Article

The Impact of the COVID-19 Pandemic on Citizens' Attitudes and Behaviors in the Use of Peri-Urban Forests: An Experience from Italy

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Abstract: Peri-urban forests are complex systems capable of providing amenity and scenic values as well as recreational opportunities for citizens. From early 2020, national governments have promulgated restrictions, requiring citizens to adopt a new lifestyle to counter the COVID-19 outbreak. This study aimed to understand if citizens' behaviors and attitudes in the use of peri-urban forests are changing due to COVID-19 restrictions. Methodologically, a questionnaire survey was carried out, adopting a systematic sampling method. Two peri-urban forests were chosen as study areas: the first one was close to the town of Trento in the Alps (Monte Marzola), and the second one was in the proximity of the city of Florence (Monte Morello). At the end of data collection, 281 questionnaires were collected and processed. The results showed an increase in visits to peri-urban forests during the COVID-19 pandemic (36.4% of visitors in Monte Marzola and 17.1% in Monte Morello, respectively) with the aim of satisfying the need for relaxation and contact with nature. However, the use of peri-urban forests in times of crisis has been quite different in the two contexts: the visitors of Monte Marzola evidenced the role of a forest as a place where they can satisfy their need to play sports (mean value 4.53 in a five-point Likert scale), while Monte Morello forest was considered by visitors to be a place where the demand for companionship was fulfilled (mean value 4.27).

Keywords: COVID-19 outbreak; pandemic restrictions; citizens' attitudes; questionnaire survey; peri-urban forests; recreational activities

1. Introduction

Recently, the Food and Agriculture Organization (FAO) of the United Nations defined urban and peri-urban forests as networks or systems comprising all woodlands, groups of trees, and individual trees located in urban and peri-urban areas; they include forests, street trees, trees in parks and gardens, and trees in derelict corners [1]. Focusing on peri-urban forests, these woodlands and tree networks are located between urban areas and rural landscapes. For this reason, peri-urban forests provide a dual function and several ecosystem services typical of both urban and rural areas [2,3]. On the one hand, the rural context ensures amenity and scenic values and related aesthetic benefits [4,5]. On the other hand, urban forests also provide recreational opportunities for residents due to their proximity to urban centers [6,7].

Generally, peri-urban forests are situated in more peaceful and aesthetically attractive contexts compared to urban areas. Therefore, visits to peri-urban forests are a positive experience for citizens. In particular, peri-urban forests have been recognized to exert higher restorative effects compared with urban forests [8,9]. As emphasized by many authors, peri-urban forests provide many benefits for the physical, psychological, and social wellbeing

of urbanized people, such as [10,11]: habitats and species conservation, climate change mitigation, pollution control, and recreational and leisure opportunities. Regarding the latter, the FAO [12] also remarked on the positive impact on physical and mental health of these forests, which offers a healthy environment for citizens. From a physical point of view, peri-urban forests contribute to facilitating illness recovery and reducing sick leave, improving attention capacity, reducing several conditions including obesity and other various diseases, and in general ameliorating visitors' physical wellbeing [13–15]. From a psychological and mental point of view, an urban population can benefit from the contribution of peri-urban forests in reducing stress and anxiety, improving mental health, increasing pain tolerance, and supporting psychological wellbeing in general [16–18].

In the last century, the crucial role of green spaces in improving the quality of life in urban centers, providing multiple benefits, has developed due to urbanization and globalization phenomena that have occurred in many parts of the world [19,20]. The importance of green spaces in offering health-related services and wellbeing to citizens through ecosystem services has aroused much interest from both the scientific community and policymakers. In 2020, the World Health Organization (WHO) recognized this important contribution of green spaces in maintaining citizens' mental and physical wellbeing [21]. To this aim, urban authorities must guarantee access to outdoor spaces and public areas, keeping parks open, with measures to ensure physical distancing and avoid crowding [21].

During the ongoing COVID-19 pandemic, urban green spaces have quickly become the focus of attention and discussions, as well as scientific research, on the role and contributions of these spaces to citizens' health and stress-minimization [22,23]. If the importance of green areas during times of crisis is recognized, when focusing on the effects of the pandemic on the use of green spaces, some considerations are needed. To limit the transmission and severity of COVID-19, national governments across the globe issued different kinds of measures and restrictions [24–26]. Physical distancing and the prohibition of mass gatherings were key restrictions in the use of public spaces worldwide [27,28], but the severity of lockdowns was different in various contexts [29,30]. In some countries, citizens were prohibited from leaving their homes unless performing an indispensable service, while, in others, they were allowed to go out for nature recreation and were able to enjoy parks and green areas [31,32].

It is crucial to reflect on the two features of outdoor recreational spaces during the management of a public health emergency, such as the COVID-19 pandemic. The management of outdoor recreational spaces should be aimed toward balancing citizens' needs and the positive effect on physical and mental health of these areas with risks derived from the spread of the viral infection using green spaces [32].

In this context, Italy was one of the Western countries most severely affected by the COVID-19 pandemic. Currently, the virus is still circulating, with new variants in Italy, such that crisis and emergency situations still persist, as in many countries worldwide [33–35].

Beginning with these considerations, the present research was carried out from May 2021 to September 2021—at the end of the third wave, when vaccines were available—and no severe lockdown restrictions were present in Italy. During the survey, people involved in the face-to-face interviews had already faced three waves of outbreak, as well as the Draconian measurements implemented by the Italian government to tackle the COVID-19 pandemic [36]. In fact, from February 2020 to February 2021, during the evolution of the first and second waves, prolonged lockdowns were introduced in Italy to prevent the spread of the COVID-19 virus.

Regarding outdoor activities, in Italy during the lockdowns, the situation varied according to the pandemic's evolution. In March 2020, outdoor activities were only allowed alone or with members of the family, while, at the end of March, citizens were asked to stay at home, and it was not possible to walk more than 200 m from home. Similar restrictions were imposed in 2021 in regions with a high spread of the virus. During these periods, public green areas inside cities were also closed, and visits to green spaces were obviously characterized by this forced reduction [37,38].

The aim of this study was to investigate the impact of the COVID-19 pandemic on the use and attendance of peri-urban forests in two different Italian contexts. The study also analyzed the role of peri-urban forests to mitigate the negative effects of the COVID-19 pandemic, offering several ecosystem services useful for the wellbeing of urban populations. The data were collected through a questionnaire survey administered to visitors to two study areas: the first was a peri-urban forest located in central Italy, near the urban center of Florence, while the second one was located in an Alpine context, in north-eastern Italy, near the town of Trento. The research hypothesis was that visitors' use and perception towards peri-urban forests has been deeply influenced by the COVID-19 pandemic. Furthermore, the socio-demographic characteristics and the cultural context play a crucial role in the complex relationship between an individual's emotions and natural resources.

