Building and Environment 245 (2023) 110836

Contents lists available at ScienceDirect

Building and Environment

journal homepage: www.elsevier.com/locate/buildenv

Thermal comfort and productivity in a workplace: An alternative approach evaluating productivity management inside a test room using textual analysis

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ARTICLE INFO

Keywords:
Productivity management
Thermal comfort
Textual analysis

ABSTRACT

One of the issues in building research is the design of environments providing high standards of comfort and increasing the productivity of occupants and workers. However, the subjectivity related to perception and comfort, and the difficulty in assessing productivity are two critical aspects widely reported in the literature. In this work, the new Methodology for the Analysis of Computerized Textual Data (M.A.D.I.T.) has been applied to the study of productivity. It investigates the use of Natural Language, considered as the medium through which humans attribute sense to the situations they are involved – in this case, a working reality. The new strategy tries to fill the gap on the difficult quantification of productivity management due to the bias linked to the personal assessment criteria, that can hardly be predicted and evaluated. Experimental tests have been carried out in a test room to observe how people react and interact with a typical office workplace, with fixed and controlled environmental parameters, thus focusing on how individual perceptions, evaluations and preferences can be used by potential workers to manage their productivity. The research, while providing further evidence that comfort level does not seem to provide a direct and exclusive factor of productivity, it also offers productivity management indicators, which can be used not only to evaluate work activity, but also to orient it towards a higher level of efficiency and effectiveness.

1. Introduction

1.1. Background

One of the primary purposes of buildings is to provide healthy and comfortable environments for occupants. For this reason, current national and international comfort standards are intended to increase the thermal acceptability of indoor environments and improve occupants' thermal comfort, defined as "that condition of mind that expresses satisfaction with the thermal environment and is assessed by subjective evaluation" [1]. Due to the complexity and the strong subjective influence of thermal perception, the evaluation of thermal comfort has been widely investigated in the past 50 years, starting from the analytical formulation obtained by Fanger [2], the Predicted Mean Vote (PMV). The PMV index aims to predict the average thermal sensation of people in controlled stationary indoor environments based on the thermal balance of the human body, which considers the effect of six environmental parameters: air temperature, air humidity, air velocity, mean radiant temperature, human metabolic rate and clothing insulation. The formulation proposed by Fanger, which links the thermal load with the thermal perception, is described through the seven-point scale: 3 (cold), −2 (cool), −1 (slightly cool), 0 (neutral), +1 (slightly warm), +2 (warm), +3 (hot). The traditional approach tends to indirectly associate the range between −0.5 and +0.5 in the thermal sensations with a range of comfort, and to assume that thermal neutrality represents the peak of the comfort scale. According to the Fanger's formulation, acceptable thermal conditions for the users depend on the heat transfer between the human body and the surroundings. With the mechanisms of thermo-regulation, the human body interacts with the surroundings exchanging sensible heat through conduction, convection, and

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https://doi.org/10.1016/j.buildenv.2023.110836
Received 1 June 2023; Received in revised form 31 August 2023; Accepted 11 September 2023
Available online 20 September 2023

radiation, latent and sensible heat through respiration, and latent heat through water diffusion and sweating through the skin layer [3]. In all these processes, the above-mentioned six environmental parameters have a crucial effect.

A second approach was studied to determine thermal comfort: the adaptive model by De Dear and Brager [4]. The new method is based on the adaptive principle, which states that people context and thermal history could affect their expectations and preferences (aspects that were not accounted in the PMV model). Behavioral, physiological and psychological adaptation were considered as significant aspects influencing the heat balance models, but their impact still could not be accounted. The adaptive model is based on field studies in naturally ventilated buildings determining a linear regression between the acceptable ranges of indoor operative temperatures to prevailing outdoor air temperatures were established.

Individuals can express different thermal sensations with the same environmental conditions: De Dear and Brager [4] showed that many office workers considered their working environment unacceptable from a thermal point of view, even though the measured conditions were within comfort standards. This example and many others present in the literature, emphasizes the criticality of dealing with a subjective aspect, such as thermal comfort, but also leads to reflections on the models and methods currently in use to investigate it. A recent study by Schweiker et al. [5] focuses on the assumptions that are implied in the use of the scales for the evaluation of sensation, acceptability and preference. From the analysis of a large dataset, it emerges that the grades of the scales are not universally interpreted as equidistant and that the link between the different scales cannot be uniquely defined. Moreover, as the adaptive model already predicted, the context in which the occupants are placed could have effects not only on preference but also on the interpretation of the scale itself. For this reason, in a subsequent paper, Schweiker [6] hypothesizes the integration of adaptive model and heat balance approach not only for naturally but also for mechanically-ventilated buildings.

Two main experimental approaches have been defined in literature to study the thermal comfort of buildings and indoor environments, e.g., laboratory and in-field investigations. Although in-field investigations allow observing the interaction between people and the environment in places where people usually live, tests carried out in an environmentally controlled place and provided with sufficient monitoring systems [7], i.e. a test room or a climatic chamber, give the possibility of the possibility of detecting, controlling and manipulating each thermo-physical parameter describing the indoor environment of the room and quantifying the impact on the output of the study, e.g., the occupant perception.

According to the review paper of Pisello et al. [7], the experiments for thermal comfort assessment mainly deal with three scopes: the research for a better knowledge of human comfort, the analysis aimed at testing HVAC systems or other devices and the field of predictive models. Two different approaches can be distinguished among experimental tests: either the comfort parameters are changed to investigate comfort limits, or the comfort variations are fixed to study how other aspects (e.g., age, emotions) can affect the perceived thermal sensation. This approach can be very useful for studying the behavior of other variables, e.g., productivity in working places, as it is a widely discussed topic in literature.

For this reason, the use of a climatic chamber for simulating an office environment was largely applied in the literature to assess comfort conditions in offices – from Oseland in 1995 [8], who evaluated the thermal comfort of the same group of people in different environments, to several recent works testing HVAC systems' settings and operation, different occupant behaviour [9], user acceptability [10]. However, few studies concerning the potential relationship between thermal comfort and individual productivity were found. Tanabe and Nishihara [11] and Tanabe et al. [12] tried to evaluate the variations in performances of 40 subjects placed in different environmental conditions (25.5 °C, 28 °C, 33 °C) performing office tasks. Zhang et al. [13] studied the performance variation in an office with a 22.5 ± 1.5 °C temperature range, but they could not find significant variations. Cui et al. [14] simulated an office session in a climatic chamber, where physiological parameters were measured, and subjective evaluation was given through the thermal sensation vote (TSV); the performance of subjects was evaluated through different tasks (pattern matching, addition, memory typing) in both steady state and dynamic conditions. Finally, Hashiguchi et al. [15] studied the influence of comfort and vertical temperature difference on mental performance; the authors highlighted that despite the wide comfort variations, it was hard to find a link between comfort and cognitive performance. More recently, Rasheed et al. [16] found out that people were influenced differently by IEQ factors depending on the time they commonly spend in the office and they did not find a correlation between IEQ factors and their perception of health for those who spent less time in the office building.

Productivity is considered a broad measure of various aggregate behaviors, often difficult to quantify [17]. Commonly, productivity is defined as the efficiency with which a company transforms inputs into outputs [18,19]; more broadly, it is defined as the relationship between inputs and outputs. This latter also applies to the productivity of individual workers: inputs are the information, materials and instruction received, and outputs are the tasks, duties, and decisions made [17]. Social, psychological and cultural factors can have an influence on workers' individual productivity; however, this influence is hardly predictable. Differently, the quality of the indoor environment is a variable that can be monitored, controlled and improved to minimize its influence on people's behavior [20]. In fact, Leaman [21] argues that there is a possible relationship between the two: people who are dissatisfied with the temperature, air quality and noise in their offices are more likely to say that these elements have an impact on their productivity. However, results can be contradictory, and several studies found that productivity is not maximized with a neutral environment [22]. Pepler [23] found that young employees worked better in a cold environment. Kosonen et al. [24] observed that a lower PMV (-0.21) led to a higher productivity. Cui et al. [25] experiments in a climate chamber showed that a cold-to-neutral thermal environment increased workers' performance. Moreover, Lan et al. [26] found that the cognitive performance in typing tasks was higher in slightly cooler condition rather than warmer ones. Although it has been studied for many years, there is no standardized methodology for measuring productivity that is unambiguously accepted by economists and finance and accounting professionals [17].

Ilgen and Schneider [27] classified the methods for productivity evaluation into three categories: physiological, subjective and objective.

Regarding the first category, these studies use physiological measures to evaluate how productivity can change in relation to personal comfort and environmental factors. For instance, Umer [28] compared cognitive tasks performed by participants to physiological parameters such as ECG, skin temperature, breathing and skin conductance; Lei et al. [29] employed also ECG measurements along with heart rate variability and electrodermal activity measures. This kind of research allows precise measurements with regard to body parameters, but presents some significant criticisms; in particular the invasive nature of the detection methods can influence the condition of the experimental subjects and physiological responses can be influenced by many factors simultaneously [30].

Among the subjective methods, Hu et al. [31] and Kaushik et al. [32] administered surveys to participants, in order to collect personal evaluations about productivity performance; this approach allows the involvement of potentially large samples, but the outcomes may be affected by participants' personal conceptions of their own productivity, thus detecting perceived productivity rather than the actual productive ability [33]; furthermore, outcomes may be influenced by factors such as age, occupation and region [22].

Lastly, in their research Latini et al. [34] combined a self-report survey with the administration of cognitive tests to evaluate the response inhibition ability (Stroop test), working memory skills (OSPAN test) and task switching skills (Magnitude-parity test). Similarly, Obayashi et al. [35] administered a survey and had the participants perform intellectual activities, for instance a receipt-classification task. The application of cognitive tests, along with the evaluation of task execution, allows to compare subjective findings with objective outcomes regarding participants' performances; however, these performances do not necessarily reflect a real work activity, therefore this kind of experimental designs may result unrealistic [36]. Furthermore, productivity assessment can be impaired by many confounding factors that are not taken into account by cognitive tests [37].

Ultimately, no consensus has yet been reached on an approach to evaluate productivity; this has led some researchers to adopt occupants' satisfaction with the work environment as a surrogate for individual productivity [38]. Therefore, in the literature it is widely accepted that comfort and productivity are positively correlated variables (i.e. an increase or decrease in the degree of comfort corresponds to an increase or decrease in productivity), but it is still debated how these may influence each other [22].

1.2. Aim of the research and novelty

To bridge this gap, we introduce the concept of productivity management, defined as *the relationship between the interactive-discursive configuration of the (working) strategies employed and the interactive-discursive configuration of the results achieved, with reference to the pursuit of a defined corporate objective*. This new concept differs from what is already available in the literature, which we will refer to as "individual productivity". This choice is based on the fact that focusing on productivity as perceived by individual workers can lead to biases linked to their personal assessment criteria, which may not reflect performance indicators useful to improve the work environment and increase productivity itself. Furthermore, occupants' satisfaction towards work environment may be a misleading indicator of individual productivity. Indeed, literature shows that occupants' perceptions about the environment can diverge from measured environmental conditions; also, personal satisfaction and environmental conditions can easily vary and affect workers differently.

Otherwise, studying productivity management allows detaching from workers' personal assessments and opinions, providing comparable indicators of the efficiency and effectiveness of the work activity. Furthermore, within our definition, the environmental parameters become inputs that can be used strategically for productivity management: we do not consider them only as perceptual entities but as interactive elements of the overall productivity management configuration. Through this approach, we can observe how workers attributes value to their environmental perceptions, evaluations and preferences and to what extent workers exploit their environmental perceptions and priorities to increase the productivity management level or, in contrast, configure the work activity excluding them. So, by describing (also) whether and how workers use environmental parameters to pursue the corporate objective, it is possible to evaluate productivity management.

The structure of the article is developed as follows: first, the *Methodology* section is presented which includes the description of the room used for the tests (2.1), the layout and presentation of the tests (2.3 and 2.4), the method for the productivity analysis (2.4), the presentation of the questionnaires used (2.5) and a focus on the activity of the participants (2.6). The *Results* section is divided into the presentation of the data of people participating in the tests (3.1), thermal comfort results (3.2) and productivity results (3.3). Finally, the *Discussion* (Section 4) and *Conclusions* (Section 5) of the paper are presented.

2. Methodology

2.1. Description of the case study

The tests were performed in a test room in the Department of Industrial Engineering of the University of Padova (Italy). The CORE-CARE Laboratory (COntrolled Room for building Environmental Comfort Assessment and subjective human Response Evaluation) aims to control indoor environmental parameters to investigate the impact of IEQ on thermal comfort of occupants and other aspects of human life, such as productivity in working places. A full description and presentation of the laboratory can be found in Marigo et al. [39]; it consists of a 16 m^2 room equipped for the control and detection of indoor environmental parameters.

