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Videoconference fatigue: validation of the Italian translated Zoom Exhaustion and Fatigue Scale (ZEFS)

Silvia Simbula, Giulia Paganin & Monica Molino (2023). Videoconference fatigue: validation of the Italian translated Zoom Exhaustion and Fatigue Scale (ZEFS). Fatigue: Biomedicine, Health & Behavior, 12(1), 43-57. DOI: 10.1080/21641846.2023.2290137

Abstract

Background. The global COVID -19 pandemic prompted widespread lockdowns as governments sought to contain the spread of the virus and minimize fatalities. Measures such as the stay-at-home orders imposed in Italy and the suspension of non-essential economic activities disrupted work and education worldwide. Telework, previously used by only one in five workers, gained prominence, albeit unevenly across countries. The surge in telework required the extensive use of video conferencing platforms. However, prolonged use of these platforms led to "Zoom fatigue", characterized by mental fatigue and exhaustion.
Objectives. The aim of this study is to validate the Zoom Exhaustion & Fatigue Scale (ZEFS) in its Italian version, examining its relationship with videoconferencing characteristics, and outcomes such as emotional exhaustion, sleep problems, and technostress.
Method. The study included a sample of 372 workers (50% female) who held video conferences at least once a week. They were asked to complete an online self-report questionnaire.
Results. The results confirmed the original structure of the scale and identified a second-order factor and the five dimensions of Zoom fatigue, namely general fatigue, visual fatigue, social fatigue, emotional fatigue, and motivational fatigue. In addition, Zoom fatigue was positively correlated with sleep problems, emotional exhaustion, techno-stressors, frequency of video conferences and burstiness, and negatively correlated with attitudes toward video conferences, confirming the construct validity of the ZEFS.
Conclusions. The present study suggests that the Italian version of the ZEFS is a psychometrically sound measure for assessing Zoom fatigue in the Italian working population. The practical implications of these findings are discussed.

Keywords: Zoom fatigue; technostress; exhaustion; sleep problems; videoconference; remote working.

Introduction

In March 2020, a global pandemic caused by the COVID-19 was unleashed, plunging nations into chaos and desolation. Numerous governments enforced a rigorous lockdown, aiming to restrict the transmission of the virus and minimize the number of deaths caused by the illness. For instance, in Italy, citizens were mandated to stay at home from March to May 2020, while all non-essential economic activities were suspended.

As known, the COVID-19 pandemic has significantly affected the world of work and education.

Before the COVID-19, one in five workers carried out some form of telework, with numerous differences among countries [1]. Specifically, the percentage of Italian employees regularly engaging in telework was merely 2%, in contrast to the European average of 8% [2].

With physical distancing mandates, the use of video conferencing platforms has become a regular occurrence. Although video conferencing is not a new concept, it has become increasingly popular during the COVID-19 pandemic. According to a report by Zoom, the platform's daily active users increased from 10 million in December 2019 to 300 million in April 2020. Similarly, Microsoft Teams and Google Meet reported significant increases in daily participants [3].

Although the use of videoconferencing platforms has become essential during the pandemic and despite the numerous benefits resulting from the use of these tools, video calls have been shown to have undesirable effects on people's health and well-being, if used for lengthy periods of time [4].

With the advent of the COVID-19 pandemic, technology has become ubiquitous, and some individuals perceive it as a true intrusion into their lives, generating a sense of hyper-connectivity with resulting discomfort and stress [5]. Among the negative consequences of the excessive use of videoconferencing platforms, the phenomenon of "Zoom fatigue" has rapidly gained popularity in the mainstream media.

"Zoom fatigue" is defined as the exhaustion and burnout associated with the excessive use of video conferencing platforms [6,7]. The term has become general due to the extensive use of the Zoom platform for video conferences, with many people using "zoom" as a verb instead of "video conferencing." As a result, even though it can happen with any video conferencing software, we will refer to the phenomenon as Zoom fatigue throughout this paper.

Despite there has been a significant amount of research conducted on the health impacts of excessive screen usage, the evidence relating to Zoom fatigue is still in the early stages. Moreover, although the health emergency caused by the pandemic is hopefully coming to an end, it has led to a significant acceleration in remote work and the use of video conferencing platforms. Indeed, remote work continues to be used consistently in Italy in 2023, although to a lesser extent than last years.

