My home is my new office: The relationship between environmental comfort, workplace attachment, and psychological needs in the context of remote working

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ABSTRACT

As a result of the COVID-19 pandemic, more and more organizations have implemented remote working, and more and more workers have experienced an overlap between home and work environments. Home environments, therefore, had to be readjusted in their spatial configurations to meet and satisfy the needs of workers. Through the lens of Self-Determination Theory, the study aims to investigate how perceived remote workplace environment quality indicators (PRWEQIs) can contribute to greater home working engagement through the satisfaction of autonomy, competence, and relatedness needs and attachment to the home workplace. The research consists of two cross-sectional studies. The first one examines how the place-related needs of autonomy, competence, and relationship, satisfied by the home working place features, can mediate the effect of perceived comfort on home workplace attachment. The second study analyzes how comfort and workplace attachment can contribute to satisfying the same needs referred to the job activities, thus generating greater engagement in the home worker. The research provides supportive empirical evidence that workplace attachment can also be developed under home working conditions.

1. Introduction

In late 2019 and early 2020, the COVID-19 pandemic caused global upheavals. Lockdowns changed societal habits, leading to social isolation and a significant shift to remote work, and particularly in the configuration where workdays and tasks are conducted within one's domestic environment. The expressions "remote working," "e-working," and "smart working" are used to refer, often undifferentially, to those types of work activities that can be conducted at any time, any place and are characterized by intensive and extensive use of technology to foster flexible work practices (Grant et al., 2013). Despite this definition, as noted by Smite, Christensen, Tell, and Russo (2023), in the context of remote work, temporal flexibility and autonomy in choosing the work location often do not coincide. Indeed, while all remote work configurations allow autonomy in choosing where to work (i.e., work from anywhere), and particularly in the adaptation of the home environment as a workplace (i.e., work from home, home working, or home office), temporal flexibility may not be guaranteed. This can restrict work activities to the same time span used in traditional office settings.

According to Eurostat (2022), 24% of Eurozone workers worked remotely in 2021, up from 14% in 2019. In Italy, the pandemic accelerated remote work adoption. Before the pandemic, 87.6% of workers had never worked remotely (INPS – Direzione Centrale Studi e Ricerche, 2021). According to data from the "Osservatorio per lo Smart Working" of the Politecnico di Milano (2022), during the emergency, remote work involved 5.47 million workers (33% of the workforce), decreasing to 4 million in 2021 and 3.6 million in 2022, mainly in large organizations, with an average of 3.4 days per week worked remotely. Although the scientific literature on remote working is expanding year by year, to date, the results constitute what has been referred to as the paradox of mutually incompatible consequences for remote employees (Gajendran & Harrison, 2007). This paradox is due to the often contradictory results that have characterized research on remote working. For this reason, before understanding whether remote working has become the "new normal" in the world of work, it is necessary to understand better which of its configurations can lead to a real positive impact on the worker and the organization. Some studies show remote work leads to less stress (Kröll et al., 2017; Delanoeije & Verbruggen, 2020) and higher

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engagement (Mäkikangas et al., 2022; Masuda et al., 2017) and productivity (Golden & Gajendran, 2019), while others show no significant or opposite effects (Henke et al., 2015; de Vries et al., 2019; Narayanamurthy & Tortorella, 2021). With the rise in remote and home-based work, the scientific literature on employment and organizational consequences has expanded, yet the exploration of new working environments remains limited. Remote work often leads to an overlap between home and work settings, creating dedicated home workspaces. This overlap breaks down the traditional barriers separating family life from work life (Mann et al., 2000; Russell et al., 2021). Home environments, such as bedrooms or kitchens, may not be ideal for work tasks. Adisa et al. (2021) found that remote workers sharing spaces with family members or roommates experienced declines in well-being, engagement, and productivity. Remote work offers autonomy and flexibility in workspaces (Gajendran & Harrison, 2007; Maruyama & Tietze, 2012), making the domestic environment's physical and spatial characteristics crucial for studying work well-being. Evidence shows that the home environment can positively influence well-being (Emami & Sadeghlou, 2021). The home carries symbolic significance, representing both physical and material aspects and identity meanings tied to memories and experiences (Rowles & Bernard, 2013). This dual identity becomes important when the home also serves as a workplace. Müller et al. (2022) found that a suitable workplace, quiet, distraction-free, and well-equipped, enhances remote work performance. In South Korea, noise annoyance at home was linked to reduced job satisfaction and performance (Park, Shin, & Kim, 2023). Factors such as temperature, room size, and separate workstations positively impact performance and well-being by reducing discomfort (Awada et al., 2021; Xiao et al., 2021). Bergefurt et al. (2022) examined Indoor Environmental Quality (IEQ) factors on mental health during the COVID-19 pandemic. Daylight, outdoor views, artificial light, privacy, and greenery in the home office positively influenced well-being and concentration while reducing stress and arousal. Perception of a private, trouble-free remote work environment correlated with better online interactions and work focus. Finally, Mura et al. (2023a) found that perceived environmental comfort (acoustic and visual comfort, quality furnishings, safety, and space usability) was positively related to work engagement and remote job satisfaction and negatively to work-related stress.

1.1. Workplace environmental comfort and occupational well-being

Each place represents the context in which we perform our daily activities. This context is not merely a "background" but is characterized by the presence of physical and social elements and stimuli, whose perception and evaluation constitute the first step in the process of adapting to the space. In this regard, consistent with the theoretical framework proposed by Shin (2016), the assessment of environmental qualities follows the distinction between environmental satisfaction and comfort. "Environmental satisfaction" refers to an individual's subjective assessment of how well a specific environment meets their expectations and needs, as well as how positively they regard it (Bonaiuto & Alves, 2012). This evaluation is significantly shaped by the person's experiences, needs, and expectations (Elder et al., 2003). Unlike satisfaction, the notion of "comfort" is predominantly used in environmental design research to explore the physical and physiological sensations, along with the perception of particular environmental stimuli from the immediate environment (Shin, 2016). Consequently, the perception of comfort involves measuring environmental elements as objectively as possible, without implicit or explicit reference to individual preferences. This type of assessment can therefore be conducted by experts (Bonnes & Bonaiuto, 1995) or through the use of "naïve" environmental evaluations or observation-based assessments (Gifford, 2002) that rely on perceptual evaluation data collected from individuals who observe or use the environment. The physical elements of a workplace, and therefore the relative perception of comfort, may be considered valuable assets for the job if they effectively contribute to accomplishing work

objectives and/or fostering personal goals and development (Bakker & Xanthopoulou, 2013). Creating a worker-tailored and worker-centered work environment contributes to occupational well-being and a competitive advantage for the whole organization (Scrima et al., 2022). Just as the COVID-19 pandemic has been an accelerator for the partial migration from classic, centralized offices to home office, so previous changes in the organizational world, such as the advent of new technologies, the digitization of work or different approaches to leadership, have modulated and influenced the architecture of workspaces (Challenger, 2000). Among these changes, the most noticeable one concerns the entire office layout, which, according to Kallio et al. (2015), with its spatial configuration and organization, represents the first impact of organizational culture and how work is organized. In this regard, many researchers have demonstrated the negative effects of large open-plan offices, which, while from one point of view provide more significant savings and control for the organization, from the other side are characterized by acoustic discomfort and distraction, resulting in declines on productivity and job satisfaction (Haapakangas et al., 2018; Hongisto et al., 2016). More recently, increasing attention has been given to the study of Activity-Based Workplaces (ABWs), a spatial configuration in which there are no fixed workstations and where workers can move freely from one space to another depending on the work task at hand. The results, however, are still mixed and contradictory (Bhave et al., 2020). While these particular configurations have often been found to be better than classic open-plan offices (e.g., Jahncke & Hallman, 2020), negative or non-significant effects emerge when compared with private offices (e.g., Haapakangas et al., 2019; Halldorsson et al., 2021). In addition to layout, many researchers have focused on specific environmental elements identifiable with indoor environmental quality (IEQ) factors, i.e., all those elements that, in addition to the objective evaluation by designers, can be analyzed in terms of individual perception and satisfaction (Kim & de Dear, 2013). For all major IEQs, such as acoustic comfort, natural and/or artificial lighting, thermal comfort, and air quality, research has shown a positive effect on occupational well-being (Rashid & Zimring, 2008). Experiential privacy within the workplace is another element that links the layout of offices and various IEQs. As defined by Sundstrom et al. (1986), this aspect is characterized by conversational and acoustic privacy, which relate to the ability to exchange information without being eavesdropped on or disturbed by third parties, and visual privacy, which is the ability to isolate oneself and have a space dedicated to one's activity.

