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Different Environments and Physical Activity before and during the COVID-19 Lockdown: Data from Slovenia

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Abstract: The relationship between physical activity and green spaces has been widely researched, but less so when comparing physical activity in different environments. This study investigates the variations in physical activity across six environments (nature, park, urban, home, sportsground and indoor venue) and how it was influenced by lockdown governed during the COVID-19 pandemic. Data were collected from 1161 participants using an online survey conducted in spring 2021 in Slovenia. The results show that 95.5% of respondents are somewhat physically active, mostly in nature and at home. Respondents found natural shade, trees, secure access to and secure use of green spaces most important, recreational routes most encouraging, and bad smells and crowdedness most discouraging for outdoor physical activity. During the lockdown, 80% of people maintained or increased their physical activity. Regression analysis showed significant differences in preference for green space characteristics and levels of physical activity in different environments. Several sociodemographic and living environment characteristics also appeared significant. Our research findings underline the importance of considering a variety of environments when exploring preferences for physical activity. They also provide scientific evidence and justification for recommendations in planning and policy-making to encourage outdoor physical activity.

Keywords: green space characteristics; physical activity; Slovenian population; COVID-19; regression analysis; spatial planning and public health policies

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1. Introduction

In recent years, the attention given to adequate physical activity and balanced diet has increased in Europe. However, the COVID-19 pandemic completely surprised the countries in Europe and around the world, leaving authorities in search of urgent responses. During the first wave in spring 2020, governments around the world imposed many severe restrictions to contain the COVID-19 outbreak, such as ceasing public operations and requiring people to stay at home. Maintaining physical activity using indoor recreational facilities was no longer possible in most countries. Consequently, depending on the measures allowed, outdoor green spaces have become important for providing opportunities for recreation to maintain physical and mental health. In Slovenia, for example, the most severe measures confined people to their own municipality, but public green spaces remained open, restricting only the use of urban equipment, such as children's playgrounds, street workouts and outdoor fitness equipment. The profoundness of COVID-19's impact on public spaces has been of interest to scholars ever since the first restrictions were put in place. It has been hypothesised that various measures have fundamentally changed people's use and perceptions of public spaces and possibly contributed to increased adverse physical and mental health outcomes for parts of the population [1,2].

The beneficial influence of green spaces on people's general health [3], mental health [4–6], wellbeing [7] and physical activity [8–10] has been proved, particularly during the COVID-19 lockdown [11]. However, most scholars have focused on green spaces, such as urban parks

or nearby green spaces, or treated green spaces as a homogeneous environment type [12]. There is a lack of research on the comparison of different types of environments (both indoor and outdoor) to understand the levels of physical activity there and to create opportunities for improvements. Variability in definitions of public open space adds to the problem [13]. This is important to consider since there is some evidence that preference for the environment type may influence levels of physical activity. For example, Brownson et al. [14] indicated nature trails in rural areas as a preferred environment for physical activity, while Coombes et al. [15] argued for formal green spaces, Kaczynski and Henderson [16] for parks in a neighbourhood, and Vich et al. [17] for large green spaces and the beach. Other studies explored different green space types, but did not focus on physical activity specifically (see e.g., [18,19]). Moreover, some studies have failed to find an association between specific green space types and physical activity [3,20,21]. The ambiguity in the evidence may be explained by different definitions and the measurement techniques of the green space (e.g., sportsgrounds and green streets are often excluded from green space), but it may also be due to the preference for physical activity in indoor environments [22,23]. Therefore, little is known about the strength of the relationships between public green space as well as private and indoor environments. In this respect, recent studies have recommended that future studies should focus on trying to distinguish types of green spaces in terms of more specific activities [19]. In this study, we aim to address the gap regarding the relationships between different environments and levels of physical activity.

Rather than a comparison of green space types, researchers have focused on green space characteristics as physical activity motivators. However, the evidence shows mixed associations between them. For example, several research studies have reported positive associations of green spaces with the size [10,24] and facilities offered [16,24], while Markevych et al. [25] did not find an association. The same authors also did not find an association between the presence of the green spaces and its use, and the amount of green spaces was not a significant motivator in a study by Ord et al. [8]. Furthermore, distance was not a significant predictor for physical activity in a study by Kaczynski et al. [16], while Coombes et al. [26] found that people who lived close to green spaces were more likely to meet recommended physical activity guidelines. Several studies found no association between safety and physical activity [16,24], while others have (e.g., [27,28]). Natural features such as trees or water were in general found to be positive [24,28] as long as they were not the source of any potentially adverse influences on health, such as allergenic pollens, disease vectors, increased exposure to pesticides and herbicides, or under poor maintenance [25,29]. The discrepancies between the influence of different green space characteristics on the use of green spaces for physical activity may be due to a wide range of measures and methods used [9,25] and due to differences in geographical and cultural settings, which are based on different physical environment attributes and are thus not directly comparable [30]. Regarding the latter, the great majority of studies come from North America and Australia. Western Europe has been experiencing a recent boost on this topic, while the rest of the world is largely understudied and thus should be given more attention [25,30,31].

This research focuses on Slovenia, where research on the associations between green spaces and physical activity is incomplete and limited [32]. Slovenia is a European Union (EU) country with roughly two million inhabitants, scarcely populated compared to its western neighbours, with around 50% of the population living in urban areas and only the capital exceeding 100,000 inhabitants. It is characterised by a hilly and forested landscape. It belongs to the Central and Eastern European (CEE) countries, where mortality and morbidity rates are remarkably higher than in Western Europe, due to, among other things, different attitudes towards health and low activity levels in comparison to Western Europe [33–35]. This was particularly evident during the transition period from the central planning system to a market economy in the early 90s. Although the situation is gradually improving, many CEE countries are still below the EU average in terms of life expectancy, morbidity and mortality [36]. In Slovenia, as in the rest of the world, the main cause

of morbidity and mortality are chronic noncommunicable diseases, for which physical inactivity is one of the major risk factors [37]. According to the World Health Organization (WHO), one in four adults worldwide fails to meet the minimum recommendations for physical activity [38]. In Slovenia, this accounts for 69% of adults [39]. Physical inactivity grows with the country's economic growth and has its grounds in increasingly sedentary lifestyles, (perceived) lack of time for physical activity, changing patterns of transport, technological development and urbanisation [38]. Physical inactivity is habitual and simply advising people to reduce sedentary time is unlikely to be effective. Multi-sectoral endeavours influencing wider determinants such as changes in macro-scale policies, the transport system and the built environment, marketing policies, and the education system, are more likely to encourage behavioural changes [40].

Considering the variety of actions that could be taken to tackle physical inactivity, this study aims to make a contribution by investigating physical activity in different environments and answering the question of what role green space has in the uptake and maintenance of physical activity. Specifically, it examines the following questions:

(1) Whether and how physical activity is associated with features and equipment of green spaces?
(2) Whether and how these associations vary across different types of environments?
(3) Whether and how the COVID-19 pandemic lockdown influenced physical activity?
(4) Whether the above models of physical activity vary across socio-demographic groups and characteristics of people's living environment?

We hypothesize that people, regardless of their socio-demographic characteristics, generally most appreciate natural-like and modestly managed green spaces. We suspect that physical activity of most people was immensely reduced during the COVID-19 pandemic, mostly due to strict measures implemented during the lockdown. We further assume that most of the people resumed their pre-COVID-19 activities after the end of the pandemic.

