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Working from home in Australia during the COVID-19 pandemic: cross-sectional results from the Employees Working From Home (EWFH) study

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ABSTRACT

Objectives To investigate the impacts, on mental and physical health, of a mandatory shift to working from home during the COVID-19 pandemic.

Design Cross sectional, online survey.

Setting Online survey was conducted from September 2020 to November 2020 in the general population.

Participants Australian residents working from home for at least 2 days a week at some time in 2020 during the COVID-19 pandemic.

Main outcome measures Demographics, caring responsibilities, working from home arrangements, work-related technology, work–family interface, psychosocial and physical working conditions, and reported stress and musculoskeletal pain.

Results 924 Australians responded to the online questionnaire. Respondents were mostly women (75.5%) based in Victoria (83.7%) and employed in the education and training and healthcare sectors. Approximately 70% of respondents worked five or more days from home, with only 60% having a dedicated workstation in an uninterrupted space. Over 70% of all respondents reported experiencing musculoskeletal pain or discomfort. Gendered differences were observed; men reported higher levels of family to work conflict (3.16±1.52 to 2.94±1.59, p=0.031), and lower levels of recognition for their work (3.75±1.03 to 3.96±1.06, p=0.004), compared with women. For women, stress (2.94±0.92 to 2.66±0.88, p<0.001) and neck/shoulder pain (4.50±2.90 to 3.51±2.84, p<0.001) were higher than men and they also reported more concerns about their job security than men (3.01±1.33 to 2.78±1.40, p=0.043).

Conclusions Preliminary evidence from the current study suggests that working from home may impact employees' physical and mental health, and that this impact is likely to be gendered. Although further analysis is required, these data provide insights into further research opportunities needed to assist employers in optimising working from home conditions and reduce the potential negative physical and mental health impacts on their employees.

Strengths and limitations of this study

- A key strength of the study is the use of a range of validated measurement tools to examine the environmental exposures for workers whilst working from home during the COVID-19 pandemic.
- The baseline data were collected during a period of sustained lockdown in one of the states (Victoria), which provides unique insights into the experiences of people working from home under those conditions.
- The population sample has a higher proportion of respondents based in Victoria, the southern state of mainland Australia which experienced the longest period of lockdown in the world so the impacts on this group are likely to differ from those elsewhere in Australia and beyond.
- The use of a convenience sample is a limitation and recruitment of females was higher than males; however, this is consistent with emerging research in COVID-19 studies

INTRODUCTION

The current global pandemic caused by COVID-19 has resulted in an unprecedented situation with wide ranging health[1] and economic impacts[2 3] which differ markedly by gender.[4 5] The unexpected and rapid global impact necessitated immediate actions and a key public health measure has been the shift to employees' working from home (WFH) where possible.[6] While WFH is often offered to employees as a flexible work benefit to improve the integration between work and other life activities, it is less commonly undertaken in a full-time capacity or mandatory capacity.[7 8] In response to the public health restrictions to reduce the transmission of COVID-19, organisations rapidly transitioned to WFH without a clear understanding of the impact of ongoing WFH on mental and physical health.[9]

In March 2020, Australians experienced their first lockdown due to COVID-19. All people who were able to work from home were required to do so. By May, many restrictions were lifted, but the requirement to

maintain WFH, where possible, was retained. Since then, lockdowns have been ongoing, particularly for residents of Victoria. WFH will continue to be an important part of the COVID-19 mitigation strategy and, as such, it is important that policies and procedures to support sustainable practices are used. This will require data from impacted populations to ensure these meet the needs of employers and employees to optimise working conditions. Prior to the pandemic, data suggest that approximately one-third of the Australian working population were undertaking some hours of work from home.[10] In comparison, during the pandemic (June 2021) 57% of employed people in Victoria were working from home more than once a week,[11] suggesting that working from home was a new experience for many people, and for most it was not through choice, but mandated.

A recent rapid review identified WFH as a complex occupational health issue, necessitating organisations use a systems-based approach, taking into account the organisational, job and individual aspects of work.[12] This approach is a distinct departure from more conventional workplace assessment strategies which commonly focus on the physical aspects of a person's work and fail to address the psychosocial conditions. The review identified a need for policies to be implemented around work–home boundary management, role clarification, clear performance indicators, appropriate technical support, facilitation of coworker networking and training for managers. There appears to be a high likelihood that WFH will remain a central aspect of future working conditions well beyond the current COVID-19 pandemic[13]; as such, the overarching objective of the Employees Working from Home (EWFH) study was to explore the relationships between a broad range of workplace characteristics and the impact on employees' health and well-being.

