INFLUENCE OF THE PHYSIOTHERAPY PROGRAM ON ADOLESCENTS WITH FUNCTIONAL SLUMP POSTURE

Tanya Grueva, Simona Bogdanova
National Sports Academy "Vassil Levski", Sofia, Bulgaria

ABSTRACT
Most researchers focus their attention on developing posture habits in preschool and the first two years of school. Less attention is paid to the pre-high school and high school years of adolescent posture habits. This is a period of losing interest in sports activities and concentrating more on studies, leading to the development of musculoskeletal alterations that trigger inadequate postural patterns. Slump posture is the most commonly observed condition among adolescents. They often adopt this posture during prolonged periods of sitting, particularly while studying or using electronic devices. Slump posture can lead to discomfort and long-term musculoskeletal issues. By participating in physiotherapy, adolescents may experience a reduction in discomfort associated with poor posture, improved spinal alignment, and overall conditioning.
The purpose of this report is to demonstrate that physiotherapy is vital during this developmental stage. It can help adolescents develop healthier habits and establish proper posture.
In our investigation, 14 children aged between 13 and 18 years with Slump posture participated. They underwent a six-month physiotherapy program that included strengthening exercises targeted at the back, shoulder, and core muscles, along with flexibility training and stretching exercises to address tightness in the chest and hip flexors. A Kraus-Weber 6-step test was performed before and after the testing period to track any progression in muscle function and changes in postural behavior.
The results show that some strength position tests improved, but all of the participants could not complete the flexibility tests.
In summary, the influence of physiotherapy programs on adolescents with functional Slump posture is significant, as it addresses and improves musculoskeletal alterations during a crucial time of physical and cognitive growth. However, to maintain these improvements and enhance flexibility, consistency is essential in combating poor postural habits during these formative years.

ORCID
Tanya Grueva
https://orcid.org/0000-0001-5455-2474

Cite this article as:
Grueva, T., Bogdanova, S. (2025). Influence of the physiotherapy program on adolescents with functional slump posture. *Proceeding book of the 4th International Scientific Congress "Applied Sports Sciences", 2025, Sofia.* pp. 267 - 272.
https://doi.org/10.37393/ICASS2025/41

Keywords: *Slump posture, adolescent, physiotherapy*

INTRODUCTION

Maintaining good posture in children has long been a focus of health and educational experts. However, fostering proper postural habits in today's children poses a challenge, as many struggle to maintain attention and motivation for physical activity. A sedentary lifestyle often begins in early childhood and continues into adolescence, reducing opportunities for natural postural development. Proper posture—defined as the optimal alignment of the body against the force of gravity—is not only important for physical coordination and balance but also for injury prevention and mental well-being. Studies have shown that good posture can boost confidence and self-esteem in children (Dehcheshmeh, 2023).

During childhood, the musculoskeletal system is still developing. As such, this period represents a critical window for establishing postural habits that can influence long-term health outcomes (Dugan, 2018).

Research has traditionally focused on postural development in preschool and the early primary school years (Balko et al., 2017; Cicovic et al., 2025; Toloza et al., 2021). Comparatively little attention has been paid to posture during the pre-high school and high school years—a time when many adolescents begin to lose interest in sports and shift their focus to academic tasks. This transition often results in musculoskeletal alterations and poor postural habits (Holt et al., 2020).

Slump posture is the most commonly observed condition among adolescents. It is characterized by rounded shoulders, a forward head position, leaning the body weight on the bones and spine, and not utilizing the trunk muscles to maintain an upright position. They often adopt this posture during prolonged periods of sitting, particularly while studying or using electronic devices (Laser et al, 1998). Unfortunately, a bad tendency of computer use by children is increasing at home as well as in classrooms. Studies from various developed countries report similar trends: American teenagers spend more than 16 hours weekly on computers for schoolwork, communication, and entertainment (Stanger & Gridina, 1999); Australian students aged 10–17 years report an average of 16.9 hours (Harris & Straker, 2000); and Hong Kong students aged 13–18 report about 18 hours weekly (Subrahmanyama et al., 2001).

