



Research paper

The green spaces of the city and their significance in rehabilitation of cognitive functions – The spatial method of stimulation

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Abstract: The article addresses the spatial aspect as a factor of significant importance for the success of rehabilitation functions. The location of cognitive rehabilitation activities in an open, urban space allows people with reduced fitness to take up stress-free rehabilitation activity without time limitations and without stigmatization. The architectural design of the positions for mental rehabilitation implemented in public space was addressed to people with dysfunctions of all ages and people suffering from covid fog as a result of a past disease. This article presents the results of preliminary observational studies conducted on a focus group of COVID19 convalescents, who were provided with an open rehabilitation space equipped with 12 rehabilitation tables. The results showed the decisive influence of the placement of rehabilitation elements in the open green space for rehabilitation results. The task of the mind training path is to raise and maintain intellectual fitness in a friendly recreational space. Prototype studies have shown that, depending on the arrangement of individual stops, the mind training path offers different efficiency of exercises, but it is always a better result than in closed spaces of medical facilities.

Keywords: Covid-19, park space, aging society, cognitive functions

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1. Introduction

The need for green space that enables outdoor activity is one of the basic assumptions of good urban planning practices. These spaces are not new acquisitions of urban planning and have historically existed in urban spaces. The aim of the study was to answer the question of how nowadays such spaces should be shaped so that they respond not only to the physical needs of residents but also to the needs of cognitive rehabilitation. At this point, it is worth paying attention to research on sustainable urban regeneration [1–3], for which the actions described by the authors can be a valuable supplement and continuation and will strengthen the synergy of regeneration also with an important sociological factor.

The aim of the research was to develop and test a “mind training path”. It is a space of mental rehabilitation consisting of 12 stations, allowing for the stimulation of such cognitive functions as: memory, logic and problem thinking, concentration, reflexes and attention as well as analytics and thought processes. As part of the research, both boards and an element distributed in space were to be developed, which contain rehabilitation tasks, and a spatial model was to be developed that was most favorable for the assumed function, according to the knowledge of experts in the field and observations during the tests of the boards.

In order to obtain guidelines for formulating a spatial response to the above needs and to guide the work related to modeling public spaces of cognitive rehabilitation, it was decided to conduct a study on a test group of 10 participants using 12 prototype tables designed in cooperation with experts from the fields of sociological, psychological, neurological and geriatric sciences in various spatial arrangements and configurations. The study consisted of several basic parts – the selection of a small and cross-sectional group of respondents (representing various physical and mental fitness), substantive preparation of boards in cooperation with experts – so that they would meet the needs of users, fulfill the rehabilitation function and were ergonomically adapted to users with different degrees and forms of disability including aging [4], physical preparation of tables and testing of spatial layouts of tables and the influence of the layout, sequence and configuration on the rehabilitation process monitored by an interview with users and their assistants.

1.1. Public green spaces in the rehabilitation process of rehabilitation. Subject and purpose of research

Before medicine provided an explanation of the psychological benefits of spending time in nature it was suspected that there was a close relationship with nature between the dense urban structure and outbreaks of epidemics, as well as the lack of physical and mental hygiene [5]. Over the decades, park areas and royal gardens began to emerge with positive health consequences for the inhabitants [6]. A little later, movement in green areas began to be promoted. In many countries, including Poland, in the nineteenth century, places dedicated to sports activities were created. The doctor Henryk Jordan played a significant role in the topic of leisure in Poland. Thanks to him, in 1888 a park intended for children’s recreation began to be established in Krakow. It was the first and at that time the only park with such a function in Europe. Currently, active recreation in city parks in Poland

is declared by 66% of the inhabitants. Green areas constitute the non-commercial core of public space, a diverse place full of symbolism and content. They perform not only aesthetic functions, but also ecological and health-related ones. The greenery of cities comes in various forms: parks, squares, gardens, protective and insulation greenery and greenery accompanying services including public services such as: schools, hospitals and health centers, nursing homes, cultural centers, etc. [7, 8].

Parks and other green spaces play an important social role and serve everyone, regardless of their background, by providing a greater sense of community [9]. Adequate availability of green areas can positively affect the climate of the area and better air quality. Preventing the urban heat island, regulating humidity is also a merit of urban green areas [10]. Urban greenery directly affects the higher value of the property. People with access to parks or similar green spaces not only exercise more, but also experience less stress, anger and de-pression [11].

