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Evolution of the Concept of Sensory Gardens in the Generally Accessible Space of a Large City: Analysis of Multiple Cases from Kraków (Poland) Using the Therapeutic Space Attribute Rating Method

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Citation: Krzeptowska-Moszkowicz, I.; Moszkowicz, Ł.; Porada, K. Evolution of the Concept of Sensory Gardens in the Generally Accessible Space of a Large City: Analysis of Multiple Cases from Kraków (Poland) Using the Therapeutic Space Attribute Rating Method. *Sustainability* **2021**, *13*, 5904. <https://doi.org/10.3390/su13115904>

Academic Editors: Katarzyna Hodor, Magdalena Wilkosz-Mamcarczyk and Jan K. Kazak

Received: 30 April 2021

Accepted: 17 May 2021

Published: 24 May 2021

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Abstract: This paper presents a study on public gardens with sensory features located in Kraków (Poland). Data for the analysis of the facilities were obtained during site visits using observations. The paper uses a research method for the analysis of therapeutic outdoor areas in cities based on the evaluation of their attributes. This method makes it possible to characterise features of objects as well as their value. It is a practical tool, which enables an in-depth analysis of public spaces. The study showed that public gardens with sensory features located in Kraków have significant deficiencies, which make it impossible to fully exploit the potential of the sensory space.

Keywords: therapeutic space; sensory garden; Kraków; public space; rating method

1. Introduction

Sensory gardens are typically described as a type of therapeutic garden, e.g., in the cross-sectional work by Winterbottom and Wagenfeld [1]. These types of gardens are created in public spaces and sometimes form part of therapy and healthcare centres. This trend grew even more when it was demonstrated that the view of greenery and the presence in a green space have a positive impact on patient health [2]. Initially, sensory gardens were designed primarily with blind people in mind (the oldest included the touch- and smell-focused garden at the John J. Tyler Arboretum, in Lima (1949, PA, USA), or the fragrance garden at the Cambridge University Botanical Garden (1960, Cambridge, UK)), but over time they were tailored to all visitors, regardless of ability or disability, which was labelled universal design [1]. Few detailed studies about them have been published, and the existing literature focuses mostly on cases from specific countries. Such works include those of Hussein [3], which focused on therapeutic sensory gardens accompanying educational facilities for the disabled in Great Britain. Gonzales and Kirkevold discussed the problem of therapeutic gardens accompanying care homes in Norway [4]. An analysis of various therapeutic sensory gardens in Lithuania was presented by Balode [5].

Contemporary sensory gardens are often intended to stimulate various human senses. Apart from the five basic senses—touch, taste, smell, hearing, and vision—the holistic sensory systems of the human body have also become a focus. Winterbottom and Wagenfeld argue that the designs of therapeutic gardens should focus on the relationship between gardens and movement, balance, and touch [1]. This appears to be of particular significance in sensory healing gardens.

The Sensory Trust (from the United Kingdom) defines a sensory garden as ‘a self-contained area that concentrates a wide range of sensory experiences. Such an area, if designed well, provides a valuable resource for a wide range of uses, from education to recreation’ [6]. This definition does not categorise stimuli and does not focus on how many and which senses should be used to receive them, focusing instead on an area’s potential

to generate stimuli. With this definition, sensory gardens can have a variety of uses, the therapeutic use not being the primary one. It better characterises sensory gardens designed in public spaces, i.e., where such gardens accompany various places and institutions (e.g., at housing estates, at schools, as parts of public parks and gardens) and have a diverse set of users.

Hussein (2009) noted that sensory gardens should be designed so as to be perceived and experienced from up close, using all of one's senses [7]. This type of garden allows the user to develop a close and highly individualised relationship with each of its elements. The senses can be influenced by various elements, such as vegetation, paving, or outdoor furniture [1]—especially sound, tactile, and kinetic elements such as reliefs or musical instruments. Water is also an essential element in all therapeutic gardens. Its basic property is to feed the soil and the plants. Winterbottom and Wagenfeld point out that a good practice in therapeutic gardens is to establish bioswales and raingardens, which not only support rainwater management but also bring birds, butterflies, and dragonflies into the garden [1]. Water features can also have sensory significance. The sound of water in a stream, fountain, or cascade is a factor that affects the sense of hearing.

Polish-language literature features few works on sensory gardens, which could be associated with their being relatively new. Our search of academic literature indicates that interest in the topic of sensory gardens in Poland emerged after 2000, and one of the first authors was Pawłowska [8]. In publications from the period 2010–2020, a division can be seen between literature describing Polish case studies and the problem of using sensory gardens for the rehabilitation of users with visual impairment. A study of various Polish therapeutic garden cases, including sensory gardens, can be found in publications by Dudkiewicz et al. [9], Górską-Kłęk [10], or Trojanowska [11]. Studies of sensory gardens as spaces for the visually impaired were published by Dąbski & Dudkiewicz [12], Trojanowska [13], Woźny & Lauda [14], and Zajądacz & Lubarska [15], who analysed selected Polish cases.

