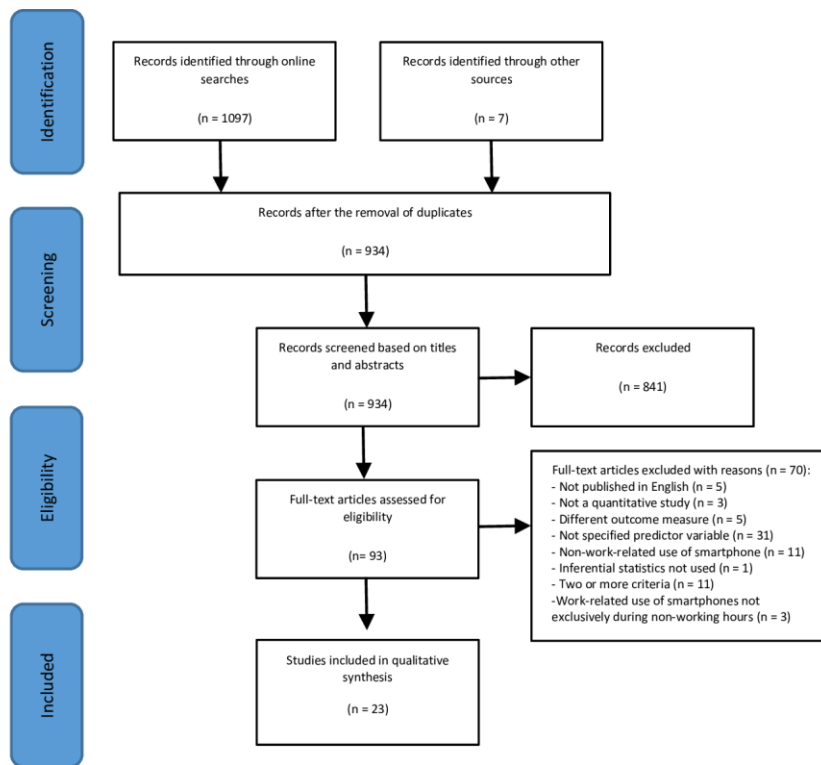835 **S2 Text.** Example search strategy for PsychINFO.

836 **S3 Table.** Operationalisation and measurement of smartphone technology and work-life conflict in
837 included studies, and additional study variables.

838 **S4 Table.** Summary of findings: The association between the use of smartphone technology for work
839 in off-job hours and work-life conflict.

840 **S5 Table.** Variables moderating or mediating the relationship between smartphone-use and work-life
841 conflict.

842 **S6 Table.** Summary of findings examining work-related wellbeing, attitudes, and work behaviours as
843 outcomes.

844

Identification

Records identified through online searches

(n = 1097)

Records identified through other sources

(n = 7)

Screening

Records after the removal of duplicates

(n = 934)

Records screened based on titles and abstracts

(n = 934)

Records excluded

(n = 841)

Eligibility

Full-text articles assessed for eligibility

(n= 93)

Full-text articles excluded with reasons (n = 70):
- Not published in English (n = 5)
- Not a quantitative study (n = 3)
- Different outcome measure (n = 5)
- Not specified predictor variable (n = 31)
- Non-work-related use of smartphone (n = 11)
- Inferential statistics not used (n = 1)
- Two or more criteria (n = 11)
-Work-related use of smartphones not exclusively during non-working hours (n = 3)

Included

Studies included in qualitative synthesis

(n = 23)

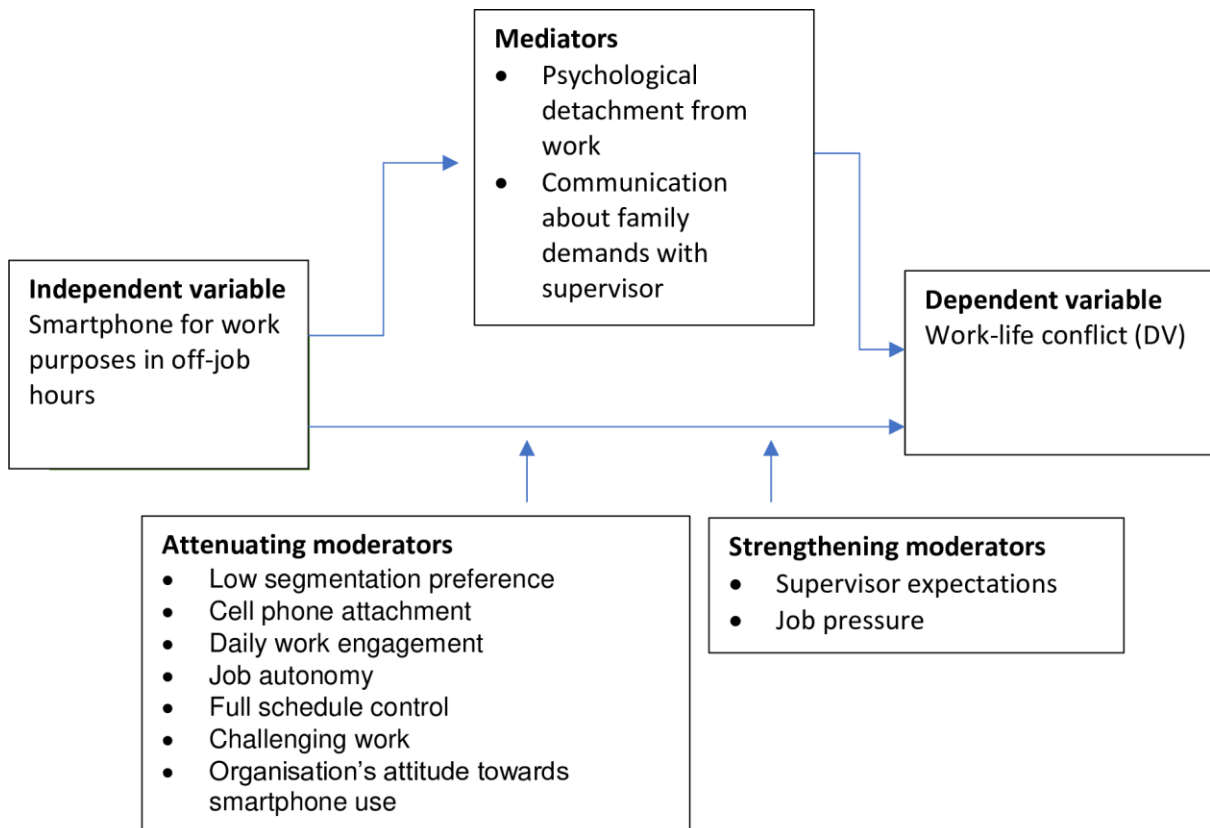845   **Fig. 1.** The review process based on PRISMA flow diagram

846

Fig. 2. Mediators and moderators of the relationship between smartphone use for work purposes in

847 off-job hours and work-life conflict.

848

What is the problem?

- When employees use smartphones for work purposes in non-work hours this can cause problems for some employees in balancing their work and home lives.

- For some employees, there can be negative impacts such as job stress and strain, and sleep disturbances.

- This could lead to reduced job satisfaction, burnout, and intentions to leave.

What can employers do?

- **Develop workplace policy** relating to work-life balance. To include 'availability' policy and where appropriate, discouragement of work-related smartphone use outside regular work hours (recognising needs of the job role, and individual preferences).

- **Encourage open conversations** with employees about their (and the organisation's) expectations of availability outside of working hours.

- **Enhance employee skills for 'psychological detachment' from work** by creating boundaries around the use of smartphones /email outside of working hours, where appropriate and mutually agreed.

What can employers do?

- **Provide training for line managers** about the potential negative effects on employees of smartphone use for work purposes during off-job hours. Consider the influence of leadership styles.

- **Raise awareness** of factors influencing decisions to use smartphones during non-work hours.

- These might include personal preferences, workplace norms, the nature of the job role, and the employees' level of control over their schedules and work.

- **Reduce** unnecessary job pressure and regularly **review** workloads.

- **Enhance** employees' job autonomy and **impart** full personal control over work schedules (where possible).

