



# “The Forest Has Become Our New Living Room” – The Critical Importance of Urban Forests During the COVID-19 Pandemic

Hannes Weinbrenner\*, Jasmin Breithut, Wiebke Hebermehl, Anna Kaufmann, Tabea Klinger, Therese Palm and Kristina Wirth

Department of Societal Change, Forest Research Institute Baden-Württemberg (FVA), Freiburg, Germany

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### \*Correspondence:

Hannes Weinbrenner  
hannes.weinbrenner@forst.bwl.de

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Out of nowhere the COVID-19 pandemic has turned people's everyday lives upside down. Public places in urban areas were closed. However, leaving the house for recreational and leisure purposes in nature was still allowed in Germany – even during lockdown in March and April of 2020. As a result, urban forests have gained unprecedented importance – not only for recreational activities, but also for maintaining social contacts and coping with psychological stress. With these diverse requirements, many people have appropriated urban forests in new and changed ways. Using the example of the forests around the southern German city of Freiburg, a team of researchers from the Department of Societal Change at the Forest Research Institute Baden-Württemberg (FVA) carried out a mixed-method study to investigate how these appropriation practices are working and to shed some light on the relevance of forests for city residents in these circumstances. In addition to the statistical analysis of an online questionnaire, ethnographic observation data and Instagram posts were analyzed. This methodological triangulation was carried out in order to purposefully combine the strengths of each method while at the same time reducing the intrinsic biases and blind spots. This resulted in a better understanding of the importance of urban forest during this extraordinary period of time. Our results show that urban forests became critically important during the lockdown. Many visitors appropriated the forest with very different motives and for different purposes. For many visitors, the forest provided the same functions during this extraordinary period that public spaces otherwise do. The forest was not only consumed as a natural space, but also constructed by visitors as a social space. We can illustrate how this social meaning was both negotiated and reproduced. To provide an abstraction of our results, we refer to the theory of spatial appropriation as well as to new approaches in sociology of space that conceptualize space as a network of social relations. These results give rise to broader questions for future research projects, recreational forest research, forest and health, and forest planning.

**Keywords:** COVID-19, mixed-methods, social research, forest, health, appropriation, recreation, cultural ecosystem services

## INTRODUCTION

The COVID-19 pandemic and the correspondent policy measures to reduce the transmission of the virus have turned people's everyday lives upside down. Home-office, home-schooling, closures of sports facilities and culture centers, and other far-reaching restrictions of everyday life affected people's working and leisure habits to an unprecedented degree. Especially people living in densely populated cities were restricted in their freedom of movement and their recreational or leisure activities (Musselwhite et al., 2020). The scope of these restrictions was quite different between countries and even regions (DW, 2020; Ugolini et al., 2020) but caused psychological stress for many people affected by them (Donovan and Blazer, 2020; Wilder-Smith and Freedman, 2020). In Germany, people were still allowed to roam freely in green spaces like forests for recreational and leisure purposes while adhering to social distancing advisories. To some people, these public green spaces were the only places they could go to meet their needs for recreation or even for coping with psychological strains. Subsequently, in many countries, where the use of green spaces was not forbidden, an increase in the use of such areas could be observed during the COVID-19 induced lockdown (e.g., Derks et al., 2020; Geng et al., 2020; Grima et al., 2020; Ugolini et al., 2020; Venter et al., 2020).

The importance of green spaces for leisure and health, especially in urban and peri-urban areas, has already been reported to be crucial before the COVID-19 pandemic (Barton and Pretty, 2010; Iwata et al., 2016; van den Bosch and Sang, 2017; Baumeister et al., 2020). However, the COVID-19 pandemic made new social norms and rules of conduct necessary (e.g., wearing masks, social distancing). This extraordinary situation made it possible to observe how people relearned how to recreate in urban forests and interact with other visitors. Therefore, our research team could gain an insight into why forests are so important for many people and how this importance is socially reproduced. Especially qualitative social science methods help to understand such perceptions and processes. For example, Botsch et al. (2014) showed that forests are perceived as a "counterhorizon" to civilization which adds to understand recreational processes and the perception of conflicts occurring in forests.

Therefore, an increase in the use of these natural green spaces poses the risk of increasing conflicts between visitors, nearby residents, and management goals defined for these areas (Derks et al., 2020; McGinlay et al., 2020). One crucial conflict might be an increase in crowding in the forests. In the past years, crowding has become one of the most researched issues in recreation research. The phenomenon occurs when the number of encounters in a given area is perceived as too high, and therefore the situation is evaluated negatively (Schmidt and Keating, 1997). Perceived crowding is influenced by visitor characteristics and characteristics of those encountered, as well as situational variables (Manning, 1985; Volz and Mann, 2006). Simultaneously, more people using such areas might increase awareness and appreciation of such spaces' ecosystem services.

To gain a deeper insight into these different aspects, using the example of the forests around the southern German city of Freiburg, we carried out a mixed-method study to investigate the importance of forests for city residents under these extraordinary circumstances during the COVID-19 pandemic. We started our research process by focusing on the following questions:

- Is there an increase in the number or frequency of people using urban forests compared to the pre-COVID-19 situation? If yes, which factors influence this increase?
- Why do people visit urban forests?
- Do urban forest visitors experience conflicts?

During our research process and while analyzing these questions, we discovered the importance of appropriation practices in the recreational use of forests. Therefore, we introduced a theoretical framework of sociology of space and theories of appropriation to structure our research further. Spatial appropriation became popular as a scientific concept within psychology and educational science in the 1960s and 1970s (Korosec-Serfaty, 1976; Benages-Albert et al., 2015). The concept serves to analyze how people actively shape their environment in interaction with their surroundings. In this context, appropriation is often understood as changing existing arrangements (Deinet and Reutlinger, 2004; Deinet, 2009). The practice of appropriation in this theoretical framework entails several meanings: The active engagement with the environment as well as the creative arrangement of spaces with symbols and signs. Furthermore, it means changing given situations and arrangements, broadening one's behavioral repertoire, and using new skills to adapt to new conditions. This concept of appropriation of space has often been used to explore the acquisition of new spheres of action connected with childhood and adolescence (Deinet, 2009; Benages-Albert et al., 2015). More recent research in this field emphasizes the creative aspect of appropriation that entails changing given spaces and situations and, more importantly, actively creating "spaces" in the first place. In contrast to the traditional psychological understanding of appropriation, the analytical focus shifts from the educational to social and symbolic aspects of appropriation (Wehmeyer, 2013).

We used this framework as a sensitizing concept (Bowen, 2006) for our ongoing research process. Moving forward, we focused on the following questions:

- How do urban forest visitors appropriate the forest as "their" space during the extraordinary situation of the COVID-19 pandemic?
- Which types of appropriation practices are used, and how do they interfere with each other and other forest management goals?

## MATERIALS AND METHODS

In order to get a complete picture of how the pandemic influenced the recreational use of urban forests, we implemented an innovative mixed-methods research design. A methodological

triangulation was carried out to purposefully combine each method's strengths and reduce at the same time intrinsic biases and blind spots (Creswell and Clark, 2018; Creswell and Creswell, 2018). Each methodological approach has its strengths and weaknesses. Quantitative methods are strong in calculating correlations and their significance mathematically. While they provide explanations for proportions and probabilities, quantitative analyses often fail to provide a deeper understanding of meaning. The construction of social meaning, and varying perceptions of the world can be captured much more profoundly and in greater detail with qualitative methods.

In our qualitative analysis we follow methodological procedures that aim not at representativity in a statistical sense, but at representativeness nonetheless. A qualitative approach to generalizability lies in the identification of patterns that are embedded in underlying social structures and in this sense represent or point to broader social phenomena (Gatti and André, 2010; Flick et al., 2017). Therefore, our qualitative analysis aims to show which social patterns and social meanings are revealed in the material examined. These point to changes in social interaction in the social context of a pandemic and thus allow us to draw conclusions beyond the sampled cases and documents. We understand the exceptional situation of the COVID-19 pandemic as an opportunity to observe trends in the forest and different social meanings of forest as if in a burning glass. The new situation of the pandemic makes it possible to question and analyze things that otherwise seem self-evident.

