

A Meta-Analysis of Work Connectivity Behavior and Work-Life Conflict: A Work-Family Resources Model Perspective

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Abstract

With the continuous development of information and communication technologies, processing work through such technologies during non-work hours and in non-work places—namely, Work Connectivity Behavior After-hours (WCBA)—has become a ubiquitous phenomenon. As WCBA is a work behavior occurring during non-work hours and in non-work places, its relationship with work-life conflict has garnered substantial attention in empirical research; however, existing empirical findings have been notably inconsistent. Grounded in the Work-Family Resources Model, this study proposes a two-stage processual theoretical model of WCBA's influence on work-life conflict and identifies factors contributing to the inconsistency in their relationship. Meta-analytic results based on 67 independent samples (30,498 participants) reveal that WCBA is moderately positively correlated with work-life conflict ($r = 0.34$), with their relationship being moderated by the manifestation of work-life conflict, WCBA usage tools, marital status, child-rearing status, sampling method, and WCBA measurement approach. The findings clarify the relationship between WCBA and work-life conflict and the reasons for its inconsistency, offering implications for organizations and employees to manage WCBA appropriately to mitigate work-life conflict.

Full Text

A Meta-Analysis of Work Connectivity Behavior After-Hours and Work-Life Conflict: A Work-Home Resources Model Perspective

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Abstract

With the continuous development of information and communication technologies, working through information and communication technologies during non-work hours and in non-work locations—referred to as Work Connectivity Behavior After-hours (WCBA)—has become a widespread phenomenon. Because WCBA represents a form of work behavior occurring outside conventional work hours and locations, its relationship with work-life conflict has attracted substantial empirical attention. However, existing empirical findings remain inconsistent. Drawing upon the work-home resources model, this study proposes a two-stage processual theoretical model of how WCBA influences work-life conflict and identifies factors contributing to the inconsistency in this relationship. Based on a meta-analysis of 67 independent samples (30,498 participants), the results demonstrate a moderate positive correlation between WCBA and work-life conflict ($r=0.34$). This correlation is moderated by the manifestation of work-life conflict, WCBA tools used, marital status, parental status, sampling method, and WCBA measurement approach. These findings clarify the relationship between WCBA and work-life conflict, explain the sources of inconsistency, and provide insights for organizations and employees to manage WCBA effectively to mitigate work-life conflict.

Keywords: work connectivity behavior after-hours (WCBA), work-life conflict, work-home resources model, meta-analysis

Since the 1990s, the rapid advancement of information and communication technologies has fundamentally transformed how employees work (Gephart, 2002; Hu et al., 2021). In particular, the proliferation of communication and computing devices (e.g., mobile phones, computers) and the maturation and expanding coverage of information transmission technologies (e.g., fiber broadband, 5G networks) have made working through information and communication technologies during non-work hours and locations—Work Connectivity Behavior After-hours (WCBA)¹—a common phenomenon (Boswell & Olson-Buchanan, 2007; Ďuranová & Ohly, 2016; Ren et al., 2023). Surveys indicate that most employees engage in WCBA (GFI Software, 2014; Workplace Options Survey, 2014; 51job, 2022), and the number of such employees continues to grow (Arlinghaus & Nachreiner, 2014). Consequently, WCBA has attracted considerable research attention, with studies examining its effects on work performance (Ren et al., 2023), work engagement (Lanaj et al., 2014), turnover intentions (Ferguson et al., 2016), sleep (Eichberger et al., 2022), and work-life conflict (Butts et al., 2015).

Because WCBA occurs during non-work hours and in non-work locations, its relationship with work-life conflict² has been extensively investigated (Schlachter et al., 2018). However, empirical results remain inconsistent: some studies find

a positive correlation (e.g., Butts et al., 2015; Ferguson et al., 2016; Ma et al., 2016), while others find no significant relationship (e.g., Golden, 2012; van Zoonen et al., 2020; Zhang et al., 2020). This inconsistency prevents a clear and comprehensive understanding of the WCBA-work-life conflict relationship, creating confusion for organizations and employees seeking to manage WCBA effectively. Therefore, this study examines the relationship between WCBA and work-life conflict and identifies factors influencing this relationship.

Drawing on the work-home resources model (ten Brummelhuis & Bakker, 2012; Wang et al., 2021), we propose a two-stage processual theoretical model of how WCBA affects work-life conflict and identify factors causing inconsistency in this relationship. Specifically, WCBA—as a work role demand—depletes employees’ personal resources (non-work time, psychological resources), leading to personal resource shortages (non-work time scarcity, work stress). These shortages, in turn, prevent employees from effectively fulfilling life role demands (work-life conflict). Factors related to personal resource depletion effects (manifestations of work-life conflict, WCBA tools, job position) influence the resource depletion process; factors related to life role demands (gender, marital status, parental status) affect the conflict formation process; and factors related to external resources (marital status, parental status, national/regional economic conditions) affect the conflict formation process by influencing how external resources meet life role demands. The overall theoretical model is shown in Figure 1 [Figure 1: see original paper]. We tested these propositions using meta-analysis.