More specifically, workplace conditions—physical and psychosocial—have been associated with a range of negative health outcomes which include musculoskeletal and stress-related mental health disorders.[12 14 15] Employers are required to undertake activities to support the protection of all workers and reduce injury risk; early identification of adverse working conditions, regardless of where the work is being undertaken, will enable targeted strategies to address potential risks.[16 17] Such workplace assessment activities are traditionally undertaken by occupational health professionals, ergonomists or health and safety representatives at the organisation, but the rapid shift to working from home meant that many of the usual work environment assessments were bypassed in order to comply with governmental public health responses.[9]

Working from home can have positive and negative impacts on the work–family interface; where the traditional boundary settings between work and home are challenged[18 19]; with potential for increased role conflict[20] or spill over between the two domains. One example of negative spill over includes work–family conflict (WFC), in which conflict arises when the general demands of, time devoted to, and strain caused by the job interfere with family (non-work) life.[21] High levels of WFC are associated with negative impacts on physical and mental health, low job satisfaction and heightened intentions to leave the workplace.[22–24] In the other direction, family–work conflict (FWC) arises when the general demands of, time devoted to, and strain created by the family interfere with performing work-related responsibilities.[21] As such, the multiple role transitions required when WFH may reduce WFC but may increase FWC[19 20] and impact employee productivity. Boundary theory,[25] which underpins much of the–work family interface research area, proposes that individuals maintain psychological, physical and/or behavioural boundaries around their different life roles, such as their work and home roles. However, the COVID-19 pandemic has raised challenges with boundary management due to mandated WFH for prolonged periods of time. The rapid change to WFH during the COVID-19 pandemic required transitions for employees, to support the greater public health need, without careful consideration of boundary setting. Prior to the current pandemic, research identified that employees WFH adjust their approach to managing the work–family interface depending on the number of days they are based at home.[7]

A further impact of the pandemic was the increased burden of care-related duties, due to school and child-care centre closures. While evidence suggests that men increased their role in care-related duties, women continued to take on a disproportionate share of the unpaid work.[26 27] Prior to the pandemic, women also assumed a greater role in household duties but without the additional burden of WFH and balancing these often-competing demands.[28] Already, data suggests negative impacts of the pandemic on women's working lives at far greater levels than their male counterparts,[29 30] along with greater dissatisfaction of the balance between paid and unpaid work.

The overall objectives of the EWFH study itself are to examine (1) The impacts of psychosocial and physical hazards, related to WFH, on mental and physical health and (2) To investigate differences in health outcomes between employees and identify patterns of gendered differences. The aim of this paper is to describe the measures used, the characteristics of the sample population engaged in the EWFH study, and the baseline survey results to identify relationships for further investigation. The cross-sectional data provides the baseline for a longitudinal study.

METHOD

Study design

The EWFH study used a sequential mixed-methods approach which included (1) a cross sectional study (survey) and (2) a descriptive qualitative study (focus groups).[31] The purpose of the cross-sectional study was to explore the physical and psychosocial impacts of WFH. Using focus groups, the descriptive qualitative study

Table 1 Description of the population

	All (n=964)	Male (n=230)	Female (n=728)	P value*
Age				0.004
18–35 years	209 (26.49%)	40 (21.28%)	165 (27.73%)	
36–55 years	450 (57.03%)	103 (54.79%)	346 (58.15%)	
56 years and over	130 (16.48%)	45 (23.94%)	84 (14.12%)	
State				0.712
Victoria	807 (83.71%)	190 (82.61%)	611 (83.93%)	
Other	157 (16.29%)	40 (17.39%)	117 (16.07%)	
Industry				<0.001
Education and Training	321 (33.30%)	66 (28.70%)	254 (34.89%)	
Financial and Insurance Services	49 (5.08%)	10 (4.35%)	39 (5.36%)	
Healthcare and Social Assistance	138 (14.32%)	18 (7.83%)	119 (16.35%)	
Information, Media and Telecommunications	45 (4.67%)	16 (6.96%)	29 (3.98%)	
Professional, Scientific and Technical Services	207 (21.47%)	51 (22.17%)	154 (21.15%)	
Public Administration and Safety	98 (10.17%)	28 (12.17%)	70 (9.62%)	
Transport, Postal and Warehousing	32 (3.32%)	11 (4.78%)	20 (2.75%)	
Other	74 (7.68%)	30 (13.04%)	43 (5.91%)	
Sector				0.0783
Public sector	524 (54.36%)	118 (51.30%)	403 (55.36%)	
Private sector	288 (29.88%)	80 (34.78%)	207 (28.43%)	
Not for profit sector	119 (12.34%)	21 (9.13%)	96 (13.19%)	
Self employed	33 (3.42%)	11 (4.78%)	22 (3.02%)	
Role				†
Manager	157 (16.29%)	47 (20.43%)	109 (14.97%)	
Professional	587 (60.89%)	154 (66.96%)	429 (58.93%)	
Clerical or administrative workers	198 (20.54%)	21 (9.13%)	176 (24.18%)	
Community and personal service worker	10 (1.04%)	1 (0.43%)	9 (1.24%)	
Sales worker	9 (0.93%)	4 (1.74%)	5 (0.69%)	
Technician, trade, machinery operators and drivers	3 (0.31%)	3 (1.30%)	0 (0.00%)	
Business size				0.996
Sole trader	29 (3.01%)	7 (3.04%)	22 (3.02%)	
Small business	74 (7.68%)	18 (7.83%)	55 (7.55%)	
Medium business	95 (9.85%)	22 (9.57%)	73 (10.03%)	
Large business	766 (79.46%)	183 (79.57%)	578 (79.40%)	
Domestic arrangements				0.402
Single person household	123 (12.76%)	24 (10.43%)	99 (13.60%)	
Adults only	418 (43.36%)	99 (43.04%)	315 (43.27%)	
Dependents	423 (43.88%)	107 (46.52%)	314 (43.13%)	
No of children				0.579
None	622 (64.52%)	140 (60.87%)	476 (65.38%)	
1	119 (12.34%)	29 (12.61%)	90 (12.36%)	
2	181 (18.78%)	50 (21.74%)	131 (17.99%)	
3 or more	42 (4.36%)	11 (4.78%)	31 (4.26%)	
Child's life stage‡				
Preschool	94 (27.49%)	35 (38.89%)	59 (23.41%)	<0.001
Grades prep-2	90 (26.32%)	20 (22.22%)	70 (27.78%)	<0.001

