Research Article

The Home as an Unregulated Workplace: A Narrative Review of Ergonomic, Physical, Environmental, Digital and Security Conditions in Hybrid Work, with an Agenda for Employers in India

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Abstract

Background: Hybrid work moves part of the working week into employees' homes, which were never designed, inspected or secured as workplaces. Research on hybrid work has concentrated on productivity and work–life balance, while the physical and digital conditions of the home workplace have been studied in separate occupational health, ergonomics and information-security literatures. **Objective:** To integrate evidence on five conditions of the home workplace — workstation ergonomics, movement and sleep, the indoor environment, connectivity, and information security and monitoring — and to identify what employers can and cannot control, with attention to India. **Methods:** Narrative review of peer-reviewed studies identified through PubMed, Crossref and OpenAlex searches (2000–2026), supplemented by intergovernmental guidance. Evidence was organised in a layered framework and appraised descriptively by study design. **Results:** Musculoskeletal complaints are common among home-based computer workers (about 40–72% in surveys, including Indian samples of 54% and 72%), and are associated with laptop use, long hours and the absence of a dedicated, adjustable workstation. Working from home is consistently associated with more sedentary time and less physical activity (pooled Hedges' g = +0.36 and −0.29). Satisfaction with daylight, a dedicated room and freedom from distraction are associated with better mental health, but objective measurement of home environments is rare. Connectivity and device access remain unequal, and in India the digital divide is compounded by housing constraints. Remote work enlarged the cyber-attack surface, and work pressure motivates insecure workarounds; electronic monitoring does not improve performance but is associated with higher stress. Intervention evidence specific to home work is thin: employer-provided furniture with training is associated with better comfort, whereas education alone did not change behaviour in a cluster randomised trial. **Conclusions:** The home workplace is a shared responsibility in which the employer controls equipment, training, security architecture and monitoring design, but not space, household demands or the domestic network. We propose an employer agenda built on provision rather than instruction, and a research agenda centred on objective measurement, intervention trials and Indian regulatory analysis.

Keywords: hybrid work; telework; ergonomics; musculoskeletal disorders; sedentary behaviour; indoor environment; digital divide; cybersecurity; electronic monitoring; occupational health; India

1. Introduction

Hybrid work is now a stable arrangement rather than an emergency measure. In the United States, roughly a quarter of paid working days were still being worked from home in 2023, about four times the pre-pandemic share (Barrero et al., 2023), and a large field experiment showed that two home-working days a week reduced quitting by a third without harming performance (Bloom et al., 2024). These findings have shaped how organisations talk about hybrid work: as a question of productivity, retention and work–life balance. A less visible consequence has received far less attention from management research. Every hybrid arrangement relocates part of the job into a dwelling that the employer did not choose, has not assessed and usually cannot enter.

Offices are governed workplaces. Furniture is specified, lighting and ventilation are designed, networks are administered, and occupational safety and health law assigns responsibility for hazards. The home has none of these features by default. An employee may work at a dining table with a laptop, in a shared room with children nearby, on a household network secured by a default router password. Each of these conditions is known, from separate bodies of research, to affect health or security. Ergonomics research documents the musculoskeletal and visual effects of poor workstations (Alencar et al., 2024; de Macêdo et al., 2020); physical activity research documents the effect of home working on sitting and movement (Chaudhary et al., 2024; Wilms et al., 2022); environmental psychology documents the effects of light, noise and space (Bergefurt et al., 2022); and information-security research documents how remote work expands the attack surface (Lallie et al., 2021). These literatures rarely speak to one another, and they rarely speak to the human resource managers who design hybrid policies.

The gap matters particularly in India. Indian information technology and service firms adopted home and hybrid work at scale, but Indian housing is on average more crowded, domestic workloads are heavy, and connectivity is uneven (Garrote Sánchez et al., 2021; Mukherjee & Narang, 2023). Indian studies have begun to document musculoskeletal and visual symptoms among home-based professionals (Bahkir & Grandee, 2020; Gupta et al., 2023; Pande et al., 2026), but there is little synthesis that connects these findings to employer practice or to the country's labour and data-protection law.