1.2. Park space and medicine – experiences

Urban space is a multifunctional structure containing urban tissue and biologically active areas. The latter form the basis of leisure in the city and ensure environmental balance. Due to local conditions, there are many models of greenery in urban areas. However, the most important thing in them is the continuity of the natural system and the minimization of fragmentation [12]. Regardless of the spatial possibilities and terrain conditions, each green area in the city is valuable. Nowadays, green areas in the city have started to fulfil a new function, forced by the state of the epidemic. They have become a safer and more desirable places than public spaces in a compact structure. The last 2 years have shown that green areas have become a safer place to be active near the place of residence than traditional meeting places such as pedestrian areas and squares in the city [13]. In terms of rehabilitation of residents, they are a place of social, physical and mental rehabilitation [14].

1.3. Park space and medicine – experiences

According to Barbara A. Wilson, there is no single correct strategy and method of cognitive rehabilitation, and the measure of its success is its progress over time. Emotional, behavioral and social problems do not usually occur individually, so rehabilitation should take into account all these elements and set clear and achievable goals [15]. Actions that were similar in assumptions were already used and the positive influence of activities similar to those in this study on the cognitive rehabilitation process was demonstrated [16]. Staying in public space, especially without time limits, extends the period of potential social exposure. It is recommended for people after hospital episodes, people struggling with progressive symptoms of dementia, people with various disabilities and people who have social difficulties for other reasons [17]. Social rehabilitation is help in returning to society, which – along with the end of the pandemic – will be a factor supporting the inhabitants of cities after long-term limitations in interpersonal contacts. COVID-19 has caused a dysfunction in many people [18, 19], commonly known as “brain fog”. These

people, due to lack of concentration, problems with fluent expression, and sudden loss of conversation threads, gradually withdraw from social life, losing self-confidence. Just being around people can improve this condition. Everyday leisure with dogs, cycling with children in playgrounds, jogging, practicing yoga, tai-chi or sitting on a park bench feeding birds – all of those activities are always a chance for contact – at least by eye, conversation or joint activities and care for interpersonal bonds [20].

The open park space gives the opportunity to test physical abilities without having to go to fitness clubs payless and without being assessed. Referring to psychologists from the AWF in Krakow research, seniors feel much better in such places, because they exercise together and do not have to worry that they will have to compare their fitness to younger people [21]. In public space development plans, more and more attention is now paid to groups that have so far been often marginalized. New solutions are introduced to improve the accessibility of recreational spaces for people with reduced mobility. This applies not only to the elderly, but also to people with disabilities. Integrative playgrounds and recreational spaces that take into account the needs of all residents are an important step on the way to society without harmful and painful divisions. There are more and more outdoor gyms around the world, but in the space of Polish cities they are not yet a very common function, but there is a growing demand for informal outdoor exercise.

Public spaces and devices for the rehabilitation of cognitive functions in Polish cities are not common yet. It is especially important for professionally active people, children and young people learning and studying – so wherever intensive thought processes and their efficient articulation are required. With regard to aging society in Poland, 2,170,651 (M) and 4,887,000 (F), the mental gym in the public space will allow over 35% of the society to maintain mental fitness [22].

The mobility decreases with age (Fig. 1), and although statistical data show that the results have improved over the last 70 years, but they are still unsatisfactory.

Part of people practicing sports, fitness, other physical reaction, gym exercises in the number of people of a given age group in 2019

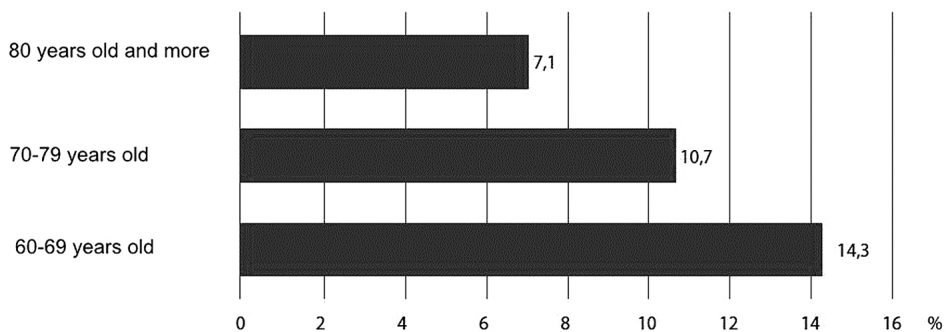


Fig. 1. Part of physically active people in the total number of people of a given age

Over the years, intellectual skills also deteriorate and there are problems with field orientation. Many older people also suffer from Alzheimer's disease or Parkinson's disease,

and other conditions [23] also those related to aging. Therefore, both in the case of older people and younger people with cognitive problems, caused by treatments or diseases (e.g. COVID-19) or as a result of inborn neurological problems, the rehabilitation of cognitive functions in the green space is a definite indication [24].

