

Contemporary trends in design of public physical activity spaces in selected residential areas in Młynówka Królewska area, Cracow

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Abstract

This article outlines research directions for the design of public spaces that encourage physical activity. The objective of research is to evaluate spatial and functional solutions of the selected spaces and to identify potential new forms of these spaces. The paper identifies the essential elements of well-functioning public spaces that promote health and well-being of local communities based on urban analysis and the Author's own observations. The results of this study demonstrate the importance of location of facilities with diverse functions, scales, and levels of technological advancement, as well as the characteristics of the surrounding environment, in influencing and shaping the types of physical activity observed within these spaces. The results also highlight the complexity of issue addressed and indicate the need for further research into movement activity spaces.

Keywords: public space, physical activity, sustainability, residential area, green spaces, recreational areas, health, lifestyle

1. Introduction

1.1. Issues

The civilization progress and dynamic development of technologies have led to an intensification of a rhythm of human life. These factors influence the expectations, both residence and surroundings. In the contemporary era, living space is not merely a place to live; it is also a space designed to promote well-being and provide convenient access to urban infrastructure, including public transport, various services, and places for recreation, leisure, and physical activity. In response to the deluge of information, chronic stress and a growing public awareness of determinants that support a healthy lifestyle, areas offering access to extensive green spaces are appreciated. The subsequent issue addressed in this study is the necessity to adapt public spaces in order to accommodate diverse needs of users from different demographics. The problems addressed in this study include issues related to the evaluation of public spaces for physical activity in residential areas and the impact of their design on the activity of residents.

1.2. A glossary of terms and abbreviations

In this study, the term *physical activity* space is defined as a generally accessible (public) space for various forms of physical activity. Such spaces are most often exposed in an appropriate manner and serve a variety of functions, including those of sports fields, tennis courts, outdoor gyms and playgrounds. The following terms are employed in this study: accessibility, facilities, flexibility of use, spatial configuration, safety and neighbourhood. *Accessibility* is defined as the ease with which facilities and spaces for physical activity are accessible to all residents, regardless of age or physical abilities. This term encompasses access to sports facilities, cycling and walking paths, playgrounds, and other locations that facilitate physical activity. In context of physical activity spaces, a term *equipment* is understood to refer to the use of equipment that is already present in these spaces.

In contrast, the *flexibility* of solutions used allows for the positioning of individual pieces of equipment in a manner that permits the space to be adapted to changing needs. The spatial *configuration* indicates a state in which the elements of the space are arranged in a way that contributes to the creation of spatial arrangements which provide users with a sense of intimacy and security. The term *neighbourhood* is understood to refer to the immediate vicinity of the studied spaces, encompassing a range of facilities and architectural elements, including sports, service, and educational facilities, as well as residential architecture.

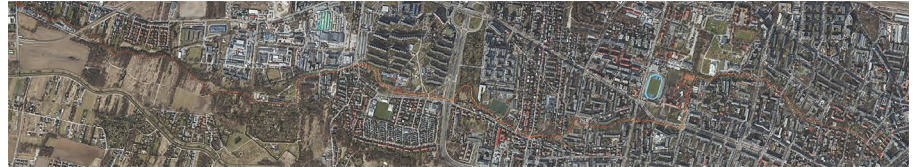
The research described in this paper was conducted in the area of a former watercourse, which has been transformed over the years into a linear park, known as Młynówka Królewska in Cracow. The green areas, which extend from Filtrowa Street to Grottgera Street at the level of Aleja Trzech Wieszczów, are characterised by a diverse structural composition. A network of pedestrian and bicycle routes was established along the entire length of the establishment. The aforementioned principal traffic artery is accompanied by recreational areas with designated spaces for physical activity (Fig. 1).

1.3. Research subject

The research focuses on the analysis of selected spaces (including their new forms) and the assessment of the quality of physical activity spaces in terms of accessibility, equipment, flexibility of the solutions used, spatial configuration and safety. Furthermore, the study considers the impact of the surrounding environment, including housing, service, sports or educational

facilities. This study also considers the legibility of the applied solutions and aesthetic values, as well as their impact on the use of the studied areas. The selected physical activity spaces situated along Młynówka Królewska Park in Cracow were subjected to study (Fig. 1).

