

**WORKING PAPER - 2020**

## **A systematic review of reviews on isolated and confined working**

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## **Abstract**

**Background:** The current pandemic has led to many people working involuntarily in their homes for extended periods and no contact with co-workers other than through information and communications technologies. The likely impact of such extreme forms of remote working on wellbeing and performance cannot be extrapolated from the existing literature on teleworking.

**Aims:** To examine the impacts on psychological wellbeing, worker performance of extreme forms of isolated, remote or confined working, and to identify potential risks and risk mitigation strategies. To use findings to suggest likely impacts and risk mitigation strategies for workers who will continue to work in their homes as social distancing restrictions are lifted slowly.

**Methods:** Systematic review of systematic reviews and meta-analyses. Searches carried out April 2020.

**Results:** Although there is individual variability, in general isolated/remote working has detrimental effects on psychological wellbeing and performance. Risk factors relate to social isolation, difficulties organising remote work and proximity of domestic and work environments. A range of risk mitigation strategies are possible.

**Conclusion:** Information and communications technologies are the means of delivering many if not all risk mitigation strategies. Worker and manager involvement in the design of those strategies may help to ensure success, as would manager knowledge of remote working.

## Introduction

The current pandemic has required many workers to work remotely from colleagues, often at home, with no physical proximity to work colleagues. This situation is likely to continue, as social distancing measures are lifted only slowly. Moreover, some organisations may find it cost effective to move to remote working even after social distancing measures are lifted (e.g. due to reduced rental costs). There is an established literature on teleworking. This literature indicates benefits for teleworkers in terms of enhanced job satisfaction and performance, reduced conflict between home and work roles on the one hand, yet reduced role clarity and supervisory support on the other [1].

However, there is a divergence between the current situation and homebased working in usual circumstances. Many homebased workers do so voluntarily, have specialised equipment to enable homebased working (desks, dedicated workspace, suitable computing and connectivity) and are able to connect with other workers in the same physical space through regular visits to organisational locations. In the current situation, workers may be working at home without such advantages, rendering drawing conclusions from the existing literature of teleworking problematic. However, there is also a literature on workers who work in extremely remote, confined and/or isolated conditions (Antarctic workers, spaceflight, remote, rural locations). Examining this literature may help provide better knowledge of the likely impacts of homebased working in the current conditions and impacts on psychological wellbeing, worker performance, possible risk factors and potential risk mitigation strategies.

Two review questions were developed to address this gap: 1) What wellbeing and performance changes (positive or negative) do workers experience, who spend extended periods remote working in confinement and / or isolation? 2) What, if anything, is known about how to mitigate challenges arising in isolated and / or confined working conditions?

## Methods

Initial scoping found that systematic reviews already existed covering varied isolated and confined working conditions. A review of systematic reviews and meta-analyses was planned to synthesise relevant findings. A protocol was developed by the authors, following the PRISMA-P checklist [2]. The protocol is available from the authors by request.

The review focussed on systematic reviews and meta-analyses about adult workers, of any nationality, who spent extended periods working in isolation or confinement or where extensive or extended use of technology was required to work remotely. The occupational element was a key inclusion requirement to differentiate this study from more general reviews of social isolation. Reviews focussed on children, older people or whole communities in a non-work setting were excluded, as were reviews of team dynamics between face-to-face groups sharing an isolated worksite. Reviews on conventional teleworking (without a remote or rural element) and simulated isolated and confined working conditions were also ineligible. Search terms specified occupational settings involving isolated and / or confined conditions that differed substantially from more 'conventional' face-to-face work settings. For inclusion, reviews had to provide a) findings on positive or negative change in wellbeing and / or performance for the workers and / or b) findings relating to mitigating challenges arising in isolated and / or confined working conditions.

Only English-language, peer-reviewed journal articles from between January 2005 and April 2020 were included. The limited timeframe acknowledged significant potential differences in working remotely prior to 2005, without the types of information and communication technology now available to isolated and confined workers. The following databases were searched: Cochrane database of systematic reviews, APA PsycINFO, Medline, Web of Science Core Collection, Scopus, Academic Search Complete, Applied Social Sciences Index and Abstracts (ASSIA), International Bibliography of the Social Sciences (IBSS). The search string is given in table 1.

The two authors conducted the study selection process in four stages: de-duplication, title and abstract screening, full text screening and data extraction. An overview of the process is given in figure 1 and resulted in the final inclusion of 12 systematic reviews. Apart from de-duplication, the two authors carried out the processes independently before the results were shared for consideration at each stage. In cases of initial disagreement, consensus was reached via discussion. Selected items from the CASP systematic review checklist [3] were used, alongside custom questions, to assess the final full text selection for risk of bias. No documents were excluded on this basis. The authors prepared a narrative thematic summary based on the data extracted.