Each surface of the test room is equipped with an independent radiant system, which can be controlled separately and supplied either with hot water generated by a warm circuit or cold water from the chilled circuit. Both warm and cold circuits have suitable water tanks to provide stable heating and cooling loads. Hot and cold water production occurs in the control room, where a ventilation unit operating with external air is installed to operate in cooling or heating integration, dehumidification, or free-cooling modes. The test room was built inside an existing office building, thus creating a realistic working environment; it was furnished with four facing desks with computers, providing a workstation per each tested person, as seen in Fig. 1.

2.2. Duration of the study

The tests were conducted between December 1, 2021, and March 22, 2022; in particular, the tests were carried out either during the morning between 9.30 a.m. and 11.30 a.m., or in the afternoon between 3.30 p.m. and 5.30 p.m. Among the total number of tests (16), 9 took part in the morning and 7 in the afternoon. They were considered representative of the winter season, which ranges from October 15 to April 15 according to the national laws for climatic zone E [40]. The setting of the tests was chosen to explore 5 thermal conditions representing different points of the PMV scale. Moreover, two different ventilation rates were studied: 80 m^3/h (1.5 h^{-1}) and 250 m^3/h (4.8 h^{-1}). The combination of the settings dealt to 16 tests, whose overview is reported in Table 1.

2.3. Experimental setup

The clothing condition was set and defined a-priori, asking participants to wear long trousers, a sweatshirt, socks, and shoes. Subjects were asked not to modify the clothing during the whole experimental session, e.g., without lifting the sleeves of the shirt or changing the hairstyle. The clothing thermal resistance has been estimated and fixed at 0.75 clo, according to the calculation method provided by ASHRAE 55-2020 [1].

During the test room setting and for the whole test, the acquisition

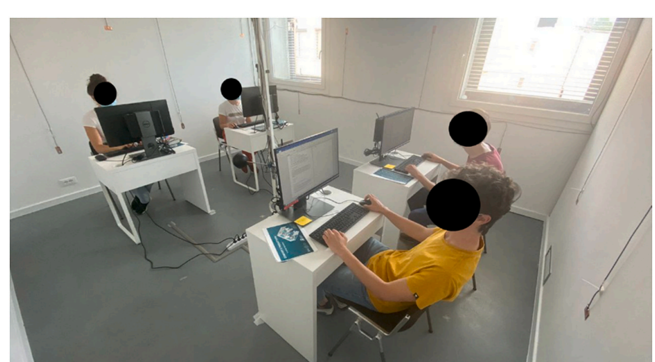

Fig. 1. Office test example.

Table 1
Setup conditions.

Date	PMV	Air flow rate [m^3/h]	Participants
December 01, 2021	0	250	4
December 02, 2021	0	80	4
December 03, 2021	−0.5	250	4
December 07, 2021	−0.5	80	4
December 15, 2021	+0.5	250	4
December 21, 2021	+0.5	80	4
January 21, 2022	+0.7	250	4
February 03, 2022	−0.7	80	4
February 04, 2022	−0.7	250	3
February 11, 2022	+0.7	80	3
February 24, 2022	0	250	4
February 25, 2022	+0.5	250	4
March 03, 2022	−0.5	250	3
March 10, 2022	+0.7	250	2
March 18, 2022	−0.7	250	4
March 22, 2022	+0.7	250	4
		Total	59

system of the laboratory provided the detection of the air temperature, relative humidity and 26 surface temperatures (all data were stored with a 2-s sampling rate). Once combined with the view factors of the radiant surfaces, the collected data allowed the calculation of the mean radiant temperature (MRT), which was therefore used to obtain the operative temperature (t_o). Assuming the resistance due to clothing (0.75 clo), the metabolic rate (1.2 met, corresponding to typical office activities) and the airspeed (ranging from 0 to 0.05 m/s, as verified by on-site measurements), the application of the Fanger's thermal comfort equation [2] allowed the calculation of the real-time PMV. Concerning the air velocity, the measurements performed during the tests highlighted some differences between the tests with the different air flows; for this reason, the air velocity input was 0 m/s for the calculation of PMV in tests with 80 m^3/h, whereas it was 0.05 m/s in case of air flow equal to 250 m^3/h. Thanks to the real-time PMV calculation, it was possible to act on the HVAC system to control the environmental parameters and keep the conditions inside the room around the predefined values: the supply temperature of the radiant panels and/or the supply air temperature were varied during the tests, whereas the airflow rate was set either at the minimum or maximum value, as shown in Table 1. The control can be made only from the control room; hence, occupants could not modify the operations of the HVAC systems according to their preference. For a more precise PMV adjustment, preliminary tests were performed to investigate how indoor parameters were affected by radiant systems operation, mechanical ventilation, outdoor conditions and the presence of solar radiation. The day before each test, the procedures to take the room to the desired conditions started (turning on radiant panels and mechanical ventilation at the defined air flow). With the presence of the thermal dummies, it was possible to take the room to conditions very close to those required for the tests. At the beginning of each test, the switch between the dummies and the real occupants allowed the test to start with the room already in stable conditions. Some effects could affect the stability of the room conditions; in these cases, the supply air temperature was the main parameter used for modifying the indoor conditions. When it was not sufficient to take the room at the desired conditions according to the PMV settings, the supply water temperature of one or more radiant panels was modified.

2.4. Analysis of productivity management

To evaluate the level of productivity management in the experimental setup, M.A.D.I.T. (Methodology for the Analysis of Computerized Textual Data) has been applied [41,42].

M.A.D.I.T. was developed as a methodology for analyzing human interactions, understood in their broadest sense as the ways of interacting with – and at that moment generating – the reality in which they live (made up of other people, the surrounding environment). The base principle is focusing on the analysis of Natural Language's usage [43], which is the medium through which humans attribute sense to the reality in which they find themselves interacting – here, a working reality. For this reason, the approach has been applied successfully in other fields of application where Natural Language is used, such as the psychological-clinical [44,45] and the organizational ones [46]. Having Natural Language and human interactions as its objects of study, it can also be properly applied in this research to analyze productivity management.

Specifically, M.A.D.I.T. has encoded the different ways in which it is possible to give sense to reality and thus interact using natural language: these theoretical units are called Discursive Repertories (DRs). DRs, represented in the Periodic and Semi-radial Table of Discursive Repertories [47], do not refer merely to a content dimension ("what" is said about a topic) but to a processual extent of generating a reality of sense ("how" an issue is expressed and argued).

Each DR has a "weight" and is characterized by specific properties which allow operationalizing the construct by defining which DRs contribute to generating a higher or lower degree of productivity management. This classification subdivides the DRs by linking some exclusively to the interactive-discursive configuration of strategies, some exclusively to the configuration of results, and some transversally to both.

The color scale in the graph (Fig. 2) represents the placement of DRs at three macro-classes (levels) of productivity management: high (in green), medium (in yellow) and low (in red). Both for Strategies and Results, the DRs of Confirmation and Specification (in light blue) stand as "Support DRs": not manifesting on their own, they bind to DRs belonging to the other categories.

The application of M.A.D.I.T. declines in operating a process of 'denomination' of what participants generate through the use of natural language. This process, using as methodological question "*what purpose does the language serve*" (coherent with a processual dimension of analysis), enables to precisely trace the elements that characterize each interaction/reality of sense and to identify the rhetorical-argumentative links that constitute the DRs used (and their combination). To exemplify: if a worker says *"This task is really hard to finish in time",* shapes that working reality through the connotation of a fact ("*[...] is really hard [...]*"); differently, if he/she states *"We won't finish in time this really hard job"*, depicts that reality by unalterably determining it ("*We won't [...]*". These examples, undergone the denomination process, pertain to different DRs and lead to different consequences in terms of productivity management. Thus, the level of productivity management of participants performing tasks, possibly representative of a real work environment, was analyzed and evaluated using M.A.D.I.T. In addition to productivity management as a whole, the focus was also on the contribution that the thermal variables could have on it. In fact, indoor environmental parameters are all elements that workers can recall and give sense to and use to maintain and/or modify their level of productivity management.

Indeed, the thermal parameters of the case study presented can be configured by workers as elements to be used while implementing work strategies, and thus affecting the goodness of results. Even more – and above all – they can be used through different DRs and produce a specific level of productivity management; for example, they can be used as tools to justify the actions performed and thus reduce one's responsibility (low level of productivity), or as elements that can be evaluated and used to anticipate and manage their impact on the personal working schedule (high level of productivity). Annex D (question h1) reports an example of how thermal parameters can be used in terms of productivity management, and thus configured through different DRs.

In conclusion, in this study the evaluation of productivity management was not carried out by analyzing the factual actions through which the worker implements their choices and strategies, for instance opening the window or adjusting the temperature (participants are not given the

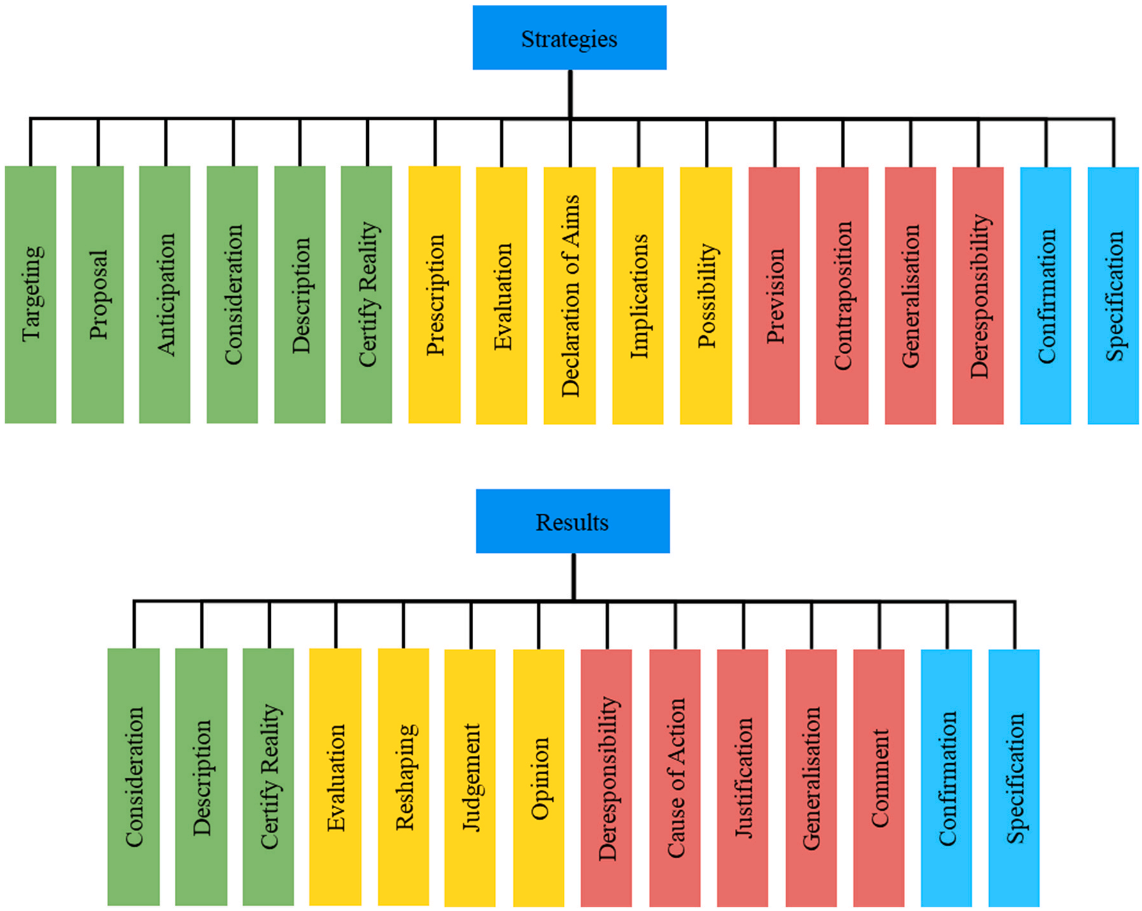

Fig. 2. DRs placement for productivity management, as related to strategies' and results' configuration.

opportunity to change the temperature or room layout). Instead, within this theoretical framework we can observe the interactive-discursive strategies (or DRs) that the worker employs to attribute value to the contextual elements, and therefore how they can organize their activity; indeed, through the use of peculiar DRs, the worker discursively builds a productivity configuration that, due of its characteristics, can be managed to a certain extent in terms of the strategies employed to achieve the corporate objective and the related results.

Therefore, from here on when mentioning the worker's "interaction" with environmental elements in order to manage productivity, the authors will refer to the discursive process in which the worker attributes value to the surrounding reality, and defines at the same time the possibilities for action (strategies) and what can be achieved through them (outcomes).