Continued

Table 1 Continued

	All (n=964)	Male (n=230)	Female (n=728)	P value*
Grades 3–6	111 (32.46%)	35 (38.89%)	76 (30.16%)	<0.001
Grades 7–10	104 (30.41%)	31 (34.44%)	73 (28.97%)	<0.001
Grades 11–12	56 (16.37%)	14 (15.56%)	42 (16.67%)	<0.001
Satisfaction with division of household responsibilities				
Household tasks	962; 4.03±1.38	229; 4.18±1.21	727; 3.98±1.43	0.119

*χ^2 or (§)Mann-Whitney test of difference between male and female.
†χ^2 not presented due to small expected values.
‡Multiple answer: percentages may not equal 100%.

aimed to provide a more nuanced and in depth understanding of WFH based on the findings from the cross-sectional study.

Study population

A convenience sample of participants from across Australia was recruited. Eligible participants were recruited through an advertisement distributed via the Facebook paid service. In addition, the advertisement was circulated through professional and personal networks of the research team, LinkedIn and the La Trobe University Facebook page. The advertisement directed people to an online questionnaire that contained screening questions to determine eligibility and only eligible respondents were able to proceed and complete the questionnaire. The following inclusion criteria were used to determine eligibility: being 18 years of age or older, working from home at least 2 days per week during the period following declaration of the COVID-19 pandemic in Australia, currently living in Australia. Recruitment of questionnaire respondents occurred from September to November 2020. Respondents were offered the opportunity to go into a prize draw to win a gift voucher, if they completed the questionnaire.

At the completion of the anonymous questionnaire, participants were invited to indicate their interest in being part of a focus group and if they were willing to undertake a follow-up questionnaire 6 months postbaseline. If responding 'yes', they were required to provide some identifiable data (ie, email address or phone contact) so they could be contacted. Interested participants were emailed a booking link to register for a focus group. On registration, participants were sent a zoom link for the focus group. When the focus group had reached the maximum number of registrations (each focus group had a maximum of six participants), any additional interested participants were automatically placed on a waiting list. All focus group participants were provided with a gift voucher to compensate for their time commitment.

Patient and public involvement

Participants were not involved in the design or implementation of this study.

Data collection

Survey

The online questionnaire was developed using internationally validated tools where possible. Demographic data, including age, gender, nature of employment, the general experience of working from home, satisfaction with the division of caring and/or household duties, patterns of WFH and the provision and comfort of workstation equipment along with location of work, was collected. Other questionnaire constructs included: sedentary behaviour, well-being and general health WFC, FWC, work-related psychosocial hazards, job satisfaction, musculoskeletal discomfort/pain, and the use of work-related technology.

Work hours were calculated based on the item 'When you are (or were) working at home during the COVID-19 pandemic, what are/were your usual working hours (average per week)?' Answers of or above 35 hours per week were considered full-time.

Division of household/caring roles was asked as 'How satisfied are you with the way household tasks are divided between you and others in your household?' and How satisfied are you with the way childcare and/or caring duties are divided between you and others in your household? This item was scored on a five-point Likert scale ranging from very dissatisfied (1) to very satisfied (5).[32]

Patterns of WFH were determined by taking respondents answer to 'Before the start of the COVID-19 pandemic, how many days per week did you usually work from home?'—with allowed responses from 0 to 5 days—from their answer to 'When you are working from home during the COVID-19 pandemic, how many days per week do you usually work from home?'—with allowed responses from 2 to 5 days.

Workstation location was addressed through the following 'When you are working at home, where do you usually work?' Three response options were offered: Wherever—'I just find a place somewhere that's free, such as on the kitchen table or other place'; Separate—'I have my own place in a separate room by myself'; and Interruptions —'I have my own place but in a room that can be busy with other people'.