1. Existing research has proposed various terms for “working through information and communication technologies during non-work hours and locations,” such as technology-assisted supplemental work, work-related smartphone use, and work connectivity behavior. We believe “work connectivity behavior” most concisely captures the essence of this behavior, and therefore adopt this term.

2. “Work-life conflict” is bidirectional, encompassing both work interference with life (work-life conflict) and life interference with work (life-work conflict). This study focuses exclusively on the former.

2. Theoretical Foundation and Hypotheses

2.1 Definition and Measurement of WCBA

Although definitions of WCBA vary across studies, most encompass: (1) occurrence during non-work hours (e.g., after work, during vacations); (2) occurrence in non-work locations (e.g., at home, social gatherings); (3) performance of work-related tasks (supplemental work nature); (4) use of information and communication technologies (e.g., mobile phones, computers); and (5) absence of

formal contracts or compensation agreements (no explicit remuneration from the organization) (Eichberger & Zacher, 2021; Ye et al., 2018). WCBA is typically measured through frequency, duration, or intensity. For example, Fenner and Renn (2010) measured the frequency of using mobile phones, pagers, and computers for work tasks during non-work hours; Wright et al. (2014) measured weekly duration of using smartphones, tablets, and laptops for work during non-work hours; and Derks and Bakker (2014) measured the intensity of smartphone use for work after hours.

2.2 Definition and Measurement of Work-Life Conflict

Work-life conflict refers to a state where work role demands prevent employees from effectively fulfilling life role demands (Greenhaus & Beutell, 1985). Depending on the life role involved, work-life conflict can be categorized as work-family conflict or work-leisure conflict. Work-life (family, leisure) conflict manifests in three forms: time-based, strain-based, and behavior-based conflict. Time-based conflict occurs when time spent on work leaves insufficient time for life (family, leisure) role demands. Strain-based conflict occurs when work-related strain prevents effective fulfillment of life (family, leisure) role demands. Behavior-based conflict occurs when work behavior patterns spill over into life (family, leisure) roles, hindering effective fulfillment of life role demands (Greenhaus & Beutell, 1985; Tsaur et al., 2012). Representative measures include Geurts et al.'s (2005) work-life conflict scale (time and strain forms), Netemeyer et al.'s (1996) work-family conflict scale (time and strain forms), Carlson et al.'s (2000) work-family conflict scale (time, strain, and behavior forms), and Tsaur et al.'s (2012) work-leisure conflict scale (time, strain, and behavior forms).

2.3 The Relationship Between WCBA and Work-Life Conflict

According to the work-home resources model, work role demands deplete employees' personal resources (e.g., time, emotional, cognitive resources), leading to personal resource shortages that prevent effective fulfillment of life role demands (ten Brummelhuis & Bakker, 2012; Wang et al., 2021). In this study, WCBA (a work role demand) first requires employees to perform work-related tasks during non-work hours (e.g., communicating with clients via phone after work), depleting non-work time and causing time scarcity (Boswell & Olson-Buchanan, 2007; Ferguson et al., 2016; Gadeyne et al., 2018). Time scarcity, in turn, prevents employees from having sufficient time to meet life role demands (time-based work-life conflict), such as being unable to do housework due to work demands.

Second, WCBA involves performing work-related tasks (e.g., revising work materials on a computer during weekends), depleting cognitive and emotional resources and causing work stress (Ferguson et al., 2016; Wan et al., 2019). Additionally, WCBA violates normal social norms (Prasopoulou et al., 2006), such as being invited to an online meeting during vacation, which may trigger negative evaluations of WCBA and anger. Anger immerses employees in event-related

thoughts, depleting attentional and cognitive resources and causing work stress (Butts et al., 2015). Work stress then prevents employees from effectively fulfilling life role demands due to strain (strain-based work-life conflict), such as being too stressed to engage in enjoyable activities.

Finally, work stress prevents employees from psychologically and behaviorally disengaging from work after WCBA ends (Bennett et al., 2018), causing work behavior patterns to spill over into life roles and hindering effective fulfillment of life role demands (behavior-based work-life conflict). In summary, WCBA depletes personal resources (non-work time, psychological resources), leading to personal resource shortages (non-work time scarcity, work stress) that trigger work-life conflict. Therefore, we propose:

Hypothesis 1: WCBA is positively related to work-life conflict.

2.4 Factors Influencing the WCBA-Work-Life Conflict Relationship

As noted, WCBA's effect on work-life conflict involves both personal resource depletion and conflict formation processes. Therefore, factors related to personal resource depletion effects influence the resource depletion process; factors related to life role demands influence the conflict formation process; and factors related to external resources influence the conflict formation process by affecting how external resources meet life role demands. We propose that work-life conflict manifestations, WCBA tools, job position, gender, marital status, parental status, and national/regional economic conditions belong to one or two of these categories and influence the relationship between WCBA and work-life conflict through these mechanisms. The theoretical model is illustrated in Figure 1 [Figure 1: see original paper].

