

THE HOME-BASED TELEWORKING: THE IMPLICATION ON WORKERS' WELLBEING AND THE GENDER IMPACT

Ylenia Curzi^a
Barbara Pistoresi^{a,b}
Erica Poma^{a,1}
Chiara Tasselli^a

^a Department of Economics "Marco Biagi",
University of Modena and Reggio Emilia, Modena, Italy

^b RECent, Center for Economic Research,
University of Modena and Reggio Emilia, Modena, Italy

Fecha de recepción: 13 de enero de 2021

Fecha de aceptación: 9 de abril de 2021

Abstract

Home-based telework is becoming more and more common and with it the dematerialization of the work-life boundary. If, on one side this working form increases the worker's discretion, on the other hand it could seriously damage his/her well-being. This paper explores the influence of organizational conditions on work-related stress of a sample of home-based teleworkers drawn from the 2015 European Working Conditions Survey. It also uses the 2020 Living, Working and COVID-19 Survey to analyse the evolution of the gender differences in telework from 2015 to 2020. We find that the perceived stress of the home-based teleworkers is mainly due to the forms of working time arrangements and work intensification, for example the lack of discretion over work pace, working with tight deadlines and at high speed, working during free time to meet work demands. Female teleworkers also perceive that the lack of discretion in the working time arrangement and the lack of recovery time increase their stress. The analysis also documents a sharp increase in the perceived level of stress from 2015 to 2020 and higher levels of stress in women mainly due to work-life balance problems. This gender stress differential is reasonably constant in the two periods and hence both in the emergency and in normal telework. The general agreement in the literature that telework is as a way of promoting better wellbeing and work-life balance for workers especially for women is not supported by our findings.

Keywords: *work-related stress, home-based teleworking, gender inequalities, work-life balance.*

1 erica.poma@unimore.it

INTRODUCTION

As result of the fourth industrial revolution and the consequent process of digitalization, home-based telework is becoming an increasingly popular work mode. This suggests the importance of examining its effects on e-workers well-being and its socio-economic implications, especially on vulnerable groups, such as female workers who are very involved in teleworking. Several studies consider telework as an opportunity to improve the workers well-being thanks to greater flexibility and time that workers can dedicate to their family and private life. Other authors found out that telework boosts working performance and reduces the perceived stress associated to commuting (Barbuto *et al.* 2020; Baruch & Nicholson 1997; Gajendran & Harrison 2007; Thulin *et al.* 2020).

Nevertheless, another stream of literature documents a greater level of work-related stress among teleworkers, due to a boost in work intensity. Compared to traditional workers, individuals who work remotely use ICT tools with more frequency, which cause an intensification of working activities because of a distorted use of these instruments, which can lead the e-workers to be always available, even during the recovery moments, in order to meet unreasonable working demands (Chesley 2014; Curzi *et al.* 2020; Ter Hoeven *et al.* 2016). Moreover, this new working style is likely to lead to mental illness, associated with high level of perceived stress due to difficulties in balancing work life dimensions, whose boundaries tends to blur (Baruch & Nicholson 1997; Mann & Holdsworth 2003; Moen *et al.* 2016).

The purpose of this study is twofold. Firstly, it explores the relationships between working conditions and stress in the context of telework, with a special focus on gender differences. We test the hypothesis that home-based telework causes an increase in the perceived stress and a rise of the gender gap due to uneven distribution of domestic housework at the expense of women who telework. Secondly, this paper studies the relationship between the work-related stress and others well-being dimensions, that is sleep quality, mental health problems and work-life balance issues. In order to achieve these objectives, we analyse a sample of teleworkers surveyed in the Sixth Wave of the European Working Conditions Survey (Eurofound 2015) and in the "Living, Working and COVID-19" e-Survey (Eurofound 2020).

This paper is structured as follows. The following section provides a brief literature background on the work-related stress in the context of telework and on some organizational dimensions which may significantly influence the e-workers' well-being. Then, the third section presents the data and sample which we analysed; moreover, we include in this part a subsection describing all the variables used with their units of measure. Section fourth contains the descriptive statistics and first findings concerning the organizational models adopted by the whole teleworkers sample and the two sub-samples of male and female teleworkers.

Main results are presented in two subsections. First, organizational dimensions, such as autonomy, discretion, and job intensity (Albano *et al.* 2018; Curzi *et al.* 2020; Gajendra *et al.* 2015; Fonner & Roloff 2010; Suh & Lee 2017; Ter Hoeven & Van Zoonen 2015) are analysed by conducting multivariate regressions to detect the main determinants of work-related stress among teleworkers (Allen 2001; Bélanger 1999). This distinction led us to develop some diversity management policy, finding out organizational levers that could prevent work-related stress episodes reducing gender inequalities, for example the introduction of different forms of manager support or the presence of appropriate recovery times between working days (Baruch & Nicholson 1997; Casper *et al.* 2004; Kwang *et al.* 2019). All the above-mentioned organizational dimensions have been analysed by gender and they show different effects depending on whether the teleworker is a man or a woman. Then, the second subsection presents a data analysis concerning the relationship between the work-related stress and others well-being dimensions (sleep quality, mental health problems and work-life balance issues) both during normal and pandemic time. Finally, last section summarizes our main findings, the limitations and possible future developments of our research.

THEORETICAL FRAMEWORK

Some research analyses the role of telework and its consequences on work organization models. These last, in a remote context, imply an intensified use of ICT tools, greater forms of autonomy and discretion and an increased intensification of the working activities due to various factors: first of all, the incorrect use of ICT technologies and failure to comply with the "right to disconnect" (Albano *et al.* 2018; Curzi *et al.* 2020; Eurofound & ILO 2017; Poletti 2017).

These news models of work change the working relationships and have important consequences on the e-workers' well-being: many studies support the thesis that telework and other mobile work arrangements are much more exposed to frequent episodes of work-related stress with a negative impact on workers well-being (Chesley 2014; Curzi *et al.* 2020; Kelliher & Anderson 2010; Mann & Holdsworth 2003).