Fig. 1. Młynówka Królewska linear park in Cracow, The location of recreational space. Description: red dots – beginning and the end of the park; lines: red – main pedestrian and cycle path; orange – separated cycle path. 1 – Łobzów Park (own elaboration)



1.4. Scientific and technical knowledge

This paper presents the results of studies on green spaces, in order to show whether the design of the spaces under study is in line with the needs of users. The most up-to-date research in this field includes a qualitative study of places of residence, published in the *Interim Report* (European Commission, 2002). Empirical evidence indicates that access to green open spaces, such as public parks and the accompanying sports infrastructure, is a significant determinant of quality of life.

The beneficial impact of green spaces on quality of life was also demonstrated in the publication *Urban Green Spaces and Health* (World Health Organisation, 2016), in which numerous urban areas with diverse structures were examined. Access to green spaces in urban areas has been associated with reduced stress levels, improved mood and increased life satisfaction. Individuals with convenient access to green spaces are more likely to engage in outdoor activities, which can lead to enhanced physical fitness and overall health.

Furthermore, the paper reports on the distance of the amenities in question. A distance of 300 to 500 metres is considered to be a distance that makes an area easily accessible. The distance at which green spaces become beneficial to human health and well-being has also been investigated in earlier studies (Chmielewski, 2001; Schneider-Skalska, 2004), which reached similar conclusions. Studies on the influence of the design of green areas in residential neighbourhoods (Yin, Liu, Sun, 2023; Almagor, Omer, Omer, Birenboim, 2024) indicate that the distance of recreational areas from the residence is as important as access to the city centre.

Moreover, proximity to physical activity spaces has been demonstrated to reduce the risk of cardiovascular disease (Garg et al., 2021; Huang et al., 2023). A number of studies have been conducted on the beneficial effects of the presence of walking and cycling paths in the vicinity of residential areas and accompanying barriers (Wang et al., 2016; Lei et al., 2024). The study identified characteristics that facilitate the utilisation of physical activity spaces in urban areas.

A further review was conducted of the motivational factors for physical activity in public spaces (Baert, et. al, 2011). This identified 61 motivational factors and 59 barriers to physical activity among older people. It is crucial to highlight the findings of studies demonstrating a significant influence of the residential environment on the health of residents (Jiang et al., 2024). It can be reasonably deduced that outdoor activities have a beneficial effect on the immunity levels of residents. Furthermore, a positive perception of the surrounding environment of the residence encourages the utilisation of accompanying recreational spaces. It is similarly important to conduct research into the needs of residents of all ages, including families. The common space in a residential area should meet quality criteria in terms of social life, health, comfort and beauty. The presence of public spaces in the housing area provides the opportunity to utilise the resources of the neighbourhood and encourages contacts and meetings. Studies have demonstrated the importance

of close access to a variety of services and public transport stops (Dudzic-Gyurkovich, 2023).

Due to the importance of the study area, it is also necessary to mention the studies concerning the Młynówka Królewska area in Cracow. The results of studies examining the economic role of the Młynówka Królewska and its influence on the current development of the city are well known (Hebda-Małocha, Małocha, 2007; Miszczyk, Morawiec, Stachura, 2009). The necessity for an understanding of the historical context of a location in order to create visually appealing green spaces that are seamlessly integrated into the existing urban fabric was exemplified in this instance.

A further study was conducted, which indicated the spatial potential of the Młynówka Królewska park (Kowalski, Zieliński, Amado, 2021) in the context of the revitalisation of riverside areas. The study area was identified as a means of improving the accessibility of green areas within the city, which is of significant importance in light of the constant overdevelopment of residential areas in the area (Dudzic-Gyurkovich, 2021). The Młynówka Królewska, measuring approximately 7.5 km with an area of 29.4 ha, represents a significant component of urban greenery within the western part of Cracow. It exerts a profound influence on the urban fabric of the area and is a notable feature within the cityscape. The presence of this area on the city plan provides convenient access to recreational areas for the surrounding residential areas.

The study area is the Łobzów Park adjacent to Młynówka Królewska, which is an integral part of the park and palace complex of the Royal Palace in Łobzów. The site was entered in the register of monuments in 1983 and included in the Młynówka Królewska – Grottgera Local Plan in 2012. It has long attracted the interest of scholars who, over the years, have attempted to systematise knowledge and sources on both the palace itself and the surrounding green areas.

