

PSYCHOLOGY

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An *aikido*-based intervention supporting the therapy of a child with autism spectrum disorders – a case study

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Abstract

Background. Numerous scientific studies conducted in recent years have confirmed the positive effects of the participation of children and youth with autism spectrum disorders (ASD) in therapeutic intervention programs based on traditional Chinese martial arts, karate and taekwondo.

Aim. The aim of this study was to present the case of a boy with ASD and to evaluate changes in the severity of autism symptoms that were observed during the five 10-day *aikido* camps organized between 2013-2017.

Methods. The case study method was used to present the results of observation of the boy with ASD during each *aikido* camp and immediately after it. The author's own observation sheet was used to evaluate the changes in the boy's behavior.

Results. The subject took part in an *aikido* camp for the first time at the age of 12. He was then a child with developmental deficits in social relations, communication, and physical abilities. The exercise program based on the aikido curriculum was implemented during five camp in the form of 90-minute group classes. The gradual reduction in the severity of autism symptoms was evident both in social interactions and communication with peers. A growing involvement in physical exercise was also observed, as was better coordination and ability to perform the sequence of movements, as well as a reduction in fear of performing new motor tasks.

Conclusions. The *aikido*-based program, which was used as an additional therapeutic intervention for one boy with ASD, helped to reduce the severity of his ASD symptoms in the areas of social relations, physical abilities and communication behaviors.

Introduction

Autism spectrum disorders (hereinafter ASD) are a serious and increasing social and economic problem, involving not only individuals affected by the disorders and their families, but the whole society. While some individuals with ASD have varying degrees of abilities that could potentially lead to independent and productive lives with varying levels of support, others are severely affected and require life-long care and support [World Health Organization 2013: 7]. To reduce the number of people requiring long-term care, early diagnosis and appropriate treatment should be provided.

Official World Health Organization data state that around the world one child in 160 have ASD and subsequent disability (the global median prevalence of ASD is 6.2/1000). The prevalence of ASD reported in countries that monitor this problem varies significantly across

studies, showing an upward trend everywhere [World Health Organization 2013: 8]. For example, the results of scientific research conducted in the USA with the help of the network monitoring problems of autism and developmental disorders in children aged 8, confirm the increase in the number of diagnosed ASD cases per 1000 children from 4.2 in 1996, 15.5 in 2010 [Van Naarden Braun *et al.* 2015], up to 16.8 in 2014 [Baio *et al.* 2018]. In Poland, large-scale epidemiological studies have not been carried out so far, however, scientists dealing with this issue estimate that the spectrum of autism occurs in 14.7 per 1000 children, or one in 68 children [Pisula 2014]. ASD is four times more common in boys than in girls [American Psychiatric Association, 2013: 50-59].

According to the classification of mental disorders DSM-5 (developed by the American Psychiatric Association) since 2013, ASD is characterized by the occurrence of two axial symptoms: communication dis-

orders / social interactions and stereotypical, repetitive patterns of behavior that create a narrow range of interests and activities that are unique to a person. These symptoms occur early in the child's development, usually before the age of three. Fixed deficits in social communication and social interaction are evident in a variety of situations. These may be deficits of reciprocity in social contacts, non-verbal communication necessary in social interactions and the ability to create, sustain and understand relationships. As the development progresses, the severity of symptoms changes and thanks to compensation mechanisms some of the symptoms may be hidden [American Psychiatric Association 2013: 50-59]. Individuals with ASD may have a very varied level of intellectual functioning, and they can also have comorbid conditions, including epilepsy, depression, anxiety [Syriopoulou Delli *et al.* 2018; Spain *et al.* 2018] or attention deficit hyperactivity disorder (ADHD) [World Health Organization 2013].

The term of "Autism Spectrum Disorder" has been defined in the Diagnostic and Statistical Manual of Mental Disorders DSM-5 [American Psychiatric Association 2013], and includes self-contained overall disorders classified in ICD-10 [World Health Organization 1992] as: early childhood autism, high-functioning autism (HFA), atypical autism, Asperger syndrome, children's disintegrative disorder and overall developmental disorder not diagnosed differently (PDD). ASD-related disorders limit the child's developmental abilities to varying degrees, and individual symptoms may vary in severity [Volkmar *et al.* 2005].