This worsening in workers well-being can be explained by different variables. In particular, some scholars underline that so-called job autonomy may have an ambiguous role: the organizational model of telework implies that workers can choose how and when to work, flexibly managing their working time arrangements, however, in some cases, this can deteriorate the e-workers' well-being, leading to an increase in work intensification and, finally, to more frequent episodes of work-related stress, reducing the general well-being of workers (Azad *et al.* 2016; Biron & van Veldhoven 2016; Cavazotte *et al.* 2014; Gajendran *et al.* 2015; Kelliher & Anderson 2010; Mazmanian *et al.* 2013). According to the literature, this kind of phenomenon is called, the "autonomy paradox" (Putnam *et al.* 2014).

In order to improve the understanding of this relationship, some scholars have suggested that it is of key importance to distinguish between the concept of autonomy and the one of discretion (for a definition of both concepts see Albano *et al.* 2018; Curzi *et al.* 2020).

In addition, other studies prove that telework causes an amplification of gender differences, contributing to boost gender stereotypes and inequalities which already exist in the traditional work models, worsening the general level of perceived stress in a greater measure to women who telework, compared with the case of man who work from home (Baruch & Nicholson 1997; Karkoulian *et al.* 2016; Mann & Holdsworth 2003; Moen *et al.* 2016).

As mentioned in the introduction, additionally to investigate the influence of organizational dimensions on stress, our analysis also aspires to provide in-depth exploration of stress conditions especially regarding its objective manifestations.

Work-related stress is a serious and growing problem (Holmes 2002) that arises when the pressure of work is too heavy and causes physical and mental reactions that in the short-term period increase worker productivity (*eustress*) but in the long run (*distress*) could seriously damage employees' health (Pereira & Elfering 2014).

According to the literature there is a strong linkage between stress and several health and safety issues, below we focus on the most relevant ones that we have also managed to identify among the information available in the database.

Physical health and Psychological health

Stress is primarily a mental condition, but it may also involve physical problems. This happens because of psycho somatization²: science reveals that there is an essential link between "soul and body"

² The Merriam-Webster dictionary defines psychosomatic as: of, relating to, involving, or concerned with *bodily symptoms caused by mental or emotional disturbance*.

or "*psyche and soma*" – hence the word "*psychosomatic*" (Compare & Grossi 2012). This reason drives us to deal with Physical and psychological matter jointly.

According to several studies stress led to biological, behavioural and cognitive modifications that cause (Compare & Grossi 2012; Holmes 2002; Maslach & Leiter 1997; Selye 1976; Varvogli & Darviri 2011):

- physical side effects as: asthma, back pains, dizziness, headaches, mouth disorders, gastrointestinal problems and neck pains
- physical side effects as anxiety, depression, mood changes.

Logically, the presence, intensity and duration of one (or more) side effect(s) is(are) highly dependent on the extent and the ferocity of stress. In case of prolonged suffering both -stress and side effects- could convert in chronic illness.

Work-life balance

In recent years there has been considerable interest in work-life balance issues that suggest being a critical argument especially in the context of telework and even more if teleworkers are women (Shaw 2011). The relationship between an unbalanced work-life time and the presence of stress seems to be established (Bell *et al.* 2012; Kelly *et al.* 2020; Matuska 2013). Moreover, the inability to stop worrying about work during free time (as it happens to who have a scarce WLB) may be a significant link in the relation between stress and sleep (Åkerstedt *et al.* 2002).

Sleep quality

Several authors associate stress' presence to disrupted sleeping patterns (Åkerstedt *et al.* 2002; Åkerstedt, Nilsson & Kecklund 2009; Compare & Grossi 2012; Knudsen *et al.* 2007; Pereira & Elfering 2014) by demonstrating that in the workweek with a high workload and much stress are also those in which workers' sleep is more disturbed than usual and they release higher levels of cortisol (Dahlgren 2005).

Literature reviews allow us also to identify previous studies (Knudsen *et al.* 2007) who built the "*low sleep quality indicator*" by utilizing the exact same sub-variables that are available in the EWCS dataset: "*difficulty falling asleep, difficulty staying asleep, and non-restorative sleep*". It was found that poor sleep quality (based in the same sub-variables that we utilize in our study) is associated with job stressors as work overload, role conflict, autonomy, and repetitive tasks.

All the side effects itemized are not antagonistic, they are not exclusive to each other, indeed very often they are correlated and occur simultaneously. In fact, a lot of literature consulted deals with more than one at the same time. Stress leads to multifaceted and heterogeneous problems which differ in manifestations that could become a real danger to the health of workers.

Moreover, from a utilitarian point of view, stress is not just a workers' health issue, but it also becomes an important factor for business efficiency. As work stress is a major contributor to absenteeism and reduced work productivity and performance (Arredondo *et al.* 2017; Compare & Grossi 2012; Deshpande 2012; Hawksley 2013; Wu, Hu & Zheng 2019), it could easily interfere with managers' goal.

DATA AND SAMPLE

Our analysis is based on a sample of home-based teleworkers drawn from the 6th wave of the European Working Conditions Survey (EWCS) (Eurofound 2015). It also uses the 2020 Living, Working and COVID-19 Survey to analyse what happens during the Coronavirus pandemic (Eurofound 2020). Particularly, from the 6th wave of the EWCS we drew up a sample of 1,355 home-based workers. To obtain this extraction,

we adopted the teleworkers definition, in accordance with the literature, which identifies them as those who work mainly from home and use with high frequency the ICT instruments (Eurofound-ILO 2017). This sample has been, additionally, divided in two sub-groups: one composed by male teleworkers and another composed by female teleworkers. A different definition of teleworker is adopted for the 2020 sample extraction: we consider all those workers who, in the months of April and May 2020, during the pandemic emergency, declared to work from home. In this second sample both emergency and non-emergency teleworkers are included, and for this reason, the sample size is greater than in 2015 and equal to 7,384 observations.