This review asks three questions. What is known about the ergonomic, physical, environmental, digital and security conditions of the home workplace and their consequences? Which of these conditions can employers influence, and which lie outside their control? What should employers and researchers do next, particularly in India? We organise the evidence in a layered framework, summarise each layer, and derive agendas for practice and research.

2. Method

This is a narrative review, chosen because the relevant evidence is spread across disciplines with different designs and outcome measures that do not permit quantitative pooling. Searches were run in PubMed, the Crossref and OpenAlex bibliographic databases and Google Scholar for publications from 2000 to 2026, combining terms for home-based work (telework, work from home, remote work, hybrid work, home office) with terms for each domain (ergonomics, musculoskeletal, sedentary, physical activity, sleep, eye strain, indoor environment, noise, lighting, internet, digital divide, cybersecurity, information security policy, electronic monitoring, technostress, occupational safety and health law). Reference lists of included reviews were screened.

Peer-reviewed empirical studies, systematic and scoping reviews, meta-analyses and legal analyses were included when they addressed home-based or remote work, or, for foundational constructs (technostress, security-policy compliance, office ergonomics interventions), when they provided the evidence base on which home-work studies draw. Studies from India and other South Asian settings were sought specifically. Three intergovernmental guidance documents were included as grey literature. Every bibliographic record was checked against registry metadata. Evidence was appraised descriptively by design (cross-sectional, cohort, randomised trial, review); no formal risk-of-bias scoring was undertaken, which is a limitation of the method.

3. A layered framework of the home workplace

We organise the evidence in five layers that run from the body outward (Figure 1). The *workstation layer* concerns the furniture and equipment at which work is done. The *movement layer* concerns sitting, physical activity, sleep and visual load across the working day. The *environment layer* concerns the room and dwelling: space, light, noise, temperature and interruptions. The *connectivity layer* concerns the network and devices on which work depends. The *security and monitoring layer* concerns how organisational data are protected in the home and how employers observe work done there. A sixth element, *governance*, cuts across the layers: the allocation of legal and organisational responsibility for each.

The framework makes one distinction explicit. In each layer, some conditions are within the employer's reach (equipment, training, network architecture, monitoring design), whereas others belong to the household (the available space, other occupants, the domestic broadband plan). Hybrid work policy that treats the home as an office will over-estimate what the employer controls; policy that treats the home as purely private will under-use the levers the employer does have.

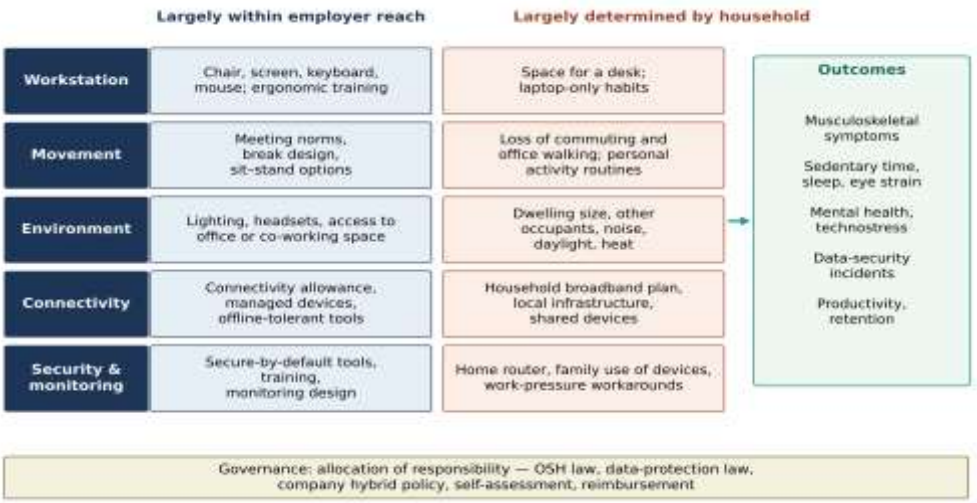


Figure 1. *Layered framework of the home workplace in hybrid work. Each layer contains conditions largely within employer reach (left) and conditions largely determined by the household (right); outcomes and governance apply across layers.*