2.4.1 Moderating Effect of Work-Life Conflict Manifestations Wang et al. (2021) note that work role demands are integrative (including time, emotional, and cognitive demands) and thus deplete different personal resources (e.g., time, emotional, cognitive resources) with varying effects. As discussed, WCBA simultaneously depletes non-work time and psychological resources, causing time scarcity and work stress, which lead to time-, strain-, and behavior-based work-life conflict. However, because WCBA necessarily consumes non-work time, its depletion effect on non-work time is stronger, resulting in stronger effects on time scarcity and, consequently, stronger effects on time-based work-life conflict. Conversely, as a supplemental work behavior (Fenner & Renn, 2004), WCBA's depletion effect on psychological resources is relatively weaker, resulting in weaker effects on work stress and, consequently, weaker effects on strain- and behavior-based work-life conflict. Therefore, we propose:

Hypothesis 2: The correlation between WCBA and time-based work-life conflict is stronger than those with strain- and behavior-based work-life conflict, while the correlations with strain- and behavior-based conflict do not differ.

2.4.2 Moderating Effect of WCBA Tools WCBA is primarily conducted via telephone (including landlines, mobile phones, smartphones) and computer (including desktops, laptops, tablets), with different tool types focusing on different task forms (Gadeyne et al., 2018). Therefore, telephone-based WCBA and mixed-tool WCBA (including both computer and telephone) can be considered different work role demands with varying resource depletion effects, leading to differential impacts on personal resource shortages and work-life conflict³. Specifically, telephone-based WCBA primarily involves communication tasks (e.g., discussing work progress with colleagues via phone after work), characterized by short duration and simple content. Mixed-tool WCBA includes both communication and non-communication tasks (e.g., writing code on a computer after work), characterized by longer duration and more complex content⁴. Consequently, mixed-tool WCBA has stronger depletion effects on non-work time and psychological resources, leading to greater personal resource shortages and stronger effects on work-life conflict. Empirically, Gadeyne et al. (2018) found a stronger correlation between mixed-tool WCBA and work-life conflict ($r=0.22$) than between telephone-based WCBA and work-life conflict ($r=0.12$)⁵. Therefore, we propose:

Hypothesis 3: Mixed-tool WCBA shows a stronger correlation with work-life conflict than telephone-based WCBA.

2.4.3 Moderating Effect of Job Position Both managers and regular employees engage in WCBA, but their WCBA patterns differ (Boswell & Olson-Buchanan, 2007). Therefore, managers' WCBA and employees' WCBA can be considered different work role demands with varying resource depletion effects. Managers' work is more complex than employees', meaning their WCBA tasks are more complex, leading to stronger depletion effects on non-work time and psychological resources. However, managers also have higher job control than employees, meaning their WCBA tasks are more controllable (Boswell & Olson-Buchanan, 2007), which weakens the depletion effect on psychological resources. For example, Schieman and Young (2013) found that job control (including autonomy and schedule control) weakened WCBA's positive effect on psychological strain. Because managers' WCBA simultaneously exhibits strong and weak depletion effects, we cannot theoretically determine whether managers' and employees' WCBA differentially affect personal resource shortages and work-life conflict. Therefore, we pose:

Research Question 1: Does the correlation between WCBA and work-life conflict differ across job positions?⁶

2.4.4 Moderating Effect of Gender Traditional social labor division expects men to focus on work role demands and women on life role demands (Cinamon & Rich, 2002), implying women typically have more life role demands than men (Michel et al., 2011). At equivalent WCBA levels, while male and female employees experience similar personal resource depletion and shortages,

women's greater life role demands produce stronger work-life conflict. For example, Gutek et al. (1991) found that paid work hours (non-work time scarcity) had a stronger positive effect on work-family conflict among women.

However, traditional gender-based division of labor has changed, with modern society showing gender convergence in work and life role demands (Barnett & Hyde, 2001). Men increasingly spend time on life role demands, and individuals generally believe life roles should not be primarily women's responsibility (Galinsky et al., 2013), reducing gender differences in life role demands. At equivalent WCBA levels, with similar life role demands, male and female employees experience similar work-life conflict. Meta-analytic evidence shows no gender difference in the positive relationship between work hours and work-life conflict (Byron, 2005; Michel et al., 2011). Empirically, studies find no gender differences in WCBA's positive effect on work-life conflict (Boswell & Olson-Buchanan, 2007; Wilkinson & Haar, 2023). Therefore, we pose:

Research Question 2: Does the correlation between WCBA and work-life conflict differ across genders?

2.4.5 Moderating Effect of Marital Status Marriage increases life role demands, meaning married individuals have more life role demands than unmarried individuals (Ford et al., 2007; Michel et al., 2011). Marriage also serves as an external resource (Hobfoll, 2002; ten Brummelhuis & Bakker, 2012) that helps fulfill life role demands (e.g., partners can help with housework), meaning married individuals have more external resources to meet life role demands. At equivalent WCBA levels, while married and unmarried employees experience similar personal resource depletion, married employees' additional external resources can meet both their increased and some of their unchanged life role demands, resulting in weaker work-life conflict. For example, Noor (2002) found that spouse support (a form of external resource from marriage) weakened the positive effect of work hours on work-family conflict, and meta-analytic evidence shows a weaker positive correlation between work hours and work-family conflict among married individuals (Michel et al., 2011). Therefore, we propose:

Hypothesis 4: The correlation between WCBA and work-life conflict is stronger among unmarried employees than among married employees.

