

Postural disorders in preschoolers – serious issue of the present time

MGR. MARINA SRPONOVÁ

Catholic Univ. in Ruzomberok, Faculty of Health, Slovakia

Slovak Medical University in Bratislava, Faculty of Nursing and Professional Health Studies

Summary

Proper body positioning is an important part of overall health of an individual and it is formed as early as in preschool years. Postural disorders are becoming more and more of a serious issue in preschool years when children are only getting accustomed to keeping the proper posture. This contribution aims to find out whether incorporating exercises into a common pre-schooler day will alter acquired postural disorders. The sample consisted of 28 preschoolers aged 5-7. Data collection was conducted using aspexy and muscular disbalance was assess by muscular test and shortened muscle tests by Janda. Results were processed using MS Excel. Final examination showed adjustment in body posture, especially the backbone with 10.7% of preschoolers.

Key words: Posture. Preschoolers. Back exercises.

Introduction

Nowadays, postural disorders rank among serious problems. The lifestyle of modern population defined by lack of motion and sedentary way of life at work as well as in schools significantly contributes to the rising tendency in postural disorders and developing vertebrogenic problems. Some authors classify vertebrogene symptomatology as civilisation diseases. Dvoák (2008, p.17) states it is the most common illness second to only cold and the conse-

quences have a significant socio-economic impact. While in the past postural disorders were usually associated with higher age, nowadays they occur more and more frequently in children, even in preschool years. The data from our clinical praxis proved the rising numbers of postural disorders at such a young age and that is why we monitored this particular aspect in nursery schools in Ruomberok which also confirmed that postural disorders pose a serious problem nowadays.

Postural disorders and the project Healthy little back

Body posture is the characteristic way one's body segments are positioned in space whether being static or while moving. Several authors (Kolá a kol, 2009, Blahušová, 2002, Sochová, 2002) define the ideal body posture as follows:

- the chin at right angle to the neck, the connecting line between the external auditory meatus and the eyes is horizontal and the vertex pulled up, the head in alignment with the body axis,
- shoulders pulled back and down, shoulder blades are symmetrical and drawn to the ribcage, upper limbs loosely on the sides of the trunk,
- the stomach tucked in,
- the spine with no scoliotic curvature in frontal line and with continuous curves in sagittal line,
- the pelvis symmetrical in frontal line, in sagittal line so called inclinacio pelvis or pelvic inclination or neutral pelvic position,
- the legs position loosely one next to another, with the parallel feet.

This is called a proper body posture or ideal, physiological posture. Any deviation from proper body posture is called incorrect posture which is defined by forwarded head posture connected with a slight recline, hyperkyphosis, protruding shoulder blades, weakened upper back muscles and shortened breasts muscles, accentuated lordosis, weakened abdominal muscles, shortened knee joints flexors, weakened gluteal muscles, mainly *m. gluteus maximus* (Hromádková, 2009). If we did not pay attention to issues and symptoms of incorrect posture, they would lead to serious back deformities, intervertebral discs damage, faster degenerative backbone changes and vertebrogene pain that become a serious issue of each patient.

The most suitable way to "fight" the incorrect posture and its complications is prevention and education. Our study focused on preschool years when the basics of proper posture are only being formed, muscles are elastic and flexible, children like to move, which is the basis for forming the proper

posture, and they are just beginning to develop habits to move correctly and lead a healthy lifestyle.