Table 2 Work situation

	All (n=964)	Male (n=230)	Female (n=728)	P value*
No of days worked from home during COVID-19				0.002
2 days	52 (5.51%)	10 (4.48%)	41 (5.73%)	
3 days	98 (10.38%)	13 (5.83%)	85 (11.89%)	
4 days	118 (12.50%)	18 (8.07%)	99 (13.85%)	
5 or more	676 (71.61%)	182 (81.61%)	490 (68.53%)	
Change in days WFH pre to during pandemic				‡
Decreased	6 (0.64%)	1 (0.45%)	5 (0.70%)	
Stayed the same	61 (6.46%)	10 (4.48%)	51 (7.13%)	
Increased	877 (92.90%)	212 (95.07%)	659 (92.17%)	
Mean change	944; 3.82±1.53	223; 4.02±1.44	715; 3.76±1.56	0.010
Months worked from home	944; 6.34±1.65	223; 6.58±1.69	715; 6.26±1.64	0.006†
Average hours worked				‡
Full time	684 (71.62%)	190 (83.70%)	491 (68.01%)	
26–34 hours	137 (14.35%)	20 (8.81%)	115 (15.93%)	
21–25 hours	74 (7.75%)	9 (3.96%)	65 (9.00%)	
15–20 hours	45 (4.71%)	6 (2.64%)	38 (5.26%)	
14 hours or less	15 (1.57%)	2 (0.88%)	13 (1.80%)	
WFH preferred days				0.094
None	47 (5.96%)	6 (3.19%)	40 (6.72%)	
1	75 (9.51%)	25 (13.30%)	50 (8.40%)	
2	227 (28.77%)	50 (26.60%)	176 (29.58%)	
3	239 (30.29%)	57 (30.32%)	179 (30.08%)	
4	91 (11.53%)	18 (9.57%)	72 (12.10%)	
Every day	110 (13.94%)	32 (17.02%)	78 (13.11%)	
Workstation Location				0.001
Work wherever	139 (14.74%)	28 (12.56%)	111 (15.55%)	
Separate room	569 (60.34%)	157 (70.40%)	408 (57.14%)	
Separate room w/interruptions	235 (24.92%)	38 (17.04%)	195 (27.31%)	
Workstation comfort (compared with prepandemic)				0.186
Decreased	486 (51.54%)	100 (44.84%)	382 (53.50%)	
Stayed the same	284 (30.12%)	79 (35.43%)	204 (28.57%)	
Increased	173 (18.35%)	44 (19.73%)	128 (17.93%)	
Typical work from home				
Sitting (% of time)	77.60±24.80	77.36±22.99	77.72±25.28	0.168†
Standing (% of time)	10.01±13.73	9.85±11.37	9.96±14.06	0.302†
Walking (% of time)	6.88±7.80	7.63±7.29	6.67±7.97	0.037†
Heavy labour (% of time)	0.43±3.57	0.37±1.65	0.45±4.00	0.224†
Technology				
Technology support	794; 3.85±0.82	190; 3.79±0.82	598; 3.88±0.81	0.130†
Productivity	791; 4.23±0.83	188; 4.15±0.77	597; 4.26±0.85	0.009†
Technology complexity	789; 2.49±1.02	188; 2.50±1.01	595; 2.50±1.02	0.955†
Job satisfaction				0.010
Very unsatisfied	23 (2.83%)	11 (5.64%)	12 (1.96%)	
Unsatisfied	68 (8.35%)	14 (7.18%)	53 (8.65%)	
Neither	126 (15.48%)	25 (12.82%)	101 (16.48%)	

Continued

Table 2 Continued

	All (n=964)	Male (n=230)	Female (n=728)	P value*
Satisfied	394 (48.40%)	106 (54.36%)	284 (46.33%)	
Very Satisfied	203 (24.94%)	39 (20.00%)	163 (26.59%)	
Mean (SD)	814; 3.84±0.98	195; 3.76±1.03	613; 3.87±0.97	0.273†

*$\chi 2$.
†Mann-Whitney test of difference between male and female.
WFH, working from home.

Workstation comfort was assessed through the question, 'How comfortable is your home workstation (where you usually work at home) compared with your usual workstation before the COVID- 19 pandemic', with five response categories from much less comfortable to much more comfortable.

Technology and equipment was measured through the provision of a list of equipment, laptop, desktop, phone/tablet and other with yes/no responses. A question asked about the use of a separate mouse/keyboard with a laptop, response categories were 'yes, both a keyboard and mouse', 'yes, a mouse but not a keyboard', 'yes, a keyboard but not a mouse', 'no'. A question asked, 'do you use a separate screen with your laptop, with yes/no response'.

Sedentary behaviour was measured using the Occupational Sitting and Physical Activity Questionnaire[33] to obtain subjective measures of time spent on various types of activities, that is, sitting, standing, walking and physically demanding work.

Well-being and general health were measured using items from the Copenhagen Psychosocial Questionnaire (COPSOQ).[34] Well-being was measured with 13 Items scored on a five-point Likert scale ranging from not at all (1) to all the time (5). An example item was 'how often have you felt worn out?'. General health was measured with a single item ('in general, would you say your health is?') and scored on five-point scale ranging from poor (1) to excellent (5).

Work–family conflict and family-work conflict were measured using the 10-item scale developed by Netemeyer *et al*.[21] Items were scored using a seven-point scale ranging from strongly disagree (1) to strongly agree (7). An example item for work–family conflict was 'the demands of my work interfere with my home and family life'. An example item for family–work conflict was 'I have to put off doing things at work because of demands on my time at home'.

Psychosocial hazards were measured using 33 items drawn primarily from COPSOQ.[34] Quantitative demands, influence at work, sense of community at work, social support from supervisor and social support from colleagues were scored on a five-point scale ranging from never/hardly ever (1) to always (5). An example item was 'I get behind in my work'. Predictability, role clarity, role conflicts, quality of leadership, recognition, organisation justice, insecurity over employment, insecurity over working conditions, and vertical trust were scored on a five-point scale ranging from to a very small extent (1) to a very large extent (5). An example item was 'work is distributed fairly'.

Overall job satisfaction was measured using a single item from COPSOQ ('how pleased are you with your job overall, everything taken into consideration?') that was scored on a five-point Likert scale from very unsatisfied (1) to very satisfied (5).

Eight items compared work-related factors while working from home during the COVID-19 pandemic with work before the pandemic. An example item was 'I can get help and feedback from my work colleagues, if needed'. These items were scored on a five-point scale from much less than before (1) to much more than before (5).

