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Introducing a Scale for Measuring Attachment to Urban Green

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Abstract: Urban green contributes to enhanced well-being and overall quality of life in urban populations. The concept of place attachment provides an established avenue for exploring the intricate connections between urban environments and personal experiences. Building on the notion of place attachment, we investigated the perceptions of horizontal and vertical urban green by introducing a novel Urban Green Attachment (UGA) scale. A cross-sectional study using an online survey in German, measuring emotional, cognitive, and behavioral relations to urban vegetation, was conducted among 164 adult inhabitants of the Volkert quarter in Vienna, Austria. Using principal component analysis, we found that the UGA scale was a reliable measure of attachment to urban green, with ten items within the "attachment" factor. Study participants highly valued vertical green, but did not differentiate their attachment to it from horizontal greenery within the specific local context and by design of the measures we used. Thus, further studies and ethnographic investigations, preferentially accompanied by methods such as walking interviews, are needed to test the scale for other populations and settings. The UGA scale emerges as a valuable tool for advancing understanding in this critical area, given the current climate change-driven transformations of cities, building on the creation of green infrastructure.

Keywords: Austria; sustainability; urban green space; health; well-being; place attachment; nature

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1. Introduction

Green space commonly refers to any area of land that is covered with vegetation, including parks, gardens, and peri-urban forests [1]. In their review on the use of the term green space, Taylor and Hochuli [2] found two primary interpretations: first, green space as being equivalent to nature and, second, as describing urban vegetation. This divergence definition-wise likely stems from the lexicalization of the term, indicating a lack of consensus among researchers in this respect. A singular, prescriptive understanding of green space might simply not mirror the actual experience of urban citizens. In the current study, we employed a context-specific definition, using "green space" for places with extensive vegetation and the broader term "urban green" for any kind of vegetation that can be found in a city environment.

The current global trend towards a hotter climate highlights the importance of green space in urban areas to sustainably improve public health and well-being [3]. Beyond the cooling potential of vegetation, green space in densely populated cities influences inhabitants' quality of life [4,5]. Access to urban green can promote physical activity, which is important for maintaining fitness levels, and this is associated with reduced risks of various chronic illnesses, such as obesity, cardiovascular disease, and respiratory illnesses [6]. Additionally, studies have shown that urban green has numerous benefits for mental health, including reduced levels of stress, improved cognitive function, and better mood [5,7]. Moreover, urban green offers opportunities for people of all ages to engage

in social and cultural activities, which can facilitate building or maintaining a sense of community, social peace, and social cohesion [6].

The relevance of urban green in terms of health benefits is well known [8]. On the one hand, green space (in the sense of horizontal green), in general, provides manifold social benefits, such as providing space for recreation and relaxation. On the other hand, trees (in the sense of vertical green) are specifically important for offering shade, among other ecosystem services, such as improved micro-climate and air quality [9]. Regardless of their species, size, or amount, trees might be rated differently by humans in terms of aesthetic value than extensive horizontal types of green space, such as lawns, flowerbeds, and shrub-dominated or ruderal vegetation. Horizontal green differs from vertical green by providing unique opportunities for sport, playgrounds, picnics, events, and other such activities.

Increasingly taking into account personal experience, human health, and well-being, social–ecological systems research on urban green has started to integrate concepts from environmental psychology and human geography [10]. A key concept for describing human relations with places in urban areas from a social–ecological systems perspective is place attachment [11,12]. One commonly used framework for understanding individuals' attachment to nature is the psycho-evolutionary theory of biophilia, which suggests that humans have an innate tendency to connect with other living beings, including plants [13]. This theory posits that humans evolved in close relation with natural processes, and thus have an inherent need to interact with these in order to thrive.

As a further important concept, the place attachment theory suggests that people develop emotional connections to specific places, including green urban environments [11]. The concept postulates that attachment to place is shaped by a variety of factors, including the physical characteristics of the environment, personal experiences, and memories associated with a specific locality and the social interactions that occur there. Taken together, these theoretical approaches suggest that individuals' attachment to urban green is shaped by both innate dispositions and tendencies, as well as experiences. However, place attachment has not yet been fully explored with regard to how the attachment to horizontal and vertical green may differ.

