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A Mixed Approach on Resilience of Spanish Dwellings and Households during COVID-19 Lockdown

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Abstract: The confinement by COVID-19 has meant a re-reading of housing for Spanish households, resulting in the only available and safe space to carry out daily activity. This complex phenomenon has generated a completely different way of inhabiting it, as well as of relating to domestic spaces. For this reason, the home perception and its characteristics must be evaluated, highlighting those perceived as deficiencies, or as preferences in such an unusual context as lockdown, where the experience was different depending on the dwelling characteristics, and the family in question. To deepen in this double perception home-dwelling, a mixed method was used, with two online forms. The first is a quantitative questionnaire, while the second asks the participants for photographs and narratives about such images. More than 1800 surveys and 785 qualitative responses were obtained. From both approaches, the joint discourse arose, allowing an exploratory analysis of the current situation of the Spanish residential park, and the resilience demonstrated in this period by both households and their usual dwellings. This study should facilitate the development of new proposals on housing in contexts similar to the COVID-19 pandemic.

Keywords: COVID-19; housing; resilience; lockdown; qualitative technique; photograph; questionnaire; mixed method; household behavior

1. Introduction

The SARS CoV-2 coronavirus pandemic has entailed a global health emergency [1]. Until its arrival in Europe, with the first 10 cases in France, Finland, and Germany, a total of 7818 confirmed cases were reported worldwide as of 30 January 2020 [2]. On 11 March 2020, when excess deaths reached over 56,500 across Europe [3], the World Health Organization (WHO) decided to declare the COVID-19 pandemic [4], inviting all countries to take extreme health measures [5]. To date, more than 8 million cases have been confirmed in Europe [6].

In Spain, since the first case was detected on 31 January of the same year [7], there were more than 860,000 cases by October 2020 [6], with a total of 163,021 deaths from all causes in our country to date, being between 10.4% and 61.9% more than expected for the whole period [8].

Faced with such a threat to Public Health, Spain declared the State of Emergency on 14 March [9], in which the Spanish Government urged the entire population to stay at home, thus preventing any type of activity and movement at the national and international level, including non-essential professional activity (except for social services, transport, and logistics).

Preventive or containment quarantine is the most basic public health measure used against the transmission of diseases in the community [10]. During this pandemic, each country has

established this measure of social isolation with different nuances, based on evidence, criteria, and particular circumstances [11]. In Spain, this lockdown took place between 14 March and 22 June 2020, experiencing different phases of de-escalation, in which some limited movement was progressively allowed, depending on the activity or circumstances [12].

This unprecedented situation meant that, for the first time in more than a century, Spain experienced (as in so many other countries) a phenomenon of great social and economic impact, where the house became the nerve centre of all kinds of activities for all households: cohabitation, leisure, work and study, ordinary and extraordinary tasks [13].

This situation has promoted different ways of relating to our cohabitants in this specific spatial context. It has been a unique opportunity to study from a technical context how life has developed in these homes, what perception households have of themselves, spending 24 h inside them, and how these domestic spaces have been adjusted to the needs generated by this situation, which can affect these households in different ways [14], especially the most vulnerable ones [15]. The factors on which the study presented in this article focuses link the characteristics of the household [16] to those of the dwelling and its environment [17].

At the time the pandemic arose, there were no studies of confined households and dwellings from a technical point of view that included analysis of domestic spaces and qualities as a goal in itself. There were questionnaires on socio-economic circumstances that might include some aspects of housing [18] or studies on psychological conditions relating the main characteristics of the built environment to the psychological effects of being confined for long periods of time [19]. Faced with this scenario, the impacts of this measure are cited, not only biomedical, but also social, which should be addressed from the respective fields of knowledge [20], and even legal implications, on the rights of individuals without undermining community protection [21].

Globalisation does not only imply an increase in the pandemic threat, but also Public Health measures must be addressed at the international level to protect beyond our borders [22]. On the other hand, with dramatic social impact phenomena, preventive management against similar threats must be addressed decisively [23]. In cases of public health threats, trust in government institutions to deal with measures imposed by public health authorities is critical [24]. One of the ways to face this problem of trust is through transparent information shared with the community [25].

The relationship between housing and the health of the population is direct, affecting the quality of life and life expectancy, and the development or worsening of different pathologies [26]. Global epidemics have had a decisive influence on the built environment towards healthier models, learning something from each of them [27]. In particular, aspects such as comfort or indoor air quality are decisive, the lack of the latter being the tenth cause of avoidable risk [28]. For all these reasons, the general condition of the dwelling and its material qualities have been established as a Determinant of Social Inequality in Health [29].

During this quarantine, many studies have used the online form to reach their potential participants [30] on home confinement. To a lesser extent, telephone surveys have been used, particularly in longitudinal studies, with a pre-established participant base [31].

Qualitative studies have also been undertaken, either to learn more about community experiences [32] or as part of mixed studies [33]. The literature establishes that, already in previous epidemics, it has been possible to legitimise community knowledge and experience, where researchers became facilitators to elaborate the discourses and thus give rise to citizen science [34]. Other studies used qualitative techniques to delve into the situation of certain vulnerable groups and possible weak points on which to act [35]. Even though there are not many known cases of research using online group techniques, some studies exist; however, participants had been previously convened face-to-face before COVID-19 [36].

This publication presents in detail the mixed method used, combining quantitative and qualitative approaches, using questionnaires and photographs, their tags, and open-ended contextualization

questions. The aim is to better understand the Spanish population's perception of lockdown, its relationship with housing, and the degree of resilience to these extreme circumstances.

Some of specific objectives of the whole project were: analyse the alteration of daily activities and habits, especially those related to habitability, comfort, energy saving, and the subjective perception of satisfaction with the domestic spaces; evaluate the impact degree of confinement as a measure of public health and the adaptability of homes and dwellings to the circumstances; study the incidence of this home-dwelling relationship in different habitats and urban areas; propose strategies for interventions and design of resilient homes for future similar situations; and create citizen science, through the use of telematic tools to reach to homes, and unveil the link between users and the inhabited space, in this unusual context. Additionally, the research questions considered for the qualitative part were: *Which are the spaces where the participants have spent the most time during confinement, and what they are like? What tasks have users developed, related to these spaces and their qualities, in this period? What are the aspects perceived as less pleasant by these people, given the circumstances? And what has made a space results, in an isolation context, more comfortable for these users?*

To this end, this contribution includes the results obtained on the characteristics, equipment, and supplies of the dwelling; changes in use and occupation habits; changes in main energy consumption; the adaptation of the home to unforeseen circumstances; and the main needs and preferences for domestic spaces and equipment. Habitability and comfort have been the central pillars of this study, as they are basic for staying in the home in terms of well-being and health, both physical and mental.

The results and reflections offered in this contribution are expected to address specially to academia, researchers, professionals, and technicians implied in the design and renovation process of housing, those people involved in Public Health and Housing, decision-makers, and to anyone who wants to deep into the social phenomenon of COVID-19 confinement at home, including home users, offering a comprehensive picture in this context. However, this exploratory study, due to its nature, could not cover all the households' situations, such as those related to more vulnerable areas.

2. Materials and Methods

A mixed method was used to carry out this study, based on both quantitative and qualitative approaches. They were proposed in two independent forms, although they were linked under the same purpose: to enrich from two different perspectives the understanding of a singular and extreme phenomenon, the confinement at home due to COVID-19. Thus, it allowed to fully know the relationship between the subjects of the household, the way of experiencing confinement, and the relevance and adequacy of the space they share during the 24 h of the day: the housing.

This study obtained a favorable report from the Ethics Committee belonging to the Spanish National Research Council (CSIC, for its acronym in Spanish), with approval code number 057/2020.

2.1. Study Launch and Potential Participant Recruitment

Given the lockdown situation, it was not easy to reach the study subjects. For this reason, and in order to reach as many participants as possible, it was proposed that they respond through two online forms, one quantitative, and the other one qualitative.

An advertising campaign for the study was carried out through social networks, institutional websites, and media. An invitation was made to participate through these channels (as a social speaker). To make the sample extensive to the entire national territory more effectively, emails were sent with the relevant information and the links to the forms to neighbourhood associations (all those that had accessible emails through web scraping) and town councils across Spain. In this period of the study, the project did not yet have financial funds and therefore the data collection was proposed as exploratory, with a non-probabilistic sample for convenience.

At the end of the form in the so-called "part 1", or quantitative form, an invitation was made to collaborate, voluntarily and independently, in the "part 2", or qualitative form, through its corresponding web link.

The SurveyMonkey® platform was used for online forms. Both forms asked some introductory questions about socio-demographic information (gender, age, work activity, completed studies, postal code, and whether there were people teleworking at home, among others). The purpose was to be able to elaborate a descriptive analysis of the participation.

2.2. Quantitative Study (Questionnaire)

The quantitative part of the study was established as an anonymous self-completed online questionnaire, through the SurveyMonkey® platform. This platform was user-friendly, adjusting to the device from which it was accessed with an Internet connection. This questionnaire had 58 questions, with an average response time of around 15–20 min, organised by themes on the dwellings and households to which the participants belong. However, in no case would the participants answer the 58 questions, since the questionnaire had some control questions, the response of which depended on whether the participant was directed to some questions or others. For instance, in the case of the type of heating and cooling systems, and equipment available in the home, or if someone at home teleworked or not, among others.