As for generally available spaces, sensory gardens were found to have an even poorer representation in Polish-language literature. The idea of aligning sensory spaces with the structure of therapeutic parks was proposed by Trojanowska [11], who argued that multi-sensory stimulation is the fundamental purpose of such parks and is associated with creating separate spaces dedicated to sensory impacts. A multiple case study of small sensory gardens located in the most densely developed parts of New York was presented by Pawłowska [8]. This study underscores their role as spaces that positively influence human wellbeing, especially of individuals who work in downtown areas of large cities, who are the typical users of such gardens. Sensory gardens in cities can thus play the role of restorative gardens, i.e., places that offer conditions favourable to reattaining the body's internal balance (homeostasis), which can improve emotional and psychological wellbeing, for instance by reducing stress [16]. Krzeptowska-Moszkowicz et al. [17] discussed creating sensory gardens that would be friendly both to humans and animals in large cities, as this could aid in enhancing the scope of positive stimuli that affect the human senses.

2. Evolution of the Idea of Sensory Gardens in Poland

Sensory gardens are closely tied with the human senses but can have different definitions, as our perspective on this garden type is evolving. One of the more often-quoted definitions in Polish-language literature states that 'mianem ogrodu sensorycznego określa się kompozycję tak zaprojektowaną, aby bodźce pozawzrokowe były użyte celowo i to w większym natężeniu niż zwykle' (a sensory garden is a composition designed so that non-visual stimuli are used intentionally and at a much greater intensity than usual) [8]. It classifies sensory gardens as layouts addressed primarily to the blind, which does not exclude their use by all visitors. This is a view that stems from the original perceptions of these gardens as places primarily intended for the visually impaired.

The construction of sensory gardens in Poland began only two decades ago. In 2008, Pawłowska wrote that 'the idea of sensory gardens was not yet popular in Poland' [8].

Design work on sensory gardens was also viewed as a certain form of experimentation. In the first decade of the twenty-first century, this idea was already present in Poland, and conceptual designs were created at universities—e.g., at the Cracow University of Technology, some students prepared concepts for sensory gardens as part of their diploma theses under Pawłowska's guidance [18], although completed projects with such gardens were far from common, especially in public spaces.

The first projects to focus on generally accessible spaces in Poland were sites near national park headquarters and as parts of arboretums. They included: the Environmental Garden of the Senses near the Mouth of the Warta National Park Directorate Building, which had educational features targeting children and young people (2000), the Garden of the Senses near the Babia Góra National Park headquarters building in Zawoja (2007), with amenities for the disabled, including the blind, and the Sensory Garden in the Arboretum and Physiography Facility in Bolestraszyce (2008), which was also adapted to the needs of the disabled, including blind people. During this initial period, the first generally accessible sensory gardens in Poland were located outside of large cities. They were also linked with educational facilities. Only during the second decade of the twenty-first century did such gardens begin to appear in cities, associated with functions that were not educational. Their scope of use was also extended, which brought them closer to the definition of sensory gardens proposed by the Sensory Trust. In Kraków, the establishment of gardens with sensory features and located in public spaces has only been practised for a couple of years, which makes them relatively new facilities, dating from the period between 2013 and 2020, but more are being planned.

Large cities, as areas with a mosaic of places with a diverse range of functions, are dedicated to specific forms of activity. We can thus ask whether sensory gardens are built in spaces with different uses, or whether they are associated with a specific type of urban space. In this paper, we analyse the case of Kraków, one of Poland's largest cities. The objective of this paper was also to characterise and assess gardens with sensory features and located in Kraków as therapeutic spaces, with the use of a specific analytical tool.

3. Object of Study

Kraków is Poland's second-largest city, the largest being Warsaw. Its area is around 327 km², and its population is around 780 thousand [19]. Kraków is a geomorphologically varied city. Various geographic and phytogeographic regions come into contact here [20].

The city's urban greenery system consists of natural greenery that comprises 7.88% of the city's area, with forests making up 6.04%. Apart from forests, these areas also include complexes of aquatic and epilithic plants, as well as naturally growing plants. Urban greenery also includes semi-natural plant complexes such as meadows and pastures, which cover 7.39% of the city's area. There is also anthropogenic plant cover, which constitutes 36% of the city, and includes: fields, orchards, allotment gardens, and ruderal plants. This type of greenery also accompanies developed areas and household gardens and amounts to 29.11% of Kraków. Landscaped greenery covers only 13.47% of the city's area and includes public parks, fortress greenery, cemetery greenery, greenery accompanying sports grounds, streets, Jordan gardens (in Poland, this name is given to green areas established mainly in cities, intended for children and young people), and housing estates [21].