Taking all this into consideration, the head of the neurosurgery clinic MUDr. Róbert Rusnák, PhD., implemented a project called Healthy little back, whose main aim was to prevent incorrect posture in children. The team consisting of a neurosurgeon, an orthopaedist, a physiotherapist, a nurse and teachers prepared a set of medical exercises for children in nursery schools as a part of the prevention-education process. These sets follow the State Curriculum 0 valid for the Slovak Republic, specific skills in children these exercises are supposed to develop and strategies used in teaching and learning process like verbal instructions, examples, instructions by touch, principles of sequencing and adequacy, praise, encouragement, warning (Rusnák et al., 2014). These strategies are combined with principles of medical exercises such as: exercise accuracy, aiming at a specific muscle, keeping physiological posture before and after exercising, doing the exercise slowly (no swinging) with the help of breathing and relax (Rusnák et al., 2014). In accordance with the State Curriculum 0 the exercises start from lower positions – sitting, lying on the stomach, lying on the back to vertical position – standing. All sets are preceded by a dynamic warm-up supporting the development of gross motor skills. Anatomical peculiarities in preschool children cause some limitations in the sets: positions are not kept for a long time, no unilateral load, no fast backward head tilting, no hanging or front support, no uncompensated backward bending in loins and lumbar spine (Kístek, Dvořáková, 2012). To encourage proper exercising we recorded the sets on a DVD that helps teachers in their work with children in nursery schools. We also wrote a manual with detailed description of each exercise, mistakes to avoid, motivation and number of repetitions. We also organized training sessions for teachers where they were instructed how to diagnose incorrect posture in children, how to implement medical exercises in nursery schools and how to proceed in case of serious back deformities.

To verify the efficiency of medical exercising we implemented a pilot project called Healthy little back in two nursery schools in Ruomberok. The project was started in February 2015 and carried out in cooperation with the Catholic university in Ruomberok, Department of physiotherapy and the results were positive.

Evaluation of results

The main aim of the study was to find out verify whether implementing medical exercises in nursery schools has any impact on preschool children pos-

ture. Partial aims focused on exercises helping muscular dysbalance causing incorrect posture. We observed whether muscles likely to weaken (shoulder blades muscles, m. rectus abdominis and m. gluteus maximus) get stronger as a result of exercising and whether muscles likely to shorten (pectoral muscles, hamstrings and erector trunci) stretch. As it is a pilot project, the research sample consisted of 28 children aged 5-6. Proband was a subject of study from February to May 2015. Children exercised daily, supervised by students of the Catholic university in Ruomberok and their teachers. When the project was started, we carried out initial aspxy examination in which we detected deviations in correct posture in three views: frontal, lateral and back based on criteria stated by Hromádková, i.e the backbone curvature, forwarded head, shoulder antversion and protruding shoulder blades. We used standardized tests: muscle test and shortened muscles tests. These tests are based on 6 levels defined by Janda (2004, p.15) as follows:

- level 0 – in attempt to move a muscle there is no muscle reaction,
- level 1 (tic) – a muscle contracts but there is not enough strength to move the tested part, which is about 10% of a normal state,
- level 2 (very weak) – a muscle makes the move in full extent but it does not overcome resistance equal to the weight of the part tested, which is about 25% of a normal state,
- level 3 (weak) – a muscle makes the move in full extent, it overcomes resistance of gravity, which is about 50% of a normal state,
- level 4 (good) – a muscle makes the move in full extent, it overcomes moderate resistance, which is about 75% of a normal state,
- level 5 (normal) – a muscle can overcome significant external resistance in full extent, moderate resistance, which is 100% of a normal state,

To test shortened muscles a standardized test created by Janda was used. Shortening is defined in 3 levels:

- level 2 – a muscle is significantly shortened,
- level 1 – a muscle is a partly shortened,
- level 0 – a muscle is not shortened.

All conditions of testing such as proband's correct position, fixation, resistance and the right direction of the move (Janda, 2004; Taká, 2003) were kept.

The testing of probands and exercising itself was carried out with the consent of the parents. The initial examination took place before the first exercising session (February 2015) and the final one at the end of the school year (May 2015). The results were processed and evaluated using MS EXCEL. We compared the posture and muscle condition data from the initial and final examinations.

Results interpretation

The first one is the backbone aspexy examination. We followed the backbone curvature on sagittal plane in 28 preschoolers. The initial examination confirmed a pathological backbone curvature in 15 children (53.6%) and physiological curvature in 13 children (46.4%). The final examination showed improvement in the axial body in 3 children, with 16 children out of 28 with physiological sagittal plane backbone curvature (57.1%) and 12 children (42.9%) with the wrong backbone curvature. (Table 1)