## **Results**

The characteristics of the 12 reviews are summarised in Table 2.

In respect of impacts on wellbeing, the reviews indicate negative impacts of isolated/remote working and no positive effects. These include job dissatisfaction, burnout, fatigue [4], impaired mental health (specifically anxiety and depression [5,6] ), poor sleep quality [5] which exasperates other problems [7], boredom [5] and increased substance misuse [4,5]. That there are impairments to wellbeing across several reviews and different occupations and remote environments suggests at least some of the harms can be linked to the features of isolated/remote working contexts. There is some evidence of differential effects, with worse mental health displayed in women working remotely [6]. These effects may be contextual, as Yazd et al.'s review [6] focused on farmers. Studies of Antarctic workers suggest there is no specific pattern of detrimental effects linked to the duration of isolated/remote working [8]. Instead, variations may be linked to specific events rather than weather, diurnal factors or the amount of time spent isolated/remote working: such events include arrivals of new workers and performing tasks outside [8].

Similar to wellbeing, the reviews also reported isolated/remote working to be linked only to impaired performance outcomes, and with no performance benefits. Effects that may manifest themselves earlier during periods of isolated/remote working may be reduced motivation [9],

reductions in high level cognitive performance (self-awareness and critical reflection [10]; reduced problem-solving ability [11]; poor vigilance [5]. However, Strangman et al. in their review of isolated, confined and extreme environments [7], including space flight, noted high interindividual variability in effects on cognitive performance, suggesting some people may adapt to isolated/remote and confined environments better than others. The reviews also indicate adverse effects of isolated/remote working on social performance, including compassion fatigue in rural healthcare workers [4] and interpersonal problems in isolated, confined and extreme environment workers [5]. Long term effects on performance include increased turnover, due to isolation and other stressors [4, 12]. Evidence on turnover comes from reviews only of rural and isolated/remote healthcare workers. However, it is likely that the results would generalise, given consistent links between stressors, reduced mental health and increased turnover found elsewhere [13]. Evidence on other performance outcomes is provided across several contexts, so is also likely to generalize.

The reviews have identified many and varied risk factors for poor wellbeing associated with isolated/remote working. These can be split into three major areas: i) social factors, ii) problems caused by the organisation of isolated/remote work and iii) proximity of domestic and work environments.

Social factors include isolation [4, 6, 10], including isolation from family and friends [12]. Social factors also subsume difficulty obtaining support from other professionals and managers [4, 14], including lack of responsiveness [12] and poor debriefing after exposure to adverse work events and situations [12]. Social factors may exacerbate other problems [12]. Isolation may be problematic where people are also unwilling to seek help, especially professional help for mental health problems [6].

Problems caused by the organisation of isolated/remote work include poor communication, manifest as workers being unclear about goals, roles and expectations [14], workers being provided with misleading information and lack of recognition [12]. Also included here is provision of human

resource management services, related to under-resourcing, lack of responsiveness, poor communication from human resources managers and reduced access to professional development and training opportunities [12]. Problems with accessing professional development/training may have shorter term effects on motivation but may become manifest as performance problems over the longer term. Other issues are related to workload, including low staffing levels [4, 6] and difficulty obtaining cover for annual leave [12]. However, it is likely that issues pertaining to staffing are more closely linked to labour market conditions in remote and rural areas rather than isolated/remote working *per se*. Other reviews do indicate increases in workload due to the nature of the tasks [4, 7], with isolated/remote workers having to engage in multiple roles or take on work they are not fully equipped to deal with because there is no other person in the vicinity to do the work.

The proximity of domestic and work environments may be problematic. Working in the home or in close proximity to home can create difficulties in separating personal and work lives [12] and lead to conflict with family members [6]. Yazd et al. [6] indicate the risk of conflict with family members may be higher for women, perhaps related to social norms in respect of caring and domestic roles. Moreover, there may also be problems if housing conditions are in general poor [6].

Risk mitigation strategies can be classified according whether they are targeted at individuals, improving the social environment or more systemic, organisation wide changes. Those targeted at individuals and the social environment may be easy and quick to implement. One theme underlying a range of interventions is to support isolated/remote workers in managing their own problems.

Individually targeted interventions, such as provision of various decision aids (checklists, guidelines, protocols), can help isolated/remote workers cope with complex or novel problems [15]. Evidence that there is individual variation in adaptation to isolated/remote working [5] may suggest

that isolated/remote workers could be trained in strategies to help them adapt, especially in task focused coping rather than avoidant coping.

