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# Achievement of psychological comfort in 5-6-Year-Old children with scoliosis against the background of daily medicinal-prophylactic clothes' wearing for half a year



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## ABSTRACT

**Introduction:** Five to six years old children with scoliosis degree I to II were noted to have some increased level of anxiety and lowered confidence level against the background of (typical for the given state) their physical development inhibition.

**Methods:** Daily medicinal-prophylactic clothing was applied to the observed children 5-6 years for six months to relieve the symptoms of scoliosis. The dynamics of morpho-functional indices, anxiety level and self-esteem in children at the end and at the end of the observation were taken into account.

**Results:** It was found out that the observed children with scoliosis wearing daily medicinal-prophylactic clothes for 6 months were noted to have lowered spinal curvature evidence and an increase of strength and tolerance of body muscles. In addition, there was a significant decrease in anxiety level and increase confidence and motivation level.

**Conclusion:** To conclude, daily wearing of the designed variant of medicinal-prophylactic clothes for half a year can provide the removal of scoliosis signs in 5-6-year-old children and create psychological comfort bringing the accountable indices nearer the control values.

**Keywords:** Children, preschool age, scoliosis, medicinal-prophylactic clothes, psychological comfort.

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## INTRODUCTION

Growth and development of children are often accompanied by the development of morpho-functional disturbances in the musculoskeletal system.<sup>1</sup> Scoliosis is the most common etiology of morpho-functional disturbances and the prevalence among Russian children still remains high.<sup>2</sup> It was noted long ago that presence of scoliosis in a body always led to worsening of the common vital activity with development of persistent psychological discomfort.<sup>3</sup> It is connected with the fact that scoliosis progression weakens the function of internal organs with aging.<sup>4,5</sup> Presence of scoliosis disturbs the work of cardio-vascular system and worsens indices of blood system<sup>6,7</sup> with gradual development of hypoxia in the body.<sup>8</sup> Hypoxia resulting in lack of oxygen in the brain cells of the children with scoliosis thus weakens anabolic processes in them what promotes worsening of many psychological processes.<sup>9</sup>

The high prevalence of scoliosis in children and danger of polymorbidity development keep the need in continuation of efficient correction approaches of spinal curvature with an obligatory account of their impact to the emotional status of the children.<sup>10</sup> Some possibilities of impacts on somatic indices of body and psychical processes<sup>15</sup> were studied earlier

in the clinic<sup>11,12</sup> and in experiments.<sup>13,14</sup> At the same time, there was low attachment of children to traditionally applied scoliosis regular durable medicinal physical training,<sup>16</sup> thus the author understands the urgency of continuation of its correction variants' search. In addition, compliance of children to scoliosis treatment reduce the symptoms thus providing the children with psychological comfort. Such variant of medicinal impact on a children' body can become the foundation for scoliosis prophylaxis and the basis for its correction. Later, it can preserve the health of children' internal organs.<sup>17</sup> Wearing medicinal-prophylactic clothes (MPC) can be considered as an alternative to medicinal physical training as they both improve scoliosis manifestations. It is known that compliance to MPC can be higher than medicinal physical training.<sup>18</sup> At the same time, the possibility of psychological comfort in children with scoliosis with the help of constant MPC wearing remains practically unknown, thus making the demand for conducting additional research. That is why the author put the following aim in our research – to estimate the possibility of psychological comfort in 5-6-year-old children with scoliosis degree I to II against the background of daily MPC wearing for half a year.

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**Materials and methods:** The research was conducted on children living in Central Russia (Moscow city and Moscow region). It took 34 healthy children of both sexes with the age between 5 to 6 years and also 39 children of both sexes with the same age range with scoliosis degree I to II at full absence of any accompanying diseases within them. Given research was approved by local Ethics Committee of Russian State Social University on May, 14th, 2015 (record №5). Both parents of children taken into the research gave written informed consent on the participation of their children in the research. The children themselves agreed verbally in the presence of their parents and witnesses.

Deviation degree of the spinal column in children was determined with a test by pasting special cord with lead in the field of the 7<sup>th</sup> cervical vertebra using adhesive plaster.<sup>3</sup> The distance from the vertical position until acanthus was found with the help of this lead by characterizing the degree of spinal curvature in the frontal plane. The value of humeral index was calculated by dividing the value of a child's humerus width from the chest side (cm) by the value of humerus width from the back side (cm).<sup>18</sup>

The degree of spinal mobility in examined children was estimated when the body tilts forward, backward and sideward. When the body tilts forward at straightened legs, the researcher determined the distance from the middle finger of each hand until the floor surface (cm). When the body tilts backward, the researcher determined the difference of line length (cm), which connected the tops of acantha of the 7<sup>th</sup> cervical vertebra and the initial part of the intergluteal fold. The estimation was conducted in vertical position and backward tilts. Lateral spinal mobility was found in the course of distance estimation from the ends of hands' middle fingers until the floor during maximum tilt sideward from standing position. The higher was the given difference, the more spinal mobility in frontal plane was.<sup>3</sup>

Detection of anxiety level in the observed children was conducted using "Scale of personality anxiety" test.<sup>10</sup> The child was asked 40 questions in accordance with the technique. His/her answers were processed and interpreted to estimate the child's anxiety level.