2.4.6 Moderating Effect of Parental Status Individuals with children are typically married (unmarried child-rearing is rare), while childless individuals may be married or unmarried. Parents have both marital and parental role demands, while childless individuals may only have marital role demands, meaning parents have more life role demands overall (Ford et al., 2007; Michel et al., 2011). As noted, marriage is an external resource that helps fulfill life role demands, meaning parents have more external resources than childless individuals. At equivalent WCBA levels, while parents and childless employees experience similar personal resource depletion, we cannot definitively determine whether parents' additional external resources can meet their increased life role

demands, making it unclear whether work-life conflict will be stronger, weaker, or similar. For example, Adkins and Premeaux (2012) found that number of children strengthened the positive effect of work hours on work-family conflict, but meta-analytic evidence shows no difference in the work hours-work-life conflict relationship across parental statuses (Byron, 2005; Michel et al., 2011). Empirically, some studies find that having children strengthens WCBA's effect on work-family conflict (Kotecha et al., 2014), while others find no effect (Wilkinson & Haar, 2023). Therefore, we pose:

Research Question 3: Does the correlation between WCBA and work-life conflict differ across parental statuses?

2.4.7 Moderating Effect of National/Regional Economic Conditions

National/regional economic conditions constitute an external resource (Hobfoll, 2002; ten Brummelhuis & Bakker, 2012) that helps fulfill life role demands (e.g., developed countries/regions have better public childcare services). Thus, individuals in developed countries/regions have more external resources to meet life role demands than those in developing countries/regions. At equivalent WCBA levels, while employees in developed and developing countries experience similar personal resource depletion, those in developed countries have more external resources to meet life role demands, reducing dependence on personal resources (ten Brummelhuis & Bakker, 2012) and resulting in weaker work-life conflict. Therefore, we propose:

Hypothesis 5: The correlation between WCBA and work-life conflict is stronger among employees in developing countries/regions than among those in developed countries/regions.

2.4.8 Exploratory Analysis of Other Factors Beyond theoretically derived hypotheses and research questions, we conducted exploratory analyses of other potential moderators: publication status (published vs. unpublished), sampling method (multiple vs. single organization), research design (cross-sectional vs. experience sampling), WCBA measurement (frequency, duration, intensity), employee age (mean sample age), organizational tenure (mean tenure), WCBA timing (after work vs. non-work hours), WCBA location (home vs. non-work locations), and work-life conflict type (work-life, work-family, work-leisure conflict).

3. Method

3.1 Literature Search

The numerous terms used to describe WCBA complicate comprehensive literature retrieval. We therefore identified relevant Chinese and English terms (e.g., work connectivity behavior, work-related communication technology use,

use of communication technologies after hours, information and communication technologies use after hours) through review articles (Ďuranová & Ohly, 2016; Eichberger & Zacher, 2021; Schlachter et al., 2018; Cheng et al., 2023; Ye et al., 2018; Yuan & Tang, 2018) and combined them with work-life conflict terms (e.g., work-nonwork conflict, work-life conflict, work family conflict) for topic searches in multiple databases. Specifically, we searched Chinese databases (CNKI, Wanfang, VIP) and English databases (Web of Science, PsycINFO/Articles, EBSCOhost ASC/BSC, Scopus, ProQuest). Detailed search keywords are in Appendix Table 1. We conducted three search rounds (October 2021, October 2022, December 2023), retrieving 178 Chinese and 438 English articles. We also examined reference lists of review articles and conducted citation searches, yielding 11 additional English articles. All retrieved literature was published between 1992 and 2023.

3.2 Literature Screening

Inclusion criteria were: (1) reporting correlation coefficients (r) between WCBA and work-life conflict or statistics convertible to r (Cohen's d , t , F values); studies reporting only regression coefficients (β) were excluded (Roth et al., 2018); (2) reporting clear sample sizes; (3) being Chinese or English literature; (4) for duplicate samples, selecting the more comprehensive and formally structured article. Following PRISMA guidelines (Moher et al., 2009), we screened all retrieved literature through four phases (identification, screening, eligibility, inclusion), ultimately including 17 Chinese and 45 English articles. The screening process is shown in Figure 2 [Figure 2: see original paper].

3.3 Literature Coding

Coding principles: (1) code by independent sample; multiple independent samples within one article were coded separately; (2) if an independent sample was a subset of a larger one, code the larger sample (Boswell & Olson-Buchanan, 2007); (3) if independent samples overlapped, code the larger sample (Wilson, 2013); (4) for experience sampling designs, code between-person correlations (e.g., Gadeyne et al., 2023); if unavailable, code within-person correlations (e.g., Chen, 2019); (5) for multiple correlations within one sample (e.g., Ferguson et al., 2016 reporting WCBA correlations with time-, strain-, and behavior-based work-family conflict), compute composite correlations using Hunter and Schmidt's (2004) formula:
$$r_{\text{composite}} = \frac{\sum r_{ij}}{\sqrt{m + (n - 1)}} \sqrt{m + (n - 1)}$$
, where $r_{\text{composite}}$ is the composite correlation, $\sum r_{ij}$ is the sum of all correlations between variables X and Y , m and n are the numbers of variables X and Y , and r_{ij} are mean intercorrelations among variables X and Y ; (6) for objectively measured WCBA, assign reliability as 1 (e.g., Butts et al., 2015); composite reliability coefficients were computed using Mosier's (1943) formula⁸; average reliability coefficients were assigned to samples without reported reliability⁹.

