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The Design of Public Space Augmentations for Encouraging Activities Conducive to Social Inclusion, Prevention and Rehabilitation

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Abstract--- *Among contemporary societal challenges there are those raising from the demographic processes along the globe. The new reality makes the designers face the yet unexplored needs of a society experiencing the dysfunctions connected with aging and disability. The architectural and urban design should follow the future requirements and remain one step ahead in order to arrange space to serve prevention of exclusion and dependence in the older age. Analysing the urbanization processes it is clear that the city would be more likely the place of residence for the people within the next 30 years. It creates multiple possibilities to benefit from the cultural as well as health care potential of urban centres and maintain the independence as well as the quality of life. Therefore contemporarily the greatest designer's concern is accessibility. Nevertheless it has been observed that easy access leads to passivity and on one hand it leads to equal opportunities, on the other hand it creates no challenge and reduces motivation to train everyday life activities, which is necessary for elderly to preserve mobility. So apart from models of public space accessibility there should be also actions undertaken in order to raise motivation for functional training. The other issue in today's generation behaviour is lack of physical contact and shifting communication platform from real life to virtual space. The result is that the social skills are dropping, and there is no motivation to initiate face to face contact. This process leads to the limitation of conversational talents, the lack of motivation to engage in social life and it leads to exclusion of those whose intellectual abilities are not sufficient to exist in virtual space. The purpose of this study is classification and valuation of public space design along with the dedicated activities in real and virtual space. The types of innovative solutions of public space design will be systemized and described to start the study on effectiveness of those methods in processes of social inclusion, developing communication skills, conducting motor training.*

Keywords--- *Design for Elderly and Disabled, Activation, Public Space Design, Preventive and Rehabilitation Training.*

I. INTRODUCTION

Working as an architect and urban designer is considered to be the profession of social trust, so it bears certain responsibilities. The main concern in this case is the quality of space including the aesthetical image as well as functional correctness. Both of those issues evolve in time so they have to be approached from the contemporary, constantly updated perspective. Nowadays among the most urgent problems that need to be faced by architects and urban designers are environmental protection and public health related to the processes of urbanization and demographic changes. There is evidence of changing behavioural patterns by design that can be used to improve the

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lifestyles of the population in order to improve the theorising of this problem is based mostly in research in the field of cognitive psychology (e.g., Ajzen, 1991; Bandura, 1986; Becker, 1974; Michie, Stralen, & West, 2011; Mosler, 2012; Schwarzer, 2008), behavioural economists (Anand & Lea, 2011; Ariely, 2009; Sunstein & Thaler, 2008) as well as marketing and design (Brown, 2009, Aunger 2016). The scientists agree that the applied science should be furtherly developed using the interdisciplinary approach to design in order to achieve the planned goals.

The problem of promoting healthy lifestyle and the design towards activating elderly and disabled people is especially important in the public space domain. According to Eurostat data every 4th person in the European Union suffers from disability and there are 19, 7 % of age more than 65 years old. The main diseases occurring in the group of biologically disabled people are injuries and diseases of the musculoskeletal system (in 54%), the circulatory system (in 44%), eye diseases (in 32%) and neurological diseases (in 30%). The average lifetime expectancy is increasing so the experiencing the negative health effects of ageing - a progressive loss of physical, mental, and cognitive integrity, leading to impaired functions and increased vulnerability to morbidity and mortality is raising. (López-Otín C, 2013, Beard JR, 2016). According to geriatricians the main diseases among people of 65 and older are arthritis, heart diseases, cancer, respiratory diseases and Alzheimer's disease (Chang et. all 2019). So the efforts should be undertaken to create the environment for preventive and rehabilitation training as well as social contacts in order to preserve the proper health condition of the population. Public recreational space design in this context should be one of the main fields of focus.

II. Objective and Method of Research

The field of research is to recognize the potential of public recreational space design to encourage and perform possible actions towards maintaining physical and mental efficiency of the elderly and people with disabilities. The process of rapid urbanization has caused the phenomena that the urban space has become an ordinary place of outdoor activity.