Focusing the attention on the 2015 sample, which results to be the main object of our analysis, it emerged that this database result to be composed mainly by individuals between 18 and 65 years, which are predominantly women (57%). Teleworkers have, on average, high levels of qualifications: a share of 32% of the sample is represented by teleworkers with a Master and 28% have a bachelor's degree. In addition, 6% of the sample have a Doctorate Degree.

By analysing the economic sector in which teleworkers are employed, we find a prevalence of the tertiary and advanced tertiary sector, in which are employed the 86% of teleworkers, with a female prevalence in the tertiary sector (64%) and a male prevalence in the advanced tertiary sector³ (77%).

Measures

The independent variables are referred to the different questions of the European Working Condition Survey. The answers of the sample of teleworkers relating the year 2015 are used to construct scale, dummy and continuous variables which are used in the estimated regressions. Consistently with the outcomes highlighted by the empirical studies presented in Section 2, which represents the theoretical basis of our research, we selected the following variables as proxy, from one side, of the organizational levers analysed (e.g. autonomy, discretion, work intensification) and, from the other side, of work-related stress and correlated dimensions (e.g. work-life balance, sleep quality, psychophysical health). Moreover, a summary table containing all the items used for the creation of variables and indicators is presented in the Appendix.

Work-related stress is an ordinal variable (1= Low frequency of stress episodes; 5= High frequency of stress episodes) related to how often the teleworker declares to perceive stress during the working activities

Gender is a dummy variable in which 0=Man and 1=Women

Autonomy over Work Goal is an ordinal variable (1= Scarce autonomy; 5= High autonomy) which considers the participation of the workers in setting their working objectives.

Discretion over work methods is a scale variable (1= Scarce discretion; 5= High discretion) created by the mean of z-scores of different dummies regarding the possibility to choose the tasks, methods and procedures of work.

Discretion over Work Pace is the mean of z-scores binary items regarding the discretion in the choice of own working speed, as well as the possibility to determine when to take a break. It is a scale variable (1= Scarce discretion; 5= High discretion).

³ "Advanced Tertiary Sector" represents an evolution of the traditional tertiary sector which requires to provide intellectual services such as business advisory services, IT services and all those activities belonging to the field of the new technologies and information (Zanni 2008).

Autonomy in the choice of working colleagues is an ordinal variable (1= Scarce autonomy; 5= High autonomy) regarding the choice of individuals to work with.

Involvement in Autonomous groups is a binary variable (0 = No; 1= Yes) concerning the presence of common tasks which must be performed by working in a team of more members.

Lack of discretion over work schedule is a dummy variable (0 = Absence of discretion; 1=otherwise). It regards the lack of discretion in the working time arrangement when those are totally determined by the company without possibility of changes.

Working at high speed is a scale variable (1= Working at reasonable pace; 5= Working at pressing pace) which is referred to the necessity of working with tight deadlines and at high speed, in a limited time with respect to all the tasks demanded

Work pressure is a binary variable (0=No; 1=Yes) composed by the mean of different dummy variables which consider the presence of different tasks demanded by colleagues and customers requiring a specific working pace, as well as the case of working with instruments and machines which force the workers to follow the working pace established by the machine.

Frequent Work Interruption is an ordinal variable (1= absence of working interruptions; 5= High working interruptions) which indicates how often the worker is exposed to work interruptions.

Insufficient recovery time is a dummy variable (0= Sufficient Recovery time; 1=Otherwise) which indicates if the worker has sufficient recovery time between the working days.

Supplemental work is an ordinal variable variable (1= Low charge of supplemental work; 5= High charge of supplemental work) indicating how often workers must work during the free time in order to meet work demands.

Manager Support is an ordinal variable (1=Never; 5= Always) created as a mean of different variables which analyse many dimensions of support as the provisions of feedbacks about the objectives achieved, the support in terms of personal and professional development, the recognition of the worker as an individual with its own needs and other psychological dimensions.

Complex Task is a binary variable (1=Yes; 0=Otherwise) indicating if the worker must accomplish tasks and objectives that (s)he considered complex and difficult to achieve.

On the job Learning is a dummy variable (1=Yes; 0=No) which identifies that kind of work which involves some learning process during the working activities.

Skill Match is a dummy variable (1=Yes; 0=Otherwise) created as mean of different variables referred to the compatibility between work duties and personal skills.

General Health is measured by an ordinal item assessing how work affects health (1= positive influence; 5= negative influence).

Physical Health is a continuous variable created by summing 10 dummy variables that identify the presence (1) or the absence (0) of disturbs as: hearing problems, skin problems, backache, muscular pains in shoulders, neck and/or upper limbs, muscular pains in lower limbs, headaches, eyestrain, injury(ies), anxiety, overall fatigue. In this variable 0 indicates absence of physical problems and 10 the presence of all, namely 0 is referred to excellent physical condition and 10 to poor physical condition.

Psychological Health is a mean of five sub-variables which consider emotions like: feeling cheerful and in good spirits; feeling calm and relaxed; feeling active and vigorous; feeling, waking up fresh and rested, feeling exhausted at the end of the working day, being excited about own life. The range of the mean moves from 1 (good psychological conditions) to 5 (critical psychological conditions) and each

variable contributes to the general mean with the right direction (higher are the values, saddest is the respondent condition).

Work Life Balance is a mean of three sub-variables that explore if work dominates the respondent's life which are referred namely to: kept worrying about work when not working, felt too tired after work to do some of the household jobs which need to be done; found that your job prevented from giving the desired time to family. As the PsychologicalHealth variables the range of the mean moves from 1 (good work-life balance) to 5 (critical work-life balance).

Sleep Quality is a mean of three sub-variables (Difficulty falling Asleep, waking up repeatedly during the sleep, waking up with a feeling of exhaustion and fatigue) that investigate workers sleeping conditions. As above, also this variable moves from 1 (excellent sleep quality) to 5 (poor sleep quality).

Descriptive Statistics and First Findings

The following section provides a first analysis relating organizational and work-related stress variables contained in the European Working Condition Survey (2015) database.