With more than 50% of the city covered by vegetation, Vienna, the capital of Austria, with about two million inhabitants, has a high proportion of urban green in international comparison [6]. The Viennese city government has formulated targets for green space accessibility for its citizens in terms of size and distance to green space, as well as the green space surface per resident. Several greening measures have been implemented in recent years, despite the sharp competition for space used for motorized mobility. However, areas with scant green space and a rather low degree of green space connectivity are still considerable on a local level [6]. This is a serious challenge to public health, further compounded by the prospect of increasingly severe heat waves in the upcoming decades that are likely to substantially affect Vienna [3].

Yet urban green has often been treated in generic terms, neglecting structural differences related to the presence or absence of trees that impact their ecological functions and might influence green space effects on human health and well-being [2,4,5]. Thus, differential perceptions of single or groups and rows of trees (vertical green) and lawns, flowerbeds, and extensive shrub or ruderal vegetation (horizontal green) are not well researched, especially regarding the attachment levels of inhabitants of the same urban area [14]. One reason for this rather generic view of green space in particular, and urban green in general, might be the general dearth of green space in densely populated urban areas. Moreover, urban green spaces in cities like Vienna often include small patches of greenery encircling tree trunks, as space is limited due to competition with motorized vehicles [6]. Due to the different structural characteristics, the attachment to horizontal or vertical green for residents might vary [15].

This study was part of a larger research project entitled "Making Green Inclusive. Ecosystem Services, Health Impact Assessment and Participative Scenarios" [16]. The selection criterion for the study area was the heat development during summer months and

the proportion of green space. Both criteria applied to the Volkert quarter in Leopoldstadt, Vienna's second district. Despite being surrounded by two prominent green spaces, i.e., the Augarten and the Prater, the neighborhood stands out as one of the hottest parts of Vienna with sparse green infrastructure [17]. In addition to the topological and geographical suitability of the study area, the Volkert quarter was characterized by high social diversity.

In the present analysis, we hypothesize variations concerning place attachment between two distinct urban green categories, namely horizontal and vertical green. This might be relevant in densely built environments with little leeway for extending the surface of horizontal green, often forcing policy-makers to decide whether to create new parks, extended parklets or community gardens or to plant single trees or small groups of trees [14]. So, we developed a unidimensional scale in German for exploring possible differences in attachment to structurally distinct types of urban green. We introduced the term Urban Green Attachment (UGA) and developed a scale for measuring it quantitatively using data from a cross-sectional online study conducted in the Volkert quarter among inhabitants of this area.

2. Methods

2.1. Study Design

This non-representative online study collected self-reported information regarding urban green in the Volkert quarter in Vienna among a purposive sample of adults. The survey was designed using the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) [18]. Study participation was voluntary, and we did not offer incentives for participation. We did not use randomized or adaptive items. Prior to data collection, ethical approval was granted from the institutional ethical committee of the Medical University of Vienna, Austria, in July 2021. This study was conducted following the ethical standards laid down in the Declaration of Helsinki.

To review the completeness and comprehensibility of the survey, 15 voluntary participants pre-tested the online survey. We integrated the feedback from the pre-testers into the final version of the questionnaire. The online survey was accessible barrier-free via the web-based survey tool SoSci Survey from 12 July 2021 to 14 February 2022 [19]. The cover page informed participants about the study's aim. All study subjects indicated their informed consent before starting the online survey. The link to the online survey was distributed following a snowball system via commonly used social media pages, local newspapers, and designated groups on WhatsApp, Facebook, and Signal. Inclusion criteria were being an adult, living in the Volkert quarter, and being able to participate in a German online survey.