The history of the place dates back to the second half of the 14th century, when Casimir the Great erected a fortalicium – a residential and defensive building, as confirmed by Maciej from Miechów in *Chronica Polonorum* of 1519. The initially modest residence acquired a representative character in the 16th century, when Stefan Batory commissioned Santi Gucci to extend it, retaining the brick tower from the time of Casimir the Great. Further work continued under Sigismund III Vasa in the years 1594–1595 and in the years 1602–1605, when Giovanni Trevano gave the establishment a Baroque character (Kieszkowski, 1935).

There is a lack of data on the fate of the palace after its destruction by the Swedes. It is unclear how the palace was rebuilt under Jan III Sobieski and how it was transformed when it came into the possession of the Austrians at the beginning of the 19th century and was converted into the Cadet School (Hryniewicz, 2018; Pikurski, 2020). After 1918, the building served as the Cadet School, while today it still houses the Faculty of Architecture of the Cracow University of Technology.

The royal garden at Łobzów was formed during the Renaissance period and is considered the first ornamental garden (Jankowski, 1923). Its history depended on the fate of the Łobzów residence. An attempt was made to reconstruct the Renaissance reconstruction phase of the residence based on previous research (Bogdanowski, 1997). The most detailed research on the transformation of the surroundings of the former palace from medieval times to the 20th century includes a review of sources and an attempt to reconstruct the changes occurring in the complex, together with a detailed calendar (Krasnowolski, Rączka, 2007). Numerous preserved iconographies and plans showing the changes to the surroundings of the residence both at the time when it was the seat of the king and at a later time, when the function of the building changed, may have been helpful in conducting the research.

The former site has undergone numerous transformations and over time has been divided up among various users. Beginning in the 1950s, among

other things, a stadium with stands, a sports hall (WKS Wawel still in operation today) and a petrol station in the foreground were built on the historic garden. Full fences were introduced, disrupting the historic compositional layout (Zachariasz, 2014).

The Łobzów garden has been the subject of several revalorisation projects. One of them envisaged the development of the historic garden area as a public museum of garden art (Bogdanowski, Zachariasz, 1990). In 2013, another project was developed, taking into account contemporary realities and ownership status (Zachariasz et. al., 2013). The part of the project covering the northern part of the former gardens, which is the subject of the present study, is very similar to the currently existing Łobzów Park. The plan shows the existing course of fences, main paths, playing fields and tennis courts and much of the greenery.

The facility in its existing state was put into use for residents in 2015–2016.

Nowadays in Poland there are many recreational zones in public spaces with origins similar to Łobzów Park in Cracow. One such example is Szczytnicki Park in Wrocław, located on the site of the former duke's gardens. The history of the park site dates back to the second half of the 13th century. The project to arrange and manage the princely gardens began in the second half of the 19th century. As a result of adding new plots to the tidy former gardens and making numerous replantings, by the middle of the 20th century the park had grown from 40 to 100 ha, making it one of the largest parks in Wrocław. The area is characterised by extensive green areas, accompanied by avenues and recreational areas. This park is distinguished by its high compositional and dendrological values (Pierścionek, 2014). The park includes the Japanese Garden, which is popular with tourists. The zoo and the Centennial Hall are in the vicinity, making the site an important point on the city map.

A second example of a recreational zone in public space with a similar origin is the Henryk Jordan Park in Cracow (a historic garden). The history of one of the oldest and best known parks in the city dates back to the 19th century. Officially opened in 1865, the park was gradually extended and beautified. The 19.77-ha site is distinguished by numerous walking and cycling paths, flowerbeds, fountains, sculptures and monuments, a pond and benches. Today, as in the Łobzów Park, there are playing fields, playgrounds and outdoor gyms. The extensive green areas located in the city centre also host a variety of cultural events. Like the previous example, it is an important point on the tourist map of the city. This area, due to its natural, cultural and educational values, is the subject of research (Torowska, 2014).

1.5. Hypothesis and Research Objective

The objective of the research is to confirm the hypothesis, typology and evaluation of the spatial and functional solutions of the spaces selected for study, which are situated along the Młynówka Królewska city park in Cracow. The thesis put forth is that factors such as equipment, safety, spatial configuration, and flexibility favor the use of the spaces under study. The character of the surrounding area exerts a significant influence on the willingness of different age groups to use the facilities. The objective of this research is to ascertain whether the introduction of novel forms of physical activity can be accommodated within the existing framework, in terms of equipment, safety, spatial configuration and flexibility.