Table 1 shows the relative frequencies of the variables correlated with work-related stress and underlines the presence of gender differences: particularly, the discretion and autonomy variables which tend to reduce the perceived work-related stress, are much more present inside male teleworkers, on the contrary, the women group tend to have an higher presence of those autonomy and discretion variables which cause an increase of work-related stress, as the case of the rigidity in the work schedule and the Discretion over work method. Conversely, variables such as the Autonomy over Work Goals or the Discretion Over Work Pace, which reduce work-related stress, are present with more frequency in the male group of teleworkers.

T-tests support our conclusions: the estimated values of the considered variables are higher than our critical level of 1.96 in most of the cases concerning the Autonomy and Discretion variables. The distribution of these variables is heterogeneous and causes a higher perceived stress for women.

T-tests estimated over the work intensity variables do not suggest this heterogeneous distribution which we find in the autonomy and discretion variables, except the case of some variables as the presence of inadequate recovery times between working days, which occurs more frequently in the man group.

This different distribution shown by T-tests and the relative frequencies estimated support the conclusion according to which it is necessary to implement work organizational levers and policies of diversity management in which women who telework have much more autonomy and discretion over those aspects which contribute to reducing work-related stress. Women can get a positive impact on stress especially if they could utilize autonomy and discretion in the definition of working hours.

TABLE 1
DISTRIBUTION OF VARIABLES AND T-TEST AMONG TELEWORKERS: THE DIFFERENCES BETWEEN MEN AND WOMEN

Variables	Teleworkers (M+F)	Male Teleworkers	Female Teleworkers
Work-Related Stress	78% (2.68)	75%	81%
Autonomy over Work Goals (-)	79% (3.30)	83%	76%
Discretion over Work Method (+)	92% (3.35)	86%	96%
Discretion over Work Pace (-)	68% (3.67)	73%	63%
Rigidity in the work schedule (+)	36% (3.35)	30%	41%
Working at High Speed (+)	98% (1.50 <1.96)	96%	99%
Frequent Work Interruptions (+)	51% (1.15 <1.96)	50%	52%
Complex Task (+)	(3.29)	89%	82%
Inadequate Recovery times between working days (+)	29% (5.80)	39%	22%

Note. Correlation signs are in parenthesis in the Variables Column. T-Test are in parenthesis in the Teleworkers Column.

MAIN FINDINGS

The main results are shown in the two subsections presented below; firstly, we analyse which are the main organizational levers, between those presented previously, which lead to greater levels of work-related stress, focusing on the gender differences. Secondly, we deepen the different dimensions of perceived work-related stress in order to have a complete representation of the phenomenon. After having represented these multifaceted aspects of work-related stress, we compare the evolutions of them in two different teleworkers sampled in 2015 and 2020 by Eurofound, with special attention to the work-life balance pattern between men and women e-workers.

Organizational Model and work-related stress among male and female teleworkers

In this section we focus on the organizational models adopted by teleworkers and its influence on work-related stress. To this aim three regression models on work-related stress are presented in Table 2: the first model based on the sample including all the teleworkers questioned in the Sixth Wave of the European Working Conditions Survey (2015), and others two models differentiated by the gender dimension. This analysis draws up the influence of the organizational variables, such as discretion, autonomy, work intensification, and other dimensions as the manager support, on the perceived stress declared by teleworkers and their different impact on male and female teleworkers.

Autonomy and Discretion Variables

The autonomy and discretion variables are not correlated to work related-stress with the same sign: the autonomy over work goals and the discretion over work pace are negatively correlated with work related-stress, in other words, they operate as factors which reduce work related-stress. In particular, the autonomy over work goals reduces significantly the perceived stress in the whole sample of teleworkers (p -value <0.1 ; $\beta=-0.06$) but it has not significant impact on the two sub-samples of female and male teleworkers. By contrast, the discretion over work pace has a significant impact over the stress reduction

on the whole sample (p-value 0.01; $\beta = -0.20$) as well as in the two teleworkers sub-groups, separated by gender. On the opposite side, there are variables which cause an increase of work-related stress such as the involvement in autonomous groups, which leads to a significant increase in perceived stress in the whole sample of teleworkers (p-value 0.1; $\beta = 0.12$), and the discretion over work method, which increases significantly stress in male teleworkers (p-value 0.1; $\beta = 0.23$).

The involvement in autonomous work groups requires a continuous exchange of explicit and tacit information, in addition to particular communicative processes which are much more difficult to manage by distance, using ICT technologies. For these reasons working in groups in the context of telework can be difficult to implement, leading to a rise of work-related stress (Boell *et al.* 2016). As shown in Table 2, discretion variables do not always have a beneficial influence on work-related stress: e-workers who have discretion in the choice of work methods, tasks, procedures tend to have an intensification in working activities, working for longer periods or during the free time, for these reasons allow more discretion to teleworkers can threaten the workers well-being, leading to a rise in the perceived stress (Biron & van Veldhoven 2016; Cavazotte *et al.* 2014; Curzi 2020; Gajendran *et al.* 2015; Mazmanian *et al.* 2013).