2.2. Measures

A priori, the dichotomous filter question "Do you live in the Volkert quarter" (answer options: yes or no) distinguished between inhabitants and non-inhabitants of this specific area. For those who selected "no", data collection stopped at this point. For the others, the first part of the online survey collected socio-demographic characteristics (single choice) such as age (in years), gender (male, female, non-binary), living situation (with partner, alone, other), living with children, having a dog and garden ownership (all: yes, no), and highest education level (primary, secondary, or tertiary).

We developed a novel Urban Green Attachment (UGA) scale to fit in the context of our research from previously published scales on place attachment, e.g., the Abbreviated Place Attachment Scale developed by Boley et al. (2021) [12] and the Place Attachment Scale developed by Lewicka (2008) [11]. The latter scale is a widely used tool for assessing individuals' connection to their local neighborhood and for understanding the psychological factors that influence environmental attitudes and behavior. We used its German version, which we adapted to capture attachment to structurally different types of urban green. We formed two scales including eight items, each to differentiate between percep-

tions regarding horizontal and vertical green, thus forming two distinct categories of the UGA scale.

For measuring UGA in terms of perceptions regarding horizontal and vertical urban green, participants were invited to rate their relation to these categories in the context of the Volkert quarter, referring to the locally available urban green. The respective item texts made clear that we asked the participants to specifically refer to trees in the sense of a tree avenue, a group of trees, or a single tree for the scale on vertical urban green, and to green areas, in the sense of green space, for the scale on horizontal urban green. Items were presented on a 5-point Likert scale, ranging from 1: strongly agree to 5: strongly disagree.

2.3. Statistical Data Analysis

We used descriptive statistics to report categorical data as absolute and relative frequencies and continuous data as mean and standard deviation (SD). We performed all statistical analyses using the statistical software SPSS Statistics for Windows, Version 29.0 (Armonk, NY, USA, IBM Corp.) [20]. We set statistical significance at $p < 0.05$. We first created summated scales, the UGA vertical green scale and the UGA horizontal green scale, which together formed the UGA scale. We measured reliability, or internal consistency, indicating how closely related a set of items are as a scale, using Cronbach's alpha and interpreted measures as small (i.e., 0.2), moderate (i.e., 0.5), or large (i.e., 0.8) [21].

For the current data, Bartlett's test of sphericity was significant ($p < 0.001$), with values exceeding 0.8, suggesting that there is enough structure in the data for factor analysis to be meaningful. To evaluate the psychometric properties of the novel socio-psychological scale of the UGA, we assessed model fitness to determine whether the selected items accurately measure the underlying construct [22–24]. Item ratings were subjected to exploratory factor analysis (principal component analysis, PCA, with varimax rotation) to examine initial support for the green space-related attachment items. As for a Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy, we rated values between 0.5 and 0.7 as mediocre, values between 0.7 and 0.8 as good, and values between 0.8 and 0.9 as very good [25]. For the PCA, we followed the criteria used by Hammitt [26] when forming factors, i.e., Eigenvalues ≥ 1.0; factor loadings ≥ 0.40, and item loadings on more than one factor had to differ by $\geq$0.10 in loading to be retained.

3. Results

3.1. Study Population

A total of 1133 clicks were recorded for the online questionnaire (including accidental double clicks and search engine views), 217 participants started, and 164 finished the survey (75.6% completion rate). So, the final sample included 164 participants living in the Volkert quarter, with nearly half females (n = 84, 51.2%) and males (n = 76, 46.3%), and 4 non-binary respondents (2.4%, Table 1). The average age of participants was 44.4 years (SD 14.4, range from 18 to 95 years).

Table 1. Socio-demographic characteristics of the study sample (n = 164).