2.5. Research questionnaires

Two questionnaires were designed based on guidelines in ASHRAE 55 [1] and ISO 10551 [48]; subjects had to compile the first part after 1 h and the second part at the end of the test. The survey was divided into three parts, asking the participants about their *perception*, *judgment* and *preference* of the environment reproduced inside the laboratory, considering thermal, lighting and acoustic aspects. The personal thermal evaluation and tolerance had a 5-point scale reference, while the comfort preference was expressed on a 7-point scale. Although comfort votes include preferences concerning acoustics, lighting and indoor air quality, only thermal comfort analysis will be presented in the following paragraphs.

Using the methodological framework described in Section 2.4, two productivity evaluation questionnaires that integrate with the ISO 10551 protocol were developed, adding to and enhancing its outputs: one with open-ended questions, used in the first trial phase, and one with multiple choice questions, used in the second phase. In both phases, the productivity evaluation questionnaire was administered only once, at the end of the test. The questionnaires aimed to evaluate the participants' productivity management level and exploited the criteria they used to select the ISO 10551 protocol answers – thus connecting thermal evaluation and productivity management.

The open-ended questions (Annex C – Table C1) have been used in the first trial phase, corresponding to the experimental session in December 2021: the participants' entire response texts were collected and analyzed through M.A.D.I.T., observing which DRs emerged most. Questions from **a.** to **e.** were used to evaluate the *untethered productivity management*, i.e., the degree to which participants can efficiently manage the working activity when they do not consider other elements of the context that might affect the work performance, e.g., thermal evaluations or perceptions of comfort. Instead, questions from *f1.* to *h.* were used to evaluate *referred productivity management*, i.e., the level of work management that participants are capable of when they are asked to examine their work taking into consideration other elements of the context. This was done to observe: (1) if and how much thermal comfort was considered by participants in their general productivity management configuration; (2) how directly linking thermal comfort to productivity modifies it.

The open-ended questionnaire allowed us to detect which DRs are used by participants when dealing with productivity and with what frequency (paragraph 3.3.1, Fig. 6), and to detect which topics are considered by participants when addressing productivity and with what frequency (Fig. 7). To exemplify: to question **f2** of the open-ended questionnaire "*Describe in detail how the selected sensation affected the* *way of managing, completing the task and impacted on the results achieved*", the answer "*All in all, the conditions were not so "extreme" that they would not allow it to take place or interrupt it. In fact, I think these are conditions more or less similar to many places of work/study*" refers to "Judgement" and "Generalisation" DRs, accounting for a lower-middle degree of productivity management (see Fig. 2).

Moving from these findings, it was subsequently possible to develop a multiple-choice questionnaire for the evaluation of productivity management; this questionnaire, by presenting all participants with the same set of answers to choose from, allowed us to obtain a more linear and standardized output.

The multiple-choice questionnaire has been used in a second trial phase, corresponding to the experimental sessions from January to March 2022. In this case, each response option matched specific DRs indicators of a high, medium, or low degree of productivity management. Similar contents have been maintained in the answer texts to the same question so that participants could not discriminate which answer represented a higher productivity management level. Again, to exemplify: for the question **h2** of the multiple-choice questionnaire "*How do you manage this feeling towards your productivity?*", the answer option "*Since I cannot intervene in environmental variables, I can only work in such conditions, and obviously the quality of the work done may suffer*" uses the "Justification" and "Judgement" DRs, accounting for a lower-middle degree of productivity management (see Fig. 2).

All the questionnaires used in the research were administered online and were filled out on site by participants.

2.6. Activities of the participants

In Fig. 3, the structure of the tests is reported; before starting the tests, participants underwent 30 min of acclimatization, 15 in a separate room and 15 moving to the test office. During the first 15 min of acclimatization, participants were given brief and general instructions about their daily tasks. Two different tasks were randomly assigned to participants: two of the participants would be assigned a task to work on independently, while the others would work on a collaborative task. The formers were assigned analogous tasks and could not interact with each other, while the latter were allowed to interact since they were instructed to perform the same task jointly: the main goal was to maximize the identification of the participants as real workers within a realistic working environment. All tasks were assigned with the same frequency throughout the trial phases. During the second 15 min of acclimatization inside the test room, participants could complete a survey concerning general information such as gender, age, weight, height, study title and personal background, as well as information on personal well-being, type of meal and activity in the 2 h before the test. Later they read the corporate objective to pursue and the specific work tasks to perform (Annex A - Table A1).

During the 2 h of trial, participants could not interact with the researcher (e.g., they could not ask questions regarding their job or the questionnaires) nor change workstations or leave the test office room. They were only informed from the outside about the start and end of the trial and the time for filling in the mid-term questionnaire.

3. Results

The experimental results are reported in the following order: first, the general information about the tested people is shown; secondly, the results of the thermal comfort analysis are presented, followed by the results of the productivity management analysis. Finally, the discussion session is provided to link the different aspects of the tests.

3.1. Data of the tested subjects

Five settings of PMV were tested, each one reproduced three times. Up to four participants were required for each test, for a total number of 59 tested subjects. Each subject participated in the tests only once.

All of them were students aged between 19 and 30; the participants' age average value was 23.7. Among them, 56% were males (33 participants on 59), whereas 44% were females (26 on 59). They have been recruited within the university courses; thus, their participation was voluntary, not paid.

In the first test, most subjects (81%) reported being in good physical shape, and only 19% reported not eating 2 h before the test. 53% reported having little physical activity before the test to reach the test site.

3.2. Thermal comfort results

The results related to thermal comfort are reported considering the classification proposed by ISO 10551 [48], distinguishing between thermal perception, thermal preference and thermal evaluation. The following tables (Tables 2 and 3) also reported the actual mean vote (AMV), which was extrapolated from the thermal perception answers and compared with the expected PMV. For both AMV and PMV, the mean value is indicated, together with the standard deviation (SD). The SD of the PMV is calculated considering the values in all the tests with the same PMV setting with 1 min timestep. Considering the AMV, the mean values and the standard deviations are calculated including all the participants' votes for the sessions with the same PMV setting, distinguished between intermediate and final. For example, considering the setting PMV = −0.7, three tests were carried out, with 4, 3 and 4 participants, as can be seen in Table 1. The SD for the AMV calculated in the row corresponding to the PMV of −0.7 in Table 2 was calculated using the 7 votes the participants gave in the intermediate and the 7 votes they gave in the final questionnaires.

The results reported in Table 2 show that the answers to the final questionnaires show better correspondence between the AMVs and the expected PVM calculated than those from intermediate ones. This behavior was frequently recurring during testing: after 1 h, the feedback of tested subjects gave significant variability, outlining more uncertainty in reaching a common definition of the thermal state of the room.

Considering the tests in neutral conditions, half of the tested subjects assert that they perceive a state of thermal neutrality and prefer not to have changes in the thermal environment. However, some subjects perceive it to be slightly cold or warm (25% and 17%, respectively, in the final questionnaire), leading to a preference for a slightly warmer or cooler environment. This sensation seems relatively moderate, as only in a few cases it results in discomfort for the participants (in final questionnaires, 33% of subjects feel "slightly uncomfortable").

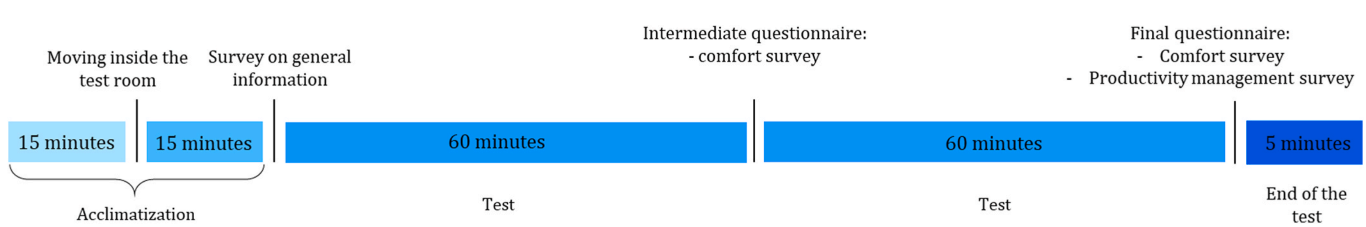

Fig. 3. Timeline of the tests.

Table 2
Answers to questionnaires about thermal perception. In the columns of AMV and PMV, the standard deviation (*SD*) is shown in brackets.

PMV	AMV		Thermal Perception		
	Intermediate questionnaire	Final questionnaire		Intermediate questionnaire	Final questionnaire
−0.7 (*SD* = *0.05*)	−0.27 (*SD* = *0.62*)	−0.82 (*SD* = *0.57*)	Cold	0%	9%
			Slightly cool	36%	64%
			Neutral	55%	27%
			Slightly warm	9%	0%
−0.5 (*SD* = *0.02*)	0.00 (*SD* = *0.74*)	−0.64 (*SD* = *0.88*)	Cold	0%	9%
			Slightly cool	27%	64%
			Neutral	45%	9%
			Slightly warm	27%	18%
0 (*SD* = *0.06*)	0.33 (*SD* = *0.62*)	0.25 (*SD* = *0.83*)	Slightly cool	8%	17%
			Neutral	50%	50%
			Slightly warm	42%	25%
			Hot	–	8%
0.5 (*SD* = *0.05*)	1.17 (*SD* = *0.99*)	0.58 (*SD* = *0.64*)	Slightly cool	0%	8%
			Neutral	33%	25%
			Slightly warm	25%	67%
			Hot	33%	0%
			Very Hot	8%	0%
0.7 (*SD* = *0.03*)	1.15 (*SD* = *0.95*)	0.85 (*SD* = *0.66*)	Neutral	31%	31%
			Slightly warm	31%	54%
			Hot	31%	15%
			Very Hot	8%	0%

Table 3
Answers to questionnaires about thermal preference and evaluation.

PMV	Thermal Preference			Thermal Evaluation		
		Intermediate questionnaire	Final questionnaire		Intermediate questionnaire	Final questionnaire
−0.7	Warmer	0%	9%	Comfortable	82%	64%
	A little warmer	55%	64%	Slightly uncomfortable	18%	36%
	No change	27%	27%			
	Slightly cooler	18%	0%			
−0.5	Warmer	0%	18%	Comfortable	55%	36%
	A little warmer	36%	55%	Slightly uncomfortable	36%	55%
	No change	36%	27%	Uncomfortable	9%	9%
	Slightly cooler	27%	0%			
0	A little warmer	17%	33%	Comfortable	92%	67%
	No change	50%	42%	Slightly uncomfortable	8%	33%
	Slightly cooler	33%	25%			
0.5	No change	17%	0%	Comfortable	42%	17%
	Slightly cooler	58%	75%	Slightly uncomfortable	33%	67%
	Cooler	25%	25%	Uncomfortable	25%	17%
0.7	No change	8%	23%	Comfortable	23%	46%
	Slightly cooler	54%	69%	Slightly uncomfortable	38%	46%
	Cooler	38%	8%	Uncomfortable	38%	8%

In the tests carried out in warmer conditions (expected PMV = +0.5 and +0.7), the intermediate questionnaire outlined a thermal perception much warmer than expected (AMV >1 in both cases). After 2 h, most subjects perceive a slightly warm environment, e.g., 67% in the tests with PMV = 0.5 and 54% in the tests with PMV = 0.7, with 15% perceiving a warm environment in the latter case. The same behavior appears in the answers to thermal preference, whereas in the second questionnaire, the responses converge toward the preference for a slightly cooler environment (69%–75%).

The tests in cooler conditions (expected PMV = −0.5 and −0.7) show the same pattern: at the beginning, the room conditions were perceived as moderate, but after 2 h, the perception fell to a slightly cold environment (64% in both cases) with the preference towards a litter warmer environment (55% and 64% of responses in the 0.5 and 0.7 tests, respectively).

In Fig. 4, the participants' answers are summarized and compared to the calculated PMV evaluated through Fanger's Model (assuming clo = 0.75, metabolic activity 1.2 met, air velocity = 0.05 m/s).

3.3. *Productivity management results*

The results below show the frequency of productivity management indicators: the analysis considers both the distribution of DRs – from which the observed productivity levels are derived – and the content clusters of the answers.

3.3.1. *First trial phase*

Referring to the first trial phase, all participants were in neutral and moderate climatic conditions (PMV between 0 and ±0.5). The percentage of each indicator's class representative of the productivity management level of questions from **a.** to **e.** (Table C1) is shown in Fig. 5.

The evaluated productivity management stands at a medium-high level. The contribution mostly comes, in particular, from the DRs of Description (23.1%) and Judgement (14.5%), that combined cover more than 1/3 of the total DRs used by participants (Fig. 6).