2. Materials and Methods

2.1. Study Area

Monte Marzola and Monte Morello peri-urban forests were chosen as the study areas (Figure 1). The first one is located 5 km from the center of the town of Trento (157.88 km^2 and 120,216 inhabitants) in north-eastern Italy, while the second one is in Sesto Fiorentino municipality, and is 15 km from the urban area of Florence (102.32 km^2 and 359,142 inhabitants) in central Italy.
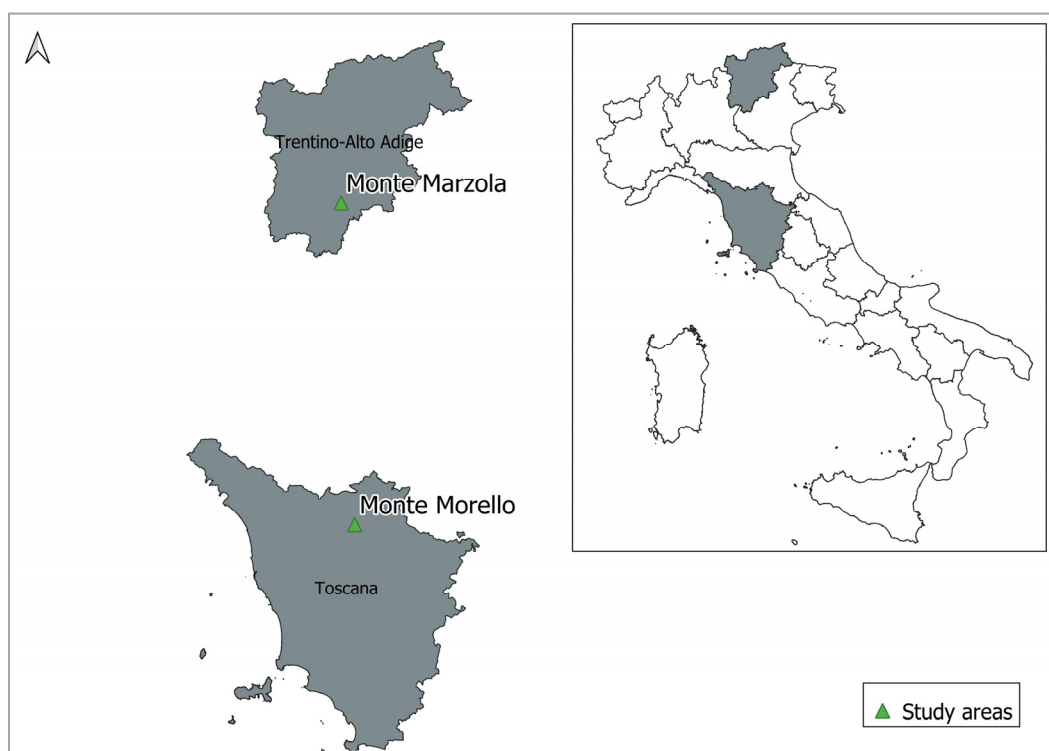

Figure 1. Location of the two study areas (Monte Morello and Monte Marzola) in Italy (source: originally created by the authors).

Monte Marzola peri-urban forest (Figure 2) is situated in the Italian Alps at an altitude of about 730 m a.s.l. [39]. This area is a place of great historical and cultural importance because, during the First World War, the Austrians built a dense network of fortifications to defend the town of Trento. The historical-cultural importance and the geographical position make the study area a popular tourist destination throughout the year. From an environmental point of view, it is a hilly mixed deciduous forest with black hornbeam (*Ostrya carpinifolia* L.) and manna ash (*Fraxinus ornus* L.), interspersed by large tracts of pure black pine (*Pinus nigra* J.F.Arnold subsp. *nigra*) stands at the lowest altitudes and a

beech forest at the highest altitudes. Black pine plantations were implemented after the deforestation carried out by the Austrians to build the fortifications.

Figure 2. Monte Marzola peri-urban forest (source: photos by the authors).

Monte Morello is a pre-Apennine mountainous relief located north-west of the city of Florence (Figure 3). In the past, Monte Morello was characterized by the presence of large forest areas, which were then subjected to intense exploitation from the 12th century onwards, leading to a strong deterioration of the vegetation. For this reason, at the beginning of the 20th century, a reforestation project was started, which was prolonged until the 1970s due to numerous interruptions [40]. The main tree species used in the reforestation of Monte Morello were black pine (*Pinus nigra* J.F.Arnold), Calabrian pine (*Pinus brutia* Ten. subsp. *brutia*), cypress (*Cupressus* spp.), manna ash (*Fraxinus ornus* L.), Turkey oak (*Quercus cerris* L.), and Downey oak (*Quercus pubescens* L.). Currently, Monte Morello forest is rather degraded and is characterized by poor regeneration and scarce stability, high fire risk, and by a huge quantity of deadwood because forest management practices were not applied [41,42]. From a touristic-recreational point of view, Monte Morello historically represents a place for outdoor recreation activities for local visitors coming from the city [6]. This is due to the fact that Monte Morello forest is easily reachable from the neighboring urban centers.

Figure 3. Monte Morello peri-urban forest (source: photos by the authors).

2.2. Research Framework

A preliminary version of the questionnaire was developed by a group of Environmental and Land Engineering students of the University of Trento, as part of a workshop conducted during the Ecology course. The first draft was then revised and integrated by the researchers involved in the project, to be administered face-to-face in the two study areas. The preliminary version of the questionnaire was pre-tested with a convenience sample of seven visitors to the Monte Marzola study area. The pre-test phase was used to identify critical issues on some questions, check the wording, and estimate the time for completing the questionnaire. During this phase, respondents completed the questionnaire in the presence of a researcher involved in the project who, at the end of the compilation, asked about any doubts. After the pre-test phase, three questions were changed to enhance understanding and two were deleted because they were considered to be redundant.

The final version of the questionnaire—developed after the pre-test phase—was characterized by nine closed-ended questions, to be easily understood by people of any social and educational background.

The first section, composed of three questions, referred to the frequency with which people went to the forest, how that frequency had changed following the pandemic, and the activities carried out. Precisely, in the first question, visitors were asked to express how often they visited the forest, while in the second question, respondents explained how the frequency of visits to the area had changed following the COVID-19 pandemic. The third question asked which type of activity was carried out in the forest, and respondents could choose between the following responses: Hiking, Walking, Climbing, Cycling, Running, Picnic-grill. The option to select Other and suggest different activities was also given.

The second section of the questionnaire—formed of three questions—focused on attitudinal and behavioral elements, such as the needs and feelings that drove people to visit the forest, and the social interactions that took place within this context.

In particular, the fourth question investigated whether a visitor's needs were satisfied by visiting the forest. The following needs were identified: Relaxation/Distraction from routine, Companionship, Sport, Activities with pets, Contact with nature, Therapeutic purposes. Needs satisfaction was indicated on an anchored five-point Likert scale format, ranging from very little (1) to very much (5).

The emotions experienced when visiting the forest were explored with the fifth question. Furthermore, in this case, the respondents were asked to estimate the level of emotions they felt when visiting the forest using a five-point Likert scale format. The list of emotions is shown in Table 1, and was based on a review in the literature [43,44].

Table 1. Definitions of emotions/feelings, taken from the Oxford Dictionary and used in this survey.

Emotions	Description
Restlessness	the state of being unable to stay still or be happy where you are, because you are bored or need a change.
Familiarity	the state of knowing somebody/something well; the state of recognizing somebody/something.
Physical wellbeing	general health and happiness.
Harmony	a state of peaceful existence and agreement.
Safety	the state of being safe and protected from danger or harm.
Freedom	the power or right to do or say what you want without anyone stopping you.
Isolation	the act of separating somebody/something; the state of being separate.

Source: Our elaboration starting from the definitions of the Oxford Dictionary.

In the sixth question, participants were asked what kind of feelings they had when meeting other people in the forest at the time of the interview, when the pandemic was still going on. The choice was between Anxiety, due to the possibility of epidemiological consequences, and Enjoyment of regaining a form of freedom. The option to select Other and suggest different feelings was also given.

The last section of the questionnaire investigated the socio-demographic characteristics of respondents, such as gender, age (distinguishing seven classes: 18–20 years old;

21–30 years old; 31–40 years old; 41–50 years old; 51–60 years old; 61–70 years old; and more than 70 years old) and level of education (elementary and technical school degree; high school degree; University and post-University degree).