Considering this scenario, it is important to use reliable assessment tools for evaluating "Zoom fatigue". To this end, the Zoom Exhaustion & Fatigue Scale (ZEFS) was developed and validated by Fauville et al. [8] in a USA population and later validated in Indonesian [9], Portuguese [10], Turkish [11], and Indian populations [12]. However, to the best of our knowledge, an Italian validation of the ZEFS is still missing. Therefore, this study aimed to investigate the factor structure of the ZEFS in Italian workers, and its construct validity, in terms of both convergent and discriminant validity.

Potential antecedents and consequences of Zoom fatigue

Although there are still few studies on Zoom fatigue, some of them have started to investigate the relationship between Zoom fatigue and some of its antecedents and consequences.

For example, in their scale validation article, Fauville et al. [8] also investigated the relationship between Zoom fatigue and some constructs including the average length of videoconferences, the average frequency of videoconferences per day, the average time interval between videoconferences (i.e., burstiness), and finally the participants' attitude towards videoconferencing. Drawing on previous research that suggests a positive association between

fatigue and internet usage duration [13] and social media usage [14] Fauville and colleagues predicted and found that higher average duration of videoconferences, higher frequency of participating in videoconferences in a day, and shorter time distance between videoconferences were positively associated with higher levels of Zoom fatigue [8]. Additionally, within the same study, it was found that a less positive attitude towards videoconferences was associated with higher levels of Zoom fatigue.

In another study, Fauville and colleagues [15] investigated the relationship between gender and Zoom fatigue, demonstrating that women exhibited higher levels of Zoom fatigue compared to men, and this difference increased with age. These findings were also confirmed in the article about the validation of the ZEFS in the Brazilian context [10], where women displayed higher levels of Zoom fatigue compared to men even after controlling for age, attitude, and frequency of video conferencing usage. In this regard, Ratan and colleagues [16] analyzed the differences between men and women in levels of Zoom fatigue based on facial dissatisfaction. Specifically, the authors showed that women were more likely to experience facial dissatisfaction than men, which makes them more likely to experience Zoom fatigue [16].

Among the most relevant consequences of Zoom Fatigue are physical and emotional ones. Zoom fatigue can lead to various physical problems such as eye irritation and pain, excessive tearing, migraines, and muscle and joint pain. Eye problems are the most common and can be attributed to an increase in the use of electronic devices and screen time [17]. In terms of emotional consequences, Zoom fatigue can result in emotional exhaustion as individuals are unable to recover the energy spent during one or more video calls, resulting in chronic fatigue. According to recent studies, video conferences require more continual attention than face-to-face meetings [18].

Emotional exhaustion, in turn, can have unpleasant implications on other activities in an individual's life. Feeling tired and exhausted undermines motivation to act, causing individuals to be reluctant towards tasks or activities that require cognitive or physical effort [5]. Long-term consequences, which have been studied to a limited extent, include sleep disturbances, decreased

attention, and exhaustion of mental or physical capacities. These can potentially compromise job performance, as well as personal satisfaction in several areas of life [17].

Moreover, Zoom fatigue is conceptually related to Technostress, as both are possible outcomes resulting from the use of technology. However, the two constructs differ in that Zoom fatigue specifically refers to the use of video conferencing platforms and not technology in general. It refers to the feeling of tiredness, anxiety, and exhaustion associated with excessive use of virtual communication platforms [19]. Technostress, on the other hand, is a less recent phenomenon tied to increasing digitalization, pervasive use of technology, and constant connectivity [20,21]. Specifically, Technostress can generally be defined as "the stress experienced by end users in organizations as a result of the use of Information and Communication Technologies (ICT)" [[22], p. 417, 418]. Previous literature also suggests that both constructs positively correlate with outcomes such as emotional exhaustion, anxiety, mental fatigue, and cognitive fatigue [5,19,23].