Based on the Polish-language literature and our own investigation, we determined that out of all Polish cities, Kraków had the most publicly available gardens with sensory features. Most of these gardens have never been analysed or mentioned in the Polish-language literature, as they were built relatively recently. The following gardens of this type can be found in Kraków (list by date of completion—garden area measurements were performed based on orthophotomaps: the area values are therefore estimates), the location is shown on the map (Figure 1):

- (A) 'Zapachowo'—fragrance garden in the S. Lem Educational Park (2013)—ca. 742 m²;
- (B) Sensory Garden at the Piaski Nowe housing estate (2019)—ca. 903 m² (Figure 2);

- (C) Garden with sensory features near the J. Czapski Museum (2018–2019)—ca. 260 m² (Figure 3);
- (D) Sensory garden with a sensory path in Tysiąclecia Park (2020)—ca. 1840 m²;
- (E) Sensory garden in Reduta Park (2020)—ca. 2385 m²;
- (F) Playground with sensory features in Jordan Park (built gradually, mostly in recent years)—ca. 2800 m².

Figure 1. Placement of existing gardens with sensory features (A–F) in Kraków. City parks have been marked in green.

Figure 2. Sensory Garden at the Piaski Nowe housing estate, phot. Krzeptowska-Moszkowicz I., 2021.

Figure 3. Garden with sensory features near the J. Czapski Museum, phot. Porada K., 2020.

The existing sensory gardens in Kraków are small spaces within the urban tissue. The first garden of this type in the city was located near an educational building, which aligned with the initial trend in Poland. Gardens in different settings, e.g., in city parks, started to be built later. In our study we used material procured during visits to each site, which were conducted between 2019 and 2021, during spring and summer periods (due to vegetation). These were single visits, lasting several hours each, during which we conducted an inventory of sensory elements. The visits also allowed us to obtain specific data used to characterise each garden and to collect photographic material that can be of aid in analysing and illustrating specific problems (Figures 2 and 3).

4. Research Method

To determine the spaces where gardens with sensory features are located, we analysed the setting of each of their locations. We did this during on-site analyses.

Afterwards, we used a modified version of Trojanowska's method [22], assuming that essential values of therapeutic spaces—in the form of green areas—are comparable. This method was used to analyse public areas in cities, which is another argument in favour of using it to assess the generally accessible gardens with sensory features under study. The method is based on attribute analysis. The attribute was characterised as 'a feature of space or the presence of a type of equipment' [22]. The method assumes that as the number of attributes present in an area increases, so does its therapeutic potential.

Trojanowska used this method to analyse the therapeutic potential of parks, which is why it was necessary to adapt it to highly specific features, namely sensory gardens.

Well-designed sensory gardens should be characterised by the following distinctive characteristics [15]:

- they should be designed with the intent to stimulate human senses;
- they should form a complete whole, isolated from the surroundings;
- they should affect all the senses;
- they should focus on non-visual stimulation;
- apart from sense-stimulating plants, they should also feature other elements that stimulate the senses.

Additional elements can be added to this list:

- they should be animal-friendly, as the presence of animals increases the scope of positive stimuli [17];
- they should be equipped with water features, because of their sonic properties and their importance for plants and animals;
- they should have dedicated use indications that facilitate experiencing the garden from up close [17];

It was necessary to account for the characteristics presented above in the attribute set used to rate the garden. This was possible as the method was not designed as a finite tool, allowing for the addition of attributes.

After analysing the attributes listed by Trojanowska and comparing them with the characteristics of sensory gardens, we found that there was a significant difference concerning one element. Sensory gardens are spaces that are isolated from the surroundings, as experiencing them is oriented inwards, towards perception from up close, while large green areas such as parks are mainly focused outwards, on perceiving distant vistas, including those from outside of a given park's space. This was accounted for in the attribute set, with only a small number of attributes being removed, as we decided that their use in rating sensory gardens was not justified. The remaining attributes, as used by Trojanowska, remained unchanged, with some being combined, as it was possible to rate them together. These included 'elements that indirectly affect the comfort of use of the space: access to food, drink, toilets and others'. We did not find it justified to rate each of these elements separately in the case of sensory gardens, as they all determine user comfort and are often provided in a set (e.g., by the coffee shop in the garden of the J. Czapski Museum, as well as in Reduta Park).

Trojanowska segregated the attributes she had selected by assigning them to design stages—the same approach was used here, with the following stages: functional programme, function-spatial structure, design of internal spaces, architectural form and place-making. We also accounted for sustainability criteria.