Musculoskeletal discomfort/pain frequency and severity ratings were recorded separately for five body regions (neck/shoulders, hands/fingers, arms, middle to lower back, and hips/bottom/legs and feet) using a measure with evidence of validity in a number of different industry sectors.[35] Response options for pain/discomfort frequency ranged from never (1) to almost always (5).

Table 3 Workstation technology

Workstation technology	Employer provided (n=793)	Employee provided (n=793)
Laptop	570 (71.88%)	177 (22.32%)
Desktop	109 (13.75%)	97 (12.23%)
Separate keyboard	334 (42.12%)	239 (30.14%)
Mouse	406 (51.20%)	315 (39.72%)
Phone	208 (26.23%)	339 (42.75%)
Tablet	63 (7.94%)	119 (15.01%)
Separate screen	287 (36.19%)	281 (35.44%)
Desk (including sit/stand)	10 (1.26%)	33 (4.16%)
Chair	25 (3.15%)	17 (2.14%)
Headset	11 (1.39%)	13 (1.64%)
Printer	7 (0.88%)	17 (2.14%)
Other	16 (2.02%)	26 (3.28%)

FWC, family–work conflict; WFC, Work-family conflict.

Table 4 Psychosocial work environment

	Cronbach alpha	All (n=964)	Male (n=230)	Female (n=728)	P value*
Work–family/family–work conflict (WFC/FWC) (max score=7)					
WFC	0.954	871; 3.69±1.66	208; 3.69±1.57	657; 3.69±1.70	0.964†
FWC	0.952	869; 2.99±1.57	208; 3.16±1.52	655; 2.94±1.59	0.031†
COPSOQ (max score=5)					
Quantitative demands	0.824	860; 2.49±0.83	207; 2.54±0.88	647; 2.48±0.82	0.413†
Influence at work	0.863	859; 3.15±0.93	207; 3.23±0.87	646; 3.13±0.96	0.137†
Predictability	0.804‡	834; 3.29±0.94	201; 3.37±0.89	627; 3.26±0.96	0.171†
Recognition	0.881‡	791; 3.91±1.05	189; 3.75±1.03	596; 3.96±1.06	**0.004**†
Role clarity	0.905	834; 3.78±0.85	201; 3.76±0.80	627; 3.78±0.87	0.494†
Role conflict	0.725‡	834; 2.49±1.00	201; 2.58±0.95	627; 2.46±1.01	0.076†
Quality of leadership	0.864‡	719; 3.45±1.17	174; 3.36±1.15	540; 3.49±1.17	0.149†
Social support from supervisor	0.914‡	814; 4.11±1.06	191; 4.06±1.08	617; 4.13±1.06	0.321†
Social support from colleagues	0.895‡	825; 4.19±0.90	196; 4.15±0.81	624; 4.20±0.93	0.106†
Sense of community at work	0.803‡	831; 4.06±0.86	200; 4.00±0.89	625; 4.08±0.85	0.220†
Job insecurity	0.829‡	736; 2.96±1.34	177; 2.78±1.40	553; 3.01±1.33	**0.043**†
Insecurity over working conditions	0.683‡	616; 2.09±1.13	148; 2.01±0.98	464; 2.12±1.17	0.708†
Vertical trust	0.899	779; 3.63±1.02	182; 3.58±1.03	591; 3.65±1.02	0.447†
Organisational justice	0.738‡	617; 3.49±0.94	153; 3.40±0.94	459; 3.52±0.94	0.180†

Bold indicates significant at p<.05.
*χ^2.
†Mann-Whitney test of difference between male and female.
‡Two item scale, Spearman-Brown reported instead of Cronbach's alpha.
COPSOQ, Copenhagen Psychosocial Questionnaire.

Severity, if applicable, was scored using a three-point scale from mild (1) to severe (3).

Technology support and productivity were measured using a scale developed specifically for this study. Examples of items to measure technology support and productivity respectively were 'I can get good help and support from work if I have technology (hardware or software) problems" and "the software I use when working at home enables me to work effectively'. Technology complexity was measured using two items based on the Technostress Creators Scale.[36] Items were scored on a five-point scale from strongly disagree (1) to strongly agree (5). Questions were asked about the provision of hardware and software, sample question is, 'Which of the following hardware has your employer provided for you to use at home', with a list and responses to tick all that apply, including an option for other.

Focus groups

Seven focus groups were scheduled with participants, based on the following characteristics: managers (two groups), women with dependent children at home (one group), those living alone (one group), residents of Western Australia and Queensland states (one group), and general population (but excluding managers; two groups). Residents of Western Australia and Queensland states were excluded from other focus groups, and grouped together in a separate group, as they had a very different experience of the COVID-19 pandemic compared with the rest of the Australian states. Due to the widespread geographical distribution of participants, and the COVID-19 pandemic, focus groups were held online using the Zoom meeting platform.

Data analysis

Survey

COPSOQ variables were combined into domains per COPSOQ III guidelines.[34] Cronbach's alpha was computed for these domains as well as WFC and FWC, except when the score was derived from two items; Spearman-Brown providing a better estimate of reliability in such cases. To adequately describe the respondents of the EWFH survey, all valid responses were used. Variable sample sizes between items are therefore expected. Sample size or frequency are presented.