TABLE 2
ORGANIZATIONAL VARIABLES AND WORK-RELATED STRESS:
A COMPARISON BETWEEN MALE AND FEMALE TELEWORKERS

Variables	Teleworkers (M+W)	Men	Women
Const.	2.17*** (0.223)	2.43*** (0.413)	2.61*** (0.265)
Gender	0.14** (0.063)		
Autonomy and Discretion variables			
Autonomy over work goals	-0.06* (0.029)	-0.06 (0.043)	-0.05 (0.038)
Discretion over work method	0.13 (0.082)	0.23* (0.126)	0.09 (0.108)
Discretion over work pace	-0.20*** (0.051)	-0.22** (0.093)	-0.16*** (0.056)
Autonomy in the choice of working colleagues	0.03 (0.022)	0.05 (0.034)	0.002 (0.029)
Involvement in autonomous groups	0.12* (0.067)	0.17 (0.115)	0.13 (0.087)
Rigidity in the work schedule	0.21*** (0.070)	0.14 (0.116)	0.22** (0.087)
Job Intensity variables			
Working at high speed	0.21*** (0.061)	0.20** (0.097)	0.23*** (0.076)
Work pressure	0.21 (0.129)	0.39* (0.202)	0.08 (0.170)
Frequents Work Interruptions	0.20*** (0.036)	0.23*** (0.057)	0.19*** (0.046)
Inadequate recovery times between working days	0.11 (0.068)	-0.07 (0.100)	0.27*** (0.094)
Supplemental Work	0.17*** (0.029)	0.20*** (0.046)	0.16*** (0.036)
The Manager Support, the tasks Complexity and Training Variables			
Manager Support	-0.09** (0.038)	-0.06 (0.066)	-0.11** (0.046)
Complex Tasks	0.26*** (0.086)	0.12 (0.159)	0.34*** (0.101)
On the Job Learning	-0.11 (0.146)	-0.55** (0.261)	0.10 (0.185)
Skill Match	-0.07 (0.054)	-0.01 (0.059)	- 0.24** (0.107)
Adjusted R	19.2%	19.0%	20.1%
SER	0.925	0.937	0.90

Notes. *** p ≤ 0.01 ; ** p ≤ 0.05 ; *p ≤ 0.1. Robust Standard errors in parenthesis.⁴

⁴ For demographic and occupation controls see Curzi *et al.* (2020).

Focusing on the differences between the two groups of men and women, it's possible to underline, first of all, that the gender variable is positively and significantly related to work-related stress ($\beta=0.14$, $p\leq 0.05$). This correlation suggests that female teleworkers are much more exposed to work-related stress episodes, as we will see later, this difference is partially explained by the distribution of housework and care duties, which result to be assigned more to women, contributing to increase the total amount of domestic and professional workloads, and causing much more difficulties in balancing work-life dimensions.

The variable relating to the rigidity in work schedule is only significant for women ($\beta=0.22$, $p\text{-value}\leq 0.05$), in contrast to the men group, for whom this variable is not significant in determining work-related stress ($\beta=0.14$, $p>0.1$). The different distribution of domestic duties and responsibilities for women who work from home explain this different level of significance regarding the effect of rigidity in the working schedules between men and women, as for these last it implies much more difficulties on work-life balance, indeed, in accordance with the literature, women tend to have a major amount of workload and familiar duties, especially in the case of telework (Baruch & Nicholson 1997; Mann & Holdsworth 2003; Moen *et al.* 2016). On the contrary, having the possibility to determine, independently, the working schedule, is much more important for women and can have a significant role in reducing work related stress.

Job Intensity Variables

Table 2 shows a significant and positive relationship between intensity variables as working at high speed, the presence of frequent work interruptions and the supplemental work: these variables act in a similar way for women and men who telework, causing a significant increase of work-related stress.

Table 2 highlights the presence of intensity variables which have different significance and impact depending on the gender considered. This is the case of the lack of adequate recovery times between working days that significantly increase work-related stress for women, with a level of significance equal to 1% ($\beta= 0.27$; $p \leq 0.01$), while, for men, the correlation is negative and work-related stress does not increase in a significative way ($\beta = - 0.07$; $p \geq 0.1$). For female teleworkers it's much more important to have adequate recovery times between working days because they are subject to a greater domestic workload, which causes an increasing physical exhaustion that leads to higher levels of perceived stress, especially if they have not adequate time to relax (Oakman *et al.* 2020; Maeda *et al.* 2019; Mann y Holdsworth 2003; Karkoulian *et al.* 2016; Moen *et al.*, 2016).

These findings are in accordance with the literature that supports a greater level of work-related stress in the e-workers with respect to traditional workers, due to a boost in work intensity (Curzi *et al.* 2020).-

Digital instruments can cause varying difficulties such as the exposition of e-workers to an excessive amount of information or problems like scarce connectivity, outdated technologies, dysfunctions of software and working programs (Chesley 2014; Poletti 2017; Ter Hoeven *et al.* 2016).

The Manager Support

Table 2 also reports the effects of other control variables, such as the work complexity and manager support, which have a variable relationship with work-related stress, often depending on the gender issue: a considerable difference regards the manager support, which result to significantly reduce work-related stress episodes perceived by the female teleworkers ($\beta = -0.11$; $p \leq 0.5$). On the opposite, the men group does not have a significant relationship with the manager support variable ($\beta = -0.06$; $p > 0.1$) and, in addition, the coefficient of reduction of work-related stress episodes is almost the middle of the one of female teleworkers. It is important to underline that this variable has been constructed considering different dimensions of work-related stress, including not only the technical support but also elements such

as the recognition of the worker as an individual with its own needs, the support in terms of professional and personal development and the provision of feedback about the quality of work done. All these elements result to be particularly appreciated by women, as they also include psychological dimensions that go beyond the only technical support.

Further studies show that the manager's support results to be particularly significant in the improvements of e-workers performance and in their engagement when it is provided by a woman rather than a man. This difference underlines the enhanced ability, on average, of women, to consider in their support many dimensions also much more immaterial, recognizing in a better way the needs of the e-workers who must handle the working activities with other duties and responsibilities. In these terms a female manager that support its e-team result, on average, much more able to understand e-workers necessities, contributing to reduce working inequalities and promoting a work environment of fairness, improving the general engagement of workers and helping to generate a widespread well-being (Bin Bea *et al.* 2019; Russo *et al.* 2020).

The task Complexity, On the Job Learning and the Skills Match

Another variable which acts differently between the teleworkers groups is the task complexity, that result to be positively correlated with work-related stress in a more significant way with the female e-workers ($\beta = 0.34$; $p 0.01$): for this reason, it is important to clearly define the objectives and tasks demanded. The variable "On the Job Learning" produces an increase of work-related stress in women, even if not in a significant extent, while it is a mitigator of stress for the men group ($\beta = -0.55$; $p .$ Women are less exposed to frequent stress episodes on work when they have to handle with clear tasks and objectives that are coherent with their personal skills, as the presence of Skill Match for women is significant in the reduction of work-related stress ($\beta = -0.24$; $p\text{-value} \leq 0.05$).

