La Medicina del Lavoro

Med Lav 2021; 112, 2: 141-152
DOI: 10.23749/mdl.v112i2.10595

Implementing Smart Working in Public Administration: a follow up study

Cristina Di Tecco, Matteo Ronchetti, Simone Russo, Monica Ghelli, Bruna Maria Rondinone, Benedetta Persechino, Sergio Iavicoli

Department of Medicine, Epidemiology, Occupational and Environmental Hygiene - Italian Workers' Compensation Authority (INAIL) Rome, Italy

Key words: flexible work arrangements, working conditions, occupational health and safety, longitudinal study

Abstract

Background: *Starting from February 2020, in Italy most organizations have had a forced transition to flexible working practice - called "smart working in emergency" – due to the Covid-19 epidemic outbreak. This allowed to continue work activities and services and contributed to contain the risk of infection in different sectors, particularly in the public administration.* **Objectives:** *This follow up study focussed on a panel of 187 workers from the Italian Workers' Compensation Authority taking part to a pilot project "Smart Working in INAIL" from January 2019 to December 2019. The aim was to investigate the effects of work organization on work attitudes, work-life balance and health outcomes before and after the introduction of the smart working.* **Methods:** *The data were collected at two time points through a web-based questionnaire. The first wave aimed to collect information up to one month before the implementation of the smart working. The second wave aimed to collect information about potential changes occurred after one year of smart working.* **Results:** *This study showed that high demands, low control and low social support might lead to reduced well-being and less satisfaction with work, and have an effect on work engagement and work-life balance. Particularly, improving social support can moderate the negative impact of high strain on well-being, preventing work-life imbalance and risk of isolation.* **Discussion:** *Findings and future perspectives are discussed to support stakeholders in defining policies and practices concerning health and wellbeing at work while preserving productivity, for a successful implementation of smart working in the public administration.*

Introduction

Starting from February 2020, in Italy most organizations have had a forced transition to flexible working practice as they had to introduce remote work for full or part of the working week due to the Covid-19 epidemic outbreak, in most cases without any prior preparation or adaptation phase. The use of remote work at home allowed continuing work activities, preserving productivity, and avoiding the interruption of several public services through the employment of over 70% of public personnel working from home in the course of the lockdown. Flexible work is not a new concept (1) but this emergency has grown the debate on its future implementations since it has highlighted several benefits in the public administration too. Nevertheless, the everyday remote work at home, broadly in use in the public admin-

Received 4.9.2020 - Accepted 5.1.2021

Corresponding author: Matteo Ronchetti - Dipartimento di Medicina, Epidemiologia, Igiene del Lavoro e Ambientale – Istituto Nazionale per l'Assicurazione contro gli Infortuni sul lavoro (INAIL), via Fontana Candida 1, Monte Porzio Catone, Roma 00078, Italia - Email: m.ronchetti@inail.it. Tel.: (0039)0694181578

istration during the emergency, leads to some concerns as those related to the 24h connection, the risk of isolation or the living together with other people working or studying from home and the intensification of work activity (1). This requires improving investigation on the effects of different types of flexible work arrangements to inform stakeholders and organizations, and to provide effective policies and interventions in the field of health and safety. In 2019, in Italy 570 thousand workers benefited from smart working for some days a week, and this represents a 20% increase compared to the previous year[1]. This means that several organizations - including public administrations - were already slowly starting to offer flexible work solutions to their workers before the Covid-19 emergency. One of the main drivers came from the introduction of flexible work regulation into the legislative framework on the improvement of the public administration[2]. Thanks to the flexible work, workers can organize their work flexibly and decide, in most cases, their work schedule, when and where they work for some days per week.

Flexible work is a multidimensional concept used as an umbrella term including any arrangement leading to an alteration in terms of time and/or place that work is done on a regular basis. This may include flexibility in: work schedule (flex time, compressed week), amount of hours worked (part time, job sharing), place and space (working at home, remote work, telecommuting, co-working). Smart working is a new term - particularly used in Italy - that refers to the use of working in flexible space and time for some days per week. Most of the studies on smart working are Italian and published in 2020 (<20 studies on Pubmed using the key term "Smart working", out of them 14 are from Italy and published in 2020), as these are particularly related to the working at home typical of the Covid-19 emergency period (2, 3, 4).

Previous studies focused mainly on the benefits of flexible work arrangements for productivity (5), but also on their impact on work processes and workers' attitudes and well-being (1, 6). Nevertheless, findings on relationships between flexible work and attitudes, wellbeing and health were not completely conclusive and extremely linked to the way flexibility is applied (1). Formal and occasional use of flexibility has been positively associated with workers' work engagement (7), psychophysical health and well-being (8, 9). Workers likely are more engaged and satisfied when flexible work arrangements allow them more control over work processes, enhance their autonomy and facilitate efficient communication between co-workers (10, 7). It is well known that increasing employees' control and social support at work should improve well-being (1, 9, 11). Thus, it is likely that those flexible work arrangements increasing workers' control and autonomy on work schedule have a positive effect on different health outcomes (12, 7). Nevertheless, some aspects of work organization might have a negative impact also on the use of flexible work arrangements, such as lacking of perceived supervisor support and high workload (12). As for the effects on work-life balance, findings are controversial (13). Generally, flexible work arrangements lead to a better work-life balance and this has a positive mediating role in reducing stress and increasing workers' job satisfaction, well-being and work retain (14). Nevertheless, some studies showed that home-based teleworkers and employees working most of the time at home did not necessarily experience a better work-life balance (15). This is likely because work and family domains are mutually incompatible in some respects, and family interference with work may emerge in everyday work from home. This could be particularly true in remote work engaging workers all workweek long.