The questions addressed in the questionnaire ranged from the general to the particular, and were: the characteristics of the homes (design and equipment), aspects of habitability and perception of overall comfort, the dynamics in the home (modification of habitual activities and new ways of living), availability and adaptation of spaces and resources, including energy ones, and the degree of resilience in the face of this unusual situation.

2.3. Qualitative Study (Photos and Written Narratives)

The qualitative study was approached from an equally anonymous form, independent of the previous one. After the socio-demographic questions for the descriptive analysis of the participation, the participants were requested to take photographs with a certain theme, adapting the Photovoice technique to the Internet use [37], where the words would serve as support for understanding what was graphically expressed. Three tags or key words were requested for each photograph, and five questions were formulated that described both what was shown in the photograph and the intention behind it, based on the SHOWeD form [38].

The photographs requested were four, although the participant would always give a maximum of three (as the first two were exclusive). The themes were: (1) space dedicated to teleworking or telestudy; or failing that, space where you carry out the activity to which you dedicate most time; (2) aspect or space of your home that you like the least; and (3) space more comfortable for you.

The narrative that accompanied the photographs was a methodological adaptation of techniques such as Photovoice or Photo-elicitation [39], whose original questions are called by its acronym SHOWeD [40]. Although these questions do not form part of the original technique in the strict sense [41], since they may vary substantially, or not be formulated at all, they served as a guide to establish triggers on the images, provoking debate, generating critical awareness, and the construction of a joint discourse.

When there are difficulties in conducting group sessions, for example when the subject matter is too private or sensitive [42], or in this case because of issues of lockdown, researchers took on the part of constructing the thread of the discussion, as well as categorising the images and testimonies, in order to understand this complex phenomenon derived from confinement at home.

This qualitative part of the study aimed to access more detailed quality information on the experiences of households in confinement. Qualitative participatory techniques allow to establish, in an exploratory manner, more intimate approaches, in which a certain climate of trust is established,

in order to unravel complex social realities that are difficult to access using other social research techniques [39].

Images, by themselves, have a great capacity to transmit, since they can contain a lot of information that would otherwise be more complex to collect, allowing, among other applications, the most vulnerable to be able to explain their reality with little or no culture [43]. Moreover, they possess the capacity for a certain objectification of the subjective, since they show sensory effects (for example, reflections of light that in turn cause a certain effect, desirable or not) that can be more or less annoying, but which remain imprinted in the snapshot and can be evaluated by a third party [44], in spite, obviously, of the author's subjective intention in the way the picture was taken. The very act of taking a photo on a given subject, and having to answer the open questionnaire with the five questions, forces the participant to reflect on where the photo was taken, what it wants to show, and why it is being taken, or what others can learn from it or from the situation reflected [41].

To facilitate this individual reflection from their homes, participants were asked to answer five questions, according to the open questionnaire, which was based on the Photovoice methodology. They should be answered briefly but in detail, concisely. These questions came from those with the acronym PHOTO, used in the Photovoice technique, and adapted for this study with the acronym IMAGE [45]:

- What do you see in this Image?
- What is happening in this iMage?
- Why did you take this imAge?
- What does this imaGe express about your life now, during the lockdown?
- What message could this imagE give to other people, to improve their lives?

2.4. Data Analysis (I): Questionnaire

As this was an exploratory study, the answers obtained to each of the 58 questions were analysed in a descriptive manner, ruling out inconsistencies, some minority responses, or categories that contributed little at the level of analysis. SPSS software, version 26, was used for this descriptive statistical analysis.

As a complementary analysis, the representativeness of the study was addressed, through a comparison by means of a test of proportions between an official data sample, and the study sample, using the Prtesti command, with a 95% confidence level. The specific Stata software version 14 was used.

2.5. Data Analysis (II): Photos

To be able to treat the images as data, and to facilitate the work of referencing and analysis by the researchers, they had to be coded beforehand. To do this, an alphanumeric code was assigned PXX_YYYY, with P being the initial of "question" in Spanish; XX the question number to which the photograph corresponds (09-telework; 16-main activity; 23-less pleasant aspect; and 30-most comfortable space); YYYY corresponds to the participant number, in order of response (the number assigned by the SurveyMonkey platform), with zeros on the left, if necessary.

Each group of photographs was then analysed according to the theme. For this purpose, those aspects of the spaces reflected in the photographs that could be analysed were categorised, highlighting their main qualities and characteristics. In addition, another category was added in which other qualities could be included that could not be generalised to other photographs, but which some in particular could show.

After this categorisation of all the photographs, it was refined, taking into account possible regroupings of terms, concepts, or qualities contributed by the contextualisation of the narrative, especially in relation to the aspects that the author of the image wanted to highlight in it.

Photographs, like the remaining qualitative (narrative) content, were analysed until the saturation of information was reached, that is, once it became recurrent with no more relevant contributions [46].

2.6. Data Analysis (III): Content Analysis and Final Categorization

To analyse all the text entries received from the participants, a Content Analysis was done. Previously, the texts related to the photographs were coded to link them to the photographs, as well as the keywords with which their authors tagged them.

Subsequently, textual analysis was carried out, using word frequency (eliminating empty words), on both the answers to open-ended questions about the photos, and on the tags, producing in each case a word cloud. For the qualitative analysis, the NVivo *software* release 1.3 was used.

A final categorisation was made by the researchers taking into account all these elements of analysis, considering elements, terms, and/or concepts linked to the phenomenon of confinement and housing, including those issues in the form of insights, shown through images or texts, apparently with little or no direct relationship [47,48], which could enrich the initial discourse that in this case established the quantitative part of the study.

3. Results

The data was collected from 30 April to 22 June, within the period of lockdown decreed by the Spanish government, which extended from 14 March to 22 June 2020 [12].

3.1. Participants' Responses and Representativeness

During the campaign period of data collection, a total of 1804 responses were obtained for the quantitative questionnaire, and 785 responses for the qualitative form, for the national territory.

Due to the number of participations obtained for the quantitative part (as well as other considerations derived from the bias of participant recruitment), a probability sample had not been considered, so the study retained an exploratory character.

Once the database was cleaned up, eliminating inconsistencies (Statistic data that do not represent the same observation as others, due to reasons as wrong, invalid responses for misunderstandings when reading questions, or typo errors in open-ended questions, e.g.), the degree of representativeness of the database was established. To this end, the data obtained was compared with secondary data from official surveys carried out by EUROSTAT [49] and the National Institute of Statistics (INE, for its acronym in Spanish) in 2018 [50–53]. The latter were in turn published through the Long-Term Strategy for Energy Renovation in the Building Sector (ERESEE, for its acronym in Spanish, 2020), published in June 2020 [54].

To establish the representativeness of the study, a comparison was made by means of a proportion test between an official and representative data sample of the analysed universe, and the study sample. The representativeness of data compared between the results of the survey [COVID-HAB] and official Spanish sources is shown in Figure 1.