Work-related Stress, Psychophysical Health, Work-life balance: Correlations and Gender differences

In the following section we let us delve into the many dimensions of stress of teleworkers as few people are prepared to admit suffering from stress or to seek help from it (Holmes 2002) or they even neither recognize their illness. We conduct further check-up on our dependent variable with a double aim:

- i. to validate the dependent variable (*work-related stress*) to give stronger solidity to our analyses.
- ii. to observe what stress' somatizations are the best *proxy* of it in our sample.

Table 3 reports a correlation matrix showing correlation coefficients between stress and the variables listed above. Each cell in the table displays the coefficient computed on two variables of the group.

Namely, the formula applied is:

$$r_{xy} = \frac{1}{n} \sum_{i=1}^n \frac{(x_i - \bar{x})}{\sigma_x} \cdot \frac{(y_i - \bar{y})}{\sigma_y}$$

Where x and y correspond each time to a pair of variables between Stress, GeneralHealth, PhysicalHealth, PsychologicalHealth, WorkLifeBalance and SleepQuality.

TABLE 3
DEPENDENT VARIABLES' CHECK: PEARSON CORRELATION COEFFICIENT

	Stress	GeneralHealth	PhysicalHealth	PsychologicalHealth	WorkLifeBalance	Sleep Quality
Stress	1					
GeneralHealth	0,41***	1				
PhysicalHealth	0,32***	0,78***	1			
PsychologicalHealth	0,35***	0,78***	0,45***	1		
WorkLifeBalance	0,54***	0,48***	0,38***	0,43***	1	
SleepQuality	0,23***	0,49***	0,43***	0,48***	0,35***	1
Aggregate of all previous ones ⁵	0,73***					

Source: self-elaboration based on EWCS 2015 dataset.

As we are particularly interested in the interaction with our dependent variable, we focus on the first column of the table 3 that contains the correlation between Stress and all the others. The correlation matrix shows that there is a highly and positive correlation between work-related-stress and all other variables. Moreover, the p-value in each correlation is statistically significant: lower than 0.001 ($p < .001$). It indicates strong evidence against the null hypothesis, as there is a very low probability that the null is correct (and the results are random).

Table 3 is also a preliminary support to our second goal: by providing evidence of the correlation between work-related stress variable and other factors we can assume that these last should be a quite good proxy of the presence of stress.

The most interesting result, in our opinion, is that the strongest relationship that emerges from the matrix is between stress and WorkLifeBalance' variable. The interpretation is that -in our subsample of teleworkers- who claim to experience stress is also the most likely to report suffering of work-life-balance problems.

This interesting result invites us to follow this path by doing further analysis, so we decided to split teleworkers subsample by gender and to recompute the same correlation matrix for it.

It arises that for female teleworkers the correlation between Stress and WorkLifeBalance is even stronger than for male ones.

Moreover, we repeat the same computation for the whole EWCS dataset therefore on all types of workers and it emerges that if we consider all types of workers the correlation between the WorkLifeBalance and Stress is only 0.44 against the 0.54 of the subsample of teleworkers.

This comparison has further strengthened our confidence in the importance of work-life balance issues to determine stress in teleworkers as the strong linkage between work-life balance problems seems

⁵ Methodological note: this variable is computed by aggregate the standardized form of: GeneralHealth, PhysicalHealth; PsychologicalHealth, WorkLifeBalance and SleepQuality.

to be so prominent for teleworkers. These results could be considered the first step of a bigger research plan. We assume that could be possible integrate with a recent dataset (Living, working and COVID-19) produced by Eurofound to monitor workers' condition during the pandemic.

There are several reasons behind the relevance of this second dataset in our study: at first, it contains the exact same indicators we used to generate the WorkLifeBalance variable secondly it allows us to add a lot of information about workers' time management. This second point could help us to better investigate what lies behind the work-life balance issue: How do workers manage their time? Why cannot they find a balance between work and private life?

Even if there is not enough space in this research to integrate our findings with a detailed analysis on this second dataset, we are glad to insert some simple pre-analysis with the hope that it serves as a continuous stimulus for future research.

The gender differences among teleworkers: an evolution from 2015 to 2020

As stated in the previous section, a new dataset collected by Eurofound (2020) is used to get more information about teleworkers' time management, work-life balance issues and mental health issues. Before going into this extra information, we exploited the possibility to compare those variables, that are identical, in the two datasets to examine the evolution of these dimensions and the gender gap from 2015 to 2020, as shown in Table 4.

The analyses conducted are focused just on the European teleworkers, dividing them by the gender variable.