Based on the above-mentioned literature, a further aim of the present study was to examine the relationship between the construct of Zoom Fatigue and some of its antecedents (gender, age, duration and frequency of video conferences, burstiness) and outcomes (emotional exhaustion, sleep problems, and technostress), in order to provide further contribution to the construct validity of the scale.

Method

Participants and Procedure

The present research aimed to delve into the phenomenon of Zoom fatigue in the Italian context, and was designed for participants who held video conferences at least once a week on average.

The study was conducted in Italy between July 2021 and August 2022, using convenience sampling. The researchers contacted participants through social networks and asked them to complete an online self-report questionnaire. The questionnaire's cover sheet provided information about the anonymity of participants and their organizations, the confidentiality of the study, and the

voluntariness of participation. All participants gave their informed consent before participating in the research. The research adhered to the Helsinki Declaration and was approved by the ethical committee of the Psychology Department at the University of Milano-Bicocca (protocol number: RM-2021-425). In terms of inclusion criteria, participants had to be at least 18 years old, be employed and use videoconferencing as a work tool. Therefore, only those who reported making at least one video call per day were included.

The sample consisted of 372 white-collar workers, equally divided between females (50%) and males (50%). The average age of the workers was 38.58 years (*SD*=11.94). On average, workers had 14.31 years of total work experience (*SD*=12.49), and an average of 8.64 years of experience at their current company (*SD*=9.49). The majority of participants were either married or cohabiting (52.9%), and 67.7% did not have any children. Most of the workers had permanent job contracts (74.7%), while a smaller percentage had fixed-term contracts (12.1%), and the remaining 13.2% had other types of contracts. The job level was: 18.0% entry level, 19.1% intermediate, 19.4% specialist, 11.3% analyst, 18% manager, 4.6% director, 9.6% other levels. On average, participants reported working remotely between zero and seven days per week (*M*=3.66 days; *SD*= 1.38); 15.9 % did not work remotely. Regarding the frequency of video calls, 22.8% of participants claimed to have an average of one video call per day, 24.2% had two video conferences, 17.5% had three, 15.9% had four, and 19.6% had five or more video calls.

Measures

Zoom fatigue. The technique of Back Translation [24] was used to translate into Italian the 15-item scale of Zoom Fatigue developed by Fauville and colleagues [8]. The items specifically investigated the five dimensions found by the authors in their study [8]: General fatigue (sample item: “How tired do you feel after video conferencing?”), Visual fatigue (e.g., “How irritated do your eyes feel after video conferencing?”), Social fatigue (e.g. “How much do you want to be alone after video conferencing?”), Emotional fatigue (e.g., “How emotionally drained do you feel after video

conferencing?") and Motivational fatigue (e.g., "How often do you feel too tired to do other things after video conferencing?"). All items are measured on a 5-point Likert-scale ranging from 1 = *not at all*, 2 = *slightly*, 3 = *moderately*, 4 = *very* to 5 = *extremely*, except for the two frequency questions (i.e., "How often do you feel like doing nothing after video conferencing?"; "How often do you feel too tired to do other things after video conferencing?"), which used a five-point Likert scale structured as: 1= *never*, 2= *rarely*, 3= *sometimes*, 4= *often*, 5= *always*.

The technique of back translation was also used for the following scales adapted from the original article of Fauville et al. [8]:

Attitudes. Attitude toward video conferences was measured with a three-item Likert-scale (sample item: "How much do you like participating in video conferences", $\alpha = .81$), ranging from 1 = *not at all* to 5 = *extremely*.

Frequency. The average number of conferences per day was measured with a single item "On a typical day, how many video conferences do you participate in" on a 7-point Likert-scale ranging from 1 = *1* to 7 = *7 and more*.

Duration. Participants were asked to indicate "on a typical day, how long does a typical video conference last" on a 4-point Likert-scale ranging from 1 = *less than 15 min*, 2 = *16 to 30 min*, 3 = *31 min to an hour*, and 4 = *more than an hour, considering the average duration.*

Burstiness. Participants were asked to indicate "on a typical day, how much time do you have between your video conferences?" As in the original article of Fauville et al. (2021), burstiness was reversed coded as less time between meetings indicating high burstiness. The response options range from 1 = *more than an hour*, 2 = *31 min to an hour*, 3 = *15 to 30 min*, and 4 = *less than 15 min*.