Open-air activities such walking, gardening, socializing providing everyday motoric training, up till now commonly performed in rural areas, need to be transferred to public recreational space of the cities. Currently it is observed that outdoor recreational space is fitted with equipment design to support the need of the physical and social activity of children and youth such as playgrounds, skate parks, sport grounds etc. as well as people with a high degree of fitness including outdoor gyms, running paths, nordic walking, cross-country skiing. There are no places encouraging outdoor social and physical activities designed for elderly nor people with disabilities.

The objective of the study will be to identify and explore the new use of public space according to the contemporary needs of society regarding observed and prognosed demographic changes. The purpose of the research will be also to specify the methods of training to help maintain and increase the mobility of population including the issues of connecting built environment with virtual augmentations.

There will be also described the possible benefits of adjusting public recreational space to the needs of people with reduced mobility or spatial orientation. The design of such areas would not require large refurbishment developments rather augmentations that allow the identification of the space and by introducing information systems and elements of nature, such as terrain features, water, greenery - as well as elements of small architecture to provide

sensory stimulation.

The method of research would be identifying and classifying types of public recreational areas according to their therapeutic potential. The study will regard conventional and experimental areas in order to display the possibilities of transformations in order to use them as a part of everyday involuntary training.

III. BENEFICIARIES

Seniors and people with multiple sclerosis, Parkinson's disease, stroke and with other disorders are beneficiaries of motosensory functional training in urban space. These people may experience fear of situations that require moving in urban space - using public transport, pedestrian crossing. Movement disorders and problems with the musculoskeletal system may restrict activity only to the place of residence. Participation in social and cultural life is also often difficult to achieve for such people. Motosensory functional training is also suitable for people who want or need continue rehabilitation process.

They have not opportunity to stay in a rehabilitation clinic and often do not have money for therapy with a physiotherapist in private center. The problem is also a long term waiting for rehabilitation services in public hospitals and clinics. The waiting time in a queue for rehabilitation often causes loss of previously developed motor skills and therapeutic successes. The motosensory training in urban space is based on sensory elements which have a therapeutic effect on people after stroke and with other neurological diseases [19]. Additional sensory stimulation causes the brain plasticity process and influences the functional improvement of the motor system [20]. Older people also are beneficiaries of the motosensory training in urban space. They have huge problems feeling the position of their own body in space. This causes balance problems and results in an increased risk of falls. Training of the elderly on the motosensory path will maintain physical fitness and independence in the movement of these people [21]. Training like this should improve quality of life. In addition older people often have diseases that also require therapeutic movement like diabetes, obesity, degeneration of the joint orneurological disorders described at the beginning [19,21]. Therapeutic urban space can be also the site of attractive walks for health adult and children. It could be place to spend time in active way and prevention. It could be also a good opportunity to improves family relations, and social contact. An area for exercises colud be place to the exchange of experiences between disability and healthy people. Public space – Accessibility and Universal design

Despite the process of evolution of public space, its importance does not change. Jan Gehl states that it is the essence of the city [1]. According to the definition, it has a special meaning to meet the needs of residents, improve their quality of life and promote social networking. According to sociological studies there are 6 main associations of public space: utility, interactivity, civic and political potential, axiology, symbolic meaning and identity [2]. In architecture and urban study the main field of interest is the utility but it can only be defined according to the users' needs which expand beyond this association. The design approach should address all of the above mentioned qualities in order to be fully comprehensive. In urban studies in Poland the main document issued by Polish Association of Urban Designers regarding public space design covers among others the aspect of economic value of space image, social participation, protection of cultural heritage, social integration, accessibility and minimization of conflicts moreover shaping according to various value systems and needs [3]. Up till now in urban design theory and education

there were two main ideas recognized essential for public space developments - accessibility and universal design. In September 2019 there was a new bill on ensuring accessibility for people with special needs, which sets out measures to ensure accessibility and the obligations of public entities in this regard. It concludes a long term process of incorporating the needs of people with disabilities into the building code.

