

Article

# Social Isolation and Stress as Predictors of Productivity Perception and Remote Work Satisfaction during the COVID-19 Pandemic: The Role of Concern about the Virus in a Moderated Double Mediation

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**Abstract:** From mid-March to the end of May 2020, millions of Italians were forced to work from home because of the lockdown provisions imposed by the Italian government to contain the COVID-19 epidemic. As a result, many employees had to suddenly switch to remote work, experiencing both troubles and opportunities. Social isolation from colleagues and the workplace represents a typical aspect of remote work which increased significantly during the social confinement imposed by the government. This study investigates the correlates of social isolation in terms of stress, perceived remote work productivity and remote work satisfaction, proposing the sequential mediation of stress and perceived remote work productivity, and the moderating role of concern about the new coronavirus. An online survey was conducted, and the responses of 265 employees showed the deleterious role of social isolation in stress, which leads to decreased perceived remote work productivity that, in turn, is related to remote work satisfaction. Furthermore, the results suggest that concern about the virus moderates the relationships between social isolation and remote work satisfaction, from one side, and remote work perceived productivity and remote work satisfaction from the other. This latter result suggests that the indirect sequential effect of social isolation on remote work satisfaction is conditional on concern about the virus. Some conclusions are drawn to support managers and HR officers in the choices to better manage employees' work during the health emergency.

**Keywords:** social isolation; stress; job productivity; remote work satisfaction; concern about COVID-19

## 1. Introduction

After China and some other Asian states, Italy was the first Western country to suffer the dramatic effects of the COVID-19 virus and to ask its approximately sixty million inhabitants to stay at home to stem the spread of the pathogen. From 12 March 2020, until the first lightening of the containment measures in the second half of May, millions of Italian workers, and the organizations where they work, were forced to rethink their working methods, mainly to make daily activities executable from home through the use of current technological tools.

The shift from presence-based work to remote work was, in most cases, facilitated by new government legislation. Nevertheless, it consisted of an unforeseen, relatively fast and improvised change and, therefore, deficient from a design point of view. This was intended to limit the damage

otherwise caused by not working but, on the other hand, forced thousands of people to ways of working with which they were unfamiliar, which were sometimes perhaps even unsuitable for the tasks performed, and in a period of psychological tension. This scenario of remote work during the COVID-19 emergency carries both benefits and critical points.

The scientific literature on remote work has already extensively illustrated some possible benefits of this arrangement, finding positive results with respect, for instance, to job satisfaction, job performance, organizational commitment or work–family conflict [1–3]. Nevertheless, remote working has been observed to also accomplish negative results, such as professional isolation, a reduced possibility of obtaining promotions, the breakdown of professional relationships, as well as an increase in family–work conflict [1–3]. Both positive and negative results, in any case dependent also on individual, work, organizational, family, as well as technological factors [4], however, cannot be completely related to the unplanned and unexpected remote working arrangements established to manage the emergency generated by the COVID-19 spread.

The COVID-19 emergency created concern in many people who were reporting anxiety, depression and stress, especially when they were already suffering from poor health [5,6]. Studies on work at the time of COVID-19 also show that confinement has led to an increase in inequalities between groups of employees, with some employees more satisfied and others more dissatisfied with their work [7] and, in the long term, might also lead to an increase in wage inequality among Italian employees [8]. On the other hand, remote working has also allowed employees to discover they could work from home [9].

In this study, we build on the health-impairment path of the job demands–resources model, which establishes that job demands, those aspects of the job that require sustained physical and/or psychological efforts, predict increased stress and exhaustion which, ultimately, lead to reduced job performance [10]. The perception of being separated and the lack of opportunities for emotional and social interaction with the team and the supervisor [11] can be considered a job demand, and previous studies have already shown the deleterious effects of social isolation on health [12] and performance [13]. Considering that the social isolation experienced by workers during lockdown represents the extreme point [14] of a characteristic that is usually present in remote work, this study focuses on the role of social isolation in remote work. The study pursues three main goals. First, we want to investigate the relationship between social isolation and stress from one side and remote work satisfaction from the other side. Secondly, we aim to understand if the relationship between social isolation and remote work satisfaction is mediated through stress and employees' perceptions of productivity. A sequential, double mediated model was tested in this regard. Third, we examine if concern about COVID-19 plays a moderating role and influences both the direct relationship between social isolation and remote work satisfaction and the relationship between perception of productivity and remote work satisfaction.

In order to conduct this study, in the next paragraph, we introduce the theoretical approaches on which our research hypotheses are based. Subsequently, the methodological part and the results describe the empirical component of this study and its outcomes; then, we discuss the findings and provide suggestions to managers and HR officers to improve the experience of employees engaged in remote work and, consequently, their wellbeing and productivity outcomes.