In The Guardian, Michael Zandi, a consultant at the UCL Institute of Neurology in London, says the studies conducted so far indicate that the percentage of survivors of SARS-CoV-2 infection and developing cognitive impairment is up to 20%. As of today (data for June 2021) it is about 418,000 people excluded from active social life. (20% of 2,040,108 confirmed cases in London). In Poland, however, such studies have not been carried out, but people who have recovered from COVID-19 report experiencing persistent difficulty in concentrating, as well as headaches, anxiety, fatigue or sleep disturbances [25]. These people have limited abilities in terms of active participation in social events, conferences, conducting meetings, participating in remote learning, and even working directly with people where high mental agility is required.

2. Materials and methods

2.1. Study design

The authors – specialists in the field of spatial planning and urban planning were part of the research team dealing with the spatial and design aspect of research. Together with an expert team in the field of sociology and neurology, they developed designs for boards and their spatial layout, taking into account knowledge not only in the field of spatial planning of urban planning, but also expert knowledge in many fields that touch on the subject of cognitive rehabilitation.

The conducted research is a pre-test observational study on a small number of deliberately selected participants. This method of selecting the group of respondents and the methodology of conducting the research was dictated by the need to adapt the boards and their layout to the most diverse group of recipients. In addition, for organizational and sociological reasons (which was recommended by an expert in the field of sociology), the research group could not be too large at the time of conducting the research, because it would distort the results of spatial research. A large number of simultaneous users of the space would affect the choice of: boards – both in spatial and substantive terms (increased competition in the group) by users and movement paths, and these were key aspects when conducting observations on the rehabilitation space and its layout. The aim of the study was to observe the influence of green space on cognitive and adaptive processes as well as to optimize and increase interest in rehabilitation space. The study was conducted with a 4.5-month observation period and continuous access to the tested set of tables. After the observation period, a post-test was performed, the results of which were discussed in terms of both the benefits that the users subjectively received and the external evaluation of the assistants accompanying the test subjects. Moreover, as part of the study, a spatial analysis of the array configuration and the subjective impact of spatial configurations on the testing process was carried out. The

subjects had open access to a set of 12 exercise charts placed in the open space of the garden of the nursing home and used them as part of their time spent in the garden. They were accompanied by assistants in the free use of the boards. Both the group of testers and assistants were surveyed in the pre-test and post-test phases.

2.2. Participants

The group of respondents is a small group – 10 people, whose selection is based on two conditions – a history of Sars-Cov2 infection with a mild or moderate course (not requiring hospitalization) and belonging to a group of people with special needs – in one of three categories – special intellectual needs, special social needs or special physical needs. The group of respondents includes people with a wide age range, from the youngest under 35 to the oldest over 70. The group of respondents included people with intellectual disability, dementia of various etiology and severity, with the autism spectrum (with neurodevelopmental disorders), with intellectual disability and with physical disability. Such a diverse group of respondents enables a cross-sectional observation of the impact and application possibilities of the tested solution and enables the direction of further research on representative groups to be determined. Moreover, it enables a better understanding of observation villages, as each of the test persons has different needs.

2.3. Research environment

Mental activity in the green space of the city (voluntary and free to stay), so in place which where the presence is not stigmatizing does not indicate a disorder. The basic need of the group of people experiencing the neurological effects of a past infection is cognitive neurological rehabilitation (Table 1) [26], for which not everyone can afford because of financial or logistical reasons. In contemporary psychology, an ecological trend has developed, which sees the issues of human well-being in the context of an organized physical and social environment [27]. Comparative studies in the field of psychology show that patients with mental problems cope better in social contacts when they can be treated and rehabilitation in one's own environment. Hence, the assumption that the rehabilitation of the mental sphere should take place in the same way as the physical rehabilitation.

Table 1. Groups of cognitive functions

I	II	III	IV
Memory, logic, problem-atic thinking	Mental concentration	Focused attention Quick reflexes	Analytical thinking, thought processes

The study took place in the area of the Nursing Home in Chorzów, Poland. The area for conducting the tests and configuring the layout of the boards is a garden at the center with a size of about 2 ares. The area is mostly covered with a lawn with high greenery, especially

along the fences, Research indicates a large impact of social contact and the availability of cognitive rehabilitation on the quality of life of survivors and the need to develop tools and methods to help people who have experienced or are experiencing long-term neurological effects of the transition of SARS Cov-2 infection [28].

The boards are to serve the fully able recipients as well as those with mental and physical limitations. They have to be durable, cheap and safe to use. A simple form of communication will allow to use it without additional instructions (Fig. 2). In principle, these elements can be installed both in the neutral green space of parks, housing estates, squares inside housing estates, as well as in hospitals, nursing homes, educational centers or other target group support facilities. The mental gym is aimed primarily at highly efficient people in society struggling with complications after COVID-19 on the part of the nervous system. The quality of the services provided, also in the fight against the Covid fog, affects the process of treatment and return to society [29]. It is also one of the first symptoms of senile dementia. The boards in the assumption allow you to change the content so that they can still be attractive and motivate to exercise in a longer period of time.