The study, presented here, extends a broader investigation of the green space affordances for outdoor physical activity within the nationally funded project "Going out to stay healthy". More information about the project can be found at: http://venzazdravje.uirs.si/en-us/ (accessed on 11 November 2022). The presented findings refer to a nation-wide survey of 1161 participants.

2. Materials and Methods

2.1. Definitions

In this study, we defined *physical activity (PA)* as any bodily movement that uses energy, being either part of daily activities or self-reported participation in organised or unorganised sport or exercise, which can take place indoors or outdoors [41]. A sufficient amount of physical activity to provide some health benefits and reduce health risks refers to a duration of at least 30 min a day on five or more occasions in a week of moderate-intensity aerobic physical activity. The latter means one is working enough to raise their heart rate, but they are still able to talk [42]. Examples include brisk walking and cycling, as well as gardening and household chores. We defined *green space (GS)* as all publicly and privately owned and publicly accessible open space, which exhibits a certain degree of naturalness, and it can be designed or with natural characteristics, for example, parks, woodlands, nature areas, squares, children's playgrounds, school yards, pedestrian paths and bicycle routes. In this research study, we focused on the following four green space subtypes, based on the national Spatial Order of Slovenia classification [43]:

- nature, which refer to natural or semi-natural environments such as forests, meadows, riparian zones, hills, etc.;
- parks, which include large park areas, small urban green spaces, and children's playgrounds;
- urban green-grey spaces, which include natural elements in connection with infrastructures such as paved pedestrian and cycling paths within urbanised setting, squares, neighbourhood streets, and similar;

- sportsgrounds within wider recreational areas, which include outdoor courts to play ball games (e.g., tennis, badminton, basketball, football), running tracks, outdoor fitness areas, and street workout areas.

We also investigated two indoor environments: indoor venues including gyms, swimming pools, indoor fitness areas, dance halls, yoga and aerobics studios, etc., and home, which refers to residential buildings with private green spaces such as a garden or backyard.

2.2. Questionnaire Design, Study Sample and Data Collection

For data collection, we developed a semi-open questionnaire, which measured as follows: (1) physical activity behaviour, (2) outdoor physical activity motivations, and (3) sociodemographic and living environment characteristics. The types of questions were single- or multiple-answer types of questions, rankings in order of preference or frequency, semi-open questions, and five-point scale questions.

In the first part, participants were asked about their physical activity frequency (measured in the number of occurrences per week), their pre- and post-COVID-19 habits with regard to physical activity (semi-open questions), activities undertaken (ranking listed activities in order of frequency, with a possibility to write additional ones), and environment chosen for physical activity (measured in temporal occurrences). Different environments were structured and presented to the survey participants in line with the definitions in Section 2.1. The second part of the questionnaire measured respondents' opinions of the size, number, connectivity, safety, natural features, equipment, accessibility, availability and attractiveness of green spaces for outdoor physical activity (all either ranking or five-point scale questions). The characteristics, explored in the third part, were as follows: sex, age, living area and type of residence, level of education, current employment and work characteristics (all single- or multiple-choice answer types with the possibility of writing an additional comment).

Data were collected nationally via an online survey targeting the general population above 15 years of age, which is the minimum age required in Slovenia for participation without caregivers' consent. The survey was disseminated through emailing to municipalities, NGOs, health organisations, expert networks, national and local health institutions and social media. It remained open for three months, from April 2021 to July 2021. After a month, the descriptive statistics were run, and the results reviewed to target the fraction of the population which was underrepresented among the filled-in questionnaires. Ultimately, we collected 1161 questionnaires. It should be noted that a targeted Facebook advert was used to attract a male fraction of the population; however, the entire sample remained gender imbalanced, which seems to be a common problem in online surveying [44].

2.3. Statistical Analysis

Descriptive statistics were used to analyse respondents' recreational behaviour, including sorts of activities, types of green spaces they visited, green space characteristics as physical activity motivators and barriers to visiting. Binary logistic regression was used to investigate the association between potential predicting factors and levels of physical activity in different environments. In line with the definition of physical activity in this study, we measured it at two levels: the first level measured the minimal physical activity of respondents and we set it at 'at least once a week' rather than at the 'none' level, since the WHO approaches physical activity as "every movement counts" and thus no movement is rather unlikely in at generally mobile population [41]. The second level was 'five or more times a week', presenting the minimum required physical activity to provide some health benefits and reduce health risks (WHO, 2020). Prior to performing logistic regression, any possible significance between variables was uncovered using the Chi-square, Mann-Whitney and Kruskal-Wallis tests. Models were adjusted for age (three groups: 15–29, 30–64 and 65+ years old), gender, occupation, education, work characteristics, area of residence and type of housing. The results are presented as odds ratios (OR) with 95% confidence

intervals (CI). A *p*-value of < 0.05 indicates statistical significance. SPSS version 28 software was used to conduct all statistical analyses.

3. Results

3.1. Profiles of Respondents

Table 1 lists the main sample characteristics. The majority of the participants were female (75.8%) and the participants' mean age was 47 years old. Most had college or university education, were employed and had sedentary work. Of the participants, 61% lived in a house with a garden; however, their area of residence was relatively evenly split between cities, suburbs and countryside. Interestingly, 42% of urban residents achieved sufficient physical activity, compared to 32% of suburban and 36% of countryside residents. However, overall only 33% of respondents achieved sufficient physical activity, which matches the national records [39].

Table 1. Characteristics of the Study Sample (N = 1161, of which missing responses vary among questions and are not included in the calculation).

Sociodemographic Characteristics	**N (%)**
Sex:	*N = 800*
Men	181 (22.6)
Women	606 (75.8)
Prefer not to say	13 (1.6)
Age in Years:	*N = 794*
15–29 (young people)	165 (20.8)
30–64 (middle-aged people)	445 (56.0)
65 and more (older people)	184 (23.2)
Education:	*N = 802*
Primary and secondary school *	88 (11.0)
Vocational training	43 (5.4)
High school	75 (9.4)
College or university	452 (56.2)
Specialisation/masters/doctorate	141 (17.6)
Other	3 (0.4)
Occupation:	*N = 793*
Employed/self-employed	434 (54.7)
Unemployed	22 (2.8)
Retired	198 (25.0)
Student	139 (17.5)
Living Environment Characteristics	
Work Characteristics:	*N = 750*
Sedentary work	497 (66.3)
Standing work	35 (4.7)
Physically active work	164 (21.9)
Diverse work	54 (7.1)
Type of Residence:	*N = 784*
Apartment	224 (28.6)
Apartment with a common garden	18 (2.3)
Apartment with a private garden	41 (5.2)
House without a garden	23 (2.9)
House with a garden	478 (61.0)
Area of Residence:	*N = 786*
City or larger urban area	301 (38.3)
Small town, suburban area	250 (31.8)
Countryside	235 (29.9)

Table 1. *Cont.*

Sociodemographic Characteristics	N (%)
Recreational Behaviour of the Respondents	
Frequency of at least 30 min of Moderate-intensity PA Per Week **	*N = 1158*
None	52 (4.5)
1–2 times a week	310 (26.8)
3–4 times a week	412 (35.6)
Five or more times a week	384 (33.1)
PA During the COVID-19 Lockdown:	*N = 1031*
Less than before	213 (20.7)
Same	484 (46.9)
More than before	334 (32.4)
Long-term Changes in PA Habits due to the COVID-19 Situation:	*N = 899*
Yes	374 (41.6)
No	434 (48.3)
I don't know	91 (10.1)

* Primary and secondary education is obligatory in Slovenia. ** Recommended levels for PA per day, based on the WHO guidelines [42].