Content-wise, a relevant point is that only 0.3% of them directly link productivity to comfort and 1.4% state an influence of climatic parameters on the untethered productivity management (Fig. 7).

Looking now at the aggregated results of questions from **f1.** to **h.**

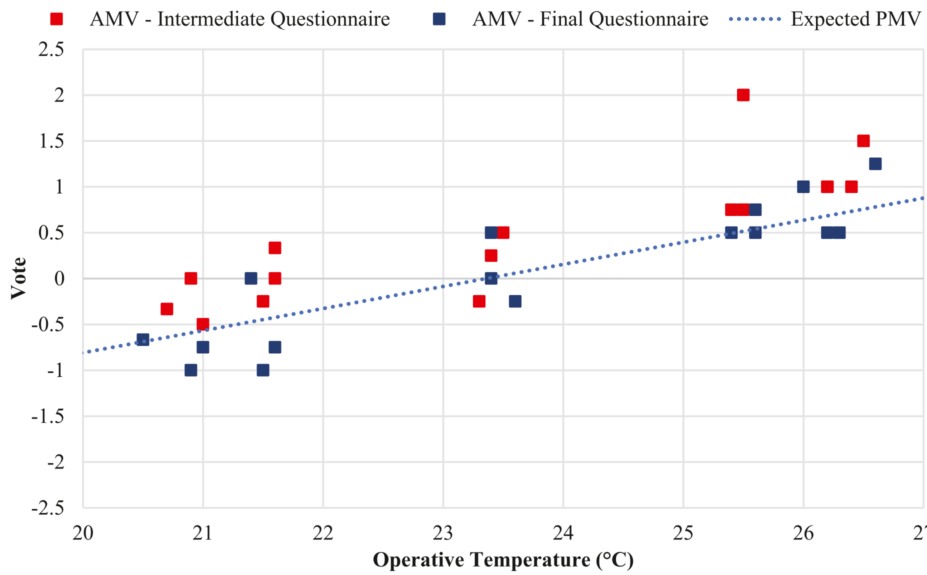

Fig. 4. AMVs in different tests as a function of the operative temperature.

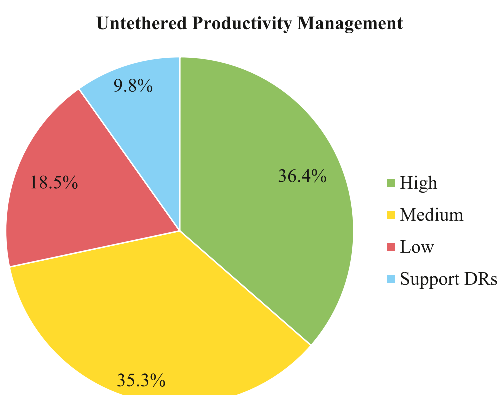

Fig. 5. Untethered productivity management's indicators percentages in the first trial phase.

(Table C1) we observe an increase in the high productivity management indicators percentage of almost 10%, as shown in Fig. 8.

Also, there is a decrease in the medium productivity management indicators and the use of the two support DRs (Fig. 9). Again, the most used DR is the Description one, which stands at 31.5% and accounts for 1/3 of the total DRs used. Participants use a similar percentage of the Certify Reality and Possibility DRs (around 12% and 10.9%).

Regarding the contents dimension, participants state more strongly that climatic parameters influence productivity (around 11%). Specifically, the thermal parameter is considered in the 12.2% of the total contents used, while the others (air quality and visual) account for only 1.7%. Lastly, a link between productivity and overall comfort is made with 6.8% of content elements (Fig. 10).

3.3.2. Second trial phase

3.3.2.1. Untethered and referred productivity management and personal thermal preference. In the second trial phase in the test room, we used the multiple-choice questionnaire with 35 participants.

First, we compared participants' thermal perceptions (question *1.* From the ISO questionnaire – Table B1) with untethered productivity management (question from *a.* to *e.* – Table C1) (Fig. 11).

Participants who report being more comfortable are more oriented toward productivity management, while those who are in discomfort have a lower level of productivity management. This finding seems to be consistent with what has been reported in the literature, namely that the degree of comfort is positively correlated with productivity, i.e., a higher degree of comfort corresponds to higher productivity.

However, this correlation is not supported, or is even controverted, when using questions that survey the level of referred productivity management (Fig. 12).

For instance, in question *h* (Table C2), participants are asked to describe how they use their thermal evaluation in reference to their productivity. Participants who reported being in a discomfort state present a largely higher level of productivity management than participants who reported being in a comfortable state.

Furthermore, regardless of the thermal evaluation expressed, the number of participants with intermediate management level remains high and relatively similar in the three response categories.

3.3.2.2. Productivity management in different predicted mean vote conditions. In the second trial phase, participants were divided within different climatic conditions, thus we grouped the results of the productivity management evaluation into two clusters: the "Neutral or moderate PMV" group includes tests carried out with the neutral climatic condition (PMV = 0.0) and tests with the moderate condition (PMV = ±0.5), which are both to be considered comfortable thermal conditions according to UNI EN ISO 7730:2006 [49]; the "Uncomfortable PMV" group includes the tests with the uncomfortable condition (PMV = ±0.7).

Fig. 13 collects the outcomes of both the first and the second trial phases, showing how participants with different levels of referred productivity management (1 – high; 2 – intermediate; 3 – low) distributed themselves within the different PMV sets. In the first trial phase, the level of referred productivity management has been evaluated using questions from *f1* to *h* (Annex C – Table C1), while in the second trial phase questions *d, h* and *i* (Annex C – Table C2) have been used.

As shown in Figs. 13 and 53% of participants with a high level of referred productivity management are distributed within the uncomfortable condition, while 64% of participants with a low level of management are distributed within the neutral or moderate condition; these outcomes seem to challenge the idea that a more comfortable environment corresponds to a higher productivity, thus the direct correlation between comfort and productivity is not confirmed by the data presented.

On the other hand, participants with an intermediate level of

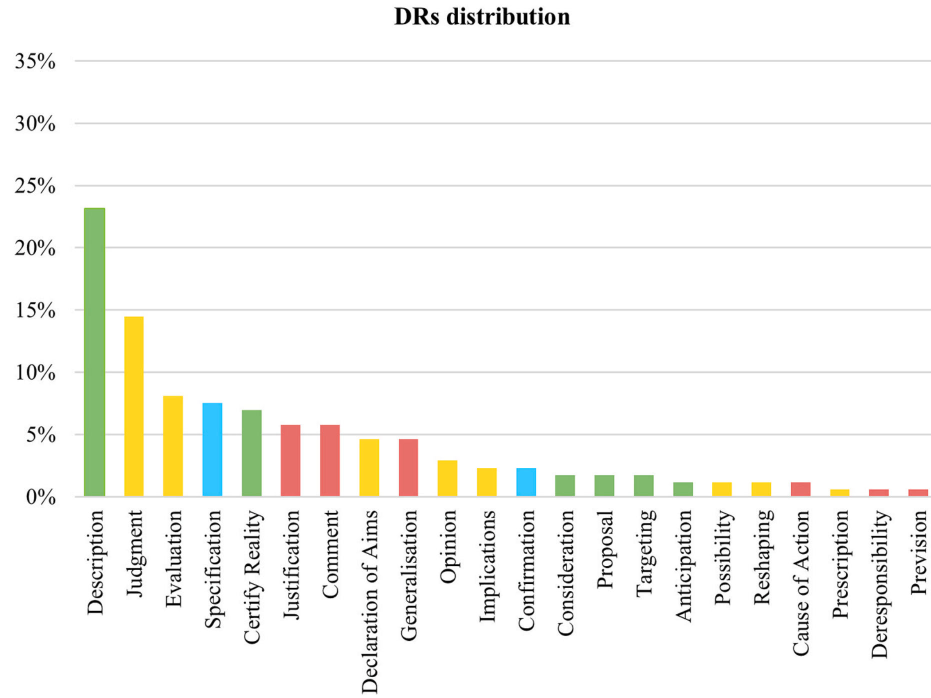

Fig. 6. DRs distribution for untethered productivity management's in the first trial phase.

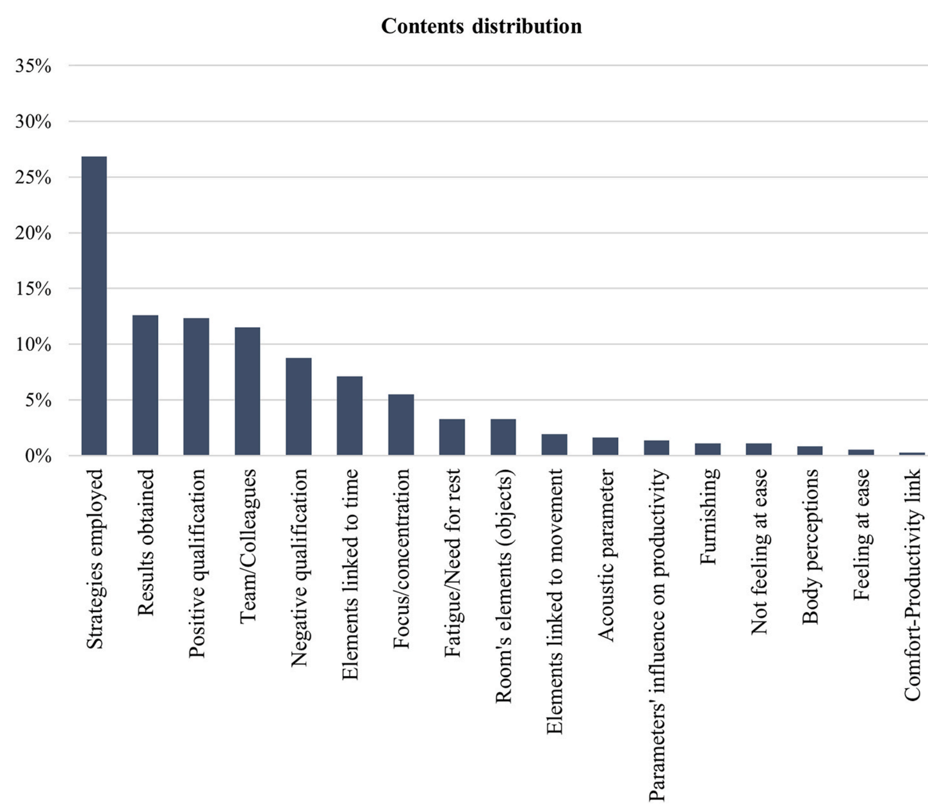

Fig. 7. Contents distribution for untethered productivity management's in the first trial phase.

management are strongly concentrated (79%) in the neutral or moderate PMV condition, and it might be argued that the climatic conditions favored this group of participants in achieving an intermediate level of productivity.

In order to further investigate these findings, the outcomes have been analyzed from a different perspective. Results have been grouped into three different clusters: the "Cold" condition includes tests carried out with an uncomfortable cold climatic setting (PMV = −0.7) and tests with a moderate cold setting (PMV = −0.5); the "Neutral" condition includes tests with a neutral setting (PMV = 0.0); the "Warm" condition includes tests with a warm uncomfortable setting (PMV = +0.7) or a warm moderate setting (+0.7).

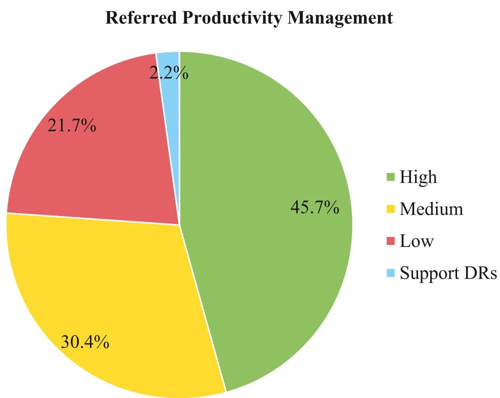

Fig. 8. Referred productivity management's indicators percentages in the first trial phase.

Then, it was analyzed how the thermal preference, expressed by participants in the first and second trial phases, is distributed across the different levels of referred productivity management (high; intermediate; low) and PMV settings (Cold; Neutral; Warm).

Personal thermal preference has been evaluated using question 3 from the questionnaire for thermal comfort evaluation (Annex B, Table B1).

As shown in Fig. 14, in the Neutral condition (middle column) it is possible to observe that as the level of referred productivity management decreases, the demand for thermal change expressed by participants increases.

On the other hand, observing the Cold and Warm conditions (outer columns), participants with a high level of productivity management present rather uniform thermal requests: in fact, thermal preferences are similarly distributed within the moderate or uncomfortable PMV settings; furthermore, there is a lower demand for thermal change in the Warm condition.

In contrast, participants with a low or intermediate level of productivity significantly vary their thermal preferences depending on whether they are in the Warm or Cold condition.