In order to address the aforementioned issues, the following research questions were formulated: What are the contemporary trends in the design of public spaces for physical activity in the study area? Which areas are located in the vicinity of the aforementioned spaces? How do the aforementioned spaces for physical activity respond to the needs of the residents? What are the factors promoting the use of the aforementioned spaces? Does the proximity of sports facilities influence the use of public spaces for physical activity?

What factors hinder the use of the aforementioned spaces? Which age group is most likely to use the selected physical activity complexes?

1.6. Methods of research

The research methodology used was a site visit and a functional-spatial analysis of the physical activity spaces. A specific emphasis was placed on analysing the manner in which outdoor gyms function. A summary of the elements to be analysed was drawn up, taking into account data such as the location of each complex, the accessibility radius (to the studied facilities), neighbouring buildings with regard to function and spatial barriers. A further research method employed was the measurement and observation of the solutions in question, with a view to ascertaining their flexibility and suitability for use in the context of social isolation. The research is further enhanced by photographic documentation.

1.7. Research context

The context for research on contemporary trends in design of public physical activity spaces in residential areas encompasses several key aspects: social, urban and health. As population densities increase and the impact of green recreational areas on the physical and mental health of residents becomes more widely understood, there is a growing need to create spaces that promote healthy living and social inclusion. In the context of urban areas, it is essential to consider how to optimally use available spaces to meet the physical activity needs of residents, while also ensuring sustainability and enhancing quality of life. The global threat of the novel coronavirus (COVID-19) has prompted a renewed focus on accessibility and health. Research that addresses the specific needs of users in the context of the current pandemic highlights the significance of the immediate environment. The importance of proximity and accessibility of public spaces for physical activity has become particularly evident in the context of the global pandemic. The importance of public spaces for physical activity has become particularly evident in the context of social distancing. It is therefore crucial to ensure that these spaces are accessible and proximate, and that they can be used despite the need for social distance.

Another context for the research is the ageing population. As individuals age, their preferences for the function and accessibility of public spaces undergo a transformation. There is a growing interest in identifying the challenges faced by older adults in urban areas in Poland and across Europe. The study found that factors that facilitate the functioning of older people in public spaces include pavements in good condition and a relatively high proportion of small architectural elements, such as benches and waste bins, which create conversation-friendly places. In order to facilitate the mobility of older individuals in residential areas, it is imperative to avoid the implementation of elements that impede efficient mobility, such as stairs and high kerbs. Furthermore, the distance between the place of residence and the leisure area can be perceived as too great and discouraging.

1.8. Research problem, existing constraints

The research problem concerns the analysis of contemporary trends in the design of selected public spaces for physical activity, with particular consideration of the way in which outdoor gyms are organised. The utilisation of mobility activity spaces is constrained by spatial barriers, including fences, high kerbs, the absence of clearly visible entrances and passageways leading to the study areas, and ramps for bicycles and wheelchairs. One potential deterrent to the utilisation of the space is a bad technical condition of the

facilities. It is widely acknowledged that the proximity of green areas, which provide opportunities for outdoor recreation, enhances the quality of life in urban environment.

Moreover, the presence of green spaces contributes to a reduction in noise levels, an improvement of air quality, and the creation of a comfortable, aesthetically pleasing and pleasant environment for place of residence. Furthermore, the proximity of green public spaces has a positive impact on the physical and mental health of residents, encouraging them to engage in outdoor physical activity. New movement activity spaces have been created in the study area. These spaces surveyed are multifunctional in nature.

However, it is uncertain whether they are accessible to people of all generations. It is currently unclear whether the individuals surveyed utilize the spaces in question. The necessity of ensuring that equipment and additional lighting are in good working order, together with other measures to ensure a sense of security, is also unclear. Aspects concerning the use of the repeatedly mentioned convenient spatial configuration and the flexibility of existing solutions must also be questioned. This study aims to ascertain whether the existence of such areas meets the needs of the local community and whether they are suitable for users from different age groups. It will also establish whether the areas studied meet the criteria for sustainable design. The results of the study will provide new insights that can be used for further research and will assist in the planning and transformation of physical activity spaces in other locations.