TABLE 4
T-TEST AND RELATIVE FREQUENCIES OF WELLNESS DIMENSIONS: A COMPARISON
BETWEEN MALE AND FEMALE

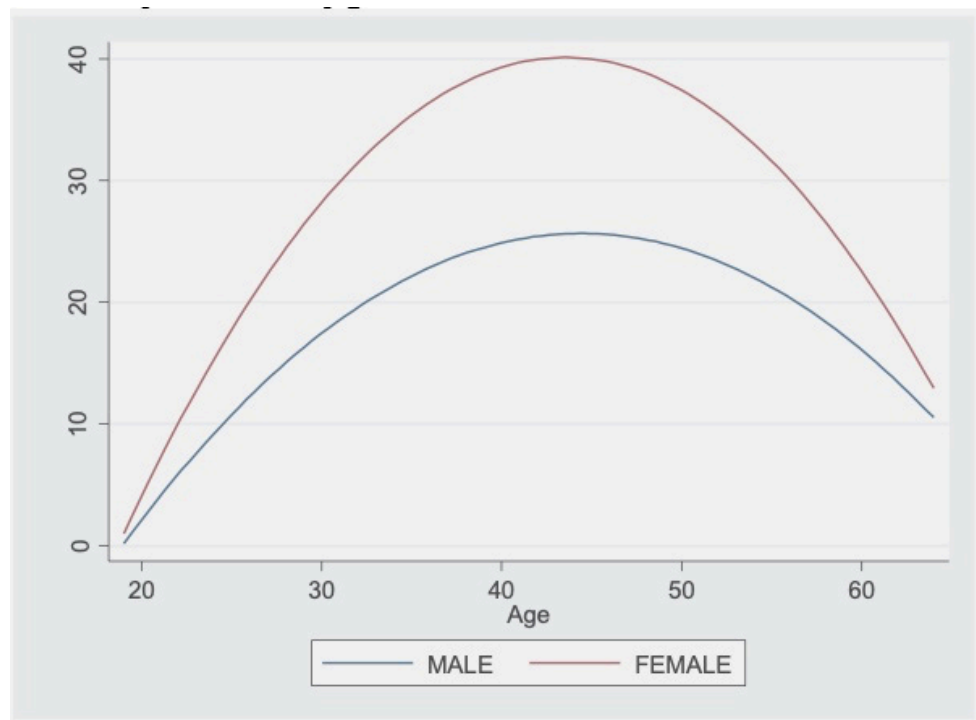
	T-test	Male Teleworkers	Female Teleworkers
<i>Psychological Health</i>			
2020	-7.67	53%	60%
2015	-3.72	25%	32%
<i>Work-life Balance difficulties</i>			
2020	-8.65	42%	50%
2015	-3.03	38%	48%

Note. The critical value of 1.96 is used for T-test. Teleworkers 2015 N= 1,355; Teleworkers 2020 N =7,384

As the previous analysis suggests, it is possible to find out a different distribution of all these dimensions between male and female teleworkers: it is clearly visible from Table 4 that the Psychological Health presents a heterogeneous distribution between male and female teleworkers. In 2020, teleworkers manifest in a greater extent to have mental illnesses, this difference is due to the pandemic in which all the European States and the whole world is actually involved.

Regarding Work-Life Balance, Table 4 shows that in 2015, the share of female teleworkers who declared to have significant difficulties in managing work-life dimensions was equal to 48% in contrast to the 38% of male teleworkers. This differential of 10% decreases by 2 percentage points in 2020 but it is still significantly persistent: as the whole situation in terms of work-life duties seems to be worsened in 2020, both for men and women who telework, the gender gap, considering the wellness dimensions of Table 4, remains almost steady.

FIGURE 1
WEEKLY CARE HOURS BY GENDER



Source: self-elaboration based on Eurofound 2020 dataset.

Following the path of our research, we are particularly absorbed in the Work-Life Balance issue and through Figure 1 and Table 5 we penetrate the domestic life of our sample: both clearly demonstrate that women who telework are much more subject to different home and care duties.

Figure 1 outlines the difference in the weekly hours⁶ dedicate to home and care duties by gender. As expected, female spend more time than male in hours of unpaid work and we can easily recognise that this gap is not constant according to the age of individuals (highest gender difference exists in the 30-50 age group).

There is satisfactory agreement between those results and what we expected from the natural life cycle in which young are single (younger are the individuals lower are the differences in care duties) and adults enter a family unit (in which women are the main responsible of home and care duties). Then, as individuals age, the family workload decreases (children become independent, etc.) and the gap in care tasks.

⁶ Methodological note: fitted values are obtained by regress age, age2, educational level completed, household size, country of origin and urbanization level on "totalhcare". Totalhcare is computed by summing up hours per week that each individual devotes to: children's (or grandchildren's) care, elderly or disable's care and cooking. The regression is run twice: once for female subsample and one for the male one. Then the predicted values originated from the two regression are display in the quadratic fit of age.

TABLE 5
AVERAGE OF WEEKLY HOURS BY GENDER, DETAILS

	childcare		grandcare		cookcare		totalhcare	
	male	female	male	female	male	female	male	female
weekly hours' mean	9.1	13.8	3.1	4.5	11.5	18.4	20.6	33
pwmean⁷ (female vs male)	4.7***	1.4***	6.9***	12.4***				
	t 5.18	t 3.04	t 10.68	t 9.60				

Source: self-elaboration based on Eurofound 2020 dataset.

Table 5 reports gender differences in average time devote to: children's care (nearly to five hours gap per week), elderly or disable's care (one hour and a half of bias), cook (about seven hours), and general care activities that involve all the previous ones (twelve and a half hours). For all activities, there is a greater involvement of women and the pairwise comparisons of means highlight strong evidence against the null hypothesis (all T-values greater than |2,58|).

CONCLUSIONS

This paper analyses the stressors associated with home-based telework and identifies the main organizational levers which can potentially reduce work-related stress. Moreover, it focuses on different manifestations of stress on health and wellbeing detecting a strong linkage with the work-life balance issue. To this aim, it explores the influence of organizational levers on work-related stress of a sample of home-based teleworkers drawn from the 2015 European Working Conditions Survey. It also uses the 2020 Living, Working and COVID-19 Survey to analyse the evolution of the gender differences in telework from 2015 to 2020.

The main findings are as follows. For the whole teleworkers sample, as well as for the sub-samples separated by gender, the perception of having discretion in the choice of the working speed and the possibility to determine when to take a break (i.e. discretion over work pace) decrease significantly work-related stress. On the contrary, working with tight deadlines and at high speed, working during free time in order to meet work demands (i.e. supplemental work) and the exposition to frequent work interruptions increase the level of stress.

Focusing on gender differences, female teleworkers perceive that the lack of discretion in the working time arrangement (that is rigidity in the work schedules which are totally determined by the company without possibility of changes) and the lack of recovery time increase significantly their stress, with positive coefficients which are more than twice compared to those of the male teleworkers model, for whom, in addition, these variables have not a significant impact. Moreover, facing complex tasks which do not match with personal and professional skills causes a significantly increases in perceived stress for the women group and for the whole sample, but not for male teleworkers (i.e. "Skill match", "Complex Task"). The support in terms of personal and professional development, the recognition of the worker as an individual with his/her own needs and other psychological dimensions (i.e supervisor support) reduce significantly the occupational stress in the female group and in the whole sample. By contrast, the discretion over work method causes a significant increase in perceived stress only for male teleworkers. For these lasts, moreover, the variable "on the job learning" plays an important role in reducing work-related stress, unlike the women's group for whom this aspect has not a significant impact.