Indeed, participants with an intermediate level of productivity management express a high need for thermal change in the Warm condition, in which 58% ask for a clear change and none express a preference for the "no change" option; on the other hand, they seem to better tolerate the Cold condition, since 37% want no change and none ask for a clear change, likewise the preferences expressed in the Neutral condition.

Furthermore, participants with a low level of productivity in the Cold and Warm conditions express different thermal preferences: in the Cold condition, participants are almost equally divided between those who do not want any change (28%) and those who want a clear change (29%), and in the Warm condition this contrast becomes even more pronounced (clear change: 40%; no change: 40%).

4. Discussion

The output of the thermal comfort analysis performed in this study (Fig. 4) shows that Fanger's model gives a good prediction of the occupants' thermal perception in the CORE-CARE laboratory, confirming the reliability of the model that was originally set up for test rooms and climatic chambers.

The results' analysis focuses on the important role of acclimation: despite the resting time given before the beginning of the tests, it was noticed that, after 2 h, the questionnaires corresponded coherently with the expected model, and participants converged towards a common definition of the environment. This suggests that even in a steady-state environment, the interaction between the participants and the room is continuously evolving, determining variations of both the participants' thermal perception and the thermal evaluation (the average AMV and the people evaluating the thermal environment as "comfortable" decreases in the final survey with respect to the intermediate one) as it can be seen in Table 3.

It is interesting to note a higher tolerance of tested subjects to cold environments in wintertime: considering the final questionnaires, the percentage evaluating the thermal environment as "comfortable" is 64% in the case of expected PMV = −0.7 respect to the case with PMV = 0.7 where the percentage is 46%; in the tests with PMV = −0.5 the ratio is 36%, compared to the 17% of test with PMV = 0.5; also the answers that

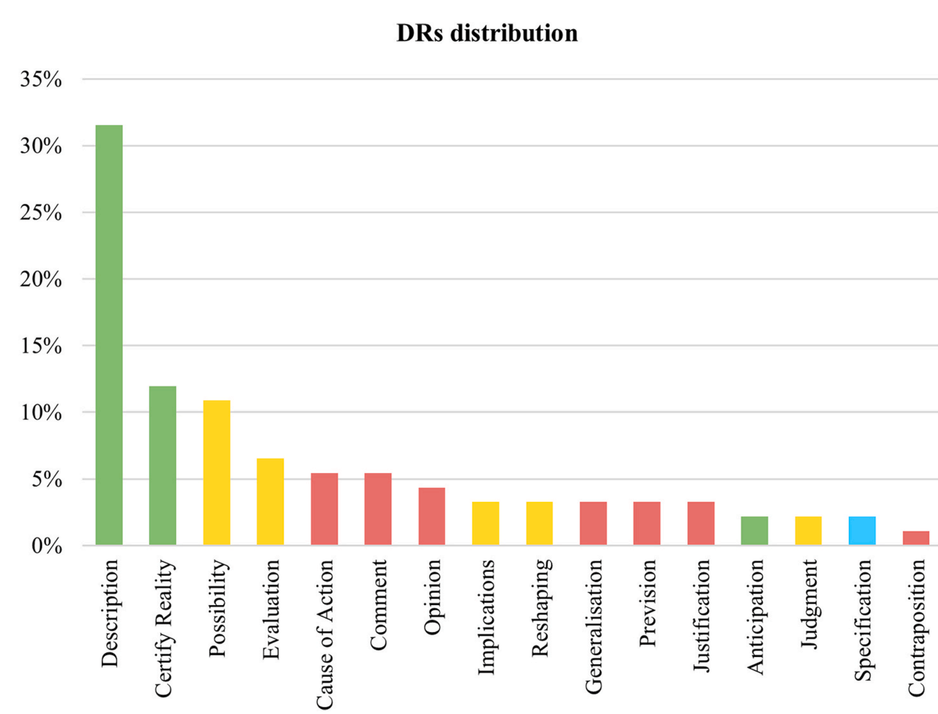

Fig. 9. DRs distribution for referred productivity management's in the first trial phase.

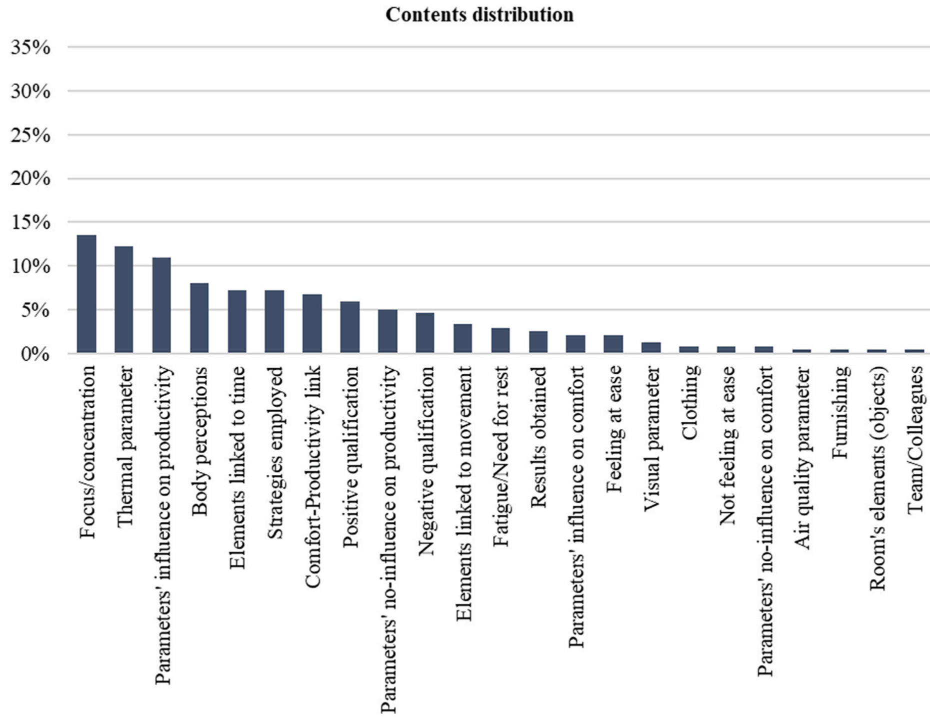

Fig. 10. Contents distribution for referred productivity management's in the first trial phase.

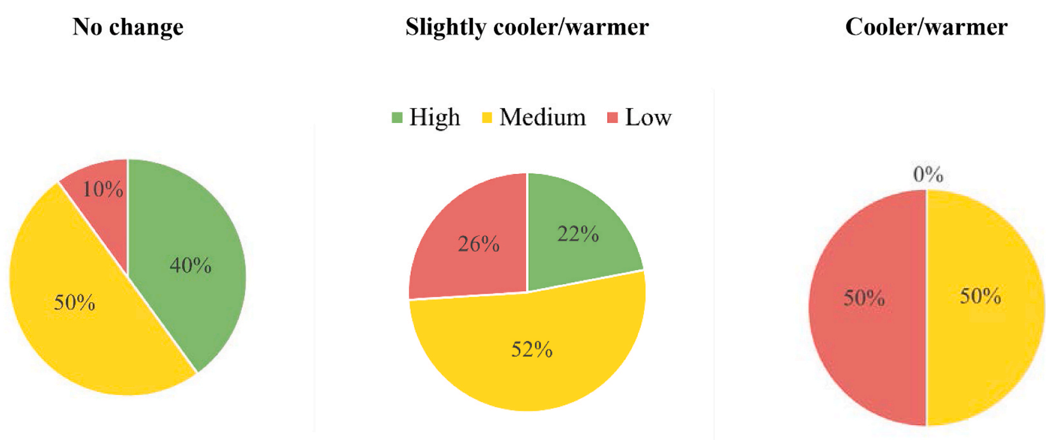

Fig. 11. Thermal perception and untethered productivity management's percentages in the second trial phase.

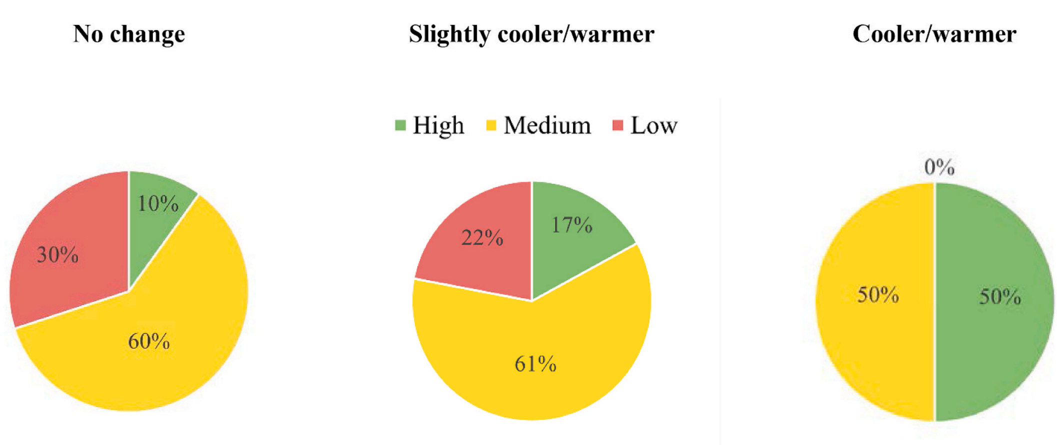

Fig. 12. Thermal perception and referred productivity management's percentages in the second trial phase.

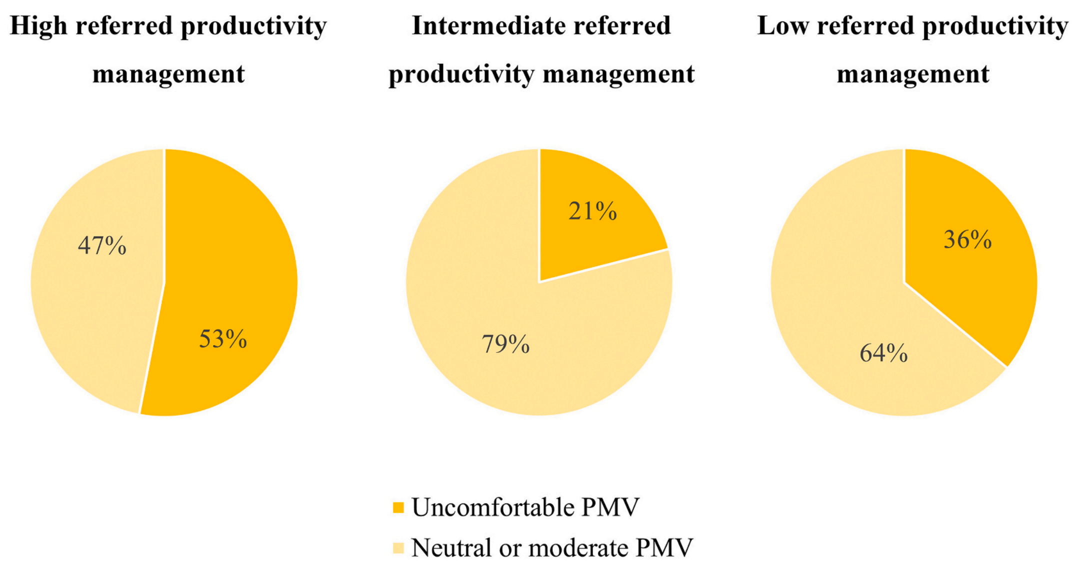

Fig. 13. Referred productivity management related to personal thermal preference as result from a preliminary analysis based on aggregated data.