This method allows for characterising a garden's features and rating its value. It is a useful analytical tool, as it allows for identifying a garden's specific weaknesses as a therapeutic space. The less attributes, the lower the therapeutic functionality of such a space, and the user can derive less benefits from being in it.

5. Results

5.1. Location of Kraków's Gardens with Sensory Features and Their Users

Based on an analysis of the surroundings of Kraków's gardens with sensory features, we isolated the following urban activity zones (Table 1).

Table 1. Overview of Kraków's gardens with sensory features and an analysis of their surroundings with urban activity zones isolated.

Garden with Sensory Features	General Overview	Location Overview	Use, Users	Urban Activity Zone
(A) in the Educational S. Lem Park	The garden has a freeform composition and consists of a path that meanders between fragrant plants	The garden is a part of a sensory educational park that familiarises users with the laws of physics and that features several dozen installations for personal experimentation	Learning through play, primarily for children, the youth, and adults	Educational zone
(B) accompanying the J. Czapski Museum	The garden has a geometric layout and consists of a large, square lawn and a path that runs around it and leads to the museum building. There are tall pots, mostly with fragrant plants and herbs, along the path	The garden is located in the city centre and belongs to the J. Czapski Museum grounds. It was designed as a place intended for the museum's supplementary events. The building's outer wall is used as a screen for film screenings, and there is also a coffee shop in the garden. There is another Museum nearby, named after E. Hutten-Czapski	Cultural activity intended for visitors to the city and its residents	Cultural and tourist zone

Table 1. Cont.

Garden with Sensory Features	General Overview	Location Overview	Use, Users	Urban Activity Zone
(C) at the Nowe Piaski housing estate	It was designed with central paths extending from a central section and leading to various garden interiors. It has a wealth of plants and small meadows covered with grass and surrounded by greenery	The garden is located on a typical block housing estate distinctive for large Polish cities. The garden is surrounded by housing blocks, streets, and parking lots	Local communal activity, it is also used as a meeting space and to stimulate activity among seniors	Urban housing estate resident activity zone
(D) in Tysiąclecia Park	The garden consists of several sections, its composition is part-freeform and part-geometric.	The garden is located in the centre of a large city park	Outdoor exercise and rest among greenery for local citizens	Recreational zone in an urban green area
(E) in Reduta Park	The garden is located on a slope; most of it is geometric. It features large, narrow beds with fruit bushes and low beds mostly filled with fragrant herbs. The garden features a coffee shop with a roof with a gravel surface and low planters with fragrant plants. The roof can be reached via stairs.	The garden is located in a large city park	Outdoor exercise and rest among greenery for local citizens	Recreational zone in an urban green area
(F) in H. Jordan Park	The garden was built gradually and consists of a sand garden, a section of wooden play equipment for children, a fountain with jets in the pavement surface, and a green labyrinth.	The garden is located in a large park which has been dedicated to children's and youth activity from its inception.	Stimulating children and the youth to lead an active and healthy lifestyle	A zone dedicated to sports activity among children and the youth

The listing above shows that the gardens under analysis are not assigned to any single specific urban activity zone, but instead are located in very different zones within the urban tissue, and as such are dedicated to different user groups. Each of the gardens has specific intended users, ranging from the local community to the general population of the city and tourists. These gardens are therefore directed towards specific users and there is a certain specialisation in this regard. However, when looking at them holistically, it can be said that they are areas of activity for every age group—children, youth, adults, and seniors.

None of the gardens under analysis had any distinguishing features that would suggest an intention of catering to the blind or visually impaired (like the first sensory gardens to be built in Poland and around the world). They lacked dedicated amenities for these groups. It was probably assumed that persons with visual impairments were not intended to be the main users of these gardens.

5.2. Sensory Stimulation in Kraków's Sensory Gardens

While accounting for the evolution of the idea of sensory gardens and the projects built in Kraków, it was found that the gardens with sensory features that existed there at

the time of this study were based primarily on the five basic human senses (Table 2). There were very few elements that stimulated other senses.

Table 2. Listing of sensory stimuli in Kraków’s gardens with sensory features.