The questionnaire was administered face-to-face from May 2021 to June 2021 in Monte Marzola peri-urban forest, after the end of the third Italian wave of COVID-19; while, in Monte Morello, the questions were administered from August 2021 to September 2021. In both study areas, the questionnaires were administered by two operators, following a systematic sampling scheme consisting of interviewing every second visitor passing through the identified sampling points. The sampling points, selected based on the areas of highest attendance indicated by locals, were, for both study areas: (1) a parking area/trailhead; (2) a refreshment point. At both points, it was possible to intercept any category of visitor: sportspeople, hikers, dog walkers, on-site workers, holidaymakers, etc.

2.3. Data Analysis

All statistical analyses are carried out using XLStat 2020.

When answering the fourth and fifth questions, respondents indicated their needs and emotions using a five-point Likert scale. The symmetric Likert scale gives independence to a respondent to select any answer in a symmetric way in either direction. The data collected using the five-point Likert scale format were processed to produce the main descriptive statistics (mean, median, and standard deviation).

For the other questions, the percentage of the frequency distribution (%) was calculated.

The Chi-square (χ^2) test was used for the questions of the first thematic section. with special regard to the use and attendance of the forest and the activities carried out. The Chi-square (χ^2) test was applied to test both the association between the two study areas and between the socio-demographic characteristics of respondents (i.e., gender, age, and level of education). The level of significance was set at $p < 0.01$. The null hypothesis assumed that there were no differences among the two study areas or the various socio-demographic classes regarding the use of forests and the activities carried out, whereas the alternative hypothesis assumed that there were differences.

In addition, the data collected using the five-point Likert scale format were statistically compared using the Mann-Whitney and Kruskal-Wallis non-parametric tests to highlight the influence of the socio-demographic characteristics of respondents (gender, age, and level of education) on the answers.

The Kruskal-Wallis test ($\alpha = 0.01$)—a non-parametric statistical test to assess the differences among three or more independently sampled groups on a single, non-normally distributed continuous variable—was used to highlight differences considering the age and level of education of respondents.

The Mann-Whitney U test ($\alpha = 0.01$)—a non-parametric statistical test to highlight the differences between two independently sampled groups that come from the same population– was used to point out differences considering gender and comparing the two study areas.

3. Results

3.1. Socio-Demographic Characteristics of the Respondents

At the end of data collection, the sample consisted of 281 respondents distributed as follows: 152 in Monte Morello and 129 in Monte Marzola, respectively. Comparing the two study areas, a similar response rate was observed: 85.4% in Monte Morello and 82.7% in Monte Marzola. In Monte Morello, 152 visitors completed the questionnaire and 26 refused; while in Monte Marzola, only 129 of 156 visitors completed the questionnaire. The response rates of this study are in line with those of other in situ studies carried out in Italy, which had a response rate between 70% and 90% [6,45,46].

As shown in Table 2, in both study areas, the majority of respondents were males (73.7% in Monte Morello and 67.4% in Monte Marzola). Considering the age, the most representative age class was 31–40 years old for Monte Morello (25.0% of respondents) and

51–60 years old for Monte Marzola (20.9% of respondents), demonstrating that the sample of respondents was biased towards the adult classes. In both case studies, the distribution of respondents by age showed that approximately 80% of the sample was between 21 and 60 years old.

Table 2. Socio-demographic characteristics of the respondents in the two study areas.

Socio-Demographic Characteristics/Study Area	Monte Marzola (*n* = 129)	Monte Morello (*n* = 152)
Gender (%)		
Male	67.4	73.7
Female	32.6	26.3
Age (%)		
Less than 20 years old	6.2	4.6
21–30 years old	14.7	19.1
31–40 years old	20.2	25.0
41–50 years old	19.4	14.5
51–60 years old	20.9	20.4
61–70 years old	13.2	11.8
More than 70 years old	5.4	4.6
Level of education (%)		
Elementary/technical school degree	13.2	7.9
High school degree	42.6	49.3
University/post-university degree	44.2	42.8

Source: our elaboration.

Concerning the level of education, the sample distribution was similar in the two areas, with around 90% of the sample concentrated in the two highest levels of education (92.1% in Monte Morello and 86.8% in Monte Marzola).

3.2. Impact of Pandemic on Visitors' Use and Activities in the Forests

Concerning the frequency of visits to the forest (Figure 4), in both study areas, the answer "weekly" prevails, but with a slightly higher rate for Monte Morello (41.4%) than for Monte Marzola (33.3%). The results show that the remaining visits are distributed in the following way in the two sites: "almost every day" (23.7% for Monte Morello, 17.8% for Monte Marzola), "monthly" (22.4% for Monte Morello, 17.8% for Monte Marzola), "less than once a month" (9.9% for Monte Morello, 20.2% for Monte Marzola), and "less than once a year" (2.6% for Monte Morello, 10.9% for Monte Marzola). These results evidence that the two peri-urban forests are both characterized by the higher frequency of "weekly" visits, but the tendency is different for the other options: the low frequency of visits is higher in Monte Marzola, while the percentage of visitors who attend the study area "almost every day" is higher in Monte Morello.

The Chi-square (χ^2) test ($\alpha = 0.01$) shows statistically significant differences between the two study areas ($p = 0.004$).

Regarding data pertaining to socio-demographic characteristics, the results show a higher percentage of females that visit the forest "almost every day" compared to males in the Monte Morello study area (40% vs. 17.9%). In Monte Marzola, differences between males and females emerge pertaining to the "weekly" response, which is widely selected by males (40.2%) and less by females (19%).

In Monte Morello, the results by age show that the frequency of daily visits to the forest increases in the older age classes (14.3% of the respondents were less than 21 years old, 11% were between 21 and 40 years old, 24.2% were between 41 and 60 years old, and 51.3% were more than 61 years old). The Chi-square (χ^2) test confirms statistically significant differences between age classes ($p = 0.001$). Conversely, this trend is not observed for visitors to the Monte Marzola area, where the "weekly" frequency of visits is the most common in almost all age classes.
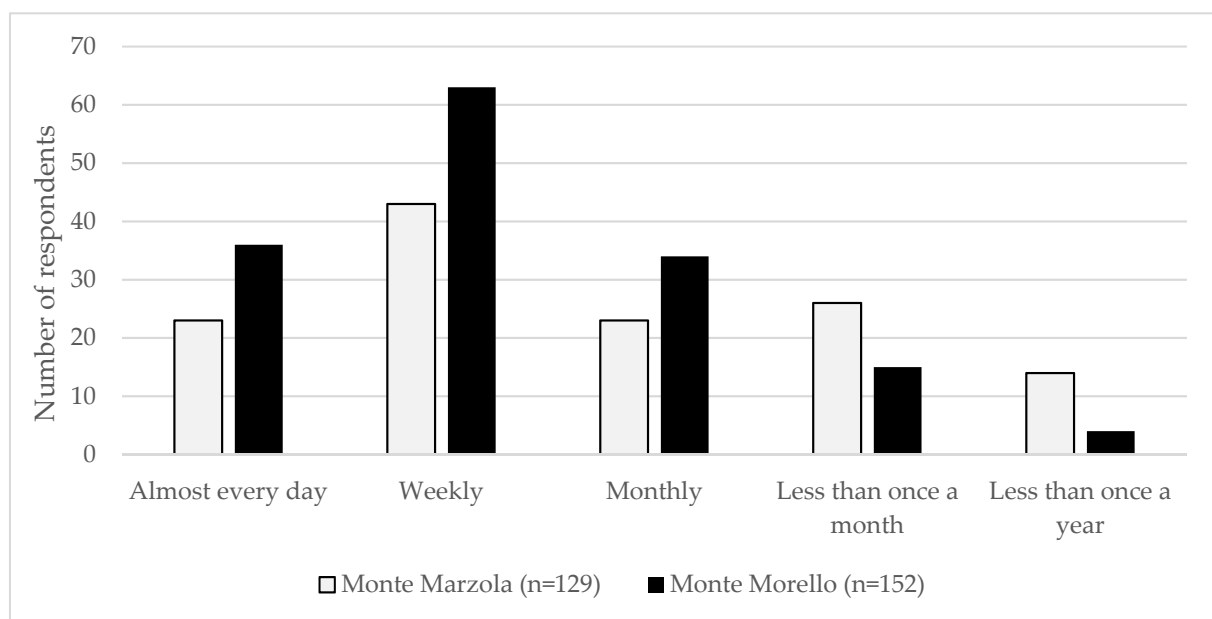
Figure 4. Frequency of visits to Monte Morello and Monte Marzola peri-urban forests (source: our elaboration).