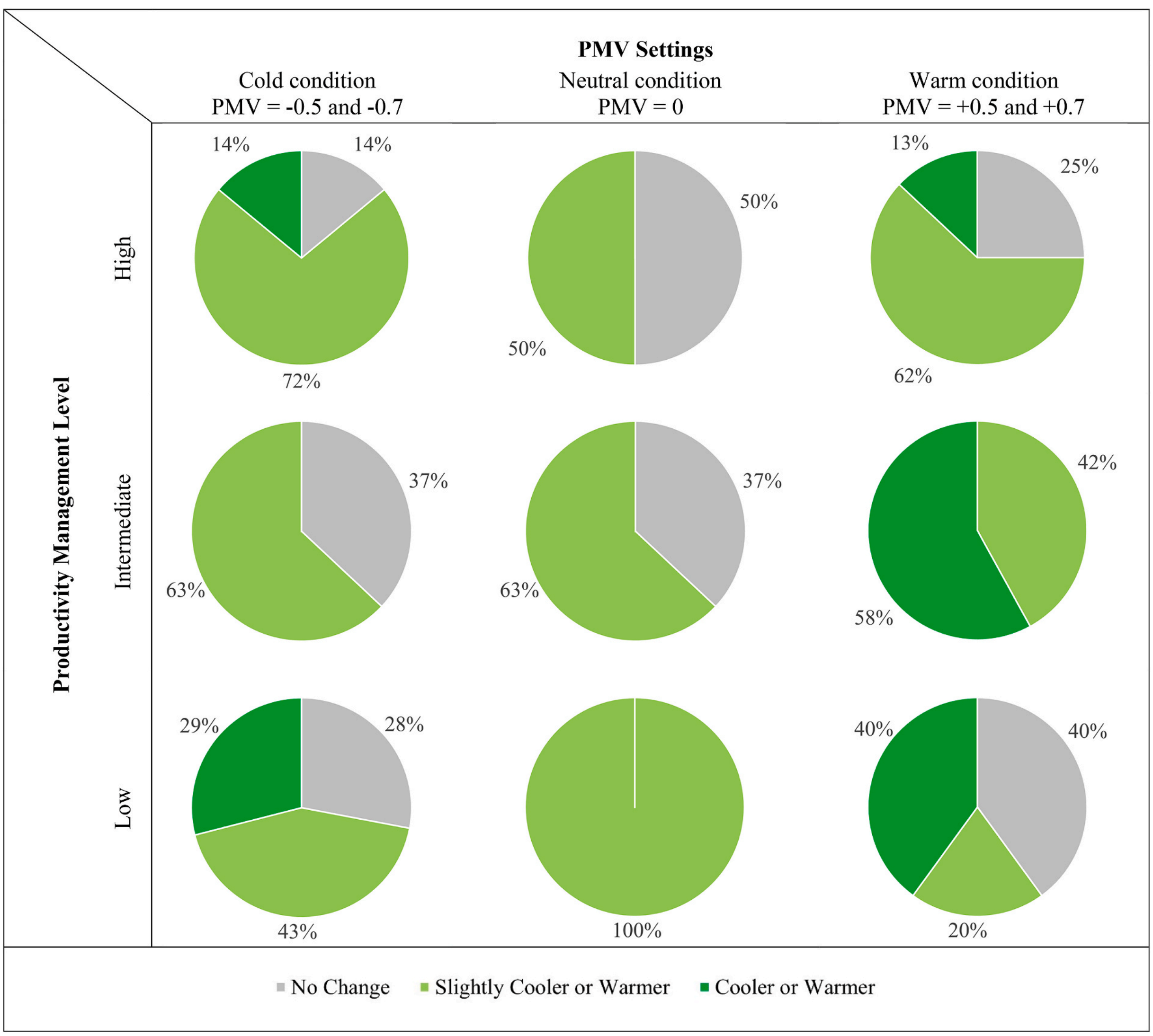

Fig. 14. Personal thermal preferences expressed by participants from both the first and the second trial phases, divided by different levels of referred productivity management and by PMV settings.

define the environment “slightly uncomfortable” and “uncomfortable” show a higher percentage in warm conditions tests than in colder ones. Further studies should investigate if more tested people can confirm this behavior. It is worth looking for a seasonal tolerance compared with users' expectations (warm environments in winter are less accepted compared to the summer season) or if the high clothing resistance is a mitigating variable for the tolerance of cold environments.

Another relevant aspect can be seen by comparing the answers of thermal perception, preference, and evaluation. The analysis of single responses showed a good match in perception and preference (e.g., people perceiving a slightly cool environment, generally gave a coherent answer on their preference). On the contrary, the relation between the perception of a warm or cool environment and their evaluation (e.g., comfortable, or not) was unclear, as seen in Table 3. As already presented in the Introduction section, the use of scales is a controversial issue, as the relationship between thermal sensation and comfort can be affected by many factors [5]. For this reason, the definition of “comfortable environment” given by participants should be further investigated, as it provides a different definition of the environment compared to a vote based on the real perception (warm, cool).

Concerning productivity management, outcomes point out that, in contrast to what is reported in the field literature, a positive correlation is not necessarily an effective way to describe the relationship between comfort and individual productivity. This is suggested by the results of the first trial session, which highlights that a negligible portion of the participants (0.27%) directly linked productivity to comfort or reported that environmental parameters influence productivity management (1%).

These results are further supported in the second trial session, which shows that at least 50% of the participants were always able to maintain an intermediate level of untethered productivity management, even when the preference for a strongly higher or lower temperature was recorded and, therefore, there was plausibly a state of discomfort (Fig. 11). This aspect suggests that the environmental condition could not have determined the participants' level of productivity management.

Furthermore, productivity management has been analyzed within different climatic conditions.

Firstly, in Fig. 13 results of the productivity management evaluation have been grouped into a “Neutral or moderate PMV” condition (PMV = 0.0; PMV = ±0.5) and an “Uncomfortable PMV” condition (PMV = ±0.7). About the intermediate level participants, they are strongly concentrated in the neutral or moderate climatic condition (79.6%), and it could be assumed that the favorable environment allowed these participants to achieve an intermediate level of productivity, even though they couldn't exercise elevated management skills. This outcome might suggest a correlation between comfort status and productivity, and consistently with this outcome a lower level of productivity management was expected to be associated with the uncomfortable climatic condition; nevertheless, 64.3% of participants with a low level of referred productivity management are in the neutral or moderate condition. Again, participants with a high level of management were expected to be concentrated in the most favorable climatic condition; instead, 53% of them are in the uncomfortable one. Therefore, a direct relationship between comfort and productivity seems not to be confirmed.

Subsequently, to further investigate these findings, in Fig. 14 results have been grouped into a Cold condition (PMV = −0.7; PMV = −0.5), a Neutral condition (PMV = 0.0) and a Warm condition (PMV = +0.7; +0.7). With respect to the Neutral condition (middle column of Fig. 14), participants with a high level of productivity management are able to use the neutral climatic condition to their advantage, expressing in fact a low need for thermal change (50% no change; 50% slight change); on the other hand, as the level of productivity management decreases, the demand for thermal change increases, which indicates that participants with an intermediate or low level of productivity are more unlikely to recognize the climate condition as favorable and thus use it to increase their productivity.

Instead, within the Cold and Warm conditions (outer columns of Fig. 14), the lower the level of productivity management participants are capable of, the more they are influenced by the climatic condition in which they work; indeed, participants with a low level of management are scarcely oriented towards productivity and, therefore, when interacting with the environmental parameter they may pursue different goals, other than the assigned work task. This implies that the worker's thermal preference may be influenced from time to time by their own contingent personal goals, rather than by the productivity task, and thus the thermal preferences expressed by low level participants are strongly differentiated and conflicting.

As for participants with an intermediate level of productivity, they too present mixed thermal preferences in the moderate or uncomfortable PMV conditions: in the Cold condition they are able to manage the effects that the unfavorable climatic condition may have on productivity, e.g. by employing thermoregulation strategies, and in fact they express a low demand of thermal change; in the Warm condition, on the other hand, they encounter greater difficulties in managing their comfort status in order to increase productivity, and therefore they shift their focus on modifying external environmental conditions rather than operating on their perceptions, thus expressing a stronger request for thermal change.

In contrast, participants with a high level of productivity are able to remain goal-oriented and modulate the effects of the climatic condition on their work, thus expressing a lower need for change.

From the analysis carried out it becomes clear that it is reductive trying to understand productivity as a mere effect of comfort; rather, the results suggest that productivity comes from the complex interaction between the worker, their perceptions of comfort, the strategies they can employ and the surrounding work environment; therefore, it is worth to investigate this kind of interactions more thoroughly in order to understand how productivity can be generated and managed.

Lastly, while investigating the connection between comfort and individual productivity, the second trial session highlighted the distinction between untethered and referred productivity management, showing that participants are capable of a higher level of productivity management if they refer their work activity to context elements such as perceptions, evaluations and thermal preferences (Fig. 12). This result suggests that if participants can use environmental elements to configure their productivity, they can better describe their environment, their state of comfort, how this can affect productivity management, and lastly, investigate possible ways of managing it (referred productivity management). On the other hand, when the environmental element is excluded from the participants' configuration of productivity (untethered productivity management), as it is not made available by the question text, the participants see their possibilities of managing productivity reduced, and they are more exposed to variation in environmental parameters. Ultimately, workers who perform untethered productivity management may experience more negative effects on their productivity when facing thermal discomfort.

5. Conclusion

The analysis of the recent literature showed that there is no standardized methodology to evaluate productivity, thus leading researchers, and secondly also economists, finance and accounting professionals, to adopt a biased definition of productivity, that does not allow to produce comparable outcomes. In order to overcome this issue, this paper focused on a novel method to analyze how a typical office user manages his or her productivity, through the use of questionnaires. Users compiled the questionnaires during specific tests carried out in a test room designed as a typical office workplace, where environmental parameters were set to simulate neutral, moderate and uncomfortable PMV conditions according to the Fanger's model. From the analysis of the results, several outcomes can be presented:

1. There was a good correlation between the thermal model and the feedback obtained from the users.
2. The importance of the acclimation is demonstrated by the analysis of the final test, which were more coherent with the environmental settings compared to the intermediate test.
3. Although the statistics should be expanded, at the current state people seem to have a higher tolerance towards cold environments.
4. Participants do not consider workplace environment variables to be a prevalent factor affecting productivity management unless this link is directly suggested by the question.
5. From a preliminary analysis based on aggregated data, a deterministic relationship between comfort and productivity cannot be supported, since a higher level of comfort does not appear to provide a straightforward and exclusive factor of a higher level of productivity management. Analyzing data subdividing PMV conditions in more specific categories, some trends has been found. In particular, participants with an intermediate or low level of productivity in the neutral conditions are more unlikely to recognize the climate condition as favorable and thus use it to increase their productivity. Contrarily, participants with a high level of productivity are able to remain goal-oriented and modulate the effects of the climatic condition on their work, thus expressing a lower need for change.
6. Workers can express a higher level of productivity management, as far as they are enabled to refer their work activity to elements of the environment, such as perceptions, evaluations and thermal preferences.

Concluding, it can be stated that the thermal comfort seems not to be a dominant driver on the productivity of a common office user; therefore, to evaluate productivity management, it appears necessary to observe the impact of each different element of the work environment and their mutual interaction. In fact, even though the explorative research presented important outcomes for the analysis of individual productivity, nevertheless further experimental trials should be carried out to include more variables that contribute to obtain a comfortable, yet productive, environment. For instance, lighting and acoustics are similarly important to achieve high productivity levels, as well as furniture ergonomics. Moreover, although the model presented constitutes an alternative and valid method for the study of comfort and productivity, the research pointed out that the application of such models can be demanding. In fact, it requires the creation of working groups with transversal skills, specific preparation of the material to perform the tasks and expensive controlled laboratories, similar to the Core Care lab used for this research.

Furthermore, this model is still under development and further applications of this research will be carried out to look at the potential of the new method, improving the analysis of comfort and productivity and, ultimately, providing a rigorous methodology for workspace management.

In conclusion, when building an office space, considering the occupants perspective starting from the design phase could lead to a more favorable ratio between comfort and productivity, while promoting good practices towards energy saving policies and enabling executives and workers to manage the impact of work activity on their health.

CRediT authorship contribution statement

Marco Marigo: Writing – review & editing, Writing – original draft, Investigation, Formal analysis, Data curation, Conceptualization. **Laura Carnieletto:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis, Data curation, Conceptualization. **Christian Moro:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation. **Tommaso Arcelli:** Writing – review & editing, Writing – original draft, Methodology, Data curation, Conceptualization. **Caterina Ciloni:** Methodology, Conceptualization. **Gian Piero Turchi:** Supervision, Funding acquisition. **Michele De Carli:** Supervision, Funding acquisition. **Antonino Di Bella:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

Acknowledgements

This work was developed as part of the Project BIRD n.213710, titled “AEOLUS - new criteria for assessing the indoor environmental quAlity to Enhance the well-being of peOpLe their prodUctivity and their Satisfaction” which has received funding from the Department of the Industrial Engineering of the University of Padova.

The CORE-CARE laboratory was created with funding from the TWINNING PROGRAM 2017, Three-Year Research Development Plan 2016–2018, from the Department of Industrial Engineering of the University of Padova.

Annex A – Task definition

Below are the texts of the assignments that were given to the four participants in each test carried out in the research; each text contains specific instructions that the participants had to follow during the test.

Table A1
Instructions for the execution of the independent task.