Among the other critical issues, we must consider the risk of non-stop availability due to the possibility of 24/7 connection and extreme time flexibility. Overwork and prolonged working hours are among the psychosocial factors most connected to psychophysical health outcomes, such as stroke and ischaemic heart diseases (16, 17). New information and communication technologies increase the expecta-

1 - Observatory of the Politecnico di Milano Management School https://www.som.polimi.it/lavoro-agile-presentati-i-dati-della-ricerca-dellosservatorio-smart-working/

2 - Law No. 81 of May 22nd 2017 (articles 18-24) "Measures to protect self-employed non-entrepreneurial work and measures to promote flexible articulation in the times and places of employment", Ministerial Directive No. 3 of June 1st 2017 on flexible work (National Gazette of July 17th 2017, No. 165), Law No. 124 of August 7th 2015 "Delegations to the Government on the reorganisation of public administrations".

tion of availability, further aggravated by an extreme flexibility due to the stay home and the lack of clear and solid legislation on the right to disconnect.

Most of the studies cited above are cross sectional and do not offer any comparison among ordinary work and different forms of flexible work. Moreover, they focused on the associations with flexible work with some dimensions and outcomes related to the working conditions. The purpose of this study is to provide a contribution to the investigation of the effects of flexible work overtime on different psychosocial aspects of work and their potential impacts on outcomes related to health and wellbeing, to inform policy and health and safety practice on its positive aspects and prevent the negative ones. Thus, this aimed to examine whether the use of smart working for one day per week for 12 months might change the perceptions of working conditions and relative impacts to attitudes towards work, health and wellbeing. Particularly, in a unique study we investigated the role of smart working in improving job attitudes, health and wellbeing, and the effects of some changes in aspects of the work organization, such as social support at work, demands and workload, autonomy and clarity of role on outcomes after one year of flexible work. This study focused on a panel of workers from a public administration. This is a sector where flexible work is starting to acquire more importance and thus it is required to investigate most effective ways of applying it in terms of health protection and improvement of working conditions. Moreover, this study has the value added of using a longitudinal approach to verify the existence of changes in relationships among the aspects investigated and the outcomes after one year of smart working experience. Most of the previous studies examined the effects of flexible working conditions on health adopting a cross-sectional design, which does not enable exploration of causality (12). In particular, we analyzed the influence of work organization on work engagement, work-life balance, general health, wellbeing and work satisfaction over time to investigate changes emerged by moving from the engagement in ordinary work (5 days per week at the office) to flexible space and time job one day per week for 12 months.

Method

Participants and procedure

The Italian Workers' Compensation Authority (INAIL) developed a pilot project on "Smart Working in INAIL" that included 319 workers, selected by the Human Resource Department from different organizational units. Workers included in the project were given the opportunity to work remotely one day a week for one year, from January 2019 to December 2019. The purpose of the pilot project was to monitor and test the use of flexible work in a small group in view of extending this practice into the organization in the future. Criteria of involvement in the pilot project are based on the adaptability of work activities to flexible work and the skills in using information and communication technologies and tools offered by the organizations. In particular, the workers included in the pilot project have almost totally administrative and technical positions and are employed in operational activities.

A questionnaire was developed to collect information related to work organization, psychosocial risks, work-life balance, use of new information and communication technologies, and some outcomes as attitudes towards work, general and mental health and wellbeing. The data were collected in two times. The first wave - time 0 - aimed to collect information up to one month before the implementation of the smart working (December 2018). The second wave - time 1- aimed to collected information about potential changes emerged after one year of smart working one day a week. Workers were invited through an e-mail to take part in the study by filling in a web-based questionnaire of 15 minutes. Out of the 319 workers invited, 237 workers answered the time 0 questionnaire (response rate= 74.3%). One year later, we invited all the respondents to the time 0 to fill-in the questionnaire again (December 2019). Out of 237 workers invited, 198 answered to the follow up questionnaire (response rate= 83.5%). Then, we eliminated questionnaires with more than 50% of missing answers and the final number of workers included in this study was 187 workers corresponding to those answering to both the study waves (longitudinal response rate= 78.9%).

Measures

To test the impact of smart working experience on the quality of working conditions, we adopted a model that analyzes the relationships between aspect related to work organization and work context namely psychosocial factors at work (independent variables) and some outcomes measures (dependent variables). In particular, the independent variables considered refer to the employees' perceptions of several aspects related to work organization.