4. Evidence by layer

4.1 The workstation layer: ergonomics and musculoskeletal health

The most consistent finding of the home-work literature is that improvised workstations are common and that musculoskeletal complaints follow. Among 843 university employees sent home in 2020, more than 40% reported moderate or severe discomfort, mostly in the back, neck, eyes and shoulders; 85% worked mainly on laptops, and fewer than half had chairs with adjustable armrests (Gerding et al., 2021). An Italian sample found low back pain in 41% and neck pain in 24% of home workers, with workstations falling short of national workplace standards (Moretti et al., 2020). In a Japanese internet survey of 4,227 desk workers free of back pain before the pandemic, those whose home working increased had twice the odds of developing low back pain (Minoura et al., 2021), and in the Dutch Lifelines cohort of 28,586 workers, home working was associated with more arm, neck and shoulder pain, partly through longer sedentary time (Loef et al., 2022). Not every study finds a change: in Estonian office workers moving home, pain prevalence was stable even though workers rated their ergonomic conditions as worse (Argus & Pääsuke, 2021).

Indian evidence points in the same direction and suggests a high baseline. Before the pandemic, 38% of Indian IT office workers reported upper-body pain over twelve months (Sahu et al., 2020). During compulsory home working, self-reported musculoskeletal disorders among 281 Indian professionals rose from 48% to 54% (Gupta et al., 2023). Among 200 software professionals, twelve-month prevalence reached 72%; only 65% had a dedicated workspace and fewer than half had received ergonomic training, and working eight or more hours a day roughly tripled the odds of symptoms (Chaturvedi et al., 2025). In a 2026 examination study of 214 hybrid IT employees in Pune, current pain prevalence was 54%, with daily working hours the only significant predictor (Pande et al., 2026).

A systematic review of 17 studies comparing teleworkers with office workers attributes teleworkers' pain to inadequate home workstations, laptop use, long hours, work–family conflict and environmental factors (Alencar et al., 2024). Two observations follow for employers. First, the laptop is the ergonomic default of hybrid work, and it is poorly suited to sustained use without an external screen, keyboard and mouse. Second, working hours recur as a predictor in several studies, which suggests that the ergonomic problem is partly a work-design problem that furniture alone will not solve.

4.2 The movement layer: sitting, activity, sleep and visual load

Working from home reduces incidental movement. A meta-analysis of 17 studies found that the transition to home working reduced physical activity (Hedges' g = −0.29) and increased sedentary behaviour (g = +0.36) (Chaudhary et al., 2024), and a systematic review of 21 studies reported roughly 16% more sedentary time and 17% less physical activity (Wilms et al., 2022). Device-based measurement confirms the self-reports: Tokyo office employees took about 59% fewer steps on home-working days than on office days (Kikuchi et al., 2025). A 2025 meta-analysis of 38 studies estimated about half an hour more sedentary time during working hours on home-working days, while noting that only four studies were at low risk of bias (Schöne et al., 2025). Early in the pandemic, newly home-based US adults sat and used screens more than those whose work was unchanged (McDowell et al., 2020).

Visual load rises with screen time. Digital eye strain is estimated to affect half or more of computer users (Sheppard & Wolffsohn, 2018). In an Indian online survey, almost all respondents reported more screen time after lockdown, averaging almost five additional hours a day, and 96% reported at least one ocular symptom (Bahkir & Grandee, 2020); another Indian survey linked eye strain to longer screen time, short viewing distance, dark rooms and infrequent breaks (Ganne et al., 2021). Sleep is also affected by the home setting: in a one-year Japanese cohort of 2,099 home workers, failing to meet recommendations for the physical home-work environment was associated with insomnia symptoms in a graded fashion (Hirashima et al., 2024).

The movement layer matters for hybrid policy because the loss of commuting and in-office walking is structural. It is not offset by the time saved from commuting unless employees choose to reinvest that time in activity, and the evidence summarised above suggests that many do not.