The respondents ranked the frequencies of activities undertaken, where the highest ranked variable was coded with 5 and the lowest with 1. Variables ranked lower than 1 and unranked variables were coded with 0, hence relatively low mean values (Figure 1).

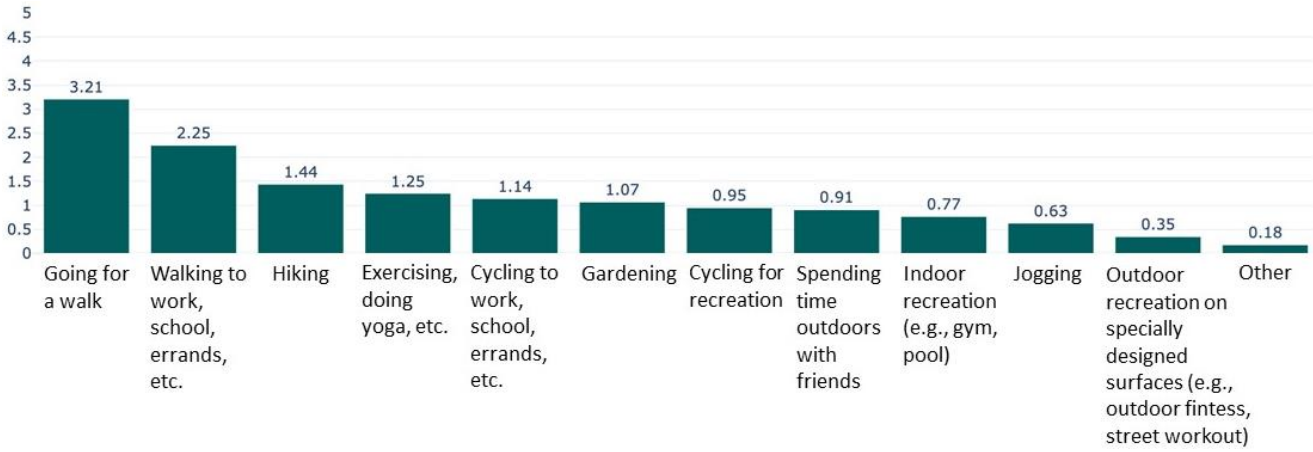

Figure 1. Most Frequently Undertaken Forms of Physical Activity by the Respondents (N = 910). Note: Missing values are excluded from the calculation.

Respondents who did not reach sufficient physical activity, were also required to list reasons for failing to achieve enough physical activity, among which most of them selected 'lack of time' (Figure 2).

We studied the association between all sociodemographic background factors (sex, age, education and occupation) and living characteristics factors (area of residence, housing type and work characteristics) on the levels of physical activity before, and possible changes to physical activity during, the COVID-19 pandemic. Integrating the nonparametric tests, we found a significant difference in sex, age, occupation, area of residence and housing type in the frequency of physical activity before the pandemic and during the COVID-19 lockdown. With regard to sex, we did not find any significant difference between men and women in the frequency of physical activity before the pandemic, but the lockdown significantly increased physical activity practices of women ($U = 43323$, $z = (-4.649)$, $p \leq 0.001$). Women, compared to men, were more likely to claim long-term changes to physical activity habits due to the COVID-19 pandemic (Pearson's Chi-square = 15.780, $p \leq 0.001$, Figure 3).

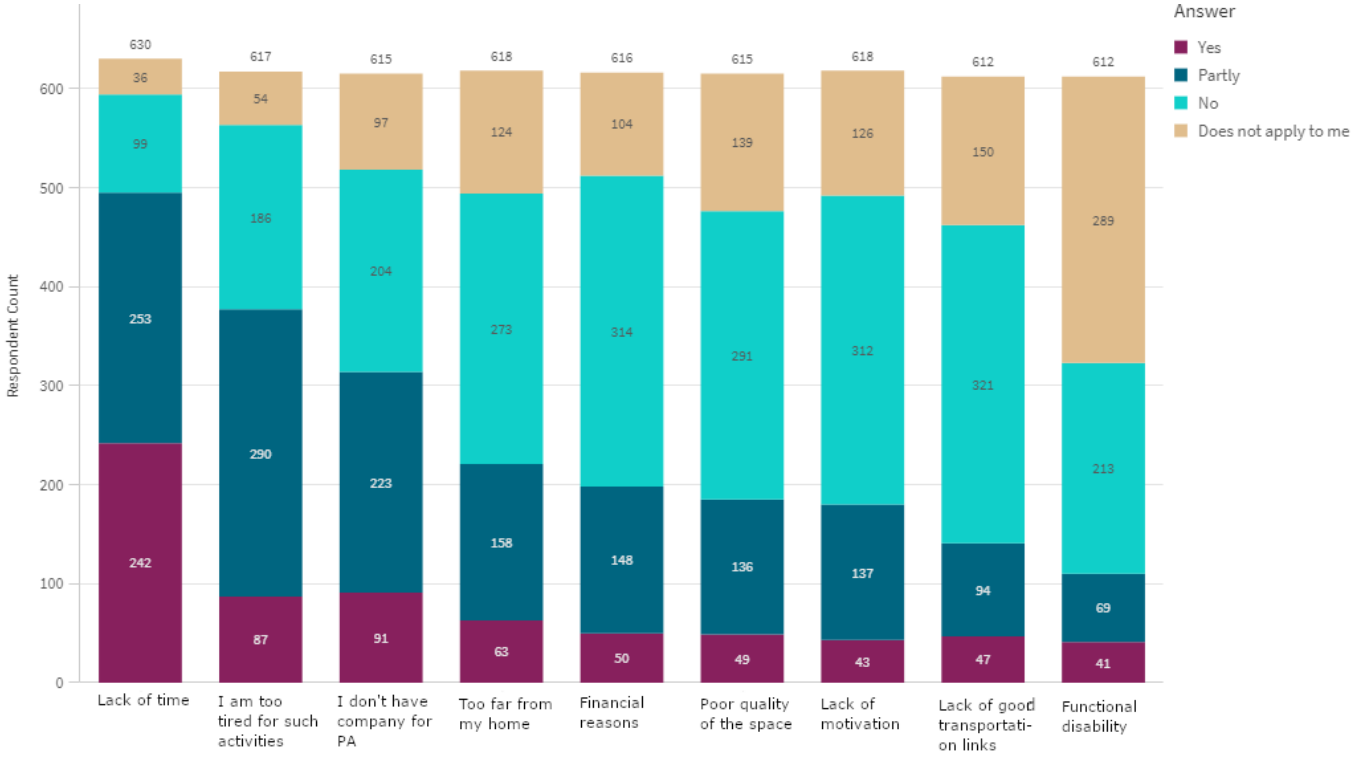

Figure 2. Reasons for Failing to Achieve Sufficient Physical Activity. Note: Missing values are excluded from the calculation.