The technique called "Staircase"<sup>19</sup> was applied for clarifying the child's self-estimation state. The conclusion about self-estimation level was made by processing and interpreting the results, which can be overestimation, adequate, underestimation.

The author's questionnaire, consisting of 10 questions,<sup>20</sup> was used for estimating motivation level for MPC wearing. The child must choose only one variant of answer to each question. The child's

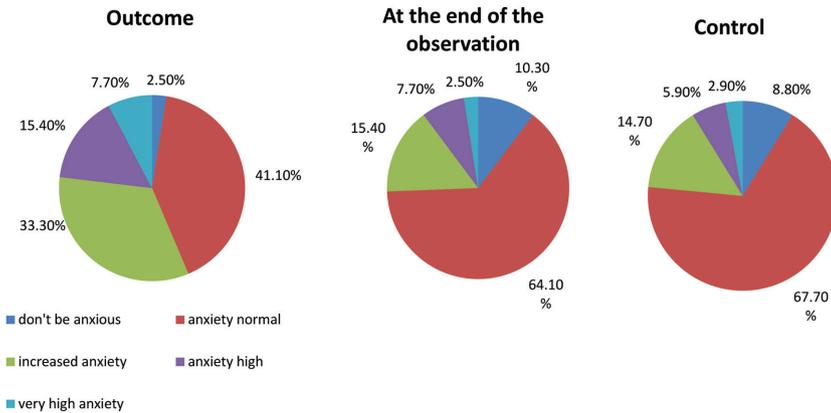
relation to MPC was estimated by processing and interpreting of the results. Strong positive relation was estimated in 3 points; positive relation was estimated in 2 points; neutral answer (do not know, it depends, and so on) was estimated in 1 point; and negative relation to MPC was estimated in 0 points. On the basis of the received data, the five motivation levels for MPC wearing were established: the first level – high motivation to MPC; the second level – good motivation to MPC; the third level – positive relation to MPC; the fourth level – low motivation to MPC; the fifth level – negative relation to MPC.

All the children from experimental group were recommended to wear daily MPC, designed by the author for scoliosis correction.<sup>21</sup> Applied MPC contained a button band and a panel, provided by elastic straps in the upper part, and their ends were connected with both panel sides. The panel was made of non-stretching material and there were pockets with inflexible plates in the corner area of blade bones. The ends of elastic straps were fixed to both panel sides on the level of blade bones and the pockets were attached to the reverse side of the panel. The panel and the button band were supplied with sleeves, a collar, skirts or trousers of any material. Given MPC were put on in a vertical position along with the arms were drawn backward with the help of elastic straps. Inflexible plates pressed the inner part of blade bones promoted flattening of the back. The presence of elastic belt did not hamper normal breathing and at the same time, promoted right fit of clothes on the body. The clothes were worn the whole day and put off before going to bed. In the research, all the children with scoliosis were recommended to wear MPC daily during the whole day for 6 months.

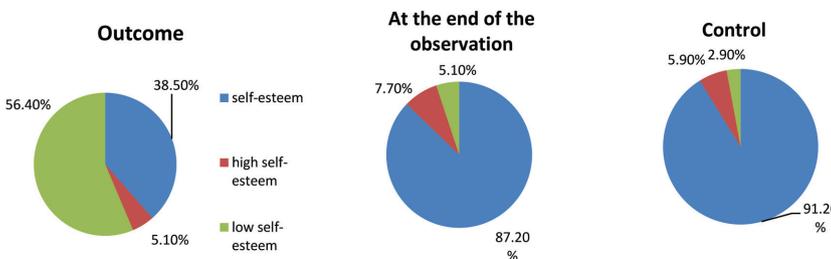
The children from the experimental group were observed and examined at the beginning, 3 and 6 months of continuous MPC wearing. The control group was observed and examined once at the beginning of the study. The results were processed by Student's criterion (t). Statistical processing of received information was made with the help of a programme package "Statistics for Windows v. 6.0", "Microsoft Excel". Differences in data were considered reliable in case of  $p < 0.05$ .