Our mixed-methods research design's value lies in its depth, revealing multiple facets of how urban forests were experienced and used during the COVID-19 pandemic in Germany. While statistical representativeness was not intended, we have tried to obtain a detailed and multifaceted picture of the importance of urban forests in this extraordinary situation. Accordingly, the study is designed as an exploratory approach to functions of urban forests that have hardly been examined so far. Grounded

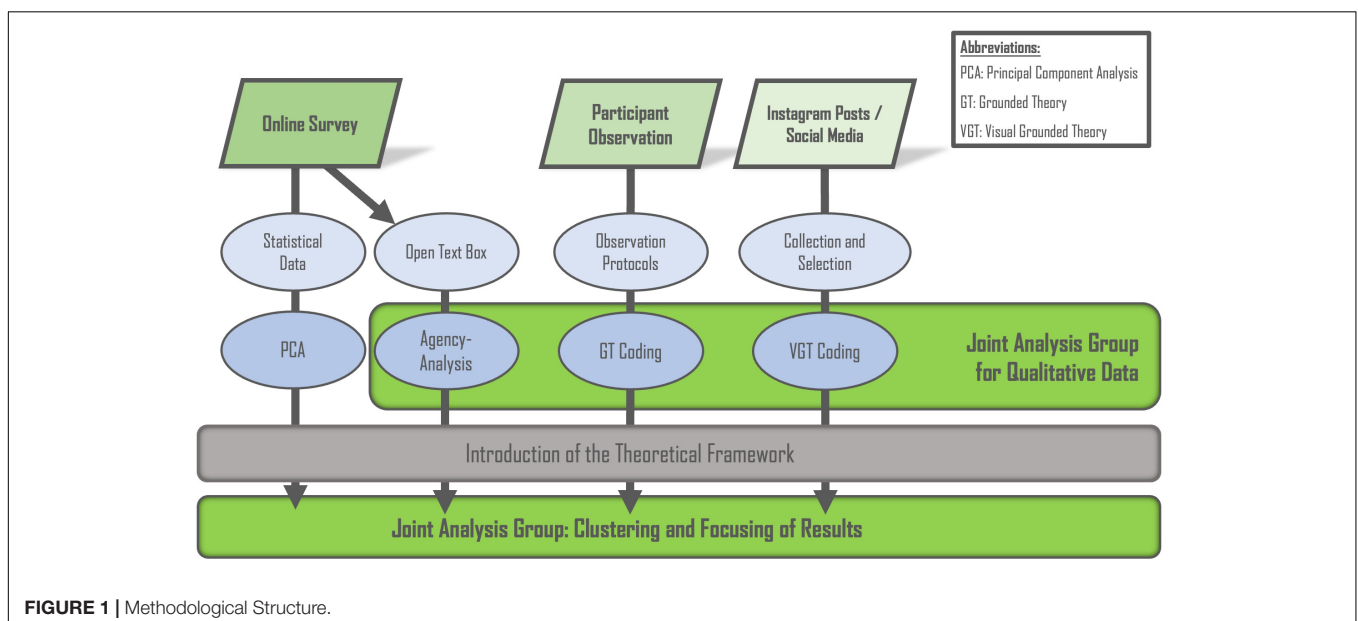
Theory Methodology (GTM) was used as a framework for our recursive research process. On the basis of a broad and rich data and our theoretical knowledge, we generated new, practically and theoretically relevant insights and hypotheses with the potential for further generalization (Charmaz, 2014). **Figure 1** shows the methodological structure of the study:

Our complementary study design consists of an online questionnaire, participant observations and data from the social media platform Instagram.

## Quantitative Online Questionnaire

A quantitative online questionnaire was conducted between April 7th and May 29th 2020, among the visitors of the urban forests around the city of Freiburg. Participants were asked to answer questions about their free time activities in the forest, their last visit to the forest, and also retrospectively about their visits to the forest before and during the pandemic. Principal component analysis (PCA) was used, to extract several motivational components for forest visits (Fromm, 2012; Field, 2017). These components represent, in part, different forms of use and expectations toward the forest. The statements on forest visits can also be cross-tabulated with the temporal development of the Corona restrictions. For the analysis of the quantitative data, IBM SPSS 23 was used. For bivariate correlations, chi-square tests or rank-order correlations were performed depending on the data level of variables involved. To determine statistical significance, we used  $p < 0.05$ . 714 persons filled out the questionnaire completely and answered the 27 partly open, partly closed questions, while 123 additional participants answered some, but not all questions. Participants who answered more than 80% of the relevant questions were included in the statistical analysis.

To inform forest visitors about the study and to motivate them to participate, posters were hung up at various forest entrances in the city of Freiburg showing information about the study and



the conducting institutions. Additionally, they contained a link as well as a corresponding QR code. Besides that, advertisements were placed on Facebook and Instagram with information about the study. These online advertisements were limited to the Freiburg area. Finally, an article in the local newspaper informed about our project and encouraged people to participate. In order to motivate the participants to fill in the questionnaire until the end, we gave them the opportunity to participate in a raffle for several prizes at the end of the questionnaire.

## Agency-Analysis of Open Text Descriptions

In addition to the statistical analysis of the online questionnaire, we also included an open text box. We asked all participants if they saw a connection between the coronavirus containment measures and their forest visits in the days and weeks prior. If they answered “yes,” they were asked to describe the connection in an open text box. 352 descriptions were given. These descriptions were assigned to different categories based on inductive coding. Finally, using “mini-max” selection (Kelle and Kluge, 1999) a broad range of descriptions was selected from the total number of assigned descriptions to be analyzed in greater detail using an interpretative analysis approach. To analyze these texts, we used agency-analysis. This interpretative approach examines to whom agency and thus responsibility for actions (or omissions) are attributed (Bandura, 1995; Emirbayer and Mische, 1998; Bethmann et al., 2012). In this sense, agency can be attributed to persons but also to objects, institutions, or anonymous powers such as fate, bad luck, divine providence, and so on. Generally speaking, agency is “a basic component of all concepts that explore or explain who or what has the power to act or is attributed with this power” (Barnes, 2000; Helfferich, 2012). Therefore, with the help of these analytic heuristics, it is reconstructed to whom or to what the writer ascribes agency on a micro-linguistic level. Our research team members analyzed around 50 descriptions this way, following a line-by-line approach. Results and interpretations were then discussed in team meetings to ensure intersubjective transparency. Final results were afterward condensed in memos (Charmaz, 2014) as continuous text.

## Participant Observation

Participant observation is part of a set of research methods used for collecting qualitative data in the social sciences (Kawulich, 2005). It can be described as “the process enabling researchers to learn about the activities of the people under study in the natural setting through observing and participating in those activities” (DeWalt and DeWalt, 2002: 2; Kawulich, 2005: [2]). Participant observation allows the researcher to transcend the boundaries of verbal expressions by observing the non-verbal: events, daily routines, social interaction, group dynamics, the non-verbal expression of feelings, behavioral patterns, body language, etc. (cf. Spittler, 2001: 1,8,9).

Concerning our study, 18 participant observations were conducted by a group of researchers in different forest sites in and around the city of Freiburg between March 31st and

April 14th. While pursuing their individual interests and hobbies during their visit to the forest (like exercising the dog or horse, jogging, playing with their child), the researchers paid attention to other forest visitors’ behavior, spontaneous encounters, and social interactions that ensued. In short, they observed what was happening around them while at the same time reflecting their own involvement in the occurring events. A short field guide was handed out to all observers to provide a minimal framework that structures all observations. Participant observation was an appropriate approach in that it enabled “witnessing processes of forest-related interaction [...] and not merely relying on accounts from hindsight” (Bethmann et al., 2018: 96), “having access to contextual information that might explain conflict dynamics” (ibid.) and “accessing ‘unspeakable’ aspects of the relationship that [...] [forest visitors had] toward forests” (ibid.) during the first Corona lockdown in spring 2020.

All observations were written down in protocols, which were then analyzed according to the approaches of Grounded Theory (Charmaz and Mitchell, 2009; Charmaz, 2014). Grounded Theory contains, among other things, the systematic process of analyzing data collected and inductively developing a theory based on these insights. This was achieved through regular meetings in an analysis group, in which the observation protocols were compared for similarities and differences, fragmented into units of sense, and broken down analytically by finding categories for different passages from the text (“Coding”) (Corbin and Strauss, 1990: 432).

## Image Analysis of Instagram-Posts

Communication is nowadays increasingly visualized in social media and chats. Therefore, it is important to consider visual data in social research. Instagram is one of the most famous image-based social media platforms. During the first lockdown in spring 2020, we decided to take a sample of Instagram pictures posted with the hashtag “#imwald,” which is German for “in the forest.” All pictures were posted on Instagram between March 10<sup>th</sup> and April 15<sup>th</sup>. Since the pictures were collected manually, we took screenshots of six images at a time. Later these screenshots were cut apart into single images in an automated way. Thereby some information got lost. Thus, from posted photo series, only the first images were collected. Besides that, no image titles, hashtags, nor comments were collected. In the end, a sample of 5172 pictures was analyzed.