In many countries, intensive actions are taken to improve the quality of life and functioning of people with ASD. Therapy and education of autistic children have ceased to be a marginal problem, and it is becoming a social problem affecting many families and most educational institutions. The area of undertaken activities is the search for intervention methods and programs that can minimize the effects of developmental deficits typical of ASD and optimize the adaptation of the child to the surrounding reality. One of the ways of this search are attempts to use therapeutic intervention programs based on physical exercises adapted to the individual needs and possibilities of children and adolescents with ASD. The effectiveness of such interventions have been studied via case studies, single subject designs, and studies with small sample sizes.

Scientific research published in recent years confirms the positive effects of the participation of children with ASD in various types of therapeutic intervention programs based on specially selected physical exercises [Szot 2003; Ferreira *et al.* 2018; Najafabadi *et al.* 2018]. Intervention programs used in therapies of children and adolescents with ASD consisted of such forms of exercise as swimming [Yilmaz *et al.* 2004; Pan 2011], trampoline gymnastics [Lourenço *et al.* 2015], ice skat-

ing [Casey *et al.* 2015], or horseback riding [Wuang *et al.* 2010]. More and more often, the subject of scientific research is the analysis of a wide range of benefits that can be achieved in work with children and teenagers with ASD using martial arts and combat sports [Bell *et al.* 2016; Zou *et al.* 2017]. Recent scientific studies have demonstrated the efficacy of therapeutic interventions based on taekwondo [Kim *et al.* 2016], karate [Bahrami *et al.* 2012; Movahedi *et al.* 2013; Bahrami *et al.* 2016] and mind-body exercises based on traditional Chinese martial arts [Chan *et al.* 2011; Chan *et al.* 2013]. Only two publications describe the possibility of adopting a typical *aikido* curriculum as a therapeutic option for children with ASD [Leveson 2003; Paul 2011].

The aim of this study was to present a case of a boy with ASD and to evaluate changes in the severity of autism symptoms that were observed during the five 10-day *aikido* camps organized between 2013-2017.

Methods

The boy, whose case was described in this paper, was selected from boys diagnosed with ASD, taking part in the holiday *aikido* camps organized regularly by the *Aikido* Lublin Academy and the *Aikido* Rzeszow Academy. The participants of the camps between 2013-2017 were children and youth aged 8-17 years, regularly attending the *aikido* training. Every year, in a group of about 30 children there were 3-6 boys with ASD, who were under the care of the Rzeszow Association for Disabled and Autistic Children named "Solis Radius".

The decision on the participation of children with ASD in the camp has always made jointly by the child's parents and instructor of *aikido*, who is also a behavioral therapist. As a selection criterion, the relatively high functionality of the child, their level of interest in physical exercises and the child's desire to go to an unknown place were taken into consideration. The selection criterion for the study was also obtaining the consent of the child's parents and active participation in all the camps organized between 2013-2017.

In the group of nine children with ASD who participated in the camps from 2013 to 2017, all the criteria were met by one boy.

The case study presents the results of observation and evaluation of behavioral changes of a boy with ASD noted between 2013-2017 during the *aikido* camps and immediately after them. The information used to describe the case of the observed boy was obtained through interviews with his parents, with two therapists who worked with the boy in the center of "Solis Radius" and with the *aikido* instructor. The results of five-year observations conducted by each of them were also used.

To evaluate the changes in the boy's behavior, the author's observation sheet, consisted on three parts, was

used. Each of these parts included the most noticeable symptoms of the developmental deficits in the areas of communication, social relations and physical abilities. These symptoms were determined based on information obtained through interviews with parents, therapists and *aikido* instructor. Only those symptoms which were visible when the boy was 12 years old were selected.

The assessment was based on a 5-point Likert scale, where numbers determined the change in severity for each of the ASD symptoms as follows:

- 1 – Significant intensity
- 2 – Slight intensity
- 3 – No change
- 4 – Slight reduction
- 5 – Significant reduction

On the basis of rating issued by each evaluator, an average points were calculated for each part of the assessment sheet in subsequent years. The average points was interpreted as: intensity of symptoms < 3; no change = 3; reduction of symptoms > 3.