The level of education of respondents influences the frequency of visits in both study areas, and respondents with a low level of education show the higher frequency of "daily" visits (54.5% in Monte Morello and 26.3% in Monte Marzola).

Concerning how the frequency of visits to forests had changed during the COVID-19 pandemic, the results show that most respondents stated that their attendance remained unchanged, but with rather different rates between the two areas (65.1% in Monte Morello, 43.4% in Monte Marzola). The visitors who increased their attendance during the COVID-19 pandemic were 36.4% in Monte Marzola and 17.1% in Monte Morello, showing different behaviors in the two areas. Similar results were observed in the two peri-urban forests for respondents who declared that their frequency decreased (12.5% in Monte Morello, 12.4% in Monte Marzola) or that they discovered the forest for the first time during the COVID-19 pandemic (5.2% in Monte Morello, 7.8% in Monte Marzola). The Chi-square (χ^2) test ($\alpha = 0.01$) showed statistically significant differences between the two study areas ($p = 0.001$).

Observing the results by gender (Table 3), the results show that in Monte Marzola the frequency of visits of males increased more than that of females (40.2% vs. 28.6%), while females declared that their attendance had not changed during the pandemic, more so than males (54.8% vs. 37.9%).

The results by age show that, in the Monte Marzola area, most of the young visitors (62.5% of those less than 20 years old) and the old visitors (42.8% of those more than 70 years old) increased their attendance to forest during the COVID-19 pandemic. For the other age classes, some deviations from the trend were observed: 26.3% of respondents in the age class 21–30 years old and 28.6% of those in the age class over 70 years old stated that they discovered the forest for the first time during the COVID-19 pandemic. The Chi-square (χ^2) test ($\alpha = 0.01$) did not reveal any significant differences regarding the distribution of the respondents according to gender, age, and level of education.

The results pertaining to the relationship between the socio-demographic characteristics of the visitors of Monte Morello and the change in the frequency of visits during the pandemic revealed that attendance to the forest had not changed in most cases, and comprised between 55.6% and 100%. Furthermore, in Monte Morello, the Chi-square (χ^2) test ($\alpha = 0.01$) did not reveal any statistically significant differences.

Table 3. Change in the frequency of visits to forests during the COVID-19 pandemic in the two study areas by age, gender, and level of education.

Socio-Demographic Characteristics/Change of Frequency	Increased	Decreased	Unchanged	New Area Discovered during the Pandemic
Monte Marzola (*n* = 129)				
Gender (%)				
Male	40.2	13.8	37.9	8.0
Female	28.6	9.5	54.8	7.1
Age (%)				
Less than 20 years old	62.5	0.0	37.5	0.0
21–30 years old	31.6	10.5	31.6	26.3
31–40 years old	42.3	11.5	46.2	0.0
41–50 years old	24.0	12.0	60.0	4.0
51–60 years old	44.4	11.1	44.5	0.0
61–70 years old	23.5	23.5	41.2	11.8
More than 70 years old	42.8	14.3	14.3	28.6
Level of education (%)				
Elementary/technical school degree	42.1	10.5	42.1	5.3
High school degree	36.4	12.7	43.6	7.3
University/post-university degree	34.5	12.7	43.6	9.1
Monte Morello (*n* = 152)				
Gender (%)				
Male	18.8	9.8	65.2	6.3
Female	12.5	20.0	65.0	2.5
Age (%)				
Less than 20 years old	28.6	0.0	71.4	0.0
21–30 years old	10.4	24.1	58.6	6.9
31–40 years old	18.3	13.2	60.5	7.9
41–50 years old	13.7	13.6	63.6	9.1
51–60 years old	16.1	9.7	74.2	0.0
61–70 years old	33.2	5.6	55.6	5.6
More than 70 years old	0.0	0.0	100.0	0.0
Level of education (%)				
Elementary/technical school degree	27.3	0.0	72.7	0.0
High school degree	13.3	14.7	68.0	4.0
University/post-university degree	18.5	12.3	61.5	7.7

Source: our elaboration.

Regarding the recreational activities carried out in the forest by visitors, the trend was similar in the two peri-urban forests (Figure 5). The most popular activity in Monte Morello was Hiking (30.3% of the respondents), while in Monte Marzola it was Cycling (29.5%). Walking was an important activity carried out by 24.3% and 24.0% of visitors to Monte Morello and Monte Marzola, respectively. The percentage of respondents who were in the forest for Climbing or for Picnicking was very low in both study areas (0.7% and 1.3% in Monte Morello and 1.6% and 0.8% in Monte Marzola).

It is interesting to highlight that a high percentage of respondents (13.8% in Monte Morello and 10.1% in Monte Marzola) indicated the option "Other", explaining that they were in the forest for a job activity or that they are going to a nearby restaurant or bar. No statistically significant differences between the two study areas (p = 0.43) were evidenced by the Chi-square (χ^2) test (α = 0.01).

The results showing the relationship between the age and the level of education of the respondents and the activities carried out in the forests also revealed a widespread preference for Hiking, Cycling, and Walking, and no significant differences were showed by the Chi-square (χ^2) test. It is interesting to observe that differences between males and females emerged in both study areas. In Monte Morello, 35.0% of females were in the forest for Walking and 32.5% for Hiking, while for males, the percentages were 20.5% and 29.5%, respectively. A total of 29.5% of males were in the forest for Cycling, while none of the