Fig. 3. Recommendations for employers and line managers (Photo 1 by Ruan Richard Rodrigues, Photo 2 by Amy Hirschi, Photo 3 by Luis Villasmil; all on Unsplash)

849

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	Scoping review. 1,2,5
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	3-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	6
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	2,5-6
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	2,7
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	2,6
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	S2 text
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	9
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	9
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	Table 1 and Supplementary

			file S3
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	9,19 and Table 2
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	N/A (narrative scoping review)
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	N/A

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851

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	N/A
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A (scoping review)
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	7-8, Fig 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Table 1
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	19, Table 2
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	N/A
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	N/A
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	N/A
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
DISCUSSION			

Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	21-27, Fig.2, Fig.3, Supplementary Tables S4, S5
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	28-30
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	24-30
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	N/A

852

853 *From:* Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The
854 PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097
855 For more information, visit: **www.prisma-statement.org**.

857   **S2 Text.** Example search strategy for PsycINFO

858

859

860   S1: smartphones OR (mobile devices) OR (mobile phone) OR (cell phone) OR iPhone OR blackberry OR (android phone) OR (windows phone)

861

862   S2: (work-life conflict) OR (work-family conflict) OR (work-life balance) OR (work-life interface) OR (work-life interference)

863

864   S1 yielded 19,012 results and S2 yielded 7,004 results. For both the searches, the identified terms should have appeared "anywhere" in a manuscript. When
865   both S1 and S2 were combined ([S1] AND [S2]), it produced 51 outputs, and after date restrictions (01/01/2012 - 29/11/2023) were imposed, it produced 44
866   outputs.

867

868 **Supplementary File S3.** Operationalisation and measurement of smartphone technology and work-life conflict in included studies, and additional study
869 variables.

Study		Smartphone technology	Work-life conflict	Other study variables
Brown and Palvia (37)	Definition	**Mobile-device:** A personal device that combines a cell phone with a hand-held computer, typically offering internet access, data storage, e-mail capability, etc. (such as a smart phone) (37).	Not defined.	Work-related mobile-device usage at work, Personal mobile-device usage at work, Productivity, Employer expectations, and Flexibility
	Measurement	Mobile device-use was measured using a six-item Likert-scale. It was not clear whether the scale was self-constructed or pre-existing.

The average variance extracted (AVE) value of the scale was .68 indicating satisfactory convergent validity, and composite reliability was .93. Factor loadings for all items were greater than .6.

It was unclear whether the study assessed functional or perceptual aspects of work-related smartphone use during nonworking hours. | Measured using a five-item Likert-scale. It was not clear whether the scale was self-constructed or pre-existing.

The AVE value was .82 indicating satisfactory convergent validity, and composite reliability was .96. Factor loadings for all items were greater than .8. | |
| Derks et al. (45) | Conceptual | **Smartphone:** a mobile device with the functionality of a pocket PC, which facilitates calendar management, unlimited access to the Internet, making phone calls, and receiving emails anytime, anywhere (45). | **Work-home interference (WHI):** a process of negative interaction between work and home domains (1). | Recovery activities from work: Psychological detachment, Relaxation, |

				Mastery, and Control/ Autonomy
	Measurement	Smartphone usage for work-related purposes during non-working hours was assessed using a self-reported background questionnaire. However, the exact question asked was not stated. It was unclear whether the study assessed the functional or perceptual aspects of work-related smartphone use during non-working hours	Daily WHI was measured using the eight-item subscale of the SWING (Survey Work– home Interaction NijmeGen; (2). Items adjusted for day-level measurement by Van Hooff et al. (1) were used. Items were rated on a five-point Likert scale. The scale demonstrated high internal consistency (α = .97).	
Derks et al. (46)	Conceptual definition	**Daily work-related smartphone use during off-job time:** not defined.	**Work-family conflict:** The extent to which professional and family responsibilities are incompatible with each-other (3).	Segmentation preference, workload, daily role family performance
	Measurement	Measured using a four-item scale developed by Derks and Bakker (4) (α = .78). The scale included both structural (example item: "*Today, I used my smartphone intensively during after work hours for work-related purposes*") and perceptual (example item: "*Today, I felt obliged to respond to work-related messages during the evening hours*") aspects of work-related smartphone use during nonworking time.	Daily work-family conflict was measured using a five-item subscale of the Work– Family Conflict Scale (5) (α = .92). Items were adjusted for day-level measurement by the researchers.	

Ragsdale and Hoover (38)	Definition	**Cell phones:** Portable and flexible devices for staying connected to work (38). The researchers focused specifically on work-related cell phone (WRCP) use during nonworking hours (38) (Cell phones as access to job demands Section, p. 55).	**Work-family conflict:** an inter-role conflict in which work, and family demands, are incompatible with each-other (3).	Cell phone attachment, work engagement, and emotional exhaustion
	Measurement	Measured using a seven-item Likert scale developed by the researchers (α = .95), which captured expectations related to WRCP use (e.g., "*My supervisor relied on me carrying my cell phone to contact me*"), actual use (e.g., "*I find myself using my cell phone for work at home*"), and thinking about use (e.g., "*My cell phone has become a constant reminder of work.*") during nonworking hours. A review of the dimensions and sample items suggested that the scale assessed both the functional as well, as the perceptual aspects of WRCP	Assessed using a nine-item Likert scale developed by Carlson et al. (6) (α = .89).	
Derks et al. (47)	Definition	**Daily smartphone use after work hours** was not defined by the authors.	**Work-home interference**: an inter-role conflict in which work, and family demands are incompatible with each-other (3).	Supervisor expectations, norms set by colleagues, workload, daily work engagement

	Measurement	It was measured using a four-item Likert scale developed by Derks and Bakker (4) (α = .77). Items were rated on a five-point Likert scale. The scale measured both functional and perceptual aspects of work-related smartphone use during nonworking time.	Daily WHI was measured using the eight-item subscale of the SWING (Survey Work– home Interaction NijmeGen) (2). Items adjusted for day-level measurement by Van Hooff et al. (1) were used. Items were rated on a five-point Likert scale. The scale demonstrated high internal consistency (α = .91).	
Derks and Bakker (23)	Definition	**Smartphone:** a wireless device with functions to manage the calendar, make phone calls, browse the web, and to send and receive e-mails (4).	**Work-home interference:** an inter-role conflict in which work, and family demands are incompatible with each-other (3).	Daily psychological detachment, daily exhaustion, daily cynicism, and daily relaxation
	Measurement	Intensive smartphone use was assessed using a four-item self-constructed scale. All items were rated on a five-point Likert scale.	Daily WHI was measured using the eight-item subscale of the SWING (Survey Work– home Interaction NijmeGen) (2). Items adjusted for day-level measurement by Van Hooff et al. (1) were used. Items were rated on a five-point Likert scale. The scale	

			demonstrated high internal consistency (α = .88).	
Carlson et al. (39)	Definition	**Mobile device:** a smartphone or an internet-enabled tablet.	**Work-to-family conflict (WFC):** a form of inter-role conflict in which the role pressures from the work and family domains are mutually incompatible in some respect (3).	Relationship tension, spouse family-to-work conflict, spouse job satisfaction, and spouse job performance
	Measurement	Mobile device use for work (by job incumbents) during family time was assessed using a three-item scale developed by Ferguson et al. (40). All items were rated on a five-point Likert scale and the scale demonstrated satisfactory levels of internal consistency (α = .95). The items of the scale assessed the functional dimension of mobile device use for work during family time (example item: "*How frequently do you use a mobile device to perform your job during family time?*")	Job incumbents' WFC levels were measured using a nine-item scale developed by Carlson et al. (6). The scale demonstrated satisfactory internal consistency (α = .93).	
Yun et al. (48)	Definition	**Office-home smartphone (OHS):** a smartphone device used for personal uses, as well as for nonpersonal, nonfamily purposes." (48). The researchers focused on OHS for work purposes for the purposes of this study.	**Work-to-life conflict due to OHS**: not defined.	Job stress, user resistance to OHS, segmentation culture, and segmentation preference

		Measurement	Four attributes of OHS (work overload, flexibility, autonomy, and productivity) were measured by combining items from different scales (all rated on five-point Likert scale) and by translating them into Korean (if required). All the items were reported in Table 3 of the study.	It was measured using a five-item scale (α = .89) (7). All items were rated on a five-point Likert scale. An example item includes, "The work use of smartphones interferes with my home and personal life."	
			Work overload was measured using a four-item scale (α = .91) (7,8). Example item: "*After using smartphones for work purposes, I feel that the number of requests, problems, or complaints I deal with is more than what is expected*."		
			Flexibility was measured using a four-item scale (α = .88) (9). Example item: *"Since you used smartphones for work purposes, how much flexibility have you had in selecting the location where you work?"*		
			Autonomy was measured using a three-item scale (7,10). Example item: "*After using smartphones for work purposes, I control the content of my job*."		
			Productivity was measured using a four-item scale (α = .79) (11). Example item: "The work use of a smartphone helps to improve the quality of my work."		