Results

Case presentation:

The described case is a boy who was 16 at the last year of the study. The subject comes from a full family, in which both parents work. In this family there is also a younger child without dysfunction.

The observed boy in his childhood attended nursery school and then state schools. Although he studied with healthy children, he required an individual course of teaching. He graduated from elementary school, junior high school, and is currently a high school student. In addition, he graduated from the first-level state music school in the piano class, which includes only music classes.

Autism spectrum disorders were diagnosed at the end of the third year of his life. Soon after this diagnosis, a special stimulation program was started with him at home. It consisted of exercises stimulating the boy's behavior with using touch, sound, light, colors and con-

tact with objects of various shapes and different warmth. All exercises were performed three times a day for three years under the supervision of his mother. At the age of 6 to 9 years, the boy used therapeutic exercises conducted by specialists at home. Exercises were held twice a week and were carried out as part of specialized care services of a social welfare center. At the age of nine, he began therapy at a specialized center for autistic children "Solis Radius". It consisted of individual and group classes, aimed at stimulating his development with particular emphasis on the social behavior, interaction and communication. Among the applied therapies, music therapy was included. Therapeutic activities at the center for autistic children were realized twice a week.

The boy attended the *aikido* camp for the first time at the age of 12. He was then a child with developmental deficits in terms of communication and social relations. He had problems with functioning in a peer group and with establishing contacts. In stressful situations, he displayed stereotypes, such as crouching, swinging, waving his arms and loud laughter or screaming. The boy had also noticeable deficits in psychomotor development, consisting of problems with body balance in unstable positions and poor visual-motor coordination. He had symptoms of dyspraxia, which were manifested by difficulties in understanding, planning and performing physical tasks in a smooth, automatic, coordinated, economical way, in the right order from the beginning to the end.

He manifested aversion to physical effort and fear of performing unknown motor tasks. In many situations, such as eating meals or personal hygiene, the boy's behavior was a sign of his lower functioning in relation to his age. He did not perform many self-service activities independently, demanding help from the caregivers. He claimed that he could not and did not want to do it on his own. He was musically talented and played the piano.

Aikido based intervention program:

The *aikido*-based intervention program consisted of 90-minute classes carried out twice a day for 10 days of the camp. During one camp

Table 1. Therapeutic activities supporting the development of the boy

Duration	Boy's age	Therapeutic intervention	Person leading therapeutic activities	Location and frequency
From 2004 to 2007	3-6	A special stimulation program – exercises with touch, sound, light, colors and contact with objects of various shapes and different warmth.	Mother	At home, three times a day.
From 2007 to 2010	6-9	An individual stimulation program – exercises aimed at stimulating his behavioral development.	Therapist from specialized care services of a social welfare center.	At home, twice a week.
From 2010 to 2017	9-16	Individual and group classes, aimed at strengthening the stimuli that shape his development of social behavior, interaction and communication.	Therapist from Rzeszow Association for Disabled and Autistic Children "Solis Radius".	At the therapeutic center, twice a week.

Source: Authors' own research.

eighteen classes were carried out. Depending on the weather, they were held in the gym or outside. The course of the classes was a typical training in *aikido*, adapted to the possibilities of novice *aikido* students.

About 30 children and teenagers participated in each class, including several boys with ASD. All classes were started from *mokuso*, during which the students were sitting with their eyes closed behind the aikido instructor (*sensei*). This part of class has been designed to turn off thoughts, mute emotions, prepare and improve motivation. Then, for about 30 minutes the group practiced individual gymnastics *aiki-taiso*, consisting in imitating teacher's movements. This kind of exercises are preparation for performing of *aikido* techniques. They aim at sensory reviving and preparing individual body parts for physical exercises, improving breath control, as well as coordination, balance, and body posture. During the next 30 minutes the group practiced the basic elements of *aikido* such as: *ushiro ukemi* (backward roll), *mae ukemi* (forward roll), *yoko ukemi* (falling to the side), *tai sabaki* (moving off the line of attack), manual techniques in the positions *suwari waza* (both partners were sitting in *seiza* position), *hanmi hantachi waza* (when one person was sitting and the other was standing) and *tachi waza* (when both partners were standing). Practiced technique also included *osae waza* (controlling or holding), and *nage waza* (throws). The last 30 minutes of classes included techniques with a wooden stick *aiki-jo*. These exercises were usually done outside. Classes were always ended by *mokuso*. Each class was diversified by various elements of group exercises and games.