Independent task 1 (I1)	Independent task 2 (I2)
You are an employee in a leading literary translation agency, renowned for the quality of its translations, specializing in English language books. The company is currently in charge of the translation of the book “The environment in the age of the internet”. In order to achieve this objective within the deadline set by your manager, the work has been divided among several resources. You have been given the task of translating chapter 3 (pp.53-74). So, you are asked to produce a Word document containing the translated text. You are not allowed to use online dictionaries for the task, but you may use the printed dictionary that has been provided to you. The time limit you have is 2 h.	You are an employee in a leading literary translation agency, renowned for the quality of its translations, specializing in English language books. The company is currently in charge of the translation of the book “Liminal Spaces”. In order to achieve this objective within the deadline set by your manager, the work has been divided among several resources. You have been given the task of translating chapters 7 (pp. 109-118) and 11 (pp.147-160). So, you are asked to produce a Word document containing the translated text. You are not allowed to use online dictionaries for the task, but you may use the printed dictionary that has been provided to you. The time limit you have is 2 h.

Table A2
Instructions for the execution of the collaborative task.

Collaborative task 1 (C1)	**Collaborative task 2 (C2)**
You are two employees of a leading agency in the organization of events and recognized for the high degree of satisfaction and success of the initiatives implemented. Currently, the company is in charge of planning an event aimed at the community of Padua. The event that was decided to plan is aimed at raising awareness of the issue of environmental pollution. Your manager has given you the task of producing a series of documents useful for the design of the event and its dissemination, to be submitted to him. *List of points to outline and define, in a Word file:* - Type of event: which event are you planning? Describe the reasons for the choice made, stating the strengths in relation to the objective of the event; - Number of participants and location: how many participants do you plan to involve in relation to the defined objective? Where will the event take place? List the criteria and implications of the choices; - Resources needed (budget, human, territorial): How much do you expect to spend on the event? How many people are needed for organization and management? What institutional roles need to be involved? Draw up a detailed resource/cost plan on Excel; - Any institutional figures and/or territorial bodies to be involved: which figures within the reference territory (district, city, region) could be involved in order to pursue the event's objective? Are there territorial bodies that you consider useful to contact? Produce, in a separate Word file, one or more proposals for e-mail texts to be sent to these; - Program: what activities do you plan to carry out during the event? Will the event last one or more days? Within what time frame will it take place? Draw up a program for the event, taking all these aspects into account; - Promotion and communication strategy: under what name will the event be advertised? How do you plan to promote the event? Which communication channels do you plan to use (e.g. social, radio, leafleting, etc.)? Depending on the chosen channels, produce the text and graphics for the communication: social post, poster, radio message, etc. In order to produce what is required you have two computers with internet access. The time limit you have is 2 h.	Issue: in Padua it has been observed over the past year the difficulty for students to find accommodation. You are two professionals active in an association that deals with community projects. You decided to participate in a call for applications, launched by the municipality of Padua, created to respond to the above-mentioned issue. Specifically, your task is to make a presentation to be submitted to the Mayor and a team of expert evaluators, in which you will outline your proposed solution accompanied by Power Point slides and ad hoc documents/attachments. *In your presentation, you should address the following points, providing data to support your arguments:* - Elements describing the issue (numerical data, newspaper articles, other sources, etc.), also written down in a Word file; - What possible causes/reasons led to the issue expressed? - What possible solutions have already been implemented within the area or in other contexts? - What resources in the area can be involved/of support to deal with the issue? You are asked to produce an Excel document in which you provide a list and assessment of the resources available in the area; - What solution do you propose to manage the issue? Go into detail as to why such a solution could be effective; - How could the effectiveness of your proposal be evaluated? What verification indicators could be collected to demonstrate that the proposal has worked? In order to produce what is required, you have two computers with Internet access at your disposal. The time limit you have is 2 h.

Annex B – Questionnaire for thermal comfort evaluation

Below are the questions from the questionnaire that was administered to the four participants in each of the tests carried out during the research, in order to detect participants' perceptions, evaluations and preferences regarding environmental temperature. The questionnaire was formulated according to Standard ISO 10551.

Table B1
Questionnaire for the thermal comfort evaluation

Questionnaire for thermal comfort evaluation
a. How are you feeling now? - Cold - Very cold - Slightly cool - Neutral - Slightly warm - Hot - Very hot b. How do you find this environment? - Comfortable - Slightly uncomfortable - Uncomfortable - Very uncomfortable c. How would you prefer to be now? - Much warmer - Warmer - A little warmer - No change - Slightly cooler - Cooler - Much cooler d. Would you accept this environment rather than reject it? - Yes - No e. How do you consider the environment? - Tolerable - Slightly difficult to tolerate - Fairly difficult to tolerate - Very difficult to tolerate - Intolerable

Annex C – Questionnaire for productivity management evaluation

Below are the questions from the two questionnaires administered to the four participants in each test carried out during the research, in order to evaluate the level of productivity management that the participants were able to perform.

The first set of questions belongs to the open-ended questionnaire, administered in the first experimental session (December 2021); the second set of questions and answers belongs to the closed-ended questionnaire, administered in the second experimental session (from January to March 2022).

Table C1
Questionnaire for the productivity management evaluation given in the first experimental session.

Open-ended questions questionnaire
a. How do you consider your productivity while performing the task assigned to you? b. Describe the strategies and actions you evaluated and chose to apply that made you achieve the level of productivity just described. c. At the end of the 2 h of work, thinking back over everything you employed to complete the task, what considerations would you make about the result obtained? d. Given the result you have achieved, how would you modify the strategies and actions taken in order to increase the productivity level? e. As an employee of ***(I1 and I2)*** *the publishing house whose objective is to translate the book/****(C1)*** *the agency whose objective is to organize the event you worked on/****(C2)*** *the association whose objective is to realize the presentation of the project* you worked on, how would you deal with the critical issues you encountered during these 2 h in order to pursue the corporate objective? If there were changes in the ISO "Personal thermal assessment" question from *t1* (mid-term questionnaire) to *t2* (end questionnaire): f1. Describe in detail how the change in the selected sensation affected the way of managing, completing the task and impacted on the results achieved. If there were no changes in the ISO "Personal thermal assessment" question from *t1* (mid-term questionnaire) to *t2* (end questionnaire): f2. Describe in detail how the selected sensation affected the way of managing, completing the task and impacted on the results achieved.

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Table C1 (*continued*)

Open-ended questions questionnaire
g. Since the thermals were never changed, how did you maintain or alter your comfort level in order to manage and complete the assigned task? Referring to the answer given to the "Personal thermal preference" question (question "c") from the questionnaire for thermal comfort evaluation: h. How sensing "x" (e.g. "slightly cooler") could have affected the way you managed, completed the task and impacted on the results achieved? Describe in detail what could have happened.

Table C2

Questionnaire for the productivity management evaluation given in the second experimental session.

Multiple choice questions questionnaire
<u>Intermediate questionnaire</u>. a. Are you currently considering the environmental variables of your today's workplace in carrying out your tasks? - Yes - No a1. [If the answer is "Yes"] Which ones? Referring to the answer given to the ISO "Personal thermal perception" question: b. How is the selected thermal perception impacting on your level of comfort? - Thermal perception affects my comfort by making me more or less comfortable in the workplace based on the influence it has on my physical, perceptive and social state in performing the assigned task. - Thermal perception affects my comfort as the bodily perceptions from being in the room make me feel comfortable/uncomfortable in performing the task. - Thermal perception strongly affects my comfort. That is why it is essential to always set a temperature that makes workers feel comfortable. c. Is thermal perception impacting on your level of productivity? - Yes. - No. c1. [If the answer is "Yes"] How is the selected thermal perception impacting on your level of productivity? - It is impacting because, relying on the bodily sensations and perceptions that the parameters generate, I observe how the quality of the work I am doing changes and I can imagine what the result at the end of the work will be like. - It's impacting because, since I can't change the environmental variables, those variables change the conditions of the room and the work and therefore will impact what the final result is. - It is having a major impact. I really think that every change in the environmental parameters is affecting the task I am doing and that the progress of the rest of the work I am left with will totally depend on this. Referring to the answer given to the ISO "Personal thermal evaluation" question: d. d1. [If the answer is "Comfortable"] How do you use this feeling towards your productivity? - I try to notice how staying in the room produces this feeling and increases my concentration on the task, so that I can use it to maintain a high level of productivity. - I don't know how much this feeling is affecting my productivity. It may be that the result depends on my degree of concentration, which is also derived from the effect of the room on me. - I am not using and will not use this feeling for my productivity. What I am able to achieve is solely a result of my degree of concentration, and does not relate to being in the room. d2. [If the answer is "Slightly uncomfortable"/"Uncomfortable"/"Very uncomfortable"] How do you manage this feeling with regard to your productivity? - Even if I cannot intervene directly on the environmental variables, I consider the sensations they give me by assessing their impact on the performance of the task, calibrating the actions to be performed accordingly to make the situation comfortable and not undermine the quality of work. - Since I cannot intervene on environmental variables, the feeling is certainly variable. Considering that the task has to be carried out with a certain degree of precision anyway, I am focusing on the task so that the feeling will not affect productivity. - Since I cannot intervene in the environmental variables, I cannot do anything but work under such conditions. However, I will try to distract myself from the sensations I have experienced and continue to work. - Since I cannot intervene in environmental variables, I can only work in such conditions, and obviously the quality of the work done may suffer. <u>Final questionnaire</u>. e. As an employee of company X, how do you consider your productivity today in pursuit of the company goal? - My productivity was related to how I performed the task assigned to me: I considered what I had at my disposal (time, environment, tools) to get an idea of how the actions I was going to take would make me proceed efficiently and concentrate at my best. - My productivity was related to how I carried out the task assigned to me: concentration was useful for me to keep the focus on what is being done. Even stopping and catching my breath can be useful to have an overview of the work done. - My productivity was related to how I performed the task assigned to me: the more focused I was, the more productive I was. Achieving the given steps always depends on my concentration. Referring to the answer given to the ISO "Personal thermal perception" question:

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Table C2 (*continued*)

Multiple choice questions questionnaire
f. How did the selected thermal perception impact on your level of comfort? - Thermal perception affects my comfort by making me more or less comfortable in the workplace based on the influence on my physical, perceptive and social state in carrying out the task assigned to me. - Thermal perception had an impact on my comfort: body perceptions and physical states produced by room temperature may have made me feel comfortable/uncomfortable. - Thermal perception had a strong impact on my comfort level. This impact is decisive in assessing whether or not you feel comfortable/uncomfortable in working environments. g. Has thermal perception impacted on your level of productivity? - Yes. - No. [If the answer is “Yes”] How did the selected thermal perception impact your level of productivity? - It had an impact because, based on the bodily sensations and perceptions that the parameters generated, it was possible to imagine the result at the end of the 2 h, so that I could consequently calibrate actions useful for maintaining the quality of the result itself. - It impacted partly because it was not possible to change the environmental variables that produced this perception, and partly because the way I acted, in my relationship with them, affected the final result. - It had a major impact. I really think that any change in the environmental parameters caused an influence on the task I was performing and therefore the result I achieved depended on this. Referring to the answer given to the ISO “Personal thermal evaluation” question: h. h1. [If the answer is “Comfortable”] How do you use this feeling towards your productivity? - Noticing which environmental variable was producing this feeling and increasing my concentration on the task, so that I could replicate it and calibrate it to maintain a high level of productivity. - Noticing that the environmental parameters were affecting my productivity, although I realized that I was still evaluating what action to take with respect to the parameter to increase productivity. - I realized that the more comfortable the environmental parameters made me feel, the more productive I was. This modality was extremely useful in assessing productivity. h2. [If the answer is “Slightly uncomfortable”/”Uncomfortable”/“Very uncomfortable”] How do you manage this feeling towards your productivity? - Even if I cannot intervene directly on the environmental variables, I consider the sensations they give me by assessing their impact on the performance of the task, calibrating the actions to be performed accordingly to make the situation comfortable and not undermine the quality of work. - Since I cannot intervene on environmental variables, the feeling is certainly variable. Considering that the task has to be carried out with a certain degree of precision anyway, I am focusing on the task so that the feeling will not affect productivity. - Since I cannot intervene in the environmental variables, I cannot do anything but work under such conditions. However, I will try to distract myself from the sensations I have experienced and continue to work. - Since I cannot intervene in environmental variables, I can only work in such conditions, and obviously the quality of the work done may suffer. i. Have you considered the environmental variables of your workplace today in carrying out your tasks? - Yes. - No. i1. [If the answer is “Yes”] Which ones? i2. [If the answer to “i" question is “Yes”, and the answer to the ISO “Personal thermal evaluation” question is “Comfortable”] You selected the comfortable option in the previous answer. Given the request to use room environment variables to increase your productivity, how did you use them for this purpose? - I began to calibrate the physical states resulting from the environmental parameters to maintain focus and achieve a discrete result, evaluating the most effective ways of acting to move in the direction of the delegated objective. - I started to pay attention to how the variables were affecting the way I performed the task to try and keep that perception constant, which helped me to achieve a decent result. - I simply started realizing that I was comfortable with these variables and that I could produce more. Thanks to these parameters it was possible, in my opinion, to achieve a decent result. i3. [If the answer to “i” question is “Yes”, and the answer to the ISO “Personal thermal evaluation” question is “Uncomfortable”] You selected the not comfortable option in the previous answer. Given the request to manage room environment variables to maintain your productivity, how did you use them for this purpose? - Among the possibilities, concentrating on what needs to be done allows you not to put the focus on the parameter and to get used to the body temperature thus maintaining the level of productivity. - One possible option I tried was to concentrate as much as possible on the work to be done, but I’m not sure if this had an impact on maintaining productivity. - The only option I had was to concentrate as much as possible on the work to be done without thinking about anything else, thus maintaining my productivity level. j. j1. [If the answer to “i" question is “Yes”] At the end of your work shift, how do you consider the result obtained with reference to the environmental parameters? - The environmental parameters had an impact on the result achieved: this was in fact the result of the strategies I put in place, and therefore also of how I managed the relationship with the environmental variables. In this sense, the analysis of body perceptions and sensations is useful to understand how to act on the parameter in order to finish the task without the quality of the final result being affected. - The environmental parameters had an impact on the result achieved: in my relationship with them sometimes they could have increased or decreased the quality of the final result. This is why I took actions to try to remain comfortable and focused. - The environmental parameters had an impact on the result achieved: if they had been more comfortable I would have remained focused and achieved a better result. It is essential to consider all these variables in the workplace.