The effects of poor posture are already observable in adolescents. Another study shows that approximately 30% of children report musculoskeletal discomfort—comparable to the 32% found among Finnish students. This rate is lower than that reported in the United States (77.1%) and Australia (60%), but higher than the 18% previously noted in England (Robins et al., 2001).

Slump posture can lead to discomfort at the present moment and long-term musculoskeletal issues later in life. By participating in physiotherapy, adolescents may experience a reduction in discomfort associated with poor posture, improved spinal alignment, and overall conditioning (Hill & Keating, 2016). Numerous methods have been used to improve body posture in children, the most important of which is performing therapeutic and corrective exercises (Sheikhhoseini & Kamelan, 2025). Consistent physical activity and regular exercise play a fundamental role in establishing good posture in children. Though the researchers underline that the exercise program should be a child-centered model in order to have adherence. The fundamental principles of this approach are: Attention to individual differences – guided by individual characteristics such as age, weight, developmental level, interests, and postural needs; and Fun and diverse activities – where exercises are transformed into fun and engaging games using age-appropriate equipment, supportive tools (Hill & Keating, 2016; Holt et al, 2020).

Therefore, addressing postural issues in adolescents is a unique challenge. The young individuals should be properly engaged in exercising and understand the effectiveness of developing and maintaining healthy postural habits by strengthening core muscles, enhancing flexibility, increasing body awareness, improving neuromuscular coordination, improving muscle strength, and reinforcing balance and postural control (Sheikhhoseini & Kamelan, 2025).

The purpose of this report is to demonstrate that physiotherapy is vital during this developmental stage. It can help adolescents develop healthier habits and establish proper posture.

METHODOLOGY

In our investigation, 14 children aged between 13 and 18 years with Slump posture participated (Table 1). The physiotherapy visits were initiated at the parents' request, with the primary goal of improving the children's posture and promoting regular physical activity. Before starting with the treatment plan, written informed consent was obtained from the parents. All the investigated adolescents had only functional posture disability, with no trace of structural deformity. They were not engaged in any other sports activity. The participants underwent a six-month physiotherapy program that included strengthening exercises targeting the back (Figure 1), shoulder (Figure 2), and core muscles, as well as flexibility and stretching exercises (Figure 3) to address tightness in the chest and hip flexors. Exercise difficulty was tailored to each child's individual ability, allowing progress at their own pace. At the beginning, each exercise was done in one set of 10 repetitions, gradually increasing to 2-3 sets. And the progression is obtained only if the given exercise is performed confidently, or the adolescent gets bored with doing it.

Table 1. *Anthropometric characteristics of the subjects*

Parameter	Subjects (*n*=14)
Male	11
Female	3
Age (years)	14.3.6±1.1
Height (cm)	158.5±5.3
Weight (kg)	68.2 ±6.3

To enhance engagement and enjoyment, various tools were incorporated, including dumbbells, resistance bands (Therabands), balance discs, unstable surfaces, a fitball, and a foam roller (Figure 4). Initially, treatment with a physiotherapist was held once a week and was later reduced to once a month. We encouraged the adolescent to follow the exercise program daily, or at least four times a week. The included exercises were not strenuous or exhausting; on the contrary, they were energizing for the individual. The main objective of the program was to motivate the adolescents to adopt a home-based physical activity routine rather than relying on regular physiotherapy visits.

Figure 1. *Shoulder bridge – low back, Glutes and hamstring muscles*

Figure 2. *Shoulder flexion with TheraBand resistance*

The Kraus-Weber 6-step test (Kraus & Hirschland, 1954) was performed before and after the intervention period to assess improvements in muscle function and postural behavior. This six-item medical fitness test evaluates the strength and flexibility of key postural (core) muscles. It comprises five strength components—upper abdominal muscles, including m. psoas; upper abdominal muscles excluding m. psoas; lower abdominal muscles, including m. psoas; upper back muscles; lower back muscles, and one general flexibility component, assessing the flexibility of the lower back and hamstrings. The Kraus-Weber Test is simple to administer, does not require expensive equipment, and serves as a minimal muscular fitness assessment. It was originally designed to evaluate the muscular function necessary for individuals with trunk disabilities, but it is also considered a basic standard of fitness that a healthy person should be able to meet. Failure to successfully complete even one of the six components constitutes a failed test. The maximum possible score is 50 points, accompanied by a successful completion of the flexibility assessment.