Variables	N	%
Age groups (years)		
<29	21	12.80
30–39	50	30.49
40–49	43	26.22
50–59	22	13.41
>60	28	17.07

Table 1. *Cont.*

Variables	N	%
Sex		
Female	84	51.22
Male	76	46.34
Non-binary	4	2.44
Living situation		
Living alone	45	27.44
Living with a partner	98	59.76
Other	21	12.80
Children		
No children	98	59.76
Child/children	66	41.24
Garden owner		
Yes	22	13.41
No	142	86.59
Dog owner		
Yes	27	16.46
No	137	83.54
Education level		
Primary or secondary	66	39.63
Tertiary	99	60.37

3.2. Principal Component Analysis: Vertical Urban Green Attachment

Table 2 shows the ratings of the UGA scale for the category of vertical urban green in German and English. Cronbach's alpha for the eight items was 0.717, indicating a moderate level of internal consistency (mean 1.78, SD 0.58, range from 1 to 4.13). Notably, we found the lowest levels of agreement with the following statement: "I am satisfied with the supply of trees in the quarter." (mean 3.79, SD 1.31).

Table 2. Ratings of the Urban Green Attachment scale for vertical green (i.e., vertical UGA scale) in German and English (Likert scale from 1: strongly agree to 5: strongly disagree).

Original Items: German	Items: English	Mean	SD
Diese Bäume sind mir wichtig.	These trees are important to me.	1.46	0.85
Diese Bäume tragen zu meinem Wohlbefinden bei.	These trees contribute to my well-being.	1.48	0.93
Diese Bäume stören mich.REV.	These trees bother me.REV.	1.30	0.81
Ich würde etwas in dieser Nachbarschaft vermissen, wenn es diese Bäume nicht mehr gäbe.	I would miss something in this neighborhood if these trees were gone.	1.60	1.12
Ich würde diese Bäume schützen, wenn sie jemand entfernen will.	I would protect these trees if someone wants to remove them.	1.81	1.16
Diese Bäume sind schön.	These trees are beautiful.	1.55	0.98
Diese Bäume sind ein Sicherheitsrisiko.REV.	These trees are a safety hazard.REV.	1.28	0.66
Ich bin zufrieden mit dem Angebot an Bäumen im Grätzl.	I am satisfied with the supply of trees in the quarter.	3.79	1.31

Notes: REV: reverse-coded item. SD: standard deviation.

Further, we looked at the content of questions that loaded onto the same factor to try to identify common themes (Table 3). For the vertical UGA scale, factor analysis revealed a Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy of 0.804, indicating a satisfactory level for the analysis. The Bartlett test of sphericity was significant ($chi^2 = 777.066$, df = 28, $p < 0.001$), confirming significant relationships among variables. The analysis identified two components, collectively explaining 68.19% of the total variance. The five items that loaded on factor 1 were related to positive aspects and the general importance of green space; therefore, we labelled this factor "attachment". The three items that loaded

onto factor 2 were related to safety aspects and satisfaction level; therefore, we labelled this factor "discontent". This analysis revealed that the initial vertical UGA scale was composed of two components. Two of the three items forming factor 2 were reverse-coded, so their intended meaning would be the opposite, which also underpinned the finding of strong clustering to the factor "discontent".

Table 3. Principal component analysis of the vertical Urban Green Attachment scale (i.e., vertical UGA scale).

Items	Factors	
	1	2
These trees are important to me.	0.847	
These trees contribute to my well-being.	0.842	
These trees bother me.REV.		0.688
I would miss something in this neighborhood if these trees were gone.	0.790	
I would protect these trees if someone wants to remove them.	0.794	
These trees are beautiful.	0.758	
These trees are a safety hazard.REV.		0.932
I am satisfied with the supply of trees in the quarter.		−0.493

3.3. Principal Component Analysis: Horizontal Urban Green Attachment

Table 4 shows the ratings of the UGA scale for horizontal green (i.e., horizontal UGA scale) in German and English. Cronbach's alpha for the eight items was 0.751, indicating a moderate level of internal consistency (mean 1.79, SD 0.63, range from 1 to 4.38). Notably, we found the lowest levels of agreement with the following statement: "I am satisfied with the supply of green areas in the quarter." (mean 3.68, SD 1.31).