4.3 The environment layer: space, light, noise and interruption

The room in which home work takes place affects mental health. A US study of 988 office workers early in the pandemic associated poorer physical and mental well-being with reduced exercise, less contact with colleagues, children at home, distractions, workstation set-up and dissatisfaction with indoor environmental quality (Xiao et al., 2021). In a Dutch sample of 1,219 full-time home workers, satisfaction with daylight, artificial light, greenery and views was related to mental health indicators, whereas satisfaction with temperature, noise and air quality was not (Bergefurt et al., 2022). A second Dutch study found that noise and small desks were the main distractions, that a dedicated workroom reduced distraction, and that distraction carried most of the association between workspace characteristics and mental health (Bergefurt et al., 2023b). Housing quality has comparable associations in other home-bound populations: among 8,177 Italian university students in lockdown, poor indoor housing quality was associated with depressive symptoms regardless of dwelling size (Morganti et al., 2022).

Two reviews describe the limits of this evidence. A scoping review of physical home-workspace characteristics found that most studies examined noise, acoustics and privacy, and very few used objective measures (Bergefurt et al., 2023a). A 2026 scoping review of 37 studies found that 34 assessed the home environment subjectively and only nine objectively (Oda et al., 2026). The broader health literature on telework is of low certainty: a GRADE-assessed systematic review of 14 studies rated the evidence on general health, pain, well-being and stress as low or very low (Lunde et al., 2022). A rapid review nevertheless found a consistent pattern: health effects depended strongly on organisational and colleague support, social connectedness and work–family conflict, and women were less likely to benefit (Oakman et al., 2020).

The environment layer is where employer reach is weakest. An organisation can fund a desk lamp, a headset or a co-working membership, but it cannot create a spare room. This is acute in dense urban Indian housing, where a dedicated workroom is a privilege rather than a norm, and it implies that the option to work at the office, or at a nearby shared space, is itself an environmental resource that hybrid policy should protect.

4.4 The connectivity layer: networks, devices and the digital divide

Home work presupposes adequate connectivity, but adequacy is unequally distributed. Occupational task analysis suggests that about 37% of US jobs can be done entirely at home (Dingel & Neiman, 2020), but a global analysis estimated that only about one job in 26 in low-income countries is home-workable once household internet access is taken into account, and that ignoring connectivity overstates the capacity of poorer regions and lower-paid workers (Garrote Sánchez et al., 2021). Even where connection is near-universal, inequality shifts from whether one is connected to the quality of devices, peripherals and the recurring costs of maintaining them (van Deursen & van Dijk, 2019). In the United States, rural counties had slower internet even among connected households (Lai & Widmar, 2021), and the pandemic reinforced digital inequalities as a determinant of health (Beaunoyer et al., 2020).

Indian studies of home-based work describe infrastructure and set-up as recurrent problems for IT and IT-enabled services employees (Mukherjee & Narang, 2023). A survey of 1,812 Indian teachers working remotely across six states documented unequal access to connectivity, devices and training, with 82% reporting physical complaints and 92% stress, anxiety or loneliness (Dayal, 2023). Connectivity is thus not only a productivity issue; it shapes workload, stress and, as the next section shows, security.

4.5 The security and monitoring layer

Remote work enlarged the attack surface of organisations at the moment their staff were least prepared. A timeline of pandemic-era cyber-attacks documented a rapid rise in incidents, with phishing campaigns timed to government announcements and public anxiety (Lallie et al., 2021), and analyses of the same period linked the surge to remote access, phishing and ransomware (Pranggono & Arabo, 2021) and to widespread organisational unpreparedness (Furnell & Shah, 2020). A survey of 264 employees in 13 European countries found uneven security culture readiness when telework became mandatory (Georgiadou et al., 2022), and

threat taxonomies for home working identify the household router, personal devices, shared use of equipment and unmanaged cloud tools as distinct risks (Kotak et al., 2023).

Employee behaviour is central. Classic models show that compliance with security policy depends on attitudes, norms, self-efficacy and awareness (Bulgurcu et al., 2010), and that the cost of compliance deters full adherence to bring-your-own-device policies even when intentions are good (Crossler et al., 2014). Home work adds a specific pressure: among 207 employees of a research firm, work pressure and "getting the job done" justifications predicted intentions to copy sensitive data to unsecured devices in order to work at home (Jiang & Zhang, 2023). Insecure behaviour at home is often a workaround for inadequate tools rather than a disregard for rules.