Psychosocial factors at work: To ensure a high response rate to the survey, the measure used is a synthetic 18 items tool namely the Italian Short version of the Management Standards Indicator Tool[3]. Such items concerning the work content and context factors that are attributable to psychosocial risks in the workplaces (19) are measured on a 5-step Likert scale (1 = strongly disagree and 5 = strongly agree) and are related to the following six dimensions (20, 21, 22): (for each dimension, the number of items and the Cronbach's alpha (α) at T0 and T1 are reported).

Demands: (3 items; α T0=0.79; α T1=0.8): this includes aspects related to the requests from work such as workload and work pace.

Control: (3 items; α T0=0.79; α T1=0.83): this concerns workers' perceptions of their autonomy and control over the performance of their own tasks.

Peer support: (3 items; α T0=0.85; α T1=0.89): this concerns encouragement, support and resources provided by colleagues.

Managerial support: (3 items; α T0=0.90; α T1=0.90): this includes encouragement, support and resources provided by the top management/line managers.

Role: (3 items; α T0=0.76; α T1=0.75): this concerns the workers' awareness of the position they hold within the organization, the clarity of the job goals and the presence of conflicting roles.

Change: (3 items; α T0=0.69; α T1=0.73): this assesses the extent to which changes happened into the organization are managed and communicated to the workers. According to the aims of the study, we included an additional item to the dimension Change to investigated aspects related to the attitude of the management towards the innovation ("The management of my organization encourages an innovative mindset"). Introducing this aspect informs us about how a change in the way of working, as the one introduced through the smart working, is welcomed and encouraged into the organization. We believe this improves the dimension including innovation as an aspect of organizational change to be considered in the changing world of work (23). To check the value added and the reliability of this new item into the dimension Change, we estimated the internal consistency of the scale with and without this additional item through the Cronbach's alpha. We verified an improvement in the scale (from α=0.69 to α= 0.72) that allowed us to include this item.

As regards the dependent variables considered in our study, we have used the following measures.

Work engagement: (3 items; α=0.71 on time 0; α=0.78 on time 1): items are from the Ultra-Short Measure for Work Engagement (24) that is a reliable and valid measure of work engagement used in national and international epidemiological surveys on employee's working conditions. Items measure the employees' vigor, absorption and dedication to their work with a 7-step Likert scale (0 = never and 6 = always).

Work-life balance: to measure the potential imbalance between work and life duties we included 4 items with a 5-step Likert scale. In particular, two items refer to the interferences between demands from work and duties from private life (25): "The demands of my work interfere with my home and family life" and "The demands of my family or partner interfere with my work" (1 = never and 5 = always). Two further items investigate the role of smart working in improving and simplifying working and family life: "Smart working simplifies my private life" and "Smart working improves my working life". (1 "not at all" and 5 "completely"). At time 0, items were worded as expectations of interferences and improvements since the experience of

3 - The short Italian version of the MS Indicator tool was developed in collaboration with the Department of Psychology of the University of Rome "Sapienza". The "*optimal shortening*" (18) procedure was used to obtain a short version of this tool and it allows to maximize the internal coherence of the tools without sacrificing the representativeness of the content of the items with respect to the factor they measure. Therefore the Short version of Indicator Tool is a synthetic measurement tool for psychosocial risks assessment that can be used in working condition surveys. A validation study on this short version is underway.

smart working was not done yet, thus items investigated how much they believe that smart working will improve, or will not, their working life and their private life. Whereas at time 1, items were worded as impacts of the experience by asking workers how much it improved their working life and how much it simplified their private life.

Job satisfaction: in line with previous studies (26), we adopted a single item for the measurement of workers' satisfaction with a 7-step Likert scale (1 = completely disagree and 7 = completely agree).

General Health: a single item broadly used in the working condition survey (27) asks to workers to evaluate their own health with a with a 5-step Likert scale (1 = very good, 5 = very bad).

Wellbeing: (5 items α=0.89 on time 0; α=0.90 on time 1): we used a measure developed by the World Health Organization (28) aimed at investigating the degree of well-being and mental health through 5 items with a 6- step Likert scale (1 = never and 5 = always).

Finally, only at time 1, we assessed the overall satisfaction towards the smart working experience by asking workers how satisfied they feel with this experience on a 5-step Likert scale (1 "not at all" and 5 "completely").

The control variables included in the study models are: gender, age, education[4], marital status[5], number of children aged less than 12 years, job seniority[6] and commuting[7].

Statistical analysis

The survey included 187 workers observed one year after the first observation (time 0 and time 1) and for this reason we have 374 observations for all variables.

Differences between time 1 and time 0 were calculated using paired sample t-test.

A major potential problem for a panel data set is the unobserved variances of the missing variables. Two techniques are most commonly used to control for the unobserved variables: fixed effects or random effects. The rationale behind the fixed-effect model is that individual characteristics may impact or bias the predictor and we need to control for this. The variation across observations, therefore, is assumed to be correlated with the independent variables. For this reason, fixed effect model removes the effect of the time-invariant characteristics. Otherwise, random effects model assumed that the variation across observation is random and uncorrelated with the predictor included in the model (29). To decide between fixed or random effects model, we ran a Hausman test that indicated a random-effect model should be more efficient for our regressions.

The analyses were carried out using SPSS version 25 and STATA version 14.

Results

We examined the influence of work organization on work engagement, work-life balance, general health, well-being and job satisfaction after and before the introduction of the 12 months of smart working.

