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AN INTEGRATIVE APPROACH OF STRETCHING AND PLAY TECHNOLOGIES IN DEVELOPING FLEXIBILITY IN PRESCHOOL GIRLS

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Abstract. *The article examines an integrative approach to the development of flexibility in preschool girls (aged 5–6) by combining stretching techniques with play technologies. The research is grounded in national policy documents on preschool education reform in Uzbekistan and aims to provide both theoretical justification and experimental evidence of the effectiveness of such an approach. Flexibility is recognized as a key factor in children's physical development, contributing to mobility, coordination, and overall health, while play serves as the leading activity that shapes social, emotional, and cognitive engagement at this age. The study was conducted in several preschool institutions in Andijan region and included an experimental program of training sessions held three times a week for 30 minutes. The program was structured into four sections: dynamic stretching games, static stretching games, "animal stretching" exercises based on imitative movements, and team-based flexibility games. A control group followed traditional stretching methods. To evaluate effectiveness, initial and final flexibility tests were administered, including wrist and thumb flexibility, shoulder and back mobility, forward bend, sit-and-reach, bridge, and splits. The results showed that the experimental group demonstrated statistically significant improvements compared to the control group in most tests, particularly in standing forward bend, sit-and-reach, and all split exercises, with growth rates exceeding 80–90%. The integration of play elements ensured higher motivation, sustained participation, and a positive emotional environment, which proved crucial for young children's engagement. However, some areas, such as shoulder flexibility (back scratch), sit-and-reach at age six, and bridge exercises, showed limited progress, indicating the need for more targeted and systematic exercises. The findings confirm that combining stretching and play technologies is an effective pedagogical strategy for enhancing flexibility in preschool children. This integrative method not only promotes physical qualities but also supports motivation, creativity, and social interaction, thereby making the training process more engaging and holistic. The study provides methodological recommendations for preschool educators, emphasizing the*

importance of balancing static and dynamic exercises, strengthening age-appropriate preparatory activities, and integrating playful forms to achieve sustainable physical development outcomes.

Keywords: *flexibility, stretching, play technologies, integrative approach, preschool girls.*

Introduction. This research is carried out within the framework of international scientific evidence emphasizing the importance of early childhood physical activity and flexibility development. According to the World Health Organization [1], daily structured and unstructured physical activity is essential for preschool children's motor skills, health, and overall development. Recent studies highlight that stretching-based programs contribute to improved range of motion and musculoskeletal health in young populations [2]. Furthermore, researchers underline that playful movement activities are a key pedagogical approach in preschool education, as they integrate physical, cognitive, and social development in a holistic manner [3]. Flexibility is considered one of the key factors in children's physical development. It helps to increase the mobility of muscles and joints, as well as to improve physical activity and overall health. Flexibility development is especially important for children aged 5–6, as it forms the foundation for their future physical preparedness. This article analyzes the interrelation of stretching and play technologies in the development of flexibility, their impact on children's physical development, and practical methods of application. In addition, the effectiveness of the integrative approach is examined on the basis of scientific studies and practical experience.

Flexibility is a decisive quality in preschool children, ensuring movement culture, correct posture, and the prevention of injuries. Stretching exercises are the main means of improving flexibility, and the correctly chosen type, dosage, timing, and playful integration directly affect the outcome. Recent studies have shown that regular stretching significantly increases ROM (Range of Motion) after just 2 weeks, which confirms the necessity of implementing methodologically grounded programs for children [4, p.186–194].

Stretching increases ROM through several mechanisms: reduction of passive stiffness of the muscle–tendon units, increased pain tolerance and sensory adaptation, and changes in muscle blood supply characteristics. It has been demonstrated that even short-term (5–30 s) static stretching can increase ROM and reduce musculo-tendinous stiffness [5, p.154–164].

Static stretching immediately increases ROM, but holding stretches for 60 s or more before strength- and speed-demanding activities may reduce performance; stretches of ≤60 s have minimal or no negative effect. Therefore, after a warm-up, dynamic stretching and sport-specific movements are recommended [6, p.2633–51; 7, p.1468; 8, p.279–285].

Stretching performed several times per week leads to a significant increase in joint ROM after 2 or more weeks; this effect is observed across different age groups, including children [4, p.186–194].

Studies indicate that stretching during childhood helps prevent musculoskeletal problems, reduces the risk of overweight, and supports the maintenance of flexibility [9, p.150–157].