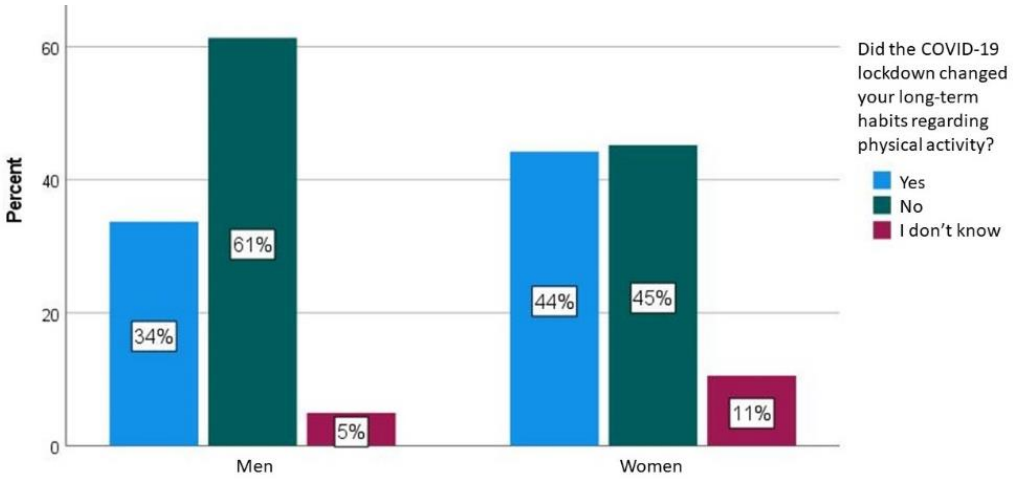

Figure 3. Long-term changes of physical habits due to the COVID-19 pandemic (N = 787). Note: Missing values are excluded from the calculation.

Furthermore, the frequency of physical activity before the lockdown significantly increased with age (H(2) = 13.421, p = 0.001, Figure 4). Of people aged over 65 years of age, 50.5% achieved a sufficient level of physical activity compared to 29.7% of the youngest group and 34.0% of the middle-aged group. The oldest group was also the least inactive (1.6%). The percentage splits among physical activity frequency levels for the other two age groups were similar. However, compared to the other two age groups, the middle-aged group reported a significant increase in physical activity during the COVID-19 lockdown (H(2) = 13.389, p = 0.001).

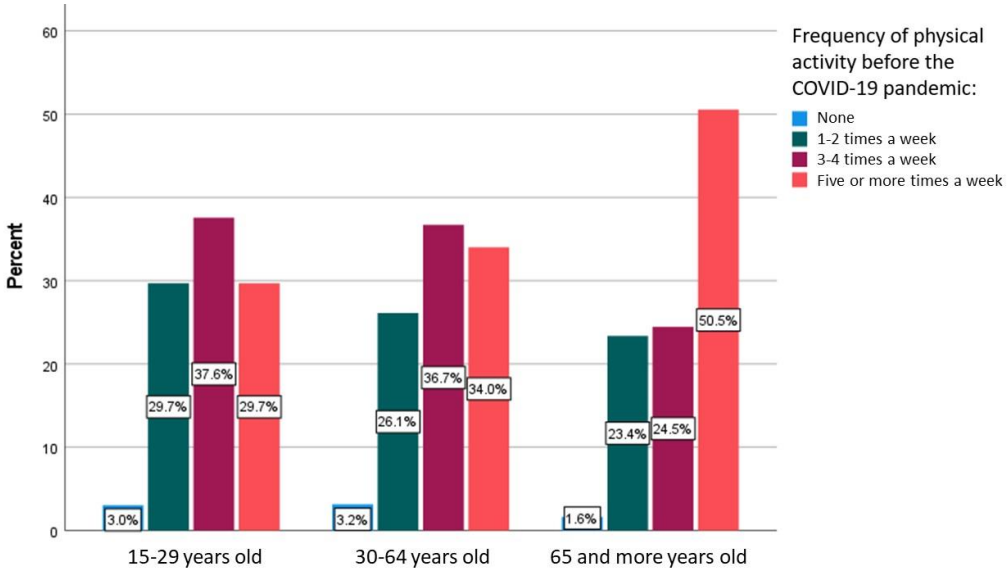

Figure 4. Frequency of physical activity before the COVID-19 pandemic among different age groups (N = 793). Note: Missing values are excluded from the calculation.

In order to take into account the correlation among predictors, we used logistic regression to test the relationship between significant socio-demographic and living environment characteristic with the changes to physical activity during the COVID-19 lockdown. The target variable (physical activity during the COVID-19 lockdown) was re-coded into a binary one, to distinguish between 'less than before the lockdown' and 'same or more than before the lockdown'. Due to high multicollinearity between the age and occupation, we did not include age into the model. In terms of occupation, logistic regression results showed that significantly higher percentage of employed people increased or maintained the level of physical activity during the lockdown, compared to retired people and students (see Table 2 for details). Countryside residents significantly increased their level of physical activity during the COVID-19 lockdown, compared to urban residents (see Table 2 for details). Housing type did not appear to be significant.

Table 2. The Relationships between Socio-Demographic and Living Environment Characteristics and the Level of Physical Activity during the COVID-19 Lockdown.

Socio-Demographic and Living Environment Characteristics	Same or More PA during the COVID-19 Lockdown OR (95% CI)
Sex (Female)	1.65 (1.10–2.50) *
Current occupation:	
Employed	(Reference) *
Unemployed	1.19 (0.34–4.19)
Retired	0.54 (0.35–0.83) **
Student	0.45 (0.27–0.75) **
Area of Residence:	
Urban	(Reference) *
Suburban	1.46 (0.91–2.33)
Countryside	2.33 (1.33–4.09) **
Housing Type:	
Apartment	(Reference)
Apartment with a common garden	5.11 (0.65–39.95)
Apartment with a private garden	1.64 (0.64–4.18)
House without a garden	0.65 (0.23–1.84)
House with a garden	0.98 (0.62–1.56)

* $p \leq 0.05$; ** $p \leq 0.01$; OR: Odds Ratio; CI: Confidence Interval.

3.2. Associations between Green Space Characteristics and Physical Activity

The importance of green space features and equipment for physical activity was checked with two sets of questions, measured on a five-point Likert scale, where 1 means unimportant and 5 very important. Figure 5 presents the first set of responses to questions.

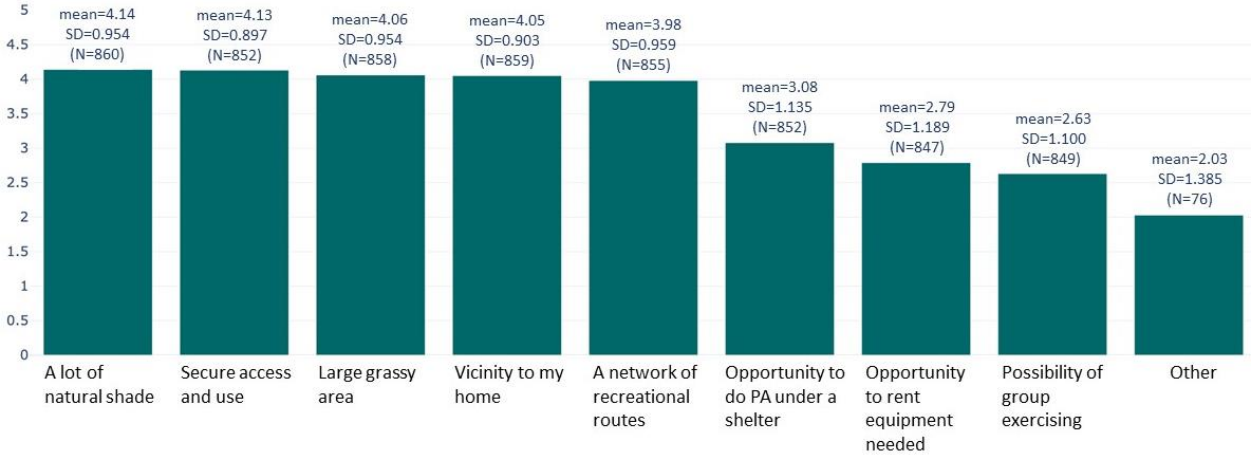

Figure 5. Features of Green Spaces, Important to Respondents for their Physical Activity. Note: Missing values are excluded from the calculation.