The image analysis was conducted based on the Visual Grounded Theory Methodology (Mey and Dietrich, 2017). As our large sample did not allow us to analyze each image in great detail, we adjusted the analysis process so that the number of images was still manageable. In an attempt to consider the complete range of images posted at the time, and exploring the multiple layers of meaning that images express, we interpreted and categorized the data in four subsequent coding steps:

1. initial coding based on “face value” analysis (Charmaz, 2014: 116): Examples for these categories are pictures with a view, different perspectives on trees or people, paths, kids or animals. After this first step, we decided to reduce our sample by focusing only on pictures showing people. Since our



- research interest is in the appropriation of forests by humans, we expected the most insights from this sample.
2. Open coding by activity: We sorted the images again by activities such as sitting on a bench, playing, walking with the dog or doing sports in order to grasp the broadest possible variety of appropriation practices.
  3. Axial Coding integrating results from participant observation analysis: In the next step, we analyzed the images in depth and developed core categories that captured commonalities and differences in the visual language and established connections to the results from participant observation (e.g., transfer of gyms and playgrounds from the city to the forest).
  4. Typology: Based on the core categories, we build a typology of forest appropriation practices. For presentation of the analysis, we identified images that are representative of these practices, that show the proponents of the respective category in idealized form. Due to copyright protection some of the images we show in the results section are not from the original sample and were reconstructed and taken by the authors as indicated.

## Study Area

The city of Freiburg is located in the southwest of Germany between the Rhine plain in the west, which is characterized by industrial agriculture, and the comparatively sparsely populated Black Forest as a low mountain range in the east. Due to its location, Freiburg is a popular destination for tourists from France and Switzerland and for athletes, hikers, mountain bikers, and other nature lovers from the near or middle surroundings.

Freiburg's city forest, is composed of two forest areas. These two areas are climatically and geologically completely different natural spaces: the "Mooswald" in the north-west within the Upper Rhine Plain and the mountain forest, the actual "Black Forest," in the east and south of the city.

The forest areas on the plain are dominated by heat-loving, oak-rich deciduous forests. The mountain forests are rich in conifers with beech, fir, spruce, and Douglas fir. Recreation is an essential function of the forests, numerous forest paths but also narrow hiking trails criss-cross the area, and there are many benches, forest huts, and barbecue sites.

## RESULTS

### The Importance of Urban Forests

We discuss the importance of urban forests during the COVID-19 pandemic by first presenting insights into the statistical data. In our online questionnaire, which took place during the spring lockdown in 2020, 837 people participated, while 714 completed the questionnaire. 50% of the participants entered the questionnaire between April 7<sup>th</sup> and April 19<sup>th</sup>. In the following weeks until May 29<sup>th</sup>, fewer people participated each day.

Among the study participants, 59% are women and 40% men between the ages of 16 and 82 (mean age 41; median 38). 51% of the participants live in households with more than two persons and 46% have at least one child.

After public life was significantly curtailed from mid-March 2020, a large proportion of participants went to the forest more often (in some cases, significantly more often). Overall, this applies to almost two-thirds of respondents (61.8%), mainly younger people, people from households with more than three members, and women. Compared to the period before the lockdown, the number of forest visits in Freiburg's urban forests increased from an average of 2.7 visits per week to 4.2 visits. In fact, also people who usually tend not to spend time in the forest visited the forest during the lockdown. Only 2.3% of the participants state that they reduced the number of forest visits.

Besides that, the time spent in the forest increased significantly. Almost two-thirds of the respondents declare that they spent more time in the forest than before the restrictions (62.4%). Only 4.6% shortened their visits. 72% of those who increased the frequency of their forest visits state that they stayed in the forest "longer than before." While only 4% shortened their stays ( $p = 0.000$ ; Kendall-tau-b: 0.254) However, we did not find any significant differences between various occupational activities and increased frequencies or length of forest visits.

In order to get a better understanding of why people go to the forest and how a forest visit helps them, a PCA was conducted on a set of items from the questionnaire. Varimax was used as rotation. KMO is 0.683, and the explained variance is 68%. Four motives for visiting the forest could be derived from the PCA: First, forest visits helped to stay healthy and do sports. For 79%, this motive applies completely, for 19% partially. There is almost no one for whom the health aspect is not important (2%). Second, forest visits helped to reduce psychological stress. 37% of respondents fully agree here, while 54% partially agree. Therefore, this motive also plays a role for many respondents but is not as important as the previous one. Third, forest visits helped with social distancing. For 26%, this motive is entirely relevant. However, for just as many (26%), it does not apply. For 48%, it plays a partial role. The fourth motive is quite contrary to the third one: For 13% of all participants, forest visits helped to keep in touch with friends or just to be amongst people. 45% partially agree to that, while for 42%, it plays no major role (see **Figure 2** Proportions of the four components).

However, to this point, it remains unclear why the urban forests gained so much more importance during the lockdown. To get an insight, we asked all participants whether they see any connection between their forest visits and the COVID-19 pandemic. Two-thirds of all respondents agree that there is a connection (67.2%), while 32.8% do not agree. All participants out of the first group were asked to describe this connection in an open text box in their own words. 352 descriptions were given. In a first step, we structured the answers using content analysis. However, this approach did not yield much insight into the connection between forest visits and the COVID-19 pandemic. Therefore, we used an interpretative approach to gain a better understanding. In a second coding approach, we identified six different forms of connections: (1) Forest visits as retreats from the reality of the pandemic, (2) coping with a changed everyday life, (3) feeling free in the forests, (4) more intensive experience, (5) discoveries, and (6) new forms of forest use. Axial coding using a focus on agency showed that coping with a changed

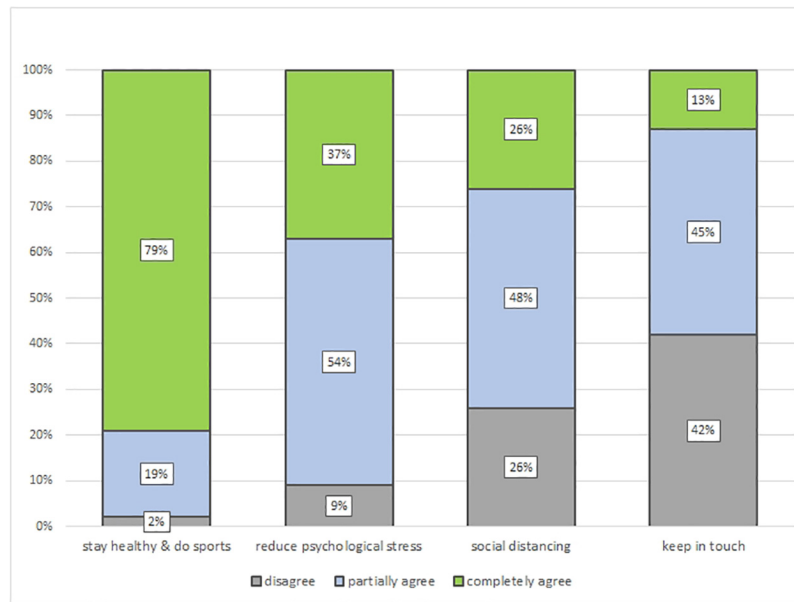


FIGURE 2 | Proportions of the four components.

everyday life and practices of compensations emerged as the most important categories:

## Coping and Compensation

Many participants describe that they visited the forest to cope with psychological stress caused by the COVID-19 pandemic, such as fear of infection, de-limited working hours due to home office solutions, and a lack of social contacts. One of the participants puts it this way: *“The forest has become more a place of escape from the situation. In the urban area, you have to see it everywhere. In the forest, you can still think of other things.”*

For many forest visitors, the forest has become a place of compensation. Many public places were closed by COVID-19 containment measures. Some of the needs that are met in these places during regular times could also be met in the forest during extraordinary times. Thus, for many families that had to care for their children at home, the forest became a kindergarten and a playground. Many young participants no longer met with friends in cafés but in the forest. Gyms were moved into the forest. Off the trails, people used tree stumps to meditate on them. By providing many opportunities for very different activities, the forest serves as a substitute – or functional equivalent – on many levels.

Looking closer at the texts that we categorize as coping or compensation, we find they differ in their agency constructions. In the comments which can be assigned to the aspect “coping,” there is hardly any active agency and few action predicates. Rather, processes are described that take place without one’s intervention. “Coping” is something that is provided by the forest. The forest is constructed as a place that is precisely not the city. While contagion risk, work, and stress are linked to the city, the forest is seen as a place of tranquility, freedom, and distance from COVID-19 measures. However, agency constructions in the

context of “compensation” are often described more active as a reaction to an external circumstance. This goes along with the fact that the participants often appear as agents and therefore actively shape and create positive and pleasant situations.