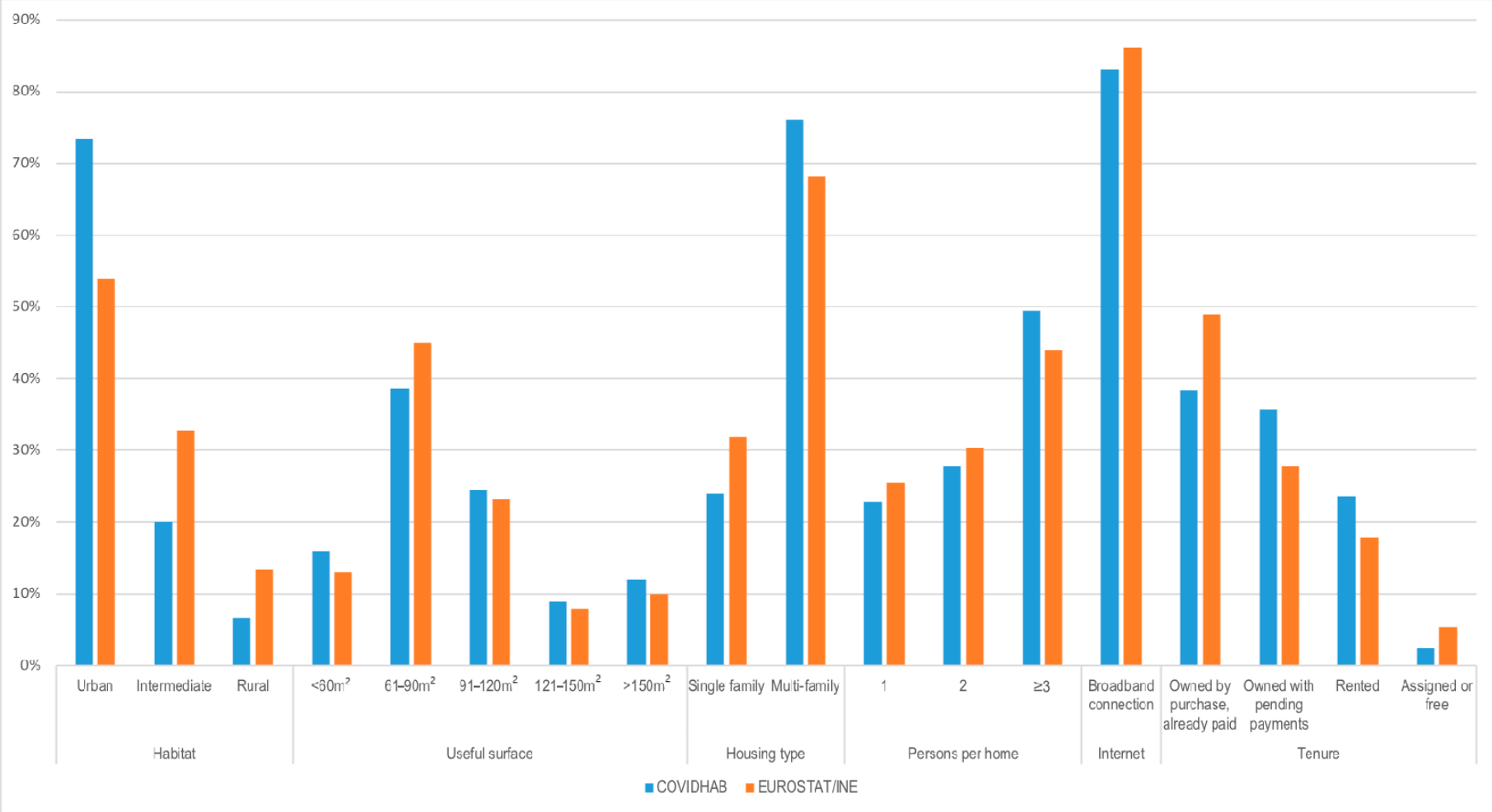

Figure 1. Response distribution: [COVID-HAB] vs. official Spanish data sources (EUROSTAT- National Institute of Statistics (INE)).

A single-sample hypothesis test was used to compare both samples [55]. It was performed using the command "Prtesti", a form of immediate proportion testing [56] that analyzes the sample by means of the "z" test, in this case for a single sample, testing the null hypotheses based on the official data, using Stata software version 14. The output in Stata format provided a confidence interval (CI) derived entirely from the sample data, and a "*p*" value for the "z" score derived from the assumption that the null hypothesis was true. This *p*-value was used to decide on statistical significance, and there might be discrepancies between this *p*-value and the CI.

The null hypotheses were based on six variables defined as basic to the relationship between households and their dwellings in the context of this study: (1) the type of habitat; (2) the type of dwelling; (3) the useful area; (4) the number of persons in the household; (5) the tenure status of the dwelling; and (6) access to broadband connection (internet), as represented in Figure 1.

3.2. Quantitative Results: Questionnaire

For the quantitative form, 1804 responses were obtained, distributed at the national level. Figure 2 reflects the socio-demographic distribution of the participation obtained.

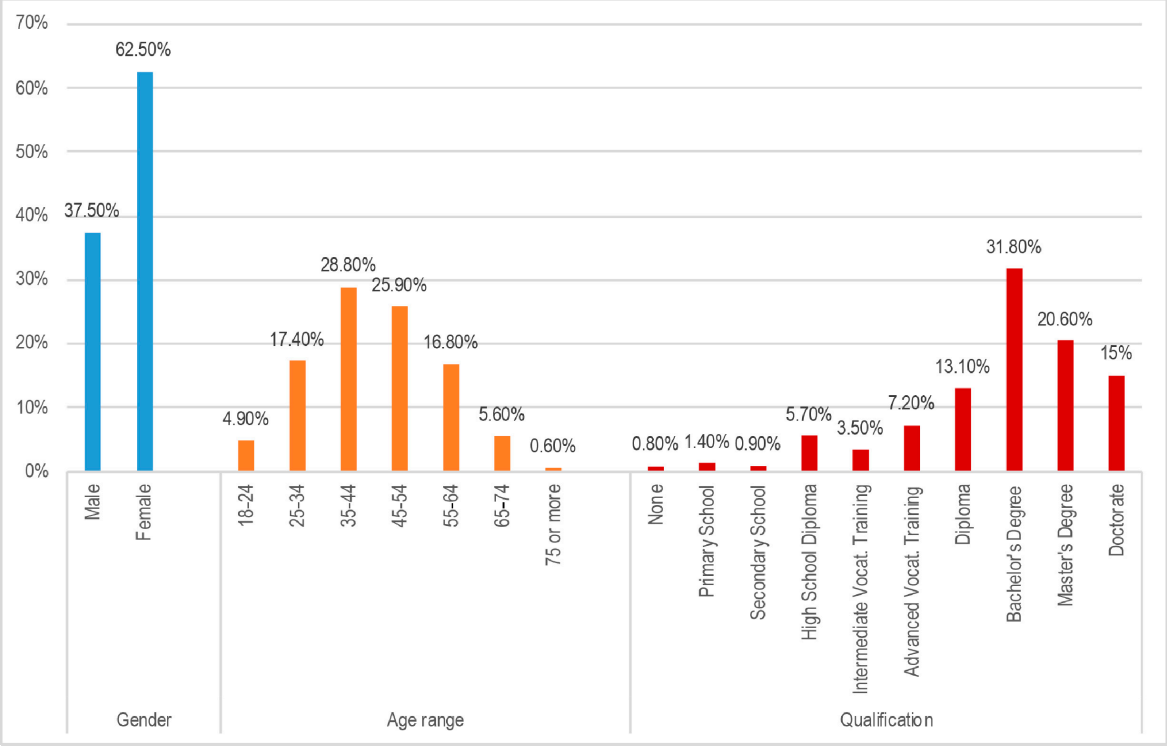

Figure 2. Main socio-demographic data from quantitative participants.

The 58 questions included in the quantitative questionnaire, except for the initial and final one, which were participation controls, were divided into seven topics: (1) socio-demographic data, (2) characteristics of the dwellings, (3) habitability, (4) comfort, (5) use and occupation habits, (6) equipment and supplies, and (7) energy consumption patterns.

Of these, the most significant of each topic are attached below, according to the general perception of resilience among households and dwellings.

(1) Socio-demographic data: already included in Figures 1 and 2.
(2) Characteristics of the dwellings: in addition to those set out in the previous sections, Figure 3 shows the availability of spaces open to the outside, and the type of space it is.

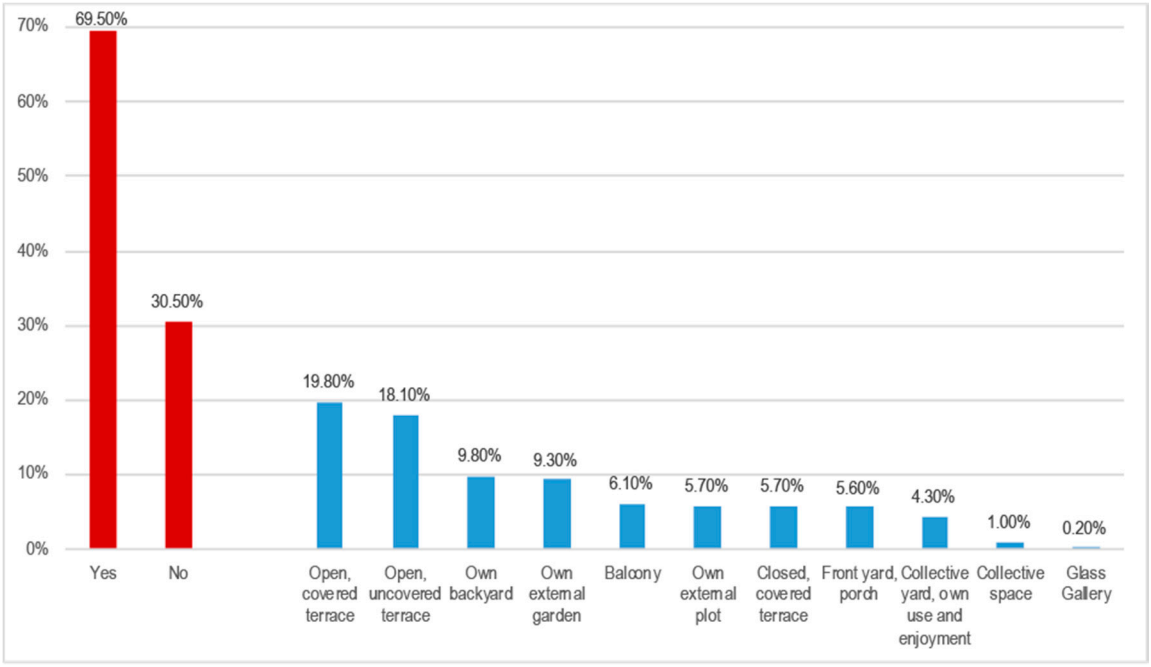

Figure 3. Availability and type of external open spaces.

(3) Habitability: in this topic, answers to questions related to the general lighting qualities of the home (natural and artificial), indoor air quality and noise insulation are highlighted, represented in Figure 4.