The second set focused on more specific green space elements and equipment, respectively (Figure 6). It should be mentioned that in 'Other', 'a bus' was listed most frequently.

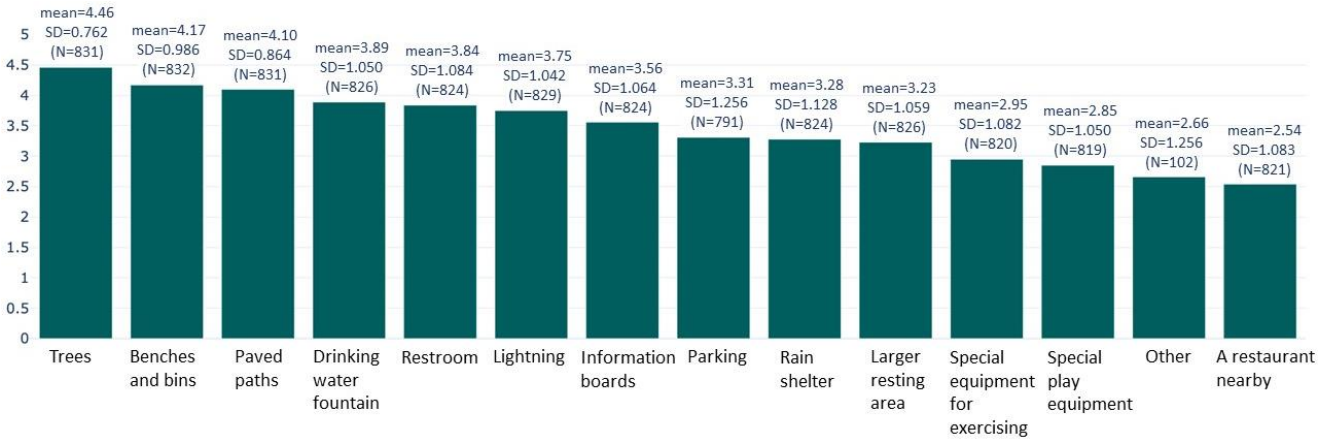

Figure 6. Equipment of Green Spaces, Important to Respondents for their Physical Activity. Note: Missing values are excluded from the calculation.

Encouraging elements and barriers for outdoor physical activity were measured by ranking listed features and equipment. We re-coded variables in the same manner as activities (see above). As can be seen in Table 3, 'pedestrian paths' were ranked highest by far among encouraging elements, while differences between barriers were smaller.

The ordinal dependent variable, measuring temporal occurrences of physical activity frequency on four levels ('5–7 times a week', '1–4 times a week', 'Few times a month', 'Never/I don't use/it is not available to me'), has been converted to two binary variables, 'PA frequency of at least once a week' and 'PA frequency of five or more times a week', both taking values true or false. A series of binary logistic regression analyses was conducted to investigate the correlation between potential predicting factors and these two new variables, in six different environments (in nature, in a park, in urban green-grey spaces, at home, on an outdoor sportsground and using indoor venue). Sixty-eight items were pre-tested for significance against each target variable and only significant items were included in the correspondent regression model, together with significant background factors. It should

be noted that physical activity frequency on outdoor sportsgrounds and physical activity frequency using indoor sport venues were only tested for the threshold of at least once a week, due to the low number of respondents who use these environments five or more times a week. Table 4 lists green space features and equipment which appeared to be of significant importance and motivation for outdoor physical activity in association with physical activity frequency in different environments.

Table 3. Encouraging Elements and Barriers for Outdoor Physical Activity.

Encouraging Features and Equipment for Outdoor PA (N = 790) *	**Mean**	**Standard Deviation**
Pedestrian paths	3.51	1.832
Cycling lanes	2.81	1.939
Space for playing ball	1.35	1.739
Space for exercising, doing yoga, etc.	1.29	1.667
Jogging track, fitness trail	1.11	1.662
Outdoor fitness, minigolf, ping-pong, climbing wall, etc.	1.02	1.549
Space for dancing	0.69	1.402
Pumptrack	0.63	1.294
Other	0.14	0.733
Barriers to Outdoor PA (N = 786) *	**Mean**	**Standard Deviation**
Bad smell	2.11	1.842
Crowd	1.88	1.901
Trash	1.85	1.892
Rain	1.63	2.039
Noise	1.38	1.672
Heat	1.27	1.709
Cold	1.21	1.732
Snow	1.15	1.825
Wind	0.84	1.472
Strangers' pets or other animals	0.51	1.278
Glare	0.23	0.782
Absence of people	0.18	0.851
Weak light	0.17	0.689
Other	0.04	0.412

* Min = 0 for all items, Max = 5 for all items.

Table 4. The Association between Green Space Characteristics and Physical Activity Outcomes.

Important Features and Equipment for Outdoor Physical Activity		
Frequency of PA (min. 30 min)	**At Least Once a Week OR (95% CI)**	**Five or More Times a Week OR (95% CI)**
In Nature	*Possibility to recreate in a group:* 0.76 (0.64–0.95) *	*Enough cycling lanes near my home* *Yes*: 1 (Reference) * *No*: 0.59 (0.38–0.92) * *I don't know*: 0.53 (0.19–1.44) *
In a Park	*Large grassy area:* 1.35 (1–07-1.71) * *Large resting areas*: 1.36 (1.09–1.70) ** *Enough parks near my home* *Yes*: 1.00 (Reference) ** *No*: 0.43 (0.25–0.72) ** *I don't know*: 1.98 (0.60–6.58)	*Enough sportsgrounds near my home* *Yes*: 1.00 (Reference) *No*: 0.16 (0.03–0.79) * *I don't know*: 0.80 (0.17–3.74)