		A review of items suggested that the study measured the perceptual facet of OHS.Note: Items of flexibility and autonomy subscales loaded onto the same factor in exploratory factor analysis thus, these two subscales were combined.		
Ferguson et al. (40)	Definition	**mWork:** Defined as the frequency of using a smartphone (or a tablet) with access to the internet to access and complete work tasks during leisure time (40).	**Work-family conflict:** a form of inter-role conflict in which the role pressures from the work and family domains are mutually incompatible in some respect (3).	Administered to incumbent (burnout, organisational commitment, and turnover intentions) Administered to spouse (resentment towards the organisation of the job incumbent, commitment to the job incumbent's organisation, and engagement in mWork [control variable])
	Measurement	Job incumbents' engagement in mWork was measured using a three-item (five-point Likert) scale (12). The scale demonstrated satisfactory levels of internal consistency (α = .94). Example item: "*How frequently do you use a mobile device to perform your job during family time*?" A review of the items indicated that the scale measured the functional aspect of mWork.	Job incumbents' levels of WFC were assessed by their spouses using a nine-item scale developed by Carlson et al. (6). The scale included items related to time-based WFC (α = .92), strain-based WFC (α = .94), and behaviour-based WFC (α = .90).	
Gadeyne et al. (49)	Definition	**Work-related smartphone use outside work hours:** not defined.	**Work-to-home conflict**: Resulting from competing temporal demands of different life domains and strain or stress caused by spillovers from one life domain to the other (3).	Integration preference, integration norms, work demands, work-related PC/laptop use outside work hours, home demands, and overtime

	Measurement	It was measured using a two-item (five-point Likert) scale (α = .90) (49), where participants were asked to rate how often they used their smartphones for work-related goals outside work hours. In addition, how many minutes per day they spent on average on their smartphones for work-related purposes outside work hours. Items on the scale measured the functional aspect of work-related smartphone use outside work hours.	It was measured on a six-item scale developed by Carlson et al. (6). Items related to time-based (α = .86) and strain-based (α = .87) work-to-home conflict were included. All items were rated on a seven-point Likert scale.	
Schieman and Young (33)	Definition	**Work contact:** Defined as the frequency with which workers send and receive work-related communications (e.g. emails, phone calls, text messages) outside of regular working hours (13,14). This study was included because phone calls and text messages can only be made/sent using a mobile phone.	**Work-to-family:** the degree to which individuals perceive that work interferes with the responsibilities and expectations of family and competes for individuals' finite amounts of time and energy (15).	Psychological distress, sleep issues, job autonomy, schedule control, challenging work, and job pressure.
	Measurement	Work contact was measured using three items rated on a five-point Likert scale (α = .78). Example item: "How often were you called about work-related matters when you were not at work?"	WFC was measured using a four-item scale (α = .90). All items were rated on a five-point Likert scale.	

		A review of items indicated that the study assessed functional aspect of work-related smartphone use during nonworking hours.		
Harris (41)	Definition	**Smartphone:** a device that combines a cell phone with a hand-held computer, typically offering Internet access, data storage, e-mail capability, etc. (41). **Work life to personal life (WLPL) smartphone intrusion:** smartphone for work-related purposes during personal time.	**Work-life balance:** the degree to which an individual is equally engaged in and satisfied with their work and family role (16).	Organisational attitudes towards smartphones use, job stress, life satisfaction, job satisfaction, personal life to work life smartphone intrusion, and personal life to work life balance
	Measurement	WLPL smartphone intrusion was measured using a 14-item (five-point Likert) self-constructed scale (α = .78). Example item: *"I feel using my smartphone for work invades my personal life."* A review of items indicated that the scale assessed the perceptual facet of work-related smartphone use during nonworking hours. In addition, participants were asked, *"On average how many hours a week do you spend using your smartphone for work during personal time?"* (time spent using smartphones) and *"During an average week how often do you use your smartphone for work related activities during personal time?"* (frequency of smartphone use). These items assessed the functional aspect of work-related smartphone use during nonworking hours.	WLPL balance was measured using a 15-item (six-point Likert) scale developed by Fisher (17). The scale demonstrated satisfactory levels of internal consistency (α = .90).	
Burney (42)	Definition	**Smartphones:** compact devices that can be used for calling, messaging, mapping, and obtaining or exchanging information (18,19).	**Work-life balance:** the extent to which, an employee feels content with their personal and professional lives (20,21).	N/A

	Measurement	Participants were asked in the demographics questionnaire if they used a personal smartphone for work purposes, a company-issued smartphone, or both. It was not clear whether it assessed the functional or perceptual aspect of work-related smartphone use during non-working hours.	Work-life balance was measured using a four-item scale (α = .84 - .89) (22). All items were rated on a five-point Likert scale.	
Ward and Steptoe-Warren (51)	Definition	BB use for work purposes during non-work hours was not operationalized by Ward and Steptoe-Warren (51).	Work-family conflict (WFC) was operationalized as an inter-role conflict between work and family roles (23).	Psychological well-being, perceived job control, and psychological detachment
	Measurement	The frequency of BB use for work during nonwork hours was measured using the frequency subscale of the Work Connectivity Behaviour After-Hours (WCBA; α = .88) measure (24). All items were rated on a five-point Likert scale. The duration of BB use for work during nonwork hours was measured using the duration subscale of WCBA measure (α = .73).	WFC was measured using an eight-item (five-point Likert) scale developed by Kopelman et al. (α = .92) (23).	

		The frequency as well as the duration subscales of WCBA measure assessed the functional aspect of work-related smartphone use during nonworking hours		
Wei and Teng (52)	Definition	**Smartphone:** mobile phone that allows one to manage their calendar, access the internet and social media, and play games (25).	**Work-life conflict:** an inter-role conflict stemming from incompatible role pressures from work and family domains (3)..	Employment sector and work engagement
	Measurement	Work-related smartphone use outside of official working hours was assessed using a four-item, using a five-point Likert, scale (4) (α .717). Example item: "*I use my smartphone intensively.*" A review of the items suggested that the scale assessed the perceptual aspect of work-related smartphone use during non-working hours.	Work-life conflict was measured by adapting seven items (related to work interference with personal life) of a fifteen-item scale developed by Hayman (26) (α = .90)	
Bowen and Zhang (54)	Definition	**Work contact:** the frequency with which employees send and receive work-related communications (e.g., emails, phone calls, text messages) outside of regular working hours (27). This study was included because phone calls and text messages can only be made/sent using a mobile phone.	Work-family conflict (WFC) was operationalized as an inter-role conflict in which work, and family demands are incompatible with each-other (3).	Workload pressure, job autonomy, schedule control, childcare demands, household tasks, partner's work hours, partner support, family contact, family-to-work conflict, psychological distress, alcohol use, and sleep problems
	Measurement	Work contact was measured using three items rated on a five-point Likert scale (α = .78) (27). Example item: ''*How often were you called about work-related matters when you were not at work*?''	WFC was measured using a four-item scale developed by Bowen et al. (α = .91) (28). All items were rated on a five-point Likert scale.	