Table 1 reports descriptive statistics for independent study variables and smart working satisfaction. In particular, 90.9% of the respondents are very much or extremely satisfied with the smart working experience and only 1.1% are not at all satisfied. Seventy-nine percent of the study population was composed by females (No. = 147), 52.9% had a post-degree education (No. = 99) and 30% was unmarried (No. = 56). In respect to job positions, the administrative and technical staff made up 84.4% of the participants, only 0.8% are managers and 14.3% are professionals (for example researchers, physicians).

Table 2 shows descriptive statistics and paired sample t-test for the study variables. Based on the results of the paired sample t-test, significant changes between time 0 and time 1 are observed for "work demands interfere with home and family life", "family demands interfere with work-related duties" and "job satisfaction" ($p<0.05$). All the three variables report a decrease of the mean value from time 0 to time 1.

4 - Dichotomous variable=1 if participant had some post-high school education; 0 else.

5 - Dichotomous variable=1 if participant is married or common-law wife or husband; 0 else.

6 - Five categories considered less than one year; 1-5 years; 6-10 years; 11-15 years; more than 15 years.

7 - Is the ratio between the kilometres travelled and the minutes spent to get to work.

Table 1 - Descriptive statistics of sociodemographic, independent variables and smart working satisfaction

	Time 0 (*No.* = 187)		Time 1 (*No.* = 187)	
	Mean	Dev. Std.	Mean	Dev. Std.
Demands	2.55	0.80	2.58	0.84
Role	4.56	0.52	4.51	0.51
Change	3.28	0.73	3.32	0.76
Control	3.63	0.76	3.64	0.82
Managerial support	3.57	0.97	3.60	0.96
Peer support	3.65	0.77	3.63	0.84
Age (years)	50.73	6.82	-	-
Job seniority (years)	4.91	0.41	-	-
Commuting (km/min)	60.47	32.42	-	-
	Median	Interquartile range		
No. of children aged less than 12 years	0.00	1.00	-	-
	No.	%		
Gender (female)	147	78.61		
Education (higher education)	99	52.94		
Marital status (not married)	56	29.95		
Smart working satisfaction			No.	%
Not at all			2	1.07
A little			1	0.53
Moderately			14	7.49
Very much			46	24.60
Extremely			124	66.31

Table 2 - Descriptive statistics and Paired Sample t-Test for dependent study variables

	Mean at time 0	Mean at time 1	Δ time 0 - time1	Standard deviation	Sig. (2-tailed)
Work engagement	5.61	5.59	0.018	0.843	0.773
Smart working improves working life	4.07	4.10	-0.027	0.751	0.627
Smart working simplifies private life	4.22	4.17	0.053	0.781	0.350
The demands of my work interfere with my home and family life	2.91	2.75	0.160	0.970	0.025
The demands of my family or partner interfere with my work-related duties	2.72	2.52	0.203	1.058	0.009
General health	3.69	3.69	0.000	0.696	1.000
Well-being	14.12	13.72	0.401	4.722	0.247
Job Satisfaction	5.28	5.09	0.187	1.245	0.041

Table 3 shows the four most significant random effect models that have been analyzed to offer an analysis of relationships among the variables over time. We need to consider that the coefficients include both the within-time and between-subject effects. In this case, the coefficients represent the average effect of an independent variable over the dependent variable when the independent variable changes across time and between subjects by one-unit. All the significant effects are reported as follows. "Demands" are positively and statistically significant associated with "Demands of my work interfere with my home and family life" and negatively with "Well-being" (Table 3). Moreover, additional models reported in Table 4 (Appendix A), suggest that a one-unit growth in "Demands" results a decrease of 0.70 in perceived "Well-being" ($p<0.05$). Higher "Demands" are also positively associated with higher "Demands of my family or partner interfere with my work-related duties"(increase of

Table 3 - Random effect regression models of "work engagement", "the demands of my work interfere with my home and family life", "well-being" and "job satisfaction"

	Work engagement		The demands of my work interfere with my home and family life		Well-being		Job satisfaction	
	Coefficients	P-value	Coefficients	P-value	Coefficients	P-value	Coefficients	P-value
Demands	-0.038	0.511	0.243	0.000	-0.703	0.027	-0.146	0.064
Role	0.270	0.003	0.077	0.431	-0.103	0.840	0.423	0.001
Change	0.136	0.129	-0.084	0.379	1.461	0.003	0.360	0.003
Control	0.098	0.195	-0.108	0.169	-0.082	0.842	0.122	0.230
Managerial support	0.173	0.009	0.032	0.651	-0.123	0.736	0.154	0.091
Peer support	0.175	0.011	-0.012	0.868	0.698	0.065	0.168	0.072
Gender (ref. male)								
Female	0.022	0.882	0.256	0.071	-1.421	0.075	-0.094	0.620
Age	0.022	0.046	-0.006	0.529	-0.060	0.304	0.009	0.514
Education (ref. lower education)								
Higher education	-0.075	0.542	0.002	0.989	0.207	0.747	0.171	0.260
Marital status (ref. married)								
Not married	0.141	0.290	-0.204	0.102	1.388	0.047	0.391	0.019
No of children aged less than 12 years	0.006	0.952	0.139	0.130	-0.009	0.986	0.220	0.073
Job seniority								
6-10 years	-0.921	0.273	-0.815	0.301	-4.129	0.350	-0.588	0.575
11-15 years	0.720	0.273	0.589	0.337	-1.248	0.717	0.465	0.569
more than 15 years	0.137	0.817	0.577	0.297	0.596	0.848	0.431	0.559
Commuting (km/min)	0.362	0.058	-0.040	0.824	0.887	0.377	0.315	0.186
Constant	0.890	0.332	2.074	0.018	12.189	0.012	-0.462	0.690
Within	0.093		0.052		0.049		0.091	
R-square Between	0.360		0.150		0.192		0.403	
Overall	0.313		0.122		0.161		0.334	