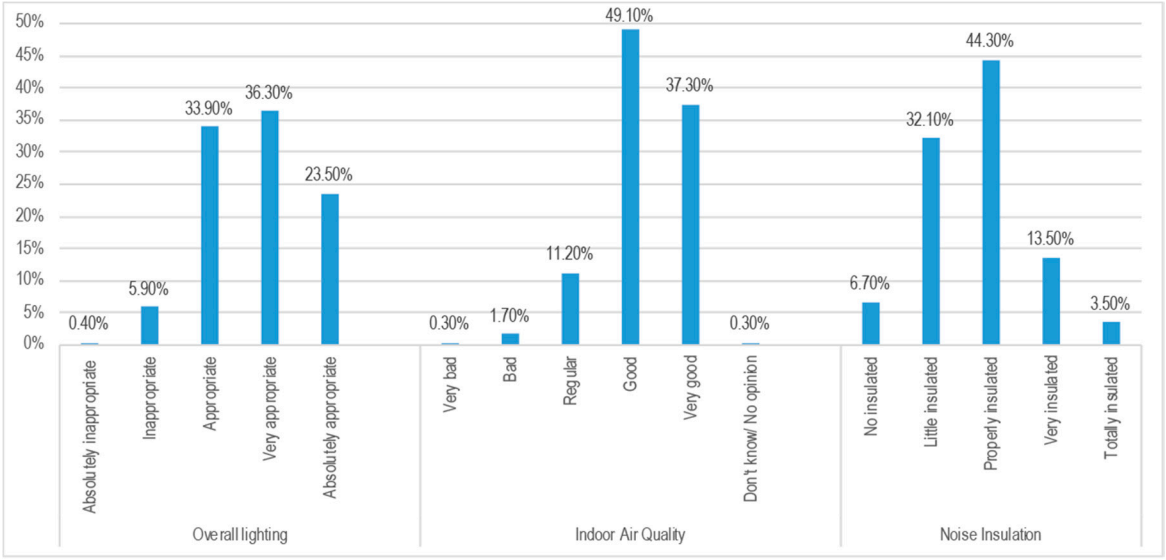

Figure 4. Distribution of adequacy on overall lighting, Indoor Air Quality (IAQ), and noise insulation.

(4) Comfort: in this section of questions, there are those that have to do with thermal comfort and the use of Heating, Ventilation, and Air Conditioning systems (HVAC). Figure 5 shows the availability and type of Heating System and the usage during lockdown.

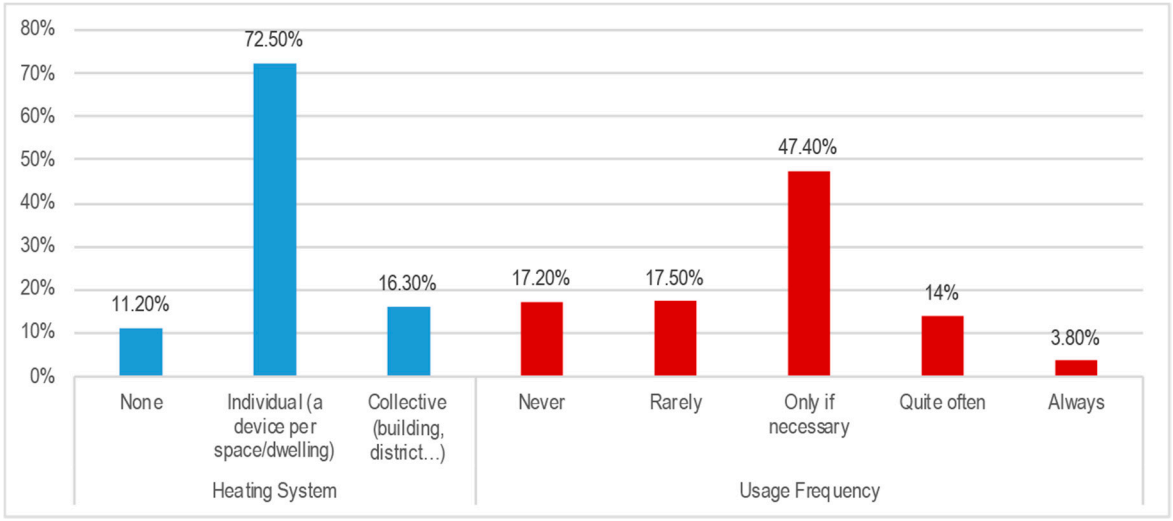

Figure 5. Availability and type of heating system. Usage frequency during lockdown.

Figure 6 represents the availability and type of Cooling System, and the frequency of usage of these systems during lockdown.

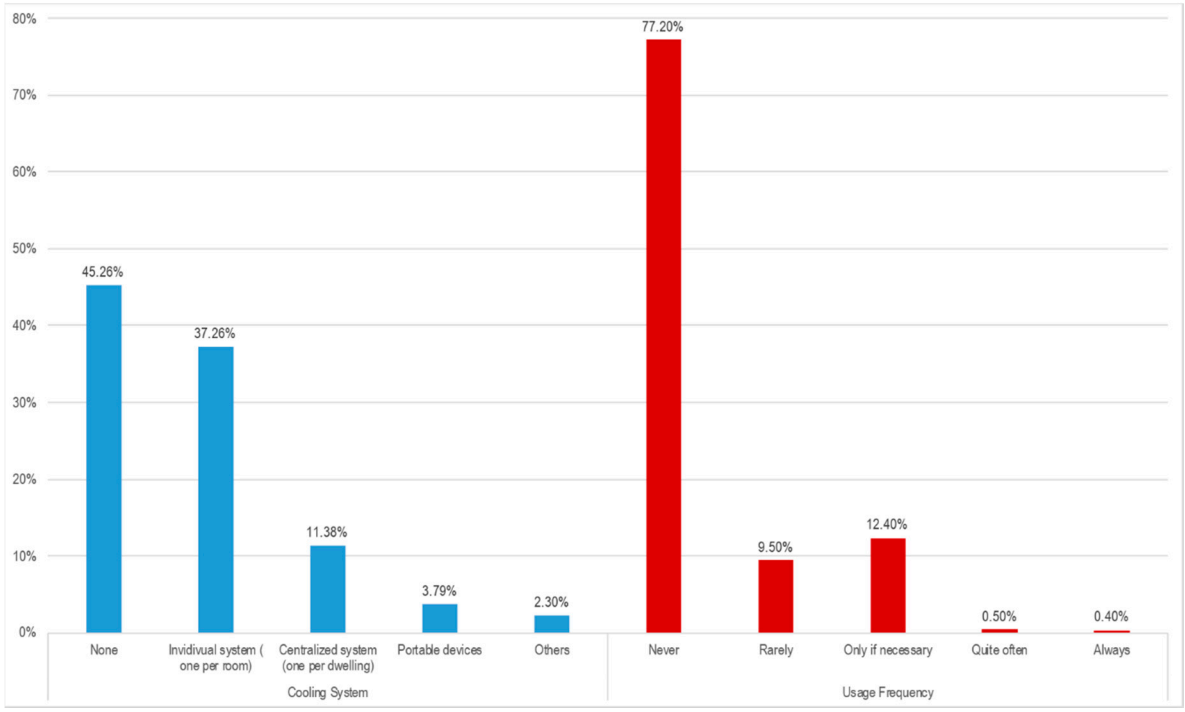

Figure 6. Availability and type of cooling system. Usage frequency during lockdown.

(5) Use and occupation habits: the main questions linked to the dedication of time to different tasks, the aspects of daily life that had been most altered, and the spatial adaptation to different needs were related.

Figure 7 shows the distribution of participants' time dedication to different main tasks, where it is scaled from 1 (minimum time dedication) to 5 (maximum time dedication).