Common to both aspects is that forest visitors experience positive agency as a result. In the case of coping, this arises from managing the additional stress caused by the COVID-19 measures. When the stress eases off during the forest visit, many feel better afterward. Compensation, however, works more directly. What one usually enjoyed doing in the free time is no longer possible in the city. In the forest, however, many visitors experience this freedom. Interestingly, the natural features of the forest play hardly any role in the participants’ descriptions. The vast majority of them focus on what they can actively do in the forest.

Other variables from our questionnaire point in the same direction. In each case, 93% of the participants feel “more relaxed” and “more satisfied” after visiting the forest. Besides that, 68% feel “more optimistic.” On the other hand, only 1% and 2%, respectively, feel “more anxious” or “more stressed.” 83% of respondents also fully or partially agreed with the statement that their last visit to the forest helped them relax and enjoy a sense of normalcy.

## Appropriation of Space

By combining our online questionnaire’s statistical results and the qualitative results of our interpretative approach, we see that forest visits help cope with psychological stress. As a result of their visits to the forest, people no longer feel powerless. Instead, they manage to be empowered to take action. To gain a more in-depth insight into how the construction of agency works and what different forms it might come in, we turn to

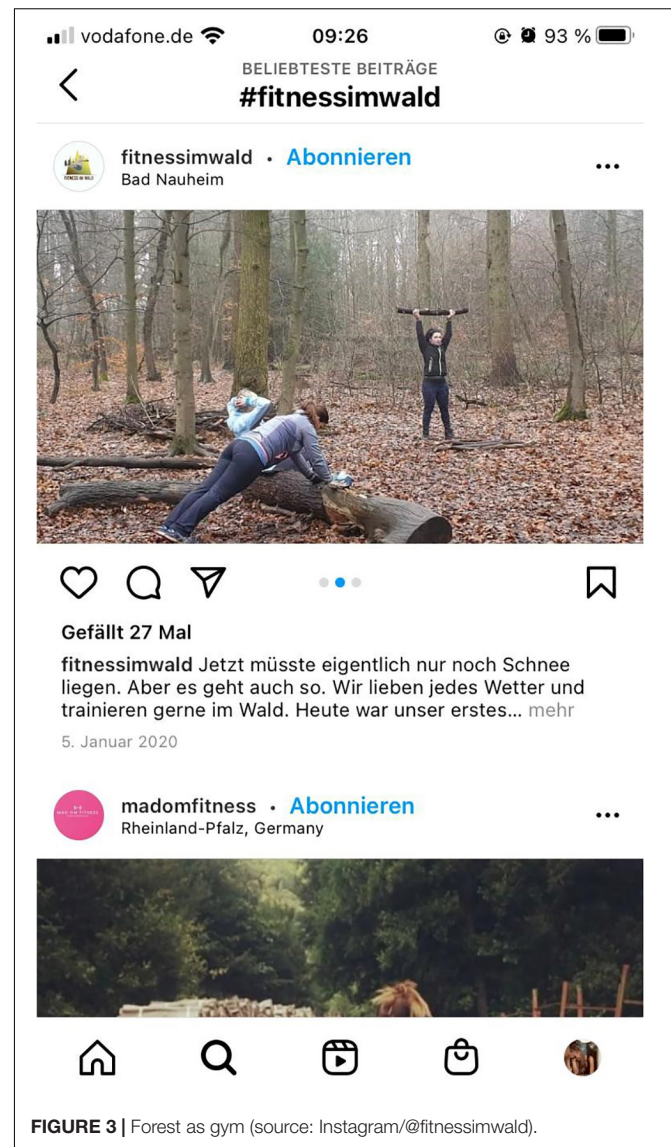
observational data and image analysis. In general, we found that active agency is constructed through appropriation practices. We distinguish three different forms of appropriation practices which partly build on each other and can also overlap. The first cluster consists of three practices – *transfer*, *occupation*, and *material changes*. These three categories are closely related to the code compensation we introduced above. While compensation describes the result of the appropriation process, *transfer*, *occupation*, and *material changes* focus on the process of space appropriation. *Transfer* describes how social norms or social spaces as a whole are transferred from the city to the forest. *Occupation* can be a result of this practice: Certain places in the forest are occupied by certain users. Others might not be able to use them as long as they are occupied. To transfer social spaces to the forest certain *material changes* might be necessary. Furthermore, *unification* with the forest can be seen as a result of the main practice *transfer*. Some people present themselves as one with the natural surroundings of the forest. Finally, we could also observe the practice of *staging* as one way to appropriate space.

### Transfer and Occupation

The appropriation practice *transfer* is represented on “Instagram” as a relocation of objects and – more importantly – of social spaces: The forest, being mostly free of restrictions and measures, becomes a replacement location to fulfill different needs, which were, before the lockdown, primarily practiced in the city. Examples for this replacement are gyms, cafés, or playgrounds. Due to the COVID-19 measures, sports clubs, gastronomy, and public places were closed. As the fulfillment of their everyday needs is not ensured anymore, individuals search for opportunities outside of previously confined space. Additionally, increasing levels of stress and the need for compensation from social distancing, government measures, home office, and potentially caring for children burden individuals. Therefore, people realize the possibility to utilize the forest as a social meeting point, gym, or playground without taking risks or breaking the rules. They rethink existing structures and behavior patterns. Especially the images of people practicing different physical activities in the forest depict an example of the *transfer* of the gym, which is typically in buildings with sports equipment, into the forest (see **Figure 3** Forests as gym).

This can further be illustrated with a quote from one of our observation protocols. The situation took place on April 7<sup>th</sup> in a part of the forest, relatively close to the city center of Freiburg:

*“I reach the first stop on the fitness-trail. Here three pull-up bars in different heights were built for the fitness-trail. During the last few weeks, more and more additional ‘equipment’ has been added: In addition to the original pull-up bars, there are now several wood-carved dumbbells lying neatly on the ground. Several stones of different sizes lie around on tree stumps. Black ropes with knots at even intervals and an elastic band have also been installed on the pull-up bars. There is a real hustle and bustle here now. About ten people. Only men. They are all relatively young. I guess between 16 and mid 20’s. On one of the tree stumps is a blue Bluetooth music box. It plays electronic music with a lot of bass. One of the young men is holding up a stone the size of a shoebox in front of his belly,*



**FIGURE 3 |** Forest as gym (source: Instagram/@fitnessimwald).

*standing upright and holding the stone. When he sees me coming, he moves aside.”*

The observer arrives at a place in the forest that already had a specific function before the pandemic (“*stop on the fitness-trail*”). However, during the first lockdown, various other elements seem to “*have been added*” to this space. It is especially noticeable how lovingly and with how much effort individual *material changes* were made (“*with knots at even intervals*”; “*several wood-carved dumbbells lying neatly on the ground*”). By transferring their gym from the city to the forest, these ten men also transferred a certain set of rules and norms from the city to the forest: The arrangement of their equipment follows a special system and logic, which is only accessible to these ten men as insiders of this small group. The same goes for their movements and exercises, which seem to be coordinated with the rest of the group so that they don’t interfere with each other while exercising. It is thereby occupied by a coherent





**FIGURE 4** | Sitting in forest (source: Instagram/@systemisch.achtsam.artgerecht/Teresa Kotter).

group utilizing its space to fulfill their needs and everyday practices. This *occupation* we understand as a consequence of the *transfer* practice. It becomes especially relevant in times of social distancing. People respecting not getting too close to each other provokes feelings of confinement, as everybody searches for empty spaces. This atmosphere becomes more pronounced with additional individuals visiting the forests.

In general, this kind of appropriation is also represented in images of people sitting on benches or in trees (see **Figure 4** Sitting in forest). Lastly, if children play in a specific place, it is also occupied for others, granted they do not wish to engage.

Many pictures also show people practicing yoga outside, hugging trees, and stretching their arms toward the sky. Furthermore, we found many images of children playing in the woods. The virus containment measures include, among other things like staying home to not meeting others, the prohibition of playground visits. This requires a shift in children's entertainment options. The forest offers a possibility to actively care for children without taking risks (see **Figure 5** Forests as playground).