Table 4. Ratings of the Urban Green Attachment scale for horizontal green (i.e., horizontal UGA scale) in German and English (Likert scale from 1: strongly agree to 5: strongly disagree).

Original Items (German)	Items (English)	Mean	SD
Diese Grünflächen sind mir wichtig.	These green areas are important to me.	1.43	0.89
Diese Grünflächen tragen zu meinem Wohlbefinden bei.	These green areas contribute to my well-being.	1.52	1.01
Diese Grünflächen stören mich.REV.	These green areas bother me.REV.	1.33	0.87
Ich würde etwas in dieser Nachbarschaft vermissen, wenn es diese Grünflächen nicht mehr gäbe.	I would miss something in this neighborhood if these green areas didn't exist anymore.	1.55	1.06
Ich würde diese Grünflächen schützen, wenn sie jemand entfernen will.	I would protect these green areas if someone wants to remove them.	1.74	1.13
Diese Grünflächen sind schön.	These green areas are beautiful.	1.84	1.18
Diese Grünflächen sind ein Sicherheitsrisiko.REV.	These green areas are a safety hazard.REV.	1.24	0.74
Ich bin zufrieden mit dem Angebot an Grünflächen im Grätzl.	I am satisfied with the supply of green areas in the quarter.	3.68	1.31

Notes: REV: reverse-coded items. SD: standard deviation.

Further, we looked at the content of questions that load onto the same factor to try to identify common themes (Table 5). The factor analysis for the horizontal UGA scale revealed a Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy of 0.804, indicating a satisfactory level for the analysis. The Bartlett test of sphericity was significant ($chi^2 = 718.651$, df = 28, $p < 0.001$), confirming significant relationships among the variables. The analysis identified two components, collectively explaining 67.53% of the total variance. Some variables showed negative loadings, which did not indicate any meaning regarding the strength of the variable with regard to the factor. However, it implied that the variable was related in a direction opposite to the factor. In other words, as the factor increases, the variable tends to decrease, and vice versa.

Table 5. Principal component analysis of the Urban Green Attachment scale for horizontal urban green (i.e., horizontal UGA scale).

Items	Factors	
	1	**2**
These green areas are important to me.	0.778	
These green areas contribute to my well-being.	0.866	
These green areas bother me.REV.		0.605
I would miss something in this neighborhood if these green areas didn't exist anymore.	0.773	
I would protect these green areas if someone wants to remove them.	0.687	
These green areas are beautiful.	0.854	
These green areas are a safety hazard.REV.		0.642
I am satisfied with the supply of green areas in the district.		−0.782

Notes: Extraction method: principal component analysis. Rotation method: varimax with Kaiser normalization. The rotation converged in three iterations. REV: reverse-coded item.

The five items that loaded onto factor 1 were related to positive aspects and the general importance of urban green; therefore, we labelled this factor "attachment". The three items that loaded onto factor 2 were related to safety aspects and satisfaction level; therefore, we labelled this factor "discontent". This analysis revealed that the initial scale was composed of two sub-scales. Two of the three items forming factor 2 were reverse-coded. So, in the analysis, their intended meaning would be the opposite, which is reflected in the strong clustering to the factor "discontent".

3.4. Principal Component Analysis: Urban Green Attachment Scale

To test whether the two vertical and horizontal UGA scales can be merged to yield a total UGA scale covering both categories of urban green, we conducted a principal component analysis of the combined set of items (Table 6). As a result, we found that a three-factor solution existed. For the total UGA scale, factor analysis results indicate a robust model fit, with a Kaiser–Meyer–Olkin (KMO) measure of 0.870 and a significant Bartlett test of sphericity (χ^2 = 2047.822, df = 120, $p < 0.001$). The model accounted for a substantial amount of variance (70.55%) across the three components. Additionally, the internal consistency, assessed through Cronbach's alpha, was high with 0.847 for the 16 items included in the analysis.