## 2. Literature Review and Hypotheses

### 2.1. Social Isolation and Stress

The lack of face-to-face interaction with colleagues represents one of the main differences between working in ordinary times and remote working in the time of COVID-19. The massive application of telework has created a kind of “a trouble shared is a trouble halved” effect [15], therefore making the phenomenon not limited to a few people but applicable to thousands of workers who had to use technologies to communicate and reduce the sense of social isolation and loneliness during the COVID-19 pandemic [16]. A recent study has shown that overload or complexity of technologies

needed to work remotely have adverse outcomes on employees' wellbeing [17]. Moreover, isolation, already existing in conditions of normal teleworking [18], should be even more investigated during the pandemic, because recent studies have shown a relationship between the loneliness of this time and higher levels of stress and depression experienced by people [19,20].

If the latter results refer to general life, in this study, we hypothesize that a relationship between isolation and stress and depression may also be observed in relation to work life. In ordinary conditions, isolation is related to the perception of greater stress [12,21], and this is in line with the job demands–resources (JD–R) model [22]. According to this theory, the lack of face-to-face interaction may be perceived as a job demand, which, for its nature, constitutes a source of distress. For this reason, the first hypothesis of this study is that:

**Hypothesis 1 (H1).** *In remote work during the COVID-19 pandemic, the social isolation generated by the lack of face-to-face contact with colleagues is positively associated with stress.*

## 2.2. Social Isolation, Stress and Perceived Remote Work Productivity

Productivity constitutes one of the most critical points of interest of work, and for this reason, in this research, we investigated if it is related to perceptions of social isolation and stress.

The relationship between social isolation and job performance in a remote work environment has already been investigated in a study conducted by Golden et al. [13], who highlighted the negative effect that professional isolation had on job performance as evaluated by employees' supervisors.

The role of stress as a negative predictor of objective and subjective measures of productivity was also explored in non-remote work settings. For instance, an extensive study on about 16,000 workers revealed that stress leads to decreased job performance [23], and similar results have also been found in more recent studies [24,25]. On the other hand, to our current knowledge, no study has examined the relationship between stress and productivity in a remote work context or in a work context during a pandemic.

Despite this lack of research, literature suggests that it is reasonable to think that stress is associated with a reduction in productivity also in remote work during the COVID-19 pandemic. The JD–R Model proposes a health-impairment path in which job demands predict increased stress and exhaustion, which, ultimately, lead to reduced job performance [10]. Working at home during COVID-19 often forced a significant technological change, which constituted a demand for many employees, especially because it was coupled with the absence, or the limited resources, that a company could offer in terms of training on how to use those technologies. Moving a large part of one's own work overnight, with limited information on how to use software for remote work collaboration, inevitably created some stress to employees, whereas training, technologies and piloting were usually planned and offered to employees in companies that introduced remote work in "ordinary" conditions (e.g., [26,27]).

Stress is defined as a response to fatigue that employees feel when the demands of work exceed their ability to cope with them [28]. During the confinement, suboptimal use of technology [17] may be a source of stress or, to be more precise, a source of technostress [17,29]. Previous studies show that technostress is essentially dependent on information overload and the need to be constantly available and reachable for work-related issues [30], with these two aspects characterizing working at home during the pandemic. Literature has also shown that these latter aspects are strictly and negatively related to employees' self-perception of productivity [31].

According to the JD–R model, to the studies on the relationship between stress and productivity in "ordinary conditions" and to the consideration of technostress as both an outcome of working at home during the COVID-19 pandemic and a predictor of the perception of poor productivity, in this research, we hypothesize that:

**Hypothesis 2 (H2).** *In remote work during the COVID-19 pandemic, social isolation (H2a) and stress (H2b) are negatively related to the perception of remote work productivity.*

### 2.3. Remote Work Satisfaction in Remote Working

Job satisfaction is one of the most used and indicative indices of wellbeing experienced in work contexts, and it reflects the extent to which employees find their expectations fulfilled by their work experience [32].

The relationship between social isolation due to remote work and job satisfaction has already been examined in previous studies. For example, a study on team virtuality, conducted on a sample of workers from 33 different countries, found that social isolation, in both its facets of physical and informational isolation, negatively predicted job satisfaction [33]. Analogous results were found by Bentley et al. [34] in a sample of 804 teleworkers working in 28 New Zealand companies: This study confirmed both the negative influence of social isolation on job satisfaction and the role of stress and the number of hours of teleworking as a mediating variable in this relationship. In addition, the authors found a negative association between social isolation and satisfaction which was stronger for people who teleworked eight hours a week or more than for people who worked remotely only up to seven hours a week. In our study, we focused on remote work satisfaction as a variation of job satisfaction, considered the satisfaction with the work done remotely. We assumed the same negative relationship between social isolation and remote work satisfaction because social isolation implies the loss of social relationships, an important job resource that offers social support, social recognition or exchange of work-related information, as it happened during the COVID-19 confinement, when respondents found themselves in forced and intense social isolation and remote work activities. Therefore, we hypothesize that:

**Hypothesis 3a (H3a).** *In remote work during the COVID-19 pandemic, social isolation is negatively related to remote work satisfaction.*

As mentioned, some studies showed that intense (many days a week) remote working strengthens the negative association between social isolation and job satisfaction compared to moderate (typically about two days a week) remote working [34–36]. Time spent working remotely, however, may not be the only modulating factor in this relationship. In particular, working remotely during confinement is charged with a strong emotional component related to health uncertainties and threats. Thus, considering remote work satisfaction, we argue that concern about COVID-19 may moderate the relationship between social isolation and remote work satisfaction by accentuating that negative relationship.