While analyzing our sample of Instagram pictures, we also found a quite specific presentation of *occupation* practices. In contrast to the other examples, places and objects are not occupied by "sitting" or "climbing" on them. Here, the body and the body language play a central role. This body posture recalls the way explorers of the colonial era were portrayed and is repeatedly reflected in the self-portrayal of adventure travelers (Fernweh – Forum Tourismus & Kritik Im Iz3w, 2006). We call it an "explorer pose" (see **Figure 6** Explorer pose). The posture is very expansive, self-confident and dominant. In this way, space – here the forest – is occupied and taken possession of. Against the background of the COVID-19 pandemic, the "explorer pose" can



**FIGURE 5** | Forests as playground (source: Instagram/@bald.im.wald).

be seen as a way to regain control over a situation and experience oneself as an individual capable of action by gaining control over the forest as "uncontrolled wilderness and nature."

### Material Changes

Many spaces developed by *transfer* and *occupation* practices are changed and re-arranged by their users. We understand these *material changes* as a consequence of the *transfer*. When appropriation takes place in the form of *transfer*, this can result in *material changes* but does not necessarily have to. The forest provides a wide variety of items such as branches and leaves, which visitors use. They not only touch these items, but they also grab, replace, or even take them home. Hence, the visitors modify the forest items spatially and personalize the forest according to their needs. Analyzing the pictures posted on Instagram, we found that visitors actively intervene in the forest's appearance through spatial changes in three different





**FIGURE 6** | Explorer pose (source: Instagram/@simon\_kmyr).

ways. First, appropriation on the level of *material changes* can occur by collecting items to take them home, for example, for decoration or cooking purposes. Next, material changes can occur when people use objects of the forest to create or build something from them. We found that this form of appropriation often happens when children are playing in the forest. They, for example, use branches to build tents, which leads to substantial spatial changes (see **Figure 7** Forests as places for building activities). Simultaneously, the branches are given a new meaning as components of this newly built structure. Here, compared to the “explorer pose,” another form of “exploring” can be identified: *Material changes* are used to explore the forest by investigating it and by using coincidental discoveries for one’s own individual purposes (the same could be said about the occupation of places described above).

### Unification

With *unification* we refer to practices that emphasize the relationality between the (human) body and space. As with the “explorer pose,” the body and the body language play a central role. The depicted persons connect with the forest through the body in different ways by taking up a certain posture. By stretching out one’s arms to the sky, for example, it seems as if the person would embrace the world and the space in which they are located (see **Figure 8** Embracing the world in the forest). Such a posture sets a counterpoint to the existing rules of social distancing and isolation during the pandemic.



**FIGURE 7** | Forests as places for building activities (source: Instagram/@wildnessen.ch).

Other photographs addressing *unification* evoke associations with different senses. People interact with the space around them by “getting close” to the forest, its’ plants, trees, and living beings by watching, touching, smelling, and listening (see **Figure 9** Connecting to the forest with the help of the senses). It seems like an alternative way to connect with the surrounding and thus to experience oneself as an individual who continues to feel connected to the world.

In addition, there are photographs in which the persons depicted merge with the space surrounding them (see **Figure 10** Merging with the forest). Compared to the “explorer pose,” their body posture and language are less expansive – with their arms in the pocket and gazing into the distance, they become one with the forest and part of the ensemble – they let the forest work on them.





**FIGURE 8** | Embracing the world in the forest (source: Instagram/@kamigoesaroundtheworld).



**FIGURE 9** | Connecting to the forest with the help of the senses (source: Tabea Klinger).





**FIGURE 10** | Merging with the forest (source: Instagram/@ak\_hobbyphoto/Adrian Kühnel).



**FIGURE 11** | Forests as photo studio (source: Wiebke Hebermehl).

## Staging

One further type of appropriation practice can be concluded from looking at the performative aspect of the pictures: It seems like the photo studio is transferred into the forest to take portraits or sometimes even conduct professional photo shootings (see **Figure 11** Forests as photo studio). We term this type of practice *staging*. Since all pictures were posted on Instagram to attract attention and depict oneself and experiences made favorably, the appropriation of the forest for personal staging takes place on all pictures to a certain extent. The forest and its spatial objects are in this sense used as a means of communication.

Insights generated through the Instagram picture analysis an observational data concerning the appropriation of forest space mirror the results of the quantitative analysis mentioned before. They show how and through which types of practices coping and compensation are actively achieved. Results both from qualitative and quantitative data point to the forest's great importance to the health and psyche during the COVID-19 pandemic.

## Social Arrangements and Conflicts

The appropriation practices do not happen automatically and not only on an individual level. They require new social configurations and norms of interaction. Therefore, we focused on our observation data to better understand how social interactions worked during the first COVID-19 lockdown. We also investigated what made these social interactions so important to some of the forest visitors. We could identify a broad range of interaction settings, which differs mainly in how successful the interaction is perceived to be. However, some aspects of social interactions seem to be relatively stable across all observed situations:

During human interactions in the forest, the initial contact between several forest visitors plays a central role. The initiation of contact pre-structures the further interaction. If it is successful, conflicts can often be avoided. However, if the initial contact is not successful, the subsequent interaction is likely to fail. Establishing contact is so crucial because it creates a framework that limits the possibilities for the following action. The fact that it is so important to initiate contact in a way that is appropriate to the situation already points to a first central problem that we were able to develop from the observation protocols: How does one



make contact with strangers in a completely new and unfamiliar situation? The COVID-19 pandemic and the changes in social interactions it triggered (no more handshaking, no touching, minimum distance of 1.5m – but only to strangers and not to members of one's own household) turn basically all forest visitors into complete communication and interaction rookies. It is no longer possible to fall back on acquired rules and norms for visiting the forest. Simultaneously, one cannot rely on how the other forest visitors will react. This becomes particularly clear in the case of “keeping a distance.” Creating and maintaining the “right” distance are activities that always takes place reciprocally in interactions: You just can't do it on your own. Therefore, interaction partners always depend on each other to participate. “Keeping distance” only works out if all interaction partners try to keep it; otherwise, it fails. All actors involved must therefore have roughly the same understanding of this interaction and adapt themselves accordingly. We use an example from our observation protocols to illustrate the first type of interaction setting. This situation took place on March 31<sup>st</sup>:

*“Jogging down through the woods, I meet two women with several dogs who have apparently met each other while walking. One stands on the left, the other on the right of the path, and they talk to each other animatedly. On this path, there is a distance of probably 1.5 to 2 meters between them. The dogs run around in between. My only choice is to run through the middle, which makes me a little uncomfortable. First, I am too close to both women, and second, the dogs are in my way. I ask one of the women if I can run past her dog, standing a bit off to the path's side. She affirms briefly and concentrates again on her conversation. The dog looks at me attentively and then comes running toward me, barking. The woman runs over and grabs his collar to pull him away from me. In the process, both dog and woman come up to half a meter close to me. I continue to run. The woman returns to her previous position, and the two women become absorbed in conversation again.”*

This illustration exemplifies a sequence of interactions, which we found in several observation protocols. We call it the “tension arc of the forest encounter.” This consists of three sections. First, the compression – a problem is emerging: In the example, the observer is approaching and finds an uncomfortable situation. How is she supposed to maintain the required distance here? She tries to contact one of the two women, perhaps hoping that the women could help her and stand aside. However, this interaction fails.

Therefore, the second part of the tension arc is unfolding: The actual passage holds a high potential for conflict. The very thing the author wanted to avoid happens: The dog rushes toward her, and the owner fails to keep the minimum distance to catch her dog again. The only thing left for the observer to do is to run away. But subsequently, nothing happens: No argument, no apology. This is quite typical for this kind of interaction. There are yet no social norms about how to interact. Therefore, there are also no norms about how to resolve and end such situations.

## Risk Passages

This example is illustrative of a pattern of interactions. We call them “risk passages.” They are characterized by the fact that at least one actor understands the situation differently

and has different needs for the reciprocal actions of the other actors involved than the others. If such a situation exists, the possibility condition for a risk passage is given. Risk passages gain importance in the forest, especially during the COVID-19 pandemic. This is because the very interaction between people can now become a danger to oneself and the others involved. However, this invisible danger of infection is perceived very differently by people. Particularly in the spring of 2020, at the beginning of the pandemic, people showed varying degrees of sensitivity to these dangers. Some were particularly cautious, others overwhelmed, and yet still others thought everything was exaggerated. The course of social interaction then depends on whether contact is established between the actors involved and, if so, whether this contact is successful. Especially the second point is more problematic than it seems: Since most social situations are entirely new and unpracticed for the actors involved, it is by no means clear whether it is possible to communicate in such a way that they understand the needs of one another and then act accordingly.