Figure 3. *Stretching back and the tights, shoulder strength*

Figure 4. *One-leg squat with foam roller*

Statistical analysis was done, where mean values and standard deviation were calculated for each parameter of the test. A paired-sample *t*-test was used to determine if there were differences between data obtained before the physical activity program and after six months of participation. The significance level was considered at $p < .05$

RESULTS

The results indicate that while some strength-position test scores improved, none of the participants were able to complete the flexibility component of the Kraus-Weber 6-step test. As a result, all participants failed the overall test even after six months of consistent practice. This suggests that improving flexibility to meet the normative standards may be particularly challenging at this age if it has not been developed and maintained from early childhood. However, this hypothesis requires further investigation.

Table 2. *Statistical results of the 5 strength steps from Kraus Weber test*

5 strength tests	Beginning		6th month		d	d%	d_{es}	t	p
	$Mean_1$	SD_1	$Mean_2$	SD_2					
Up. Abs+Psoas	7.143	4.688	10	0	-2.86	-40	-1.22	2.28	.041
Up. Abs-Psoas	5.714	5.136	10	0	-4,29	-75.01	-1.67	3.12	.044
Lo. abs+Psoas	7.143	2.179	9.714	0.061	-2.57	-35.99	0	4.25	.002
Up. back	6.643	2.341	9,571	0.646	-2,93	-44.08	0	4.51	.001
Lo. back	6.214	2.007	9.357	0.633	-3.14	-50.58	0	5.59	<.001

Notes. SD – standard deviation, d – mean differences (degrees of freedom), t – t-criteria of Student

Despite this limitation, participants demonstrated improvement across all five strength components, as shown in Table 2. Each test step was analyzed in detail to gain a better understanding of individual muscle group performance. Statistically significant improvements were observed in muscle function related to the lower abdominal muscles, including the m.psoas; upper back muscles; and lower back muscles. Detailed graphical data illustrating these improvements can be found in Figures 5 through 7.

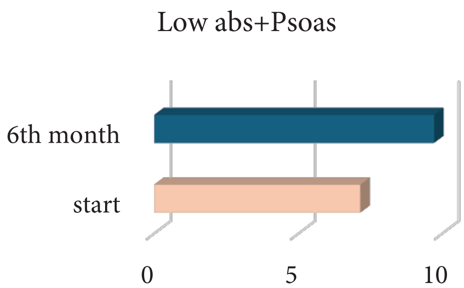

Figure 5. *Low abs+m.psoas strength test*

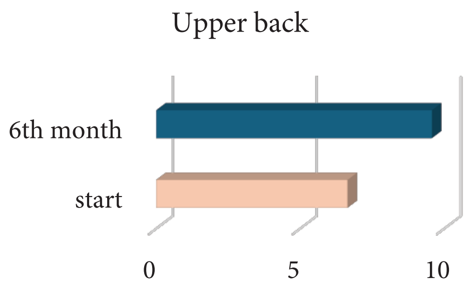

Figure 6. *Upper back strength test*

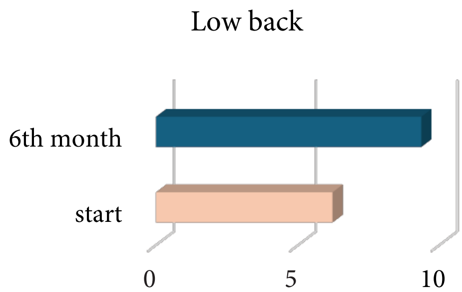

Figure 7. *Low back strength test*

After six months of practice, the highest score was achieved on the lower abdominal and psoas muscle test, with an average performance hold of 9.7 seconds out of a possible 10. The greatest improvement over the testing period was observed in the upper abdominal muscle test (excluding the psoas), with an increase of 4.29 points compared to the baseline. These findings suggest that both the upper and lower abdominal muscle groups were effectively activated and strengthened throughout the intervention period.