The coding process: The first author developed a preliminary coding manual, pilot-coded 15 articles, and refined the manual (final version in Appendix Table

2). The first author coded remaining articles, and the second author coded all articles. Coding consistency was 85%, with discrepancies primarily in subjective judgments (e.g., WCBA tools, conflict manifestations). All authors reviewed and resolved discrepancies. Final coding yielded 68 independent samples with 30,709 participants (detailed coding table available in Excel file⁹).

3.4 Analysis Strategy

We used Hunter and Schmidt's (2004) random-effects meta-analytic method (psychometric meta-analysis) to estimate sample-weighted mean correlations and test main and moderating effects. Because correlations in organizational research are affected by measurement error, we based analyses on reliability-corrected correlations using the formula: $r = r_o / \sqrt{\alpha}$, where r is the corrected correlation, r_o is the observed correlation, and α is internal consistency reliabilities (Cronbach's α) of WCBA and work-life conflict. Main effects were assessed via the sample-weighted mean of reliability-corrected correlations (\bar{r}) and 95% confidence intervals (CI); significance was indicated if the 95% CI excluded zero. Categorical moderators were tested via subgroup comparisons: compute Z for each subgroup and test differences using Chiaburu et al.'s (2013) Z-statistic: $Z = (\bar{r}_1 - \bar{r}_2) / \sqrt{(\sigma^2 / n_1 + \sigma^2 / n_2)}$, where $\bar{r} = \sum r_i / k$ is the sample-weighted mean observed correlation, σ is the standard deviation of observed correlations, and k is the number of independent samples. Significant Z indicates significant moderation. Analyses used the psychmeta package in R (Dahlke & Wiernik, 2019).

Continuous moderators were tested via random-effects meta-regression: $r = \beta_0 + \beta_1 X + \epsilon$, where r is the reliability-corrected correlation for sample i , X is the moderator, ϵ is random variation, and ϵ is error. Significant β_1 indicates significant moderation. Analyses used the metafor package in R (Viechtbauer, 2010).

4. Results

4.1 Sensitivity Analysis

Outliers can affect meta-analytic precision and lead to erroneous conclusions (Viechtbauer & Cheung, 2010). However, Hunter and Schmidt (2004) note that outliers may simply reflect large sampling errors, and removing them may overcorrect error and underestimate true heterogeneity. Therefore, outliers should only be removed in extreme cases or due to data errors. We identified potential outliers using multiple methods and compared results with and without them. First, converting 68 independent samples' observed correlations to Z-scores revealed one outlier (Dong et al., 2022) exceeding the mean by 3 standard deviations ($Z=4.26$). Second, the forest plot (Appendix Figure 1) showed this sample's 95% CI did not overlap with any others. Third, outlier diagnostics (Appendix Figure 2) confirmed it as an outlier (Viechtbauer & Cheung,

2010). Although sensitivity analyses showed no differences with and without this outlier, its extreme value ($r=0.90$) warranted removal. We report results after outlier removal.

4.2 Publication Bias Tests

Significant or large-effect studies are more likely to be published (Dickersin et al., 1992; Hunter & Schmidt, 2004), creating publication bias that threatens meta-analytic validity (Borenstein et al., 2009; Kepes et al., 2012). We tested for publication bias using multiple methods. Funnel plot analyses showed: (1) most observed correlations clustered in the upper middle of the funnel with symmetrical distribution (Appendix Figure 3 [Figure 3: see original paper]); (2) Egger's regression test showed non-significant intercept ($p=0.10$); (3) Begg and Mazumdar's rank correlation test showed non-significant Kendall's tau ($p=0.85$); (4) trim-and-fill analysis (Duval & Tweedie, 2000) required no adjustments. File drawer analysis (Rosenthal, 1979) yielded a fail-safe N of 4,956, far exceeding the $5k+10$ (345) criterion. Publication status did not moderate the WCBA-work-life conflict relationship (Table 1). These results suggest minimal publication bias and reliable meta-analytic findings.

4.3 Hypothesis Testing

Tables 1 and 2 present main effect and moderation results, plus heterogeneity tests. Table 1 shows a moderate positive correlation between WCBA and work-life conflict ($r=0.34$, 95%CI[0.31,0.37]), supporting Hypothesis 1. Heterogeneity tests showed $Q=323.67$, $p<0.001$, indicating heterogeneity in reliability-corrected correlations (Hedges & Olkin, 1985); $I^2=79.61\%$ indicates high heterogeneity (Borenstein et al., 2009; Hunter & Schmidt, 2004), necessitating moderation analysis.