In addition to the social actors, however, the local conditions also play an essential role in risk passages. Spatial narrowness can promote risk passages if the narrowness makes it difficult to establish a safe distance. When the already limited space is appropriated and thus occupied by other people, conflicts are also more likely to arise. According to our observations, the exact opposite spatial structure can also promote risk passages: the junction. Here, spatial confinement is no issue. Instead, problems arise from a lack of overview. In contrast to spatial narrowness, visitors are not dealing with an obvious and congested situation, but with an ambiguous and fluid one: Several people arrive at the junction at different speeds, with various artifacts, with animals, and with different needs. It is precisely this lack of orientation that makes it difficult to maintain an overview. Consequently, it is hard to behave correctly in a social situation where the actors involved are mostly beginners to this type of interaction.

Risk passages and the increased number of forest visitors can lead to conflicts and unpleasant situations. We also asked about this specifically in our online questionnaire. 5% of the participants stated that they had experienced unpleasant situations with other forest visitors during their last forest visit. In general, survey respondents did not perceive more disturbances than usual: 60% of participants stated that interactions with other people during their last visit to the forest were exclusively or predominantly positive. One-third of the respondents described the encounters as “neutral.” There is also a significant correlation between the statement “my visit to the forest helped me to cope with stress” and the statement “the other forest visitors convey a sense of normality to me.” This correlation is highly significant but rather weak ( $p = 0.000$ ; Kendall-tau-c: 0.148).

However, new fields of conflict emerged which are specific to the COVID-19 pandemic. These can be explained on the one hand by the increased number of visitors. Some participants complained about crowding. Additional to the increased number of visitors, the unfamiliar requirement of “keeping a distance” might also have intensified the feeling of crowding. On the other hand, these new conflicts reflect the different motives for visiting the forest described above: Above all, some of those who want

to be alone and enjoy the peace and quiet feel disturbed by the number of other people in the forest. To illustrate, we cite some of the responses in the open text box on conflicts and disturbances during the last visit to the forest: *“I go to the forest to relax and be alone; this is hardly possible with the mass walks.”* Others’ recreational forms are also perceived as a disturbance, for example: *“In some places apparently gyms are relocated to the forest.”*

In addition, a new focus of disturbance has developed: perceived disregard for current contact restrictions and the recommended minimum distance of 1.5 meters. In response to the open-text-box question on who or what precisely disturbed the respondent during their last visit to the forest, half of the respondents mentioned disturbances connected to the COVID-19 related distance requirement, such as: *“On narrow trails, I rarely experience joggers or mountain bikers even bothering to keep their distance, so I’ve been avoiding them lately.”* Like this person, a third (33.1%) of respondents affirmed, *“I try to avoid trails where keeping a minimum distance of 1.5 m from other people is not possible.”*

### Ensemble

Apparently, however, forest visitors have adapted to the forest’s new challenges and requirements at different rates. Risk passages and unpleasant encounters, in general, can also be triggered when people with varying perceptions of risk or with different degrees of willingness to respond to the needs of other forest visitors meet. Contrasting the “risk passage,” we present another type of interaction pattern. We call it: the “ensemble.”

In the ensemble, all participating forest visitors are either part of only one group to start with and therefore know all the details of interaction that are required. Or – if they are not all members of one group – they have the competence to grasp the norms and rules required spontaneously. In the ensemble, all participating actors merge into one actor – as it were, an ensemble that performs a choreography. All participants share a common body of knowledge and a common set of values and norms. We could observe that ensembles differ in their openness to include further individual actors in the ensemble. To illustrate this, we quote from another observation protocol. This situation took place on April 3<sup>rd</sup>:

*“I hear how several people loudly say, ‘Ah hello.’ I look down to the forest road and see that a couple (C1) greet each other with two other people, a man and a woman of similar age (C2), who come toward them on the same forest road. C1 stops on one side of the road, feet in the grass off the side of the road. C2 comes to meet them. They walk about 1m off the path into the grass on the opposite side of the path from C1. They greet each other extensively. Meanwhile, a jogger with headphones approaches them. All retract another half step away from the path. When the jogger comes closer, they all realize at the same time that they all know the man and start to greet each other, laughing. The jogger takes the headphones off. He jogs to the point where he is exactly in the middle of the path, about 3m either to C1 and C2 jogging on the spot ‘standing’ alternately looking to C1 and C2.”*

The situation shown here differs fundamentally from the above-described situation of our observer’s encounter with the

two women and their dogs. Here, the integration of a third actor into the already existing group succeeds. Even more: The whole situational sequence seems to take place without any kind of negotiation. The two couples (and the jogger) already seem to move much more naturally in the new normality of the forest visit than in the other quoted sequence.

The sequence also differs from the first quoted sequence (“transfer”). There, the young men at the fitness trail form an ensemble that is quite exclusionary. Here, we can assume that this ensemble has already existed for some time. It has now been moved from the city – or the gym in the city – into the forest because of the COVID-19 measures. Specific norms and rules, such as loud electronic music or the reproduction of masculinity, have been transferred to the forest. Through this appropriation practice of transfer (the forest becomes the gym), the ensemble members manage to move through the forest seemingly without conflict or friction. However, the flip side of this perfection is the closure to the outside. Additionally, in this specific case, the appropriation of acoustic space takes place, which still extends beyond the purely physical presence. Thus, conflicts can also arise with ensembles if they do not perceive the other forest visitors’ needs. The performance of their choreography makes it impossible/difficult for other forest visitors to unfold their respective choreography.

The ensemble also transfers a certain set of rules and norms from the city to the forest. This creates a hybrid space with an equivalence on a functional level: the forest becomes the gym and a place for meeting people like in a café. At the same time, the forest is undoubtedly not a gym nor a café, but it can serve the same functions. There are, however, distinct differences: Unlike a real gym or café, the new “gym” or “café” is outdoors. Both are also free of charge and open to the public. Every passerby can theoretically just join in. At the same time, this practice of transfer to the forest also offers new possibilities: In the forest, the surroundings can be built or changed by the visitors themselves. The spatial arrangement of the entire space is also ultimately in the hands of the ensemble. Thus, the social space created here is a hybrid of city and forest, created only through the appropriation practices of a group and the transfer of a set of norms and rules from one spatial setting to another.

The statistical data shows an increasing importance of the forest during the COVID-19 pandemic which becomes visible by a growing number of forest visits and more time which is spent in the forest during the lockdown than before these restrictions. In this context, especially four motives for visiting the forest proved relevant: to stay healthy and do sports (1); to reduce psychological stress (2); to help with social distancing (3); and (in contrary to motive three) to keep in touch with friends or to be amongst people (4). Asking for the direct connection between the COVID-19 pandemic and forest visits, coping and compensation became central categories. Concerning this, the forest is perceived as a place contrary to the city while at the same time needs which are normally met in urban places are now moved into the forest. In this sense, forest visitors appear as agents who actively shape and create their time spent in the forest.

This active agency is constructed through three interrelated appropriation practices. The first cluster consists of three

practices: *transfer* conceptualizes the forest as a replacement location where different everyday needs can be fulfilled; *occupation* is understood as a consequence of the *transfer* practice when certain places in the forest are occupied by certain users; *material changes* occur when the visitors modify the forest items spatially and personalize the forest according to their needs. The second appropriation practice *unification* addresses the relationality between the (human) body and space for example when the depicted persons on Instagram connect with the forest through the body in different ways by taking up a certain posture or when their body posture evokes certain associations with different senses. The third practice *staging* points to the performative aspect of the pictures interpreted here when the forest is used as a photo studio and serves mainly for the purpose to stage oneself.

Subsequently, the increased number of forest visits and the interrelated forms of appropriation practices lead to a set of new social arrangements and potential conflicts during the forest visit. These can be described with the help of the categories *risk passages* and *ensemble*. *Risk passages* are characterized by the fact that different actors have different understandings and needs concerning the situations and the reciprocal actions of the other actors involved during the forest visit which especially gained importance during the COVID-19 pandemic. Furthermore, the local conditions play an essential role in risk passages. Finally, there is the *ensemble* as another interaction pattern where all actors share a common body of knowledge and a common set of values and norms comparable to an ensemble performing a choreography.

In summary, we can conclude the following results: The statistical data shows an increasing importance of the forest during the COVID-19 pandemic which becomes visible by a growing number of forest visits and more time which is spent in the forest during the lockdown than before these restrictions. In this context, especially four motives for visiting the forest proved relevant: to stay healthy and do sports (1); to reduce psychological stress (2); to help with social distancing (3); and (in contrary to motive three) to keep in touch with friends or to be amongst people (4). Asking for the direct connection between the COVID-19 pandemic and forest visits, coping and compensation became central categories. Concerning this, the forest is perceived as a place contrary to the city while at the same time needs which are normally met in urban places are now moved into the forest. In this sense, forest visitors appear as agents who actively shape and create their time spent in the forest.