From one point of view, working from home because of the pandemic may decrease the fear of becoming infected, enhance the possibility of spending time with family members, decreasing perception of loneliness and depression [37], protect against exposure to continuous conversations with colleagues about the pandemic [38] and therefore mitigate the effects of isolation on remote work satisfaction. From another point of view, however, according to the JD–R model, social interaction with, and social support from, colleagues represent a job resource whose lack, in individuals already suffering from the emergency health situation, may amplify the adverse effects of social isolation. In the uncertainty of the effects of concern about COVID-19 on this relationship, and in the absence of studies in literature already investigating this phenomenon, we assume that:

**Hypothesis 3b (H3b).** *The relationship between social isolation and remote work satisfaction is moderated by concern about the COVID-19 pandemic.*

Job satisfaction is usually considered as an outcome of work experience, but on the other side, it is not clear whether job satisfaction should be considered a predictor or an antecedent of job performance,

since studies investigating the cause–effect relationship between these two constructs give conflicting results [39].

One of the main studies conducted in a remote work environment showed no significant relationships between job performance and job satisfaction [13], further confirming the difficulty of univocally understanding this relationship. On the other hand, Judge et al. [39], in their extensive review on the relationship between job performance and job satisfaction, paved the way for future research to test the relationship between performance and satisfaction, with mood as a variable influencing the association between these constructs. Thus, following Judge et al. [39], we tested the direct effect between the perception of remote work productivity and remote work satisfaction and, considering the context strongly charged with emotionality, we also hypothesized that concern about the pandemic might moderate that relationship. Thus, we hypothesize that:

**Hypothesis 4a (H4a).** *In remote work during the COVID-19 pandemic, the perception of remote work productivity is related to remote work satisfaction.*

**Hypothesis 4b (H4b).** *The relationship between the perception of remote work productivity and remote work satisfaction is moderated by concern about the COVID-19 pandemic.*

Finally, we argue that during the pandemic, social isolation is negatively related to remote work satisfaction both directly and indirectly. Considering the health-impairment path of the JD–R model and our previous hypotheses, we argue that the social isolation experienced during the pandemic may increase employee stress which, in turn, decreases remote work satisfaction. In addition, using the same rationale, social isolation is negatively related to the perception of remote work productivity which, in turn, is related to remote work satisfaction. Thus, in addition to these two simple mediation processes, we also posit a sequential, mediated process in which both stress and perceived remote work productivity serve as mediators between social isolation and remote work satisfaction. Therefore, we hypothesize that:

**Hypothesis 5 (H5).** *In remote work during the COVID-19 pandemic, the negative relationship between social isolation and remote work satisfaction is indirect and mediated in the following way: simple mediation through stress (H5a); simple mediation through perceived remote work productivity (H5b); sequential mediation through stress and perceived remote work productivity (H5c).*

### 3. Materials and Methods

#### 3.1. Participants and Procedure

In April and May 2020, 354 Italian employees answered an online questionnaire disseminated through social networks and a popular instant messaging app. The questionnaire was administered via the Qualtrics platform and took about 15–20 min to be completed. Of the 354 participants, 89 people were not remote workers or did not fill the questionnaire completely. Therefore, 265 participants were included in this research.

The participants, working exclusively from home in that period, mainly belonged to the 26–35 age group (42.3%), while 21.1% were in the 36–45 age range, 17% in the 46–55, 11.3% were under 25, and 8.3% were over 56. Men accounted for 37% of the respondents; 59.2% of the sample had a Master’s degree, 14.7% a High School diploma, 13.2% a Bachelor, 12.1% a Ph.D. or equivalent, and only a person had completed only the middle school cycle. There were 80.4% of respondents employed in the third sector (among them, 59.2% in the private third sector and 40.2% in public tertiary organizations), while organizational tenure was, on average, 7.52 years (SD = 9.56; Min = 0; Max = 40).

Most participants (78.5%) were experiencing remote work for the first time, while only 13.2% of respondents had previous experience of remote work, or had already planned, before the outbreak of the pandemic, to work remotely. Only 28 (8.3%) of them had at least 3 months of remote work experience.

In accordance with current regulations, participants provided their informed consent. Information about the purposes of the study, the voluntary and anonymous participation, as well as terms related to privacy and the possibility of withdrawing from the study at any moment, were provided on the first page of the questionnaire. The Ethics Committee of the University of Bologna evaluated and approved this study.

### 3.2. Measures

In addition to socio-demographics (gender, age, education and tenure), the questionnaire included the measures described below. With the only exception of the control variable of experience with remote work, all the measures were assessed using a 5-point Likert scale (from 1 = “Strongly disagree” to 5 = “Strongly agree”).