1.2. Basic psychological needs and well-being

The relationship between a worker and their work environment can be understood through the lens of the Person-Environment Fit Theory (Edwards et al., 1998; Van Vianen, 2018). According to this perspective, workers seek contexts that align with their needs, creating a perfect fit with the environment. It is crucial that the physical environment, including the office's spatial characteristics, meets workers' needs and preferences, a concept referred to as "need-space fit" by Gaudiino and Di Stefano (2023). Satisfying certain basic needs forms the foundation for human motivation. Self-Determination Theory (SDT; Ryan & Deci, 2000) posits that specific psychological and social nutrients, when fulfilled within an individual's interpersonal and cultural contexts, facilitate growth, integrity, and well-being. SDT outlines a continuum of human motivation, from amotivation to intrinsic motivation, passing through stages such as external regulation, introjected regulation, identified regulation, and integrated regulation (Gagné, 2014). Basic Psychological Need Theory (BPNT; Ryan et al., 1995), a sub-theory of SDT, suggests that an individual's position on this motivational continuum depends on the satisfaction of three basic and universal needs: autonomy, competence, and relatedness. The need for autonomy involves the intrinsic desire to feel volitional and experience psychological freedom in activities (Ryan & Deci, 2000). The need for competence pertains to the intrinsic desire to feel effective in interacting with the

environment (White, 1959). Finally, the need for relatedness involves the intrinsic propensity to feel connected with others, to be part of a group, and to love and care for others while feeling loved and cared for in return (Ryan & Deci, 2019). Since its inception, SDT has been applied to various contexts to study the motivation behind different human behaviors. These include sports (e.g., Block et al., 2022), academic activities (e.g., Johansen et al., 2023), acceptance of new technologies (e. g., Burnell et al., 2023), societal development (e.g., Mosca et al., 2023), and environmental protection behaviors (e.g., Baxter & Pelletier, 2020). In organizational contexts, SDT has been applied successfully to understand and enhance employee motivation and well-being. Meeting the needs for autonomy, competence, and relatedness is critical not only for promoting employee well-being but also for achieving the organization's strategic and economic goals (Coxen & Rothmann, 2021; Slemp et al., 2021). This approach underscores the importance of creating work environments that cater to these fundamental needs, thereby fostering a more motivated, satisfied, and productive workforce.

1.3. Workplace attachment and needs

Over the past 50 years, place attachment has been one of the most studied constructs concerning the relationship between the physical environment and the individual and has attracted researchers' attention in various human sciences. Referring to the seminal works in interpersonal attachment (Ainsworth, 1979; Bowlby, 1969, 1982), a place can be characterized as a "safe haven" when it facilitates the fulfillment of the individual's particular needs. This is evident when individuals utilize a place to seek refuge from threats, engage in problem-solving activities, and experience emotional relief (Scannell et al., 2021). Therefore, the place can become an object of attachment (Scrima et al., 2017; Stancu et al., 2020). Recently, drawing from Bowlby's perspective (1969; 1982), some authors (e.g., Rioux, 2006; Scrima, 2015) have interpreted place attachment as dependent on the interaction between self-perception and perception of the place. The interplay between these two aspects and their positive or negative nature delineate three styles of workplace attachment: secure (positive self/positive place), anxious (negative self/positive place), and avoidant (positive self/negative place). Although there is no clear and unambiguous definition of place attachment (Lewicka, 2011; Scannell & Gifford, 2010), most researchers agree in identifying it with the affective bond that an individual creates with a meaningful place and which, in addition to the affective component, includes cognitive and behavioral components (e.g., Giuliani, 2003; Low & Altman, 1992). Although place attachment has been defined and operationalized in divergent ways, such as in the case of the sense of place (Jorgensen & Stedman, 2001), the person-process-place (PPP) framework (Scannell & Gifford, 2010) or by reconnecting it to the more classical interpersonal perspective (e.g., Scrima et al., 2017; Scrima, 2020), a precise taxonomy regarding the antecedents of the place attachment has not yet been produced. Following the PPP framework, place attachment would be a multidimensional construct resulting from the interaction between the personal dimension, place characteristics, and psychological processes (i.e., affect, cognition, and behavior). A place can become an object of attachment as it carries emotions, experiences, and meanings (Manzo, 2005) and contributes to realizing individual goals (La Guardia & Patrick, 2008). Attachment then depends on the physical and social characteristics of the place itself (e.g., Hidalgo & Hernandez, 2001; Lewicka, 2011). In the study by Bonaiuto et al. (1999) and subsequent studies (e.g., Bonaiuto et al., 2015; Fornara et al., 2010), it was found that architectural and town-planning, social relations, context features and punctual and in-network services of the neighborhood of residence, combined with the length of residence, thus picking up the personal dimension of PPP framework, were good predictors of place attachment. More recently, some research has hypothesized how the physical and functional characteristics of the place, through the satisfaction of specific psychological needs, can generate the feeling of affective attachment to the place. In

his correlational study, Landon et al. (2021), taking up the three dimensions of sense of place (i.e., attachment, dependence, and place identity; Jorgensen & Stedman, 2001) showed how it was dependent on the ability of wilderness areas to satisfy basic psychological needs for autonomy, competence, and relatedness. These results were later confirmed experimentally in the context of evacuation sites and environmental risk (Ariccio et al., 2021). When these places enabled the satisfaction of the three needs of SDT (Ryan & Deci, 2000), as well as those of, for example, uniqueness, closeness, comfort, and activity support, the participants who were to evaluate the evacuation sites not only rated them correctly and positively but also demonstrated increased feelings of place attachment. The study of attachment to place has been applied to different contexts, such as the home and residential environments (Bonaiuto et al., 2006; Fornara et al., 2018) and natural places (e.g., Colley & Craig, 2019; Landon et al., 2021) and different populations, such as children (e.g., De Dominicis et al., 2017; Scannell et al., 2016), elderly (e.g., Fornara et al., 2019; Fornara & Manca, 2017) or victims of environmental or social disasters and forced to leave the place of attachment (e.g., Albers et al., 2021; Ariccio et al., 2021). In recent years, more and more attention has been given to work environments and the potential positive effects of workplace attachment on occupational well-being. According to Inalhan and Finch (2004), designing a work environment that meets the worker's needs can contribute to developing an attachment to the workplace and the organization as a whole. This was confirmed in research by Velasco and Rioux (2010), where workers with higher workplace attachment also reported higher levels of commitment to the organization. Further empirical research has confirmed that attachment to a work environment centered on the worker and his or her needs is an important predictor of key organizational outcomes, such as well-being (e.g., Rioux, 2005, 2006), engagement (e.g., Hamel et al., 2023; Mura et al., 2023b), job satisfaction (e.g., Scrima et al., 2019), organizational citizenship behaviors (e.g., Bruny et al., 2023; Nonnis et al., 2022; Rioux & Pavalache-Ilie, 2013), and protection from symptoms of work-related stress and emotional exhaustion (e.g., Rebillon et al., 2023; Scrima et al., 2021).

1.4. The present study

With the present research, we aspire to extend the scientific literature concerning the relationship between home working environments, basic psychological needs, and work well-being. The research consists of two cross-sectional studies conducted on two samples of Italian employees who, when completing self-report questionnaires, were working at least one day per week remotely, specifically within their home environment. The first study will explore the antecedents underlying attachment to the home workplace through the lens of Self-Determination Theory. The second study will analyze how this form of attachment to the home workplace can contribute to meeting the needs for autonomy, competence, and relatedness and increased engagement in the home worker.

2. Study 1

2.1. Aim and hypotheses

The study aims to analyze, through the lenses of Self-Determination Theory (SDT; Ryan & Deci, 2000), how the environmental characteristics of the home workplace, through the satisfaction of autonomy, competence, and relatedness place-related needs, can contribute to creating the affective bond of home workplace attachment. Just as with interpersonal attachment, where the characteristics of the attachment figure, by satisfying specific relational needs, facilitate the development of attachment relationships (La Guardia & Patrick, 2008), similarly, as highlighted in the literature (e.g., Ariccio et al., 2021; Droseltis & Vignoles, 2010; Landon et al., 2021), the characteristics of place, conceived as an object of attachment, through the satisfaction of specific

person-environment relational needs, facilitate the development of place attachment. In the case of place-related needs identified by SDT, therefore, the characteristics of the place should ensure autonomy and competence in its management and daily tasks, and facilitate an optimal level of relationship with other social actors within the space. Specifically, it is hypothesized that.

H1. Perceived comfort in the home working environment (PRWEQIs) is positively associated with satisfaction of place-related needs of autonomy (H1a), competence (H1b), and relatedness (H1c).

H2. Satisfaction of place-related needs of autonomy (H2a), competence (H2b), and relatedness (H2c) is positively associated with attachment to the home workplace.

H3. Perception of comfort in the home working environment (PRWEQIs), through supporting the satisfaction of place-related needs of autonomy (H3a), competence (H3b), and relatedness (H3c), is positively associated with attachment to the home workplace.

2.2. Method

2.2.1. Participants

The research sample consisted of 307 Italian workers with clerical roles and duties, recruited from public (15.6%) and private (84.4%) organizations who were working at least one remote workday per week at the time of compilation (February–March 2023). The entire sample indicated their home environment as the place used for remote work, of which 171 (55.7%) identified themselves as men, with an average age of 33 years ($SD = 8.92$; min $= 20$; max $= 63$) and organizational seniority between 1 and 40 years ($M = 4.58$; $SD = 5.78$). On average, the sample worked remotely for 3.21 working days per week ($SD = 1.40$). Table 1 shows the sociodemographic characteristics of the sample.