Technostress creators. To measure the technostress creators, we adopted the Italian Translation of the Technostress Creators Scale [25] consisting of eleven items taken from the technostress creators scale [21]. The scale tapped three different constructs: techno-overload (four items; α = .89; sample item: "I am forced by technology to work much faster"), techno-invasion (three items; α = .81: sample item: "I spend less time with my family due to technology") and techno-complexity (four items, α = .84; sample item: "I need a long time to understand and use new technologies"). Participants used a Likert scale from 1 = *strongly disagree* to 5 = *strongly agree*.

Emotional Exhaustion. The emotional exhaustion scale of the Maslach Burnout Inventory-General Survey (MBI-GS) [[26,27] was used to measure feelings of being emotionally extended and depleted of one's resources (α = .89). The scale comprises five items and includes statements such as "I feel emotionally drained from my work". Items were rated from 0=*never* to 6=*every day*.

Sleep problems. To evaluate sleep problems the Minimal Insomnia Symptom Scale (MISS) was used in its Italian version [28]. The MISS includes three items (α = .75) that cover issues of initiating sleep, waking up in the night, and not feeling refreshed in the morning (e.g., I have difficulty sleeping). Participants used a Likert scale from 0 = *never* to 4 = *always*.

Strategy of analysis

First, we examined the psychometric properties of the items, such as mean, standard deviation, skewness, and kurtosis, using SPSS 28 to ensure the robustness of the analyses. We considered values < |3| [29] to be adequate for asymmetry and kurtosis. Second, since the factor structure of ZEFS has already been previously assessed, we used confirmatory factor analysis (CFA) [30] in MPlus version 8 to evaluate the factorial validity of ZEFS in the Italian context. For the CFA, the method used for estimating was the maximum likelihood (ML). According to literature [31] several

criteria for evaluating the goodness-of-fit were considered, including the χ^2 goodness-of-fit statistic, the root mean square error of approximation (RMSEA), the comparative fit index (CFI), the Tucker–Lewis index (TLI), and the standardized root mean square residual (SRMR). A non-significant value of χ^2 indicates that the proposed model fits the data well. RMSEA values lower than 0.05 indicate a good fit, and values lower than 0.08 indicate an acceptable fit. CFI and TLI values greater than 0.90 indicate an acceptable fit, and values greater than 0.95 indicate a good fit. The SRMR has a range from 0 to 1, with a cutoff criterion of 0.08 and values lower than 0.05 indicating an excellent fit.

Additionally, we verified the internal consistency reliability using Cronbach's α. To assess both convergent and discriminant validity, the following steps were taken: the average variance extracted (AVE) was determined from the measurement model. Acceptable values are above 0.50 for AVE. Additionally, discriminant validity was evaluated by demonstrating that the square root of the AVE for each latent construct was higher than the correlation between that construct and the other latent constructs. Finally, the construct validity was evaluated through Pearson correlation coefficients among the ZEFS score, which is the average rating of all items on the ZEFS, and several constructs, as technostress, emotional exhaustion, sleep problems, video conference use (i.e., frequency, duration, and burstiness), and attitude towards video conferencing. Furthemore, some socio-demographic variables (i.e., gender, age, marital status, contract type, role, number of children, seniority on the job) were also included in the correlation analyses to investigate their associations with ZEFS.

Results

The items showed more than acceptable skewness and kurtosis values, as only one item had a value slightly above |1|. Therefore, it was found to have a general normal distribution for all indicators.

Factorial validity

We tested four models: a one-factor model in which all items loaded on a single factor (M1), an uncorrelated five-factor model in which the five Zoom fatigue dimensions did not correlate with each other (M2), a correlated five-factor model in which the five Zoom fatigue dimensions correlate with each other (M3), and finally a second-order factor model that assumes that the five core factors are best represented by a single general factor (the core of Zoom fatigue; M4). As reported in Table 1, the first two models did not provide an adequate fit to the data. Both M3 and M4 showed an acceptable fit to the data. However, both AIC (Akaike's information criterion) and BIC (Bayesian information criterion) values were slightly better in M4, which had a non-significant increase of the χ^2 value compared with M3 ($\Delta\chi^2 = 6.8$; $\Delta df = 5$; $p = 0.236$). Thus, we chose M4, the one with the second order factor, as the best model, which is graphically represented in Figure 1.