Comparisons between respondents who self-identified as male and those who self-identified as female, depending on the type of variable, were conducted using χ^2 analysis or the Mann-Whitney test of difference. Analysis was carried out in R V.4.0.3.

Focus groups

A schedule of questions was developed using data from the survey and a recent review undertaken by the research team[12] which covered the following: workplace support (eg, 'how supportive are your supervisor(s) and/or coworkers?'), performance indicators (eg, 'did your job role change?'), technical support (eg, 'how was the

Table 5 Health and well-being

	All (n=964)	Male (n=230)	Female (n=728)	P value*
Self-perceived health				0.275
Poor	29 (3.24%)	7 (3.32%)	22 (3.24%)	
Fair	200 (22.32%)	42 (19.91%)	155 (22.83%)	
Good	358 (39.96%)	95 (45.02%)	262 (38.59%)	
Very good	237 (26.45%)	56 (26.54%)	179 (26.36%)	
Excellent	72 (8.04%)	11 (5.21%)	61 (8.98%)	
Mean (SD)	896; 3.14±0.96	211; 3.10±0.89	679; 3.15±0.98	0.655†
Stress (max score=5)				
Burn-out	900; 3.13±0.89	212; 2.85±0.85	682; 3.21±0.89	<0.001†
Stress	899; 2.87±0.92	212; 2.66±0.88	681; 2.94±0.92	<0.001†
Somatic stress	900; 1.98±0.81	212; 1.68±0.72	682; 2.07±0.82	<0.001†
Cognitive stress	900; 2.61±0.90	212; 2.38±0.81	682; 2.67±0.91	<0.001†
Pain and discomfort (range 1–12)				
Neck or shoulders	553; 4.34±2.92	99; 3.51±2.84	448; 4.50±2.90	<0.001†
Hands or fingers	318; 2.59±2.30	53; 2.55±2.13	262; 2.60±2.35	0.737†
Arms	254; 2.28±2.10	47; 2.00±1.69	202; 2.35±2.20	0.241†
Middle to lower back	521; 3.81±2.97	99; 3.70±2.92	417; 3.83±2.96	0.600†
Hips, bottom, legs or feet	432; 3.41±2.83	75; 2.80±2.42	352; 3.54±2.90	0.027†

*$\chi 2$.
†Mann-Whitney test of difference between male and female.

technical support that you received?'), future (eg, 'what would be your ideal work arrangements?'). Focus groups were recorded, and all recordings were transcribed. Transcriptions were analysed using an inductive thematic analysis approach. All authors independently analysed three transcripts to identify coding categories, then convened to develop the coding categories into a broader framework which was used to code the remaining four transcripts. Themes were then constructed from the coding framework. Results from the focus groups will be reported elsewhere.

RESULTS

In total, 964 questionnaire responses were received, of which 83.7% of respondents resided in Victoria (table 1). The majority of respondents were female (n=728, 75.5%) with 230 male and 6 respondents who identified as 'other'. Women participants were slightly younger than the males and disproportionally worked in the 'Education and Training' field.

Almost all respondents worked from home for an increased number of days during the COVID-19 pandemic (table 2). Approximately 70% of the population worked five or more days from home, with only 60.3% having a dedicated workstation in a private room without interruptions. A disproportionate number of women worked in spaces with frequent interruptions (χ^2=13.19; p=0.001).

Workstation technology was generally supplied by the employer; however, a substantial number of respondents reported providing their own separate keyboard (30.1%) and screen (35.4%; table 3). The use of sit/stand desks was rare with just 5.4% of respondents reporting the use of these at home. Almost all respondents were provided with the necessary software to perform their work by their employer.

Males reported experiencing higher levels of FWC and lower levels of job recognition than females.

Females reported higher levels of job insecurity (table 4) than males. Most respondents reported their health as 'good' or 'very good' (table 5). On all measures of stress (burn-out, general stress, somatic and cognitive) females were more negatively impacted than males. Over 70% of respondents reported experiencing some form of pain or discomfort towards the end of their working day. However, females reported higher levels of neck/shoulder and lower limb (hips, bottom, legs or feet) pain than males.

All respondents who identified their gender as 'other' were younger professionals with low levels of WFC. However, these six individuals reported low levels of social support from their supervisor and colleagues and had a below average sense of community at work. None reported their health as 'excellent', and all reported pain and discomfort in their neck or shoulders towards the end of their working day (data not included in tables due to low numbers).

DISCUSSION

The overall aim of this paper was to describe the EWFH study and baseline characteristics of the study population. The COVID-19 pandemic resulted in a rapid transition to

working from home to suppress virus transmission. This EWFH study will provide insights into the experiences and health impacts on participants who were working from home during the pandemic, and their experience of work during follow-up periods. A range of workplace physical and psychosocial exposures were measured, along with stress and musculoskeletal pain. From the baseline data, gendered differences were identified in relation to several factors including FWC, job recognition and job insecurity, stress and musculoskeletal pain; these will be explored in greater detail in this paper.

Males reported higher levels of FWC than females. At the time of this phase of data collection, the country was in various stages of lockdown with schools and childcare centres closed in some areas (Victoria). Therefore, many people with dependants were WFH while also supervising children. While this situation is unusual, the dual responsibilities of managing work and childcare are more commonly undertaken by females,[29] which may shield males from potential conflict between non-work demands and work activities.[37] In the current study, females were more likely to work part time compared with the males which may enable greater flexibility for managing the family- to-work interface, than their male partners.[38] This change in working arrangements may mean that males are not 'shielded' from the dual responsibilities women have typically undertaken, and are more exposed to potential conflict between non-work demands and work activities, thus reporting higher FWC than females.