2.2.2. Tools and procedure

The research was conducted in full compliance with the Ethical Principles of Psychologists and Code of Conduct of the American Psychological Association (APA) and was authorized by the Ethics Committee of Sapienza University of Rome (approval number 85/203, dated September 27, 2023). Participants were recruited from appropriately trained psychology trainees. After being informed about the purposes of the study and reading and completing the informed consent for data processing, participants completed an online self-report questionnaire containing the following measures.

Perceived Remote Workplace Environment Quality Indicators (PRWE-QIs; Mura et al., 2023a). The scale consists of 15 items (Alpha $= 0.86$) to assess perceived environmental comfort in the setting used for remote work, investigating aspects of acoustic comfort (e.g., *"The room where I* work is quiet enough"*), visual comfort (e.g., *"In this room during the day, there is enough natural light"*), quality of furnishing (e.g., *"The furnishings in this room are in good condition"*), safety (e.g., *"In this room, I can move safely"*) and space usability (e.g., *"In this workstation, I have all the equipment necessary for the work activity at hand"*).

Place-related SDT Basic Psychological Need Satisfaction. Nine items were adapted from the Basic Need Satisfaction in Relationships scale (La Guardia et al., 2000) and Ariccio and colleagues' (2021) study. The items analyze how well the home workplace meets the needs for autonomy (3 items; Alpha $= 0.71$; e.g., *"This place makes me feel free to make my own decisions"*), competence (3 items; Alpha $= 0.84$; *"This place makes me feel able to complete challenging activities"*), and relatedness (3 items; Alpha $= 0.85$; e.g., *"This place makes me feel emotionally close to other people"*).

Home Workplace Attachment. We adapted to the home working context the four items (Alpha $= 0.83$; e.g., *"This workplace is my favorite place to work"*) of the place attachment factor of the Sense of Place scale (Jorgensen & Stedman, 2001).

For all measures, the scale used was a 5-step Likert scale (1 = *"Strongly disagree"*; 5 = *"Strongly agree"*). At the end of the questionnaire, sociodemographic data were collected from the study participants (gender, age, organizational seniority and sector, and days worked at home per week). In the Appendix, all the items used and their respective instructions are reported.

2.2.3. Data analysis

Research hypotheses were tested through model 4 of the PROCESS macro v3.5 (Hayes, 2017) of the SPSS v.26 software, setting perceived comfort in the home working environment (PRWEQIs) as the independent variable (IV), the three needs of SDT (autonomy, competence, and relatedness) as parallel mediators and home workplace attachment as dependent variable (DV). We also performed calculations for the bootstrap confidence interval to assess all three mediations' indirect effects utilizing 95% confidence intervals and 10000 bootstrapping iterations. Gender, age, and home working days per week were entered into the model as covariates. In addition to preliminary analyses and correlations between variables, a Confirmatory Factor Analysis (CFA) was conducted using the statistical software Jamovi 2.2.5 (2021) to assess the factorial structure of the PRWEQIs. A *priori* power analysis was conducted using Monte Carlo simulation using the statistical tool by Schoemann et al. (2017), estimating a small-to-medium effect for the relationship between all variables in the model with 5000 Power Analysis Replications (20000 Monte Carlo Draws for Replications) and a confidence level of 95%. The minimum required sample size was 306 subjects. The sample collected was sufficient to achieve a power of 0.80 in estimating all three indirect effects.

2.3. Results

2.3.1. Preliminary analysis

As a preliminary analysis to exclude the potential presence of common method bias, Harman's single-factor test (Podsakoff et al., 2003) was conducted. The results of the exploratory factor analysis (EFA) performed on all variables (i.e., 28 total items) indicated that the single factor accounted for 31.8% of the total variance, which did not exceed the 50% threshold. Therefore, the presence of common method bias was excluded. To confirm the statistical structure of the Perceived Remote Workplace Environment Quality Indicators (PRWEQIs), a Confirmatory Factor Analysis (CFA) was conducted through the statistical software Jamovi 2.2.5 (2021). The results presented in Table 2 show that the single-factor model (Model A) does not report satisfactory fit indices, unlike Models B and C (Hu & Bentler, 1999; Kline, 2011; Schermelleh-Engel et al., 2003). To compare the two remaining alternative models (with nested parameters), a chi-squared difference test was conducted between the more constrained model (model C) and the less constrained model (model B). Since the chi-square test was not significant ($\Delta\chi^2 =$

Table 1
Sociodemographic characteristics of participants.

	n	%
Gender		
Male	171	55.7%
Female	136	44.3%
Organizational sector		
Public organization	48	15.6%
Private organization	259	84.4%
Days working from home per week		
1	34	11.1%
2	72	23.5%
3	74	24.1%
4	58	18.9%
5	61	19.9%
6	8	2.6%

Note: $N = 307$. Participants were on average 33 years old ($SD = 8.92$; min $= 20$; max $= 63$) and with an average organizational seniority of 4.58 years ($SD = 5.78$; min $= 1$; max $= 40$).

Table 2
CFA for perceived remote workplace environment quality indicators (PRWEQIs).

PRWEQIs	χ^2	df	p	χ^2/df	CFI	NNFI	SRMR	RMSEA [90% CI]
Model A: 1-Factor	1084.22	90	<0.001	12.05	0.53	0.45	0.14	0.19 [0.18, 0.20]
Model B: 5-Factor	127.40	80	<0.001	1.59	0.98	0.97	0.04	0.04 [0.03, 0.06]
Model C: 5-Factor + 1 Second Order Factor	133.10	85	<0.001	1.57	0.98	0.97	0.04	0.04 [0.03, 0.06]

Note: CFI = comparative fit index; NNFI = (Non) Normed Fit Index; SRMR = (Standardized) Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation.

5.66; Δdf = 5; p = 0.34), it was possible to present the model for consideration with a second-order factor related to perceived environmental comfort in the remote work context (Pavlov et al., 2020). Table 3 displays means, assessment of univariate normality, and correlations between the investigated variables. The normality assumption was not violated for any of the measures, as evidenced by skewness and kurtosis values falling within the range of −1 to +1. From the correlation analysis, the satisfaction of the three place-related needs identified by Self-Determination Theory correlated positively with each other: the satisfaction of the need for autonomy was found to be positively correlated with the satisfaction of the need for competence (r = 0.65, p < 0.001), and the satisfaction of the need for relatedness (r = 0.27, p < 0.001), which in turn correlated positively with the satisfaction of the need for competence (r = 0.39, p < 0.001). Higher levels of perceived comfort in the home working environment (PRWEQIs) were found to be associated with high levels of satisfaction with the needs for autonomy (r = 0.52, p < 0.001), competence (r = 0.75, p < 0.001), relatedness (r = 0.27, p < 0.001), and attachment to the same home workplace (r = 0.44, p < 0.001). The latter variable was also positively correlated with the satisfaction of the needs for autonomy (r = 0.49, p < 0.001), competence (r = 0.51, p < 0.001), and relatedness (r = 0.43, p < 0.001). Regarding socio-demographic variables, gender and remote workdays did not correlate with any of the study variables. In contrast, age was found to be positively correlated with place-related need satisfaction of competence (r = 0.16, p < 0.01) and relatedness (r = 0.14, p < 0.05) and perceived comfort in home working environment (r = 0.15, p < 0.05).

2.3.2. Model testing

Fig. 1 shows the results of the parallel mediation model. Analysis of the results showed a significant total effect for the overall model (B = 0.73, p < 0.001), confirming all research hypotheses. As expected, a direct effect of perceived comfort (PRWEQIs) on home workplace attachment emerged (B = 0.27, p < 0.01), explaining 22% of the variance. On the direct effect, no statistically significant effect of covariates (gender, age, and remote work days) emerged. Overall, it emerged that better environmental configurations from a physical-spatial perspective were associated with higher levels of home workplace attachment. Regarding the relationship between comfort and satisfaction of the place-related needs, H1 was fully supported. Indeed, statistically significant positive effects emerged in the relationship between PRWEQIs and the satisfaction of the PR-N for autonomy (H1a: B = 0.55, p < 0.001), competence (H1b: B = 0.79, p < 0.001), and relatedness (H1c: B

= 0.47, p < 0.001), explaining 29%, 36% and 9% of the variance, respectively. Also, for H1, there were no statistically significant effects of gender, age, and remote work days. The results also supported the hypotheses regarding H2; the dependent variable, home workplace attachment, was positively associated with the satisfaction of the PR-N for autonomy (H2a: B = 0.38, p < 0.001), competence (H2b: B = 0.17, p < 0.05), and relatedness (H3b: B = 0.24, p < 0.001), explaining 41% of the variance. Significant effects of gender, age, and remote work days did not emerge for H2 either. Finally, concerning H3, the indirect effects analysis confirmed how the comfort experienced in the home working environment that supports the satisfaction of place-related needs of autonomy, competence, and relatedness might contribute to greater home workplace attachment. Indeed, partial mediating effects emerged from the satisfaction of the PR-Ns for autonomy (H3a: B = 0.21, *BootSE* = 0.06, *BootLLCI* = 0.07, *BootULCI* = 0.33), competence (H3b: B = 0.14, *BootSE* = 0.07, *BootLLCI* = 0.01, *BootULCI* = 0.21), and relatedness (H3c: B = 0.12, *BootSE* = 0.03, *BootLLCI* = 0.06, *BootULCI* = 0.18) regarding the relationship between PRWEQIs and home workplace attachment.