Table 1 shows WCBA-time-based conflict correlation ($r=0.30$, 95%CI[0.24,0.35]) was stronger than WCBA-strain-based conflict ($r=0.22$, 95%CI[0.15,0.28]), $Z=1.98$, $p<0.05$, and stronger than WCBA-behavior-based conflict ($r=0.14$, 95%CI[0.04,0.24]), $Z=3.42$, $p<0.001$. WCBA-strain- and behavior-based conflict correlations did not differ ($Z=1.57$, $p=0.12$), supporting Hypothesis 2. Mixed-tool WCBA showed stronger correlation with work-life conflict ($r=0.35$, 95%CI[0.32,0.38]) than telephone-based WCBA ($r=0.22$, 95%CI[0.11,0.34]), $Z=2.57$, $p<0.05$, supporting Hypothesis 3.

Table 2 shows meta-regression results: manager proportion was non-significant ($b=0.02$, $p=0.86$), indicating no job position difference (Research Question 1). Male proportion was non-significant ($b=-0.02$, $p=0.88$), indicating no gender difference (Research Question 2). Married proportion was negatively significant ($b=-0.26$, $p<0.01$), indicating stronger WCBA-work-life conflict correlation among unmarried employees, supporting Hypothesis 4 (moderation plot in Appendix Figure 4 [Figure 4: see original paper]). Parental proportion was negatively significant ($b=-0.28$, $p<0.01$), indicating stronger correlation among

childless employees (Research Question 3; moderation plot in Appendix Figure 5 [Figure 5: see original paper]).

Table 1 shows no significant difference between developing ($r=0.36$, 95%CI[0.32,0.40]) and developed ($r=0.34$, 95%CI[0.30,0.38]) country/regional correlations ($Z=0.70$, $p=0.48$), failing to support Hypothesis 5. Exploratory analyses revealed significant moderation by sampling method and WCBA measurement. Specifically, multiple-organization samples showed stronger correlation ($r=0.35$, 95%CI[0.33,0.38]) than single-organization samples ($r=0.20$, 95%CI[0.09,0.31]), $Z=2.98$, $p<0.01$. Frequency-based WCBA showed stronger correlation ($r=0.35$, 95%CI[0.32,0.39]) than duration-based WCBA ($r=0.28$, 95%CI[0.22,0.34]), $Z=2.17$, $p<0.05$.

5. Discussion

5.1 Research Contributions

5.1.1 The WCBA-Work-Life Conflict Relationship Despite extensive empirical research, inconsistent findings have prevented clear understanding of whether WCBA causes work-life conflict. While narrative reviews have examined this relationship (Ďuranová & Ohly, 2016; Schlachter et al., 2018; Cheng et al., 2023; Ye et al., 2018; Yuan & Tang, 2018), integrated empirical tests were lacking. This study, grounded in the work-home resources model, provides meta-analytic evidence of a moderate positive correlation ($r=0.34$), demonstrating that WCBA generally impedes employees' ability to fulfill life role demands. This clarifies the WCBA-work-life conflict relationship and advances this research area.

Furthermore, although meta-analyses have confirmed positive relationships between work role demands (e.g., work hours) and work-life conflict (Byron, 2005; Ford et al., 2007; Michel et al., 2011), and WCBA represents a special form of work role demand (Ďuranová & Ohly, 2016), no meta-analysis had examined WCBA specifically. Our findings contribute to work-life conflict literature by establishing this relationship.

5.1.2 Factors Influencing the WCBA-Work-Life Conflict Relationship We theoretically and empirically examined multiple moderators. First, WCBA-time-based conflict correlation was stronger than those with strain- and behavior-based conflict, indicating that while WCBA depletes both non-work time and psychological resources, its effect on non-work time is stronger, leading to stronger effects on time-based conflict. This responds to Wang et al.'s (2021) call to examine multiple pathways through which situational demands affect individual responses.

Second, mixed-tool WCBA showed stronger correlation with work-life conflict than telephone-based WCBA, indicating stronger resource depletion effects and

greater impact on personal resource shortages. As mixed-tool WCBA includes both communication and non-communication tasks while telephone-based WCBA primarily involves communication, this suggests communication-focused WCBA may cause milder conflict, while non-communication WCBA causes stronger conflict, offering practical insights (see 5.2).

Third, correlations were stronger among unmarried and childless employees, indicating that married/parent employees' additional external resources can meet both their increased and some unchanged life role demands, weakening WCBA's effect on work-life conflict. Notably, marital status moderation aligns with Michel et al.'s (2011) meta-analysis, while parental status moderation diverges from Byron (2005) and Michel et al. (2011). This may reflect that in WCBA contexts, partners are often co-located (e.g., at home), making them more aware of life role demands and maximizing marital resources. Thus, in WCBA contexts, personal resource shortages have weaker effects on work-life conflict among parents, weakening WCBA's overall effect. These findings highlight marriage's important role as an external resource in mitigating WCBA-induced conflict.

Finally, national/regional economic conditions showed no effect, possibly because life role demands depend more on personal and closely related external resources (e.g., marriage, income) than macro-level external resources. Gender showed no effect, consistent with Byron (2005) and Michel et al. (2011), supporting gender convergence in life role demands. Job position showed no effect, suggesting managers and employees pay similar "life costs" for WCBA.