The lower scores for males compared with females for job recognition are interesting. The unique situation of WFH during the period of data collection required adaptation to new ways of working. In many cases, people worked very long hours, sometimes with reduced salary and extra responsibilities as managers learnt how to effectively supervise remote teams with very different circumstances to their usual modes of operation.[39] These multiple interacting factors may have influenced males' perceptions of how they were being recognised for their work.

Females reported more concerns about job insecurity in comparison to males. One plausible explanation is the type of work in which the females in the sample were engaged. A third of the females in the study were employed in the education and training sector. This sector has been seriously impacted by the pandemic, with high numbers of job losses in the University sector as a result of border closures which have prevented the intake of international students[2] and worldwide women have experienced more job losses compared with men.[40]

In addition, stress and musculoskeletal pain were significantly higher for females in comparison to males. A range of possible explanations exist. Previous literature on musculoskeletal pain has reported higher pain levels particularly in females in the neck and shoulder regions, so this finding is not surprising.[41] In the current situation, more females reported not having a dedicated workstation and so were using whatever location was available to them, a practice likely to be associated with increased pain. An emerging body of work relating to the impact of COVID-19 on females supports the unequal workload burden for females[5] and as such, reports of increased stress are not surprising which is associated with increased musculoskeletal pain.[42]

Future research in the EWFH study will explore many of the relationships outlined in greater detail and include the results from focus groups. In addition, a second wave of data will be collected in April/May 2021. The second wave will enable longitudinal analysis of the impacts of the WFH environment on individuals' physical and mental health. An additional benefit is the second wave of data collection will enable investigation of individuals' working patterns as the COVID-19 pandemic situation in Australia stabilises and the national vaccination programme is underway.

A key strength of the study is the use of a range of validated measurement tools to examine the environmental exposures for workers while WFH during the COVID-19 pandemic. The baseline data were collected during a period of sustained lockdown in one of the states (Victoria) of mainland Australia. Since the collection of this baseline data the capital of this state (Melbourne) has experienced the longest period of lockdowns in the world. The population sample has a higher proportion of respondents based in Victoria and this may impact the generalisability of findings to other Australian states or other populations more broadly but will provide unique insights into the impact of sustained WFH. Another potential limitation was that recruitment of females was higher than males; however, this is consistent with emerging research in COVID-19 studies. The analysis presented in this baseline paper, does not allow for causality to be inferred and a range of cofounders need to be considered in future longitudinal analysis.

CONCLUSION

This paper presents a profile of individuals working from home during the COVID-19 pandemic. Little guidance is available to support employers and employees in creating optimal environments for working from home in such unusual circumstances. Gendered differences were identified in the current study which require further scrutiny to ensure that appropriate support can be provided. It is likely that working from home for at least some of the week will continue for at least the foreseeable future, as a result of changes to work practices which occurred during the pandemic, and more recently as individuals and organisations adjust to the new and often uncertain experience of 'COVID-normal'. Therefore, research evidence is required to examine the psychosocial and physical hazards impacting individuals' physical and mental health, while working from home, to assist organisations to be responsive, ensuring they are able to minimise any unintended health consequences due to WFH.