		A review of the items indicated that the study assessed the functional aspect of work-related smartphone use during nonworking hours.		
van Zoonen et al. (57)	Definition	Smartphones: mobile, portable, and personalized access to communication, work and social networks, and information and application resources (57)	Work-life conflict: the negative effects of role pressures across the borders of work into life and vice versa (3,29)."	Discussing work demands with family, discussing work demands with supervisor, organisational identification, organizational tenure, and employer expectations to use communication technology outside of formal work hours
	Measurement	Smartphone use after hours was measured using a self-constructed scale. The scale included the prompt, "*Think about your smart phone use outside formal work hours. How often do you use the smart phone in the following ways* [for voice conversations, sending/receiving text messages, and sending/receiving email] *to perform your work outside of formal work hours (before or after work, on weekends, during vacations)?*" The item was rated on a seven-point Likert scale, and it was related to the functional aspect of work-related smartphone use during nonworking hours.	Work-life conflict was measured using a four-item scale developed by Hayman (26) (α = .91).	
Bowen et al. (55)	Definition	**Work contact**: not defined.	**Work-family conflict:** not defined.	Job autonomy and control, job pressure,
	Measurement	It was measured using three items rated on a five-point Likert scale (27) (α_1 = .84; α_2 = .83). Example item:	Work-family conflict (WFC) was measured using a four-item scale	

		"*How often were you called about work-related matters when you were not at work?*"	developed by Bowen et al. (30) ($α_1$ = .91; $α_2$ = .90). All items were rated on a five-point Likert scale.	psychological distress, and sleep problems.
		A review of items indicated that the study assessed the functional aspect of work-related smartphone use during nonworking hours.		
Bowen et al. (56)	Definition	**Work contact:** the degree to which workers send and receive work-related communications (e.g., emails, phone calls, text messages) outside of regular working hours (27). This study was included because phone calls and text messages can only be made/sent using a mobile phone.	**Work-family conflict (WFC):** an inter-role conflict in which work, and family demands are incompatible with each-other (3).	job autonomy and control, job pressure, psychological distress, and sleep problems.
	Measurement	Work contact was measured using three items rated on a five-point Likert scale (27) ($α$ = .84). Example item: "*How often were you called about work-related matters when you were not at work?*" A review of items indicated that the study assessed the functional aspect of work-related smartphone use during nonworking hours.	WFC was measured using a four-item scale developed by Bowen et al. (30) ($α$ = .91). All items were rated on a five-point Likert scale.	
Fender (43)	Definition	**Work extending communication (WEC):** the degree to which organizational employees are in contact via electronic communication technology with the	**Work-to-family conflict (WFC):** the degree to which an employee's work	Job performance, job insecurity, family-supportive organisational

		organization, its suppliers, or clients outside of normal working hours for work-related matters. WEC includes contacts initiated by either the organization or the employee. It is typically a phone call, email, text message or an instant message via a cell or smart phone. (31). **After-hours electronic communication (AEC) expectations:** the extent to which employees with electronic communication devices (i.e., cell and smart phones) believe that they are expected to be available and responsive to organizational demands after-hours via these devices (43). **Receptive electronic communication (REC) behaviour:** the extent to which individuals engage in work-related responsive communication and associated preparatory behaviours outside of normal working hours with members of their organizations, its customers and suppliers (43). **Electronic tethering (ET):** the extent to which an employee perceives that they are connected to the organization outside of normal working hours from an electronic communication perspective (43).	domain hinder effective participation in their family domain (32).	perceptions, predictability, and periodicity of WEC, affective attitude towards ET, and communication technology self-efficacy

| | Measurement | The intensity and duration of WEC was measured using a five-item self-constructed scale (α = .85). Example item: "*How many work-related communications did you receive after hours in an average week*?". A review of items in appendix B-1 (p. 242) in Fender (31) suggested that all the five items assessed the functional aspects of work-related smartphone use during nonworking hours.

AEC expectations were measured using an 8-item self-constructed scale (α = .87), using a five point scale. Example item: "*My organization expects me to answer after-hours contacts immediately*." A review of items in appendix B-2 (p. 242) suggested that the items assessed the perceptual aspect of work-related smartphone use during non-working hours.

The frequency of engaging in REC behaviours was measured using a 14-item self-constructed scale (α = .87), using a five-point Likert scale. Example item: "*Provide status reports after hours via your cell/smart phone?*" A review of items in appendix B-3 (p. 243) indicated that the scale assessed the functional aspect of work-related use of smartphone during nonworking hours.

ET was measured using a six-item self-constructed scale (α = .916) using a five-point Likert scale. Example item: "My cell/smart phone is a constant tie to | Time-based WFC (α = .897) was measured using a 3-item scale developed by Carlson et al. (6). | |

		my work." A review of ET items in appendix B-4 (p. 244) suggested that the scale assessed the perceptual aspect of work-related smartphone use during nonworking hours.		
Mansour et al. (50)**	Definition	**Use of smartphone and/or tablet for work-related purposes during nonworking hours:** the intensive use of these devices to conduct business outside official working hours.	**Work-family conflict (WFC):** a form of conflict between roles in which the general demands, the time spent, and the tension created by work interfere with family responsibilities" (5).	Work intensification
	Measurement	It was measured using a five-item, using a five-point Likert scale developed by Derks & Bakker (4); composite reliability [CR] = .92). Example item: "*I use my smartphone and/or tablet intensively outside business hours for business reasons.*" A review of items indicated that the scale measured the perceptual aspect of work-related smartphone use during non-working hours.	The intensification of WFC was measured using a self-constructed scale (CR = .93) comprising of items from validated scales, which were adapted to this study. All items were rated on a five-point Likert scale. Example item: "*Since the past five years, the demands of my job make it more difficult to take on my family responsibilities.*"	
Alwis and Hernvall (53)	Definition	The **perceived intensity of using information and communication technologies (ICTs) at work:** not defined.	**Work-life conflict (WLC):** the degree of perceived incompatibility between work and other life roles (35).	Segmentation preference and perceived intensity of ICTs at work
	Measurement	Perceived intensity of ICTs at work was measured using an adapted version of the six-item electronic tethering (ET), seven-point Likert, scale developed by	It was measured using the modified version of Netemeyer et al. (5) by Kreiner (36) (α = .92; CR = .93). All five	

		Fender (43) (α = .84; CR = .88). Example item: "*I feel as though I am always available to the organisation via technological devices (my cell/smartphone/laptop)*"	items were rated on a seven-point Likert scale.	
		This scale measured the perceptual aspect of work-related smartphone use during non-working hours.		
Moore (44)	Definition	**Smartphones:** minicomputers, allowing users to utilize email, text, and social media from the palm of their hands (44). **After hours communications for work-related purposes** using cell phones and/or computers: not defined.	Multiple definitions of work-life balance (WLB) were stated but, no one definition was adopted as the operational definition.	Facebook Use and Job Satisfaction
	Measurement	After hours communication was measured using the five-item Technology Assisted Supplemental Work (TASW) Survey (38) (α = .86). All the items were rated on a five-point Likert scale. A sample item includes, "When I fall being in my work during the day, I work hard at home at night or on weekends to get caught up by using my cell phone." The scale measured the perceptual aspect of work-related smartphone use during non-working hours.	WLB was measured using a six-item subscale of the Work-Life Balance Survey (26) called the Work Interference with Personal Life (WIPL) subscale (α = .72). All items were rated on a seven-point Likert scale.	

870 *There is inconsistency in Fender (43) regarding the number of items in the AEC expectations scale – whilst the appendix (B-2, p. 242) listed 8 items, the
871 methods chapter (p. 138) mentioned 7 items. The coefficient alpha value reported in the table are based on the seven-item scale (p. 138). **Mansour et al.
872 (50) did not mention but they added the term, "and/or tablet" to the scale developed by Derks and Bakker (4). Also, the scale constructed by Derks and
873 Bakker (4) included four items. It is not clear if there is an error in Mansour et al. (44) or if the researchers added an item.

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936

937 **S4 Table.** Summary of findings: The association between the use of smartphone technology for work
938 in off-job hours and work-life conflict.