## DISCUSSION

### Increase in Forest Visits

We found a dramatic increase in forest visits. People went into forests more often and for longer periods of time during the lockdown. Even people who did not use forests before the COVID-19 related restrictions started doing so. Thus the importance of the urban forests around the city of Freiburg has increased during the COVID-19 pandemic. These findings are not representative of the citizens of Freiburg since they rely

on self-reported data. Still, our results fall in line with other studies in different urban and peri-urban regions using both self-reported data (Grima et al., 2020) and not self-reported data (Day, 2020; Derks et al., 2020; Mutz and Gerke, 2020; Venter et al., 2020). In addition, comparing our results to other studies using representative and self-reported data pre-COVID-19 (Ensinger et al., 2013), our numbers still exceed the “normal” averages of forest visit frequency and duration.

Our findings are in line with several studies reporting novice forest visitors who did hardly or never go to forests before COVID-19 (Derks et al., 2020; Grima et al., 2020). In contrast to our study, some others found that the use of green areas decreased or were used differently. This also varies between countries and regions within countries, resulting partly but not exclusively from specific policy measure applied and different socio-demographic factors in these areas (Day, 2020; Moore et al., 2020; Morse et al., 2020; Mutz and Gerke, 2020; Uchiyama and Kohsaka, 2020; Ugolini et al., 2020; Xie et al., 2020). Due to our applied methods, we cannot relate the increases in visit frequencies and duration entirely to the COVID-19 related restrictions and changes in everyday life. Still, considering the statements of survey respondents, we can hypothesize that COVID-19 played a crucial role. Other studies show indifferent results concerning these questions. Rice and Pan (2020) found an increase in park visitation in the United States’ Western region to be mainly caused by seasonality. Contrary, Venter et al. (2020) analyzed outdoor recreation activity in Oslo, Norway, and found a significant increase even after statistically adjusting for the prevailing weather and season. More people are visiting the forest. People go to the forest who were otherwise not there. In addition to the higher number of visitors, new social norms such as social distancing have been introduced. All these factors can lead to conflicts or unpleasant situations in the forest.

### Perceptions of Conflicts and Crowding

Surprisingly, only 5% of our survey participants report they experienced unpleasant situations with other forest visitors during their last forest visit. A few weeks before we started this study, we conducted a representative survey with citizens of Baden-Württemberg on recreational use in the forest without any COVID-19 reference (Weinbrenner and Palm, 2020, unpublished). In this survey, 9% of respondents reported feeling disturbed by other forest visitors. Another study from 2017 on outdoor recreation in forests ascertains that 7% of respondents felt disturbed by other forest users during their last visit (Koep et al., 2019). When we compare all three studies, there is no significant difference in the portions of forest visitors who felt disturbed by others before and during the lockdown. On the contrary, the survey results show that, in general, forest visitors in Freiburg did not perceive more disturbances than usual. Other studies on perceived disturbance or conflicts of forest visitors focus on shares of conflicting-factors (e.g., different types of sports, forestry management, littering) but do not specify the percentage of survey respondents who feel disturbed at all. For example, Ciesielski and Stereńczak (2018) conducted a review of public demands on forests in Europe, including factors disturbing recreation. The three main human-related factors they



found are illegal dumping and littering, vandalism, and a large number of visitors.

Another explanation of our low level of conflict perception and especially perception of crowding might be that people actively avoided such situation and used the large forest area to “spread out.” Our findings support this hypothesis since almost two thirds of respondents also increased their time spend in forests and another 33,1% agreed that they avoid paths where they cannot keep distance to other people. However, this is in contrast to two other studies in the context of COVID-19, which specified increasing conflicts – also between recreationists – due to the increase in forest visitors and novice visitors (Derks et al., 2020; McGinlay et al., 2020). Both studies focus on similarly sized or even larger forest areas, one in an urban area (Derks et al., 2020) and the other also in rural regions (McGinlay et al., 2020). McGinlay et al. (2020) found overcrowding in European protected areas to be one of the major challenges. They conclude that the pandemic circumstances, including social distancing recommendations and the fear of virus transmission, crowding caused additional conflicts or exacerbated existing tensions between visitors and residents and within these groups (McGinlay et al., 2020). Since both studies rely on expert surveys and interviews of natural areas’ managers (e.g., foresters, national park managers), these reported increases might not reflect forest visitors’ perception of disturbances and conflicts considering our results. To further understand crowding perception in times of stark increases in forest visits, future studies could include additional methods which help gaining deeper insights in activity patterns like mapping tools (cf. Gerstenberg et al., 2020) or tracking data, e.g., from app providers (cf. Venter et al., 2020).

However, Dogru-Dastan (2020) showed that perceived crowding does not necessarily lead to a reduction in overall satisfaction about the site visit and that satisfaction-related consequences depend on the type of recreation. Arnberger and Mann (2008) found in their review on crowding in European forests that in every included study, respondents perceived crowding. Furthermore, they found that in various studies crowding significantly impacts the satisfaction of outdoor recreation quality (Arnberger and Mann, 2008). According to Dogru-Dastan (2020), previous research on perceived crowding and the associated consequences mainly focused on satisfaction-related effects, behavioral and affective responses, as well as post-experience behavior. Additionally, she emphasized the need for qualitative research to gain a deeper understanding of the phenomenon. Thus, our results fit into this research gap identified by Dogru-Dastan (2020) as we are applying a mixed-methods design, combining qualitative and quantitative data to understand recreation processes during the first lockdown. We add to understanding crowding perceptions since our results indicate that measuring the perception of conflicts and unpleasant situations like crowded forest areas is far from being easy. Perceptions of conflicts are highly subjective, and they seem to be entangled with the context in which they occur. Future research, therefore, should focus rather on understanding the perceptions of conflicts than the sheer amount of stated conflicts or unpleasant situations. Finally, our results indicate that in a major stressful situation like during the COVID-19 pandemic,

possible negative effects of crowding might be outweighed by the perceived positive impact of forest visits we found. In the following, we, therefore, will focus on discussing our results concerning mental health effects.

## Reasons for Forest Visits – Forest and Health

Our survey results show that many respondents visited the forests – consciously or unconsciously – for health reasons. The forest offered them a pleasant and supportive space during the time of uncertainty and restrictions. The increase in forest visits and the manifold reported health benefits of our case-study respondents show that they use forests even more intensively or (re)discover them in times of crisis as a recreational space and place of physical and mental health. This is in line with other COVID-19 related studies, which found that visiting natural areas helps people coping with psychological stress caused by the pandemic (Cheval et al., 2020; Geng et al., 2020; Soga et al., 2020). For example, Soga et al. (2020) studied the effects of visits to urban green spaces in Tokyo, Japan. They found levels of self-esteem, life satisfaction, and subjective happiness positively and levels of depression, anxiety, and loneliness negatively associated with the frequency of green space use and the existence of green window views at home. Besides others, they rely on these effects on the higher chance of social contacts in green spaces, which may improve mental health even when adhering to social distancing regulations. Previous studies, mainly conducted in the Asian region, already proved that forests significantly contribute to improving mood and have positive effects on the well-being and health of those seeking recreation (Park et al., 2009; Park et al., 2010; Tsunetsugu et al., 2010; Park, 2011; Ikei et al., 2015; Craig et al., 2016; Korpela et al., 2018). This empirical evidence shows that spending time in forests can reduce stress, stabilize the psyche, and positively affect the coronary vessels and blood pressure.

The research mentioned above on the health effects of forests is predominantly natural science-oriented or examines the psychosocial aspects of forest therapy using quantitative and experimental study designs. However, to consider the potentials and challenges of urban forests’ health effects, a qualitative-social science focus is relevant. In addition to the medically measurable effects, the forest’s psychological health effects may also be influenced by how people experience the forest. Research that focuses on social interactions or the socially constructed attributions of meaning to forests can complement and extend the picture of forests’ health effects.

Our results – specifically those based on qualitative research methods – help close this research gap of natural science-oriented health research and research focusing on leisure/recreation activities. Considering social interactions and appropriation practices, we want to highlight three findings: First, forest visits can help people find recreation while maintaining social distance. That helped people to cope with stress. Second, and in contrast, forest visits enabled people to keep social contacts while adhering to social distancing advisories which helped them deal with stress resulting from the advisories (Grima et al., 2020;

Morse et al., 2020; Ugolini et al., 2020; Venter et al., 2020). Third, we found three different appropriation practices people engaged in. These enabled them to keep or regain agency and control in times of high insecurity and legal control. This connection between agency, appropriation practices, and feelings of control was previously also reported by architectural psychology research (Evans and McCoy, 1998; Flade, 2018).