During each *aikido* class the boy had the opportunity to observe the behavior of other participants and could join in the performance of any exercise at the most convenient time. During group exercises and games, he could also decide about his own activity. The main assumption of the intervention program was to create conditions in which a boy with ASD would be able to observe social behaviors and ways of communication in his peer group, without the support of his parents. During the first two camps, the only person the boy knew was an *aikido* instructor. From the third camp, two therapists joined to the group of instructors and tutors. They worked with him in the therapeutic center "Solis Radius".

Characteristics of the obtained effects:

Observation of the boy, during five successive *aikido* camps and immediately after them, allowed for evaluation of the changes in his behavior. Both the *aikido* instructor, two therapists, and the boy's parents noticed positive changes in the boy's behavior after each camp.

The *aikido* instructor and the therapists observed and noted the boy's behavior during subsequent camps. Their relationship showed that from year to year the observed boy behaved more comfortably in his peer group and he better understood the rules applicable to the camp participants. He became more disciplined and conscientious. During the *aikido* classes at the first camp, he observed the practitioners and the instructor for a long time before he decided to do some exercises. Over time, he was involved in exercises much earlier, and performed these exercises with greater care and

Table 2. Results in the observation sheet – symptoms within communication

Problems with:	Year of observations				
	1	2	3	4	5
understanding body language	3.0	3.0	3.6	4.0	4.2
reading the emotions of other people correctly	3.0	3.2	3.6	4.0	4.2
expressing his own emotions	3.2	3.4	4.0	4.6	4.8
initiating a conversation with peers	3.0	3.2	3.4	3.8	4.2
establishing natural eye contact	3.0	3.0	3.0	3.0	3.0
accepting physical contact	3.0	3.2	3.8	4.2	4.6
understanding sarcasm	3.0	3.2	3.6	4.0	4.2

Source: Authors' own research.

Table 3. Results in the observation sheet – symptoms within social relation

Problems with:	Year of observations				
	1	2	3	4	5
being in a large group of people	3.0	3.0	3.4	3.8	4.6
meeting new people	3.0	3.0	3.6	3.8	4.6
initiating of contact with peers	3.0	3.2	3.6	3.8	4.2
fulfilling of his duties and entrusted tasks	3.4	4.0	4.6	5.0	5.0
understanding the relationships and rules in peer group	3.2	3.6	4.0	4.4	4.8
accepting an unknown environment (people and places)	3.0	3.0	3.4	4.0	4.8
accepting his peers while his leisure time (e.g. while playing)	3.0	3.2	3.6	4.0	4.4
engaging in group games and physical exercises	3.0	3.0	3.6	4.0	4.6

Source: Authors' own research.

attention. It was easier for him to do exercises in pairs and participate in group games. A significant level of reduction of his problems with relations in the group may be proved by the fact that during the last camp he conducted a few fragments of classes, playing the role of an instructor. He presented the individual *aiki taiso* exercises to the group of peers, correcting mistakes made by the other participants.

Parents who observed the boy after returning from each *aikido* camp noticed positive changes in his social behavior, manifested by easier acceptance of changes in the environment, easier contacts with peers, a better understanding of the principles of functioning in the group, and gradually increasing responsibility for the performance of tasks and daily duties entrusted to him. In the communication behaviors, they noticed that the boy was more expressive of his own emotions, and also that he don't avoid physical contact with other people. They also confirmed that the boy's physical fitness and interest in doing physical exercises gradually improved.

Detailed assessment of changes in the behavior observed in the boy was expressed in individual parts of the assessment sheet. The first part presented changes in communication behaviors

The most noticeable changes were noted in the boy's ability to express his own emotions. The average assessment of this change was 4.8 points after five years, and it was the only behavior that began to change after the first camp. The acceptance of physical contact with other people was another behavior in which a significant reduction of problems was observed. This change was finally estimated at 4.6 points. A slight reduction up to 4.2 points was noted in the boy's problems with body language understanding, correct reading of other people's emotions, initiating a conversation with peers and the ability to understand sarcasm. The only problem that remained unchanged was establishing natural eye contact. The observed boy used only the so-called learned eye contact.