Social isolation: assessed through 4 items of the scale by Golden et al. [13]. An example of an item is: “I miss face-to-face contact with coworkers”.

Stress: measured through the 4-item of the telework exhaustion scale derived by Ayyagari et al. [40] and used by Weinert et al. [21]. One sample item is: “I feel exhausted from working at home”.

Perceived remote work productivity: assessed by a single item, developed for this study, worded as follows: “When I work remotely, I am more productive”.

Remote job satisfaction: measured through 3 items derived by Lee and Brand [41], adapted to the peculiar context of remote work. Two examples of item are: “Once the emergency is over, if I had to decide to work remotely again, I would choose it” and “If a friend asked me if it is appropriate to work remotely, I would recommend it”.

Concern about COVID-19: assessed with two items, specifically developed for this study: “The Coronavirus emergency worries me” and “The Coronavirus emergency affects me emotionally (I feel frightened, angry or depressed)”.

Experience with remote work: assessed using the single item: “Which of the following scenarios corresponds best to your current situation?”. The possible answers were 1 = “I work remotely because of the Coronavirus emergency” and 2 = “I was already working remotely before the Coronavirus emergency/It had already been planned that I was going to work remotely before the Coronavirus emergency”. This item was used as a control variable.

### 3.3. Data Analysis

Confirmatory factor analyses (CFAs) were conducted to assess the dimensionality of the scales; cut-offs typically used in research were adopted [42]. Using the master validity tool for AMOS by Gaskin et al. [43], reliability and convergent validity of the measures were evaluated by computing composite reliability (CR) and average variance extracted (AVE) values, while discriminant validity was assessed by calculating maximum shared variance (MSV) values and by comparing the square root of AVEs with interconstruct correlations. Then, descriptive statistics, Cronbach’s alphas and correlations were computed. Finally, in order to test the moderated double mediation model developed for this study, we centered the variables involved in the moderation hypotheses and used the PROCESS Macro for SPSS [44], model 90. All the analyses of this study were made using SPSS 26.0 and AMOS 26.0.

## 4. Results

In order to evaluate the dimensionality of the scales, two CFAs were conducted. A five-factor model, with one factor for each measured construct, was compared with a single factor model in which all the items were grouped together. The CFAs provided unequivocal results: The five-factor model showed a better fit to the data (chi-square (68) = 195.26; chi-square/df = 2.87; Comparative Fit Index (CFI) = 0.94; Incremental Fit Index (IFI) = 0.94; Root Mean Square Error of Approximation

(RMSEA) = 0.08; Standardized Root Mean Square Residual (SRMR) = 0.05) compared to the single factor model (chi-square (77) = 888.40; chi-square/df = 11.54; CFI = 0.63; IFI = 0.63; RMSEA = 0.20; SRMR = 0.14). All the fit indices of the five-factor model were within the cut-off criteria indicated by Hair et al. [42], thus endorsing the goodness of the hypothesized 5-factor solution.

Reliability and convergent and discriminant validity of the measures were then investigated respectively through the calculation of the CR, AVE and MSV values for each measured construct, with the only exception of the perceived job productivity, which had been measured with a single item. Table 1 reports the results of such analyses, which confirm the good reliability and validity of the measures.

**Table 1.** Composite reliability (CR), average variance extracted (AVE) and maximum shared variance (MSV) of the measured variables of this study.

Variables	CR	AVE	MSV
Social isolation	0.84	0.57	0.35
Stress	0.93	0.76	0.34
Remote work satisfaction	0.88	0.71	0.55
COVID-19 concern	0.77	0.66	0.13

Convergent validity was also confirmed by comparing the square root of AVEs with correlations between constructs, with the latter lower than the square root of AVEs.

Descriptive statistics, Cronbach's alphas and bivariate correlations between variables were then computed. Table 2 shows that all the constructs are significantly correlated among them, with the only exception being the relationship between perception of productivity and COVID-19 concern.

**Table 2.** Descriptive statistics, Cronbach's alphas and correlations between variables.

Variables	M	SD	1	2	3	4	5
1. Social isolation	3.33	1.00	(0.84)				
2. Stress	2.55	1.17	0.50 **	(0.93)			
3. P. Remote work productivity	3.40	1.11	−0.43 **	−0.35 **			
4. Remote work satisfaction	3.81	1.05	−0.50 **	−0.54 **	0.65 **	(0.87)	
5. COVID-19 concern	3.66	0.91	0.32 **	0.16 *	−0.08	−0.16 *	(0.64)

Note: In the main diagonal, within parentheses, the Cronbach's alpha. \*  $p < 0.05$ ; \*\*  $p < 0.01$ .