Accessibility is a general term which can be defined as a property of the environment (physical space, digital reality, information and communication systems, products, services) that allows people with functional (physical, cognitive) difficulties to use space on an equal basis with others. In the context of physical space, this means primarily the functionality and accessibility of the built environment, and therefore architectural accessibility. The way to achieve accessibility would be by introducing the concept of universal design.

Universal design is the concept of functionality and accessibility of the built environment for all users and should benefit all members of society. It contributes to the promotion of equal and thus equitable access to goods and services for all, taking into account the needs of users with limited functionality. According to the definition in art. 2 'Convention on the Rights of Persons with Disabilities', universal design should be understood as designing products, the environment, programs and services in such a way as to be useful to everyone as much as possible, without the need for adaptation or specialized design. The main goal of introducing universal design principles is to provide accessibility of urban space, but the research shows that we need to look one step further.

IV. Current Public Space Roles

For most people meeting in public space, disability is a phenomenon known only superficially. This applies especially to significant disability associated with a lack of independence and dependence on the help of others. The view of a person with a disability- usually raises a packet of emotions with a large component of compassion, but also helplessness, fear of confrontation, fears about the impropriety of their own behaviour. This phenomena deepens the isolation.

In the layer of declarations - the community wants integration, but apparently actions are needed to facilitate the implementation of this idea. It is necessary to create spaces conducive to joint stay, action, mutual observation of both groups. They can make real meetings, raise and show real mutual interest, increase empathy and reduce isolation of dependent people. To achieve this goal a better understanding is needed. It is also necessary to show simple solutions and adaptations that make it easier for all members of the community to use the space and its objects or attractions.

According to the resources that urban design and education in this field is based on - focusing on the features that need to be answered in the design process addressing final users' needs there can be several significances distinguished such as providing space for mobility, places for social interaction, introducing culture through art, self-promotion, joint activities, also places of physical activity and passive recreation.[4] Currently it is observed that apart from necessary accessibility there is also a substantial need of another use for public recreational space - providing places for prevention, rehabilitation and social inclusion for it has become a need that concerns ¼ of the European Union population.

The prevention and rehabilitation goals are basic to provide inclusive society: preservation or restoration of

physical and mental fitness, preservation or restoration of the ability to work and participate in social life (everyday activities). Creating active environment is possible by adjusting urban environment to the requirements of people suffering from deficits by creating the public recreational spaces enabling constant activity for preventive actions.

So far there is no data nearly 40% of adults with biological disabilities had difficulties in performing self-service activities (in the age group 65 and over - only 34%), and over 60% in performing activities related to running a household (in the group of 65 years and more - only 57%). However there is no data available for the use of urban space, only the pilot research studies have proved that the use of public space is connected with the subjective level of anxiety that can be diminished in a process of "taming" urban space. [5]

Providing real life or virtual augmentations to public recreational space has a potential of changing the behavioral patterns that is required to maintain physical and mental efficiency and furthermore to improve public health. According to the WHO definition, rehabilitation is a comprehensive procedure in relation to people with physical and mental disabilities, which aims to restore full or satisfactory physical and mental fitness, as well as work and earning capacity, and the ability to take active part in social life.

V. PUBLIC SPACE AS ACTIVE TRAINING ENVIRONMENT

Public recreational space can be considered an active training environment. For people suffering from disabilities simple architectural or urban design means such as changing surface or degree of slope can become a challenge, therefore even the walking paths with different paving or a sloped pavement can become a training facility. The other field of interest should be spatial orientation. The self-confidence and the level of anxiety in public space relays, among others on spatial orientation. It might result from sensory problems such as sight or hearing impairment but it may also derive from central nervous system dysfunction. Therefore the design of public recreational space should include landmarks that would help positioning oneself in the space, as well as directional elements that would give a sense of direction of movement. There also should be places for social contacts provided in order to maintain or develop communication abilities in order to provide inclusive environment for all groups of users.