Table 1: Backbone curvature

Back view	Backbone							patho- log.
	C	TH	L	flat C	flat Th	flat L	phy- siolog.	
Initial	4	7	14	0	0	0	13	15
Initial check	0	0	0	0	0	0	0	28
Initial per- centage	14.3	25.0	50.0	0.0	0.0	0.0	46.4	53.6
Final	4	7	11	0	0	0	16	12
Final check	0	0	0	0	0	0	0	28
Final percen- tage	14.3	25.0	39.3	0.0	0.0	0.0	57.1	42.9
Difference in percentage	0.0	0.0	-10.7	0.0	0.0	0.0	10.7	-10.7

Another parameter was the head posture from the side view and its forwarded position, when the chin and the neck are not at right angle and such position is known as pathological. Such forwarded position was found in 5 children (17.9%), the head position was physiological in 23 children (82.1%). No other

head deformities were detected. The final examination showed 7.1% improvement as the forwarded head posture was corrected in 2 children (Table 2).

Table 2: Head position

Side view	Head		
	physiological	forwarded	others
Initial	23	5	0
Initial check	0	0	28
Initial percentage	8.1	17.9	0.0
Final	25	3	0
Final check	0	0	28
Final percentage	89.3	10.7	0.0
Difference in percentage	7.1	-7.1	0.0

Last two parameters evaluated by aspeky were antversion and protruding shoulder blades (scapula alatea). The initial examination showed antversion in 18 children (64.3%) while physiological position was found in 10 children (35.7%). The final examination did not show any improvement (Table 3).

Table 3: Shoulders position

Back view	Shoulders		
	physiological	antversion	others
Initial	10	18	0

Initial check	0	0	28
Initial percentage	35.7	64.3	0.0
Final	10	18	0
Final check	0	0	28
Final percentage	35.7	64.3	0.0
Difference in percentage	0.0	0.0	0.0

Bilateral protrusion of the shoulder blades was detected in 15 children, a protruding left shoulder blade in 1 child, which means that pathological shoulder blades position was detected in 16 children (57.1%) Proper shoulder position was detected in 12 preschoolers (42.9%). The final examination showed improvement in 1 child (3.6%) (Table 4).

Table 4: Shoulder blades position

Back view	Shoulder blades				
	syme- trical	Protruding both	Protru- ding right	Protru- ding left	Non symetri- cal
Initial	12	15	0	2	16
Initial check	0	0	0	0	28
Initial percentage	42.9	53.6	0.0	7.1	57.1
Final	13	15	0	1	15
Final check	0	0	0	0	28
Final percentage	46.4	53.6	0.0	3.6	53.6

Difference in percentage	3.6	0.0	0.0	-3.6	-3.6
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The results of examinations are presented in tables 5 and 6. Tables show results of the initial and final examination comparison. Table 5 shows the impact of medical exercises on muscles likely to shorten. Both muscles stretching and stagnation of the muscles are considered positive results. Out of 28 preschoolers 7 showed stretched hamstrings on their left lower limb, stagnation in 17 children and in 4 children these muscles were shortened. The right lower limb hamstrings were stretched in 6 children, 18 stagnated and shortened in 4. The results of pectoral muscles examination were worse. The left pectoral muscle got stretched in 1 preschooler, while there was no stretching of the right pectoral muscle. The examination of the muscle sacrospinalis showed the best results; this muscle was not shortened in any of the children.

Table 5: Results of the muscles likely to shorten

Shortened	Errectctores trunci	Hamstring l.sin	Hamstring l.dx	Pectorales l.sin	Pectorales L.dx
Stagnation	28	17	18	26	27
Worsening	0	4	4	1	1
Improvement	0	7	6	1	0
Total	28	28	28	28	28

Table 6 shows results of muscle strength testing. We observed the cervical spine flexors – m. rectus abdominis and m. gluteus maximus. Both muscle strength increase and stagnation are seen as positive results of the exercising. As for the cervical spine flexors 8 preschoolers showed muscle strength improvement, 17 stagnated and 3 showed worsening. M. rectus abdominis muscle strength improved in 15 preschoolers and worsened in 4. The strength of the shoulder blades muscles improved in 7 preschoolers stagnated in 18 and worsened in 3. The last one is m. gluteus maximus on the left and right lower limb. When comparing results, there were no lateral differences. The muscle

strength of m. gluteus maximus increased bilaterally in 8 children, stagnated in 20, and there was no worsening.