Before testing our hypotheses, we computed correlations between the psychological constructs considered in this research and control variables of age, gender, education, tenure and experience with remote work. Age and education were not related to any construct, while both gender and tenure were significantly related to remote work productivity (respectively:  $r = 0.20$ ,  $p < 0.01$ ;  $r = -0.14$ ,  $p < 0.05$ ) and both tenure and experience with remote work related to remote work satisfaction (respectively:  $r = -0.17$ ,  $p < 0.01$ ;  $r = -0.16$ ,  $p < 0.01$ ). Hence, we tested the hypotheses of this study by running the moderated double mediation model in PROCESS for SPSS, controlling for gender, tenure and experience with remote work. Results were not influenced by the inclusion of these control variables; thus, for reasons of parsimony and space, results are presented without these additional variables.

As reported in Figure 1, social isolation was significantly related to stress ( $B = 0.59$ ;  $p < 0.01$ ), thus confirming Hypothesis 1. Social isolation and stress were also negatively related to perception of productivity (respectively,  $B = -0.38$   $p < 0.01$ , and  $B = -0.17$ ;  $p < 0.01$ ), thus confirming Hypotheses 2a and 2b. Furthermore, remote work satisfaction was significantly, and negatively, related to social isolation ( $B = -0.18$ ;  $p < 0.01$ ), which confirms H3a, and positively related to perception of remote work productivity ( $B = 0.43$ ;  $p < 0.01$ ), which confirms H4a. Then, the two hypothesized moderations were found significant: Concern about COVID-19 negatively influenced both the relationship between social isolation and remote work satisfaction ( $B = -0.19$ ;  $p < 0.01$ ) and

between perception of remote work productivity and remote work satisfaction ( $B = -0.14; p < 0.01$ ), thus confirming Hypotheses 3b and 4b.

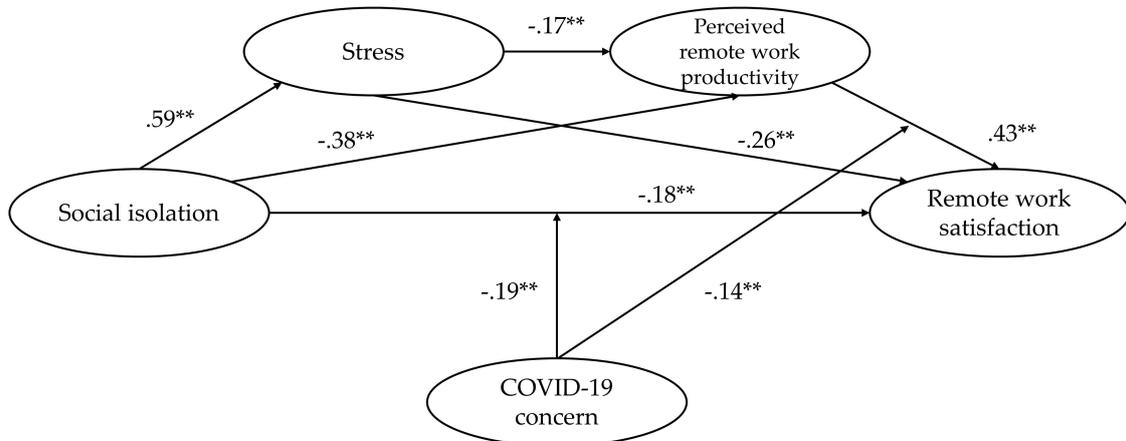


Figure 1. Tested model with significant relationships.

The two relationships affected by the moderation show different slopes, although in both cases, slopes are significant for low, intermediate and high levels of concern. The negative relationship between social isolation and remote work satisfaction became even stronger for employees who experienced more concern about the virus (Figure 2). In other words, remote work satisfaction was higher for individuals with low social isolation and high concern about the virus, and it was higher also for individuals with high social isolation and low concern about the virus.