2.4. Discussion

Drawing on the classic literature on interpersonal attachment (Ainsworth, 1979; Bowlby, 1969, 1982), a place can be defined as a "safe haven" when it satisfies specific individual needs, such as providing a retreat from threats, a space for problem-solving, and a source of emotional relief (Scannell et al., 2021, p. 47). While many parallels exist between interpersonal attachment theory and place attachment (Scannell & Gifford, 2014), it remains essential to elucidate the characteristics that make a place a safe haven. Each place of attachment carries memories, emotions, and distinctive physical and environmental features. According to the person-process-place (PPP) framework (Scannell & Gifford, 2010), the physical and spatial aspects of a place are one of the three dimensions of place attachment. For an attachment bond to form, these characteristics must align with the specific needs related to interaction with the place. This aspect is significant because individuals may feel attached to one place but not to another with similar physical characteristics. Consequently, the environment must be organized to meet individual needs, aligning with what Gaudiino and Di Stefano (2023) termed a "need-space fit." This concept emphasizes designing and structuring environments to resonate with unique individual requirements and preferences, thereby facilitating stronger place

Table 3
Descriptive statistics and bivariate correlations.

Variable	M	SD	S	K	1	2	3	4	5	6	7	8
1. Gender	–	–	–	–	–							
2. Age	32.80	8.92	1.17	0.94	−0.08	–						
3. Day in HW	3.21	1.36	0.08	−1.00	0.01	0.13*	–					
4. PRWEQIs	4.00	0.53	−0.56	0.16	−0.07	0.15*	0.05	–				
5. P-RN Autonomy	4.14	0.55	−0.41	0.06	−0.04	0.06	−0.01	0.52***	–			
6. P-RN Competence	3.83	0.73	−0.37	−0.12	−0.01	0.16**	0.07	0.57***	65***	–		
7. P-RN Relatedness	2.96	0.96	0.03	−0.61	−0.07	0.14*	−0.03	0.27***	0.27***	0.39***	–	
8. Home workplace attachment	3.42	0.84	−0.09	−0.51	−0.04	0.08	0.02	0.44***	0.49**	0.51***	0.43***	–

Note: * = p < 0.05; ** = p < 0.01; *** = p < 0.001; M = Mean; SD = Standard deviation; S = Skewness; K = Kurtosis; Gender (1 = M; 2 = F); HW = Home working; PRWEQIs = Perceived Remote Workplace Environment Quality Indicators; P-RN = Place-related need.
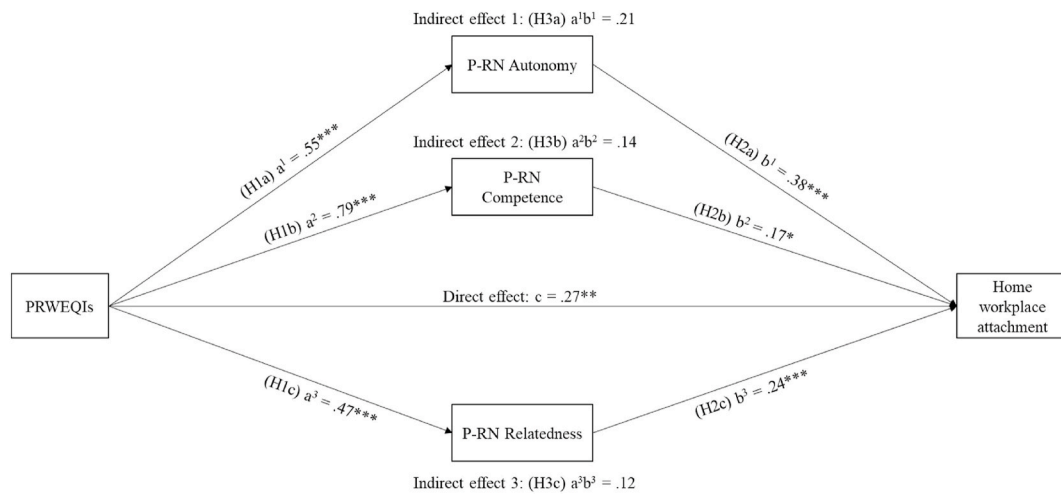
Fig. 1. Effect of perceived comfort in the home working environment (PRWEQIs) on home workplace attachment through Place-Related Need (PR-N) for Autonomy, Competence, and Relatedness

Note. Dependent variable: Home workplace attachment; $R = 0.47$; $R^2 = 0.22$ ($F_{(4,302)} = 21.09$, $p < 0.001$); Indirect effect of P-RN Autonomy: $B = 0.21$, $BootSE = 0.06$, $BootLLCI = 0.07$, $BootULCI = 0.33$. Indirect effect of P-RN Competence: $B = 0.14$, $BootSE = 0.07$, $BootLLCI = 0.01$, $BootULCI = 0.21$. Indirect effect of P-RN Relatedness: $B = 0.12$, $BootSE = 0.03$, $BootLLCI = 0.06$, $BootULCI = 0.18$.

attachment. Such alignment enhances personal well-being and fosters a deeper emotional connection to the place. Moreover, in line with the meaning-mediated model of place attachment (Stedman, 2003), people do not form direct attachments to the physical aspects of a place but to the symbolic significance associated with those features. This aspect is particularly important in studying workplace attachment, where various physical-spatial elements are crucial predictors of worker well-being (Kallio et al., 2020). Inalhan and Finch (2004) argue that investigating workplace attachment is significant because it nurtures a sense of community, enhances employee loyalty, and serves as an indicator of organizational culture. Taking up the definition of "safe haven," Study 1 aimed to empirically analyze how the home working environment, particularly its physical-spatial characteristics, can become an object of attachment capable of satisfying specific place-related needs, specifically identified as the needs for autonomy, competence, and relatedness. Consistent with the first hypothesis (H1), greater perceived comfort in the home working environment was associated with greater satisfaction of place-related needs for autonomy, competence, and relatedness. Gatt and Jiang (2021) found that workers in a flexible work environment within the office reported higher autonomy over space and desk management. Similarly, participants who perceived high comfort in their home working environment felt supported in making autonomous choices about managing their activities and competent in completing them effectively. An interesting result related to H1c indicated that even in the home working condition, the physical environment facilitated the fulfillment of the need for relatedness and, consequently, the maintenance of social and emotional relationships with others. The items used for PR-N for relatedness did not refer specifically to coworkers but generally to other people. Thus, a comfortable spatial configuration dedicated to work within the home might have ensured the maintenance of contact with others within the home environment while providing the necessary privacy to communicate with coworkers without being overheard or interrupted (Sundstrom et al., 1986). What emerges from these results is how certain physical-spatial characteristics can contribute to making the worker feel more autonomous and competent in managing the spaces and daily activities conducted within the place, and how this environmental configuration can make them feel connected and related to other people Hypothesis H2 was fully confirmed: satisfaction of the place-related needs of autonomy, competence, and relatedness led to a greater sense of attachment to the home workplace, perceiving it as a "safe haven" for work activities. These findings are consistent with previous research, such as Landon

et al. (2021), who studied natural wild environments, and Ariccio et al. (2021), who examined evacuation sites in a virtual location affected by natural hazards. In both cases, satisfying SDT needs was crucial for developing place attachment. Finally, although there is a direct effect between comfort and workplace attachment (e.g., Nonnis et al., 2022; Scrima et al., 2021), the third hypothesis (H3) was also confirmed. There was an indirect effect between PRWEQIs and home workplace attachment mediated by place-related needs for autonomy, competence, and relatedness. Given the definition of remote working as an activity that can be conducted at any time, any place (Grant et al., 2013), it is not surprising that the indirect effect of PR-N for autonomy is the strongest. This demonstrates that workers are more attached to a home environment that, with its environmental characteristics and configurations, makes them feel more autonomous in managing and adapting the space, even for work activities.