2. Research methods

The objective of this study is twofold. Firstly, it seeks to corroborate a previously formulated thesis. Secondly, it endeavors to ascertain the impact that the quality of recreational spaces in residential areas exerts upon residents' physical activity levels. A study focusing on the analysis of three selected forms of physical activity – outdoor gyms – located along the former Młynówka Królewska watercourse serves to assess new trends in the design of recreational green spaces based on sustainable design principles. The following problem groups were considered in the assessment: equipment, accessibility, flexibility of solutions, spatial configuration of the examined area, safety and adaptation of solutions used to the needs of users from different age groups.

The research was conducted using an urban analysis. The objective of this study was to diagnose functional and spatial conditions of areas under investigation. The results of this analysis were presented in the form of functional-spatial diagrams. The researchers took into account a number of factors when evaluating the suitability of the study area. These included the location of the activities being considered, the characteristics of neighbouring areas, the scale and type of neighbouring development, the scale of greenery, the openings between the study area and neighbouring areas, communication and spatial barriers, and the presence of small architectural elements. In addition, an evaluation form was used to assess a number of other factors, including the equipment available, accessibility, the flexibility of the solutions proposed, the configuration of the site, and safety.

The analysis was further enhanced by the utilisation of photographic documentation and the accessibility radius of the assessed space elements, employing GIS (geographical information system) tools such as the National Geoportal and Google Maps. The second research method used in the study was the author's own observations, which enabled the observation of the utilisation of outdoor gyms by different age groups. The study also sought to identify the factors that motivate users to use the study areas and to ascertain whether the proximity of primary services and sports facilities influences the utilisation

of outdoor activity spaces. To conduct the self-observations, an evaluation form was constructed containing a summary of the elements of the analysis, including the surveyed location of the observations and the age diversity of the users.

3. Results

This paper presents the results of a study conducted using the previously presented research methods. Outdoor gyms located in the Łobzów Park in Podchorążych Street, situated in the vicinity of the Młynówka Królewska Park in Cracow, were surveyed (Fig. 1). In the evaluation form, the equipment of the studied facilities was assessed in terms of: aesthetics, technical condition, distribution, number of devices and the presence of elements supporting their function (benches, bins). The aesthetics and technical condition of the facilities were assessed on a scale of 1 (bad) to 5 (very good). Scale from 1 (bad) to 5 (very good). The accessibility of the facilities was evaluated in consideration of the approximate distance in a straight line to the nearest residential, educational and service buildings and public transport stops, the distance from traffic routes, the technical condition of the routes (assessed on a scale of 1 to 5), and the visibility of information regarding the manner and hours of use. The flexibility of the solutions was assessed in terms of climatic conditions (ventilation, sunlight), the mobility of equipment allowing for rapid rearrangement and adaptation of the space to changing needs. In order to assess the safety of the facilities surveyed, the following factors were taken into account: lighting, location in areas of user concentration, semi-open spatial configuration and fencing. According to the rules and regulations for use posted in the range of physical activity spaces, the gym equipment is intended for people over 140 cm tall and 14 years of age (without adult supervision). The aforementioned exceptions pertain to the second location surveyed, where the facility is intended for unsupervised use by individuals over the age of 18.

3.1. Łobzów Park

The study area (Fig. 2, 3) comprises two activities: a recreation area, which constitutes the primary component of the park establishment, and a number of ancillary facilities, including two multi-purpose fields, a climbing wall, a fenced-in children's playground, and a fenced-in tennis court (Fig. 4). The park is situated in close proximity to a number of sporting facilities, including tennis courts, pitches, running tracks and a stadium. Additionally, it is located in the vicinity of an educational establishment Faculty of Architecture, CUT. Furthermore, it is situated in close proximity to a number of service facilities. The park is located in the immediate vicinity of the main traffic route, which runs along the Młynówka Królewska.

The presence of high fences, walls and tall greenery, particularly on the north-east side, results in a lack of visibility of the space over a long stretch. The proportionally small number of entrances to the facility represents an additional barrier. The location of the outdoor gyms (Fig. 4–6) in the depths of the park, at points obscured by tall greenery, means that from a further perspective the facilities surveyed are not visible to the potential user. The condition of the equipment at this location was found to be satisfactory, both aesthetically and technically. The distance between equipment at both outdoor gyms is approximately 5 m, which allows for simultaneous use of the equipment. The number of pieces of equipment at the gym in the southern part of the park is 3 (Fig. 6). Supporting elements can be seen in the vicinity of the gym. At the gym located to the north (Fig. 4, 5), where the number of devices is 7, there are no supporting elements. The total number of pieces of equipment in the

study area is sufficient to meet the needs of the local population. The distances from residential buildings, services, educational facilities, the main pedestrian route and public transport stops are within 100–200 metres, thus making the surveyed facilities easily accessible.