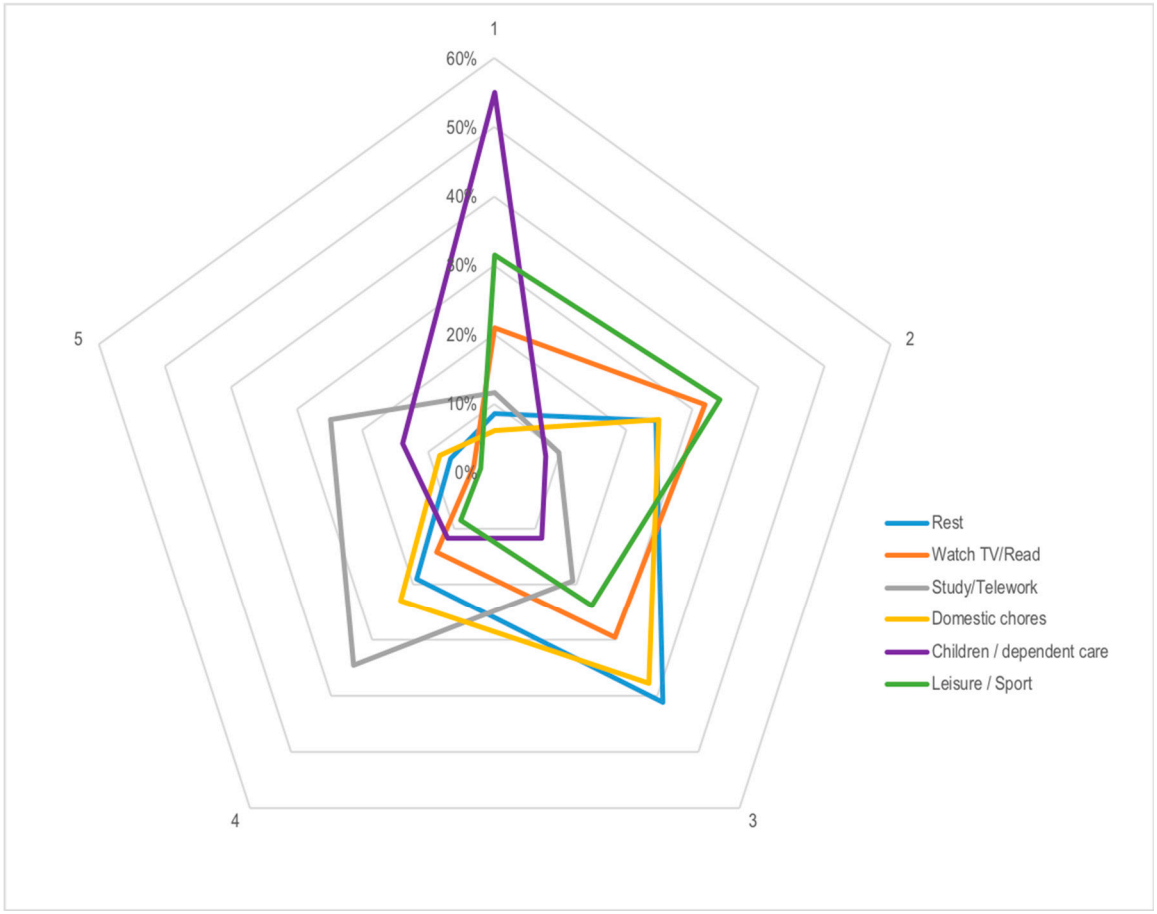

Figure 7. Time dedication to different main tasks (scale: 1 minimum time dedication, 5 maximum time dedication).

Figure 8 represents the main daily habits altered by lockdown.

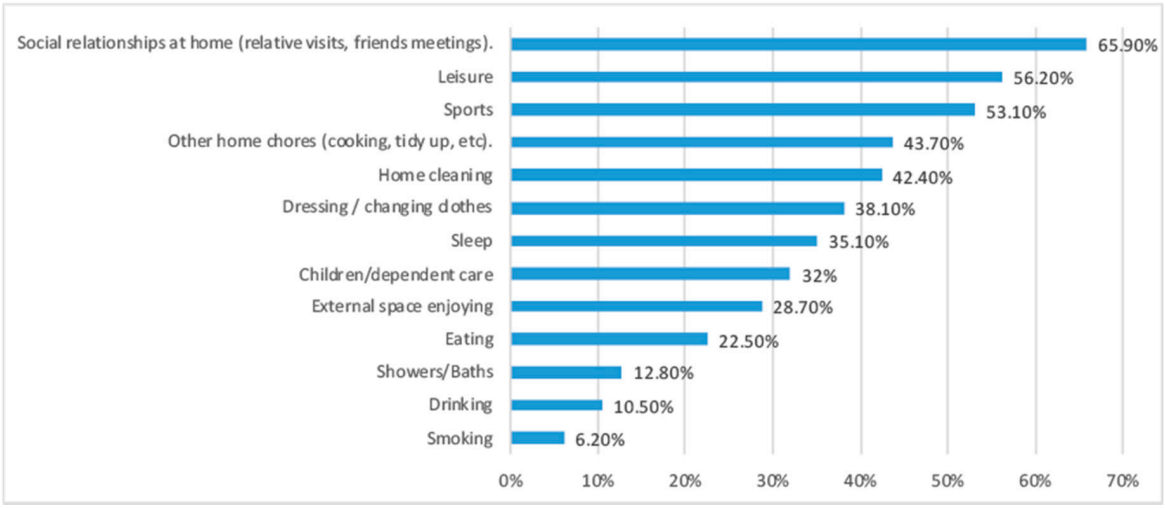

Figure 8. Main daily habits altered by lockdown.

Figure 9 shows the main spatial adaptations due to changes in habits.

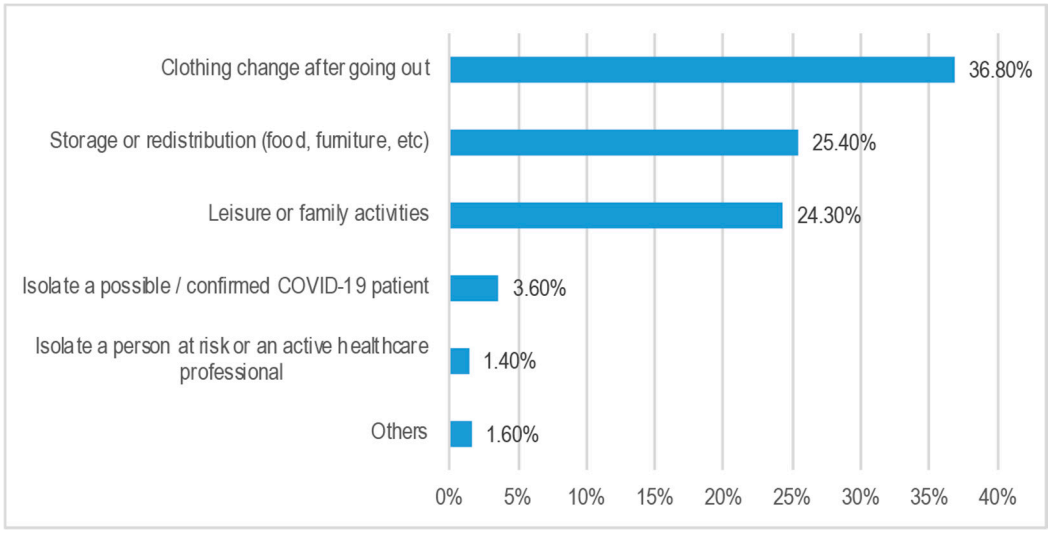

Figure 9. Spatial adaptation of dwellings during the lockdown.

(6) Equipment and supplies: here, it is found the information related to the Domestic Hot Water system (DHW) and the use of household appliances and other devices during this period. Figure 10 exposes the type of domestic hot water system and the modification of consumption in this period.

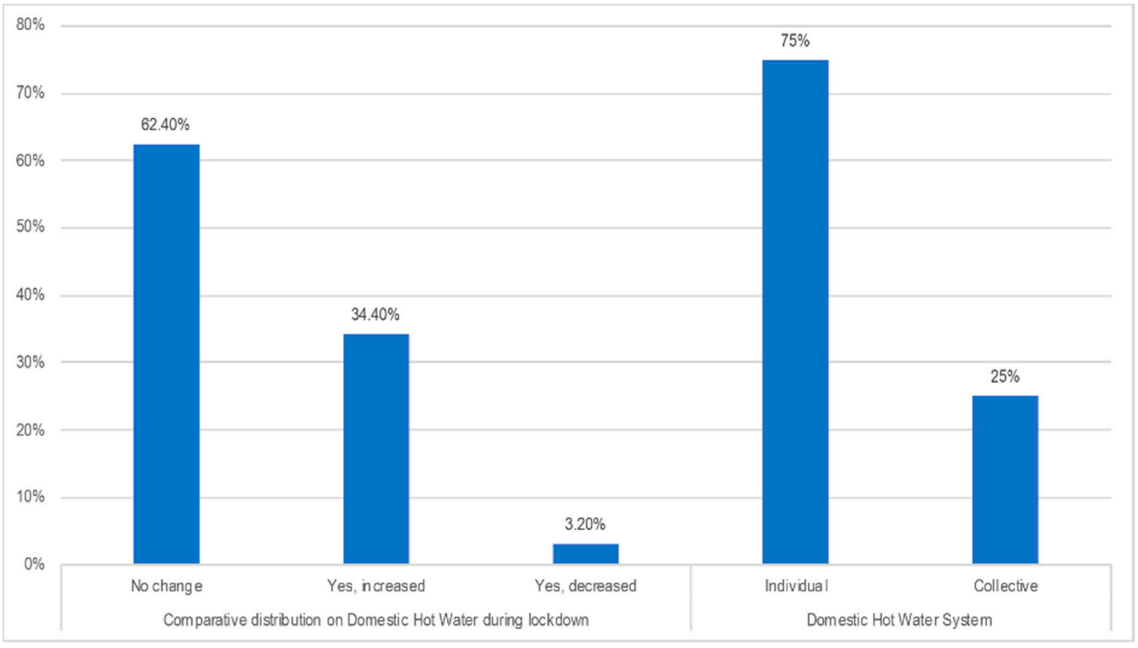

Figure 10. Type of Domestic Hot Water (DHW) system. Usage frequency during lockdown.

Figure 11 shows the use frequency of household appliances and devices at home in lockdown.