Exploratory analyses revealed significant moderation by sampling method and WCBA measurement. Multiple-organization samples showed stronger correlations than single-organization samples ($r=0.35$ vs. 0.20). Review of survey procedures revealed that single-organization studies involved organizational/leadership participation (e.g., Boswell & Olson-Buchanan, 2007; Golden, 2012), while multiple-organization studies used convenience sampling without organizational involvement. As WCBA is a non-normative behavior with potential negative organizational consequences, organizational involvement may create fear and reporting bias (organizational desirability), underestimating the true correlation. Frequency- and duration-based WCBA measurements also differed significantly, indicating these common metrics lack consistency—frequency does not represent duration (Richardson & Thompson, 2012). For example, many short calls yield high frequency but low duration, while one long computer session yields low frequency but high duration. This is supported by findings of low-to-moderate correlations between frequency and duration within the same sample (Gao, 2023; Zhou et al., 2021). Duration as a ratio scale more precisely captures WCBA levels and variance than frequency as an interval scale. We recommend future research use duration measures for more accurate WCBA assessment and rigorous conclusions.

5.2 Practical Implications

Our findings confirm WCBA causes work-life conflict, which has widespread negative consequences for employees and organizations (Allen et al., 2000; Amsstad et al., 2011; Eby et al., 2005; Kossek & Ozeki, 1998; Nohe et al., 2015). While employees should ideally avoid WCBA and organizations should restrict it (e.g., banning after-hours work emails), complete avoidance seems unlikely given modern technology's ubiquity (Perlow, 2012). Therefore, feasible measures to mitigate WCBA-induced conflict are needed.

Our findings that WCBA tools, marital status, and parental status moderate the relationship suggest interventions targeting resource depletion and conflict formation processes can be effective. First, employees should avoid non-communication WCBA to prevent excessive resource depletion and strong conflict. Second, employees should replenish personal resources during WCBA (e.g., engaging in relaxation activities) to avoid intensified conflict from sustained depletion. Finally, employees should leverage external resources (e.g., family, economic resources) to meet life role demands and buffer against conflict from resource shortages.

Organizations can implement targeted WCBA management practices. Research shows organizational expectations and norms are important WCBA antecedents (Fenner & Renn, 2010; Richardson & Benbunan-Fich, 2011). Organizations can reduce expectations (e.g., rules against non-urgent WCBA) to prevent resource depletion from trivial tasks. Additionally, flexible leave policies after extensive WCBA (e.g., optional time off following heavy after-hours work) can prevent severe conflict from large resource depletion without recovery.

5.3 Limitations and Future Directions

First, although we found stronger correlation for mixed-tool than telephone-based WCBA, we could not precisely compare computer-based versus telephone-based WCBA. Theoretically, computer-based WCBA should have stronger resource depletion effects than telephone-based WCBA, and Gadeyne et al. (2018) found stronger correlations for computer-based WCBA. However, our meta-analysis included only one sample of computer-based WCBA, precluding reliable comparison. Future research should examine WCBA across different ICT tools to provide comprehensive understanding.

Second, WCBA can be self-initiated or other-initiated (Wan et al., 2019), with different characteristics and resource depletion effects. Other-initiated WCBA is often urgent (e.g., sudden calls from supervisors), while self-initiated WCBA is typically planned (e.g., weekend emails). Urgent WCBA lasts longer and triggers more negative emotions (e.g., anger) than planned WCBA. Therefore, other-initiated WCBA should have stronger resource depletion effects and greater impact on work-life conflict. However, our meta-analysis included only five samples of other-initiated WCBA and none of self-initiated WCBA, preventing reliable comparison. Future research should examine different initiation modes

to deepen theoretical understanding.

Third, significant others (e.g., partners, parents) can also perceive employees' work-life conflict. Employees may benefit from WCBA and underestimate its interference (Boswell & Olson-Buchanan, 2007), while significant others in the life domain may have clearer perceptions of WCBA's interference. Thus, significant others' ratings may be more accurate. Our meta-analysis included only two samples of significant-other-rated work-life conflict, preventing comparison with self-rated conflict. Future research should examine WCBA's relationship with significant-other-rated conflict for more accurate understanding.

5.4 WCBA Measurement Limitations and Future Directions

First, despite definitional convergence, WCBA measurement content remains inconsistent. Regarding non-work time, some measures focus only on after-work hours (e.g., Boswell & Olson-Buchanan, 2007), while others include all non-work time (e.g., Fenner & Renn, 2010). Regarding location, some focus only on home (e.g., Ferguson et al., 2016), while others include all non-work locations (e.g., Gadeyne et al., 2018). Regarding tools, some focus only on smartphones (e.g., Derks & Bakker, 2014), while others include all possible tools (e.g., Butts et al., 2015). This inconsistency hinders integration and comparison of findings (Schlachter et al., 2018), impeding progress. Combined with our measurement recommendations (see 5.1.2), future research should strictly follow WCBA definitions in determining measurement content and develop standardized duration-based measures to advance the field.

Second, nearly all studies use self-report WCBA measures, which may be inaccurate. Schlachter et al. (2018) note self-reports depend on impression management and justification motives, and our findings confirm “organizational desirability bias” (see 5.1.2). Future research should combine alternative measures (e.g., significant-other reports, app-based tracking) for more accurate assessment and rigorous conclusions.