Table 4. *Cont.*

Important Features and Equipment for Outdoor Physical Activity		
Frequency of PA (min. 30 min)	**At Least Once a Week OR (95% CI)**	**Five or More Times a Week OR (95% CI)**
In an Urban Green-Grey Space	*A network of recreational paths*: 1.27 (1.03–1.57) * *Parking*: 0.79 (0.69–0.92) ** *Enough sportsgrounds near my home* *Yes*: 1.00 (Reference) * *No*: 0.63 (0.41–0.96) * *I don't know*: 0.39 (0.17–0.90) *	*Parking*: 0.88 (0.80–0.96) ** *Enough sportsgrounds near my home* *Yes*: 1.00 (Reference) * *No*: 0.53 (0.30–0.96) * *I don't know*: 0.21 (0.06–0.80) *
At Home	*Enough allotment gardens near my home* *Yes*: 1.00 (Reference) * *No*: 0.68 (0.47–0.98) * *I don't know*: 0.56 (0.34–0.90) *	
On a Sportsground		Not tested
In an Indoor Venue	*Trees*: 0.71 (0.54–0.93) * *Possibility to recreate in a group*: 1.39 (1.10–1.75) ** *Enough children's playgrounds near my home* *Yes*: 1.00 (Reference) * *No*: 1.03 (0.62–1.71) *I don't know*: 0.23 (0.82–0.64) **	Not tested
Encouraging Features and Equipment for Outdoor Physical Activity		
Frequency of PA (min. 30 min)	**At Least Once a Week OR (95% CI)**	**Five or More Times a Week OR (95% CI)**
In Nature	*PA in faraway GS but without traffic noise:* 1.00 (Reference) *PA in a nearby GS with traffic noise:* 0.59 (0.39–0.87) **	*PA in faraway GS but without traffic noise:* 1.00 (Reference) *PA in a nearby GS with traffic noise:* 0.47 (0.28–0.79) ** *Running track/fitness trail:* 0.86 (0.76–0.98) *
In a Park		
In an Urban Green-Grey Space		
At Home		*Pedestrian paths*: 1.22 (1.07–1.38) ** *Space to do yoga, exercise*: 1.14 (1.01–1.28) *
On a Sportsground	*Space to play ball*: 1.35 (1.15–1.57) **	Not tested
In an Indoor Venue		Not tested

* $p \leq 0.05$; ** $p \leq 0.01$; OR: Odds Ratio; CI: Confidence Interval. Note 1: Each type of environment corresponds to different regression models. Note 2: Only the OR and CI values where the *p*-value is greater than 0.05, are reported. Non-significant independent variables are not presented. Note 3: A series of background factors was included in the analysis but is reported separately (see Sections 3.3 and 3.4).

As presented in Table 4, the possibility of engaging into recreation in a group seems to be significantly less important for people who did physical activity in nature at least once a week, compared to respondents who did it less often. Additionally, choosing a farther but quieter place was significant for respondents who went into nature at least once a week. People who would be encouraged by the availability of running tracks were less likely to be engaging much in recreation in nature. Respondents who thought that there were enough cycling lanes near their home were more likely to exercise in nature five or more times a week. Furthermore, large grassy areas and large resting areas were significant for

people who exercised at least once a week in a park. Respondents who thought that there were enough sportsgrounds near their homes, were more likely to exercise in a park five or more times a week. Regarding urban green-grey spaces, a network of recreational paths was significantly important for respondents who engaged in recreation at least once a week there, while parking was important for people who did so less frequently. Respondents who thought that there were enough sportsgrounds near their home were more likely to exercise in the urban green-grey spaces one or more times a week. Pedestrian paths and spaces to exercise, do yoga, etc., would be significant outdoor physical activity motivators for respondents who exercised at home five or more times a week. Furthermore, space to play ball games would significantly encourage respondents who exercised at least once a week on outdoor sportsgrounds to do even more physical activity. It also appeared significant that respondents who used indoor venues for physical activity at least once a week did not see trees as an important feature for outdoor physical activity, compared to respondents who used indoor venues less often. However, they saw the opportunity to engage in recreation in a group as significantly important for outdoor physical activity.

Alongside the green space features and equipment, we also included 14 features indicating discouraging factors to outdoor physical activity (listed in Table 3) and possible effects of COVID-19 lockdown on physical activity levels. The results showed that COVID-19 pandemic did not long-term change the habits of people who did physical activity five or more times a week in nature (OR = 1.54, 95% CI = 1.02–2.34*) and at home (OR = 1.94, 95% CI = 1.25–3.01**), but did for those who exercised at least once a week indoors (OR = 0.47, 95% CI = 0.30–0.73**). Among other barriers, heat appeared to be a significantly higher barrier for those who exercised at least once a week in an urban green-grey space (OR = 1.15; 95% CI = 1.04–1.27**), compared to those who exercised less, and rain was a barrier for people who exercised less than five times a week in nature (OR = 0.88; 95% CI = 0.78–1.00*). While noise was a significantly higher barrier to outdoor recreation more often for respondents who did five or more times a week of physical activity at home (OR = 1.14; 95% CI = 1.01–1.28*), weak light appeared to be a lower barrier (OR = 0.43; 95% CI = 0.22–0.85*) for respondents who exercised at home less often.

3.3. The Relationships between Living Environment Characteristics and Physical Activity

As can be seen in Table 5, respondents who are physically active at work, were almost two times more likely to do physical activity at least once a week in nature and 62% more likely to do physical activity five times or more a week in nature, compared to the respondents whose work is sedentary. In comparison, respondents who are physically active at work were also more likely to use sportsgrounds at least once a week. Respondents who live in the countryside were significantly more likely to do physical activity five times a week or more in nature, compared to respondents who live in an urban environment. Suburban and countryside residents were less likely to do their physical activity in a park and in an urban green-grey space. Finally, respondents who live in a house with a garden were less likely to exercise in a park at least once a week, compared to those who live in an apartment.

3.4. Associations between Outdoor Physical Activity and Sociodemographic Groups

Our results showed that women seem more likely to undertake recreation at least once a week in nature (OR = 2.10, 95% CI = 1.28–3.43**), compared to men. We also found significant differences among all three age groups in their likelihood of exercising at least once a week in nature (15–29 years old = reference*; 30–64 years old: OR = 0.39, 95% CI = 0.20–0.75*; 65 and more years old: OR = 0.34, 95% CI = 0.15–0-76*) and older people were more likely to do physical activity at least once a week at home (15–29 years old = reference; 30–64 years old: OR = 1.64, 95% CI = 0.83–3.21; 65 and more years old: OR = 3.43, 95% CI = 1.20–9.84*). The only other significant sociodemographic predictor was occupation; retired people seem more likely to do physical activity five or more times a week at home, compared to respondents with different occupations (OR = 1.74, 95% CI = 1.05–2.90*).

Table 5. Association between Living Environment Characteristics and Physical Activity Outcomes.

	In Nature		In a Park		In an Urban Green-Grey Space		At Home		On a Sportsground	In an Indoor Venue
PA Frequency (min. 30 min)	**At Least Once a Week**	**Five or More Times a Week**	**At Least Once a Week**	**Five or More Times a Week**	**At Least Once a Week**	**Five or More Times a Week**	**At Least Once a Week**	**Five or More Times a Week**	**At Least Once a Week**	**At Least Once a Week**
	OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Work Characteristics										
Sedentary	1.00 (Ref.) **	1.00 (Ref.) *							1.00 (Ref.) **	
Standing	1.02 (0.37–2.78)	3.37 (1.38–8.22) **							0.00 (0.00-.)	
Active	2.97 (1.59–5.54) **	1.62 (1.01–2.59) *							2.99 (1.60–5.59) ** [a]	
Diverse	2.09 (0.78–5.60)	1.13 (0.48–2.64)							0.87 (0.18–4.25)	
Housing Type										
Apartment			1.00 (Ref.)	1.00 (Ref.)			1.00 (Ref.) **			
Apt. with a common garden			1.80 (0.51–6.38)	3.82 (0.45–32.71)			0.56 (0.19–1.70)			
Apt. with a private garden			1.25 (0.53–2.96)	4.51 (1.01–20.03) * [a]			0.76 (0.36–1.59)			
House without a garden			0.50 (0.13–1.86)	0.00 (0.00-.)			0.30 (0.10–0.89) * [a]			
House with a garden			0.59 (0.35–1.00) *	1.57 (0.59–4.19)			1.53 (0.99–2.35)			
Residence Area										
City		1.00 (Ref.) *	1.00 (Ref.) **		1.00 (Ref.) **	1.00 (Ref.) **				
Suburbs		1.44 (0.86–2.40)	0.49 (0.30–0.80) **		0.40 (0.25–0.62) **	0.49 (0.28–0.83) **				
Countryside		1.95 (1.09–3.48) *	0.33 (0.17–0.64) **		0.31 (0.18–0.52) **	0.16 (0.08–0.35) **				

* $p \leq 0.05$; ** $p \leq 0.01$; OR: Odds Ratio; CI: Confidence Interval. [a] Despite being significant, we did not take into account these results due to the low number of respondents. Note 1: Each type of environment corresponds to different regression models. Note 2: Only the OR and CI values where the *p*-value is greater than 0.05, are reported. Non-significant independent variables are not presented.