females carried out this activity. The Chi-square (χ^2) test showed significant differences between males and females ($p = 0.001$). Furthermore, in Monte Marzola differences between males and females emerged, and 43% of females were in the forest for Walking and 31% for Hiking, while these percentages were 15% and 21% for males. A total of 39% of males were Cycling in Monte Marzola, while this activity was practiced by 9% of females. The Chi-square (χ^2) test also showed significant differences between age groups ($p = 0.001$).
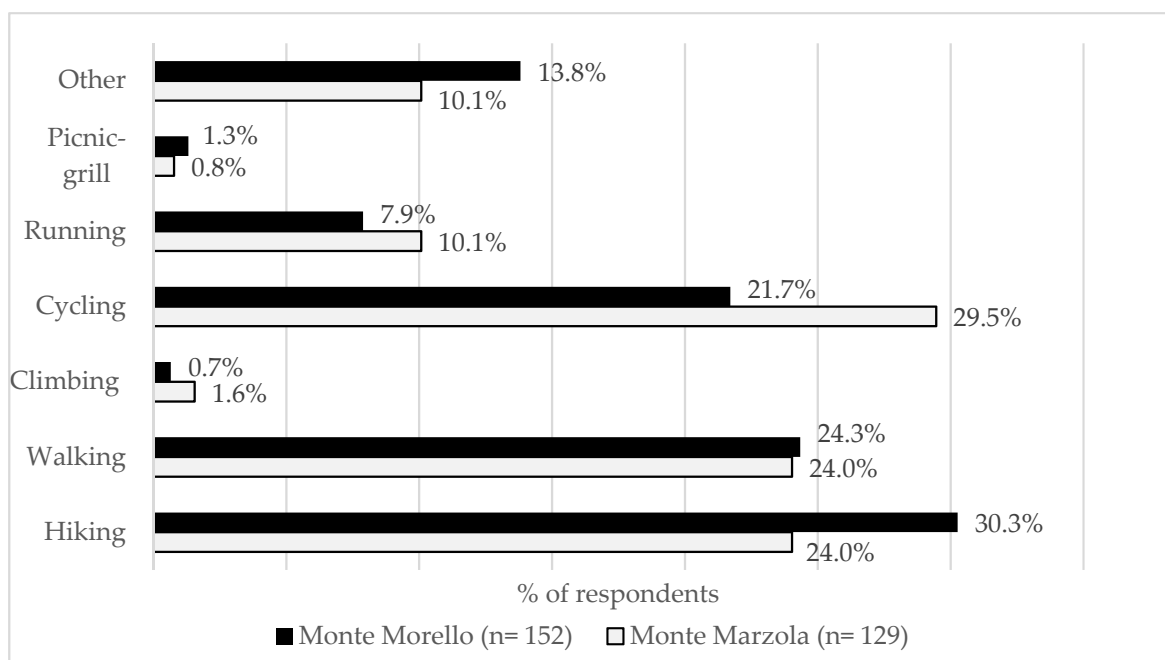

Figure 5. Activities carried out in Monte Morello and Monte Marzola peri-urban forests (source: our elaboration).

3.3. Needs and Feelings Visiting Forests during the COVID-19 Pandemic

The respondents of Monte Marzola and Monte Morello highlight that the most important needs satisfied by visiting the forest were relaxation and contact with nature (Table 4). The visitors of Monte Marzola also evidenced the role of the forest as a place where they could satisfy their need of playing sports, while Monte Morello forest was considered a place where the demand for companionship was fulfilled. Conversely, activities with pets were considered by the sample of visitors to the two study areas to be the least important need. The non-parametric test of Mann-Whitney ($\alpha = 0.01$) showed statistically significant differences between the two study areas regarding three needs: therapeutic purposes ($p = 0.007$), sport ($p < 0.0001$), and companionship ($p < 0.0001$).

Observing the data by gender, in Monte Marzola, differences were evidenced between males and females for the therapeutic role of forests and activities with pets, which were considered more important by females. In Monte Morello, females evidenced the importance of forests in undertaking activities with pets. The non-parametric test of Mann-Whitney ($\alpha = 0.01$) showed statistically significant differences between males and females for activities with pets in forests ($p = 0.007$).

The age of respondents was a socio-demographic variable that influenced some respondents' needs in Monte Marzola. Older and younger people assigned a higher importance to the forest as a place where they could find companionship, while opposite behaviors concerning the therapeutic benefit of forests were noted. In Monte Marzola, older people also gave great importance to the therapeutic role of forests, while forests were not considered a place to find relaxation. The effect of age did not have an important role in the Monte Morello study area. In fact, no statistically significant differences were shown by the non-parametric test of Kruskal-Wallis ($\alpha = 0.01$).

Table 4. Needs satisfied visiting forests during the COVID-19 in the two study areas by age, gender, and level of education (mean ± st.dev.).

Socio-Demographic Characteristics/Needs	Relaxing	Companionship	Sport	Activities with Pets	Contact with Nature	Therapeutic Purpose
Monte Marzola (*n* = 129)						
Gender						
Male	4.40 ± 0.91	3.44 ± 1.51	4.54 ± 0.89	1.93 ± 1.45	4.38 ± 1.00	3.12 ± 1.78
Female	4.38 ± 0.82	3.76 ± 1.38	4.52 ± 0.77	2.65 ± 1.92	4.52 ± 0.95	3.82 ± 1.52
Age						
Less than 20 years old	3.83 ± 1.33	4.00 ± 1.67	4.17 ± 1.17	2.60 ± 1.52	3.00 ± 1.41	2.75 ± 1.26
21–30 years old	4.31 ± 0.87	3.44 ± 1.46	4.06 ± 1.00	2.40 ± 1.55	4.44 ± 0.81	3.69 ± 1.62
31–40 years old	4.39 ± 0.78	3.19 ± 1.54	4.71 ± 0.55	1.57 ± 1.21	4.35 ± 1.07	2.68 ± 1.78
41–50 years old	4.50 ± 0.79	3.73 ± 1.22	4.42 ± 1.02	2.31 ± 1.82	4.76 ± 0.44	3.40 ± 1.92
51–60 years old	4.80 ± 0.52	3.70 ± 1.66	4.80 ± 0.70	2.00 ± 1.71	4.45 ± 1.05	3.37 ± 1.86
61–70 years old	4.33 ± 0.71	3.25 ± 1.49	4.88 ± 0.35	2.50 ± 2.07	4.63 ± 0.74	4.00 ± 1.00
More than 70 years old	3.25 ± 1.71	4.25 ± 0.96	4.33 ± 1.11	3.33 ± 2.08	5.00 ± 0.00	4.75 ± 0.50
Level of education						
Elementary/technical school degree	3.80 ± 1.26	3.86 ± 1.41	4.54 ± 0.88	3.08 ± 1.80	3.93 ± 1.28	3.92 ± 1.24
High school degree	4.46 ± 0.88	3.82 ± 1.49	4.36 ± 1.14	2.06 ± 1.65	4.65 ± 0.89	3.50 ± 1.79
University/post-university degree	4.54 ± 0.78	3.21 ± 1.48	4.66 ± 1.02	1.93 ± 1.69	4.42 ± 1.15	3.05 ± 1.72
Total	4.40 ± 0.88	3.54 ± 1.47	4.53 ± 0.85	2.15 ± 1.63	4.43 ± 0.98	3.34 ± 1.72
Monte Morello (*n* = 152)						
Gender						
Male	4.66 ± 0.56	4.21 ± 1.09	4.01 ± 1.24	1.96 ± 1.58	4.70 ± 0.68	4.21 ± 0.76
Female	4.65 ± 0.62	4.43 ± 0.98	3.60 ± 1.48	2.75 ± 1.77	4.65 ± 0.53	4.23 ± 0.73
Age						
Less than 20 years old	4.29 ± 0.76	4.71 ± 0.49	4.43 ± 0.53	2.86 ± 1.68	4.71 ± 0.49	4.00 ± 0.82
21–30 years old	4.72 ± 0.53	4.28 ± 1.07	3.72 ± 1.44	1.59 ± 1.40	4.69 ± 0.47	4.00 ± 0.60
31–40 years old	4.76 ± 0.49	4.24 ± 1.20	4.03 ± 1.28	2.37 ± 1.68	4.58 ± 0.86	4.32 ± 0.62
41–50 years old	4.68 ± 0.48	3.95 ± 1.05	4.14 ± 1.25	1.82 ± 1.56	4.82 ± 0.39	4.27 ± 0.88
51–60 years old	4.65 ± 0.61	4.35 ± 0.70	3.97 ± 1.25	2.16 ± 1.61	4.71 ± 0.46	4.32 ± 0.83
61–70 years old	4.50 ± 0.71	4.39 ± 0.76	3.22 ± 1.44	2.89 ± 2.00	4.67 ± 0.97	4.17 ± 0.86
More than 70 years old	4.57 ± 0.79	4.29 ± 0.53	4.14 ± 1.46	2.00 ± 1.73	4.71 ± 0.49	4.29 ± 0.95
Level of education						
Elementary/technical school degree	4.33 ± 0.78	4.42 ± 1.00	4.33 ± 1.15	2.75 ± 2.01	4.42 ± 1.16	4.08 ± 1.00
High school degree	4.69 ± 0.54	4.15 ± 1.05	3.97 ± 1.23	2.16 ± 1.69	4.79 ± 0.44	4.29 ± 0.80
University/post-university degree	4.68 ± 0.56	4.38 ± 1.09	3.74 ± 1.43	2.06 ± 1.57	4.62 ± 0.70	4.15 ± 0.64
Total	4.66 ± 0.55	4.27 ± 1.06	3.90 ± 1.32	2.16 ± 1.67	4.68 ± 0.65	4.22 ± 0.75

Source: our elaboration.