The second part of the assessment sheet presented changes in social relations.

In this group, the greatest reduction was noted in problems with fulfilling of his duties and entrusted tasks. The evaluators agreed that change in this behavior took

place at the earliest and remained at the same high level (5.0 points) until the end of the study. The boy's behaviors, in which a significant reduction was noted, included problems with understanding the relationships and rules of functioning in his peer group as well as accepting the unknown surrounding. These changes were evaluated after five years at 4.8 points. A slight reduction was noted in problems with acceptance his peers during non-organized activities in leisure time. This behavior was manifested by the boy's preference for individual forms of play. Gradually from the second camp, the boy got used to situations in which some peers, proposed him spending time together and playing board games. Problem with initiating of contact with peers was only slightly reduced. This change was rated as the lowest (4.2 points) among all evaluated behaviors in social relations.

The last part of the assessment sheet was concerned the boy's physical abilities.

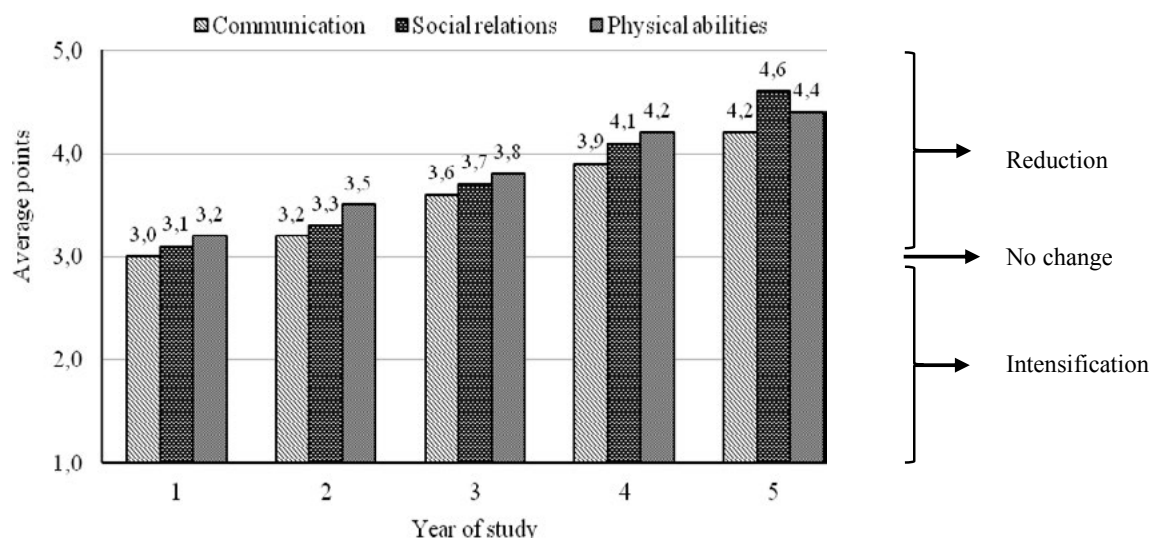
In the area of physical abilities, the most pronounced progress was in the boy's interest in doing exercises. All evaluators agreed that the problem of boy's reluctance to physical effort was reduced the most, which is confirmed by the rating of 5.0 points. The evaluators also noticed the reduction of problems with proper visual-motor coordination, proper execution of the sequence of movements and the feeling of fear of unknown motor tasks. Each of these behaviors changed slightly and at a different pace in order to finally achieve the same ratings (4.6 points).

The smallest reduction was noticed in the problems with coordinating simultaneous movements of hands and legs (4.0 points) as well as with planning and coordinating body movements (3.8 points). Probably the reason for minor changes was the fact that these symptoms are caused by dyspraxia, also known as the Clumsy Child Syndrome. It is a developmental disorder, manifested by a particular learning difficulty associated with the development of the brain, which affects the basic ability to plan the sequence of movements and all activities. In the spectrum of dyspraxia symptoms, there is also a problem with maintaining body balance. A slight reduction of this symptom was noted already in the first year and slightly stronger after the second year. However, the level it achieved in the third year remained unchanged until the end of the research. It was rated at 4.2 points.