The condition of the walkway along the longer edge of the fence was assessed as good. However, the barrier at the entrance from this side is a high kerb. The pavement at the entrance on the south side, where it is possible to pass without crossing the kerb, is in a bad state. The circulation paths in Łobzów Park are in optimal condition, exhibiting no signs of deterioration or damage. There is no visible signage indicating the opening hours of the facility. Each of the exercise machines is equipped with a QR code plaque. The study sites are partially exposed to the sun despite their proximity to tall trees. The spatial configuration allows them to be ventilated. The exercise equipment is not mobile, but its mutual distance would allow for use in conditions requiring social distance. The surveyed gyms are well lit, and it is possible to use the equipment after dark (Fig. 7). However, the lack of security caused by the distance of the facilities from the main pedestrian route, additionally fenced off by rows of medium and high greenery, has a demotivating effect on potential users. The space in which



Fig. 2. Functional-spatial analysis of Łobzów Park with adjacent areas (own elaboration)



Fig. 3. Functional and spatial analysis of Łobzów Park (own elaboration)

the studied facilities are located, due to its proximity to areas where sports activities and competitions take place, brings users together. The influence of the vicinity of the sports club grounds on the use of the outdoor gyms was not found. Both gyms are characterised by a semi-open spatial configuration. The larger facility, located in the vicinity of the tennis courts (Fig. 5) and away from the central part of the park, is additionally separated by a hedge, which makes the facility less visible on the one hand and more intimate on the other. In contrast, the smaller gym, located next to the walking path, does not have an additional fence. The smaller gym (Fig. 6), situated in close proximity to the walking path, lacks the presence of an additional fence, yet it is more visible and therefore used by a greater number of users.



Fig. 4. Recreation area (F in Fig.3)
(photo by author)



Fig. 5. The bigger gym, located to the north
(photo by author)



Fig. 6. The bigger gym, located to the north (photo by author)



Fig. 7. The smaller gym (photo by author)



Fig. 8. Outdoor gym by night
(photo by author)

4. Discussion

The findings of the research can be extrapolated to a broader context by conducting studies that demonstrate the specific transformations observed in the studied areas on a neighbourhood or city scale. The results can be compared with those of similar studies conducted in other neighbourhoods, cities, or countries. The results can be applied in practice, contributing to changes in the perception of the immediate surroundings and neighbourhood of the designed spaces as a factor potentially favouring or discouraging their use. Furthermore, the study demonstrates which elements within a given space impede or facilitate the utilisation of activities. The study does not fully address all the research questions posed in the introduction. Further research is required to gain a more comprehensive understanding of the relationship between the studied forms of physical activity and specific age groups. This should include a greater number of observation samples to ascertain how different age groups engage with these activities and which age group is most likely to use them. This would ultimately confirm whether the spaces surveyed meet the needs of the users. The study demonstrates the multitude of elements and factors involved in the process of creating well-organised and welcoming public spaces for physical activity. This serves as a foundation for further research into spaces for physical activity, both within the residential areas selected for this study and beyond.

5. Conclusion

Public spaces for physical activity play important role in shaping a quality residential environment. The presence of outdoor gyms close to the place of residence is necessary to promote and realise healthy lifestyles among children and young people and adults. These areas should be placed among greenery in a convenient spatial configuration to contribute to a sense of comfort, safety and encourage the use of these facilities. Fences can act as a barrier for both older and younger people. Such barriers are often employed for the security of users, yet they frequently impede direct access from one point to another. Despite their advantages, their presence forces the potential user of the space or the complex itself to seek an alternative route, often in

an inconvenient location. Therefore, it is advisable to avoid enclosing spaces that do not require it for reasons of security or function. Factors that are less often considered in the design of physical activity spaces, which often impede their use, include the lack of adaptation of the complexes to the needs of all users. The presence of barriers and obstacles such as unnecessary fences, stairs and high kerbs makes access difficult for seniors, people with disabilities and families with pushchairs or cyclists. The circumstances of the COVID-19 pandemic, which forced society into social isolation, also prompted reflections on the design of public spaces. The situation has prompted researchers and designers to consider the flexibility of the solutions used and their adaptability.

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