In different ways, the level of education of respondents influenced their various needs. In particular, less educated respondents, with elementary or technical school degrees, assigned higher importance to the role of the forest for activities with pets in both study areas. The same category assigned higher importance to sport in Monte Morello and less importance to the role of forests for relaxation in Monte Marzola. The non-parametric test of Kruskal-Wallis (α = 0.01) did not show statistically significant differences.

Concerning the emotions experienced in forests, the results showed that the most important emotions were the sense of freedom in both study areas (mean value of 4.61 in Monte Marzola and 4.80 in Monte Morello), and physical wellbeing in Monte Marzola and harmony in Monte Morello (Table 5). The lower score was given by visitors to both study areas to the sense of restlessness and isolation, indicating that they did not feel negative feelings when visiting the forests. The sense of safety was considered more important by visitors to Monte Marzola (4.11 vs. 3.66).

Table 5. Emotions experienced in forests during the COVID-19 in the two study areas by age, gender, and level of education (mean ± st.dev.).

Socio-Demographic characteristics/Emotions	Restlessness	Familiarity	Physical Wellbeing	Harmony	Safety	Freedom	Isolation
Monte Marzola (*n* = 129)							
Gender							
Male	1.12 ± 0.49	4.12 ± 1.05	4.61 ± 0.76	4.48 ± 0.75	4.16 ± 1.10	4.56 ± 0.80	2.69 ± 1.51
Female	1.10 ± 0.30	4.16 ± 1.14	4.63 ± 0.79	4.56 ± 0.80	4.00 ± 1.26	4.73 ± 0.60	2.78 ± 1.67
Age							
Less than 20 years old	1.74 ± 1.14	3.60 ± 1.34	4.33 ± 0.87	4.33 ± 0.82	3.00 ± 0.63	4.67 ± 0.82	2.73 ± 1.72
21–30 years old	1.03 ± 0.27	4.00 ± 0.85	4.50 ± 0.94	4.47 ± 0.92	3.93 ± 1.33	4.33 ± 0.90	2.64 ± 1.55
31–40 years old	1.00 ± 0.00	3.54 ± 1.36	4.30 ± 1.62	4.27 ± 0.88	3.73 ± 1.32	4.36 ± 1.05	2.64 ± 1.39
41–50 years old	1.00 ± 0.00	4.19 ± 0.85	4.74 ± 0.45	4.53 ± 0.70	4.65 ± 0.79	4.63 ± 0.60	2.90 ± 1.59
51–60 years old	1.00 ± 0.00	4.57 ± 0.77	4.89 ± 0.47	4.72 ± 0.57	4.39 ± 1.04	4.89 ± 0.32	2.68 ± 1.76
61–70 years old	1.02 ± 0.35	4.09 ± 1.14	4.80 ± 0.63	4.56 ± 0.73	4.22 ± 0.97	4.80 ± 0.42	2.25 ± 1.51
More than 70 years old	1.00 ± 0.00	5.00 ± 0.00	4.75 ± 0.50	5.00 ± 0.00	5.00 ± 0.00	4.75 ± 0.50	3.40 ± 2.00
Level of education							
Elementary/technical school degree	1.80 ± 1.03	3.62 ± 1.19	4.69 ± 0.63	4.57 ± 0.65	3.77 ± 1.09	4.79 ± 0.58	2.75 ± 1.76
High school degree	1.03 ± 0.18	4.24 ± 1.13	4.71 ± 0.71	4.62 ± 0.74	4.21 ± 0.96	4.66 ± 0.68	2.70 ± 1.51
University/post-university degree	1.00 ± 0.00	4.20 ± 0.97	4.52 ± 0.84	4.40 ± 0.81	4.14 ± 1.29	4.51 ± 0.84	2.72 ± 1.56
Total	1.11 ± 0.45	4.13 ± 1.07	4.62 ± 0.76	4.51 ± 0.76	4.11 ± 1.15	4.61 ± 0.75	2.72 ± 1.55
Monte Morello (*n* = 152)							
Gender							
Male	1.44 ± 1.33	4.31 ± 1.10	4.57 ± 1.47	4.62 ± 0.69	3.63 ± 0.94	4.81 ± 0.41	2.76 ± 1.37
Female	1.50 ± 0.90	4.15 ± 0.95	4.50 ± 0.97	4.58 ± 0.87	3.75 ± 0.88	4.75 ± 0.63	2.98 ± 1.33
Age							
Less than 20 years old	1.43 ± 0.53	4.14 ± 0.69	4.86 ± 0.38	4.57 ± 0.79	3.00 ± 1.00	4.86 ± 0.38	2.14 ± 1.21
21–30 years old	1.48 ± 0.69	3.69 ± 1.20	4.48 ± 0.74	4.66 ± 0.48	3.83 ± 0.76	4.93 ± 0.26	3.10 ± 1.45
31–40 years old	1.58 ± 0.86	4.21 ± 1.04	4.50 ± 0.76	4.71 ± 0.52	3.58 ± 0.76	4.68 ± 0.53	2.76 ± 1.26
41–50 years old	1.55 ± 0.74	4.36 ± 0.79	4.82 ± 0.50	4.45 ± 0.67	3.50 ± 0.96	4.86 ± 0.35	2.36 ± 1.36
51–60 years old	1.32 ± 0.54	4.61 ± 0.56	4.48 ± 0.85	4.52 ± 0.68	3.74 ± 0.68	4.77 ± 0.62	2.84 ± 1.27
61–70 years old	1.39 ± 0.61	4.56 ± 0.62	4.33 ± 0.91	4.56 ± 0.51	3.89 ± 1.13	4.78 ± 0.43	2.83 ± 1.58
More than 70 years old	1.14 ± 0.38	4.57 ± 0.79	4.86 ± 0.38	4.86 ± 0.38	3.57 ± 0.98	4.71 ± 0.76	3.86 ± 0.90
Level of education							
Elementary/technical school degree	1.50 ± 0.67	4.50 ± 0.52	4.75 ± 0.45	4.50 ± 0.67	3.58 ± 0.79	4.92 ± 0.29	2.83 ± 1.53
High school degree	1.39 ± 0.63	4.44 ± 0.79	4.63 ± 0.73	4.56 ± 0.60	3.64 ± 0.97	4.79 ± 0.53	2.97 ± 1.38
University/post-university degree	1.52 ± 0.75	4.03 ± 1.09	4.43 ± 0.79	4.68 ± 0.53	3.69 ± 0.73	4.78 ± 0.45	2.63 ± 1.29
Total	1.45 ± 0.69	4.27 ± 0.93	4.55 ± 0.74	4.61 ± 0.58	3.66 ± 0.85	4.80 ± 0.48	2.82 ± 1.36

Source: our elaboration.