Even conventional public spaces such as parks or squares have potential to become places for health promoting events. Urban parks, apart from environmental benefits, provide a comfort space in terms of different types of lighting, reduced noise and air pollution. They serve recreational and social purposes. There can serve as venue for outdoor activities for many groups of users including elderly and disabled. There can be places provided of various intimacy to provide individual or group training or relaxation space. The augmentations in this type of space would be providing tools for social activities, creating possibilities of direct contact and communication. There can also be activities performed leaded by specialized personnel or using recorded instructions. There can be a bridge between virtual reality established to communicate between the users, or the user and the trainer to perform activity in the park space. Urban squares have a different potential connected with the social domain of public space. They can provide space for social inclusion – creating a common language for people of different cultural origin and various abilities. The social space could serve as an incubator of tolerance in behavior and attitude towards other citizens.

Emerging spaces such as urban farming gardens combine the potential of social and physical activities. They provide space of interaction between people and nature, and between the users. The most significant value of this

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kind of space is its changeability and the potential of identification. The other type of gardens are sensory gardens that provide the most diverse spaces. The places of stimulation and relaxation can be used to create the environment for training patients with largest cognitive deficits. They can be augmented with instructions for activities invented for various disabilities to improve the condition of the patient regarding his or hers temporary condition. The attractiveness of the design can be the motivation for undertaking training. Existing fitness or thematic trails can be also a starting point for designing training paths for people with disabilities. The physical training for people with motoric dysfunctions can be conducted even on smaller areas, for the distance of a 100 m can be a challenge. Providing necessary instructions accessible online, in situ or a possibility of coach guided activity it can be beneficial for patients with multiple motoric disorders.

The conventional space can be adopted to the needs of elderly and people with disabilities, but there are actions undertaken in order to provide space designed for this group of users. Experimental designs combining physical and sensory training for people with deep dysfunctions are tested. One of those solutions is *Moto-sensory path*. The idea behind the sensorimotor path design is to create a training place for difficult situations in moving as close to natural conditions as possible (e.g. atmospheric conditions), but with no stress caused, e.g. by traffic hazards. The location of such activities should be in an accessible recreational space, where training places can be arranged using the example of playgrounds or outdoor gyms.

This element can not only provide a place of training, but also an attractive space by introducing natural elements of composition, such as greenery, water and natural finishing materials. The project implementation involved creating a path design along with an application supporting its use, and then testing the project's effectiveness in fitness and psychological tests.

The other experimental design was *Communication space.* The idea of a "space of communication" is creating - a space serving simultaneously multi-sensory experience and joint experience to connect people suffering from disabilities and other users in public recreational space. It encourages not only experiencing the senses of the surrounding world, but also other people by to experiencing together. Therefore, it does not limit our individual experiences by setting boundaries between individual social groups, but it is a peculiar - architectural - bridge to establishing new, deeper, joint relations.

According to the assumptions, "Communication Space" is to become a fragment of the arranged public space, which will include elements of small architecture constructed on the model of an interactive exhibition. Space is a pretext for experiencing, meeting, mutual observation and cooperation.

VI. Social Activities and Physical Training in Public Space Possibilities

Motosensory therapy is just the combination of kinesiotherapy (therapy by movoment) and sensory stimulation called moto-sensory therapy. The main goal of that stimulate is improve connections in nervous system and help to integrate stimuli reaching the body [22]. Variety materials could be used due to sensory value e.g. rough, smooth, cold, warm. Training in urban space has a therapeutic effect in area of movement system - balance exercises on an unstable, changing ground, exercise to improve the gait, sitting on a bench, reaching for an object, going up the stairs. Aromatic plants or water elements will stimulate sensory and relaxing effects on the user of such space. It is helpful

focusing on the task being performed [23].

A postural control training is very important for balance. It is often weakened by disorders related to the processing of sensory information in the nervous system. The stimulation improve eccentric muscle control. It is needed to control the speed of movement mailny during walking down the stairs. Ii is especially important not only for neurological patients but also for elderly people who suffer from disorders caused by aging of the nervous system [24]. Sensory stimulation can be part of spasticity therapy through improved neuromuscular coordination. This is a very important part of the therapy of people after stroke but also in other neurological diseases in which spasticity occurs [25].