Table 1. Results of CFA, alternative models (N = 372).

	X^2	*df*	*p*	CFI	TLI	RMSEA	SRMR	AIC	BIC
M_1.	1311.42	90	< .001	0.727	0.682	0.191 (0.182, 0.200)	0.081	13633.35	13809.70
M_2.	1246.66	90	< .001	0.742	0.699	0.186 (0.177, 0.195)	0.417	13568.59	13744.94
M_3.	245.78	80	< .001	0.963	0.951	0.075 (0.064, 0.085)	0.038	12587.71	12803.24
M_4.	252.58	85	< .001	0.963	0.954	0.073 (0.063, 0.083)	0.039	12584.50	12780.45

Note.
M_1. 1-factor model.
M_2. 5-factor model, no co-variations between factors.
M_3. 5-factor model, with co-variations between factors.
M_4. Second-order model.

--- please, insert here Figure 1 ---

Reliability

To verify the internal consistency of each zoom fatigue dimension, Cronbach's α was used. Cronbach's α showed values between good and excellent [32] for all subscales of the ZEFS. Specifically, we observed α = 0.87 for the general fatigue subscale, α = 0.94 for the visual subscale, α = 0.86 for the social subscale, α = 0.87 for the emotional subscale, and α = 0.86 for motivational

fatigue subscale.

Construct validity

To assess both convergent and discriminant validity, the following steps were taken: the AVE was determined from the measurement model. The AVE for the five constructs ranged from .69 to .84, which exceeded the acceptable threshold of 0.50. Specifically, we observed 0.69 for the general fatigue dimension, 0.84 for the visual subscale, 0.69 for the social dimension, 0.70 for the emotional subscale, and 0.69 for the motivational fatigue factor. Discriminant validity was assessed by ensuring that the square root of the AVE for each latent construct was greater than the correlation between that construct and the other constructs. The results showed that discriminant validity was also acceptable (as shown in Table 2). The total score of Zoom fatigue and all the five dimensions positively correlated with each other.

Table 2. Means, standard deviations and correlations among the Zoom Fatigue score and each dimension of zoom fatigue (N = 372).

	1	*2*	*3*	*4*	*5*	*6*
***1*. Zoom fatigue**	-					
***2*. General fatigue**	0.83**	**0.83**				
***3*. Visual fatigue**	0.77**	0.56**	**0.92**			
***4*. Social fatigue**	0.84**	0.62**	0.51**	**0.83**		
***5*. Emotional fatigue**	0.87**	0.66**	0.58**	0.70**	**0.84**	
***6*. Motivational fatigue**	0.87**	0.69**	0.54**	0.66**	0.73**	**0.83**
M	2.49	2.75	2.58	2.38	2.21	2.52
SD	0.83	0.88	1.07	1.03	0.94	1.04

Note. ** $p < 0.001$; *M*=Mean; *SD*= Standard Deviation; Diagonal elements (in bold) are square roots of AVE.

Finally, Table 3 shows the associations between the ZEFS and several constructs. All the correlations were significant and in the expected direction: Zoom fatigue positively correlated with sleep problems, emotional exhaustion and the three techno-stressors (namely techno-overload,

techno-invasion and techno-complexity), while the correlation between Zoom fatigue and attitudes toward video conferences was negative. Moreover, the total score of Zoom fatigue was positively correlated with the frequency of video conferences and burstiness, while the correlation with duration was not significant. Furthermore, as regards socio-demographic variables, Zoom fatigue was positively correlated to female gender and negatively correlated with age. Also, it was negatively correlated with being married or cohabiting, number of children, job tenure and having a permanent contract, while it was positively correlated with remote working. The managerial role did not correlate with ZEFS. The latter findings can be found in the Appendix.

Table 3. Means, standard deviations, and correlations among ZEFS and other related constructs (N = 372).