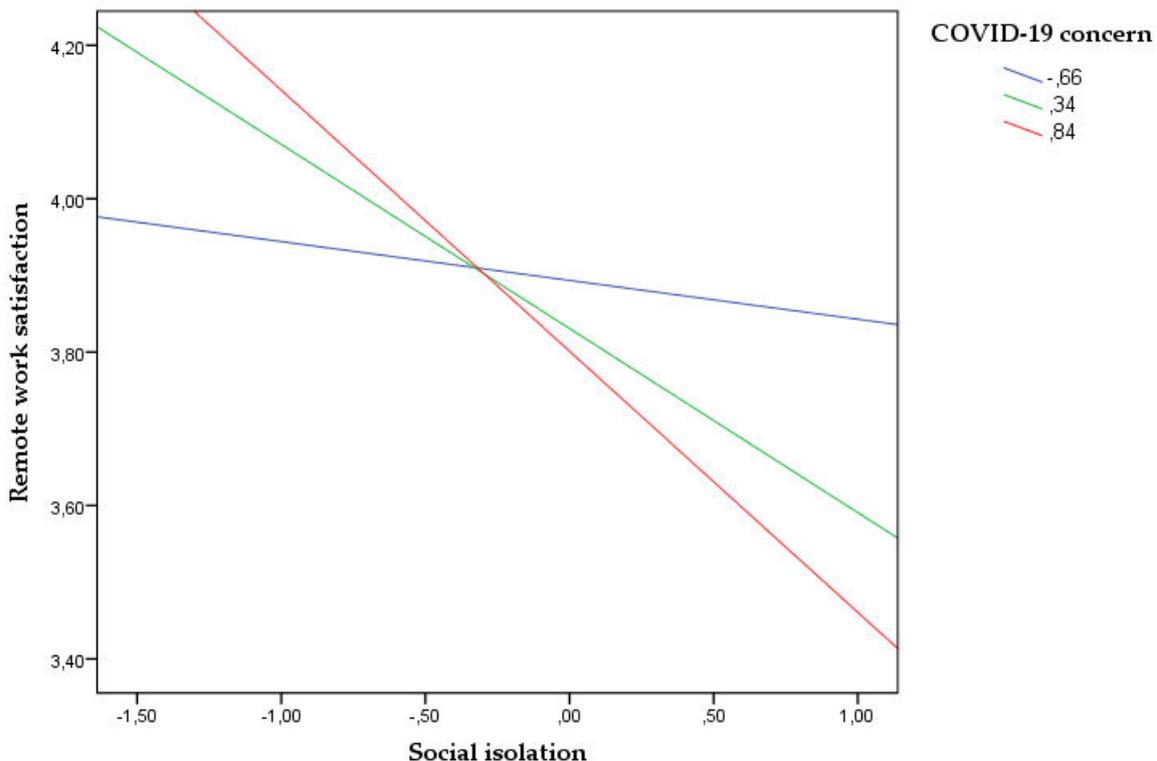
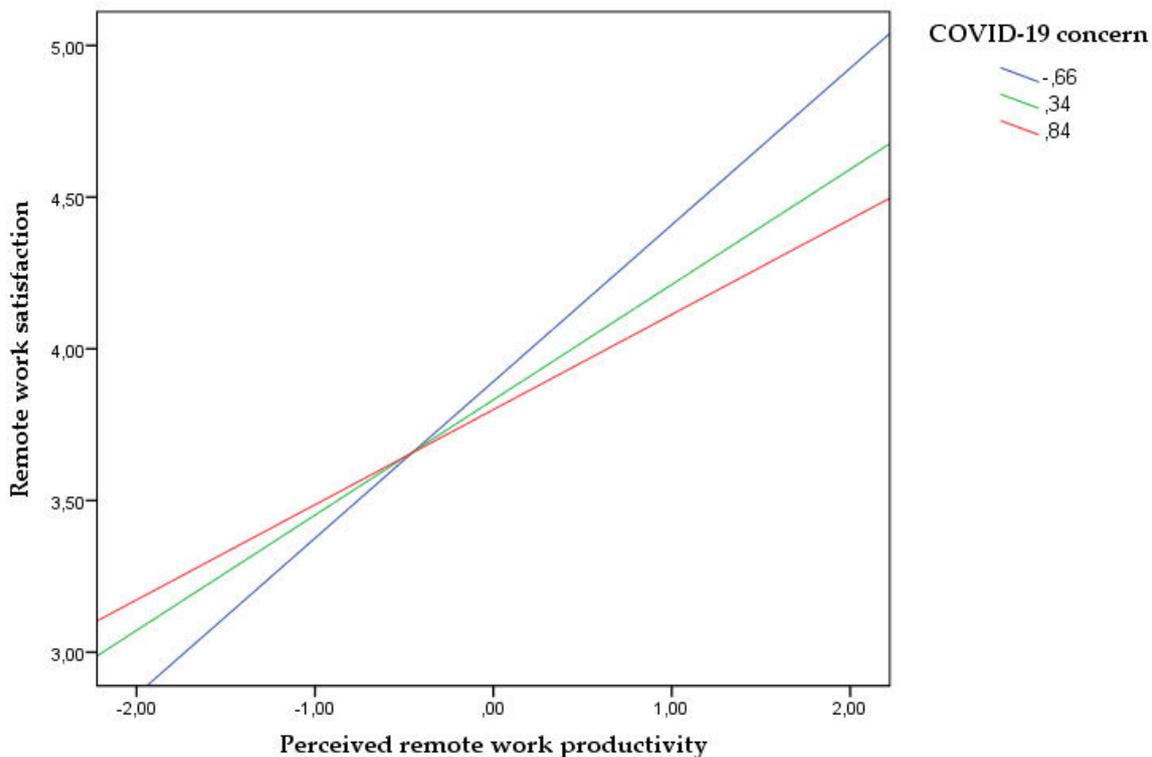


Figure 2. Moderation effect of COVID-19 concern on the relationship between social isolation and remote work satisfaction.

The opposite situation occurred for the second moderation, shown in Figure 3. In this case, the positive relationship between perceived remote work productivity and remote work satisfaction

was enhanced in the least worried employees and lessened in the most concerned ones. In other words, remote work satisfaction was higher for employees with higher perceived productivity and lower concern about the virus, while it was higher for employees with lower perceived productivity and higher concern about the virus. In short, the most worried employees showed a more modest increase in the relationship between remote work productivity and remote work satisfaction.