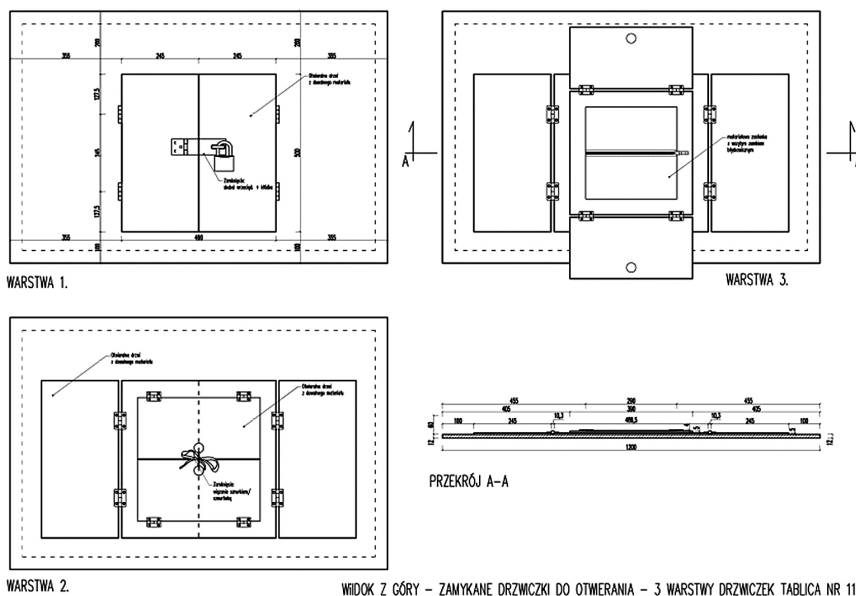


Fig. 2. Detailed technical drawing of one of the boards

The boards are made of MDF boards attached to a steel frame at an angle of 30%, enabling comfortable use both in a standing and sitting position (adapted to wheelchairs). To ensure the stability of the structure during use, it was necessary to load the structure with concrete weights. As part of the subsequent analysis and optimization of costs and quality of performance after the prototyping phase, it is suggested that the weights could be made of concrete with reduced compressive strength to reduce the cost of execution without losing the quality of the boards and their strength [30], while the MDF boards should be

replaced with a more durable and more expensive material that will be more resistant to weather conditions.. The boards were made in contrasting colors and care was taken to ensure that the movable elements are comfortable to grip and safe for each user. The boards also had to meet the condition that they could not be incomplete/destroyed during use.

In the era of a pandemic a free rehabilitation space offers a safe zone with a minimized risk of contracting the virus, and at the same time allows adults and children to re-turn to their daily duties faster. The park with equipment matched to the needs and abilities of various age groups offers a chance to integrate into social life more quickly, eliminating the effects of the disease.

“The Path of Mind Training” is a mental rehabilitation space consisting of 12 stations that allows the stimulation of such cognitive functions as: memory, logic and problem thinking, concentration, reflexes and attention, as well as analytics and thought processes.

Each of the mentioned functions will be devoted to 4 stations of the path, and each of the exercises will be developed in three levels of difficulty. This solution is dedicated to elderly people with limited perception (mainly those who develop the first symptoms of dementia) and people with intellectual disabilities, and will support the rehabilitation of their cognitive functions. In principle, these elements can be installed both in the neutral green space of parks, housing estates, on squares inside housing estates, as well as in hospitals, nursing homes, school and education centers or other target group support centers. The use of tables is intuitive, the instructions are supportive. All the pictures and pictograms used in the boards are commonly known and have been developed in consultation with a neurologist. An additional advantage of the boards is their multi-sensory character (light, protruding and movable elements – a solution used to increase their attractiveness and strengthen the motivational system, but simple enough not to overload users sensually). The level of difficulty of boards is an additional variable, adapted to the various possibilities of users (from simple, not requiring precision to more difficult, based on mapping).

In conditions similar to those in the park space an attempt was made to develop a prototype of the boards for the rehabilitation of cognitive functions. The basic assumptions concerning the boards were adapted to motor dysfunctions through the appropriate structure of the board and its accessibility. All boards had to stand on flat and hardened surface, due to the possibility of access by a wheelchair and stable immobilization of it while working with the board (unpaved green areas do not meet this condition) [31]. The assumptions of the soft path of mind training include the placement of boards in the green space and the possibility of changing the content adapting them to the users (for example increasing the difficulty level).