Social interventions include both enhancing social relationships and enhancing supervision. For workers in remote locations, there is evidence that a sense of belonging to a specific remote or rural place can help offset other issues [4], suggesting a potential for interventions to foster a sense of belonging to the remote location rather than just the organisation. Other interventions could be targeted at enhancing workplace social networks with work colleagues [5, 10] or improving family support [4]. Supervision interventions could include interventions targeting managers to be more supportive, inspiring, consultative, trusting [12, 14] and improving understanding of working in an isolated/remote context [14]. One to one communication, providing effective feedback and mentoring may usefully supplement more group based approaches to management [4, 10, 12].

Of the more systemic, organisation wide changes, one the easiest and quickest to implement could be communications from senior managers on how the organisation is supporting isolated/remote workers [14]. One other systemic change that could be implemented relatively quickly would be to delegate more authority to isolated/remote workers to take decisions that affect their job without always seeking permission from line managers [4, 16]. To sustain isolated/remote working in the longer term, changes to human resource management practices may be required, including development of policies and procedures to support isolated/remote working [15], provision of professional development and training [10, 12, 16], changes to performance and developmental appraisal [15], annual leave and recruitment procedures [12].

In an isolated/remote context, information and communications technologies are the means for delivering the other forms of interventions [10, 11, 14] and themselves require significant systemic change. Long et al. [9] identify the problem of start-up costs in the short-term but the potential for cost savings in the longer term.

In their review of remote healthcare workers, Moran et al. [16] identify several factors associated with the success of interventions. These are i) involvement of stakeholders in programme design, implementation and evaluation; ii) needs analysis prior to the intervention; iii) active intervention management and support; iv) marketing the intervention; v) organisational commitment to the intervention; vii) appropriate and available resources, including appropriate training; viii) networking between stakeholders; and ix) regular feedback and evaluation. Moran et al. indicate that networking and access to resources are directly linked to improvements in wellbeing indicators.

## **Discussion**

The review brought together evidence on the experiences of workers spending extended periods remote working in confinement and/or isolation. By looking across varied environments and occupational groups it was possible to discern broad commonalities in worker experience of isolation and confinement. Negative wellbeing and performance outcomes were associated with isolated/remote working, with specific risk factors related to: a) low social contact; b) reduced professional support linked to problems of organising isolated/remote work; c) and a porous boundary between work and home. However, it was not possible to predict the extent of negative impact on any one individual or a consistent trajectory of negative impacts over time. High variability in individual ability to adapt, combined with the positive potential of learning opportunities, suggest that the mitigation of reported negative effects may be possible with appropriate interventions.

To inform the debate on mitigation, the second research question for the review explored options for addressing challenges arising from isolated/remote working conditions. Mitigations include appropriate physical (housing, equipment) and organisational (policies, inductions, HR support) infrastructure, as well as supportive management (supervision, debriefing, performance feedback, back up with specialist knowledge) and opportunities to encounter new people and knowledge (networking, continuing professional development). The importance of these factors is

by no means unique to isolated/remote working. However, in isolated/remote conditions, the more connective mitigations rely either implicitly or explicitly on ICT solutions and scheduled (rather than informal) contact. This means of delivery can inhibit activity that would more straight-forwardly take place in face-to-face situations.

There is complementary evidence from the arena of telehealth delivery that emotional bonds, behavioural changes and learning can be delivered effectively via modern ICT options such as video-conferencing [17, 18, 19], but the means of delivery is only one element in setting up a good intervention. Just as with non-occupational conceptualisations of social isolation [20], the findings suggested that mitigations should address not just the quantity of contact, but also the quality and structure of relationships between managers and co-workers, as well as the contextual appropriateness of the practical and emotional support they provide. This contextual appropriateness point is addressed by Moran et al.'s [16] note on the importance of worker engagement and involvement in planning interventions, as well as the suggestion that managers will manage better if they themselves have some experience or understanding of working in the same conditions [14].

Seven of the reviews focused on healthcare workers, possibly limiting the extent to which conclusions generalise to other contexts. However, as indicated above, there was consistent evidence of effects on wellbeing and performance outcomes across contexts, indicating the findings most likely generalise to isolated/remote working contexts.

Many of the reviews identified severe shortcomings in the studies reviewed (e.g. reliance on cross-sectional methods [5, 6, 14]; small sample sizes [14], lack of controlled intervention studies [16]). This places limits on the confidence of any findings and conclusions that can be drawn from the review. Snape et al. [21] recommend that evidence be rated on a four-point scale, ranging from unclear evidence, initial evidence, promising evidence and strong evidence. Promising evidence is indicated by replicated findings from multiple studies with limitations. Therefore, in respect of the

findings from the present review of reviews, we would rate the body of evidence as promising in respect of establishing an association between isolated/remote working and reduced wellbeing and performance outcomes. However, given the dominance of cross-sectional methods and a lack of intervention studies with control groups, evidence in respect of identifying causal factors and effective risk mitigation strategies is lacking and can only be described as initial. For both initial and promising evidence, Snape et al. [21] recommend policy makers and practitioners incorporate other information as well as evidence from reviews into decisions.