**Figure 3.** Moderation effect of COVID-19 concern on the relationship between perceived remote work productivity and remote work satisfaction.

Table 3 shows the results observed in relation to the mediating indirect effects (H5) and the indirect effects conditional to the level of concern about the virus. Social isolation turned out to be significantly and negatively associated with remote work satisfaction both through the simple mediation of stress and the simple mediation of remote work productivity. In addition, even the sequential double mediation, through stress and remote work productivity considered together, resulted in being significant (although lower in terms of effect size in comparison to the other two simple mediations). Table 3 also shows the strength of the indirect effects depending on the value assumed by COVID-19 concern.

**Table 3.** Indirect effects of the model, with the moderator tested at its 16th, 50th and 84th percentiles.

Indirect Relationships	B	BootSE	BootLLCI	BootULCI
1. Social isolation -> Stress -> Remote work satisfaction	-0.15	0.03	-0.22	-0.10
2. Social isolation -> Perceived remote work productivity -> Remote work satisfaction				
2.1. COVID-19 concern = -0.66	-0.20	0.04	-0.28	-0.11
2.2. COVID-19 concern = 0.34	-0.14	0.04	-0.22	-0.08
2.3. COVID-19 concern = 0.84	-0.12	0.04	-0.21	-0.05
3. Social isolation -> Stress -> Perceived remote work productivity -> Remote work satisfaction				
3.1. COVID-19 concern = -0.66	-0.05	0.02	-0.09	-0.01
3.2. COVID-19 concern = 0.34	-0.04	0.02	-0.07	-0.01
3.3. COVID-19 concern = 0.84	-0.03	0.01	-0.06	-0.01

## 5. Discussion

This study addressed remote work in the peculiar context of the COVID-19 pandemic, in which employees did not alternate remote work with office work but were working remotely all week long, for many weeks. For this reason, this study focused on the experience of social isolation, whose effects were investigated in terms of stress, perception of productivity and employees' remote work satisfaction.

Results confirmed the study model that we hypothesized. First, results show that social isolation is negatively related to remote work satisfaction, confirming previous studies [33,34,41]. This result is relevant because it is one of the few studies to show that isolation is not only related to decreased job satisfaction [33,34] but also specifically to remote work satisfaction. In addition, we observed that this relationship is moderated by concern about COVID-19. The interaction suggests that the negative relationship observed above is stronger in employees more concerned about COVID-19. Thus, employees less affected by such concern seem more "immune to the solitude" because the negative relationship between isolation and remote work satisfaction is much weaker in comparison to that in those more concerned. In addition, employees less concerned and more isolated are well satisfied with their remote work, while, by contrast, employees that are more concerned about the virus are more satisfied with the remote work when less isolated. This result suggests that concern about the virus, and more in general concern about non-work related aspects, when coupled with the lack of an external resource, such as social relationships with colleagues and supervisors, can strongly affect remote work satisfaction. By contrast, opportunities for social interaction may counterbalance concern about the virus, and remote work is more appreciated in presence of more social contacts. This result is in line with the JD-R model, which suggests that when individuals experience some worries about an external event together with the lack of social contacts, then the result is a negative outcome in terms of job satisfaction.

A second result of the study concerns the strong association between social isolation and stress, which confirms previous studies [12,21]. This result suggests that the subjective experience of feeling away from colleagues not only decreases work satisfaction but also determines a stressful condition for those who worked at home during the pandemic.

Third, the direct negative influence of social isolation on workers' perceptions of productivity and remote work satisfaction was also confirmed. This result underlines the importance of social relationships and that the experience of loneliness is strongly related both to the subjective perception of productivity and to employees' personal feelings of remote work satisfaction.

The relationship between social isolation and stress and the role of stress in the simple mediations between isolation and perceived productivity from one side, and remote work satisfaction from the other side, is another result fully compatible with the JD-R model [10]. According to this model, social isolation is a job demand that increases stress, which has negative effects on other work outcomes.

The debate on the relationship between perceived performance and job satisfaction constitutes an "open dispute" in organizational psychology [39]. The relationship observed here between perceived performance during remote work and remote work satisfaction transfers this debate to the remote work field and contributes to it. Although the cross-sectional research design does not exclude the reverse correlation, our result suggests that the perception of being productive during remote work can in itself be a reason for remote work satisfaction. This seems particularly plausible when employees find themselves in a new work situation and, perceiving they can be productive as usual, they are satisfied with the new work situation. In our case, respondents were forced into the new situation of remote work characterized by limited work autonomy, constraints about when, where and how to work and reduced possibility to optimize work activities; nonetheless, perceiving oneself as being able to cope with the new situation and continue to work productively becomes a source of satisfaction with remote work.