The arrangement was designed in variants, where each user indicated a different arrangement of the boards in terms of spatial and functional aspects. Permanent elements of the concept were the existing elements, such as the DPS building, a garbage can shed and a farm building located at the entrance from the side of ul. Maciejowicka, the existing trees and the existing road communication system. Following talks and consultations with users and the owner of the land, the “Republika” Social Welfare Center, a version of the path layout with selected 6 runs in the southern part of the green area was approved for implementation.

The test group consisted of 10 people (Fig. 3), of which 8 were over 60 years old. Nine of them were people with a reduced intellectual standard (moderate and severe mental retardation) and other correlated disorders: one person with cerebral palsy using a wheelchair, one person with autism spectrum disorders, one person with Down syndrome and one person with a very severe visual impairment. The test was accompanied by testing assistants for people with disabilities who were tutors. The difficulty of the boards was adjusted to the testing group. In the survey (Fig. 5) questions carried out during the first contact (testing) with innovation, the feelings of the level of difficulty and coping with test solving were much milder in the users themselves than in the assistants who were observing them, which meant that despite the difficulties they did not get discouraged from working with the boards and willingly took up further challenges (Fig. 4). In order to reflect the conditions of the boards set up in the public space as fully as possible, it was decided not to limit the number of approaches to tasks or the time of completing tasks, but to allow users to freely use the boards. Limiting the time or the number of attempts at the task could affect the results by distorting them – participants would choose only boards whose tasks do not cause them any difficulties (they do not have a rehabilitation value for them) – this would affect the survey about boards as well as the spatial model of the most frequently chosen boards and directions of movement.



Fig. 3. Part of the group testing the boards in the garden of the “Republika” Nursing Home

The questionnaire survey of the board testers shows that the majority of board testers (60%) did not have any major problems with completing the tasks – they were not particularly difficult for them. 30% of testers replied that they do not remember there were boards that were particularly difficult for them. This is a very different result than the testers’ assistants, who all declared that there were particularly difficult tasks among the score-boards. More than half (60%) of the testers declared satisfaction with using the boards, 40% of testers replied that they do not remember being satisfied with it. Only 40% of the surveyed testers confirmed that among the tables there were those that particularly caught their attention, the rest of the respondents did not recall such a situation. Among the respondents, only 10% were not able to determine whether they would like to use the tables again – the rest of the respondents answered yes (Fig. 4). A survey of test-assistants showed that they saw

the presence of particularly difficult boards (100%) and that most of them had tables that particularly caught their attention (90%). All surveyed testers' assistants confirmed that they enjoyed working with the tables and that they would like to use them again (Fig. 5).