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
***1*. Zoom fatigue**	-											
***2*. Sleep problems**	0.35**	-										
***3*. Emotional exhaustion**	0.54**	0.49**	-									
***4*. Attitudes**	−0.47**	−0.22**	−0.32**	-								
***5*. Techno-overload**	0.45**	0.33**	0.47**	−0.26**	-							
***6*. Techno-invasion**	0.40**	0.34**	0.41**	−0.26**	0.63**	-						
***7*. Techno-complexity**	0.29**	0.24**	0.29**	−0.18**	0.37**	0.41**	-					
***8*. Frequency**	0.13**	0.03	0.17**	0.01	0.12*	0.13*	−0.03	-				
***9*. Duration**	0.04	−0.01	−0.03	0.02	−0.03	−0.05	−0.05	0.09	-			
***10*. Burstiness**	0.15**	0.14**	0.16**	−0.01	0.13*	0.14**	−0.02	0.53**	0.21**	-		
***11*. Gender (1=F)**	0.16**	0.11*	0.08	−0.02	0.04	0.06	0.01	−0.01	0.08	0.05	-	
***12*. Age**	−0.31**	−0.05	−0.22**	0.22**	−0.05	−0.02	0.12*	0.05	0.05	0.11*	−0.19**	-
M	2.49	1.67	2.74	3.16	2.71	2.44	1.91	3.00	2.85	2.09	-	38.58
SD	0.83	1.03	1.42	0.83	1.10	1.12	0.85	1.72	0.70	1.11	-	11.94

Note. ** $p < 0.01$; * $p < 0.05$; *M*= Mean; *SD*= Standard Deviation; Gender: 1= Female.

Discussion

The COVID-19 pandemic's constraints have boosted the usage of videoconferencing in many contexts and nations, emphasizing the significance of analyzing the psychological effect of its use. The ZEFS, an instrument designed to quantify the amount of fatigue produced by videoconferencing, was translated into Italian and validated in this study. Particularly, the psychometric features of the Italian ZEFS were examined in an Italian working population, as well as the relationships between Zoom fatigue and some of its antecedents (namely gender, age, duration and frequency of video conferences, burstiness) and outcomes (namely emotional exhaustion, sleep problems, and technostress).

Regarding ZEFS factorial validity, the confirmatory factor analysis (CFA) results showed acceptable ranges, supporting the reliability and validity of the ZEFS instrument in this population. In addition, from model comparisons performed, the model with a second-order factor (core Zoom fatigue) was found to be the model with a better fit. These results are in line with the validation study by Fauville et al. [8] Confirming the presence of a second-order factor in explaining the core of Zoom fatigue can be considered a significant achievement which underscores the importance of simultaneously intervening on the different factors to reduce Zoom fatigue.

Regarding the ZEFS internal consistency, our results indicated good and excellent values for all subscales. These results align with previous studies [e.g., [8,10,12]. Finally, we confirmed the Italian ZEFS's construct validity and found an association between ZEFS dimensions and several constructs. Specifically, our results showed that Zoom fatigue positively correlated with sleep problems, emotional exhaustion and the three techno-stressors (namely techno-overload, techno-invasion and techno-complexity). These results are conceptually in line with other research. For example, scholars suggest that exhaustion is associated with bad physical health outcomes, such as sleep problems, which are difficult to cure owing to their long-term nature [33]. The dimension of emotional fatigue, in particular, can hurt other aspects of a person's life. Fatigue and exhaustion reduce the desire to act, causing people to avoid jobs or activities that involve cognitive or physical exertion [5]. One of the long-term consequences could indeed be found in the reported sleep

disturbances. Another study by Salim et al. [33] shows a strong to moderate correlation between Zoom fatigue and sleep problems.

Concerning emotional exhaustion, if people attend many videoconferences each day, with few and brief pauses in between, they may develop not only Zoom fatigue but also burnout symptoms [34]. As regards technostress and Zoom fatigue correlations, the link between stress and fatigue is well documented in the general stress literature [35–37] , and this association extends to technostress and video conference fatigue research as well. For example, a study by Le et al. [38] showed that the techno-complexity is directly and significantly associated with videoconference fatigue. Another study points out that managing the different technological features of a videoconferencing system can create technostress, which could lead to different elements of videoconferencing fatigue [39] and negatively correlated with attitudes toward video conferences.