0.19, p=0.01) and determine a decrease in "General health"(decrease of 0.10 p<0.05) (Table 4). A better clarity of "Role" within the organization determines a higher "Work engagement" (an increase of 0.27 p=.00 for one-unit growth in Role) and an increase of "Job satisfaction" (0.42 p=0.00). A good management and communication of "Change" within the organization induces a higher "Job satisfaction" (increase of 0.36, p=0.00). In addition, the third model in Table 3 indicates that an one unit increase in "Change" determine an increase of "Well-being" (1.46, p=0.00). Finally, changes in "Managerial Support" and "Peer Support" determine a more positive "Work engagement" (respectively an increase of 0.17, p=0.00 and of 0.17, p<0.05).

Additional models are reported in Table 4. Most

Table 4 - Random effect regression models of "Smart working improves working life", "Smart working simplifies private life", "The demands of my family or partner interfere with my work-related duties", "General health"

	Smart working improves working life			Smart working simplifies private life			The demands of my family or partner interfere with my work-related duties			General health		
	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value
Demands	-0.077	0.054	0.151	-0.093	0.055	0.089	0.187	0.068	0.006	-0.100	0.048	0.037
Role	0.019	0.085	0.823	-0.106	0.087	0.223	0.110	0.110	0.317	-0.104	0.076	0.174
Change	0.108	0.082	0.190	0.118	0.084	0.160	-0.001	0.106	0.994	0.030	0.074	0.687
Control	0.121	0.070	0.083	0.190	0.071	0.007	-0.072	0.088	0.408	0.090	0.062	0.150
Managerial support	-0.033	0.061	0.588	-0.027	0.062	0.664	-0.082	0.078	0.294	0.033	0.055	0.543
Peer support	-0.076	0.063	0.230	-0.020	0.065	0.752	0.036	0.081	0.653	0.092	0.057	0.106
Gender (ref. male)												
Female	0.204	0.140	0.146	0.158	0.141	0.261	0.345	0.159	0.030	-0.168	0.125	0.177
Age	-0.001	0.010	0.895	-0.012	0.010	0.251	-0.016	0.012	0.173	-0.015	0.009	0.107
Education (ref. lower education)												
Higher education	-0.239	0.113	0.034	-0.112	0.113	0.323	-0.073	0.128	0.568	0.238	0.100	0.018
Marital status (ref. Married)												
Not married	0.016	0.123	0.896	-0.026	0.124	0.832	-0.079	0.139	0.571	0.058	0.110	0.594
N° of children aged less than 12 years	0.033	0.091	0.715	0.078	0.091	0.395	0.107	0.103	0.299	-0.022	0.081	0.785
Job seniority												
6-10 years	0.787	0.777	0.311	0.801	0.779	0.304	-0.450	0.883	0.610	-0.134	0.690	0.846
11-15 years	0.147	0.607	0.808	0.025	0.608	0.968	0.728	0.687	0.290	-0.155	0.539	0.774
more than 15 years	-0.565	0.548	0.302	-0.313	0.549	0.569	0.880	0.620	0.156	-0.019	0.486	0.969
Commuting (km/min)	0.060	0.177	0.736	-0.081	0.177	0.647	-0.283	0.200	0.157	-0.008	0.157	0.960
Constant	4.281	0.847	0.000	4.827	0.852	0.000	1.951	0.980	0.047	4.300	0.754	0.000
R-square Within		0.022			0.035			0.026			0.026	
R-square Between		0.114			0.105			0.131			0.144	
R-square Overall		0.096			0.090			0.101			0.119	

of them are not significant except "Control" over work that is positively and significantly associated with the opinion that smart working simplifies their private life (increase of 0.19, p=0.01).

As regards the control variables, age is positively and statistically significantly associated with "Work engagement"; marital status is significantly associated with "Well-being" and "Job Satisfaction" in those workers who are unmarried. Demands from family or partners that interfere with work-related duties are more significantly associated with women than men. A higher education is significantly and positively associated with a better "General Health" and negatively with the opinion that "Smart working improves working life".