Table 4. Results in the observation sheet – symptoms within physical abilities

Problems with:	Year of observations				
	1	2	3	4	5
taking physical exercises (unwillingness to physical effort)	3.2	3.6	4.0	4.8	5.0
planning and coordinating body movements	3.0	3.2	3.4	3.6	3.8
maintaining body balance	3.4	3.8	4.2	4.2	4.2
obtaining proper visual-motor coordination	3.0	3.4	3.8	4.2	4.6
coordinating simultaneous movements of hands and legs	3.2	3.4	3.6	3.8	4.0
the proper execution of the sequence of movements	3.2	3.6	4.0	4.2	4.6
performing unknown motor tasks (feeling of fear)	3.2	3.2	3.8	4.4	4.6

Source: Authors' own research.



Graph 1. Changes of the ASD symptoms severity in communications, social relations and physical abilities.

The average results of the evaluation of changes in ASD symptoms in the analyzed areas were presented in the graph.

The presented data allowed to state that in each analyzed area gradual decrease of ASD symptoms was visible, and was expressed by the reduction of behaviors typical for the described boy.

The greatest reduction in ASD symptoms was found in the boy's behavior in social relations. Changes in this area were already observed in the first year and were rated at 3.1 points. In subsequent years, the changes were graded gradually higher, up to 4.6 points in the last year.

A smaller reduction was found in the area of physical abilities. The changes observed in the first year were rated at 3.2 points, which was the highest grade, and in the last year it was rated at 4.4.

The smallest, but also gradually increasing reduction was found in the area of communication behavior. In this area, small changes became visible only in the second year of the study (3.2 points) and were ultimately the lowest (4.2 points).

Discussion

The purpose of this study was to present a case of a boy with ASD and to evaluate changes in the severity of autism symptoms that were observed during the five 10-day *aikido* camps organized between 2013-2017. The authors emphasize that the results presented above require taking into account a few limitations of this study. Firstly, the boy's contact with the *aikido* exercises was episodic, not continuous. Secondly, during the five analyzed years, the boy's behavior changed as a result of natural development. Thirdly, the reduction of the autistic symptoms of the boy also resulted from the effects of long-term therapeutic support. It should be remembered

that the development of children with ASD, as well as healthy children, is influenced by various internal and external stimuli. Individual symptoms of developmental disorders and the severity of these symptoms change over time [Paul 2011].

Despite these limitations, our study allows to discuss which elements of a typical *aikido* training can be used in the therapeutic dimension. It also allows to illustrate what unique benefits for individuals with ASD can be achieved by practicing *aikido*.

This martial art was created at the beginning of the 20th century by Master Morihei Ueshiba. Nowadays *aikido* is considered as an effective path to self-improvement and self-development [Wrobel 2001]. It cultivates Japanese tradition expressed in characteristic costumes, behaviors, ceremonies and attachment to the noble ideals of Japanese culture. *Aikido* philosophy excludes aggression, and the essence of its message is contained in the name of this martial art. The word *aikido* consists of three parts: "Ai" - means harmony, coordination, "Ki" - energy, internal strength, "Do" - the way, so they can be translated as a way to harmony of the body and spirit through reconciliation with nature.

Aikido differs from most other martial arts in that the practitioner seeks to achieve self-defense without injury to attackers. Furthermore, it is non-competitive and non-violent martial art. All *aikido*'s movements are based on the natural principles of balance, relaxation and focus of energy. Often circular, blending with attacker's energy, *aikido*'s techniques stress getting out of the way and coming to a place which is safe for both the attacker (*uke*) and defender (*nage*) [Levenson 2003]. The fight in *aikido* is based on the use of the attacker's strength against him, as well as on avoiding and defending against attack rather than attacking. It is often emphasized that this martial art, unlike many others, is neither a sport nor a compe-

tion. It is rather the art of communication between people [Ghazaryan 2016].