Study	Relationship Found (Yes/No)	Summary of Main findings (reported effect size)	Data Analysis
37	Yes	Work-related mobile device usage at home was significantly related to work-life conflict (β = .301, p < .01).	Partial Least Squares Structural Equation Modelling (PLS-SEM)
45	No	The difference between levels of work-home interference reported by smartphone users and PC users was not statistically significant, $F(1, 78) < 1$.	Multilevel modelling
46	Yes	Daily work-related smartphone use during off-job time was negatively related to daily work-family conflict, γ = -.48, p < .001.	Multilevel modelling
38	Yes	Work-related cell phone use during nonworking hours was positively associated with work-family conflict, β = .42, p < .01.	Hierarchical regression
47	Yes	Daily smartphone use after work hours was positively related to daily work-home interference, γ = .291, p < .001.	Multilevel modelling
23	Yes	Daily smartphone use was positively related to daily work-home interference in two statistical models: (i) γ = .227, p < .01, and (ii) γ = .334, p < .001.	Multilevel modelling
39	Yes	Job incumbent mobile device use for work during family time was positively related to job incumbent work-family conflict, β = .20, p < .01.	Structural equation modelling

48	Mixed	Work-to-life conflict was significantly predicted by only one aspect of office home smartphone – work overload, $\beta = .67$, $p < .001$. It was not significantly related to flexibility (effect size not reported) and productivity (effect size not reported).	Covariance based structural equation modelling
40	Yes	Engagement in work by the job incumbent was positively associated with time-based work-family conflict ($\beta = .38$, $p<.05$), strain-based work-family conflict ($\beta = .35$, $p < .05$), and behaviour-based work-family conflict ($\beta = .17$, $p < .05$).	Structural Equation Modelling
49	No	Work-related smartphone use outside work hours was not related to time-based work-to-home conflict ($\beta = -.051$, $p > .05$) and strain-based work-to-home conflict ($\beta = .002$, $p > .05$). Work-related PC/laptop use after work hours was related to time-based work-to-home conflict ($\beta = .169$, $p < .01$). It was, however, not related to strain-based work-to-home conflict ($\beta = .101$, $p > .05$).	Hierarchical regression analysis
33	Yes	Work contact was positively associated with work-to-family conflict, $\beta = .310$, $p < .001$.	Hierarchical regression analysis
41	Yes	Work life to personal life (WLPL) smartphone intrusion was negatively related to WLPL balance, $r = -.598$, $p < .01$. Time spent using a smartphone for work during personal time was negatively related to WLPL balance, $r = -.339$, $p < .01$. Frequency of smartphone use for work during personal time was negatively related to WLPL balance, $r = -.261$, $p < .01$.	Bivariate correlation
42	Yes	There was a statistically significant difference in work-life balance of participants who used a	One-way ANOVA and Tukey's HSD test

		personal smartphone, a company-issued smartphone, or both for work, $F_{(2, 159)} = 11.67$, $p < .001$. Results of post-hoc analysis showed that managers who used a personal smartphone (mean difference = 2.298, $p < .05$) or a company-issued smartphone (mean difference = 3.651, $p < .05$) reported better work-life balance than those who used both.	
51	Yes	The frequency of BlackBerry use for work purposes during nonwork hours was positively related to work-family conflict, $r = .34$, $p < .01$. The duration of BlackBerry use for work purposes during nonwork hours was positively related to work-family conflict, $r = .30$, $p < .01$.	Bivariate correlation and mediation analysis
52	Yes	Work-related smartphone use outside official working hours was positively related to work-life conflict, $\beta = .40$, $p < .001$.	Linear regression
54	Yes	Work contact was positively associated with work-family conflict, $\beta = .21$, $p < .001$.	Structural equation modelling
57	No	Smartphone use after formal work hours was not related to work-life conflict, $B = -.004$, $p = .986$.	Structural equation modelling
55	Yes	Work contact was positively related to work-family conflict ($n_1 = 311$, $r = .46$, $p < .001$).	Bivariate correlation
56	Yes	Work contact was positively related to work-family conflict: $\beta = .223$, $p < .001$.	Structural equation modelling
43	Yes	Work extending communication ($\beta = .172$, $p < .05$), after-hours electronic communication expectations ($\beta = .320$, $p < .001$), and receptive electronic communication behaviours ($\beta = .115$, $p < .05$) were positively related to time-based WFC.	Structural equation modelling

		The relationship between electronic tethering and time-based work-family conflict was not examined.	
50	Yes	Work-related use of smartphone and/or tablet outside working hours was positively related to work-family conflict (B = .14, p < .01).	Structural equation modelling
53	Yes	The perceived intensity of using information and communication technologies (cell phone, smartphone, or laptop) was positively related to work-life conflict (β = .51, p < .01).	Structural equation modelling
44	Yes	Technology assisted supplemental work using cell phone or computer was positively associated with work interference with personal life (r = .20 p < .05).	Bivariate correlation

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940

941 **S5 Table.** Variables moderating or mediating the relationship between smartphone-use and work-life

942 conflict.

Study	Moderator/Mediator	Findings
46	Moderator	Segmentation preference positively moderated the negative relationship between daily work-related smartphone use during off-job time and daily work-family conflict, γ = .54, p < .001. Results of simple slope tests showed that for participants with high segmentation preference ('segmenters'), the relationship between work-related smartphone use during off-job time and work-family conflict was positive but, not statistically significant, β = .25, p > .05. In contrast, for participants with low segmentation preference (integrators), the relationship between the two variables was negative and significant: β = -1.21, p < .001.
38	Moderator	Work-related cell phone use during nonworking hours was positively associated with work-family conflict: β = .42, p < .01. Cell phone attachment was negatively associated with work-family conflict (β = -.16, p < .01) and negatively moderated the positive relation between work-related cell phone use and work-family conflict: β = -.93, p < .01.
47	Moderator	Daily smartphone use after work hours was positively related to daily work-home interference (WHI): γ = .272, p < .001. Supervisor expectations were positively related to daily work-home interference (γ = .128, p < .05) and it positively moderated the positive association between daily smartphone use after work hours and daily work-home interference: γ = .102, p < .05.
47	Moderator	Daily smartphone use after work hours was positively related to daily work-home interference: γ = .251, p < .001. Norms set by colleagues were positively related to daily work-home interference: γ = .231, p < .01. The positive association between daily smartphone use after work hours and daily work-home interference was not moderated by norms set by colleagues: γ = .072, p > .05.
47	Moderator	Daily smartphone use after work hours was positively related to daily work-home interference: γ = .290, p < .001. Daily work engagement was negatively related to daily work-home interference (γ = -.270, p < .001) and it negatively moderated the positive relationship between daily smartphone use after work hours and daily work-home interference: γ = -.198, p < .001.
49	Moderator	Integration preference was negatively related to time-based work-to-home conflict (β = -.208, p < .01) and strain-based work-to-home conflict (β = -.211, p < .01). However, it did not moderate the relationship between work-related smartphone use after work hours and time-based work-to-home conflict (β = .024, p > .05) and between work-related smartphone use after work hours and strain-based work-to-home conflict (β = .005, p > .05).