Discussion

The Covid-19 emergency has spread the use of flexibility in the world of work, making it possible to keep services and productivity uninterrupted in most sectors across countries, and particularly in public administration. This experience has spread a debate among institutions, academics, stakeholders and policy makers on the future implementation of flexible work arrangements in terms of opportunities, benefits, and weaknesses. Nevertheless, we must consider flexible work solutions adopted during the epidemiological emergency completely extraordinary and characterized by some critical aspects due to the need of working at home most or all days a week, such as the risk of isolation, the sharing of spaces and technological tools with others (partners, children), the growing interferences among work and family duties. To identify effective solutions for the future application of flexibility at work, in the view of employees' wellbeing and organizations' productivity, it is needed to consider changes in impacts from standard to different flexible work solutions, beyond the forced narrowing of home-work boundaries linked to the current emergency. This study examined the effects of flexible space and time job for one day a week in a panel of workers from the public administration and allows a comparison in working conditions, attitudes towards work and impacts on health and wellbeing between the standard work and 12-month flexible work arrangements overtime. Moreover, this longitudinal study differed to the most previous ones in this field adopting longitudinal design that allows to verifying changes in impacts from the standard work to the flexible work (12). Some of our findings corroborated evidence from the literature and allowed to identify solutions and best practices to be applying in moving to flexible work.

Particularly, our findings supported the strain hypothesis of the Job Demand-Control Model and the Job Demand-Control-Support Model (30, 31) in people having flexible time and space work for one day a week. According to the strain hypothesis of the JDC model (31), an increase in demands and workload in flexible work worsen well-being and health. Having clarity in their own role and absence of conflicting roles have positive effect on workers' engagement and job satisfaction over time. In line with the JDCS model, higher managerial and peer support determine an increase on workers' engagement, indeed help, support and resources provided by line managers and colleagues have shown to lead to a greater engagement with work. In case of changes introduced into the organization, a good sharing and a clear communication from the management were found to be linked to an increase in job satisfaction. On the contrary, a bad management of changes showed negative effects on workers well-being.

As regards the work life balance, findings showed that flexible work generally leads to better perceptions of balancing. Interferences between work and private life decreased from time 0 (standard work) to time 1 (smart working one day a week) and the higher the job control the higher the perceptions that smart working simplifies private life. Nevertheless, a negative impact on work-life balance was found for women who are culturally more involved in the family care, since women showed to perceive greater interference between work and family in smart working, particularly in high demanding jobs (32, 33).

All in all, as the JDCS's strain hypothesis predicts - also in the case of flexible work arrangements - high demands, low control and low social support might lead to reduced well-being, less satisfaction with work and have an effect on work engagement

(34, 35, 36). Accordingly, finding strategies for improving social support plays a crucial role in flexible work since it seems to moderate the negative impact of high strain on well-being, work attitudes and work life balance, the last particularly for women. This might be particularly important in view of increasing the days of space and time flexible jobs that may increase the risk of isolation or decrease the sense of commitment with the organization. In such cases, preventive actions aiming to reinforce the social support at work are suggested as enforcing the occasion of virtual meetings and support, providing regular feedbacks on activities and improving tools for sharing information and documents.

Starting from our results, it would be necessary to carry out further investigations on the impact of smart working on the quality of working conditions, also including further monitoring on different forms of flexible work (as more days of smart working or remote work for five days a week). In the view of keeping the positive aspects of flexibility, it is therefore necessary to improve the understanding of potential impacts in moving to flexible work arrangements on workers' health and productivity. In this regard, a further wave of investigation (time 2 - currently ongoing) will analyze changes introduced by smart working in emergency to identify eventual critical issues related to working at home for a large number of days. Among the others, some aspects could suffer a worsening as the days of working flexibility increase as the narrowing of the boundaries between private and working life, the risk of social isolation and lack of organizational support. A further aspect to be analyzed is the impact of information and communication technology on working conditions and workers' well-being. During the emergency, digitalization processes on work activities have been accelerated. This has required a rapid development of digital skills, enhancement of information technology equipment, and massive use of social and networking technologies that allow for continuous availability and connection. One of the main consequences of the potential negative impacts of the intensive use of technology at work is technostress (37, 38, 39), defined as a "disease of adaptation caused by an inability to cope with the new computer technologies in a healthy manner" (40). Since ICT and networking platforms are strictly necessary in flexible work, future studies will also take into consideration the potential impacts of technology on the psychophysical health of workers and on expectations and perceptions of 24h workers' availability. As explained above, smart working in emergency represents an extraordinary way of distance work that encompasses several critical aspects associated to the remote work all workweek long. Our findings offered reflections on changes and impacts of the introduction of flexible work arrangements that can provide some suggestions to manage future implementation of flexible work in similar public administration (e.g. for 2 or 3 days a week and/or on jobs characterized by specific activities).