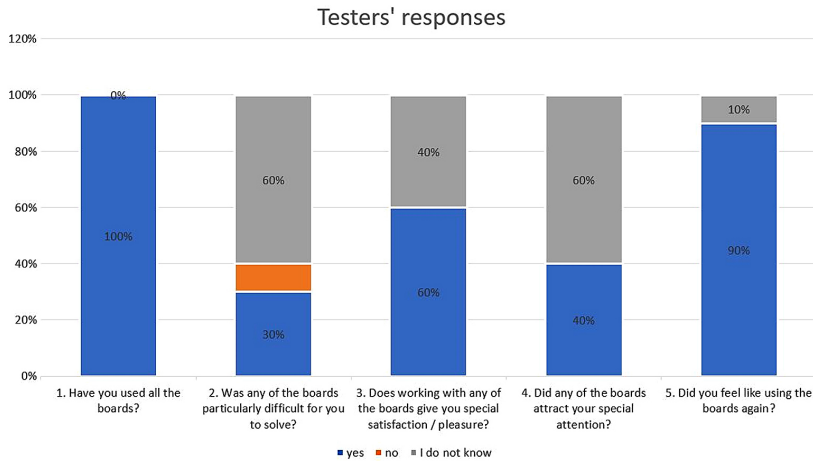


Fig. 4. Summary of survey responses for testers

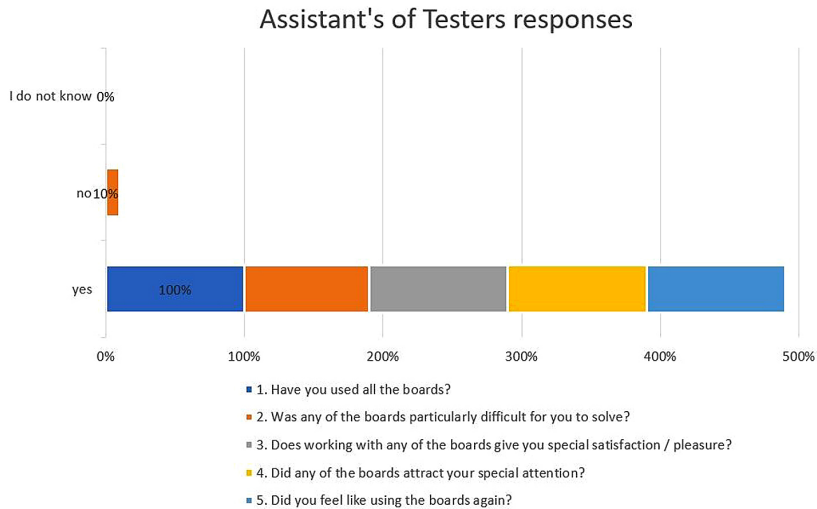


Fig. 5. Summary of survey responses for assistants of testers

In addition, observations were carried out on a group of approximately 30 people aged 18 to 55 years, both men and women with slight mental disabilities. Research has shown that men prefer various types of technical and manual tasks, while women prefer tasks related to nature, aesthetics and home. According to the trainers and group supervisors, one of the most important results of the proposed research is the stimulation of perceptiveness which stimulates cognitive functions.

According to the assumptions of the psychological model of architectural design, there are two orthogonal dimensions of space – the primary space consisting of specific physical forms, and the second – the auxiliary space, which consists of non-physical behavioral facts and psychological theories explaining them. The above two sets – architectural space and human behavior together form the product which is the “architectural environment” [32]. The table below (Table 2) presents the design matrix of the architectural environment according to Bubble (2002).

Table 2. Design matrix of the architectural environment (Bańka, 2002)

A) Auxiliary space of psychological events	B) Architectural space substrate			
	I Small towns	II City space	III Individual objects	IV Individual housing
1. Cognitive processes	C) the morphology of the places of behavior $A \times B = C$ (Architectural environment)			
2. Informal schematization				
3. Cognitive maps				
4. Territoriality				
5. Spatial activities				
6. Task orientation				
7. Processing information				
8. Emotional reactions				
9. Freedom of choice of behavior				
10. Development throughout life				

To find out if there was a correlation between the learning gain and the position of the boards in the park, the position was changed six times during the testing and was observed by the testing assistants.

In order to know if there is an increase in learning due to the location of the boards in the park (Fig. 6), they were changed during the testing 6 times and subjected to the observation of the testing assistants.

Due to the existing old stand and the need to adapt the path to the existing spatial arrangement, the possibility of locating the boards has been limited to 6 locations. In the opinion of users, the most favorable assessment (the comfort of use was as examined in an oral interview) was given to layout no. 2 (Fig. 6), which consists of a broken spatial arrangement of tables. Users raised as the greatest attraction the element of surprise what would be in the next task, good lighting (possible indirect chiaroscuro) and a central location in the park, away from the parking and the street. The 5th broken system with grouping tasks according to cognitive functions was rated lower. Grouping boards resulted in an excessive concentration of users and made it impossible to concentrate calmly, and moreover, there was an element of competition between 3 users working with the board next to each other.

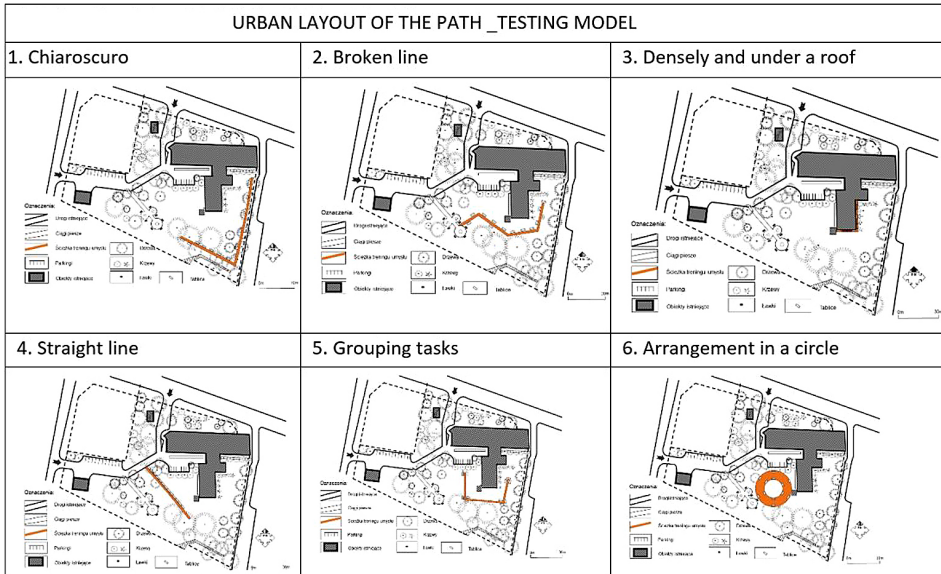


Fig. 6. Summary of survey responses for assistants of testers

Layouts no. 1, where it is broken under trees and close to the fence, and the fourth straight line, which allows the full insight into the number of tasks and causes stress due to their multiplicity, were ranked lower. The layout no. 6 in circles turned out to be the least friendly layout for this function.