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Table C2 (*continued*)

Multiple choice questions questionnaire
j2. [If the answer to "i" question is "No"] Why did you not consider them in relation to the actions put in place and the results achieved (i.e. in terms of productivity)? - I did not consider them as I do not believe they impacted on my productivity: remaining tightly focused on making the strategies and actions I performed effective also allowed me not to focus too much on the perception of environmental variables in order to perform the task assigned to me. - I have not considered them as I do not think they have impacted on my productivity: in fact, although I have felt changes to my perceptions and sensations over time, I have tried to stay focused to finish the job and not make the environment unacceptable. - I did not consider them as I do not think they impacted on my productivity. I think that if environmental variables come to impact you are not doing a good job, or if the environment becomes unacceptable, you can no longer work.
Referring to the answer given to the ISO "Personal thermal evaluation" question:
k. How would you use this heat preference to increase your productivity today? - It would help me to understand whether the perceived temperature is more or less suitable for me to perform the task effectively, and therefore to evaluate what actions to take to manage this aspect and keep the quality of the result high. - It would help me to concentrate more on the task at hand, as it would allow me to divert my attention from the perceived temperature, while keeping the quality of the result high. - Surely this thermal preference would increase my concentration, and therefore the quality of the result I would get. It would be useful to ask for the thermal preference of each worker in all workplaces.
l. How would your levels of Comfort and Productivity change if the variable (X) increased or decreased significantly [specify precisely the parameter change]? - Given that the increase or decrease is significant, comfort could change on the basis of the bodily perceptions and physical states on which this change affects, and productivity cpuld change on the basis how much impairment these perceptions/states produce with respect to the performance of the task. - Certainly both comfort and productivity would decrease, although it is not certain that one directly influences the other. In fact, one could increase while the other decreases, and vice versa. - Certainly both comfort and productivity would decrease: one influences the other, and the considerable variation of the parameter, at those levels, would not allow you to manage either one or the other.
m. How would you handle this increase/decrease? - If it prevents me from feeling comfortable and in Health in carrying out the task, I would consider the impact of this impairment on my physical state, the performance of the task and the quality of the result, I would report it to my superiors and consult the technicians to understand what to do. - If it prevents me from feeling comfortable and performing the task, I would try to do something based on what the technicians say. I would definitely have to follow the company directions and what my superiors say in order to continue the activity and stay healthy. - If it prevents me from feeling comfortable and performing the task I avoid staying in a certain environment even if it means quitting the task. Both technicians and superiors would say that Health comes first.
n. Thinking back to the work shift you have just completed, how do you consider comfort in the working environment? - It is a set of elements that workers can use as an opportunity to promote and foster their own Health and at the same time increase their productivity. - I consider it useful to assess which parameters promote more productivity and a healthy collaborative environment. - I consider it essential to feel good and work effectively. Without a minimum level of comfort it is not sustainable to work a healthy way.

Annex D – Productivity management assessment – Final questionnaire

Question	Answers	Discursive Repertories	Productivity Management level
e: As an employee of company X, how do you consider your productivity today in pursuit of the company goal?	1. My productivity was related to how I performed the task assigned to me: the more focused I was, the more productive I was. Achieving the given steps always depends on my concentration.	Description Cause of Action Generalization	Low
	2. My productivity was related to how I carried out the task assigned to me: concentration was useful for me to keep the focus on what is being done. Even stopping and catching my breath can be useful to have an overview of the work done.	Description Evaluation	Medium
	3. My productivity was related to how I performed the task assigned to me: I considered what I had at my disposal (time, environment, tools) to get an idea of how the actions I was going to take would make me proceed efficiently and concentrate at my best.	Description Targeting	High
g. Has thermal perception impacted on your level of productivity?			
g. [If the answer to question g is "Yes"] How did the selected thermal perception impact your level of productivity?	1. It had a major impact. I really think that any change in the environmental parameters caused an influence on the task I was performing and therefore the result I achieved depended on this.	Judgement Cause of Action Certify Reality	Low
	2. It impacted partly because it was not possible to change the environmental variables that produced this perception, and partly because the way I acted, in my relationship with them, affected the final result.	Evaluation	Medium
	3. It had an impact because, based on the bodily sensations and perceptions that the parameters generated, it was possible to imagine the result at the end of the two hours, so that I could consequently calibrate actions useful for maintaining the quality of the result itself.	Targeting	High
Referring to the answer given to the ISO "Personal thermal evaluation" question:			
h1.* [If the answer is "Comfortable"] How do you use this feeling towards your productivity?	1. I realized that **the more** comfortable the environmental **parameters** made me feel, **the more** productive **I** was. This modality was extremely useful in assessing productivity.	Deresponsibility Judgment	Low
	2. **Noticing that** the environmental parameters were affecting my productivity, **although** I realized that I was still evaluating what action to take with respect to the parameter to increase productivity.	Reshaping	Medium
	3. **Noticing which** environmental variable was producing this feeling and increasing my concentration on the task, so that I could replicate it and calibrate it **to maintain** a high level of productivity.	Targeting	High
h2. [If the answer is "Slightly uncomfortable"/"Uncomfortable"/"Very uncomfortable"] How do you manage this feeling towards your productivity?	1. Since I cannot intervene in environmental variables, I can only work in such conditions, and obviously the quality of the work done may suffer.	Justification Judgment	Low-Medium
	2. Since I cannot intervene in the environmental variables, I cannot do anything but work under such conditions. however, I will try to distract myself from the sensations I have experienced and continue to work.	Justification Declaration of Aims Description	Medium-Low

	3. Since I cannot intervene on environmental variables, the feeling is certainly variable. Considering that the task has to be carried out with a certain degree of precision anyway, I am focusing on the task so that the feeling will not affect productivity.	Targeting Certify Reality	Medium-High
	4. Even if I cannot intervene directly on the environmental variables, I consider the sensations they give me by assessing their impact on the performance of the task, calibrating the actions to be performed accordingly to make the situation comfortable and not undermine the quality of work.	Targeting	High-Medium
i. Have you considered the environmental variables of your workplace today in carrying out your tasks?			
i2. [If the answer to “i" question is “Yes”, and the answer to the ISO “Personal thermal evaluation” question is “Comfortable”] You selected the comfortable option in the previous answer. Given the request to use room environment variables to increase your productivity, how did you use them for this purpose?	1. I simply started realizing that I was comfortable with these variables and that I could produce more. Thanks to these parameters it was possible, in my opinion, to achieve a decent result.	Judgment Opinion	Low
	2. I started to pay attention to how the variables were affecting the way I performed the task to try and keep that perception constant, which helped me to achieve a decent result.	Evaluation	Medium
	3. I began to calibrate the physical states resulting from the environmental parameters to maintain focus and achieve a discrete result, evaluating the most effective ways of acting to move in the direction of the delegated objective.	Targeting	High
i3. [If the answer to “i” question is “Yes”, and the answer to the ISO “Personal thermal evaluation” question is “Uncomfortable”] You selected the not comfortable option in the previous answer. Given the request to manage room environment variables to maintain your productivity, how did you use them for this purpose?	1. The only option I had was to concentrate as much as possible on the work to be done without thinking about anything else, thus maintaining my productivity level.	Cause of Action	Low
	2. One possible option I tried was to concentrate as much as possible on the work to be done, but I'm not sure if this had an impact on maintaining productivity.	Possibility	Medium
	3. Among the possibilities, concentrating on what needs to be done allows you not to put the focus on the parameter and to get used to the body temperature thus maintaining the level of productivity.	Consideration	High
j1. [If the answer to “i" question is “Yes”] At the end of your work shift, how do you consider the result obtained with reference to the environmental parameters?	1. The environmental parameters had an impact on the result achieved: if they had been more comfortable I would have remained focused and achieved a better result. It is essential to consider all these variables in the workplace.	Certify Reality Justification Generalization	Low
	2. The environmental parameters had an impact on the result achieved: in my relationship with them sometimes they could have increased or decreased the quality of the final result. This is why I took actions to try to remain comfortable and focused.	Certify Reality Implications Confirmation	Medium
	3. The environmental parameters had an impact on the result achieved: this was in fact the result of the strategies I put in place, and therefore also of how I managed the relationship with the environmental variables. In this sense, the analysis of body perceptions and sensations is useful to understand how to act on the parameter in order to finish the	Certify Reality Consideration	High

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	task without the quality of the final result being affected.			
j2. [If the answer to "i" question is "No"] Why did you not consider them in relation to the actions put in place and the results achieved (i.e. in terms of productivity)?	1. I did not consider them as I do not think they impacted on my productivity. I think that if environmental variables come to impact you are not doing a good job, or if the environment becomes unacceptable, you can no longer work.	Possibility Opinion	Low	
	2. I have not considered them as I do not think they have impacted on my productivity: in fact, although I have felt changes to my perceptions and sensations over time, I have tried to stay focused to finish the job and not make the environment unacceptable.	Possibility Description	Medium	
	3. I did not consider them as I do not believe they impacted on my productivity: remaining tightly focused on making the strategies and actions I performed effective also allowed me not to focus too much on the perception of environmental variables in order to perform the task assigned to me.	Possibility Targeting	High	
Referring to the answer given to the ISO "Personal thermal evaluation" question:				
k. How would you use this heat preference to increase your productivity today?	1. Surely this thermal preference would increase my concentration, and therefore the quality of the result I would get. It would be useful to ask for the thermal preference of each worker in all workplaces.	Prevision Comment	Low	
	2. It would help me to concentrate more on the task at hand, as it would allow me to divert my attention from the perceived temperature, while keeping the quality of the result high.	Evaluation	Medium	
	3. It would help me to understand whether the perceived temperature is more or less suitable for me to perform the task effectively, and therefore to evaluate what actions to take to manage this aspect and keep the quality of the result high.	Proposal	High	
l. How would your levels of Comfort and Productivity change if the variable (X) increased or decreased significantly [specify precisely the parameter change]?	1. Certainly both comfort and productivity would decrease: one influences the other, and the considerable variation of the parameter, at those levels, would not allow you to manage either one or the other.	Cause of Action Certify Reality Deresponsibility	Low	
	2. Certainly both comfort and productivity would decrease, although it is not certain that one directly influences the other. In fact, one could increase while the other decreases, and vice versa.	Certify Reality Possibility Confirmation	Medium	
	3. Given that the increase or decrease is significant, comfort could change on the basis of the bodily perceptions and physical states on which this change affects, and productivity could change on the basis how much impairment these perceptions/states produce with respect to the performance of the task.	Anticipation	High	
m. How would you handle this increase/decrease?	1. If it prevents me from feeling comfortable and performing the task I avoid staying in a certain environment even if it means quitting the task. Both technicians and superiors would say that Health comes first.	Cause of Action Comment	Low	
	2. If it prevents me from feeling comfortable and performing the task, I would try to do something based on what the technicians say. I would definitely have to follow the company directions and what my	Declaration of Aims Prescription	Medium	

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	superiors say in order to continue the activity and stay healthy.			
	3. If it prevents me from feeling comfortable and in Health in carrying out the task, I would consider the impact of this impairment on my physical state, the performance of the task and the quality of the result, I would report it to my superiors and consult the technicians to understand what to do.	Proposal	High	

*In question **h1**, the underlined-in bold parts of the answers represent the textual elements that are indicators of the labeled Discursive Repertory(ies), which, in turn, allow for the assignment of the productivity management level rating.

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