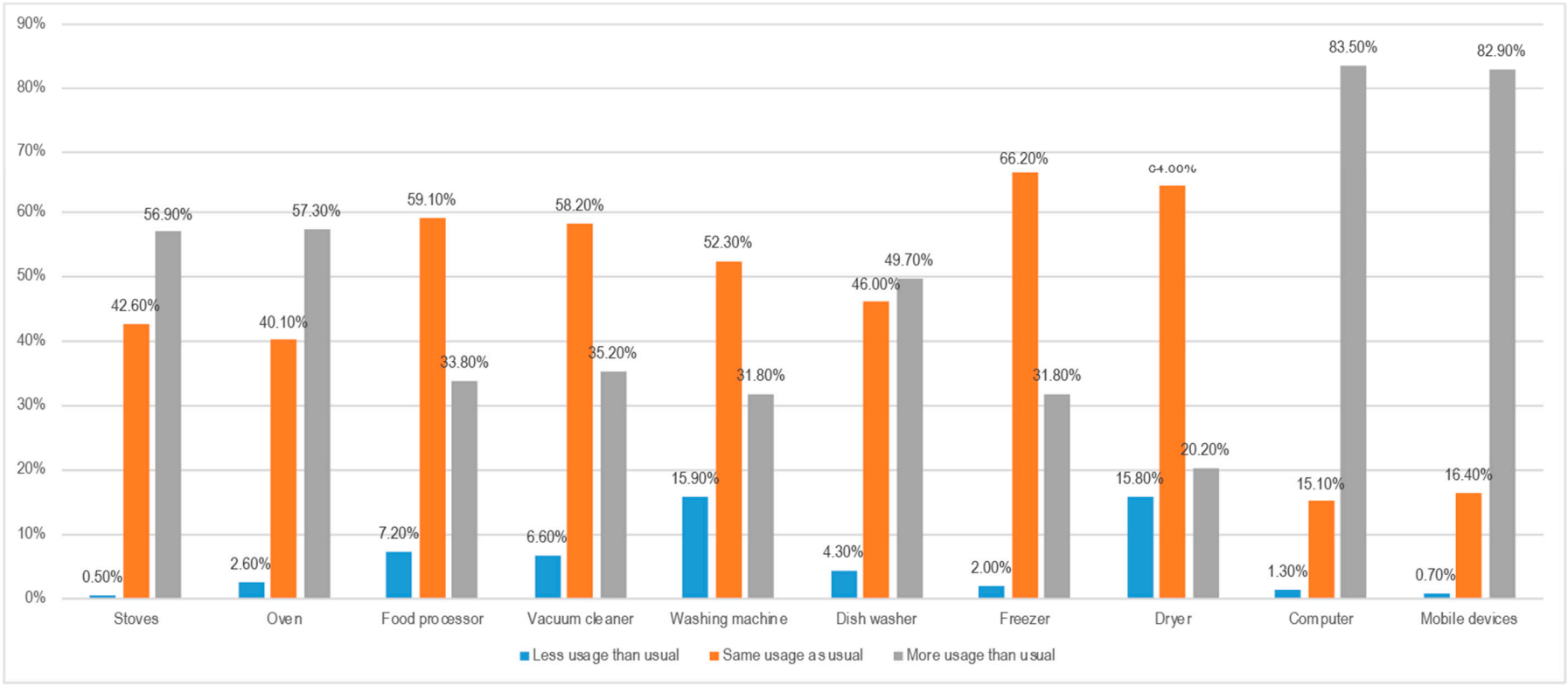

Figure 11. Compared use frequency of home appliances and devices in the home during lockdown.

(7) Energy consumption patterns: in this one, the expected modification of household energy expenditure during this period (Figure 12), and the energy saving strategies applied by households (Figure 13) stand out. In Figure 12, the expected changes in home energy expenditure are established, where "enough" is an expenditure change affordable without major economic alterations for users.

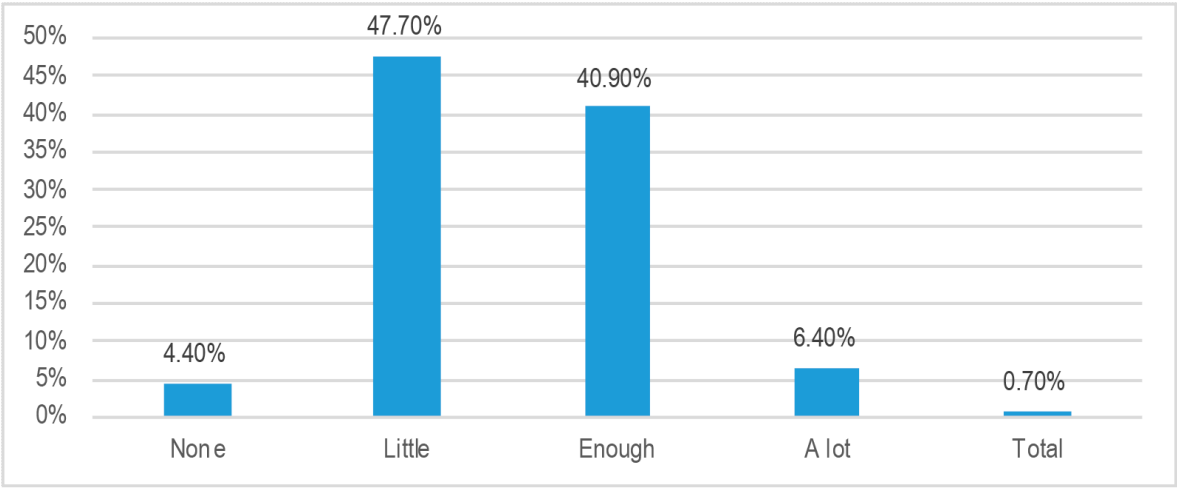

Figure 12. Expected modification of household energy expenditure during this period.

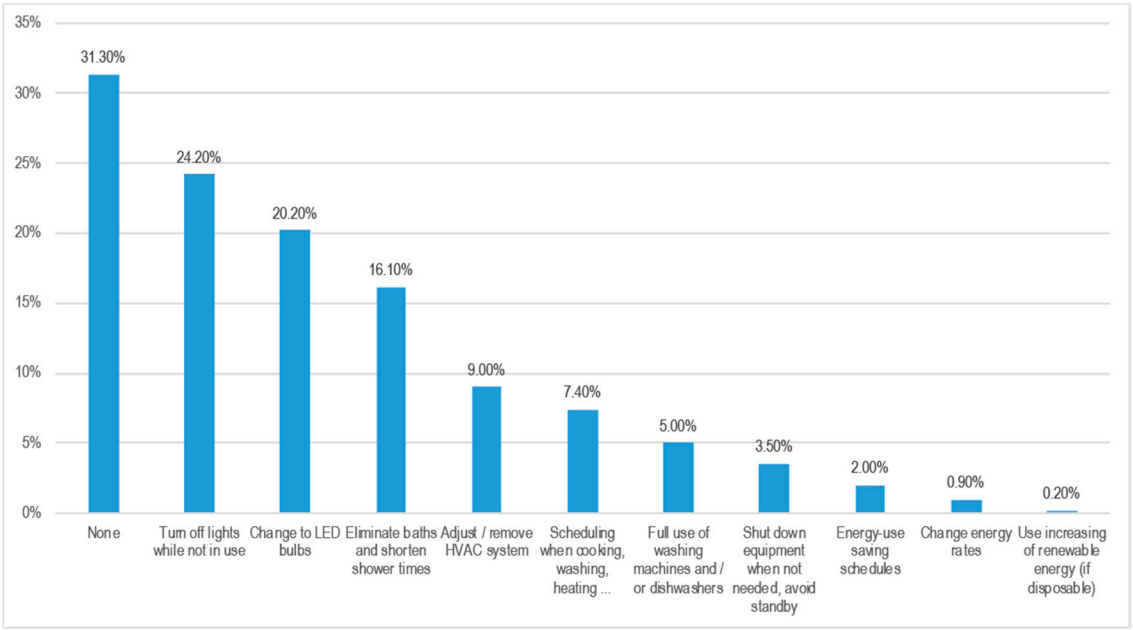

Figure 13. Strategies of energy saving carried out by households during confinement.

Finally, Figure 14 shows the improvements they would make to their housing.