Garden with Sensory Features	Taste	Touch	Sight	Hearing	Smell	Others
(A) in the Educational S. Lem Park	None	There is a sensory path near the garden—tactile sensations in feet	Flowers, greenery, plants	People laughing, birds singing	Large areas of fragrant herbs	There is a plant-based labyrinth near the garden
(B) accompanying the J. Czapski Museum	Fruits	The touch of grass, plants, sensory path—tactile sensations in feet	Colours of flowers, fruits, narrow mirrors that reflect plants	Insect buzzing	Fragrant herbs and flowers	Wigwam from willow branches, isolated meadows with grass, a small sensory path
(C) at the Nowe Piaski housing estate	The taste of herbs, nearby coffee shop	Ability to touch plants with different textures	Green and white—the plants and the surroundings	Insect buzzing	Fragrant herbs and flowers	None
(D) in Tysiąclecia Park	None	The touch of perennial plants, sensory path—tactile sensations in feet	Colours of flowers	The sound of water (a fountain)	Bitterling, the smell of herbs and flowers	Elements in the form of a line net
(E) in Reduta Park	Fruits	None	Colours of flowers	Insect buzzing	Smell of herbs	Observation deck with gravel surface
(F) in H. Jordan Park	None	Touch of sand, water, and wood	Green of plants, clear water	Sound of steps on wooden surfaces, birds singing, the sound of water	None	Labyrinth made of plants

5.3. Garden Attribute Analysis

We performed our analysis using the methodology prepared by Trojanowska [22]. Initially, we described the form the attributes took in each garden. To rate the presence of attributes (using numbers), we used the following scale:

- 1—the attribute was present, and its potential was being used well,
- 0.5—the attribute was present, but it was not used to its full potential,
- 0—the attribute was not present.

The assessment of each object was based on observations. Here we used an enhanced rating (by adding the 0.5 value) so that we could assess whether an attribute’s potential was fully introduced into the garden’s space (Tables 3 and 4). The occurrence of the attributes characterising the therapeutic spaces in sensory gardens in Krakow is also presented as a percentage in the graphs (Figure 4).

Table 3. Analysis of the attributes of Kraków's gardens with sensory features—the first group of attributes.

The First Group of Attributes							
Functional Programme	Attribute	(A)	(B)	(C)	(D)	(E)	(F)
(a) Enabling physical and psychological regeneration	Places for rest that facilitate experiencing the surroundings from up close	YES/NO (0.5) too few benches, but they are deep in the garden	YES (1) many seats in various parts of the garden, there is also a small meadow with sunbeds	YES/NO (0.5) there are seats on a platform, but no isolated places or places near plants	YES/NO (0.5) there are seats in various places, but usually along the main path	YES/NO (0.5) too few benches, only in selected places and arranged linearly	YES/NO (0.5) too few benches
	Isolation from the urban environment, noise, smells, and the pressure of time and fast living	YES (1) the garden is at the edge of a science garden and faces the park	YES (1) densely placed plants partially insulate from streets, but there are also places deeper in the garden	YES (1) the garden is located in an interior courtyard	NO (0) a busy path runs through the garden, no plants along the edges	YES/NO (0.5) frequented paths run through the garden, and there is a playground nearby, but the park itself is isolated from busy streets	YES/NO (0.5) the garden is near the park's outer fence, but there are bushes and trees here
	Ability to easily observe animals or people	YES/NO (0.5) insects—there are taller bushes, but many plants are close to the soil surface	YES (1) insects and birds—there are both taller bushes and perennials, as well as bench-side plants	YES (1) insects, as plants are in taller pots	YES/NO (0.5) there are taller perennials, but most plants are short	NO (0)—the benches are placed in a way that prevents a comfortable observation of the nearby park area	YES (1) ability to observe children at play, or birds
(b) Facilitating social contact	Ability to meet as a group	YES/NO (0.5) there is a small space with three benches, but the main path crosses through it, which can make conversing difficult	YES (1) there is a meeting space; benches are often placed in pairs and at an angle, facilitating eye contact and conversation	YES (1) there is a space for meetings—a terrace with chairs and tables that can be rearranged	YES/NO (0.5) meetings are possible, but usually for two people—benches and chairs are placed in pairs	YES/NO (0.5) ability to meet at a coffee shop, but the sensory spaces do not facilitate this	YES (1) the entire space allows group play
(c) Facilitating physical activity	Places for play and recreation	YES (1) a large lawn, with equipment for performing experiments nearby	YES (1) a meadow in a garden with sunbeds and a wigwam made of living willow branches for children	YES/NO (0.5) there is a lawn, but due to the proximity of a Museum it is not used for physical activity	YES (1) features with a line net suspended from metal frames; extensive lawns nearby	YES/NO (0.5) there are lawns, but the site is on a slope, which excludes several activity types	YES (1) the entire area facilitates play for children and their caretakers
	Place dedicated to gardening classes or hortitherapy	NO (0)—absent	YES (1) a large table for classes in the central part	NO (0)—absent	NO (0)—absent	NO (0)—absent	NO (0)—absent

Table 3. Cont.