4. Discussion

4.1. Respondents' Characteristics and Their Physical Activity Inclination in Different Environments

The purpose of this study was to examine green space features and equipment that may be important or encouraging for people to do more outdoor physical activity. We also examined several sociodemographic and living environment characteristics that may be associated with being physically active in different environments. This study is one of the first of its kind to examine the importance of green space characteristics and their encouragement capability for outdoor physical activity in Slovenia. The results of descriptive analyses and binary logistic regression provided several valuable findings which enabled us to answer research questions and form the conclusions.

Regarding the first research question, natural features such as trees, natural shade and grassy areas, secure access and use, and basic equipment such as benches, bins and drinking water fountains have been reported as most important for outdoor physical activity, which confirms previous studies [9,16]. What we found more interesting is that there appear to be differences in preferences among people undertaking recreation at different levels in different environments. For example, compared to people who undertook it in nature only occasionally, people who undertook recreation regularly were less likely to see equipment such as running tracks as an encouraging factor for physical activity. They seem to prefer doing solitary recreation in the form of walking, cycling or hiking, for which they would only need a network of recreational routes. These findings are consistent with studies by Kaczynski et al. [16] and Schipperijn et al. [9], who also indicated the importance of recreational paths for physical activity but less so of running tracks and other equipment. Both studies, however, focused on the use of parks only, and we see the contribution of our study in expanding these findings to other environments. Specifically, our study showed the importance of recreational paths for people who exercise a lot in an urban green-grey space. A network of recreational paths in urban green-grey spaces presents the opportunity for safe and 'green' commuting to work and school or for other purposes, on foot or by bicycle [30,45–47]. Achieving the recommended daily physical activity levels through active commuting leads to a number of health benefits, including reduced rates of obesity and many chronic diseases [48]. However, our study also indicated heat as a higher barrier for people who are regularly active in the urban green-grey spaces. This is an important cue for spatial planners and decision-makers to take appropriate measures to minimise or even remove this barrier to encourage physical activity in urban green-grey spaces. Trees and green areas play an important role in reducing the effect of heat, air pollution, and overwhelming noises [49,50].

Noise was indicated in our study as a higher barrier to outdoor recreation for people regularly exercising at home. For them, outdoor physical activity would be encouraged by a space for doing yoga or exercising. We can assume that they practise such activities at home and would be willing to do them outside if they were provided with appropriate spaces for such activities. Similarly, we can speculate that people who use indoor venues a lot use them for group activities such as playing basketball, volleyball or doing aerobics, since the possibility of exercising in a group was important for them to do physical activity outdoors. These findings suggest that people who currently exercise indoors see outdoor green space more as an opportunity to take their practices outdoors, rather than complementing these practices with new, outdoor ones. Such possibilities can be offered by the provision of large green areas, which is important for people to do at least some physical activity in a park, as our study has found. Particularly in cities with a high density of people with different preferences regarding types of activities, large green areas can support multifunctionality, which enables different activities to be carried out [16,25,51]. Multifunctional green space planning is also promoted by the EU [52].

Another interesting finding from our study was that weak light was not indicated as a great barrier to outdoor physical activity in general and specifically not for people who exercise a lot at home. This finding is contrary to that of Schipperijn et al. [9] who indicated

lights as relatively important pieces of green space equipment. The discrepancy may indicate different preferences regarding outdoor physical activity based on the place where they exercise (e.g., lights in cities are generally more desirable due to safety reasons, compared to the countryside) but also on the types of activities they undertake (e.g., exercising, doing yoga or going for a walk is less light-dependent than playing basketball, tennis, etc.), which has been also discussed by Mak and Jim [53].

COVID-19 restrictions affected people who did at least some physical activity using indoor venues, but not those who went a lot into nature or did physical activity at home. More interesting and contrary to our expectations is that almost 80% of respondents maintained or even increased their levels of physical activity during the lockdown. While our survey did not focus on examining (changed) levels of physical activity in specific environments during the lockdown, several other studies have revealed increased levels of outdoor recreational activity, especially in forests, urban parks and semi-natural spaces during lockdown in those countries where access to green spaces was allowed [2,54–56]. In addition, considering that 61% of the respondents in this study lived in a house with a garden, during lockdown they might have increased their home-based activities such as gardening, home exercise, doing household chores, etc. which was also confirmed by Arundell et al. [57]. Finally, our study showed that people are almost evenly split between those who do and do not think that the COVID-19 situation affected their physical activity habits in the long term. The long-term effect of the COVID-19 situation is still to be investigated in more detail in future studies.

The second question in this study sought to determine the correlation between living environment characteristics and physical activity levels in different environments. Our results showed that respondents who were physically active at work were much more likely to do physical activity in nature and to use sportsgrounds, compared to the respondents whose work was sedentary. Since this study did not exclude physical activity frequency during working time, people who are physically active at work may achieve such high levels of general physical activity because of the nature of their work. This could range from working in nature (foresters, farmers, etc.) to professional athletes, coaches, etc. We also allow the possibility of question misinterpretation, especially considering that 45% of people who claimed their work was physically active were retired. Interestingly, respondents who live in a house with a garden were less likely to exercise in a park at least once a week, compared to those who live in an apartment. This finding is contrary to previous studies, which have suggested that residents without a private garden were visiting urban parks less often than those who had a garden, arguing for people's high affinity for and connection to nature [58,59]. However, our study also included suburban and countryside residents (combined, roughly 27% of them lived in an apartment and 80% in a house with a garden) who were less likely to use parks and urban green-grey spaces for their physical activity but who took great advantage of natural environments. Similar findings have been made by several other studies [60–62]. It seems that housing type may contribute to individuals' physical activity behaviour, which should be explored more profoundly in the future, also taking into account the effects of the COVID-19 lockdown [63]. Finally, our results indicated countryside residents being significantly more active during the lockdown, compared to urban and suburban dwellers. Having nature on their doorstep, and considering the measures preventing the use of urban equipment, this is a reasonable finding and a signal for the authorities to act to ensure appropriate green space to promote physical activity of the entire population.