DISCUSSION

Postural disorders in children are becoming increasingly prevalent, warranting significant attention. Research consistently shows that incorrect body posture in adulthood often originates during childhood (Yang et al., 2020). The same team of authors claims that if left untreated, poor posture can lead to a range of adverse health outcomes, including postural deviations, reduced cardiorespiratory performance and lung capacity, headaches, back pain, and even displacement of internal organs.

Adolescence, which encompasses the period of puberty, is marked by substantial somatic, hormonal, and behavioral changes. These changes influence the development and adaptation of postural strategies (Shumway-Cook & Woollacott, 2007). During this phase, motor skills may deteriorate due to rapid changes in body proportions, such as shifts in lever arms and segment volumes (Azevedo et al., 2022; Demirbüken et al., 2016).

A growing concern is the sedentary lifestyle among youth, largely driven by the widespread use of electronic devices. It is a big challenge for the parents to make them physically active and to do something different from walking, to target the appropriate muscles for better posture and general conditioning. There are a lot of authors behind this assertion (Kumar et al., 2015; Murphy et al., 2004; Hercig, 2005). Several researchers emphasize that incorrect or unbalanced muscle use during growth periods significantly contributes to poor posture, with the most common being the Slump posture (Grimmer & Williams, 2000; Kolar, 2002).

One of the most effective solutions to improving posture is regular physical activity. Numerous studies confirm that the more time children spend engaged in organized physical activity, the better their postural alignment tends to be (Balko et al., 2017; Bogdanović & Marković, 2010). Our own investigation supports these findings: consistent corrective and strengthening exercises were shown to activate the core muscles, contributing to improved posture during daily activities. However, our findings also raise new questions. For example, despite consistent active and passive stretching exercises over six months, some children failed to meet basic flexibility benchmarks. This suggests that muscle length adaptation may require more than just time and routine stretches, indicating a need for deeper research into muscular and neuromuscular adaptations during growth.

Parent feedback from our intervention program was overwhelmingly positive. Many reported noticeable improvements in their children's posture and motivation to participate in physical activity, although these subjective reports have not yet been statistically analyzed.

Balko et al. (2017) also highlighted the crucial role of family support in fostering physical activity outside of school. According to their study, children encouraged by their families to be active had significantly better posture. Specifically, 42% of physically active children had good or perfect posture, compared to 44% of sedentary children who exhibited poor or very poor posture. Notably, the less active group spent up to three hours daily watching TV or using a computer.

We strongly believe, and our results support, that regularly practicing core-strengthening and upper body corrective exercises (especially targeting the head and shoulders) enhances postural endurance in everyday life. Similarly, Gencheva and Zaharieva (2013) observed that incorporating a Swiss ball into children's daily physical activity programs provided age-appropriate challenges. Balance exercises performed on the ball triggered automatic balance responses, contributing to spinal stability and overall posture improvement.

The primary limitation of this study is the small sample size, which restricts the generalizability of our findings. Our participants were not selected through systematic screening but were instead recruited based on parental concern regarding their adolescents' posture. This non-random selection limits the representativeness of the sample. Consequently, further research involving a larger and more diverse population is necessary to strengthen and validate our conclusions. We intend to continue collecting data using this method to expand our dataset and provide more robust support for our findings in future analyses.

CONCLUSION

Slump posture can be both prevented and treated through a structured, child-oriented physiotherapy program, consisting of strengthening exercises for shoulder, gluteus, and trunk core muscles, along with stretching exercises for Hamstrings and triceps, as well as tight chest muscles. The active physical program should be time-efficient and incorporated into the child's daily routine, ideally replacing sedentary activities such as prolonged screen time. To effectively combat the growing trend of physical inactivity among adolescents, close collaboration between parents, school educators, and physiotherapists is essential.