The First Group of Attributes							
		(A)	(B)	(C)	(D)	(E)	(F)
Functional Programme	Attribute						
(d) Meeting essential user needs	Safety in the garden space	YES (1) the garden is located in a larger, fenced science garden	YES (1) the garden is fenced	YES (1) the garden is close to the Museum, in its internal courtyard	NO (0) lack of isolation from the remainder of the park	NO (0) lack of isolation from the remainder of the park	YES (1) the site is fenced with a low fence
	Safety in direct contact with plants	YES (0.5) the plants are safe, but there are also roses	YES/NO (0.5) most plants are safe, but there are also prickly plants	YES (1) safe plants were used, mainly herbs	YES/NO (0.5) there are rose bushes around a fountain	YES/NO (0.5) safe plants were used, but there are gooseberry bushes	YES (1) the labyrinth is made from safe plants
	Seating or shelter	YES/NO (0.5) there is shelter under tree canopies	YES (1) shelter under a sail suspended above the garden's central space	YES (1) shelter inside a coffee shop that opens towards the garden	YES (0.5) there is shelter under tree canopies	YES (1) shelter inside a coffee shop	YES/NO (0.5) there is shelter under tree canopies
	Sunny and shaded places	YES/NO (0.5) there are only sunny spaces in the garden	YES (1)	YES (1)	YES (1)	YES/NO (0.5) there are only sunny spaces in the garden	YES (1)
	Amenities for the disabled	NO (0) a gravel path with solid strips, but turns are at an angle that make it impossible for wheelchair-bound persons to make them	YES/NO (0.5) wide paths, but no amenities for the blind	YES/NO (0.5) wide paths, but no dedicated amenities for the blind	YES/NO (0.5) wide, even paths, but no dedicated amenities for the blind	NO (0) the garden is on a slope, the paths along bushes are narrow and dead-ended, which hinders wheelchair movement, stairs to the observation deck	NO (0) absent
	Elements that indirectly affect comfort of use: access to food and drink, toilets, and others	YES (1) they are present in the park	YES/NO (0.5) they are absent in the park; there are bicycle stands and waste bins	YES (1) there is a coffee shop that opens towards the garden	YES/NO (0.5) there are bicycle stands	YES (1) there is a coffee shop with restrooms	YES (1) they are present in the park
(e) Cognitive support	Features that facilitate education in the garden	YES (1) plaques with plant names	YES (1) information boards that also feature plant names	NO (0)	NO (0) no plaques	NO (0) no plaques	YES/NO (0.5) learning through play facilitated by playground equipment

Table 4. Analysis of the attributes of Kraków’s gardens with sensory features—the second group of attributes.

The Second Group of Attributes							
Attribute		(A)	(B)	(C)	(D)	(E)	(F)
Functionio-spatial structure	Isolation of the garden from its surroundings, creating a separate, intimate space	YES/NO (0.5)	YES (1)	YES (1)	NO (0)	NO (0)	YES (1)
	Siting in a place that retains fragrances and sounds inside the garden	YES (1) there is a hill near the garden that shelters it from one side	YES (1) plants located around the outer rim of the garden shelter it from draughts	YES (1) the garden is surrounded by solid fences and walls	YES/NO (0.5) the garden is in a depressed area, but has no buffer greenery to protect it from draughts	YES/NO (0.5) only partially protected	NO (0)
Internal space and architectural form design	Garden complexity, presence of various garden interiors, proper path system	YES/NO (0.5) interesting path course, no interiors for longer stays	YES (1) the garden is divided into interiors where one can sit and stay longer	YES/NO (0.5) the layout is simple, the path encircles a lawn, but plant pots are only on one side	YES (1) the garden has varied interiors and each has rest spaces	YES/NO (0.5) there are diverse interiors but no paths, some paths have dead ends, little room to sit among the plants	YES/NO (0.5) the path runs through the garden’s centre, which allows easy access to its every part; there are two entrances
	Legibility of composition	YES/NO (0.5) the composition is not entirely legible, there are dead-ended side paths	YES (1) a clear central path with side paths	YES (1) legible, geometric composition	YES/NO (0.5) consists of several sections, which appear isolated from each other	YES/NO (0.5) consists of several sections which do not appear coherent	YES/NO (0.5) consists of several sections with poor compositional linkages
	Presence of water, especially water in motion	NO (0)	NO (0)	NO (0)	YES (1) there is a fountain	NO (0)	YES (1) there is a fountain in the form of water jets
	Plant sensory impact on each of the senses	YES/NO (0.5) mostly a scent-based garden	YES (1) each of the five senses is highlighted in a separate part of the garden	YES (1) plants in pots provide a diverse range of sensations, they can also be tasted	YES/NO (0.5) various plants that induce sensory experiences, no experiences based on taste	YES/NO (0.5) numerous fragrant plants and fruit-bearing bushes, one can hear the rustle of grass and the sound of gravel, but touch is not stimulated	NO (0)
	Intensity of plant sensory impact (e.g., diversity of species, large spaces, elevated beds)	YES (1) large patches of fragrant plants situated along paths	YES (1) wealth of species and strains; plants also placed in pots built into benches	YES (1) plants elevated and placed in large pots	YES (1) sensory path surrounded by sensory active plants	YES/NO (0.5) presence of fragrant plants in isolated areas, but difficult to reach and without seats	NO (0) absent

Table 4. Cont.