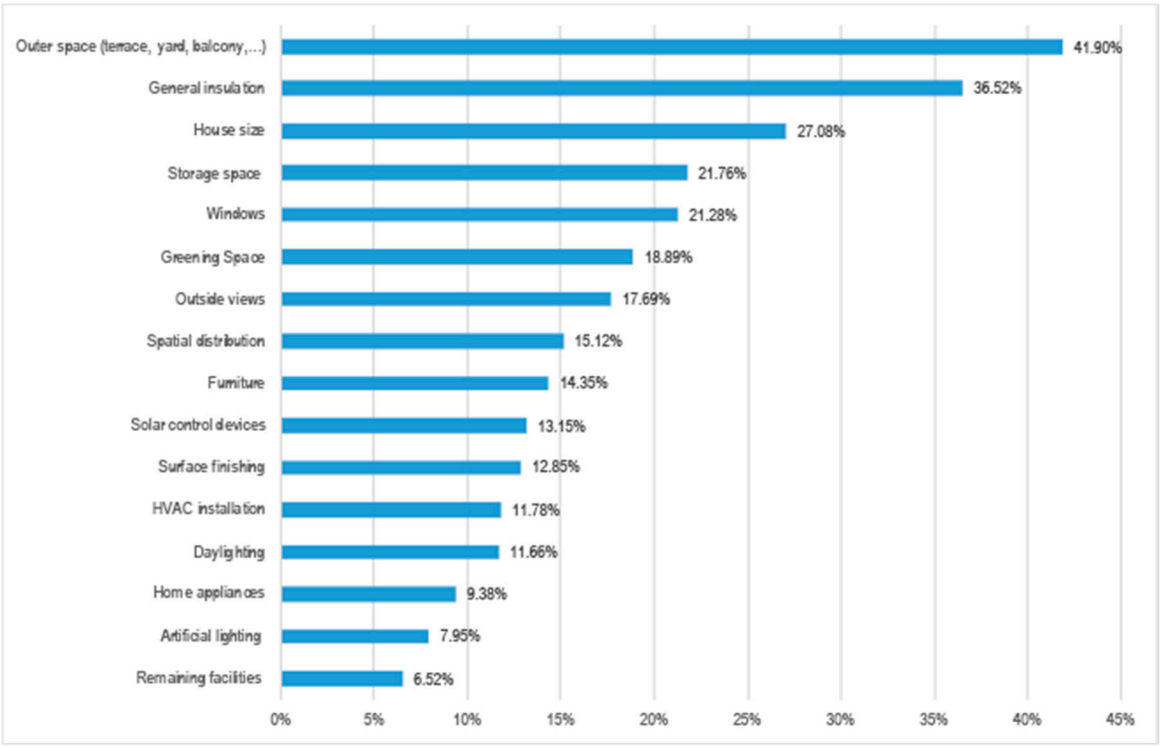

Figure 14. Aspects that participants would change at home, if possible.

3.3. Qualitative Results: Photographs

For the qualitative part of the study, a total of 785 raw responses were obtained, of which 242 are considered valid. Of the participants, 41% were men and 59% women. The ages of greatest participation were in the 45–54 years age group (31.8%) and 35–44 years age group (29.8%). Of the participants, 83% had completed university studies. Figure 15 shows the descriptive distribution of participants in the qualitative form.

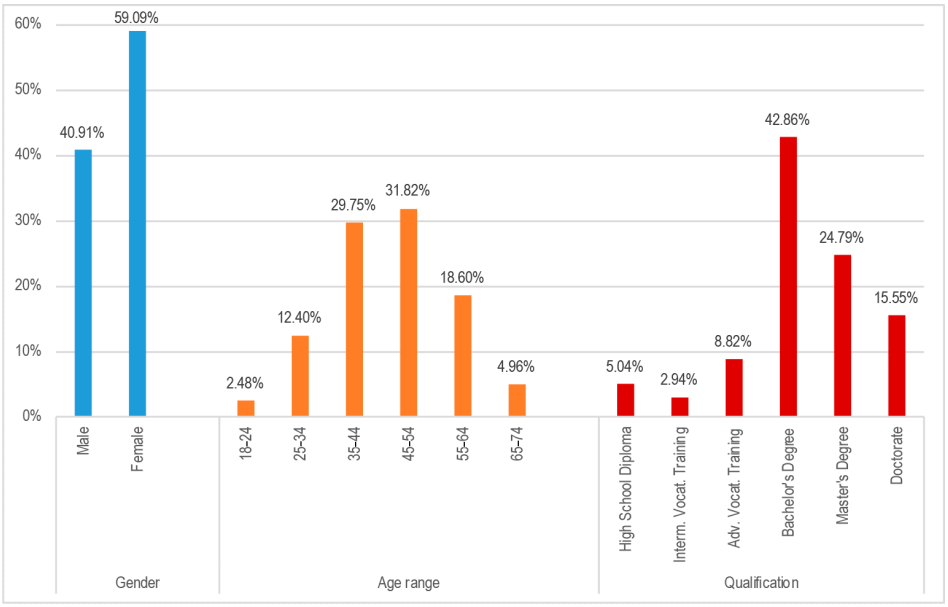

Figure 15. Descriptive distribution of qualitative participants.

This participation had resulted in a final contribution of 605 photographs, distributed as follows: (1) 213 photographs on teleworking; (2) 61 photographs on the activity of greatest dedication (if not teleworking); (3) 173 images on the aspects that are least pleasant in the home; and (4) 158 images on the most comfortable spaces at home. Figure 16 shows some photographs for categories (3) and (4).

Figure 16. Photos by participants on: (**a**) Home aspect less pleasant (**b**) Most comfortable home space.

3.4. Qualitative Results: Narratives

On the tags corresponding to the photographs (3 were requested for each of them, in each of the four possible categories), a total of 1553 tags were collected, distributed as follows: (1) 595 tags on teleworking; (2) 169 tags on the most dedicated activity (if not teleworking); (3) 463 tags on the least pleasant aspects of the home; and (4) 326 tags on the most comfortable space in the home.

Due to the existing volume of tags, the NVIVO software was used to generate the word clouds from the term frequency study. To do this, a typographical revision of the clouds was previously carried out, discarding the empty words, and grouping together those words that also had possible derivations (for example: work, working).

Table 1 presents the word clouds corresponding to the tags of the last two subjects of the photographs, the less pleasant aspect of the house, and its most comfortable space, with the most frequent terms for each of them, and their frequencies.

In addition, these 605 photographs had the answers to each of the five questions for contextualisation.

By unifying the graphic categorisation of the photographs with the subjects addressed in each of the questions, a final categorisation was generated, whose main topics were grouped into: (1) Stay/Location; (2) Lighting/Solar control; (3) Spatial organisation; (4) Equipment and furniture; (5) Activity; (6) Views; (7) Deficiencies/Preferences.

These categories could in turn be described as closed (usually dichotomous), or open. In this sense, category 7 stood out, where there was a greater variety of responses, which might contain terms linked to emotional (joy, security, motivation, company), spatial (space, light, renovation) or material needs (terrace, views, balcony). Category 5, on activity, also highlighted, especially in the questions on most dedicated activity (as it was obviously open), and in the question on less pleasant aspects, since they were usually associated with parts of the home, but also with activities, whether routine or pending to be done (tidying up, cleaning, repairing . . .).

Table 1. Word frequencies found in photo tags from participants.

Photo Topic	Word Clouds	More Repeated Words	Frequency
Home aspect less pleasant		Small	18
		Disorder	16
		Space	16
		Work	14
		Dark	13
		Light	12
		Yard	8
		Burden	7
		Uncomfortable	7
		Window	7
		Views	7
Most comfortable home space		Rest	36
		Quiet	20
		Cozy	20
		Sun	16
		Space	16
		Light	15
		Relax	15
		Comfortable	13
		Air	12
		Outdoor	11
		Leisure	10
		Living Room	10
		Terrace	10
		Bright	10

Regarding the questions associated with the photographs, the last two questions stood out: what does this image express about your life now, during lockdown? And what message could this image give to other people to improve their lives? The first of these, reflected in some way the Status Quo in which the participant contextualised their image, while in the second, the participant analysed what was represented in each image, to reflect a gap with room for improvement, or directly, to launch the proposal for improvement. In other cases, the message became a kind of advice related to the acceptance of the current situation, trying to make "a virtue out of necessity."

3.5. Overall Analysis: A Mixed Perspective

As a final discourse, the joint analysis was carried out, considering the results obtained from both approaches, which complemented each other to validate, qualify, and enrich the information from each perspective.

Regarding the characteristics of the observed dwellings, the predominant data were urban dwellings, between 61–90 m^2 (although there were also a large number of 90–120 m^2), multi-family, own already paid for or mortgaged, where households of between 2 and 3 or more members lived (the average obtained was 2.6 persons/household). This was linked to the habitability of the dwelling, where 70% also had open outdoor spaces, highlighting open terraces. In terms of environmental characteristics, general lighting and indoor air quality were considered good or very good, while noise insulation was on the borderline between appropriate and inappropriate.

As regards the time devoted to the different main tasks, it was worth noting the low level of perceived dedication to the care of children and dependents, considering that the educational and care centres were also closed. However, telework/tele study were highlighted as tasks of greater dedication. They were followed by rest and household chores, and to a lesser extent, although with a greater variety of responses, tasks related to leisure and sport.

In relation to the alteration of habits reflected in Figure 8, people have more accused the lack of visits from people outside the home (relatives, friends), as well as leisure and sports activities, or household chores. This is related to some answers corresponding to the qualitative part, where participants exposed perceptions on those changes, such as greater dedication to domestic chores with respect to day-to-day tasks; the lack of space, resources for leisure or sports, as well as the impossibility of attending specific premises (gyms or outdoor spaces), or the continuous presence of other home members are some relevant reasons why the alteration of daily habits in Spanish homes.

Regarding the quality of the spaces and their use in this period, the aspects that were least pleasant to live in are the small, narrow, untidy, poorly lit, or uncomfortable spaces. The places most represented in the images were often the entrances to the house, with a major role for the exterior-interior transition and disinfection; the laundry rooms, clotheslines, and kitchens linked to a greater execution of household chores and the consequent awareness of the poor quality of these spaces; the corridors and bathrooms because they had little lighting and a lot of surface area; or the storerooms and other spaces that were not very organised or are pending renovation. These ideas, reflected in the qualitative part, were directly related to the majority of answers to the question of adaptations to the home during lockdown, mainly: the change of clothes when arriving from outside (of the house); storage or redistribution, related to storage rooms; leisure or family activities, which justify sharing the living room or the accumulation of things in the same space for the enjoyment of more members of the household. They were also directly related to the needs detected in the question about the improvements that would be made to the dwelling, mainly related to its static aspects, building design, and envelope.