49	Moderator	Integration norms were positively related to time-based work-to-home conflict (β = .110, p < .05) and strain-based work-to-home conflict (β = .156, p < .01). However, it did not moderate the relationship between work-related smartphone use after work hours and time-based work-to-home conflict (β = -.090, p > .05) and between work-related smartphone use after work hours and strain-based work-to-home conflict (β = -.098, p > .05).
49	Moderator	The three-way interaction among work-related smartphone use after work hours, integration preference, and integration norms was not related to time-based work-to-home conflict (β = -.087, p > .05) and strain-based work-to-home conflict (β = -.082, p > .05).
49	Moderator	Work demands were positively associated with time-based work-to-home conflict (β = .230, p < .01) and strain-based work-to-home conflict (β = .231, p < .01). However, it did not moderate the relationship between work-related smartphone use after work hours and time-based work-to-home conflict (β = -.044, p > .05) and between work-related smartphone use after work hours and strain-based work-to-home conflict (β = -.022, p > .05).
49	Moderator	The three-way interaction among work-related smartphone use after work hours, integration preference, and work demands was not related to time-based work-to-home conflict (β = .007, p > .05) and strain-based work-to-home conflict (β = -.037, p > .05).
33	Moderator	Job autonomy was negatively related to work-to-family conflict (β = -.099, p < .001) and it negatively moderated the positive relationship between work contact and work-to-family: β = -.060, p < .001.
33	Moderator	Some schedule control was negatively related to work-to-family (β = -.134, p < .001), but it did not moderate the positive relationship between work contact and work-to-family: β = -.058, p > .05.
33	Moderator	Full schedule control was negatively related to work-to-family (β = -.219, p < .001) and it negatively moderated the positive relationship between work contact and work-to-family: β = -.124, p < .01.
33	Moderator	Challenging work was negatively related to work-to-family (β = -.137, p < .001) and it negatively moderated the positive relationship between work contact and work-to-family: β = -.065, p < .01.
33	Moderator	Job pressure was positively related to work-to-family (β = .406, p < .001) and it positively moderated the positive relationship between work contact and work-to-family: β = .031, p < .01.
41	Moderator	Work life to personal life smartphone intrusion was not related to work life to personal life balance, β = .04, p = .898. Organisation's attitude towards smartphone use was not related to work life to personal life balance: β = .23, p = .370. However, organisation's attitude towards smartphone uses negatively moderated the impact of work life to personal life smartphone intrusion on work life to personal life balance: β = -.231, p = .014.

51	Mediators	Job control and psychological detachment from work mediated the relationship between frequency of BlackBerry use for work purposes during non-working hours and work-family conflict (WFC), indirect effect = .1435, 95% BC bootstrap CIs (.0522, .2472). Job control and psychological detachment from work mediated the relationship between duration of BB use for work purposes during nonwork hours and work-family conflict, indirect effect = .3347, 95% BC bootstrap CIs (.0236, .6838). Job control did not mediate the relationship between frequency of BlackBerry use for work purposes during nonwork hours and WFC, indirect effect = .0080, 95% BC bootstrap CIs (-.0071, .0436). It also did not mediate the relationship between duration of BlackBerry use for work purposes during nonwork hours and WFC, indirect effect = .0081, 95% BC bootstrap CIs (-.0648, .1173). In contrast, psychological detachment mediated the relationship between frequency of BlackBerry use for work purposes during nonwork hours and work-family conflict, indirect effect = .1355, 95% BC bootstrap CIs (.0521, .2355). Also, it mediated the relationship between duration of BlackBerry use for work purposes during nonwork hours and work-family conflict, indirect effect = .3266, 95% BC bootstrap CIs (.0598, .6441). A comparison of indirect effects of both the mediators revealed that the indirect effects of psychological detachment from work were larger than the indirect effects of job control for both the frequency of BlackBerry use for work during nonwork hours (-.3185, 95% BC bootstrap CIs [-.6150, -.0690]) and duration of BlackBerry use for work during nonwork hours (-.1276, 95% BC bootstrap CIs [-.2244, -.0454]).
52	Moderator	The study examined employment sector (public vs. private) as a moderator in the relationship between work-related smartphone use outside official working hours and work-life conflict but, there were significant omissions in the results section (e.g., significance values for β values were not reported), which made it impossible to determine whether the analysis was significant or not. Although the researchers claimed that the moderation effect was not significant, the presented data is incomplete to confirm this assertion.
57	Mediator	The total effect of smartphone use after work hours on work-life conflict was not significant: B = -.010, p = .889. The direct effect of smartphone use after work hours on work-life conflict was not significant, B = -.004, p = .986. The direct effect of smartphone use after work hours on communication about family demands with one's supervisor was significant, B = .139, p = .026. The direct effect of communication about family demands with one's supervisor on work-life conflict was significant: B = -.113, p = .048. The indirect effect for the mediating role of communication about family demands with one's supervisor in the relationship between smartphone use after work hours and work-life conflict was significant: B = -.016, p = .027.

57	Mediator	The direct effect of smartphone use after work hours on communication about work demands with family members was not significant, B = .127, p = .076. The direct effect of communication about work demands with family members on work-life conflict was not significant: B = .084, p = .137. The indirect effect for the mediating role of communication about work demands with one's family members in the relationship between smartphone use after work hours and work-life conflict was not significant: B = .011, p = .111.
43	Mediator	Receptive electronic communication behaviour partially mediated the relationship between work extending communication and time-based work-family conflict. The direct effect of receptive electronic communication behaviour on time-based work-family conflict (B = .135, p = .042) was less than the total effect of receptive electronic communication behaviour on time-based work-family conflict (B = .217, p = .001).
43	Mediator*	Receptive electronic communication behaviour fully mediated the relationship between work extending communication and strain-based work-family conflict. The direct effect of work extending communication on strain-based work-family conflict (B = .037, p =.588) was not less than the total effect (B = .126, p = .050) and not statistically significant.
43	Mediator**	Receptive electronic communication behaviour did not mediate the relationship between after-hours communication expectations and time-based work-family conflict. The direct effect of after-hours communication expectations on time-based work-family conflict (B = .338, p < .001) was less than the total effect of after-hours communication expectations on time-based work-family conflict (B = .392, p < .001).
43	Mediator**	Receptive electronic communication behaviour did not mediate the relationship between after-hours communication expectations and strain-based work-family conflict. The direct effect of after-hours communication expectations on strain-based work-family conflict (B = .272, p < .001) was less than the total effect of after-hours communication expectations on time-based work-family conflict (B = .330, p < .001).

943 *It is not clear why the author (43) claimed full mediation in table 17 (p. 274) especially when the total

944 effect in the examined model was not statistically significant – the p-value for the relationship between

945 REC behaviour and strain-based WFC was not less than 0.05. **Based on the values reported in

946 table 17 (p. 274), there is clear evidence for partial mediation effect of REC behaviour in the relation

947 between AEC expectations and time-based WFC, and for the partial mediation effect of REC

948 behaviour in the relation between AEC expectations and strain based WFC. The direct effect (c' path)

949　was less than the total effect (c path) in both the models thus, partial mediation can be claimed but it

950　is not clear why the authors have mentioned "No mediation" for both the paths.

951

952　**S6 Table.** Summary of findings examining work-related wellbeing, attitudes, and work behaviours as

953　outcomes.

Study	Relationship Found	Examined outcome(s)	Findings
Positive Wellbeing			
45	Mixed	Psychological detachment	Work-home interference was not significantly associated with psychological detachment, γ = .012, p > .05. Smartphone-use was not significantly associated with psychological detachment, γ = -.113, p > .05. However, smartphone-use negatively moderated the positive relationship between work-home interference and psychological detachment, γ = -.134, p < .001.
45	Yes	Relaxation	Work-home interference was positively related to relaxation, γ = .118, p < .05. Smartphone-use was negatively related to relaxation, γ = -.48, p < .001. Smartphone-use negatively moderated the positive relation between work-home interference and relaxation, γ = -.226, p < .001.
45	Mixed	Mastery	Work-home interference was not significantly associated with mastery, γ = .086, p >.05. Smartphone-use was negatively associated with mastery, γ = -.248, p < .05. Smartphone-use negatively moderated the positive relationship between work-home interference and mastery, γ = -.128, p < .001.
45	Yes	Control/Autonomy	Work-home interference was positively associated with control/autonomy, γ = .200, p < .01. Smartphone-use was negatively associated with control/autonomy, γ = -.378, p < .01. Smartphone-use negatively work-home interference the positive relationship between WHI and control/autonomy, γ = -.229, p < .001.
38	Yes	Work engagement	Work-related cell phone use during nonworking hours was positively related to work engagement, β = .21, p < .01. Cell phone attachment was positively related to work engagement (β = .40, p