**Results:** In the control group, the growth of children was  $123.6 \pm 1.41$  cm, body weight  $24.2 \pm 1.38$  kg. In children with scoliosis, the growth was  $118.7 \pm 0.73$  cm, body weight  $21.2 \pm 2.10$  kg.

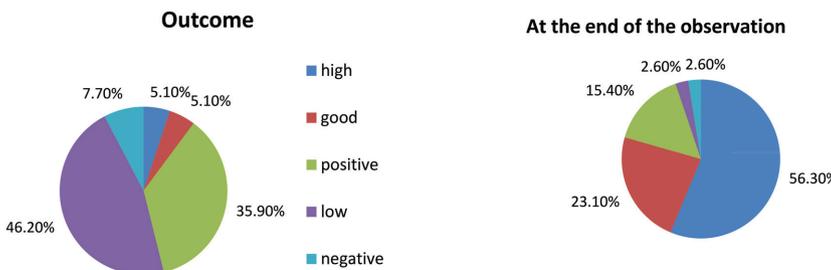
During 3 months of continuous MPC wearing, the children with scoliosis had lowered deviation degree from the vertical position by 55.2%. In addition, the vertical position decreased to the end of the research until  $1.46 \pm 0.14$  cm. In 3 months of MPC application, the children with scoliosis had lowered



**Figure 1** The dynamics of personality anxiety of children with scoliosis against the background of MPC wearing



**Figure 2** The dynamics of self-estimation level in children with scoliosis wearing MPC



**Figure 3** The dynamics of motivation level of children with scoliosis to MPC wearing

humeral index value by 5.5%. At the end of the research, it reached the value of  $0.82 \pm 0.06$  (Table 1).

Application of MPC for 3 months provided the scoliosis children with a tendency to increase of spinal mobility in three planes which reached the significant level in 6 months of the research (to the right side until  $27.9 \pm 0.17$  cm, to the left side until  $27.8 \pm 0.27$  cm, backward until  $18.7 \pm 0.38$  cm).

The result of personality anxiety were presented on Figure 1.

Peculiarities of personality anxiety among the observed children with scoliosis wearing MPC daily were shown in Figure 1. Initially, there was high occurrence of increased anxiety among them (33.3%), high anxiety (15.4%) and very high anxiety (7.7%). In the control group, there was a lowered level of anxiety (14.7%, 5.9%, and 2.9%, respectively).

Application results of the technique for self-estimation detection “Staircase” in children with scoliosis wearing MPC were presented in Figure 2.

At the initial assessment of scoliosis children, there was only 5.1% and 38.5% had overestimation and adequate self-estimation whereas underestimation was noted in 56.4% of children. Daily MPC wearing increase their self-estimation till the level relevant for healthy persons at the same age (adequate self-estimation – 87.2%, underestimation – 5.1%, overestimation – 7.7%).

The dynamics of motivation level towards MPC wearing presented on Figure 3.

At the beginning, there was low motivation for wearing MPC in children with scoliosis (high – 5.1%, good – 5.1%, positive – 35.9%). In the course of MPC wearing, the children with scoliosis were noted to have some increase validity level to its wearing, which was pointed at the formation of positive relation to it (high motivation – in 56.3%,

**Table 1** The dynamics of morpho-functional and hematological characteristics of examined children with scoliosis against the background of medioprophyllactic clothes’ wearing

Registered parameters	A group of children with scoliosis against the background of medioprophyllactic clothes’ wearing, n = 39, M ± m			Control, n = 34, M ± m
	initial state	3 months	6 months	
Deviation of spinal column from the vertical position, cm	4.5 ± 0.29	2.9 ± 0.37 p1 < 0.01	1.46 ± 0.14 p1 < 0.01	0.2 ± 0.004 p < 0.01
Value of humeral index	0.72 ± 0.16	0.76 ± 0.09	0.82 ± 0.06 p1 < 0.05	0.90 ± 0.06 p < 0.01
Degree of spinal column mobility in the course of tilts to the left side, cm	21.6 ± 1.24	24.5 ± 0.30	27.8 ± 0.27 p1 < 0.05	32.8 ± 1.45 p < 0.01
Degree of spinal column mobility in the course of tilts to the right side, cm	22.4 ± 1.34	24.7 ± 0.24	27.9 ± 0.17 p1 < 0.05	32.5 ± 2.44 p < 0.01
Degree of spinal column mobility in the course of tilts backwards, cm	14.5 ± 0.72	16.3 ± 0.41	18.7 ± 0.38 p1 < 0.05	22.6 ± 0.72 p < 0.01

Conventional signs: p – signification of parameters’ differences of children with scoliosis and control group. p1 – dynamics’ signification of accountable indices of children with scoliosis in the course of correction in comparison with the beginning.

good motivation – in 23.1%, positive motivation – in 15.4%).