2.4.1. Conclusion

Study 1 provides, to our knowledge, a first empirical approach to the study of workplace attachment in the context of remote working conducted within the home environment. As mentioned above, in most cases remote working involves the overlap between the home environment and the work environment, and this overlap may have also involved place as an object of attachment. Through a parallel mediation model, it was possible to observe, from an empirical point of view, how physical-spatial characteristics are an important predictor of place attachment through the satisfaction of the three place-related needs identified by the Self-Determination theory. Specifically, it emerged how a worker feels more emotionally attached to the home workplace when, with its spatial configuration, this place makes him or her feel more autonomous and competent in its exploration and management and in spatial and emotional relationships with other social actors. The study thus provides an important advance in the study of predictors of place attachment, not only confirming the findings of previous research (e.g., Ariccio et al., 2021; Landon et al., 2021) but extending the results to the home working environment. In Study 1, specific needs related to the interaction with the environment were analyzed. When these needs are satisfied, they facilitate the development of place attachment. Similar to interpersonal attachment, where the attachment figure fulfills specific relational needs and thereby fosters attachment bonds (La Guardia & Patrick, 2008), the physical environment contributes to the development of place attachment by meeting needs related to interaction with the place. Having established that the environment and

place-related needs constitute antecedents of place attachment, numerous studies have highlighted the positive effects of place attachment (e.g., Junot et al., 2018; Rollero & De Piccoli, 2010; Scannell & Gifford, 2017a, 2017b). Regarding interpersonal attachment, previous research has demonstrated that adult attachment styles contribute to the satisfaction of individual needs across various life domains, reducing symptoms of anxiety and depression (e.g., Kormas et al., 2014; Wei et al., 2005) and promoting overall well-being (e.g., Felton & Jowett, 2015; La Guardia et al., 2000). In their experimental study, Scannell and Gifford (2017a) demonstrated that visualizing a place of attachment contributes to the satisfaction of needs for belonging, self-esteem, and meaning, particularly among individuals experiencing social ostracism. This underscores the positive impact of place attachment in promoting socio-psychological well-being. While the role of workplace attachment in enhancing occupational well-being and performance is well-documented (e.g., Hamel et al., 2023; Mura et al., 2023b; Scrima et al., 2019), no studies have yet examined how attachment to the workplace can facilitate the satisfaction of specific work-related needs. Therefore, while Study 1 focused on identifying the predictors of workplace attachment (i.e., place-related needs), Study 2 will investigate the satisfaction of needs as a consequence of place attachment (i.e., work-related needs).

3. Study 2

3.1. Aim and hypotheses

Having established with Study 1 how, through the satisfaction of place-related needs, perceived environmental comfort can positively influence attachment to the home workplace, the goal of Study 2 is to determine how this attachment can contribute to greater home working engagement through the satisfaction of autonomy, competence, and relatedness work-related needs. Specifically, it is assumed that.

H1. Perceived comfort in the home working environment (PRWEQIs) is positively associated with home workplace attachment.

H2. Home workplace attachment is positively associated with satisfaction of work-related needs of autonomy (H2a), competence (H2b), and relatedness (H2c).

H3. Satisfaction of work-related needs of autonomy (H3a), competence (H3b), and relatedness (H3c) is positively associated with home working engagement.

H4. Home workplace attachment, through supporting the satisfaction of work-related needs of autonomy (H4a), competence (H4b), and relatedness (H4c), is positively associated with home working engagement.

3.2. Method

3.2.1. Participants

As in Study 1, the sample consisted of 440 workers with clerical roles and duties, who were working remotely at the time of compilation (June–July 2022) for at least one day per week; the sample included 233 men (53%), recruited from public (14%) and private (86%) organizations, aged between 19 and 63 years ($M = 34$; $SD = 9.80$) and average organizational seniority of 6 years ($SD = 7.41$; min = 1; max = 40). All participants reported working in their private homes for an average of 3.07 days per week ($SD = 1.56$). Table 4 shows the sociodemographic characteristics of the sample.

3.2.2. Tools and procedure

The study followed the ethical guidelines the American Psychological Association (APA) set forth and adhered to the Ethical Principles of Psychologists and Code of Conduct. The research received approval from the Ethics Committee of Sapienza University of Rome (approval number

Table 4
Sociodemographic characteristics of participants.

	n	%
Gender		
Male	233	53%
Female	207	47%
Organizational sector		
Public organization	61	13.9%
Private organization	379	86.1%
Days working from home per week		
1	66	15%
2	133	30.2%
3	84	19.1%
4	42	9.5%
5	91	20.7%
6	24	5.5%

Note: N = 440. Participants were on average 34 years old ($SD = 9.80$; min = 19; max = 63) and with an average organizational seniority of 6 years ($SD = 7.41$; min = 1; max = 40).

0000741 dated June 06, 2022). Participants were selected from psychology trainees who had received appropriate training. Before participating, individuals were given information about the study's objectives and asked to read and complete an informed consent form for data processing. Subsequently, participants completed an online self-report questionnaire that included the measures listed below.

*Perceived Remote Workplace Environment Quality Indicators (*PRWE-QIs; Mura et al., 2023a). The scale consists of 15 items (Alpha = 0.91) to assess perceived environmental comfort in the setting used for remote work, investigating aspects of acoustic comfort (e.g., *"The room where I work is quiet enough"*), visual comfort (e.g., *"In this room during the day, there is enough natural light"*), quality of furnishing (e.g., *"The furnishings in this room are in good condition"*), safety (e.g., *"In this room, I can move safely"*) and space usability (e.g., *"In this workstation, I have all the equipment necessary for the work activity at hand"*).

Home Workplace Attachment. We adapted to the home working context the four items (Alpha = 0.80; *"This workplace is my favorite place to work"*) of the place attachment factor of the Sense of Place scale (Jorgensen & Stedman, 2001).

Work-Related Basic Psychological Needs Satisfaction and Frustration Scale (Chen et al., 2015; Schultz et al., 2015). We used the three need-satisfaction factors of autonomy (4 items; Alpha = 0.71; e.g., *"I feel a sense of possibility of choice and freedom in the things in which I engage"*), competence (4 items; Alpha = 0.76; e.g., *"I feel confident that I can do my job to the best of my ability"*) and relatedness (4 items; Alpha = 0.90; e.g., *"I feel connected to colleagues who support me and whom I care about"*), adapted to the context of home working.

Home working engagement. We adapted the Work Engagement Scale Short Version (UWES-9; Schaufeli et al., 2006) in its Italian validation (Balducci et al., 2010) for the context of home working (9 items; Alpha = 0.87; e.g., *"When I work remotely I am enthusiastic about my job"*).

All measures utilized a 5-point Likert scale (ranging from 1 = *"Strongly disagree"* to 5 = *"Strongly agree"*). Following the questionnaire, participants were asked to provide sociodemographic information, including gender, age, organizational seniority, sector, and the number of days they worked from home per week. In the Appendix, all the items used and their respective instructions are reported.

3.2.3. Data analysis

Research hypotheses were tested through model 81 of the PROCESS macro v3.5 (Hayes, 2017) of the SPSS v.26 software, setting perceived comfort in the home working environment (PRWEQIs) as the independent variable (IV), home workplace attachment as the first mediator, the three work-related basic psychological needs (autonomy, competence, and relatedness) as successive parallel mediators and home working engagement as dependent variable (DV). Additionally, we conducted calculations for the bootstrap confidence interval to evaluate the

indirect effects of all three mediations. This analysis involved using 95% confidence intervals and performing 10000 bootstrapping iterations. In the model, gender, age, and the number of days worked remotely were included as covariates. *A priori* power analyses were conducted using Monte Carlo simulations in the R package Lavaan (Rosseel, 2012) to calculate the minimum required sample size to estimate the three hypothesized indirect effects, assuming a small-to-medium effect size among the model variables, with 1000 Power Analysis Replications and a 95% confidence level. The minimum required sample size was 412 subjects to achieve a power of 0.80. The achieved sample of 440 subjects is therefore suitable for estimating the indirect effects.

3.3. Results

3.3.1. Preliminary analysis

To address the potential presence of common method bias, a preliminary Harman's single-factor test (Podsakoff et al., 2003) was performed. The exploratory factor analysis (EFA) on all variables (i.e., 40 items) showed that a single factor explained 30.41% of the total variance. As this value did not surpass the 50% threshold, common method bias was deemed to be absent. The second step in the preliminary analyses was to confirm the factorial structure of the multidimensional scales through a Confirmatory Factor Analysis (Table 5). Regarding work-related needs and home working engagement, the two B models, respectively, the 3-factor (autonomy, competence, and relatedness) and 3-factor with a second-order factor (vigor, dedication, and absorption) models, achieved excellent fit indices and significantly better than the two single-factor A-models (Hu & Bentler, 1999; Kline, 2011; Scher-melleh-Engel et al., 2003). Given the equivalence between models B and C concerning PRWEQIs, a chi-square test was performed, which, being non-significant ($\Delta\chi^2 = 8.85$; $\Delta df = 5$; $p = 0.12$), allowed the 5-factor model to be considered with a second-order factor related to perceived environmental comfort in the remote work context (Pavlov et al., 2020). Table 6 presents the average values, evaluation of univariate normality, and correlations among the variables under investigation. None of the measures violated the assumption of normality, as indicated by the skewness and kurtosis values falling within the range of −1 to +1, excluding the Skewness value of the W-RN autonomy, which is still within an acceptable range (Byrne, 2016; George & Mallery, 2010; Hair et al., 2010). From the correlation matrix analysis, IV, i.e. perceived comfort in the home working environment (PRWEQIs), was positively correlated with all the variables included in the model; specifically, it was correlated with home workplace attachment ($r = . 60$, $p < 0.001$), with the satisfaction of the work-related needs of autonomy ($r = 0.22$, $p < 0.001$), competence ($r = 0.45$, $p < 0.001$) and relatedness ($r = 0.39$, $p < 0.001$), and with home working engagement ($r = 0.41$, $p < 0.001$). The model's first mediator, home workplace attachment, was also positively correlated with home working engagement ($r = 0.49$, $p < 0.001$) and with the satisfaction of the work-related needs of autonomy ($r = 0.30$, $p < 0.001$), competence ($r = 0.40$, $p < 0.001$) and relatedness ($r = 0.32$, $p < 0.001$). Finally, statistically significant correlations