REFERENCES

Azevedo, N., Ribeiro, J. C., & Machado, L. (2022). Balance and posture in children and adolescents: A cross-sectional study. *Sensors, 22*(13), 4973. https://doi.org/10.3390/s22134973

Balko, Š., Balko, I., Valter, L., & Jelinek, M. (2017). Influence of physical activities on the posture in 10–11 year old schoolchildren. *Journal of Physical Education and Sport, 17*(1), 101–106. https://doi.org/10.7752/jpes.2017.s1016

Bogdanović, Z., & Marković, Ž. (2010). Presence of lordotic poor posture resulted by absence of sport in primary school children. *Acta Kinesiologica, 4*(1), 63–66.

Cicovic, V., Pavlović, B., & Lalović, L. (2025). The influence of corrective gymnastics on the correction of bad body posture and motor ability in children. In *Antropološki i teoantropološki pogled na fizičke aktivnosti, 11*, 133-137 https://doi.org/10.5937/ATAVPA25133C

Dehcheshmeh, T. F., Majelan, A. S., & Maleki, B. (2023). Correlation between depression and posture: A systematic review. *Current Psychology, 43*, 27251–27261.
https://doi.org/10.1007/s12144-023-04630-0

Demirbüken, İ., Özgül, B., Timurtaş, E., et al. (2016). Demographic characteristics related to body posture in early adolescence. *Journal of Exercise Therapy and Rehabilitation, 3*(3), 84–9.

Dugan, J. E. (2018). Teaching the body: A systematic review of posture interventions in primary schools. *Educational Review, 70*(5), 643–661 https://doi.org/10.1080/00131911.2017.1359821

Gencheva, N., & Zaharieva, D. (2013). The fit-ball balance training in children with bad posture. In *XVI Scientific Conference "FIS Communications 2013" in Physical Education, Sport and Recreation, and I International Scientific Conference, 3,* 257–264.

Grimmer, K., & Williams, M. (2000). Gender-age environmental associates of adolescent low back pain. *Applied Ergonomics, 31*(4), 343–360. https://doi.org/10.1016/S0003-6870(00)00002-8

Harris, C., & Straker, L. (2000). Survey of physical ergonomics issues associated with school children's use of laptop computers. *International Journal of Industrial Ergonomics, 26*(3), 337–346. https://doi.org/10.1016/S0169-8141(00)00009-3

Hercig, S. (2005). O problému zdravotně oslabených žáků, který přerůstá učiteli přes hlavu [The problem of physically disordered students who grows teachers over their head]. *Tělesná výchova a sport mládeže, 71*(3), 11.

Hill, J. J., & Keating, J. L. (2016). Encouraging healthy spine habits to prevent low back pain in children: An observational study of adherence to exercise. *Physiotherapy, 102*(3), 229–235. https://doi.org/10.1016/j.physio.2015.05.005

Holt, C. J., McKay, C. D., Truong, L. K., Le, C. Y., Gross, D. P., & Whittaker, J. L. (2020). Sticking to it: A scoping review of adherence to exercise therapy interventions in children and adolescents with musculoskeletal conditions. *Journal of Orthopaedic & Sports Physical Therapy, 50*(9), 503–515. https://doi.org/10.2519/jospt.2020.9715

Kolář, P. (2002). Vadné držení těla v posturální ontogenezi [Poor posture on postural ontogenesis]. *Pediatrie pro praxi, 3,* 106–109.

Kraus, H., & Hirschland, R. (1954). Minimum muscular fitness of the school children. *Research Quarterly, 25,* 178–188.

Kumar, B., Robinson, R., & Till, S. (2015). Physical activity and health in adolescence. Clinical Medicine, 15, 267–272.
https://doi.org/10.7861/clinmedicine.15-3-267

Laser, K., Maxwell, L., & Hedge, A. (1998). The effect of computer work station design on student posture. *Journal of Research on Computing in Education, 31*, 173–188.