The Second Group of Attributes							
Attribute		(A)	(B)	(C)	(D)	(E)	(F)
Placemaking	Other sensory active elements (e.g., labyrinth, sensory path)	YES (1) sensory path and labyrinths near the garden	YES (1) small sensory path	NO (0) absent	YES (1) sensory path	YES/NO (0.5) observation deck on roof, with a gravel surface, but only accessible via stairs	YES (1) labyrinth
	Ability to personalise the space	NO (0)	NO (0)	NO (0)	NO (0)	NO (0)	NO (0)
	Ability to animate the space	YES/NO (0.5) lessons for children, the youth, or adults in the open	YES (1) a green meadow and a tent from living willow branches form a place for play and recreation	YES (1) multimedia presentations, films on the museum wall (chairs laid out on the lawn)	YES/NO (0.5) small tables where one can play board games or chess	NO (0)	YES (1) potential to use one's imagination and engage in various forms of play
	Artistic creations	NO (0)	YES (1) white cubes that act as seats	YES (1) the Museum wall has an artistic expression	NO (0)	NO (0)	NO (0)
Sustainability criteria	Special indications for use that facilitate experiencing the garden from up close	NO (0)	YES (1) one can taste fruits	YES (1) one can taste herbs	NO (0)	YES (1) one can taste fruits	YES (1) one can directly use all the equipment, including the fountain
	Biodiversity preservation: use of domestic plant species and plants attractive to various groups of animals, creating habitats for animals	YES/NO (0.5) some plants are attractive to butterflies or other insects	YES (1) introduction of plants attractive to the hymenoptera species, plants with fruit for birds; bird habitats	YES/NO (0.5) intentional use of species attractive to species of hymenoptera	YES/NO (0.5) some plants are attractive to butterflies or other insects	YES/NO (0.5) some plants are attractive to insects	NO (0)
	Sustainable water management, e.g., stormwater collection and use	NO (0)	NO (0)	NO (0)	NO (0)	NO (0)	NO (0)
	Natural energy sources	NOT APPLICABLE—no electrical appliances	NOT APPLICABLE—no electrical appliances	NO (0)	NO (0)	NO (0)	NO (0)
	Natural garden maintenance methods	No data	No data	YES (1)	No data	No data	No data

Figure 4. Presence of attributes that characterise the therapeutic spaces in each garden with sensory features in Kraków, in percentages. The letters A–F on the horizontal axis represent the gardens analysed; the description follows Figure 1.

The greatest number of attributes was found in the sensory garden at the Piaski Nowe housing estate. It was not given a perfect rating, as it did not feature any water features, including those based on stormwater. One of the least demanding solutions of this type could be a fountain for birds or for insects, with water obtained from waste, while more advanced water features include fountains, cascades, or flowing water. Following the principle that the more attributes a garden has, the better it is at performing its therapeutic function, it can be stated it was designed very well for this type of space. The deficiencies that were identified during assessment were not significant and making up for them is not impossible. We found it could be done without major changes to the garden's structure.

The least amount of points was given to two gardens that were recently built in city parks: Tysiąclecia Park and Reduta Park, as they had the lowest number of attributes. The most serious deficiency in both of them was that the sensory space was not isolated from the remainder of the parks. Isolation is a crucial characteristic of sensory gardens, and not providing it results in the gardens not having the atmosphere necessary to perceive the garden from up close and not receiving the resultant psychological regeneration. During a site visit we observed that dogs were allowed into these spaces and that people who crossed the park space were moving in a hurry. This indicates that these parks are often used as shortcuts to other destinations and visitors have no intention of using the therapeutic garden space.

In the case of the second garden, in Reduta Park, its designers used many bold and non-standard ideas (large areas covered by plants with edible fruit, a terrace with noisy gravel, or grass surrounding benches), yet their implementation, considering the failure to meet essential requirements of sensory gardens as therapeutic spaces, prevented a positive assessment.

The playground in H. Jordan Park has many features of a sensory garden. This garden could provide better sensory stimulation, both to children that visit the playground and to their caretakers, if it featured beds planted with stimulating plants.