emerged between home working engagement and autonomy ($r = 0.63$, $p < 0.001$), competence ($r = 0.58$, $p < 0.001$), and relatedness satisfaction ($r = 0.51$, $p < 0.001$). Regarding socio-demographic variables, age was correlated with all variables in the model except the satisfaction of WR-N for autonomy ($r = 0.07$, $p =$ n.s.). Higher age was indeed correlated with greater perceived comfort in the home working environment ($r = 0.23$, $p < 0.01$), home working workplace attachment ($r = 0.23$, $p < 0.001$), satisfaction of the work-related needs for competence ($r = 0.23$, $p < 0.001$) and relatedness ($r = 0.26$, $p < 0.001$), and home working engagement ($r = 0.24$, $p < 0.001$).

3.3.2. Model testing

The four research hypotheses were tested through a sequential mediation model, and all effects were controlled for the covariates of gender, age, and home workdays. Fig. 2 shows the results of the model used for testing the research hypotheses. The total effect of the model was positive and significant (B = 0.39, p < 0.001), and no direct effect of Perceived comfort in the home working environment (PRWEQIs) on home working engagement emerged ($B = 0.01$, $p =$ n.s.). Thus, as per the hypothesis, the relationship between the variables is mediated by home workplace attachment and the satisfaction of the three work-related needs. The first research hypothesis (H1) was fully confirmed, and PRWEQIs were found to be positively associated with greater home workplace attachment ($B = 0.73$, $p < 0.001$). No statistically significant effect of the covariates was found. As for H2, the hypothesis was only partially confirmed: there was, in fact, a significant effect of home workplace attachment on satisfaction of work-related needs for autonomy (H2a: $B = 0.24$, $p < 0.001$), explaining 13% of the variance, and competence (H2b: $B = 0.11$, $p < 0.01$), with 27% of the variance explained, but not on relatedness (H2c: $B = 0.10$, $p =$ n.s.). Additionally, a statistically significant effect emerged of the number of days worked at home on autonomy satisfaction ($B = 0.06$, $p < 0.01$) and competence ($B = 0.04$, $p < 0.05$). All three hypotheses regarding the relationship between work-related needs satisfaction and home working engagement were, however, confirmed: home working engagement was indeed positively associated with the satisfaction of the WR-N for autonomy (H3a: $B = 0.45$, $p < 0.001$), competence (H3b: $B = 0.25$, $p < 0.001$), and relatedness (H3c: $B = 0.13$, $p < 0.01$), explaining 58% of its variance. No statistically significant effect of the covariates was found. Because H2c was not significant, Hypothesis H4, concerning sequential indirect effects, was only partially confirmed. If, specifically, the relationship between PRWEQIs and home working engagement was found to be sequentially mediated by home workplace attachment and satisfaction of WR-N for autonomy (H4a: $B = 0.08$, *BootSE* = 0.02, *BootLLCI* = 0.04, *Boot ULCI* = 0.12) and competence (H4b: $B = 0.02$, *BootSE* = 0.01, *BootLLCI* = 0.01, *BootULCI* = 0.05), the indirect effect for WR-N for relatedness was not statistically significant (H4c: $B = 0.01$, *BootSE* = 0.01, *BootLLCI* = - 0.01, *BootULCI* = 0.03).

Table 5

CFA for perceived remote workplace environment quality indicators (PRWEQIs), remote work engagement, and work-related needs.

PRWEQIs	χ^2	df	p	χ^2/df	CFI	NNFI	SRMR	RMSEA [90% CI]
Model A: 1-Factor	1430.73	90	<0.001	15.90	0.66	0.61	0.10	0.18 [0.18, 0.19]
Model B: 5-Factor	276.93	80	<0.001	3.46	0.95	0.93	0.07	0.07 [0.06, 0.09]
Model C: 5-Factor + 1 Second Order Factor	285.78	85	<0.001	3.36	0.95	0.94	0.07	0.07 [0.06, 0.08]
Work-Related Needs	χ^2	df	p	χ^2/df	CFI	NNFI	SRMR	RMSEA [90% CI]
Model A: 1-Factor	692.86	54	<0.001	2.55	0.70	0.63	0.12	0.16 [0.15, 0.18]
Model B: 3-Factor	129.96	51	<0.001	12.83	0.96	0.95	0.05	0.06 [0.15, 0.07]
Home working engagement	χ^2	df	p	χ^2/df	CFI	NNFI	SRMR	RMSEA [90% CI]
Model A: 1- Factor	852.49	27	<0.001	31.57	0.63	0.51	0.13	0.26 [0.26, 0.28]
Model B: 3-Factor + 1 Second Order Factor	121.34	24	<0.002	5.06	0.97	0.94	0.08	0.10 [0.08, 0.11]

Note: CFI = comparative fit index; NNFI = (Non) Normed Fit Index; SRMR = (Standardized) Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation.

Table 6

Descriptive Statistics and Bivariate Correlations.

Variable	M	SD	S	K	1	2	3	4	5	6	7	8	9
1. Gender	–	–	–	–	–								
2. Age	33.91	9.80	0.78	−0.17	0.19	–							
3. Day in HW	3.07	1.52	0.35	−1.11	−0.06	−0.11*	–						
4. PRWEQIs	4.02	0.66	−0.78	0.49	0.01	0.23**	−0.06	–					
5. Home workplace attachment	3.57	0.80	−0.50	−0.17	0.03	0.23***	0.02	0.60***	–				
6. W-RN Autonomy	3.78	0.64	−0.33	0.05	−0.02	0.07	0.15**	0.22***	0.30***	–			
7. W-RN Competence	4.19	0.56	−0.76	1.19	0.09	0.23***	0.09	0.45***	0.40***	0.49***	–		
8. W-RN Relatedness	3.86	0.82	−0.70	0.31	0.23***	0.26***	−0.04	0.39***	0.32***	0.34***	0.46***	–	
9. Home working engagement	3.62	0.71	−0.65	0.40	0.09	0.24***	0.02	0.41***	0.49***	0.63***	0.58***	0.51***	–

Note: * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$; M = Mean; SD = Standard deviation; S = Skewness; K = Kurtosis; Gender (1 = M; 2 = F); HW = Home working; PRWEQIs = Perceived Remote Workplace Environment Quality Indicators; W-RN = Work-related need.
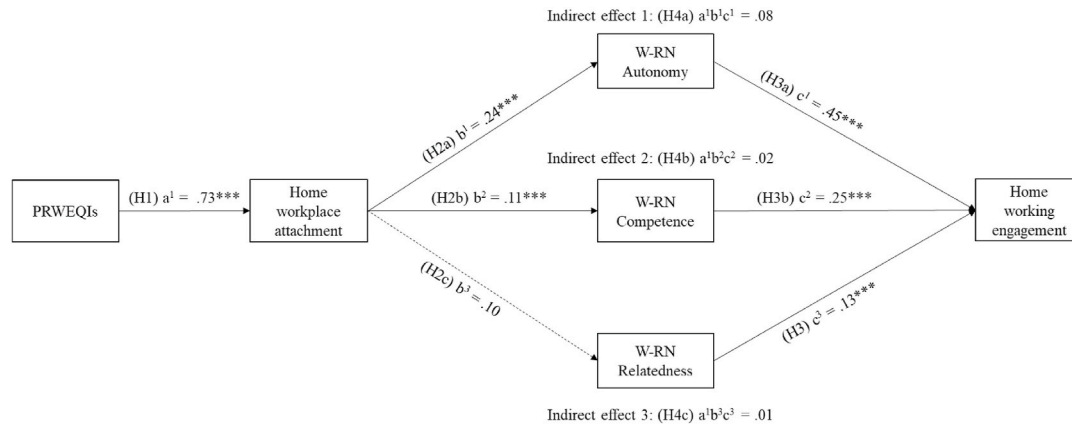

Fig. 2. Effect of perceived comfort in the home working environment (PRWEQIs) on home working engagement through home workplace attachment and Work-Related Need (WR-N) for Autonomy, Competence, and Relatedness

Note. Dependent variable: *Home working* engagement; $R = 0.76$; $R^2 = 0.58$ ($F_{(8,426)} = 73.24$, p < 0.001); Indirect effect of home workplace attachment and W-RN Autonomy: $B = 0.08$, $BootSE = 0.02$, $BootLLCI = 0.04$, $BootULCI = 0.12$. Indirect effect of home workplace attachment and W-RN Competence: $B = 0.02$, $BootSE = 0.01$, $BootLLCI = 0.01$, $BootULCI = 0.04$. Indirect effect of home workplace attachment and W-RN Relatedness: $B = 0.01$, $BootSE = 0.01$, $BootLLCI = - 0.01$, $BootULCI = 0.03$.