Another very interesting result is the sequential mediation observed here. This study extends the job demands-resources model by suggesting that a new job demand, social isolation, has an indirect effect, through stress on work productivity and, ultimately, on the individual wellbeing

of remote work satisfaction. In addition, this indirect sequential effect is conditional upon the various values of concern about the virus. In particular, employees who are more worried about COVID-19 and perceive themselves as less productive, are regardless more satisfied with remote work than employees who are less worried and perceive themselves as less productive. On the other hand, employees that perceive themselves as more productive during remote work are more satisfied when less concerned about the virus in comparison to those that are more concerned. Following the JD–R model, the mechanism of the health impairment model (social isolation related to stress, which decreases the perception of productivity, which is related to lower remote work satisfaction) works differently depending on the level of concern about COVID-19. Employees more concerned about the virus and performing less well are happier with remote work because it may be useful in safeguarding and protecting their health; at the same time, less concerned and more productive people are happier with remote work because it may help them to avoid commuting time and offer them more concentration and focus on the job. These different effects could find another explanation in the cognitive load theory [45]. According to this approach, higher levels of concern about COVID-19 may be associated with a higher cognitive burden, so few resources would be available for these already highly concerned workers to further “worry” about other contingencies, such as poor performance at work. Thus, the decline in remote work satisfaction could be explained by the fact that mental availability may already be exhausted in addressing concern about the coronavirus. Accordingly, those not very worried about the virus may instead have more resources to focus on their work performance, and this could therefore give rise to changes in satisfaction, with the latter more likely to vary depending on whether less worried workers believe they performed well or poorly.

This study advances knowledge on remote work during the COVID-19 pandemic that we are experiencing today. Like any research, however, it also has limitations. The first, already reported, is the cross-sectional design that does not examine cause–effect relationships. Different alternative models are in fact possible. Other limitations refer to the sampling procedure we used. In particular, the sample, not very large, is a convenience sample, and it is therefore not representative of the population and is affected by some biases: Participants were recruited using social networks and an instant messaging app, which clearly directed the selection of respondents toward users of those platforms. Moreover, the recruited people constitute a rather young and well-educated sample (almost half of the sample is under 35, and about 80% have a university degree), which decreases the degree of representativeness of our respondents when compared to the population of remote workers. Another limitation may be found in some measures that we used in this study. Perceived productivity and concern about COVID-19 were measured using, respectively, only one and two items. Although this is not recommended in organizational psychology and other disciplines, single items are often adopted. Finally, we observed a high number of dropouts (we used the answers of 265 out of 354 respondents). Many respondents were not engaged in remote work activities and many others did not fill the questionnaire completely, which can be attributable to the length of the questionnaire itself and to the use of electronic platforms, which are more subject to the abandonment of respondents.

Beyond these limits, however, we consider our study to be particularly relevant for stakeholders involved in the sudden transition to remote work that we described. In particular, companies and HR officers that adopted remote work programs should find opportunities to decrease the sense of social isolation and use instruments and social channels, such as video conference, use of social groups or social (and remote) coffee breaks, to maintain some form of social contact among employees, and between employees and supervisors. Second, they should develop procedures to use social channels not only for social reasons but also to ask for and obtain support in case of technological problems with the equipment for remote connection or administrative and technical issues that need the feedback of colleagues or managers. Third, companies and HR officers should provide training on the use of the equipment necessary to work remotely, in order to reduce the fear of technical failures and improve satisfaction with remote work. Fourth, it is also important to develop objective indicators of performance that employees can use to assess their own performance moving from a perceived

remote work productivity to an objective one. Fifth, in the specific case of the pandemic, organizations and HR offices should take care of employees' concern about the coronavirus by providing them clear information about the procedures implemented by the company to prevent the spread of the virus within company venues and the personal protective equipment provided to employees, avoiding giving conflicting messages that would further increase their fear [46]. Finally, the assignment of tasks can contribute to reducing concern: Easier, more affordable, "interactive" and "social" tasks for employees more concerned about the virus may reduce isolation, increase their perception of productivity and, ultimately, satisfaction with remote work.

## 6. Conclusions

In this research, we tested a model relating social isolation, stress, perceived productivity and remote work satisfaction, highlighting the deleterious effect that social isolation has on the other variables. We also tested the role that concern about COVID-19 plays in influencing workers' remote work satisfaction. In particular, this study highlights a strengthening of the adverse effects of social isolation on remote work satisfaction in workers who are very alarmed about COVID-19 and, at the same time, a greater incidence of productivity perceptions on remote work satisfaction among workers who are less concerned about the virus.

Such results provide important practical implications. Since they suggest that employees more concerned about COVID-19 show the need to feel as connected as possible to their colleagues when working remotely and those less concerned about the virus are less satisfied with remote work when their perceived productivity decreases, multiple pathways can be implemented to improve the wellbeing of these workers as much as possible. In general, favoring an experience that is closer to the ordinary one in terms of connections with colleagues and providing tasks that sustain the feeling of working to the best of one's ability are two aspects that can make remote work sustainable and that address the challenges of the confinement.

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