The non-parametric test of Mann-Whitney ($\alpha = 0.01$) showed statistically significant differences between the two study areas in terms of safety ($p < 0.0001$) and restlessness ($p < 0.0001$).

Observing the data by gender, no differences were evidenced between males and females in both study areas, confirming the general trend observed. No statistically significant differences were shown by the non-parametric test of Kruskal-Wallis ($\alpha = 0.01$).

In different ways, the age of respondents influenced some emotions perceived by visitors to the forests. In particular, young respondents in Monte Marzola declared frequently experiencing a feeling of restlessness in the forest. The same category assigned higher importance to sport in Monte Morello and less importance to the role of the forest for relaxation in Monte Marzola. Conversely, for older people, the feeling of familiarity was very important. The feeling of safety was regarded as of little importance for young people and of high importance for older people. In Monte Marzola, the non-parametric test of Kruskal-Wallis ($\alpha = 0.01$) showed statistically significant differences for feelings of safety ($p = 0.006$) and restlessness ($p < 0.0001$). In Monte Morello, no statistically significant differences were shown by the non-parametric test of Kruskal-Wallis ($\alpha = 0.01$). The only interesting deviations from the trend were young people who affirmed that they did not

feel a sense of isolation in the forest, and old people who, on the contrary, attributed higher importance to this emotion.

Observing the effect of the level of education, in Monte Marzola, people with elementary and technical degrees considered feelings of restlessness more important and familiarity and safety less important compared to the other categories. The non-parametric test of Kruskal-Wallis ($\alpha = 0.01$) showed statistically significant differences for feelings of restlessness ($p < 0.0001$).

In Monte Morello, no deviations from the trend were observed considering the level of education and no statistically significant differences were shown by the non-parametric test of Kruskal-Wallis ($\alpha = 0.01$).

Concerning the feelings of visitors when they met other persons in the forest during the COVID-19 pandemic, the results showed that the visitors of both study areas were happy when meeting people during their stay in the forest (Figure 6), perceiving a sense of freedom after a long period of forced isolation (86.8% in Monte Marzola and 82.2% in Monte Morello). A different trend was shown in relation to the other options: in Monte Morello, the option of "Other" prevailed, which represented 14.5% of visitors; while in Monte Marzola, 11.6% affirmed they had a sense of anxiety when they met other persons in the forest during the pandemic.
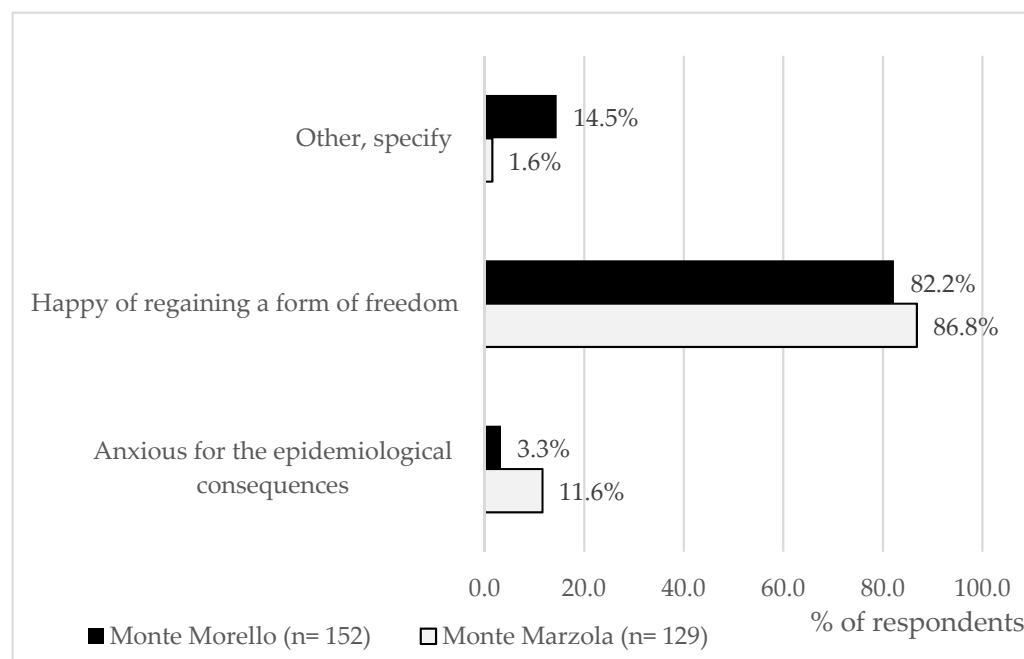

Figure 6. Feelings when meeting other persons during the COVID-19 pandemic (source: our elaboration).

The Chi-square (χ^2) test ($\alpha = 0.01$) showed statistically significant differences between the two study areas ($p < 0.001$).

The results pertaining to the relationship between the socio-demographic characteristics of the respondents and their feelings when they met other people in the forests also revealed a widespread sensation of happiness, in around 66% and 100% of respondents. The Chi-square (χ^2) test did not reveal any significant information regarding the distribution of the respondents according to gender, age, and level of education.

However, some deviations from the trend could be observed in the Monte Morello study area when considering age and level of education. Visitors over 60 years old and those with elementary and technical school degrees provided another response affirming that they were indifferent when they met other persons in the forests (61% and 41% of respondents, respectively).

4. Discussion

The results of this study firstly support evidence that, in both study areas, the majority of respondents—selected through a systematic sampling method—are adult males with a university or high school degree. Taking into consideration the sampling method used and the high response rate (85.4% in Monte Morello and 82.7% in Monte Marzola, respectively), it can be asserted that this is the main visitor target for these two types of peri-urban forests. In a study conducted in Germany, Beckmann-Wübbelt et al. [47] highlighted a sample of visitors to the Karlsruhe urban forest and Rheinstetten peri-urban forest, predominantly composed of females (55.3% of total respondents) and people with a high level of education (66.0% of respondents with university degrees). Similarly, Kičić et al. [48] showed that the visitor sample of the urban green spaces in Zagreb consisted mainly of females (57%) with a high level of education (61%). In a study conducted in the same two Italian regions as the present study, Paletto et al. [49] evidenced that the majority of visitors were males (62.0% in Pratomagno in the Tuscany region; 58.9% in Tret in the Trentino-Alto Adige region) with a high level of education (44.2% with a high school degree and 36.7% with a university degree in Pratomagno; 48.5% and 39.6% in Tret, respectively).

Reasons for the prevalence of males among the visitors of the two study areas can be hypothesized by the fact that women prefer to spend more time in urban forests—located closer to or within cities—rather than in peri-urban forests. In fact, the two peri-urban forests investigated in the present research were instead located 5 and 15 km away from the cities of Trento and Florence, respectively. In addition, our sample of respondents was characterized by a high percentage—more than 8% in both study areas—of people who were in the forest for work. These people are almost exclusively men who work in the local forest-wood supply chain.

Regarding the impact of the pandemic on people's attitudes and behaviors, the results of the present study show an increase of visits to both peri-urban forests during the COVID-19 pandemic (36.4% in Monte Marzola and 17.1% in Monte Morello) and the discovery of new forested areas to visit during the pandemic period (5.2% in Monte Morello, 7.8% in Monte Marzola). This finding is in line with a study conducted in Vermont, USA, which evidenced that people had increased or greatly increased their visitation rates to natural areas and urban forests during the COVID-19 pandemic [50]. Similar results were reported in Europe for the cities of Bonn and Karlsruhe in Germany by Derks et al. [51] and by Beckmann-Wübbelt et al. [47], respectively. Study results reported for Oslo in Norway by Venter et al. [52] and for Brussels in Belgium by Da Schio et al. [22] were also in line with these findings. Conversely, Lopez et al. [23] demonstrated that, for New York City, that the number of citizens who increased and those who decreased their use of urban green spaces during the COVID-19 pandemic was more or less equal.