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REFERENCES

1 Usher K, Durkin J, Bhullar N. The COVID-19 pandemic and mental health impacts. *Int J Ment Health Nurs* 2020;29:315–8.
2 Nicola M, Alsafi Z, Sohrabi C, *et al*. The socio-economic implications of the coronavirus pandemic (COVID-19): a review. *Int J Surg* 2020;78:185–93.
3 McKibbin W, Fernando R. *The global macroeconomic impacts of COVID-19: Seven scenarios. Asian Economic Papers*, 2020: 1–55.
4 Alon TM, Doepke M, Olmstead-Rumsey J. *The impact of COVID-19 on gender equality*. National Bureau of economic research, 2020.
5 Wenham C, Smith J, Morgan R, *et al*. COVID-19: the gendered impacts of the outbreak. *Lancet* 2020;395:846–8.
6 Douglas M, Katikireddi SV, Taulbut M, *et al*. Mitigating the wider health effects of covid-19 pandemic response. *BMJ* 2020;369:m1557.
7 Gajendran RS, Harrison DA. The good, the bad, and the unknown about telecommuting: meta-analysis of psychological mediators and individual consequences. *J Appl Psychol* 2007;92:1524–41.
8 Eurofound and the International Labour Office. *Working anytime, anywhere: the effects on the world of work*. Luxembourg & Geneva: Publications office of the European Union & International Labour Office, 2017.
9 Bouziri H, Smith DRM, Descatha A, *et al*. Working from home in the time of COVID-19: how to best preserve occupational health? *Occup Environ Med* 2020;77:509–10.
10 Australian Bureau of Statistics. *Locations of work, nov 2008*. Canberra, Australia, 2009.
11 Australian Bureau of Statistics. Household impacts of COVID-19 survey, 2021. Available: https://www.abs.gov.au/statistics/people/people-and-communities/household-impacts-covid-19-survey/feb-2021
12 Oakman J, Kinsman N, Stuckey R, *et al*. A rapid review of mental and physical health effects of working at home: how do we optimise health? *BMC Public Health* 2020;20:1–13.
13 Bick A, Blandin A, Mertens K. *Work from home after the COVID-19 outbreak*, 2020.
14 Eatough EM, Way JD, Chang C-H. Understanding the link between psychosocial work stressors and work-related musculoskeletal complaints. *Appl Ergon* 2012;43:554–63.
15 Harvey SB, Modini M, Joyce S, *et al*. Can work make you mentally ill? A systematic meta-review of work-related risk factors for common mental health problems. *Occup Environ Med* 2017;74:301–10.
16 Schulte PA, Pana-Cryan R, Schnorr T, *et al*. An approach to assess the burden of work-related injury, disease, and distress. *Am J Public Health* 2017;107:1051–7.
17 Chirico F. The forgotten realm of the new and emerging psychosocial risk factors. *J Occup Health* 2017;59:433–5.
18 Dockery AM, Bawa S. When two worlds collude: working from home and family functioning in Australia. *Int Labour Rev* 2018;157:609–30.
19 Delanoeije J, Verbruggen M, Germeys L. Boundary role transitions: a day-to-day approach to explain the effects of home-based telework on work-to-home conflict and home-to-work conflict. *Human Relations* 2019;72:1843–68.
20 Greenhaus JH, Beutell NJ. Sources of conflict between work and family roles. *Acad Manage Rev* 1985;10:76–88.
21 Netemeyer RG, Boles JS, McMurrian R. Development and validation of work–family conflict and family–work conflict scales. *J Appl Psychol* 1996;81:400–10.
22 Allen TD, Herst DE, Bruck CS, *et al*. Consequences associated with work-to-family conflict: a review and agenda for future research. *J Occup Health Psychol* 2000;5:278–308.
23 Jensen MT, Rundmo T. Associations between work family conflict, emotional exhaustion, musculoskeletal pain, and gastrointestinal problems in a sample of business travelers. *Scand J Psychol* 2015;56:105–13.
24 Fein EC, Skinner N. Clarifying the effect of work hours on health through work-life conflict. *Asia Pacific Journal of Human Resources* 2015;53:448–70.
25 Ashforth BE, Kreiner GE, Fugate M. All in a Day's Work: Boundaries and Micro Role Transitions. *Acad Manage Rev* 2000;25:472–91.
26 Carlson DL, Petts R, Pepin J. Changes in parents' domestic labor during the COVID-19 pandemic. *SocArXiv*2020.
27 Fisher AN, Ryan MK. Gender inequalities during COVID-19. *Group Processes & Intergroup Relations* 2021;24:237–45.
28 Craig L, Churchill B. Working and caring at home: gender differences in the effects of Covid-19 on paid and unpaid labor in Australia. *Fem Econ* 2021;27:310–26.
29 Craig L, Brown JE. Feeling rushed: gendered time quality, work hours, nonstandard work schedules, and spousal crossover. *J Marriage Fam* 2017;79:225–42.
30 Stevenson B. *The initial impact of COVID-19 on labor market outcomes across groups and the potential for permanent scarring*. Washington, DC: The Hamilton Project, Brookings Institution, 2020.
31 Leech NL, Onwuegbuzie AJ. A typology of mixed methods research designs. *Qual Quant* 2009;43:265–75.
32 Summerfield M, Dunn R, Freidin S. *HILDA user Manual- release 10*, 2011: p. 167.
33 Chau JY, Van Der Ploeg HP, Dunn S, *et al*. Validity of the occupational sitting and physical activity questionnaire. *Med Sci Sports Exerc* 2012;44:118–25.
34 Burr H, Berthelsen H, Moncada S, *et al*. The third version of the Copenhagen psychosocial questionnaire. *Saf Health Work* 2019;10:482–503.
35 Oakman J, Macdonald W, Wells Y. Developing a comprehensive approach to risk management of musculoskeletal disorders in non-nursing health care sector employees. *Appl Ergon* 2014;45:1634–40.
36 Molino M, Ingusci E, Signore F, *et al*. Wellbeing costs of technology use during Covid-19 remote working: an investigation using the Italian translation of the technostress creators scale. *Sustainability* 2020;12:5911.
37 Graham M, Weale V, Lambert KA, *et al*. Working at home: the impacts of COVID 19 on health, Family-Work-Life conflict, gender, and parental responsibilities. *J Occup Environ Med* 2021;63:938–43.
38 Craig L, Churchill B. Dual-earner parent couples' work and care during COVID-19. *Gender Work Organ* 2021;28:66–79.
39 Carnevale JB, Hatak I. Employee adjustment and well-being in the era of COVID-19: implications for human resource management. *J Bus Res* 2020;116:183–7.
40 Dang H-AH, Viet Nguyen C. Gender inequality during the COVID-19 pandemic: income, expenditure, savings, and job loss. *World Dev* 2021;140:105296.
41 Brandt M, Sundstrup E, Jakobsen MD, *et al*. Association between neck/shoulder pain and trapezius muscle tenderness in office workers. *Pain Res Treat* 2014;2014:1–4.
42 Johnston V, Jull G, Souvlis T, *et al*. Interactive effects from self-reported physical and psychosocial factors in the workplace on neck pain and disability in female office workers. *Ergonomics* 2010;53:502–13.