Employers' responses to the visibility problem of remote work raise a further issue. Electronic performance monitoring is multidimensional and its effects depend on its design (Ravid et al., 2020). A meta-analysis of 94 samples found that monitoring did not improve performance and was associated with higher stress, with more transparent and less invasive monitoring associated with more positive attitudes (Ravid et al., 2023), and a second meta-analysis reached similar conclusions (Siegel et al., 2022). Monitoring and workload were associated with greater work–home interference among Chinese home workers, whereas social support reduced the main remote-work challenges (Wang et al., 2021). Technostress — overload, invasion of personal time and complexity — is consistently linked to adverse health and work outcomes (Ayyagari et al., 2011; Borle et al., 2021; Tarafdar et al., 2007). In a sample of 881 Indian employees, the organisation's home–work interface amplified rather than buffered the effect of technostress on work stress (Dutta & Mishra, 2024).

4.6 Governance: who is responsible for the home workplace?

Legal analyses of telework, almost all European, converge on a position of retained but constrained responsibility. Employers remain responsible for teleworkers' occupational safety and health, but privacy rights in the home limit inspection, so the burden shifts towards information, training and self-assessment (Erikson & Rosin, 2025; Montreuil & Lippel, 2003). A 2026 study of five home offices found that all failed European lighting standards and proposed worker self-assessment checklists precisely because employers cannot inspect homes (Sikora et al., 2026). Statutory "rights to disconnect" in France and Spain connect working-time protection to remote work (Lerouge & Trujillo Pons, 2022), and a review of Croatia's response showed how data-protection exposure under the European General Data Protection Regulation grows with remote work in the absence of specific guidance (Škiljić, 2020). The International Labour Organization and World Health Organization have issued practical guidance on safe telework (International Labour Organization, 2020; World Health Organization & International Labour Organization, 2022), and the European Agency for Safety and Health at Work has documented increased physical and psychosocial risk exposure among teleworkers (European Agency for Safety and Health at Work, 2021).

In India, the Occupational Safety, Health and Working Conditions Code, 2020, consolidates workplace safety law, and the Digital Personal Data Protection Act, 2023, places duties on organisations that process personal data. We found no peer-reviewed analysis of how either instrument applies to work performed in employees' homes. This is a significant gap, because the allocation of responsibility for home workstations and home-network security in India is, in practice, being settled by company policy rather than by law or evidence.

5. Synthesis

Table 1 summarises the evidence by layer, its certainty, the Indian evidence and the principal employer lever. Three cross-cutting conclusions emerge.

Table 1. Summary of evidence by layer of the home workplace

Layer	Main findings	Dominant designs; certainty	Indian evidence	Principal employer lever
Workstation	Musculoskeletal symptoms common (≈40–72%); laptops, non-adjustable furniture and long hours implicated	Cross-sectional, some cohort; low–moderate	Four studies; prevalence 38–72%	Provide adjustable chair, external screen, keyboard and mouse with training; limit hours
Movement	More sitting ($g \approx +0.36$), less activity ($g \approx -0.29$); fewer steps; eye strain and sleep effects	Meta-analyses of observational studies; device-based studies; moderate	Two eye-strain surveys	Design for movement breaks; sit–stand options; screen-break norms

Layer	Main findings	Dominant designs; certainty	Indian evidence	Principal employer lever
Environment	Daylight, a dedicated room and low distraction linked to better mental health	Cross-sectional, mostly subjective; low	None specific to home work	Fund lighting and headsets; protect access to office or shared space
Connectivity	Access and device quality unequal; divide larger in low-income settings	Population and survey studies; moderate	Two studies; infrastructure a recurring barrier	Connectivity allowance; managed devices; offline-tolerant workflows
Security and monitoring	Larger attack surface; pressure drives insecure workarounds; monitoring raises stress without improving performance	Conceptual, surveys, meta-analyses of monitoring; low–moderate	One technostress study	Secure-by-default tools; usable security; transparent, minimal monitoring
Governance	Employer responsibility retained but inspection constrained; self-assessment emphasised	Legal analyses (EU-centric)	No peer-reviewed analysis	Written allocation of responsibilities; self-assessment and reimbursement policy

First, the conditions of the home workplace are interdependent. A poor workstation lengthens the day it is meant to support, a slow connection pushes employees towards insecure workarounds, and a crowded home both limits the workstation and adds the distractions that the environment literature associates with poorer mental health. Interventions that address one layer in isolation are likely to disappoint.