3. Results and discussion

In accordance with the initial assumptions of the project, the placement of the boards outside the facility caused increased interest of the testers. The dimensions of the boards were also significant, as they differed from the previously known devices used during occupational therapy. People who did not participate in the tests also showed interest in the objects.

Three months of testing conducted at the Nursing Home led the authors of the project to conclusions regarding its subsequent implementation. The most important thing turned out to be the confirmation of the assumption that long-term exposure and the possibility of using charts, getting to know the content and facing the task many times had a positive effect on cognitive processes. The task has become easier than originally, as the post-questionnaires showed. This was also confirmed by testing assistants who described the tasks as done correctly. It was also shown that the open space was conducive to the relaxation of users, was not associated with rehabilitation, but only with fun and relaxation, therefore the tasks were performed more often and more willingly. Observing other users facing the boards additionally stimulated curiosity and willingness to test themselves, also by people outside

the testing group. In addition, the location of the gym in the vicinity of nature helped to neutralize stress and mental tension, relaxation, and the location of the boards in the open space eliminated the noise and reverberation associated with rehabilitation in the building.

From the summary of the observation results, it was possible to draw design conclusions for the optimization of the position and path of mind training in green space:

1. It is important to place the boards away from heavy traffic due to the necessity of con-centration, which is disturbed due to the incoming noise. Orientation towards communication routes is also important – boards should be placed facing the paths so that potential bystanders cannot observe the exercises being performed.
2. The distance and arrangement of the boards in relation to each other is also important to be large enough so that the users do not interfere with each other. It also has a psychological aspect – because some of the tasks on the boards were quite a challenge for users. The increased distances allow for discretion and reduce the level of tension and stress resulting from the potential presence (and thus possible unfavorable assessment or comments) of other users. This means the need to limit the number of boards when there is not enough space available.
3. The boards should not be placed directly under the trees, due to the falling leaves and pollen during flowering, which stick to the surface of the boards and make it difficult to use them. The same applies to spaces exposed to high dustiness – dust and sand potentially damage the movable elements of the boards.
4. The solution “The Path of Mind Training” can be successfully used in public spaces of cities as well as in health care facilities, as it can be adapted to a wide group of recipients. This solution gives a chance to introduce a similar space in public spaces of cities – for example in spa parks, thus extending their existing function with added value, which can positively affect public health. Due to the application nature of the study, conclusions were obtained that may be helpful in formulating assumptions for a similar path for other places and groups of users. They also prove the effectiveness of the solution due to re-search on a constant group of users.

3.1. Conclusions related to the location in the park space

1. Due to the increased sensory sensitivity of some users, the boards should be located in places with limited exposure to the sun (due to heating elements), but ensuring good lighting due to the potential dysfunctions of users (problems with proper vision) and the inability to reading instructions or seeing patterns clearly.
2. The quality and type of materials from which the prototypes of the boards were made clearly showed that it is necessary to create boards from completely waterproof and frost-resistant materials, so that the weather conditions do not warp the elements, which clearly makes it difficult to use the devices, especially for users with dysfunctions fine motor skills. It would be advantageous if the boards were made of materials that are quick to dry and maintain a constant level of colour, irrespective of the weather conditions. Due to financial limitations in creating the prototype, board no. 8 did not

survive the environmental conditions and therefore it could not be used in the first test. After replacing its elements, it participated in the remaining tests.

3. It would be expedient to place them away from insect habitats- the structure of the boards and colours creates an incentive to establish nests for flying insects (several layers of plastic, labyrinths, etc.). For this reason, when constructing boards, it is also necessary to plug all unnecessary holes (e.g. in construction pipes) and seal the structure as well as possible. This conclusion also applies to tree stands during the growing season which constitute a shelter and feeding place for insects.