Although individual variability plays a role, this review of reviews suggests that in general isolated/remote working has detrimental effects on wellbeing and performance. Risk factors relate to social isolation, difficulties organising remote work and the proximity of domestic and work environments. Initial evidence suggests a range of strategies may be employed by organisations and individuals to mitigate the risks of the current rise in isolated and confined working due to the global pandemic, but only further research will identify which interventions and approaches are most successful in this new context.

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Table 1: Search string

Search terms	String
Occupational groups	(military OR army OR soldier OR navy OR sailor OR seafarer OR astronaut OR aerospace OR pilot OR moon OR mars OR polar OR arctic OR Antarctic OR winterover* OR winter-over* OR overwinter* OR over-winter* OR submersible OR submarin* OR truck OR long-haul OR LHTD OR professional_driver OR rural OR highland OR upland OR farmer OR shepherd OR herder OR offshore OR off-shore OR rig OR mining OR miner OR FIFO OR DIDO OR digital_nomad* OR endurance_sport OR novelist OR artist OR safety_monitor* OR programmer OR developer) AND
Work environment	(isolat* OR confin* OR extreme OR remote OR lone OR alone OR distance OR location_independ* OR telecommute* OR telework* OR solo) AND
Wellbeing / performance	(stress OR well-being OR wellbeing OR well_being OR mental_health OR mental_ill* OR emotions OR affect* OR mood OR job_satis* OR anxiety OR depress* OR burnout OR engagement OR work_engagement OR employee_engagement OR life_satis* OR job_strain OR psychological_health OR perform* OR productiv*) AND
Review	(best_evidence_review* OR systematic_review* OR meta-analys*)

Table 2: Studies included in the review

<b>Authors</b>	<b>Review aim</b>	<b>Review type</b>	<b>Population studied</b>	<b>Number of papers reviewed</b>
Long, Pariyo & Kallander (2018)	To provide evidence on digital strategies for health workforce development	Scoping	Healthcare workers in low and middle income countries	8 systematic, thematic and scoping reviews, 21 empirical papers and blogs
Whitall, Lee & O'Connor (2016)	To review factors affecting volunteering in palliative care in rural communities	Systematic	Volunteers (excluded from this review) and healthcare workers	68 empirical papers
Strangman, Sipes & Beven (2014)	To review effects of spaceflight and analogue environments on cognitive performance	Systematic	Astro/cosmonauts and other isolated workers	32 spaceflight studies, 56 analogue studies including Antarctic
Bartone, Krueger & Bartone (2018)	To review individual behavioural and cognitive adaptation to isolated, confined and extreme environments	Systematic	Isolated, confined and extreme environments workers	73 studies
Mbemba, Gagnon, Paré & Côté	To review evidence on the effectiveness of interventions to promote nurse retention in rural or remote areas	Review of reviews	Nurses in rural or remote contexts	5 reviews ranging from 14-43 studies in each review
Yazd, Wheeler & Zuo (2019)	To identify risk factors for and understand how farmers' mental health has been measured	Systematic	Farmers and farm workers	167 studies
Nayani, Nielsen, Daniels, Donaldson-Feilder & Lewis (2018)	To review the leadership and management of occupational safety and health for distributed workers	Systematic	Distributed workers	23 studies
Moran, Coyle, Pope, Boxall, Nancarrow & Young (2014)	To review support strategies for health care practitioners in rural and remote contexts	Integrative	Healthcare workers	43 studies

<b>Authors</b>	<b>Review aim</b>	<b>Review type</b>	<b>Population studied</b>	<b>Number of papers reviewed</b>
Vasan, Mabey, Chaudhri, Brown Epstein & Lawn (2017)	To review support and performance improvement interventions for healthcare workers	Systematic	Healthcare workers in low and middle income countries	40 studies
Gagnon, Pollender, Trépanier, Duplâa, & Ly (2011)	To review the impact of interventions using information and communications technologies on recruitment and retention of healthcare professionals	Systematic review	Healthcare workers	13 studies, 6 focused on rural or remote workers
Hawkes & Norris (2017)	To assess temporal variation in mood during Antarctic deployments	Meta-analysis	Antarctic workers	21 studies
Lenthall, Wakerman, Opie, Dollard, Dunn, Knight, MacLeod & Watson (2009)	To identify stressors experienced by nurses in remote areas	Systematic review	Remote area nurses	26 studies

Figure 1: Selection and eligibility stages