Second, provision outperforms instruction. In a field study in an office setting, ergonomic training combined with a highly adjustable chair changed knowledge and workstation set-up (Robertson et al., 2009). Among Danish home workers, those who had received an employer-provided adjustable desk, adjustable chair and ergonomics training were more likely to report improved comfort (Nguyen et al., 2026). In a pilot randomised trial, a height-adjustable desk combined with an online programme improved affect and work satisfaction, whereas the desk alone did not (Falk et al., 2022). By contrast, a 12-week education programme delivered to 370 Japanese teleworkers in a cluster randomised trial did not improve home-workstation set-up or symptoms (Kanamori et al., 2026). The Cochrane review of workplace sitting interventions found that sit–stand desks reduced sitting by about 100 minutes a day in the short term, on low-quality evidence (Shrestha et al., 2018), and a scoping review found only ten intervention studies designed specifically for home workers (Crane et al., 2022). The pattern across this small evidence base is that employers change home-work conditions by supplying things and support, not by sending guidance.

Third, the evidence base is weakest where Indian employers most need it. Indian studies document musculoskeletal and visual symptoms well but say little about the home environment, security behaviour or the legal allocation of responsibility.

6. Agenda for Employers

The framework and synthesis suggest six priorities for organisations operating hybrid arrangements, especially in India (Figure 2).

1. **Provide a minimum home-workstation kit.** For employees working at home more than one day a week, supply or reimburse an adjustable chair, an external monitor, keyboard and mouse, and offer brief set-up training. Treat the laptop as a docking device rather than a workstation.
2. **Design for movement and screen breaks.** Build breaks into meeting norms, avoid back-to-back video calls, and make sit–stand options available where feasible.
3. **Protect the office as an environmental resource.** For employees without adequate space at home, a guaranteed desk at the office or a shared space nearby is a health measure, not a concession.
4. **Fund connectivity and manage devices.** Pay a connectivity allowance where home broadband is a condition of work, issue managed devices, and design workflows that tolerate intermittent connections.
5. **Make security usable.** Supply tools that are secure by default (managed virtual private networks, single sign-on, secure file sharing) so that employees under deadline pressure do not need workarounds, and train employees in recognising phishing.
6. **Monitor minimally and transparently.** Prefer outcome-based performance management; where monitoring is necessary, disclose what is collected and why, and avoid continuous or keystroke-level surveillance.

Each priority should be accompanied by a written allocation of responsibilities between employer and employee, supported by a self-assessment checklist for the home workstation and home network, consistent with the approach recommended where employer inspection is not possible (Sikora et al., 2026; World Health Organization & International Labour Organization, 2022).