The higher percentage of visitors who increased their visits to Monte Marzola peri-urban forest compared to Monte Morello is due to the distance between the urban area and the forest, which is 5 km for Monte Marzola and 15 km for Monte Morello. For this reason, the residents of Trento town could reach Monte Marzola more easily, even during the COVID-19 lockdown periods and relative restrictions. Furthermore, it is important to evidence that Monte Morello is the only important peri-urban forest near the town of Florence, with 18,475 visitors per year, mainly coming from the province of Florence [6]. Conversely, Monte Marzola peri-urban forest is one of the three peri-urban forests of the Trento town, while the other two are Monte Calisio (approximately 9 km from the urban center) and Monte Bondone (13 km). Therefore, citizens of Trento have more destinations to choose from, compared to those of Florence.

In Monte Marzola, the results show that the frequency of visits by males increased more than that by females, and most young visitors increased their attendance to the forests during the COVID-19 pandemic. This outcome confirms, as confirmed by previous studies [22,53], that, during the COVID-19 pandemic, young people found a refuge in the forest, a quiet place where they could relax. Nevertheless, young respondents in Monte Marzola declared to frequently experience a feeling of restlessness when they were in the

forest. Young people were almost certainly the component of society most severely affected by the COVID-19 pandemic from a psychological point of view [54,55], and they probably increased their forest visits because other activities were not allowed, but forests were new places for them and sometimes sources of a sense of anxiety [56].

Our results also evidence that the two areas are both characterized by a higher frequency of "weekly" visits, but the percentage of visitors who attend the study area "almost every day" is higher in Monte Morello peri-urban forest. In addition, in Monte Morello peri-urban forest, a higher percentage of females visit the forest "almost every day" compared to males, and the frequency of daily visits to the forest increases in the older age classes and for people with low levels of education. The differences in the frequency between the two study areas are probably due to the differences between the two communities described above. Monte Morello is the only important peri-urban forest available to the citizens of Florence, and for people who changed their habits during the COVID-19 pandemic attending forests every day Monte Morello was more or less their only option. Conversely, Monte Marzola is one of a few possible destinations for the residents of an Alpine community like Trento. Most likely, the greater choice of forests closer to the urban area influenced the results for the Monte Marzola study area.

The results show that the COVID-19 pandemic affected the use and attendance of peri-urban forests, influencing various aspects such as the frequency of visits, the activities carried out, or the visiting times. Our outcomes are in line with other studies showing a widespread transformation in the use of urban and peri-urban forests [51,57,58]. What clearly arises is that the pandemic has made people aware of the strategic role of forests [30,59].

Regarding the recreational activities carried out in the forests by visitors, the trend between the two study areas is similar and walking is an important activity carried out in both study areas. However, the most popular activity in Monte Morello is hiking, while in Monte Marzola, it is cycling. The reason for this difference can be again found in the different context of the two peri-urban forests. Florence is located in a flat area and people usually practice cycling on the roads of the surroundings of the city, while in Trento, mountain biking is very common in forests due to the many facilities developed by the public administration [49,60].

The findings of the present research concerning the recreational uses of forests confirm that females assign higher value to picnicking than males [6,61].

Concerning the needs, feelings, and emotions experienced when visiting the peri-urban forests during the COVID-19 pandemic, before discussing the results, it is important to again note that the present study was developed at the end of the third wave of the COVID-19 pandemic, and ran over a time span that included two lockdowns; the first one was characterized by strong restrictions, and the second one was characterized by different levels of limitations depending on the region and on the period. Therefore, people involved in the survey had already faced three waves of outbreak, and therefore, it allowed for an overall evaluation of the role of peri-urban forests in mitigating the impact of the pandemic. This assessment—thanks to the time that has passed since the lockdowns—is the effect of mature reflection and is not influenced by emotional aspects. It is also important to evidence that when investigating the effect of COVID-19 on peoples' behaviors and habits, it is necessary to consider the differences that may arise from the different degrees of restrictions implemented in various countries [38,51].

Regarding the emotions experienced in forests, our study evidences that visitors do not feel negative sensations when visiting forests, and the most important emotions were freedom in both peri-urban forests, physical wellbeing in Monte Marzola, and harmony in Monte Morello. Furthermore, visitors to both study areas were happy when meeting people during their stay in the forest, perceiving a sense of freedom after a long period of forced isolation. Furthermore, the most important needs satisfied by visiting the peri urban forests were relaxation and contact with nature. The visitors to Monte Marzola also evidenced the role of the forest as a place where they could satisfy their need to play sports, while Monte Morello forest was considered by visitors to be a place where the demand for

companionship was fulfilled. In both study areas, females and respondents with a lower level of education assigned a higher importance to the role of the forests for activities with pets.

All of these findings confirm the crucial role of peri-urban forests during the pandemic for physical and psychological wellbeing. This fact was also evidenced by De Meo et al. [53], who highlighted that, in time of crisis—e.g., during the pandemic—peri-urban forests are considered the most important urban green spaces, because they permit direct contact with nature and, at the same time, constitute a refuge from society. In addition, the large dimensions of peri-urban forests compared to urban parks and urban gardens permit more social distancing between people during the pandemic period. For these reasons, the peri-urban forests must be actively managed and shaped by managers in order to meet social demands, and the results of the present study can support planners and managers to design and manage peri-urban forests aimed at satisfying the needs of inhabitants in periods of crisis [51].

When investigating the relationship between the socio-demographic characteristics of the respondents and the emotions and feelings experienced in forests during the pandemic, the complexity of the interactions between people and nature emerges in a striking way. This relationship is influenced by the shift from a traditional to a modern society [62], and the presence of the COVID-19 pandemic is an additional element added to this intricate relationship.

5. Conclusions

The current COVID-19 pandemic situation, in terms of its continuous and rapid evolution due to variants of the virus (e.g., Omicron B.1.1.529, BA.1, BA.1.1, BA.2, BA.3, BA.4, and BA.5 lineages), requires special attention to be given to the role of peri-urban forests in the coming years. Our results provide some preliminary evidence regarding the influence of the pandemic situation on citizens' use and perception of peri-urban forests. During lockdown periods, citizens perceived these natural resources as a source of wellbeing and an easily accessible opportunity for relaxation and staying in touch with nature. In addition, many citizens made more use of peri-urban green spaces for sports and social activities due to their proximity to urban centers. Conversely, for other citizens, peri-urban forests can play a "refuge" role during times of pandemic crisis to escape from everyday reality and for therapeutic purposes (i.e., forest bathing and therapy). These green areas, being further away from urban centers compared to gardens, parks, and urban forests, facilitate greater social distancing and the isolation of people from each other.

Finally, it can be asserted that the research hypotheses were confirmed, as the results highlighted a change in the behaviors and attitudes of citizens towards peri-urban forests during the COVID-19 pandemic compared to normal situations. Furthermore, the socio-demographic characteristics of citizens (e.g., gender, age), as well as the cultural context, are the main explanatory variables in the differences in the use and attitudes towards peri-urban forests.

Author Contributions: I.D.M. and M.G.C. conceived and designed the study. I.D.M. and A.A. coordinated and performed the samples collection. I.D.M. and A.P. analyzed the data and interpreted the results. I.D.M. and A.P. contributed to the writing, editing and reviewing the relevant literature. All authors have read and agreed to the published version of the manuscript.

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