The ten items that loaded onto factor 1 were related to positive aspects and the general importance of green; therefore, we labelled this factor "attachment". The four items that loaded onto factor 2 were related to safety aspects; therefore, we labelled this factor "discontent". Factor 3 included the two items on participants' satisfaction with the amount (supply) of urban green; so, this factor could be referred to as "availability".

This further analysis revealed that the initial set of the two scales was actually composed of three sub-scales. The items forming factor 2 were reverse-coded. So, in the analysis, their intended meaning would be the opposite, which also underpinned the finding of strong clustering regarding the factor "discontent". The two items forming factor 3 were the respective sister items in the initial set of the two scales, underpinning that they truly composed a similar measure. The ten items forming factor 1 showed a high internal reliability (alpha 0.929) and could potentially be used as a reliable scale to form an overall UGA score incorporating both horizontal and vertical green.

Table 6. Principal component analysis of the Urban Green Attachment (UGA) scale for the two categories of vertical and horizontal green.

Items	Factors		
	1	2	3
These trees are important to me.	0.767		
These trees contribute to my well-being.	0.776		
These trees bother me.REV.		0.645	
I would miss something in this neighborhood if these trees didn't exist anymore.	0.669		
I would protect these trees if someone wants to remove them.	0.636		
These trees are beautiful.	0.780		
These trees are a safety hazard.REV.		0.873	
I am satisfied with the supply of trees in the district.			−0.839
These green areas are important to me.	0.771		
These green areas contribute to my well-being.	0.823		
These green areas bother me.REV.		0.630	
I would miss something in this neighborhood if these green areas didn't exist anymore.	0.730		
I would protect these green areas if someone wants to remove them.	0.689		
These green areas are beautiful.	0.739		
These green areas are a safety hazard.REV.		0.868	
I am satisfied with the supply of green areas in the district.			−0.877

Notes: Extraction method: principal component analysis. Rotation method: varimax with Kaiser normalization. The rotation converged in 5 iterations. REV: reverse-coded item.

4. Discussion

This study applied the concept of place attachment, which has been approached in various ways in the literature [10,11,27], to the still rarely investigated issue of structurally different types of urban green with particular reference to densely populated areas. We introduced a new tool for measuring attachment to urban green and explored the concept in relation to a non-probability study sample of inhabitants of the Viennese Volkert quarter. The development of the Urban Green Attachment (UGA) scale in German involved several steps, including a literature review of previous research on place attachment and green urban infrastructure, in particular on studies of health and well-being effects; a pilot study to test the initial item pool; and a series of principal component analyses (PCAs) to refine the scale and assess its psychometric properties [25].

The questionnaire used in this study was composed of two distinct sub-scales for the horizontal and vertical UGA with eight items each. These collected identical aspects of people's perceptions of urban green, but distinguished between two different categories of urban green, i.e., vertical and horizontal green. As shown with PCA, both sub-scales expressed a two-factor solution, with factor 1, "attachment", relating to positive aspects and perceived relevance, and factor 2, "discontent", describing the opposite construct in both sub-scales. We anticipated that individual attachment to urban green would be multifaceted. However, despite differences in the ecological and social benefits of vertical and horizontal green [9,28,29], study participants' attachment to these types did not show a significant difference within our sample. This observation could be attributed to the unique features of the Volkert quarter, which is characterized by an overall deficiency of urban green and a lack of public space.

Study respondents expressed similar attachment levels to horizontal and vertical green when considering the average ratings. This finding might speak to the initial hypothesis of this study, that, for measuring attachment to "green space", considering structural properties might be important, especially when distinguishing between horizontal or vertical green is required. It might also indicate that in subsequent studies, it is important to more precisely specify "green space", which could have been misunderstood as including trees as well.

As the ratings for the sub-scales were quite similar, which we did not expect when planning the study, we combined them to a total scale in a further step, yielding the UGA

scale. The PCA, yielding a three-factor solution, indicated that the items on the scale loaded consistently onto their respective components, affirming the internal consistency of the measure. The analysis showcased that the scale captured the intended constructs related to UGA, reinforcing its content validity [25]. This alignment between the factor structure and the theoretically derived factors provided evidence of the construct validity of the scale. In terms of score reliability, the UGA scale demonstrated strong internal consistency, as evidenced by Cronbach's alpha values for each identified factor. This consistency suggests high correlation among items within each factor, ensuring a reliable measurement of underlying constructs.