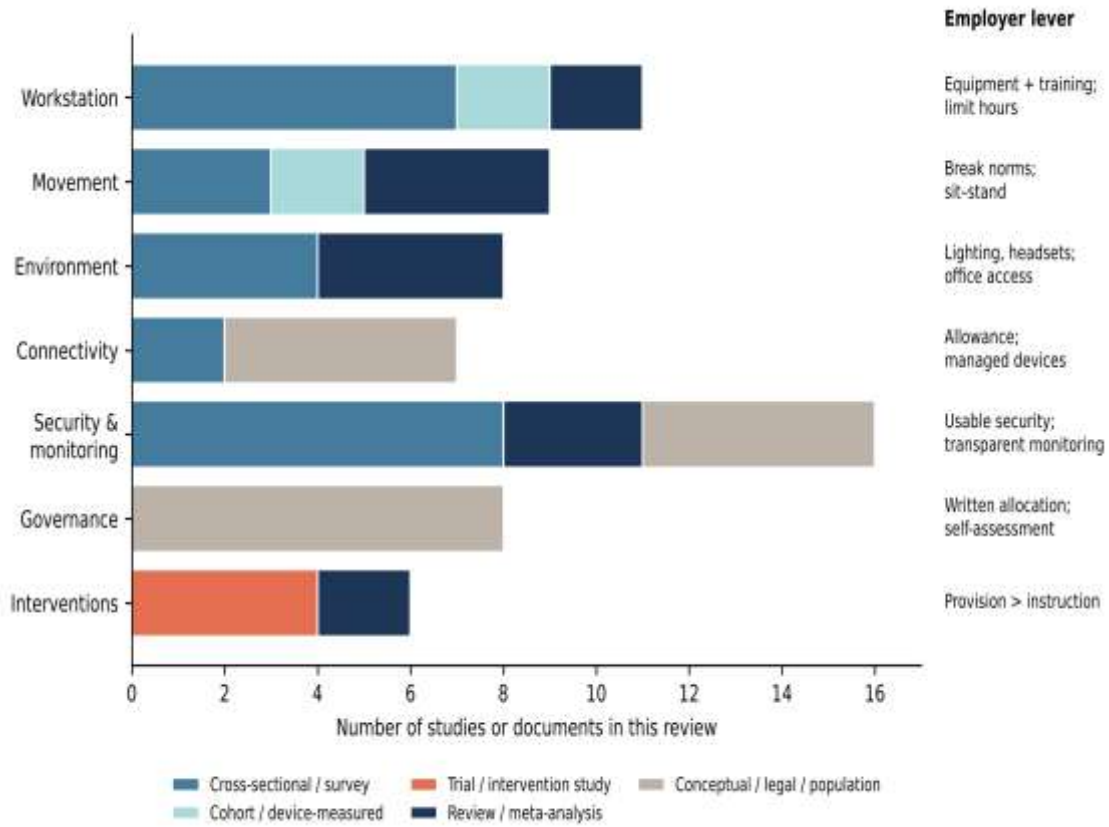


Figure 2. *Research gaps and employer levers by layer. Bars show the number of studies of each design included in this review for each layer; the right-hand column lists the main employer lever.*

7. Agenda for research

Five lines of research would most improve the evidence base.

1. **Objective measurement of home workplaces.** Light, noise, thermal conditions and workstation geometry can be measured with inexpensive sensors and photographs; linking such measures to symptoms would move the field beyond self-report (Oda et al., 2026).
2. **Intervention trials in home settings.** Cluster randomised trials comparing equipment provision, training and their combination, with musculoskeletal, visual and sleep outcomes, are needed; the null result of education alone sets the comparator (Kanamori et al., 2026).
3. **Indian and South Asian housing contexts.** Studies should examine how household density, shared rooms and domestic workload condition the effects of home work, and whether co-working or satellite offices offset them.
4. **Behavioural security in the home.** Field studies of how employees handle data on home networks and personal devices, and of how tool usability changes this behaviour, are scarce relative to conceptual threat analyses.
5. **Legal and policy analysis for India.** The application of the Occupational Safety, Health and Working Conditions Code, 2020, and the Digital Personal Data Protection Act, 2023, to home-based work requires doctrinal and empirical study, including review of how Indian employers currently allocate responsibility in their hybrid policies.

8. Limitations

This review is narrative rather than systematic. Its search was broad but not exhaustive, study selection and synthesis were not duplicated by independent reviewers, and no formal risk-of-bias assessment was undertaken, so the certainty judgements in Table 1 are indicative. Much of the evidence was collected during

the early pandemic, when home work was compulsory, full-time and improvised; hybrid arrangements with fewer home days and better-equipped homes may produce smaller effects. Some of the legal and security literature is conceptual or regionally specific. Finally, a substantial part of the health evidence is cross-sectional, so associations between workstation conditions and symptoms may reflect selection as well as causation.

9. Conclusion

Hybrid work has turned millions of homes into partial workplaces without turning them into governed ones. The evidence reviewed here shows that the conditions of these workplaces — the chair and screen, the hours spent sitting, the light and noise of the room, the quality of the connection and the security of the network — have measurable consequences for health and for organisational risk. Employers cannot control the home, but they control more of it than current practice suggests: equipment, training, connectivity, security architecture and the design of monitoring. A hybrid policy that provides these, and allocates the remainder clearly, would treat the home as what it has become: part of the workplace.

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