Finally, nearly all studies treat WCBA as unidimensional, potentially underestimating its complexity. A key feature is initiation mode—self- versus other-initiated WCBA (Wan et al., 2019)—which has different characteristics and effects (see 5.3). Future research should distinguish initiation modes and systematically examine their differential effects on employee psychology and behavior to deepen theoretical understanding.

6. Conclusion

Based on the work-home resources model, this meta-analysis systematically examined the relationship between Work Connectivity Behavior After-hours (WCBA) and work-life conflict and its moderators. Results show a moderate positive correlation between WCBA and work-life conflict, moderated by conflict

manifestation, WCBA tools, marital status, and parental status. Exploratory analyses further reveal moderation by sampling method and WCBA measurement. These findings provide practical implications for managing WCBA and directions for future research.

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Appendices

Table 1: Search Keywords

WCBA-Related Keywords	Work-Life Conflict-Related Keywords
Chinese Databases: work connectivity behavior, work-related communication tool use, after-hours electronic communication, after-hours mobile technology use, after-hours social media use, after-hours mobile phone use, using communication technology for work during non-work hours, working from home during non-work hours	work-nonwork conflict, work-life conflict, work-family conflict, work-leisure conflict
English Databases:	

WCBA-Related Keywords	Work-Life Conflict-Related Keywords
use of communication technologies after hours, information and communication technologies use after hours, ICTs use after hours, work related communication technology use outside of regular work hours, electronic communication during non-work time, electronic communication requirements, work related smartphone use during non-work hours, work related smartphone use during leisure, work related smartphone use during off job time, work related smartphone use, smartphone use after work, smartphone use after hours, smartphone use after work hours, smartphone use during after work hours, late night smartphone use, using a smartphone for work purposes, work connectivity behavior after hours, work connectivity behavior during non-work time, technology assisted supplemental work, computer supported supplemental work at home, home based telework, after hours teleworking	work life conflict, work family conflict, work home conflict, work non-work conflict, work leisure conflict, work life interference, work family interference, work home interference, work non-work interference, work leisure interference, work home spillover

Table 2: Literature Coding Manual

Variable	Description
Independent Sample ID	Unique identifier for each independent sample (1-k, separate for Chinese/English)
Literature ID	Unique identifier for each article (1-k)
Sample ID	Identifier for different samples within same article (a, b, etc.)
Literature Title	Full title
Literature Type	J=Journal, T=Thesis, C=Conference
Journal/University/Conference	Publication venue
Authors	All authors
Publication Year	Year of publication
Country/Region	A=Developing, B=Developed
Organization Source	S=Single organization, M=Multiple organizations
Male Proportion	Percentage of male employees
Manager Proportion	Percentage of managers
Married Proportion	Percentage of married employees
Parent Proportion	Percentage of employees with children
Mean Age	Average employee age
Mean Tenure	Average organizational tenure (or work tenure if both reported)
Research Design	C=Cross-sectional, D=Experience sampling
WCBA Measurement	F=Frequency, D=Duration, E=Intensity, O=Other
WCBA Tools	Phone=Telephone-based, Computer=Computer-based, Mixed=Mixed tools
WCBA Initiation	S=Self-initiated, O=Other-initiated, Mixed=Mixed
WCBA Timing	A=After work, Mixed=Non-work hours
WCBA Location	H=Home, Mixed=Non-work locations
Conflict Type	WLC=Work-life, WFC=Work-family, WleC=Work-leisure
Conflict Manifestation	T=Time-based, S=Strain-based, B=Behavior-based
Conflict Reporter	S=Self, O=Other
Rxy	Correlation between WCBA and work-life conflict
WCBA Reliability	Reliability coefficient
Conflict Reliability	Reliability coefficient
Corrected Rxy	Correlation after reliability correction

Table 3: Continuous Moderator Tests (Knapp & Hartung Method)

Moderator (Specific Indicator)	b	SE	Z	p	95%CI	Q	I ²
Job Position (Manager Proportion)	0.02	0.11	0.18	<0.01	[-0.19,0.23]	178.90	84.87%
Gender (Male Proportion)	-0.02	0.11	-0.15	<0.01	[-0.23,0.19]	506.87	89.24%
Age (Mean Age)	0.00	0.01	0.00	<0.01	[-0.01,0.01]	205.80	85.93%
Marital Status (Married Proportion)	-0.26	0.09	-2.98	<0.01	[-0.44,-0.07]	146.95	73.73%
Organizational Tenure (Mean Tenure)	-0.01	0.01	-1.13	<0.01	[-0.04,0.01]	51.53	85.99%
Parental Status (Parent Proportion)	-0.28	0.11	-2.63	<0.01	[-0.49,-0.07]	155.46	82.75%

Figure 1: Forest Plot

Figure 2: Outlier Influence Diagnostics

Figure 3: Funnel Plot

Figure 4: Moderating Effect of Marital Status

Figure 5: Moderating Effect of Parental Status

Note: Figure translations are in progress. See original paper for figures.

Source: ChinaXiv — Machine translation. Verify with original.