			< .01) and positively moderated the positive relationship between work-related cell phone use and work engagement ($\beta = 1.57$, $p < .01$).
39	Yes	Spouse job satisfaction	The indirect effect for the mediating roles of job incumbent WFC, relationship tension, and spouse FWC in the relationship between job incumbent MD use for work during family time and spouse job satisfaction was negative and significant, indirect effect = -.008, 95% CIs (-.022, -.003). The indirect effect for the same path excluding the mediating role of relationship tension was also significant, indirect effect = -.008, 95% CIs (-.021, -.001).
41	Mixed	Life satisfaction	WLPL balance ($r = .171$, $p < .05$) and frequency of smartphone use for work during personal time ($r = .139$, $p < .05$) were related to life satisfaction. WLPL smartphone intrusion ($r = -.029$, $p > .05$) and time spent on smartphone for work during personal time ($r = .029$, $p > .05$) were not related to life satisfaction.
41	Mixed	Job satisfaction	WLPL smartphone intrusion ($r = -.223$, $p < .01$), WLPL balance ($r = .311$, $p < .01$), and frequency of smartphone use for work during personal time ($r = .161$, $p < .05$) were related to job satisfaction. Time spent on smartphone for work during personal time ($r = -.033$, $p > .05$) was not related to job satisfaction.
41	Yes	PLWL balance	WLPL smartphone intrusion ($r = -.551$, $p < .01$), WLPL balance ($r = .753$, $p < .01$), time spent on smartphone for work during personal time ($r = -.416$, $p < .01$), and frequency of smartphone use for work during personal time ($r = -.315$, $p < .01$) were related to PLWL balance.
51	Mixed	Well-being	Neither frequency ($r = -.03$; $p > .05$) nor duration ($r = .01$; $p > .05$) of BlackBerry (BB) use for work during nonwork hours was significantly related to well-being. Job control and psychological detachment from work mediated the relationship between frequency of BB use for work during nonwork hours and wellbeing, indirect effect = -.0615, 95% BC bootstrap CIs (-.1323, -.0081). However, it did not mediate the relationship between duration of BB use for work during nonwork hours and wellbeing, indirect effect = -.1307, 95% BC bootstrap CIs (-.3666, .0456). A comparison of indirect effects of both the mediators revealed no significant difference in degrees for either the frequency of BB use for work during nonwork hours (.0349, 95% BC bootstrap CIs [-.0275, .1053]) or the duration of BB use for work

			during nonwork hours (.0959, 95% BC bootstrap CIs [-.0503, .2796]). Job control did not mediate the relationship between frequency of BB use for work during nonwork hours and wellbeing (indirect effect = -.0133, 95% BC bootstrap CIs [-.0647, .0076]) and between duration of BB use for work during nonwork hours and wellbeing (indirect effect = -.0174, 95% BC bootstrap CIs [-.1693, .0739]). In contrast, psychological detachment mediated the relationship between both frequency of BB use for work during nonwork hours and wellbeing (-.0482, 95% BC bootstrap [-.1172, -.0047]) as well as between duration of BB use for work and wellbeing (-.1133, 95% BC bootstrap [-.3035, -.0086]).
52	Yes	Work engagement	Results of simple linear regression revealed that work-related smartphone use outside official working hours was positively related to work engagement, $\beta = .28$, $p < .001$. The study examined employment sector (public vs. private) as a moderator in the relationship between work-related smartphone use outside official working hours and work engagement but, there were significant omissions in the results section (e.g., significance values for β values were not reported), which made it impossible to determine whether the analysis was significant or not. Although the researchers claimed that the moderation effect was not significant, the presented data is incomplete to confirm this assertion.
43	Yes	Job satisfaction	Work-to-home segmentation preference ($\beta = -.296$, $p < .001$) and psychological and physiological strain ($\beta = -.343$, $p < .001$) negatively associated with job satisfaction.
44	Mixed	Job satisfaction	Technology assisted supplemental work using cell phone or computer was positively associated with job satisfaction ($r = .16$, $p < .05$). The correlation between Facebook use and job satisfaction was not statistically significant ($r = -.0001$, ns).
Negative Wellbeing			
38	Yes	Emotional exhaustion	Work-related cell phone use during nonworking hours was not significantly associated with emotional exhaustion, $\beta = -.02$, $p > .05$. Cell phone attachment was negatively related to emotional exhaustion ($\beta = -.37$, $p < .01$) and negatively moderated the negative relationship

			between work-related cell phone use and emotional exhaustion, β = -1.38, p < .01.
23	Mixed	Exhaustion	Daily exhaustion was significantly predicted by daily work-home interference (γ = .350, p < .001). It was not significantly predicted by daily smartphone use (γ = .037, p > .05). However, daily smartphone use positively moderated the positive relationship between daily work-home interference and daily exhaustion, γ = .083, p < .05.
23	Mixed	Cynicism	Daily cynicism was significantly predicted by daily work-home interference (γ = .214, p < .001). It was not significantly predicted by daily smartphone use (γ = -.036, p > .05). The moderating effect of daily smartphone use in the relationship between daily work-home interference and daily cynicism was not significant, γ = .035, p > .05.
39	Yes	Relationship tension	Job incumbent work-to-family conflict was positively related to relationship tensions between job incumbents and spouses, β = .52, p < .01. The indirect effect for the mediating role of job incumbent work-to-family conflict in the relationship between job incumbent mobile-device (MD) use for work during family time and relationship tension between partners was significant, indirect effect = .102, 95% CIs (.044, .186).
39	Yes	Spouse family-to-work conflict	Job incumbent work-to-family conflict was positively related to spouse FWC, β = .14, p < .10. Relationship tension between partners was positively related to spouse FWC, β = .29, p < .001. The indirect effect for the mediating roles of job incumbent WFC and relationship tension in the relationship between job incumbent MD use for work during family time and spouse FWC was significant, indirect effect = .029, 95% CIs (.013, .061).
48	Mixed	Job stress	Work-to-life conflict significantly predicted job stress, β = .54, p < .001. The work overload aspect of OHS was not significantly related to job stress (effect size not reported).
40	Mixed	Job incumbent burnout	Job incumbent burnout was positively predicted by strain-based work-family conflict (WFC), β = .47, p < .01. Time-based WFC (β = -.04, p > .01) and behaviour-based WFC (β = .04,

			p > .01) were not significantly associated with job incumbent burnout.
33	Yes	Psychological distress	Work contact was positively related to psychological distress, β = .117, p < .001. Job autonomy (β = -.083, p < .001), some schedule control (β = -.085, p < .001), full schedule control (β = -.109, p < .01), challenging work (β = -.145, p < .001), and job pressure (β = .197, p < .001) were associated with psychological distress. Full schedule control negatively moderated the positive relationship between work contact and psychological distress, β = -.082, p < .01. Work-to-family (WFC) was positively associated with psychological distress, β = .236, p < .001.
33	Yes	Sleep problems	Work contact was positively associated with sleep problems, β = .123, p < .001. Job autonomy (β = -.096, p < .001), some schedule control (β = -.104, p < .01), challenging work (β = -.169, p < .001), and job pressure (β = .180, p < .001) were associated with sleep problems. Job autonomy negatively moderated the positive relationship between work contact and sleep problems, β = -.062, p < .01. Challenging work negatively moderated the positive relationship between work contact and sleep problems, β = -.067, p < .01. Job pressure positively moderated the positive relationship between work contact and sleep problems, β = .035, p < .01. WFC was positively associated with sleep problems, β = .255, p < .001.
41	Mixed	Job stress	Work life to personal life (WLPL) smartphone intrusion (r = .204, p < .01), WLPL balance (r = -.542, p < .01), time spent on using a smartphone for work during personal time (r = .205, p < .01) were related to job stress. Frequency of smartphone use for work during personal time (r = .061, p > .05) was not related to job stress.
41	Yes	Personal life to work life (PLWL) smartphone intrusion	WLPL smartphone intrusion (r = .588, p <.01), WLPL balance (r = -.497, p < .01), time spent on smartphone for work during personal time (r = .295, p < .01), and frequency of smartphone use for work during personal time (r = .213, p < .01) were related to PLWL smartphone intrusion.
54	Mixed	Family-to-work conflict (FWC)	Work-to-family conflict (WFC; β = .26, p < .001), family contact (β = .20, p < .001), household tasks (β = .21, p < .001), childcare demands (β = .20, p < .001), and partner support (β = -.28, p