Table 6: Muscle strength

Weakened	Cervical spine flexors	m. rectus abdominis	Shoulder blades muscles	m. gluteus maximus l.sin	m. gluteus maximus l. dx
Stagnations	17	15	18	20	20
Lowered muscle strength	3	4	3	0	0
Increased muscle strength	8	9	7	8	8
Number of preschoolers	28	28	28	28	28

Discussion

Incorrect posture is a serious problem nowadays and it was also confirmed by the monitoring in which we examined 57 children and found elements of incorrect posture in every single one of them, either connected to the position of the head, shoulder blades, shoulders or the backbone curvature (Table 7).

Table 7: Posture monitoring

	Backbone	Shoulder blades	Shoulders	Head
Input number	39	26	43	21
%	68.42	45.61	75.44	36.84

Total	57	57	57	57
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Since the monitoring proved the seriousness of the issue, we have decided to implement exercises in preschoolers in two nursery schools as a part of a pilot project. That is also the reason for a low number of preschoolers we observed (28). Nevertheless, we detected positive impact of exercises on preschoolers posture. The most significant one was the backbone curvature in the sagittal plane. This has improved in 10.7% of preschoolers. On the other hand the most serious problems we noticed when assessing the posture was the position of the shoulders and protruding shoulder blades. The shoulder antversion was observed in 64.3% of children (initial examination) and the final examination showed no improvement. The shoulder antversion occur as a result of shortened breasts muscles (Kolá et al., 2009) and we did not succeed in influencing this particular muscle group by exercises with only one child showing some improvement. We experienced similar results in the position of the shoulder blades with improvement in 3.6% of children. We suppose that the prevailing shoulder antversion and protruding shoulder blades may be connected with the lack of physical activity in children which is being replaced by sitting in front of a computer or a TV screen that contribute to shortening breast muscles, shoulder antversion and protruding shoulder blades. This hypothesis will be a subject of study in the following stage of the project.

When working on the project and creating sets of exercises we noticed that not only posture but also impaired gross motor skills are both an issue in preschoolers. Poková, Štyrová, Helikarová (2014, p 142 – 143) tested gross motor skills in 90 children aged 3-7. To evaluate it they used a new motor skills test. They tested standing on one leg, hopping on one leg, jumps with a turn and tandem gait. This testing proved that preschoolers gross motor skills are impaired since only 20% of the children managed standing on one leg properly, 15.6% hopping on one leg properly, 27.8% jumps with a turn properly. Tandem gait came out as the best gross motor skills with 32.2% of children managing it properly. The rest of the children made smaller, bigger or major mistakes. We took this fact into consideration when creating the set of exercises including also elements supporting the development of gross motor skills. The part of the project focused on encouraging proper posture follows the principle of preventing muscular imbalance. During exercising the muscles likely to shorten (tonic muscles) are stretched and the muscles likely to weaken (phasic muscles) are strengthened (Rusnák, 2014, Kolá, 2009). Since it is vital to use habits acquired through exercise in everyday activities (sitting,

standing, walking), each child was educated on how to sit properly. This took place while having breakfast, drawing, singing, playing and walking. As these activities – either exercises or education – were carried during a common day of a child, their reaction was positive, they looked forward to exercising and correcting prototype activities because these were implemented into their everyday activities in nursery school in a playful form without limiting them in any way.

Conclusion

It is vital to encourage health and sufficient movement in children in preschool years as it contributes to proper skeleton, muscle and posture development. Positive attitude towards exercising can be achieved by motivating children either to make their own exercising tool, by music accompanying the exercise or a short poem to be said before exercising. As for us, children were motivated by creating their own exercising tool - a snowflake, as the set of exercises was focused on winter and on acquiring basic locomotors skills needed in skiing and sledging as defined in the Curriculum ISCED 0. Exercises were also accompanied by a short poem about winter. We feel this also helps to create a positive attitude towards exercising since sets may be altered and adjusted to skills preschool children are supposed to acquire. Each set may be made more attractive by new poems or songs with different topics – spring, Christianity, morals, each exercise thus contributing besides acquiring locomotors skills to the process of education of each child.

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