Concluding from this, we suggest that future research on recreation and leisure practices should focus on appropriation practices besides activities (e.g., differing walking, biking, relaxing), as these appear to be an essential part of the recreational effect of the forest. Studies on the recreational use and health effects of the forest often frame forests as a resource (Botsch et al., 2014). Whether with or without forest therapy support, the forest is a natural space where one can recover. Following this metaphor, however, these “services” are also provided by the forest.

Similarly, foresters and forest workers are often understood as active shapers of the forest. In contrast, as the name suggests, “recreation seekers” go to the forest to passively seek recreation. In this logic, recreationists are the consumers of the forest. They indirectly consume the successful work of professional foresters. Through this framing, visitors’ active, social shaping of spaces in the forest is not considered in current research. Recreationists do not just consume the forest. They shape it. Although this is often not materially visible, the design of their recreational space, or the perceived opportunity to design it, plays a central role in the recreational value of a forest visit, according to our research. Of course, material changes also occur: Huts and shelters were built, materials such as sticks or pinecones were collected, small streams were dammed, and much more. However, these material changes only play a subordinate role in constructing the forest as a social space. Much more important are the mental constructions: How do people see the forest? What conceptions of the forest do they create in their minds? How is the forest reproduced again and again by people together as a social space? Especially against the background of the COVID-19 restrictions on everyday freedom of action and movement, the recovery of agency and control plays an important role.

Thus, the forest’s atmosphere is not only derived from the objects (trees, stones, paths) that are present in it but also from the attributions of meaning that visitors associate with these places and objects. The mental conjunction of objects and, even more, the rearrangement or reconfiguration of places in the forest create connections of objects and thus turn them into social goods. These social goods (objects with social meanings) are arranged together by the visitors into spaces in the forest.

Forests are critically important for people living in densely populated areas. In general, people who visit the forest like the experience. This result itself is far from being spectacular or even novel. We could gain an insight not only into why the forests are so important for many people but also into how this importance is socially reproduced. During the COVID-19 lockdown in spring 2020, state rules regulated all German citizens’ everyday life to an unprecedented extent in recent history. In our postmodern and individualistic society, we are all used to deciding on our way of life relatively freely. In contrast, most decisions in spring

2020 were made by the state. People felt overwhelmed and in lack of control. In these extraordinary times, it was precisely the forest which was the last place, people could actively – and relatively freely – decide on what to do (and when to do it). Being able to decide gave many people a feeling of agency and made it possible to cope with psychological stress and control loss. The forest became a place where people could feel and reproduce active and effective agency. Sometime in the future, the COVID-19 pandemic will be over, and our everyday life will probably go back to a relatively normal state. What do our results mean for forest management when these extraordinary times we now live in are finally over?

## Recommendations

In our view, there are three possible areas of action: First, the sheer number of forest visitors, their diverse activities, and their desire to appropriate the forest as a public space pose challenges for forest managers and their communication with the public. Forest owners might encounter challenges when forest visitors develop psychological ownership toward certain forest areas (Pierce et al., 2003; Avey et al., 2009; Peck et al., 2020). While forest visitors may use and perceive the forests as a public space, foresters may bring the needs of forestry and conservation to the table. Therefore, forest visitors need to be sensitized to these requirements toward urban forests. To prevent conflicts in the future, when visitors’ rush is particularly high, work in the forest could be suspended for a short time or postponed until the mornings and evenings. On the other hand, foresters and future forest policy research could – based on our results on appropriation practices – benefit from further utilizing this theory as a sensitizing concept for the development of urban forests. Foresters could shift their perspective and perceive forests as social and public spaces. Future research in this field could benefit from expanding the theory of appropriation to the sociology of space. In this theoretical framework, space is understood as the overall shape of relational connections and arrangements. Spaces are essentially created by the interactions, relationships, and connections of people themselves. This points to the concurrency of different spaces in one and the same place. Concerning social processes, space is seen as a relational network in which one’s own body is placed in relation to other bodies and social goods. Thus it can become part of the space. Therefore, social space is a space of relational bonds. It is always a network of positions and positionings and at the same time a mirror and part of social structures and power relations.

Following Löw (2001), spaces are not materially given but relational processes. So, space is not understood to be a geographical location but rather a fabric of social practices. Therefore, spaces are not conceived as a reality of their own but as the results of social processes of appropriation. Thus, following our results, one can understand forest not as a natural space but as a social space. By looking at the forest in this way, it is possible to shift the focus from the natural features to the social processes. Appropriation could then be understood as the process of arranging social goods into spaces.

Second, based on our results, active visitor management can be a double-edged sword. On the one hand, it offers the possibility

of minimizing conflicts in the forest and allowing people to have positive social experiences rather than conflicts. On the other hand, it involves the risk of limiting the possibilities of appropriation practices. According to our analysis of risk passages, one particular infrastructure is especially prone to evoke conflicts: crossroads in intensively visited forest areas. We, therefore, agree with Gerstenberg et al. (2020) suggestion: "Maintaining low stand densities at crossroads may contribute to a better visual overview and avoid visitor collisions."

Third, we argue to broaden the perspective of cultural ecosystem services (CES). Future research should emphasize that forest visitors are also part of the construction and thus the creation of all social meanings of the forest. Their active, creative efforts should be included in the responsible authorities and corporations' planning and design processes. According to our findings, the available open spaces and opportunities for appropriation practices should be strengthened and expanded to maintain or to enhance further the recreational and health effects of urban forests.

We suggest that forest planning and forest recreation research should consider two additional components: First, the forest as a place of free choice and active individual agency. It follows that, e.g., visitor guidance systems should be developed very carefully. Restricting visitors' freedom of choice and giving them the feeling of being in control can reduce the forest's recreational capacity. For adolescents and young adults in particular, the forest is known to be a place of experienced freedom of control by adults' social norms (Ensinger et al., 2013; King and Church, 2013). Moreover, King and Church (2013) studied mountain bikers' attitudes in the UK and highlighted the crucial role of active space shaping – a form of freedom and control. Secondly, the role of the forest as a space to be among other people. The social aspect of visiting a forest may become less important when visitor numbers decrease, and other social spaces such as cafés or pubs are open again. However, urban forests will remain social spaces as new trends and new forest recreation types become more popular. Each time new forest visitors enter this social space, all forest visitors will have to adapt and find new ways of being together. This process of producing and reproducing social arrangements, rules, and norms in forests is not visible on the surface.

## Methodical Reflections

Our applied mixed methods design helped uncover such different dimensions of appropriation practices and services forests provide for people in a time of crisis. We highly recommend future studies on recreation and leisure in forests should include qualitative research methods more often. They contribute to a deeper understanding of how to manage such processes and minimize conflicts as much as possible.

Our study benefits from its mixed-methods design. By combining the strengths of each method, we could eliminate specific blind spots and gain deeper insights. All three methodical approaches were carried out simultaneously during the first lockdown in March and April 2020. Therefore, it was impossible to integrate results from one approach into another instrument. A consecutive approach would have enabled us to incorporate findings from our qualitative research into our questionnaire

and vice versa. Considering the exploratory study-design and the case-study character of our research, generalizing our findings is quite delicate. On the one hand, our quantitative approach is not representative and cannot yield general insights into proportions or probabilities of different aspects of urban forest visits during the COVID-19 pandemic. However, our results are in line with other case-studies which address recreational forest use during the COVID-19 pandemic (Derks et al., 2020; Venter et al., 2020). On the other hand, our qualitative approach enabled deep insights into the reproduction of social norms and rules of conduct. The extraordinary situation of the COVID-19 pandemic enabled us to witness how visitors appropriated the urban forests for a wide variety of needs. While not aiming at statistical representativeness these results present in-depth insights into several patterns of social meaning.

## DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

## ETHICS STATEMENT

Written informed consent was obtained from the individual(s), and minor(s)' legal guardian/next of kin, for the publication of any potentially identifiable images or data included in this article.

## AUTHOR CONTRIBUTIONS

HW, TP, and KW designed the online questionnaire and carried out the study. JB, WH, AK, and TK carried out the analysis of the social media data. HW, WH, AK, and TK performed the analysis of our observation data. HW conducted the statistical analysis and prepared the draft of the manuscript. All authors contributed to the manuscript and its revision.

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**Conflict of Interest:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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