			< .001) were related to FWC. Partner's work hours (β = .01 [not significant]) was not related to FWC.
54	Mixed	Alcohol use	FWC (β = -.12, p < .01) and sleep problems (β = .23, p < .01) were related to alcohol use. WFC was not related to alcohol use, β = -.08 (not significant).
54	Mixed	Sleep problems	WFC (β = .13, p < .05) and psychological distress (β = .58, p < .001) were positively associated with sleep problems. FWC was not related to sleep problems (β = .00 [not significant]).
54	Yes	Psychological distress	WFC (β = .49, p < .001) and FWC (β = .27, p < .001) were positively related to psychological distress.
56	Yes	Psychological distress	Psychological distress was related to job pressure (β = .286, p < .001), work-family conflict (β = .320, p < .001), and work experience (β = -.158, p < .001).
56	Yes	Sleep problems	In the first path model, work-family conflict (β = .282, p < .001), job pressure (β = .155, p < .001), and work contact (β = .088, p = .030) were positively related to sleep problems. In the second path model, work-family conflict (β = .111, p = .004), work contact (β = .071, p = .036), and psychological distress (β = .546, p < .001) were related to sleep problems.
43	Yes	Psychological and physiological strain	ET (β = .157, p < .01), time-based WFC (β = .317, p < .001), and work-to-home segmentation preference (β = .215, p < .001) were positively associated with psychological and physiological strain.
Attitudes			
37	Yes	Employer expectations	Work-related mobile-device usage at home was significantly related to employer expectations, β = .349, p < 0.01.
48	Yes	User resistance to office home smartphone (OHS)	Work-to-life conflict significantly predicted user resistance to OHS, β = .23, p < .001. The work overload aspect of OHS significantly predicted user resistance to OHS, β = .26, p < .01.
40	Mixed	Job incumbent organizational commitment	Job incumbent burnout was negatively related to job incumbent organizational commitment, β = -.20, p < .01. Engagement in mWork by job incumbent was not significantly related to their organizational commitment, β = .01, p > .05.

			Spousal resentment towards job incumbent's organization was not related to job incumbent organizational commitment, β = .01, p > .05. Spousal commitment to job incumbent's organisation was positively related to job incumbent organizational commitment, β = .54, p < .05.
40	Yes	Spousal resentment towards job incumbent's organization	Job incumbent's time-based WFC (β = .29, p < .05), strain-based WFC (β = .29, p < .05), and behaviour-based WFC (β = .15, p < .05) were positively related to spousal resentment towards job incumbent's organization. Spousal engagement in mWork was also significantly associated with spousal resentment towards job incumbent's organization, β = -.08, p < .05.
40	Yes	Spousal commitment to job incumbent's organization	Job incumbent burnout (β = -.27, p < .05) and spousal resentment towards job incumbent's organization (β = -.14, p <.05) were negatively related to spousal commitment to job incumbent's organization. Spousal engagement in mWork was also significantly associated with spousal commitment to job incumbent's organization, β = .08, p < .01.
40	Mixed	Job incumbent's turnover intentions	Job incumbent organizational commitment (β = -.28, p < .01), job incumbent organizational tenure (β = -.03, p < .01), and spousal commitment to job incumbent's organization (β = -.64, p < .05) were negatively related to job incumbent's turnover intentions. The following path models from job incumbent mWork to job incumbent's turnover intentions were significant: (i) job incumbent mWork predicted job incumbent's turnover intentions via job incumbent strain-based WFC, job incumbent burnout, and job incumbent organizational commitment, indirect effect = .009, 95% CIs (.003, .026); (ii) job incumbent mWork significantly predicted job incumbent's turnover intentions via job incumbent time-based WFC, spousal resentment towards job incumbent's organization, and spousal commitment to job incumbent's organization, indirect effect = .010, 95% CIs (.003, .027); (iii) job incumbent mWork significantly predicted job incumbent's turnover intentions via job incumbent strain-based WFC, spousal resentment towards job incumbent's organization, and spousal commitment to job incumbent's organization, indirect effect = .009, 95% CIs (.003, .024); (iv) job incumbent mWork significantly predicted job incumbent's turnover intentions via job incumbent behaviour-based

			WFC, spousal resentment towards job incumbent's organization, and spousal commitment to job incumbent's organization, indirect effect = .004, 95% CIs (.001, .015); (v) job incumbent mWork significantly predicted job incumbent's turnover intentions via job incumbent's strain-based WFC, job incumbent burnout, and spousal commitment towards job incumbent's organization, indirect effect = .028, 95% CIs (.012, .066), and; (vi) job incumbent mWork significantly predicted job incumbent's turnover intentions via job incumbent's strain-based WFC, job incumbent burnout, spousal commitment to organizational commitment, and job incumbent's organizational commitment, indirect effect = .007, 95% CIs (.002, .018).
57	Mixed	Organisational identification	Smartphone use after formal work hours (β = .137, $p < .05$) and communication about family demands with supervisor (β = .135, $p < .05$) were positively related to organizational identification. Communication about work demands with family was not related to organisational identification, β = .059 $p > .05$. There was a significant indirect effect relationship between smartphone use after formal work hours and organisational identification through communication about family demands with supervisors, β = .019, $p = .018$. However, the indirect effect relationship between smartphone use after formal work hours and organisational identification through communication about work demands with family members was not significant, β = .008, $p = .148$.
43	Mixed	Affective organisational commitment	Electronic tethering (ET; β = .159, $p < .001$), time-based work-to-family (WFC; β = .099 $p < .05$), and job satisfaction (β = .652, $p < .001$) were positively associated with affective organisational commitment. ET instrumentality strengthened the positive relationship between ET and affective organisational commitment (β = .088, $p < .05$). The relationship between ET instrumentality and time-based WFC was not statistically significant (β = .012, ns).
		Behaviour	
37	No	Productivity	Work-related mobile-device usage at home was not significantly related to productivity, β = .061, $p > 0.05$.

46	Mixed	Family role performance	Daily work-related smartphone use during off-job time was positively related to relationship dimension of daily family-role performance (e.g., providing emotional support to family members), $\gamma = .39$, $p < .05$. Information about the relationship between daily work-related smartphone use during off-job time and task dimension of daily family role performance was not provided. The positive relationship between daily work-related smartphone use and daily family role performance was negatively moderated by segmentation preference, $\gamma = -.28$, $p < .05$. Daily work-family conflict was negatively related to the relationship dimension of daily family role performance, $\gamma = -.31$, $p < .001$. Results of mediated moderation analysis showed that in comparison with participants with high segmentation preference, those with low segmentation preference reported better daily family-role performance (relationship dimension) on days they more intensively used their smartphones for work-related purposes during off-job time, via reduced daily work-family conflict.
39	Yes	Spouse job performance	The indirect effect for the mediating roles of job incumbent WFC, relationship tension, and spouse FWC in the relationship between job incumbent MD use for work during family time and spouse job performance was negative and significant, indirect effect = -.006, 95% CIs (-.015, -.002). The indirect effect for the same path excluding the mediating role of relationship tension was also significant, indirect effect = -.005, 95% CIs (-.016, -.001).
40	Yes	Engagement in mWork by job incumbent	Job incumbent organizational commitment was positively related to engagement in mWork, $\beta = .36$, $p < .05$.
57	Yes	Communication about family demands with supervisor	Smartphone use after formal work hours was positively related to communication about family demands with supervisor, $\beta = .139$, $p < .05$.
57	Yes	Communication about work demands with family	Smartphone use after formal work hours was positively related to communication about work demands with family, B = .139, $p = .026$.
43	Yes	Job performance	Receptive electronic communication (REC) behaviour ($\beta = .278$, $p < .001$), time-based WFC ($\beta = .164$, $p < .01$), and job satisfaction ($\beta = .154$, $p < .05$) were positively associated with job performance. Psychological and physiological strain was negatively associated with job performance ($\beta = -.147$, $p < .001$). The

			relationship between ET and job performance was not significant (β value not reported).

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