Results from the factor analysis showed that the UGA scale encompassed three distinct factors, labelled as attachment, discontent, and availability. Attachment signifies a positive emotional connection, discontent reflects negative sentiments, and availability indicates the perceived accessibility and presence of urban green [11,12].

The UGA scale measured individuals' attachment to urban green in a densely populated, grey urban area, building on the notion that vegetation provides a wide range of benefits for urban dwellers [30]. We anticipated that this scale may be used by urban planners and decision-makers to gain a better understanding of how people relate to urban green [6,28]. The UGA scale used in this study was advantageous due to its simplicity and universal applicability, as it might be easily understood by German-speaking adult respondents from diverse socio-demographic backgrounds [27]. We intentionally chose to employ a German-only scale, thereby excluding many non-German-speaking residents. Nevertheless, there is significant potential to apply this scale to diverse populations and structural characteristics of green space. This adaptation of the scale might also consider important ecological factors like climate zones and be tailored to specific locations such as designated lawn areas as an example of horizontal green or tree avenues as an example of vertical green [2]. This approach aligns with practices observed in comparable validation studies involving translation into different languages or dialects [23,24,31].

The items forming factor 2, discontent, were purposely reverse-coded, i.e., their intended meaning was the opposite of what was analyzed. This is in line with previous research underpinning the importance of carefully considering the wording and meaning of questionnaire items when designing and analyzing surveys to ensure accurate and meaningful results [32]. Potentially accounting for language-specific characteristics, this may also have been the case in our study due to potential variations in the interpretations of the term "green areas", as demonstrated, for instance, in the case of Spanish [33].

According to Pasini et al., respondents may offer diverse responses influenced by their unique life experiences, comprehension of language nuances, and the framing inherent in self-rating instruments [24]. In our study, we asked respondents to consider various types of trees in their neighborhood. As we did not further specify whether horizontal urban green includes trees, this should be explicit in future research, particularly in the context of urban planning. For the Volkert quarter, we assumed that this did not make a considerable difference, since almost all green space in this area consists of single trees, tree alleys, or small groups of trees. To further contribute to the scientific understanding of urban residents' attachment to various types of urban green, future studies should contemplate employing nuanced categories of urban green [2]. These categories should be customized to align with pre-existing interpretations and classifications, reflecting the diverse ways in which various social groups are attached to green space and are influenced by local discourses. For example, comparable studies have illustrated differential appreciation of various garden types [28,34]. To gain a more comprehensive understanding of people's perceptions of urban green, future research should employ mixed-method designs on larger and representative study populations. These investigations should preferably be coupled with in-depth ethnographic investigations and use methods and perspectives advised by critical human geography, such as walking interviews [35].

In terms of study limitations, it is important to note that the research was carried out utilizing an online cross-sectional design and a German questionnaire. This methodol-

ogy required participants to have internet access, introducing the possibility of selection bias [36]. The anonymous nature of the online survey precluded the investigation of potential reasons for non-response. The reliance on self-reports introduced recall bias. The German scale may have allowed for different interpretations, and the lack of specific definitions and visual aids in the survey may have contributed to this ambiguity [2].

5. Conclusions

Given the numerous benefits of urban green for the urban population, it becomes imperative to prioritize their creation and maintenance. This study contributes to the existing literature by introducing a scale designed to measure attachment to urban green in German. The novel Urban Green Attachment (UGA) scale was developed in an Austrian context within an area in Vienna characterized by a notably low level of urban green and a population with diverse socio-characteristics. Our findings suggest that, for this area, and potentially for neighborhoods sharing similar characteristics in other cities, the scale provides a valuable tool for investigating attachment to urban green.

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