⁷ Pairwise comparisons of means.

Finally, the analysis documents a sharp increase from 2015 to 2020 in the proportion of teleworkers that perceive high levels of stress, this is possibly also due to the increase in the emergency telework caused by the Covid pandemic. Moreover, we find a higher level of stress in female teleworkers mainly associated with work-life balance difficulties and this gender stress differential is constant in the two periods. Teleworking during the pandemic clearly increases the difficulties in balancing work and family life, even if we can already observe the presence of gender inequalities in the distribution of household duties in 2015, as women spend more hours to perform domestic tasks and housework. This uneven distribution of household workloads explains why women need more flexibility and recovery time to reduce the perceived work-related stress.

Firms wishing to reduce the gender gap should intervene introducing more flexible working arrangements, adequate recovery times between working days, forms of manager's support on multiple aspects, including the technical as well as the psychological and personal dimensions and the definition of clear tasks.

Finally, we believe that our study presents limits which should be considered for future developments of this research. Firstly, gender differences in the context of remote work should be considered together with the various job positions. For this reason, we aim to better investigate this aspect in future studies including occupational dummies and their interactions with the gender variable. Secondly, the European database "Living, Working and COVID-19" (2020) relates the lockdown period, thus, work-life balance dimension is influenced by government measures adopted in the months of April and May 2020 in various European Countries. The Relationships among country's restrictive measures and work-life balance issues, as well as relationships among these lasts and gender inequalities, should be deepen analysed for further investigations on these topics.

AUTHOR CONTRIBUTIONS

Conceptualization: **YC, BP**; Methodology: **EP, CT**; Data Curation: **EP, CT**; Formal analysis: **EP, CT**; Writing, Review & Editing: **YC, BP, EP, CT**.

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APPENDIX 1

ITEMS AND MEASURES ADOPTED FOR THE CONSTRUCTION OF THE VARIABLES PRESENTED IN SECTION 3.2.

INDEPENDENT VARIABLES

Autonomy over Work Goal

Q61c. You are consulted before objectives are set for your work?

Discretion over work methods

Generally, does your main paid job involve...

Q53b. Assessing yourself the quality of your own work

Q53c. Solving unforeseen problems on your own

Q54a. Your order of tasks

Q54b. Your methods of work

Q61i. You are able to apply your own ideas in your work?

Discretion over Work Pace

Q54c. Are you able to choose or change your speed or rate of work

Q61f. You can take a break when you wish?

Autonomy in the choice of working colleagues

Q61e. You have a say in the choice of your work colleagues?

Involvement in Autonomous groups

Q58. Do you work in a group or team that has common tasks and can plan its work?

Lack of discretion over work schedule

Q42. How are your working time arrangements set?

Working at high speed

Does your job involve..

Q49a. Working at very high speed

Q49b. Working to tight deadlines

Q61g. You have enough time to get the job done?

Work pressure

Is your pace of work dependent on ...

Q50a. The work done by colleagues

Q50b. Direct demands from people such as customers, passengers, pupils, patients, etc.

Q50c. Numerical production targets or performance targets

Q50d. Automatic speed of a machine or movement of a product

Q50e. The direct control of your boss

Frequent Work Interruption

Q51. How often do you have to interrupt a task you are doing in order to take on an unforeseen task?"

Insufficient recovery time

Q38. Thinking of the last month, has it happened at least once that you had less than 11 hours between 2 working days?

Supplemental work

Q46. Since you started your main paid job, how often have you worked in your free time to meet work demands?"

Manager Support

Q61b. Your manager helps and supports you?

Q63a. Your immediate boss... - Respects you as a person

Q63b. Your immediate boss... - Gives you praise and recognition when you do a good job

Q63c. Your immediate boss... - Is successful in getting people to work together

Q63d. Your immediate boss... - Is helpful in getting the job done

Q63e. Your immediate boss... - Provides useful feedback on your work

Q63f. Your immediate boss... - Encourages and supports your development

Complex Task

Q53e. Generally, does your main paid job involve Complex tasks

On the job Learning

Q53f. Generally, does your main paid job involve Learning new things

Skill Match

Q64. Which of the following statements would best describe your skills in your own work?

DEPENDENT VARIABLE

Work-related Stress

Q61m You experience stress in your work?

VARIABLES CORRELATED TO WORK-RELATED STRESS

General Health

Q74. Does your work affect your health?

Physical Health

Over the last 12 months, did you have any of the following health problems?

Q78a. Hearing problems

Q78b. Skin problems

Q78c. Backache

Q78d. Muscular pains in shoulders, neck and/or upper limbs (arms, elbows, wrists, hands etc.)

Q78e. Muscular pains in lower limbs (hips, legs, knees, feet etc.)

Q78f. Headaches, eyestrain

Q78g. Injury(ies)

Q78h. Anxiety

Q78i. Overall fatigue

Q78j. Other

Psychological Health

Please indicate for each of the five statements which is the closest to how you have been feeling over the last two weeks.

Q87a. I have felt cheerful and in good spirits

Q87b. I have felt active and vigorous

Q87c. I woke up feeling fresh and rested

Q87d. My daily life has been filled with things that interest me

Q87e. I feel exhausted at the end of the working day

Work-Life Balance

How often in the last 12 months, have you...

Q45a. kept worrying about work when you were not working

Q45b. Found that your job prevented you from giving the time you wanted to your family

Q45d. Felt too tired after work to do some of the household jobs which need to be done

Sleep Quality

Over the last 12 months, how often did you have any of the following sleep related problems?

Q79a. Difficulty falling asleep

Q79b. Waking up repeatedly during the sleep

Q79c. Waking up with a feeling of exhaustion and fatigue