The training of young *aikido* adepts is associated with reduction in inappropriate social behaviors, violence, and aggression, as well as increased prosocial behaviors [Paul 2011]. This fact has been demonstrated, among others, by Edelman [1994], who used a 12-week program of *aikido* classes to help severely emotionally disturbed middle and high school students to more effectively manage their own disruptive and assaultive behaviors. The results of these studies have shown that by practicing *aikido* youths can achieve numerous physical and psychological benefits including enhanced levels of cooperation, anger control, empathy for others, respect for authority and peers, relaxation, self-confidence in the face of verbal and physical confrontation, as well as muscular and cardiovascular strength and endurance.

This broad spectrum of benefits confirms that therapeutic treatment using *aikido* training can be useful for children with special needs. The aspects of *aikido* practice that are of particular importance for people with ASD are discussed below.

The constant and repetitive elements of *aikido* trainings includes short meditation at the beginning and end of training, in the *seiza* position, which serves to purify the mind (*mokuso*). Another repetitive element is the form of inviting a partner to exercise and thanking for the joint exercise, which consists of looking into the partner's eyes and bowing in towards him (*ritsu rei, za rei*). Such rituals are an important feature for high-functioning children with ASD, which helps them calm down and creates the impression of constancy. The child knows what is waiting for him when he goes to the next training session, and thanks to this, the transition from the outside world to the *dojo* is less stressful for him. Another constant element of the training is the individual gymnastics *aiki-taiso*, which has a set of consecutive exercises, only slightly modified on successive trainings. At the beginning of the practice, the child with ASD can look at other practitioners and not performing exercises, imitating only similar to the required body positions. After some time, he can begin to imitate some movements performed by the instructor and the other practitioners. Gradually, he begins to focus on himself, getting to know the structure of his body and its functioning.

Although part of a typical *aikido* class includes group exercises, most of the practice is done with a partner, with each person alternating, and playing the role of *uke* and *nage* respectively. The techniques practiced in pairs develop coordination and non-verbal communication. Synchronization of movements with partner's movements, required during practicing different techniques, improves the precision and cooperation. Alternating movements when one person is doing the technique and the other is waiting, learning to pay attention to the

other person. Observing the reaction of the partner, for example when a technique is done too hard, improves the tactile-emotional sensitivity and allows the practitioners to understand the effects of their own actions. According to the elements of the theory of mind, widely described in the literature, also in relation to people with ASD [Spain *et al.* 2018; Sivaratnam *et al.* 2018], creating a grimace on the partner's face creates the possibility of non-verbal communication.

Exercises with *aiki-jo* require the practitioner to coordinate the left and right hand, but also to find the right space for himself and his partner. By performing alternating elements, the brain's hemispheres are synchronized in the left and right hands, and manual skills are also developed. Multi-element exercise systems stimulate memory, teach distance and precision of movement.

Group exercises and games used in classes with young *aikido* adepts introduce elements of rivalry, cooperation, group communication and coordination of tasks. The emerging element of competition develops the ability to deal with losing and winning and the associated stress. Winning gives the winner the joy, but it should also teach respect for losers. The winner should not be exalted. Failure should be overworked so that stress associated with fear of it should not block the next action.

Multistimulation, which takes place in the training of *aikido*, gives the possibility of better functioning of all the senses, as well as nervous, muscular and bone systems. Particularly valuable are exercises typical for *aikido*, including kneeling and standing starting positions that stimulate a better functioning of the sense of balance, exercises with *aiki-jo* that develop knowledge of directions and space, stretching exercises in low positions that make the whole movement apparatus more flexible and elements of hands patting, which sensitize to touch.

Each of the above-mentioned *aikido* aspects has a positive impact on the individual development of a human being, and for children and young people with ASD, equalizing and developing these features is even more important. Because thanks to such psycho-motor stimulation, the quality of functioning in everyday life increases at the elementary level [Moyes 2001].