Conclusions

This study highlights the beneficial health effects of workplace flexibility and suggests that organizations may benefit from building a culture of flexibility. Given the growing number of workers using smart working during the epidemiological emergency, this issue currently assumed great relevance for the OSH and organizational productivity implications. In Italy, research on flexible work arrangements and their implications on the quality of working conditions has acquired a central role during the emergency. This experience lead the government to promote forms of flexibility at work even after the current epidemiological emergency, especially in the public administration. The role of flexibility on innovation in work processes is now recognized, not only in the light of promoting work-life balance, but also for fostering productivity, sustainability and cost effectiveness in organizations. Above all, this requires the introduction of organizational models focusing on autonomy, goal setting, smart communication and flexible job schedule. At the same time, it is necessary to identify potential risks connected to the changes introduced by smart working through prospective studies, in order to improve workers' health and safety protection. The Italian Ministry of Public Administration confirmed the need to identify preventive and organizational measures for workers when smart working was applied in the public administration during the

epidemiological emergency[8]. Among others, it also highlighted the need to invest in worker training to deal with the digital transformation of work and to create specific skills also by addressing psychosocial risks related to the intensive use of technology. Due to the potential negative effects connected to the intensive and pervasive use of technology at work, a scientific and political debate is in progress to identify effective measures for workers health, to prevent technostress and to protect the workers' right to disconnect, namely the right of workers not to be constantly available.

Research may play a central role in providing scientific evidence on drivers and barriers related to smart working and other flexible work arrangements, to support stakeholders in defining specific policies for its future implementation in view of protecting the health and safety of workers while preserving productivity.

References

1. Charalampous M, Grant CA, Tramontano C, Michailidis E. Systematically reviewing remote e-workers' well-being at work: a multidimensional approach, Eur. J. Work Organ Psychol.2019;28(1): 51-73. https://doi.org/10.1080/1359432X.2018.1541886
2. Moretti A, Menna F, Aulicino M, et al. Characterization of Home Working Population during COVID-19 Emer-gency: A Cross-Sectional Analysis. Int J Environ Res Public Health. 2020;17(17):6284. Published 2020 Aug 28. doi:10.3390/ijerph17176284
3. Mutti A. Smart working and tele-conferences during the lockdown caused by COVID-19 bring new editorial guidelines. Med Lav. 2020;111(4):247-248. Published 2020 Aug 31. doi:10.23749/mdl.v111i4.1034
4. Iannotta M, Meret C, Marchetti G. Defining Leadership in Smart Working Contexts: A Concept Synthesis. Front Psychol. 2020;11:556933. Published 2020 Sep 16. doi:10.3389/fpsyg.2020.556933
5. De Menezes LM, Kelliher C. Flexible working and performance: A systematic review of the evidence for a business case. Int J Manag Rev 2011; 13: 452–474. https://doi.org/10.1111/j.1468-2370.2011.00301.x
6. De Menezes LM, Kelliher C. Flexible working, individual performance, and employee attitudes: Comparing for-mal and informal arrangements. Hum. Resou. Manag. 2016;56, 1051–1070. https://doi.org/10.1002/hrm.21822
7. ten Brummelhuis LL, Bakker AB, Hetland J, Keulemans L. Do new ways of working foster work engage-ment?. Psicothema. 2012;24(1):113-120
8. Casey PR, Grzywacz JG. Employee Health and Well-Being: The Role of Flexibility and Work–Family Balance, Psychol. Manag. J. 2008;11:1,31-47. https://doi.org/10.1080/10887150801963885
9. Joyce K, Pabayo R, Critchley JA, Bambra C. Flexible working conditions and their effects on employee health and wellbeing. Cochrane Database Syst Rev. 2010;2010(2):CD008009. Published 2010 Feb 17. doi:10.1002/14651858.CD008009.pub2
10. 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 Nov;92(6):1524-41. doi: 10.1037/0021-9010.92.6.1524. PMID: 18020794
11. Moen P, Kelly EL, Fan W, et al. Does a Flexibility/Support Organizational Initiative Improve High-Tech Employees' Well-Being? Evidence from the Work, Family, and Health Network Am Sociol Rev 2016;81(1), 134–164. https://doi.org/10.1177/0003122415622391
12. Swanberg JE, McKechnie SP, Ojhac MU, James JB. Schedule control, supervisor support and work engagement: A winning combination for workers in hourly jobs? J. Vocat. Behav. 2011; 79:1:613-624. https://doi.org/10.1016/j.jvb.2011.04.012
13. Allen TD, Johnson RC, Kiburz KM, Shockley KM. Work–Family Conflict And Flexible Work Arrangements: Deconstructing Flexibility. Pers. Psychol. 2013; 66:345–376. https://doi.org/10.1111/peps.12012
14. McNall LA, Masuda AD, Nicklin JM. Flexible work arrangements, job satisfaction, and turnover intentions: the mediating role of work-to-family enrichment. J Psychol. 2010;144(1):61-81. doi:10.1080/00223980903356073
15. Peters P, Dulk LD, Van der Lippe T. The effects of time-spatial flexibility and new working conditions on em-ployees' work–life balance: the Dutch case. Community Work Fam. 2009;12:3, 279-297. https://doi.org/10.1080/13668800902968907
16. Descatha A, Sembajwe G, Pega F, et al. The effect of exposure to long working hours on stroke: A systematic review and meta-analysis from the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury. Environ Int. 2020;142:105746. doi:10.1016/j.envint.2020.105746
17. Li J, Pega F, Ujita Y, et al. The effect of exposure to long working hours on ischaemic heart disease: A systematic review and meta-analysis from the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury. Environ Int. 2020;142:105739. doi:10.1016/j.envint.2020.105739