Murphy, S., Buckle, P., & Stubbs, D. (2004). Classroom posture and self-reported back and neck pain in schoolchildren. *Applied Ergonomics, 35*(2), 113–120.
https://doi.org/10.1016/j.apergo.2004.01.001

Robbins, M., Johnson, I. P., & Cunliffe, C. (2009). Encouraging good posture in school children using computers. Clinical Chiropractic, 12(1), 35–44. https://doi.org/10.1016/j.clch.2009.03.003

Sheikhhoseini, R., & Kamelan, M. (2025). Child-centered corrective exercises: A multidisciplinary approach to posture improvement in children. *Journal of Pediatrics Review. 13*(1), 1-4. https://doi.org/10.32598/jpr.13.1.1128.2

Shumway-Cook, A., & Woollacott, M. H. (2007). Motor control: Translating research into clinical practice. Lippincott Williams & Wilkins.

Stanger, J., & Gridina, N. (1999). Media in the home. In N. Norwood (Ed.), The fourth annual survey of parents and children. Annenberg Public Policy Center of the University of Pennsylvania.

Subrahmanyam, K., Greenfield, P., Kraut, R., & Gross, E. (2001). The impact of computer use on children's and adolescents' development. *Journal of Applied Developmental Psychology, 22*(1), 7–30. https://doi.org/10.1016/S0193-3973(00)00063-0.

Toloza, S. C. M., Guerrero, C. A. J., & Castaño, P. R. L. (2021). Knowledge and practices of back care: Experience in Colombian children. *Global Pediatric Health, 8*. https://doi.org/10.1177/2333794X211023460

Yang, L., Lu, X., Yan, B., & Huang, Y. (2020). Prevalence of incorrect posture among children and adolescents: Findings from a large population-based study in China. *iScience. 23*(5), 101043 https://doi.org/10.1016/j.isci.2020.101043

Corresponding author:
Tanya Grueva, PhD
Faculty of Public Health, Health Care and Tourism
National Sports Academy "Vassil Levski"
1, Gurgulyat, Str., 1700, Sofia/Bulgaria
E-mail: tanya.grueva@nsa.bg

IV International Scientific Congress "Applied Sports Sciences"

PROCEEDING BOOK

Peer-Review Statement
All full-text papers included in this conference proceedings volume have undergone a rigorous peer-review process. Each submission was evaluated by at least two independent reviewers with academic expertise relevant to the topic of the paper. Reviews were conducted in accordance with established scholarly standards, ensuring the quality, validity, and originality of the published contributions. Only papers that met the required scientific and ethical criteria were accepted for publication.

Publication Ethics and Malpractice Statement
The editors of this conference proceedings volume are committed to upholding the highest standards of publication ethics, following the principles outlined by the Committee on Publication Ethics (COPE).

By submitting their manuscripts, all authors confirm that:

- their work is original and has not been previously published or submitted elsewhere;
- the research presented is conducted in accordance with accepted ethical standards;
- all sources used are properly cited;
- there is no plagiarism, data fabrication, or falsification;
- all authors have contributed substantially to the manuscript and approve its final version;
- any conflicts of interest have been disclosed.

The editors maintain responsibility for the integrity of the publication process, ensuring fair and unbiased review, confidentiality of submissions, and immediate action in cases of suspected misconduct. Any breaches of ethical standards will lead to correction, retraction, or other appropriate measures.

21–22 November 2025

Sofia, Bulgaria

IV International Scientific Congress "Applied Sports Sciences"

21–22 November 2025
Sofia, Bulgaria

PROCEEDING BOOK

EDITORS OF THE PROCEEDING BOOK:

Prof. Ognyan Miladinov, DSc
Assoc. Prof. Milena Kuleva, PhD
Assoc. Prof. Stefka Djobova, PhD

Design: Slavka Asenova, Svetla Kostova
Publisher: Scientific Publishing House NSA Press
ISBN (Online): 978-954-718-803-7