3.2. Therapeutic conclusions related to cognitive processes:

1. Long-term exposure and the ability to use tables, learning the content and facing the task many times had a positive impact on cognitive processes. The task has become easier than originally, as the post-questionnaires showed. This is also confirmed by testing assistants who describe the tasks as done correctly.
2. The open space was conducive to the relaxation of users, it was not associated with rehabilitation, but only with fun and relaxation, therefore the tasks were performed more often and more willingly. When exercising outdoors, endorphins, commonly known as happiness hormones, are produced [33]. In addition, the location of the gym in the vicinity of nature helps to neutralize stress and mental tension, promoting relaxation
3. Placing the boards in the open space reduces the noise and reverberation associated with rehabilitation in the building

Among the testing assistants in the post-questionnaire, they were asked to rate the effects of working with charts for 4.5 months. The results indicate the enhancement of cognitive functions in all 4 categories (Fig. 7), which is the optimal expected result.

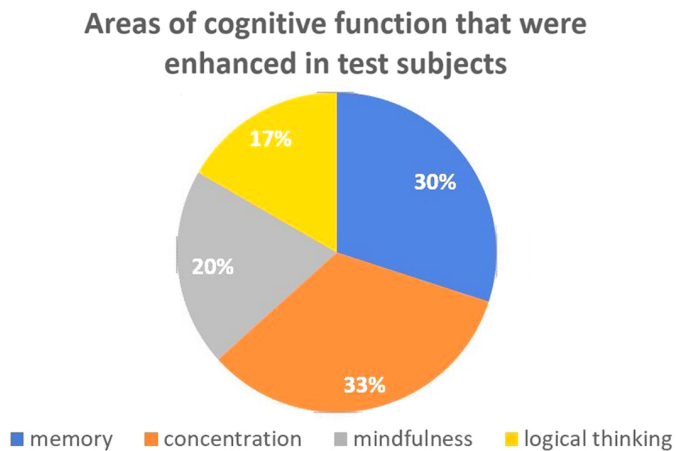


Fig. 7. Summary of survey responses for assistants of testers

4. Conclusions

The aim of the study was to answer questions about the spatial issues of external zones with a rehabilitation function in the cognitive aspect. The results of the study focus on the user's relationship with space and the impact of this relationship on the rehabilitation process. On the basis of the research and the interview, a number of conclusions concerning solutions and spatial models recommended for spaces with the cognitive rehabilitation function were established. In the conducted analyzes and testing, the results show that work on improving cognitive functions in park and green spaces gives good results and affects the overall well-being. In addition, while testing the prototype path of mind training, some determinants were noticed that allowed to indicate the optimal conditions for the location of boards/stops in the open space, which made it possible to draw conclusions for the further implementation of the project stages, consisting in introducing mind training paths in the public space of city parks. The design assumptions allow for free modification of the number of stations in 4 cognitive areas, depending on the size of the park space and the number of potential users. Due to the universality of the study and its interdisciplinary nature, the conclusions of the study can be referenced on a European scale. The complexity of the spatial systems used in the study and the verification of the results obtained in the study made it possible to draw conclusions and formulate rules that are universal and may apply to any space designed as a space for cognitive rehabilitation, what can be seen above all in relation to the methodology of research on the multi-sensory perception of space (E. Jarecka-Bidzińska, 2021) [34].

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Rehabilitacja funkcji poznawczych w zieleni miejskiej. Przestrzenna metoda stymulacji

Słowa kluczowe: Covid-19, przestrzeń parkowa, starzejące się społeczeństwo, funkcje poznawcze

Streszczenie:

Artykuł odnosi się do aspektu przestrzennego jako czynnika o istotnym znaczeniu dla powodzenia funkcji rehabilitacyjnych. Umieszczenie zajęć rehabilitacji poznawczej w otwartej, miejskiej przestrzeni pozwala osobom z obniżoną sprawnością na bezstresowe podjęcie aktywności rehabilitacyjnej bez ograniczeń czasowych i bez stygmatyzacji. Projekt architektoniczny stanowisk do rehabilitacji psychicznej realizowany w przestrzeni publicznej skierowany był do osób z dysfunkcjami w każdym wieku oraz osób cierpiących na mgłę covidową w wyniku przebytej choroby. W artykule przedstawiono wyniki wstępnych badań obserwacyjnych przeprowadzonych na grupie fokusowej rekonwalescentów z COVID19, którym udostępniono otwartą przestrzeń rehabilitacyjną wyposażoną w 12 stołów rehabilitacyjnych. Wyniki wykazały decydujący wpływ rozmieszczenia elementów rekultywacji w otwartej przestrzeni zielonej na efekty rewitalizacji. Zadaniem ścieżki treningu umysłu jest podniesienie i utrzymanie sprawności intelektualnej w przyjaznej przestrzeni rekreacyjnej. Badania prototypów wykazały, że w zależności od rozmieszczenia poszczególnych przystanków ścieżka treningu umysłu oferuje różną efektywność ćwiczeń, ale zawsze jest to lepszy wynik niż w zamkniętych przestrzeniach placówek medycznych.

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