8 - Ministry of Public Administration, directive n.3 of 2020

18. Raykov T, Rodenberg C, Narayanan A. Optimal Shortening of Multiple-Component Measuring Instruments: A Latent Variable Modeling Procedure. Struct. Equ. Model. 2015; 22(2), 227-235. https://doi.org/10.1080/10705511.2014.935927
19. Cox T, Griffiths AJ. The assessment of psychosocial hazards at work. In Shabracq MJ, Winnubst JAM, Cooper CL (Eds.) Handbook of Work and Health Psychology. Chichester: Wiley & Sons. 1995
20. Rondinone BM, Persechino B, Castaldi T, et al. Work-related stress risk assessment in Italy: the validation study of health safety and executive indicator tool. G Ital Med Lav Ergon. 2012;34(4):392-399.
21. Marinaccio A, Ferrante P, Corfiati M, et al. The relevance of socio-demographic and occupational variables for the assessment of work-related stress risk. BMC Public Health. 2013;13:1157. Published 2013 Dec 10. doi:10.1186/1471-2458-13-1157
22. Wood S, Ghezzi V, Barbaranelli C, et al. Assessing the Risk of Stress in Organizations: Getting the Measure of Organizational-Level Stressors. Front Psychol. 2019;10:2776. Published 2019 Dec 20. doi:10.3389/fpsyg.2019.02776
23. Schulte PA, Delclos G, Felknor SA, Chosewood LC. Toward an Expanded Focus for Occupational Safety and Health: A Commentary. Int J Environ Res Public Health. 2019;16(24):4946. Published 2019 Dec 6. doi:10.3390/ijerph16244946
24. Schaufeli W, Shimazu A, Hakanen J, et al. An Ultra-Short Measure for Work Engagement. The UWES-3 Valida-tion Across Five Countries. Eur J Psychol Assess. 2019; 35(4), 577–591. https://doi.org/10.1027/1015-5759/a000430
25. International Social Survey Programme (ISSP) 2015 - Work Orientations IV. Variable Report. Documentation re-lease 2017/08/30. GESIS Data Archive for the Social Sciences
26. Cortese CG, Quaglino GP:. The measurement of job satisfaction in organizations: a comparison between a facet scale and a single-item measure. TPM Test Psychom Methodol Appl Psychol. 2006; 13(4):305-16
27. Simon JG, De Boer JB, Joung IM, et al. How is your health in general? A qualitative study on self-assessed health. Eur J Public Health. 2005;15(2):200-208. doi:10.1093/eurpub/cki102
28. Topp CW, Østergaard SD, Søndergaard S, Bech P. The WHO-5 Well-Being Index: a systematic review of the lit-erature. Psychother Psychosom. 2015;84(3):167-176. doi:10.1159/000376585
29. Greene WH. Econometric analysis. New York (NY): Pearson, 2018
30. Johnson JV, Hall EM. Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. Am J Public Health. 1988 Oct;78(10):1336-42. doi: 10.2105/ajph.78.10.1336
31. Karasek RA. Job demands, job decision latitude, and mental strain: Implications for job redesign. Adm. Sci. Q. 1979: 24, 285-308. doi:10.2307/2392498
32. Kelloway EK, Gottlieb BH. The effect of alternative work arrangements on women's well-being: a demand-control model. Womens Health. 1998;4(1):1-18
33. Kelly EL, Moen P. Rethinking the Clockwork of Work: Why Schedule Control May Pay Off at Work and at Home. Adv Dev Hum Resour. 2007;9(4):487-506. doi:10.1177/1523422307305489
34. Häusser JA, Mojzisch A, Niesel M, Schulz-Hardt S. Ten years on: A review of recent research on the Job Demand–Control (-Support) model and psychological well-being, Work Stress. 2010;24(1):1-35. doi: 10.1080/02678371003683747
35. Samad A, Reaburn P. Di Milia L. The contribution of job strain, social support and working hours in explaining work–family conflict. Asia Pacific J. Hum. Resour. 2015;53: 281-295. https://doi.org/10.1111/1744-7941.12058
36. Vassos M, Nankervis K, Skerry T, Lante K. Can the job demand-control-(support) model predict disability support worker burnout and work engagement? J. Intellect. Dev. Disabil. 2019;44(2):139-149. https://doi.org/10.3109/13668250.2017.1310818
37. Dragano N, Lunau T. Technostress at work and mental health: concepts and research results. Curr Opin Psychiatry. 2020;33(4):407-413. doi:10.1097/YCO.0000000000000613
38. Berg-Beckhoff G, Nielsen G, Ladekjær Larsen E. Use of information communication technology and stress, burnout, and mental health in older, middle-aged, and younger workers - results from a systematic review. Int J Occup Environ Health. 2017 Apr;23(2):160-171. doi: 10.1080/10773525.2018.1436015
39. Tarafdar M, Ragu-Nathan TS, Ragu-Nathan B. Tu Q. The Impact of Technostress on Productivity. J Manag Inf Syst. 2007;24(1):301-328. https://doi.org/10.2753/MIS0742-1222240109
40. Brod C. Technostress: The Human Cost of the Computer Revolution. Reading (MA): Addison Wesley, 1984

No potential conflict of interest relevant to this article was reported by the authors