Both gardens with sensory features that possessed intentionally placed elements that are friendly to pollinating insects, mainly those from the order hymenoptera and butterflies (the garden at the Piaski Nowe housing estate and near the J. Czapski Museum) were found to be places where pollinating insects visited flowering plants. Other sensory gardens (in the S. Lem Park, Tysiąclecia Park, and Reduta Park), despite not being inten-

tionally designed as animal-friendly, fulfilled a similar role due to having large areas with blooming plants.

6. Discussion

The analytical tool based on Trojanowska's method [22] which we used to study Kraków's gardens with sensory features yielded results that are easy to list and allow for a quick comparison of each garden, combined with an identification of their weaknesses. This is due to the method employing a very good listing of therapeutic space attributes, which introduces a certain standardisation when studying structures of this type. This method also allows the list of attributes to be extended as the concept of therapeutic gardens evolves and develops, in addition to offering a better understanding of their potential while maintaining its value as an analytical tool. The potential of sensory gardens, both in generally accessible spaces and in healthcare and therapeutic facilities, has yet to be fully explored, with additional studies providing greater insight into their value and practical use [7].

However, it should be noted that this method was originally designed for studying public spaces. It may not be well suited to the study of gardens with sensory features that were designed to accompany healthcare and therapeutic facilities, as such gardens are prepared for highly specific users, who often suffer from health disorders and have special needs. When one designs a garden to accompany such an institution, the participation of their future users should be greater. Hussein argued that it is necessary to account for the therapeutic needs of specific patients, which is crucial to a positive outcome of their therapy [3,7], and Bengsston noted that such therapeutic gardens should be designed to offer patients a choice of activity and a sensory perception of the garden adapted to the level that they are currently capable of [23]. This means that such gardens should have a different structure than those located in public places.

The fifth group of attributes, namely accounting for sustainability precepts, was rated the lowest in the gardens under analysis. The first attribute, which concerns supporting biodiversity in sensory gardens, was found to be present only partially. The Polish-language literature highlights the significance of animal presence in therapeutic gardens [24]. It can even be suggested that it should be one of the essential characteristics of a sensory garden, as it considerably enhances the scope of sensory stimuli [17]. The presence of flowering and fruit-bearing plants in Kraków's gardens with sensory features supports urban fauna, especially insects and birds, which was visible in those gardens where specific plant species had been introduced (the garden in plant pots by the J. Czapski Museum and the garden at the Piaski Nowe housing estate). This is crucial in Kraków city parks, as beds with blooming plants are a rarity there. Furthermore, the lawns are intensively mowed, which is not conducive to plant species variety [25]. The use of ornamental plants aids in maintaining pollinator diversity, but only in the condition that the flowers have properties beneficial to them. Gardens intentionally designed as bee- or butterfly-friendly provide the best effect due to the use of species that are appropriate for them [26].

Sensory gardens have not been built in every urban activity zone in Kraków that could accommodate them. Other large cities around the world feature spaces for employees. New York provides the best practices in this regard, with its two pocket gardens: GreenAcre Park and Paley Park [8]. There are also cases of external green spaces accompanying places of employment, such as office gardens, which are sometimes built on rooftops and are dedicated solely to a given building's employees, of which London is a good example [27]. There are studies that show how crucial green surroundings are to office workers. They found that windows with a view of greenery and indoor plants visibly reduced workplace stress [28]. The ability to spend one's lunchbreak or free time in a sensory garden space would be all the more beneficial. Of the gardens under analysis, the garden near the J. Czapski Museum is the closest to this concept, although it is not a typical garden dedicated to employees. It was constructed in the city centre and includes a coffee shop terrace that is a part of the Museum, which allows visitors to spend more time in a sensory environment.

7. Conclusions

The method we used in this study allowed us to critically assess these complexes, which can enable the introduction of specific changes, as they can be easily identified as attributes. Thus, the method can be used both to study completed gardens and earlier, during the design phase. It can therefore be used in practice. It can be said that there is a need to apply it, as demonstrated by the latest gardens with sensory features that have been built in Kraków, and which have visible, essential deficiencies that prevent making use of their full potential as sensory spaces.

The method is not only a practical tool but also the proposal of an academic method (an analytical procedure that can be used in investigations) that allows for an in-depth analysis of such gardens.

In Poland, a country that has only recently begun introducing sensory gardens into public spaces, the evolution of this concept has started to develop rapidly, and Kraków's gardens are not copies of some specific scheme. They include a variety of solutions in terms of layout and sensory stimulus sources.

Author Contributions: Investigation: I.K.-M., Ł.M., K.P.; Methodology: I.K.-M., Ł.M.; Visualization: K.P., Ł.M.; Writing—original draft: I.K.-M.; Writing—review & editing: K.P. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The study did not report any data.

Conflicts of Interest: The authors declare no conflict of interest.

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