3.4. Discussion

Although the positive effects of place attachment on well-being are well-documented (e.g., Korpela et al., 2020; Rollero & De Piccoli, 2010), further research is needed to understand the psychological mechanisms linking place attachment to well-being. Place attachment meets certain human needs (e.g., Relph, 1976; Tuan, 1990) and aids self-regulatory processes for goal achievement (Korpela, 1989). Study 2 aimed to examine how attachment to the home workplace satisfies work-related needs for autonomy, competence, and relatedness, thereby enhancing work engagement. Consistent with previous research (e.g., Mura et al., 2023b; Rebillon et al., 2023) and Study 1, Hypothesis H1 was confirmed: perceived remote workplace environment quality indicators (PRWEQIs) positively predicted home workplace attachment, affirming that attachment to place depends on the physical-spatial characteristics of the environment (Scannell & Gifford, 2010). Hypothesis H2 analyzed how attachment to the home workplace satisfies work-related needs. Secure attachment satisfies autonomy, competence, and relatedness needs (La Guardia & Patrick, 2008). Scannell and Gifford (2017a) found that visualizing a place of attachment increased a sense of belonging, self-esteem, and meaningfulness. In our study, Hypothesis H2 was partially confirmed. Greater attachment to the home workplace satisfied needs for autonomy (H2a) and competence (H2b), but not relatedness (H2c). This suggests that while home workplace attachment enhances autonomy and competence, it may not sufficiently address relatedness in remote work. Just as with interpersonal attachment, studied in various contexts (e.g., Felton & Jowett, 2015; Wei et al., 2005), attachment to place can also influence individual well-being through the satisfaction of

specific needs. For instance, Scannell and Gifford (2017a) highlighted how visualizing an attachment place contributes to a greater sense of autonomy, control, and belongingness. Although it is possible to identify confirmations on how place attachment contributes to the satisfaction of the sense of belonging (e.g., Giuliani, 2003; Inalhan & Finch, 2004; Scannell & Gifford, 2017b), the absence of a statistically significant relationship could be motivated by the particular study setting. A major consequence of home working is social isolation from the organization (Bentley et al., 2016) and a lack of face-to-face interaction, formal and informal, with colleagues (e.g., Bjursell & Hedegaard, 2021; Waize-negger et al., 2020). In line with the media richness theory (Daft & Lengel, 1986), O'Neill, Hambley, & Bercovich (2014)) point out that although virtual interactions are frequent, they often lack the depth and richness of face-to-face communication, making it more challenging to meet relatedness needs. Allen et al. (2015) support this by noting that the lack of physical presence can impede the development of trust and camaraderie among remote team members. The literature underscores the importance of physical proximity for satisfying relatedness needs. For instance, Fayard and Weeks (2007) highlight that physical spaces in workplaces facilitate spontaneous interactions, which are crucial for building social bonds and a sense of community. Similarly, Kraut et al. (1990, pp. 1–12) discovered that physical proximity significantly increases the likelihood of unplanned communication among employees, which is essential for developing and maintaining work relationships. Additionally, the setting of our study, which involved home working, inherently limits physical social interactions with colleague. While home workplace attachment can enhance feelings of autonomy and competence in work tasks, it cannot replace the relational dynamics

experienced in a traditional office setting. Research by Golden and colleagues (2008) shows that remote workers often experience higher levels of isolation and lower levels of social support compared to their office-based counterparts, highlighting the difficulties in fulfilling relatedness needs in the remote working context. Additionally, the literature on displacement highlights how the experience of relocation can negatively impact social relationships and the sense of belonging (e. g., Atkinson, 2015; Scannell et al., 2016). Increased attachment to the home workplace, while not worsening relationships with coworkers and a sense of belonging to the organization, may not affect fulfilling the need for relatedness. In the context of remote/home working, the satisfaction of the need for relatedness with colleagues and the organization as a whole is not influenced by the characteristics of the location or the type of relationship established with it. Instead, it is affected by other psychosocial variables such as perceived organizational support, the frequency of alternating remote and in-person workdays, or leadership style (Bentley et al., 2016; Golden et al., 2008; Coun et al., 2021). The effect of meeting the satisfaction of SDT needs in promoting work engagement is well established in the scientific literature (e.g., Gagné, 2014; Hicklenton et al., 2019; Roussillon Soyer, Balkin, & Fall, 2022) and confirmed by the results regarding H3. Even in the home working context, the satisfaction of the need for autonomy was found to be the strongest predictor of work engagement, confirming the need for home workers to decide for themselves how, when, and especially where to perform their work activities. Finally, Hypothesis H4 is partially confirmed, bringing empirical evidence on how the relationship between environmental comfort and home working engagement is mediated sequentially by attachment to the remote workplace and satisfaction of WR-needs for autonomy and competence but not relatedness.

3.4.1. Conclusion

This second study provides new insights into the role of home workplace attachment in promoting work-related well-being. Although the literature regarding the relationship between remote working and well-being is quite extensive and expanding (e.g., Antunes et al., 2023; Torres & Orhan, 2023), to our knowledge, no research has yet focused on the role played by attachment to the remote workplace, which coincided, for the totality of our sample, with the home environment. Through a mediation model, consistent with the results of Study 1, the relationship between indicators of environmental comfort and attachment to the home workplace was confirmed. Through the satisfaction of specific work needs, the latter contributes to a greater sense of work engagement in the home worker. Specifically, the worker attached to a supportive home workplace for his or her work activity will feel more engaged in work as he or she is more autonomous in performing his or her tasks and activities and more competent in engaging in challenging and stimulating activities. Of interest is the non-significant effect between attachment and the need for relatedness, potentially due to the feeling of social isolation from colleagues and the organization experienced in remote working, which needs more study and investigation.

4. General conclusion, limitations, and practical implications

During the most challenging phases of the pandemic, the merging of home and work environments posed significant challenges. Workers had to adapt to new spaces for their duties, often creating disruptions for entire households as the traditional boundaries between family and work life dissolved (e.g., Beckel & Fisher, 2022; Russell et al., 2021). With the passing of the pandemic, the relationship between individuals and their homes is once again changing. However, the adoption of work-from-home has remained a widely implemented work organization strategy (Barrero et al., 2023). This research aimed to explore the determinants of workplace attachment and its effects on promoting work-related well-being, extending findings to home working contexts. The goal was to understand how the physical and emotional aspects of a

home workspace could influence an individual's attachment to their work environment and, consequently, their overall well-being. As Scannell and Gifford (2017b, p. 376) noted, "Further work is needed to determine whether psychological needs are antecedents to place attachment; this knowledge could inform planners […] that wish to encourage place attachment" We approached this question through the lens of Self-Determination Theory, hypothesizing that needs are domain-specific. Starting from the hypothesis that needs are domain-specific, in Study 1, we integrated the satisfaction of needs for autonomy, competence, and relatedness specifically related to the place's characteristics, examining their role as antecedents of place attachment. Our findings confirmed previous research (e.g., Ariccio et al., 2021; Landon et al., 2021), demonstrating that particular spatial and ergonomic configurations can satisfy basic and innate needs, fostering an emotional bond with the place. Furthermore, the results of Study 1 align with the framework proposed by La Guardia et al. (2000, p. 368) regarding interpersonal attachment: "sensitive relational partners are ones who respond in ways that promote a person's experienced satisfaction of these basic psychological needs. This implies that the person will gravitate toward relationships and will experience well-being within them to the extent that the relationships provide opportunities for basic need fulfillment." Each individual has specific needs related to exploring their environment; just as interpersonal attachment develops when a relationship allows for the satisfaction of individual needs, an emotional bond with a place is created when the physical-spatial configuration of the environment meets these experiential needs. Study 2 shifted focus to the relationship between attachment to the home workplace and work engagement. Here, we examined needs related specifically to work activities rather than the environmental characteristics of the home workplace. Our results indicated that an emotional bond with the place enhances the satisfaction of work-related needs, contributing to work engagement and overall well-being. In this regard, as highlighted by Scannell and Gifford (2017), a positive relationship with a place, through the fulfillment of specific needs in various life contexts, can contribute to greater well-being and satisfaction. In addition, in both studies, it emerged that the perceived comfort in the home environment dedicated to remote work plays a crucial role not only in influencing the relationship with the environment (i.e., place attachment) but also occupational well-being. Following the Job Demands-Resources (JD-R) (Demerouti et al., 2001; Schaufeli & Bakker, 2004) model, Indoor Environmental Quality (IEQs) can either serve as a resource in promoting well-being or, in particular configurations, they may constitute environmental demands and stressors that can undermine occupational performance and well-being (e.g., Fisk, 2000; Kallio et al., 2015). With particular reference to the need for autonomy, confirming previous similar studies (e.g., Sardeshmukh et al., 2012), the results demonstrate how proper management of space and its elements represent an indispensable resource for home working. While our research provides valuable insights, it is not without limitations. The cross-sectional nature of the studies makes it challenging to establish causal links between variables. Additionally, the lack of experimental studies on place attachment's antecedents and benefits complicates efforts to structurally intervene in home environments. Future research could use virtual reality scenarios to experimentally assess the effects of various IEQs. In addition, an experimental and/or longitudinal approach would allow for confirmation of the relationship between comfort and place attachment. Future studies could also incorporate measures of environmental satisfaction, which can be considered an outcome of place attachment. Even more, a longitudinal modeling approach could help to study place attachment and its evolution. A further limitation that must be taken into account is given by the sampling method, which was done voluntarily and only in the Italian context; this limitation, in addition to not allowing generalizability of the results to cultures and worlds of work other than the Italian one, does not allow us to exclude a self-selection bias. Furthermore, the sample consisted solely of clerical workers, and due to privacy