Furthermore, the total score of Zoom fatigue was positively correlated with the frequency of video conferences and burstiness. However, the correlation with duration was not significant. Previous studies demonstrate the association between the number of videoconferences and Zoom fatigue [e.g., 8,40]. It is indeed quite reasonable to think that the greater the number of video conferences held during the day, occasionally without sufficient time to recover between them, the greater the feeling of exhaustion that is experienced by workers. Finally, similar to previous research [15,34], females had greater Zoom fatigue ratings than men and younger individuals were likelier to report Zoom fatigue symptoms. In general, various gender effects in nonverbal communication may be involved in the experience of Zoom fatigue. Women, for example, tend to display more facial expressions than males [15,41], with evidence showing that this difference is related to being aware of being viewed and feeling self-awareness [16]. Regarding interpreting nonverbal behavior, women recall details about other people's looks and nonverbal actions better than males [15,16,42] Women may be more affected by the cognitive burden involved with these nonverbal techniques than males. Moreover, younger people are more likely to perform remote work that involves video conferencing and, thus, leads to experiencing more symptoms related to

Zoom fatigue. Finally, in an exploratory manner, we also examined the relationship between ZEFS and other socio-demographic variables. Specifically, the study reveals that ZEFS displayed negative correlation with being married or cohabiting, job tenure, number of children, and having a permanent contract. On the other hand, ZEFS showed a positive correlation with remote working. There was, however, no correlation between ZEFS and managerial role. These findings could be further explored in future studies.

The study is not without limitations. The first limitation concerns sample selection. Since we used a convenience sampling procedure, it is not representative of the Italian working population in general. Moreover, it is a cross-sectional study, while a longitudinal design would be more appropriate to investigate the reliability of the measure also by means of a test-retest procedure. Finally, this study considered only single-source self-report data, which implies the possibility of common method bias [48]. Additional instruments may be beneficial in future research [49]. For example, objective indicators, particularly the actual number and length of videoconferences, and/or ratings by others are needed in future studies to minimize the potential impact of common method variance.

Conclusion

The present study examined the psychometric properties of the Italian version of the ZEFS and confirmed that it is a valid instrument for assessing Zoom fatigue in the Italian context. The validation of the ZEFS in Italian is important because it helps to better understand the phenomenon of videoconferencing fatigue among Italian people, taking into account the peculiarities of the Italian context and the widespread use of videoconferencing as a work tool. In addition to a better understanding of the phenomenon, this validation offers practical benefits. For example, it allows mental health professionals and researchers to adapt their strategies and solutions to address the problem in a more targeted way, considering the specificities of the Italian population. This can lead

to improved effectiveness of implementable interventions. In addition, validation in Italian allows for more accurate and specific research on 'Zoom fatigue' within the Italian community. This is important because it can lead to a better understanding of the underlying causes, specific risk factors and possible interventions to address the problem in this population. Finally, it helps to raise awareness of the importance of addressing Zoom fatigue among the Italian public and may encourage a broader discussion on stress management related to videoconferencing and technology. This awareness may lead to more responsible use of technology and greater attention to mental health in the context of digital communication.

Disclosure statement

No potential conflict of interest was reported by the authors.

Appendix 1

Appendix 1. Means, standard deviations and correlations among the Zoom Fatigue score and each socio-demographic variables (N = 372).

	1	*2*	*3*	*4*	*5*	*6*	*7*
***1*. Zoom fatigue**	-						
***2*. Marital status (1=married/cohabiting)**	-.17**	-					
***3*. Number of children**	-.24**	.47**	-				
***4*. Job contract (1=permanent)**	-.23**	.22**	.31**	-			
***5*. Role (1=manager)**	-.09	.26**	.23**	.23**	-		
***6*. Remote working (1=yes)**	.15**	-.10	-.10*	-.05	.01	-	
***7*. Job tenure**	-.27**	.42**	.60**	.36**	.32**		-

Note. ** $p < 0.001$; * $p < 0.05$

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