Thirdly, this study found some interesting differences across sociodemographic groups. With regard to sex, women significantly increased their physical activity practices during the lockdown and were also more likely to change their long-term physical activity habits due to the COVID-19 pandemic, which aligns with findings from de Schio et al. [11]. Also, women seem more likely to do some physical activity in nature, compared to men, which can be explained by the activity type, as women's most reported physical activity types were walking, both for commuting and leisure, and hiking. This result may also indicate

women's preferences for the natural environment, compared to men [64,65]. With regard to age, young people were more likely to do some physical activity in nature, compared to the other two age groups, which was also observed during the COVID-19 lockdown by Venter et al. [66] and Taff et al. [67]. However, their physical activity frequency in general was the lowest of the three age groups and, contrary to the middle-aged group, it increased a little during the lockdown, but not significantly. Still, it did not reduce as drastically as reported from other countries [68]. Possible reasons may be specific to Slovenia and have been discussed by Morrison et al. [69]. We found older (retired) people in general being significantly more active than the other two age groups, although more likely to exercise at home. We suspect the reasons may include seeing home as a comfortable and safe environment to exercise, reduced physical ability to reach a green space suitable for physical activity, preferred physical activity types such as gardening or doing household chores and COVID-19 measures [70]. Indeed, many particularly urban older people in Slovenia are involved in different programmes that promote outdoor group exercising (e.g., the 'School of health' association or daily activity centres for older people), which closed or moved their activities online during the lockdown. However, doing physical activity in green spaces should be considered as a valuable preventive measure for promoting both physical and mental health, such as cardiovascular health and counteracting social isolation in the elderly population [71,72].

4.2. Implications of Findings

Overall, this study highlights the importance of preserving and improving green space to encourage outdoor physical activity. The increased frequency of green space use during the COVID-19 lockdown emphasised the need for outdoor physical activity and clearly showed that, while respecting distancing and hygiene precautions, some form of access to green space should be provided during the COVID-19 pandemic [2,73,74]. Since green spaces has stronger protective associations with the health of urban residents, emphasis should be placed on planning of urban green spaces, especially where the harmful exposure to heat, noise and other barriers to physical activity is most concentrated [75]. Our results point to the need to give greater attention to *diversifying*. This includes creating preferably semi-natural green spaces, suitable in terms of size and access, which enable multiple activities and also creating different types of green spaces to satisfy diverse needs [2,47,75]. This would reduce the risk of crowding, which was indicated as one of the main barriers to outdoor physical activity and also emerged as a concern during the lockdown in this study [2,74]. It would also benefit biodiversity, as promoted in the EU Biodiversity Strategy for 2030 [76]. Taken together, our findings support recent research framed around the effects of COVID-19 on the use of green space in suggesting that urban planning and policy will need to be reconsidered to respond to their interface with public health and to the changed needs and behaviours of people that have emerged with the COVID-19 pandemic [2,77].

In Slovenia, the restrictions on using green space for physical activity were not as severe as in some other countries and the overall fitness of people, especially of children as the population group at greatest risk, did not drop drastically [2,69]. However, the country reports generally insufficient physical activity of nearly 70% of the population, which was confirmed by our study. Some measures have been taken to reverse the trend. On the national level, the environment to encourage regular physical activity is listed as a priority area in the Programme on Nutrition and Physical Activity for Health 2015–2025 [78]. In its framework, several initiatives, projects and actions have been taken to promote physical activity among the population, with a particular focus on uncovering the potential of green space at the local level and encouraging active travel. Our research findings provide scientific evidence and justification for several measures and recommendations which spatial planners, policy- and decision-makers can consider to strengthen public health. The following recommendations for urban planners and policy makers may not be directly applicable to other geographic settings, but they may serve as an inspiration and example in comparative studies.

Our research indicated lack of time as a major barrier to more physical activity. To integrate physical activity into people's busy lifestyles, we see an enormous potential in active mobility, which, as our research has shown, has not yet been practised to a great extent. Therefore, we suggest emphasising creating an enjoyable environment for active mobility, based on the following:

(1) Green infrastructure planning, which may include the addition of green space, pedestrian and bike paths, and greening of cities;
(2) Ensuring responsive design by monitoring air quality, noise and heat levels, as well as keeping track of pedestrians' and cyclists' injury patterns;
(3) Shifting the mindset of decision-makers to designing communities around people rather than around cars. This is especially pertinent regarding the active travel of children to school. In the early 1990s, more than 90% of Slovenian children were walking to school, while recent trends show that three quarters of children come to school by private car, with the main reason being lack of traffic safety, as claimed by their parents [79].

In line with the above, promoting mixed-use land development that supports walkable distances to services may also encourage older people to achieve their daily physical activity through active mobility. This, however, should be considered in suburban and countryside environments as well as in urban green-grey spaces, since our research has shown that people living in suburbs and the countryside are less successful in achieving sufficient levels of physical activity.

Furthermore, continual monitoring of trends in green space use, including the number of people, green space type and activities carried out there, is crucial to determining people's needs regarding outdoor physical activity. Our research supports previous findings, which argue for the provision of a diverse, multifunctional green space network that enables different types of activities for different people. The COVID-19 situation also showed that we need to design flexible spaces which will react to the changed situation to prevent unwanted circumstances, such as the overcrowding of green space.

Apart from an objective collection of data on people's use and needs regarding green space, direct involvement through participation in local planning processes should be seen as an opportunity to receive valuable input from a variety of stakeholders, rather than a chore that needs to be completed for legal reasons.

Finally, according to our results, most people prefer natural green space features and basic facilities. Therefore, we recommend that, rather than creating high-maintenance green spaces, spatial planners and decision-makers should prioritise creating green spaces in natural environments (or nature-like green spaces) for unorganised physical activity, which includes maintaining and possibly expanding the network of pedestrian, cycle and hiking paths in nature and thus broadening the green infrastructure network. To improve accessibility for all residents, special attention should be paid to connecting urban, suburban and countryside areas.

4.3. Methodological Consideration and Future Concerns

A strength of our study has been the examination of different types of environments with regard to physical activity, which is especially relevant since recent research indicates that the type of green space matters for health [4,61]. The main limitations include the format and method of questionnaire distribution (online distribution through mailing lists, social media, etc.) which indicates not the randomised sampling method, but dependence on people's personal interest in the topic and thus participation in the survey. This might have excluded some segment of the population and has also led to the overrepresentation of women and highly educated people. We used self-reported physical activity as a measure for physical activity, which may deviate from the objectively measured level of physical activity. In addition, our sample was carried out nationally but was not representative of the entire Slovenian population, which is important to consider when generalising from the results.

Nevertheless, this study is one of the first to investigate the links between outdoor environments and physical activity in Slovenia and therefore it provides a valuable research contribution in terms of the study location. Cultural and environmental differences between countries may influence the relationship between green space and public health and thus limit the generalisation of findings across different geographical locations [25,80]. More research, especially from less developed parts of the world, is needed to better understand this relationship. Future work should also prioritise longitudinal studies to examine causal links between types of environments and physical activity of different population groups.

5. Conclusions

The present study has examined the associations between a wide range of green space characteristics, sociodemographic and living environment factors, and the level of physical activity among Slovenians in six different environments. It provides some meaningful results, based on which we have answered the research questions and formed recommendations for spatial planning and policy.

Our study emphasises natural environments as preferred green space for physical activity. Physical and mental health benefits of natural environments have been demonstrated by numerous studies. This study does not indicate that adding more features or equipment specifically aimed at physical activity, such as outdoor fitness areas or running tracks, will significantly increase the use of green space for physical activity. Most people do not seem to need much highly maintained equipment, but they value a network of recreational routes, large grassy areas and trees, as well as a space to play ball games and which supports group exercising. These preferences can be secured either with a multifunctional green space incorporating a network of recreational paths, open grassy areas and paved parts, or by a combination of different types of green spaces. More research is needed to assess which combination of green space types and characteristics would stimulate outdoor physical activity, especially in countries where physical inactivity is a major health concern.

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