The most comfortable spaces in the house were mostly living rooms, linked to leisure and family gatherings; the bedrooms associated with rest; and the spaces open to the outside, such as patios, gardens or terraces, as the most valued spaces in this lockdown. This is also directly related to the majority of responses to the question about alteration of habits at home, pointing out social relations by home visitors (relatives, friends). Indeed, one aspect that was highlighted in the most comfortable spaces was the concept of the meeting place (of the household members), the social centre of the home, perceived as something pleasant. Spaces open to the outside had also provided a meeting place at a social level, outside the core of the home, some with views of green or wooded areas. Leisure and sport had also been linked to living rooms and spaces open to the outside. The rest of the altered habits had to do with domestic tasks in the home (often carried out by people outside the household), disinfection and changing of clothes, and sleep, as the most significant.

Regarding thermal comfort, the presence of individual heating in the dwellings should be highlighted, which might explain the predominant use "only if strictly necessary." Even though confinement took place in spring, in much of Spain, temperatures were still low for weeks. Only in one part of southern Spain did spring temperatures remain rather high for the last couple of weeks of data collection. This explained why, despite having individual refrigeration equipment in more than a third of the dwellings, it was never used in almost 80% of cases. In more than 45% of the dwellings, there was no such equipment.

As for the equipment and supplies, the use of hot water and the equipment of the house stood out. Bearing in mind the change in habits in water usage, a question about general water consumption has not been specifically exposed in the questionnaire. However, changes in the consumption of domestic hot water in general had been considered (Figure 10), as well as the alterations in the use of household appliances that involved considerable water consumption, such as washing machine or dishwasher (Figure 11). Both for hot water in general and for the washing machine, there had been an increase in consumption in one third of the households, while for the dishwasher the increase amounted to half of the participating households.

With regard to domestic appliances and devices, none of them had experienced less use. The food processor, the hoover, the washing machine, the freezer and the dryer had not changed. The equipment

that had seen increased use in this period had been the stoves, the oven, computers, and mobile devices. The activity in the kitchen and with technology had therefore stood out.

On the subject of energy use patterns, the measures of energy expenditure expected during lockdown had been included, with a majority of small changes, with almost half of the responses, and 41% stating that some change would be assumed.

Although the use of HVAC systems had already been observed to be moderate, in the graph relating to energy saving strategies, it stood out with one third of the responses that no saving measures had been carried out, followed by one quarter that had switched off unnecessary lights, or one fifth that had replaced them by LEDs; 16% had eliminated baths and shortened showers. For this reason, from the fact that the participant apparently did not perceive a conscious intention to save energy, together with the 24/7 stay in the house, it could be assumed that the small expected change in the bills was upwards.

4. Discussion

This study is based on a mixed method, applied to find out in an exploratory way the experience of Spanish households in their homes during the period of lockdown, due to COVID-19, in the spring of 2020.

To our knowledge, there was no evidence of the degree of resilience of households to situations of confinement, or situations similar to the one experienced in Spain in this period, nor of the perception of households, the behaviour of their members, or their needs and preferences in this context of confinement, in relation to the living space.

The study presented here offers interesting reflections that describe the situation experienced by Spanish households during the lockdown of the spring of 2020 due to COVID-19. Specifically, we highlight in a general way the adaptation carried out by the households and their dwellings, coming from the quantitative and qualitative approaches. The final mixed analysis offers a better understanding of the social phenomenon and the impact of COVID-19 on the core of the household and the dwelling [57], as well as on the ways of living during this period.

This study is of an exploratory nature. This has been one of the most frequent consequences of the online surveys that have emerged on the issue of COVID-19 [58]. There are inherent biases in the way participants are recruited [59], as well as in the use of internet forms [60], and digital gaps, which could result in few respondents belonging to vulnerable areas. Those biases could also clarify why most respondents were teleworking, probably linked with the participant qualification. However, this method includes some clear advantages over telephone or face-to-face surveys [61], bearing in mind the context. In addition, this medium has favoured the provision of participants' own photos [62], supported by anonymity.

To establish the degree of representativeness of the quantitative results, a check was established using an immediate test of proportions based on a single sample, using the Prtesti command. The result showed some expected deviations. However, it has been observed for the most relevant variables chosen (habitat, dwelling type, surface, average household size, internet access, and tenure), that the distribution follows very similar patterns with respect to the representative data sample taken from official sources, although some of its categories had been somewhat over-represented.

For its part, in different qualitative research settings, methods and techniques were urged to be adapted to reach potential participants in safe conditions, during lockdown. Among these methods, those based on self-reported photographs or videos were cited to enable communities, especially the most vulnerable (though not exclusively), to share their experiences, show their reality, become aware of it, and empower themselves [63].

5. Conclusions

The comprehensive analysis merging the two approaches resulted in interesting insights. This study has shown the relationships between the priority activities carried out during lockdown

due to COVID-19, the consequent changes in habits, and the involvement in domestic terms, transmitted through deficiencies and preferences in the field of housing.

Teleworking has been the most dedicated task. Although this fact should be qualified by the possible biases of the study, it would be interesting to explore the extent to which this and other daily tasks have affected households in such context, distinguishing by family type, and even by gender, as well as other relevant factors. This detailed analysis could lead to interesting future research lines.

Another study that could be carried out in a more detailed way would be related to the changes in use that alteration in habitual energy consumption entails, and the participant's perception of their own consumption, the savings strategies they have implemented, and other aspects not covered in this article so as not to lengthen it unnecessarily. In this sense, an economic analysis of homes was not included in this research. The main reason why household incomes were not explicitly requested in the questionnaire, due to the researchers' criterion of omitting questions on potentially-sensitive information so as not to discourage respondents, with the subsequent risk of questionnaire leaving.

As various studies on psychological and mental effects related to confinement and the built environment have confirmed [64], there is a direct relationship between poor or bad quality housing and its services or equipment, with a more negative spatial perception, and even a greater potential for development or worsening of mental health [65], and vice versa.

The prominence acquired by the spaces open to the outside is noteworthy, and especially the views of green areas, which, according to Jo et al., bring undoubted psychological benefits, and more positive perceptions [66].

As final conclusions on how to improve design or renovation processes to reach healthier and more wellbeing houses, and resilience over time, some considerations are needed, according to the results obtained.

The habitability qualities, such as the dimensions and characteristics of the built environment, that are, dwellings and surrounding urban spaces, and their sizing according to the number of people in the home, are notable aspects to consider in the reflection towards resilient dwellings. The evolution of the home itself over time and needs may also require spatial flexibility and provision of independent and stable supplies in each space, including internet access in the rooms, and of equipment and spatial qualities for teleworking, an activity that is expected to be included in the housing program in a stable way in the coming years. Other characteristics directly related to indoor environmental quality (natural lighting and ventilation; indoor air quality; general thermal and noise insulation) and therefore also to health, as well as associated habits (natural ventilation and use of daylighting) need a review according to current regulations, as well as a comprehensive intervention in a large part of the built residential park in order to improve these issues as much as possible. Noise or thermal comfort in domestic spaces, directly linked to people's health, must imply not only interventions related to the envelope, both opaque and in gaps, but also from inside.

Access to stable supplies of resources, energy, and the internet had been essential in this period of confinement, and basic to an increasing activity at home, the telework. It is essential to overcome related gaps, such as universal and stable access to power, the internet, and digital resources.

Regarding the design of the spaces, it has been seen how those linked to domestic tasks had been perceived as not in accordance with the specific needs of confinement, which required greater storage and use of them. For this reason, it is proposed a reflection on daily tasks, their presence and space needs in the home, and the possibility of outsourcing or relocating certain uses, perhaps in a community way, to gain quality spaces linked to really essential uses in the domestic space.

As far as possible, it would be positive in this context to recover open spaces in contact with the outside, such as glazed terraces, in order to establish open-air recreation and leisure spaces, so necessary during confinement. It would also be positive to promote activities that link these open spaces with the care of plants, or small urban gardens, for a little contact with nature and the outdoors. At the same time, these spaces can offer flexibility for a better potential use, as another intervention or design issue to consider, which contributes, as indicated in the literature, to the whole well-being of the users.

The provision of equipment related to thermal installations (domestic hot water and HVAC) and power appliances that imply indoor energy consumption is in many cases inefficient, and even scarce. This, together with the limited availability of renewable energy facilities, and a certain lack of awareness on the part of users, as shown in Figure 13, could lead in certain scenarios to an even higher increase in energy consumption, especially in lockdown contexts. In this case, due to it occurrring in spring, it had a relative relevance, but this fact does not make the energy issue less relevant.

Highlighting as a final idea about this study and its results that, as a mixed method based on questionnaires, photographs, and testimonies through open questions, it has constituted a very broad analysis, which has provided a great deal of information, as well as much more enriching views than the usual ones based on quantitative surveys, or mixed methods based on interviews or open questions. Furthermore, we have accessed the homes without having invaded the private space, only with the voluntary contribution of those who have freely and anonymously agreed to share their intimate experiences, to collaborate in doing citizen science.

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