Discussion: Everyone has its unique genetic code in which its morpho-functional characteristics and possible susceptibility to various pathologies are hidden.<sup>22,23</sup> The realization of this predisposition is mostly connected with environmental impacts on a body causing the development of various somatic disturbances<sup>24,25</sup> and its progression.<sup>26</sup> All this information is acceptable for scoliosis which can develop in the course of active growth of a child's body at predisposition under the impact of unfavorable environmental factors. Preservation of researchers' attention to this state is explained by the high prevalence of scoliosis among children in the whole world and frequency of its complications.<sup>1,7</sup>

It is known that scoliosis development in children worsens metabolism and the processes of blood circulation thus disturbing the function of many internal organs, including the brain.<sup>5,6</sup> Besides, the presence of scoliotic spinal curvature, as an aesthetic defect, lowers self-estimation of a child which can strengthen and deepen the impact of developing hypoxia on his/her brain's cells. This situation forms psychological discomfort and self-doubt in children leading to psychological (problem?) as explained by low initial level of children's motivation to wear MPC. Planned explanatory work of the pediatrician and parents could not influence this motivation level.

It was clear that for rehabilitating scoliosis children, it was necessary to work out some efficient correction variants of the given state that would allow the prevention of rheological disturbances<sup>26</sup> and various somatic pathology in them later in the future.<sup>27,28</sup> Wearing MPC is one of the corrections to prevent rheological disturbances in children. However, the degree of its impact on the morpho-functional status of a child's body with scoliosis isn't yet fully studied.

Based on the conducted research, it can be stated that wearing regular MPC influences positively the values of humeral index, level of muscle strength and tolerance.

By keeping the body in proper anatomy and physiological condition, there is optimization of the internal organs of the scoliosis children. This situation leads to the adequate inflow of necessary quantity of nutrients and oxygen to bones and muscles resulting in active washing of toxic products out of them. All of these provide strengthening growth and development in the locomotor system of children on behalf of the increase of body mass, thickening of bones and optimization of their functional state.<sup>29</sup> The oncoming changes in the body create prerequisites for enhancing

the synthesis of adenosine triphosphate.<sup>30,31</sup> The synthesis of nucleic acids and proteins in locomotor system and internals is inevitably stimulated in these conditions. Given changes should be considered to be physiological basis for MPC rehabilitating impact. Its daily wearing lowers manifestations of scoliosis in children, creating the most favorable conditions for metabolism,<sup>32,33</sup> and adaptation of a child's body to environmental conditions.<sup>34,35</sup>

Estimation of psychological comfort from MPC for children is one of the most significant indices of its quality in the trial of searching the ideal technological construction, accordance of the product's surface in statics and dynamics, the physiologically justified rigidity of elements composing it.<sup>36,37,38</sup> That is why the conducted observation over anxiety dynamics in children wearing MPC was very interesting. The possibility of emotional background, which is an important element in children bodies' stabilization of children with scoliosis was shown. Lowered anxiety level and increase self-estimation promoted the formation of better mood and significantly rose adaptation of children to the environment.<sup>39,40</sup> Increase motivation towards wearing MPC in scoliosis children<sup>41,42</sup> was the indubitable evidence of the ease at wearing, provision of subjective comfort and improvement of children's general state.

It becomes clear that it is possible to significantly weaken somatic manifestations of scoliosis in 5-6-year-old children during 6 months of MPC application. Half a year morpho-functional characteristics in scoliosis children using MPC was relevant to the one after daily medicinal-physical training and some courses of massage.<sup>18</sup> At the same time, wearing of MPC can give psychological comfort to children with scoliosis in the result of anxiety removal and increase of self-estimation. This result speaks about high efficiency and great availability of the tested approach as it can remove scoliosis manifestations.<sup>43</sup> Scoliosis children's high motivation to wear MPC daily provides rehabilitating effect for somatic and psychological status of a child with scoliosis.

## CONCLUSION

Five to six years old children with scoliosis degree I to II are characterized by increase of anxiety level and lower confidence level. The initial motivation of these children to MPC wearing was low. Daily wearing of medicinal-prophylactic clothes for half a year turned out to be able to significantly improve physical indices, lower their anxiety, and increase confidence level. Besides, the level of motivation to MPC wearing significantly rose in the course

of medicinal-prophylactic clothes' application to children with scoliosis.

Conflict of interest: No Conflict of interest to declare.

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