reasons, it was not possible to request further information about their job profiles, making it even more challenging to generalize the results. In addition, an ulterior limitation is inherent in the very objective of the research, which is to assess attachment to the remotely located workplace within the home; in fact, it was not possible to measure attachment to the home environment as a whole, independent of the work dimension that is now being performed. Once again, longitudinal studies will aim to analyze whether allocating a portion of the home environment to work activity can, over time, improve or reduce attachment to the overall home environment. Moreover, the possible moderating effect of attachment to the classic, in-person workplace should be added to this aspect. In this specific study, to examine the complex relationship between perceived comfort and place attachment, we chose to focus solely on the home work environment, leaving out the examination of the same variables in offices or original workstations. Particularly, workplace/office attachment could be an important moderating variable in the relationship between home workplace attachment and work-needs satisfaction. Future studies will aim to incorporate these variables into the presented models and better analyze the relationship between home place attachment, workplace attachment, and home workplace attachment. Regarding the environmental-domestic part used for work, a measure of perceived remote workplace environment quality indicators (PRWEQIs) is proposed in the research based on the worker's perception of acoustic and visual comfort, quality of furnishing, safety, and space usability. Again, because of the complex environmental situation, it was not possible to obtain objective measurements of these physical-ergonomic qualities that could be compared with the worker's perceptions. Finally, the two studies focused separately on the antecedents (i.e., Study 1) and the consequences (i.e., Study 2) of place attachment. Although Study 1 revealed a statistically significant direct effect between PRWEQIs and home workplace attachment, indicating a partial mediation by Place-Related Needs, this variable was not included in Study 2. Future studies should integrate Place-Related Needs into the model presented in Study 2, especially by implementing longitudinal studies or manipulating needs, to confirm the relationships highlighted in the research and analyze the relationship between Place-Related and Work-Related Needs. Despite the limitations, the research provides important implications for theory and practice. First, the research provides further confirmation to the already existing literature on the relationship between place attachment and needs satisfaction (e.g., Ariccio et al., 2021; Landon et al., 2021; Scannell & Gifford, 2017a), both place-related, and thus antecedents of place attachment, and work-related, as its outcomes. As discussed in the work of Bergefurt and colleagues (2022) and Mura and colleagues (2023b), attention to environmental elements and satisfaction with one's home workspace become indispensable in promoting occupational well-being. Organizations promoting the use of home working should pay special attention to how home environments are structured and provide all necessary support to make them worker-centered work environments. In the era of remote working, this attention should start as early as the design stages of new home environments, which should no longer serve only the living function, but should be designed to provide adequate spaces to be used as remote offices, thus allowing barriers, physical or abstract, between the private home environment and the working home environment to be maintained. Despite these limitations, our research reinforces the relationship between place attachment and needs satisfaction, supporting existing literature (e.g., Ariccio et al., 2021; Landon et al., 2021; Scannell & Gifford, 2017a). Attention to home workspace environments is crucial for promoting occupational well-being. Organizations should ensure home environments are worker-centered from the design stage, maintaining barriers between private and working spaces. This focus will help in creating spaces that not only serve living functions but also support remote work effectively, preserving the delicate balance between personal and professional life.

CRediT authorship contribution statement

Alessandro Lorenzo Mura: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft. **Libera Anna Insalata:** Conceptualization, Resources, Writing – original draft. **Marino Bonaiuto:** Conceptualization, Supervision, Writing – review & editing.

Appendix

Perceived Remote Workplace Environment Quality Indicators (PRWEQIs; Mura et al., 2023a).

Think now about the environment in which you carry out your remote work activity (e.g., study, bedroom, kitchen). We refer to the environment, generally domestic, where your workstation is located and all the tools necessary for work activities are present. You will be presented with a series of statements regarding the environment and the physical spatial dimensions of the room and workstation. Respond by indicating your degree of disagreement/agreement:

Acoustic comfort.

1) The room where I work is quiet enough.
2) In this room, noises can be heard coming from other areas of the house (Reverse).
3) In this room, I can hear noises coming from outside (Reverse).

Visual comfort.

4) That workstation is well-lit during the day.
5) I am satisfied with the lighting in this room.
6) In this room during the day, there is enough natural light.

Quality of the furnishing.

7) The furniture in this room is well-made.
8) The surfaces of the furnishings of the workstation are well-made and resistant to wear.
9) The furnishings in this room are in good condition.

Safety.

10) In this room, I can move safely.
11) In this room, I can move without bumping into anything.
12) I can move freely in that room.

Space usability.

13) In this workstation, I have all the equipment necessary for the work activity at hand.
14) I am satisfied with the equipment I have available in this workstation for my work activity.
15) In this workstation, I can carry out my work activity comfortably.

Place-related SDT Basic Psychological Need Satisfaction (adapted from La Guardia et al., 2000; Ariccio et al., 2021).

Think again about the domestic environment in which you carry out your remote work activity. The following statements refer to how that place makes you feel and the type of interactions you can have within it. Please note that the statements refer to your overall experience in the place, including non-work-related activities (e.g., house care, space management, etc.). Respond by indicating your degree of disagreement/ agreement:

Autonomy.

1) In this place, I can manage my activities autonomously (where, when, and how to do them).

2) This place makes me feel free to make my decisions.
3) This place makes me feel responsible for my decisions.

Competence.

4) This place makes me feel capable of completing challenging tasks.
5) This place makes me feel capable of undertaking demanding tasks.
6) In this place, I feel confident in my abilities to tackle challenging activities.

Relatedness.

7) In this place, I can form a bond with other people.
8) In this place, I feel connected with other people.
9) This place makes me feel emotionally close to other people.

Home workplace attachment (adapted from Jorgensen & Stedman, 2001).

Think again about the domestic environment in which you carry out your remote work activity. The following statements refer to how that place makes you feel and the type of interactions you can have within it. Remember that by the term "workplace" we mean the domestic environment (room and workstation) where you usually carry out your remote work activity. Respond by indicating your degree of disagreement/agreement.

1) I feel relaxed when I'm in this workplace.
2) I feel happy when I'm in this workplace.
3) This workplace is my favorite place to be.
4) When I'm away for a long time, I miss this workplace a lot.

Work-Related Basic Psychological Needs Satisfaction Scale (Chen et al., 2015; Schultz et al., 2015).

The following statements concern your feelings and emotions experienced during the last 4 weeks regarding your remote working activity. Refer only to what you have experienced during the days when you worked from home. Please note that the statements refer solely to your remote work experience and the feelings you had while managing work tasks. Respond by indicating your degree of disagreement/agreement:
Autonomy.

1) I feel a sense of possibility of choice and freedom in the things I engage in.
2) I feel that my decisions reflect what I truly want.
3) I feel that my choices at work express who I truly am.
4) I feel like I'm doing the work that truly interests me.

Competence.

5) I feel confident that I can do my job well.
6) I feel capable in what I do.
7) I feel competent to achieve my work goals.
8) I feel able to successfully complete even the most difficult work tasks.

Relatedness.

9) I feel that the colleagues I care about, care about me.
10) I feel connected to the colleagues who support me and whom I care about.
11) I feel close and in continuous relationship with the colleagues I care about.
12) I am able to feel warmth towards my colleagues.

Home working engagement (adapted from Schaufeli et al., 2006; Balducci et al., 2010).

The following statements concern the sensations and how you might

have felt during your work activity carried out in your home environment. We refer to the days that, according to the contract, you can spend remotely. Respond by indicating your degree of disagreement/agreement.

1) When I work from home, I feel full of energy
2) When I work from home, I feel strong and vigorous
3) In the morning, when I wake up, I look forward to starting work
4) I am excited about my work
5) My work inspires me
6) I am proud of the work I do
7) I am happy when I work intensely
8) While working from home, I am immersed in my work
9) When I work from home, I completely immerse myself in my work

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