Movement therapy for autistic children is usually based on the methods and assumptions of improving children who are included in the developmental standard. However, choosing the right method for a particular type of disability is very difficult. The best effects are usually brought by skilful use of various methods depending on the individual preferences of the child, but also the skills and competences of the therapists [Szot 2003]. The results of scientific studies showing the beneficial effect of physical exercise on stimulating various areas of developmental deficiencies in children with ASD confirm the validity of this approach. Meta-analysis of Sowa and Meulenbroek [2012] that evaluated 16 behavioural studies under review were swimming, jogging, horse-

back riding, cycling and weight training, walking and other physical activities. The effects of the activities were mostly gauged in the three core symptom areas of ASD, i.e., motor, social and communication skills, but in some cases also effects on attention, academic engagement and physical condition were assessed. They emphasized that the individual programs elicited significantly more improvement than the group interventions in the physical abilities and, more surprisingly, also in the social domain.

Scientific research assessing the effectiveness of reducing the severity of typical ASD symptoms through physical exercise has shown that the greatest benefit with moderate to large effect sizes can be achieved by martial arts programs [Bremer *et al.* 2016; Zou *et al.* 2017]. Empirical evidence supports the efficacy of the martial arts on social interaction, communication, stereotypic behaviors, and balance, but individuals with ASD also experience significant improvement in self-control, memory, and cognitive function [Bell *et al.* 2016].

Researchers who studied the effects that can be achieved in the treatment of children with ASD have selected the most important aspects of practicing martial arts and sports, which they included: consistent workout, incorporation of play and games to training practice, teaching movements in small, sequential steps, visual demonstration, verbal feedback and physical prompting [Bell *et al.* 2016].

Each of the martial arts has its own specificity and in a certain way differs from the others. This should be taken into account when deciding on the choice of a martial art that best suits the individual needs of people with ASD. Scientific research indicated that a traditional Chinese mind-body exercises were beneficial to improving brain functions (inhibitory control, cognitive flexibility, and memory functioning) and improving self-control problems, commonly manifested as temper outbursts and repetitive/rigid/impulsive behaviors [Chan *et al.* 2008; Chan *et al.* 2011; Chan *et al.* 2013]. Practicing *karate*, especially *kata* techniques, was effective for consistently reducing social dysfunction in children with ASD [Movahedi *et al.* 2013] stereotypic behaviors [Bahrami *et al.* 2012] and communication deficits [Bahrami *et al.* 2016]. And taekwondo intervention was effective therapeutic option for balance improvement of children with ASD [Kim *et al.* 2016].

Aikido, is another martial art in which the effectiveness in reducing the severity of ASD symptoms has been confirmed. Specific *aikido* techniques develop concentration, body awareness, sensitivity to others and social involvement, but also balance and coordination. Because they are practiced both individually and, with a partner, so they encourage nonverbal and verbal communication, collective learning, community involvement, and self-awareness [Paul 2011]. Using a therapeutic dimension of *aikido* for reducing the severity of ASD symptoms depends on competence of therapists. Only an appro-

priate differentiation of the proportion between such characteristic aspects of *aikido* as rituality, repeatability of individual exercises, special contact with the partner and multistimulation allow to achieve many benefits and take into account the individual needs of children and young people with ASD. It can be incorporated into a rehabilitation program to help symptomatic management of ASD [Zou *et al.* 2017].

Conclusions

The *aikido*-based program, which was used as an additional therapeutic intervention for one boy with ASD, helped to reduce the severity of his ASD symptoms in the areas of social relations, physical abilities and communication behaviors

The greatest reduction in severity of ASD symptoms was found in the boy's behavior in social relations. This was expressed by the growing responsibility for the performance of his duties and entrusted tasks, better understanding of the relationships and rules of functioning in the peer group, and easier acceptance of the unknown environment. The reduction of ASD symptoms was also noted in terms of physical abilities, which expressed a greater willingness to undertake physical exercise, improved visual-motor coordination, increased correctness of movement sequences and reduced fear of unknown motor tasks. The smallest reduction in the severity of ASD symptoms was noted in the field of communication. The change in the behavior of the boy in this area consisted in easier expressing his own emotions and accepting physical contact with other people.

Future research confirming the effect of using *aikido* as an additional therapeutic intervention for children and youth with ASD should be empirical and should include larger groups of subjects. They can be helpful in finding further hints which symptoms of ASD can be mitigated or reduced using this Japanese martial art.

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