Aging is a physiological, progressive process. This is accompanied by many changes in the motor system and the whole body. In the elderly physical fitness decreases as well. This results in balance disorders and increased risk of falls. This leads to a decrease in the independence of such people. The combination of kinesiotherapy and sensory stimulation in the elderly could improve the quality of gait [19,21,25]. Training on the motosensory path is kind of the prevention of falls.

VII. TRAINING METHODS, TESTING METHODS AND EVALUATION

Is accepted to conduct training which consists of 6 randomly selected exercises, drawn from 7 specific groups, after 5 minutes every. Qualifying tests are suggested - a simple equivalent exercise and gait training strips to determine the user level of the 3 available difficulty variants.

Created training plan, for each level of difficulty, has one exercise from the group: gait training, stretching, stabilization, postural control, eye-hand coordination, balance. The whole training lasts about 60 minutes. The user could have short breaks between exercises.

Gait training is important for both neurological and elderly patients. It provides independence and the ability to move outside the place of residence. Maintaining the gait function and improving it supports healthy aging. In the case of neurological diseases, improving gait is one of the main therapeutic goals. Stabilization determines balance which is part of optimal gait. Motosensory path space stimulates balance. Changing ground with different textures additionally stimulates the balance of path users. It has a therapeutic effect, increases the difficulty of performed motor tasks and stimulates the nervous system [26].

It is possible that the training will take place under the supervision of an instructor (physiotherapist, trainer i.e.). His task is to demonstrate the exercise and tell about its purpose. In addition, the trainer corrects, motivates and encourages the user to exercise. This is the stage preparing for independent training on the path. When the user learns the exercises, he does them himself, and the trainer only supervises whether the exercises are carried out correctly.

It is also possible to train using applications and audiovisual materials that replace the meeting with the trainer. The user independently performs exercises - tests, on the basis of which a random set of exercises with an appropriate level of difficulty is selected. The third option of using the path is graphic instruction. This stage is combined with independent training. Professional pictograms have been created for this purpose. Do each exercise assigned to one figure, which represents the starting position and the set movement. Users will have a full graphical instruction,

which will be placed on the board at each exercise stand. The same instruction is also available in the application.

Methods of testing the effectiveness of training in urban space can be functional tests used in physiotherapeutic practice. They are objective research tools. In case they are done before and after a series of trainings, they can also be used as a tool to evaluate the training [27].

VIII. RESULTS AND CONCLUSIONS

Shaping the public recreational space in the city is becoming an important area in the face of processes related to the concentration of population in large urban centres. Contemporary lifestyle is constantly changing with lifestyle changes - working conditions, ways of spending free time, as well as living. Despite these transformations, the fundamental human needs in the intimate and social zones remain similar, only the ways and place of their implementation change. Hence the dynamic search for a friendly place of residence, understood as the space of the apartment and its surroundings, meeting the current requirements of various user groups. New forms of space offer the possibility of zoning privacy, contact with nature and establishing social bonds, while at the same time fitting into the image of a modern, concentrated city, combining in its structure various functions and aesthetic impressions, in response to the needs of the contemporary, multicultural community of city residents.

Accessibility and universal design have become necessity, but there is a need to look forward. Today's architects' and urban designers' responsibility is to shape public recreational space as the environment for active prevention and rehabilitation in order to provide possibility to preserve the physical and mental fitness of the population. Therefore the actions undertaken in public space should provide the environment for active training. Outdoor preventive training and rehabilitation should be promoted in order to adapt to future demographical changes. Exercising is necessary to maintain health and fitness regardless of age and physical condition to prevent social exclusion and dependency. An attractive place and form of functional training should be provided for people suffering from various disabilities, for it provides additional motivation for undertaking the regular activity which reduces the risk of early decrease of physical and mental fitness level.

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