A study conducted in Malaysia with preschoolers showed that adding just 2 minutes of stretching to play lessons for 6-year-olds improved flexibility levels. This demonstrates a small but practically important "micro-dose" approach [10, p.14–19]. Meta-analyses and reviews demonstrate that dynamic stretching before training optimizes warm-up without reducing (and sometimes even enhancing) performance, while static stretching is effective for increasing ROM but should be applied cautiously before tasks requiring strength and speed. Ballistic stretching is not recommended for preschool children without the supervision of an experienced coach [11, p.299–325]. Cognitively engaging and play-based physical activities increase motivation, coordination, and overall physical performance in children; when such programs are integrated with flexibility blocks, they enhance participation and contribute to the stable development of ROM [12, p.839–852; 13, p.13531].

The WHO recommends that children under 5 should engage in a lot of daily movement, limit screen time, and ensure proper sleep hygiene; U.S. guidelines state that children aged 3–5 should be physically active throughout the day, not necessarily meeting the strict "60 minutes" rule for older children, but instead having "plenty and varied" movements. Within this framework, short stretching blocks combined with play, distributed throughout the day, achieve the best coverage [14, p.2019; 15, p.2019; 16, p.2024].

A 30-minute session structured in the following way proved effective in improving flexibility. The warm-up part (5 minutes) prepared the body for the main load, increased muscle temperature, activated physiological range of motion in joints, and gradually accelerated cardiovascular function. The main static and active stretching (10–12 minutes) aimed to enhance the elastic properties of muscles and tendons, increase ROM, and reduce excess stiffness. Playful blocks (8–10 minutes) maintained internal motivation and made the session engaging. The final phase (5 minutes) helped restore muscles to their initial tone, slow heart rate, and calm the nervous system. Research emphasizes that dynamic stretching has positive or neutral effects on performance, which supports its use in pre-activity protocols [17, p.299–325].

The results of the study show that stretching steadily improves flexibility in children, especially when weekly protocols are applied 3 times a week, with 10–15 s hold durations for muscle groups. The combination of dynamic stretching before, static

stretching during and after, together with a playful approach that enhances motivation and participation, is the key to effectiveness. For safety, qualified supervision, pain-free ranges, and age-appropriate regressions are essential. This approach is consistent with WHO recommendations and scientific studies, and when combined with the "Stretching for Kids" platform, it serves to optimize the development of flexibility [18, p.2633–51; 4, p.186–194; 14, p.2019].

Relevance. In the modern education system, increasing attention is being paid to the physical and psychological development of preschool children. Children of preschool age are characterized by their natural activity, curiosity, and striving for independence [20, p. 11]. Through the gradual acquisition of movement skills, children develop activity [20, p. 12], which, when purposefully guided through physical education, creates favorable conditions for the early development of essential qualities such as flexibility.

Flexibility develops throughout all stages of human life, but its most intensive formation occurs during childhood [21, p. 54]. Children aged 5–6 possess high elasticity of muscles and tendons, mobility of the spine, and overall body adaptability, making this period the most optimal stage for developing flexibility [22, p. 50].
Physical education occupies a central place in working with preschool children [20, p. 21]. It is precisely during this period that the foundation for a child's comprehensive development is laid: metabolic processes in the body are highly active, the response to any physical exercise is stronger, and the level of adaptability is higher [20, pp. 47–48].

The stretching method is a highly effective tool for developing flexibility in children, with its static variants being particularly aimed at improving flexibility [22, p. 135]. At the same time, it is recommended to integrate static exercises with play forms, as this creates a positive emotional background, encourages active participation, and ensures a safe training environment for children [22, pp. 137–144].

At the preschool stage, play activity is the leading form of activity through which children's social and cognitive engagement, creative thinking, and understanding of space and time are formed [20, p. 18]. Through play, children master coordination of movements, develop cooperation and social relationships, and learn to express their emotions. It is precisely through such psychomotor and social experience that a child achieves all-round development [20, p. 59]. Therefore, combining stretching exercises with active play technologies meets both the physiological and psychological needs of children. Play is the primary activity that allows a child to express their inner world, emotions, willpower, and needs [20, p. 76–78]. The role of the play method in fulfilling didactic tasks is also significant: it enhances children's attention, stimulates creative thinking, and increases motivation [20, p. 87]. Therefore, introducing stretching exercises in the form of play during the preschool period has a multifaceted positive

impact on a child's development. Based on the above, the integration of stretching exercises with play technologies for the development of flexibility in preschool children is a highly relevant issue from both scientific and practical perspectives.

Research Aim. The aim of this study is to determine and scientifically substantiate the effectiveness of an integrative approach of stretching and play technologies in the development of flexibility in 5–6-year-old children.

Research Objectives. To study the theoretical foundations of developing flexibility in children. To analyze the impact of stretching exercises on physical development. To identify the influence of play technologies on children's physical activity and motivation. To develop an integrative approach combining stretching and play technologies and to test it experimentally. To analyze the research results and develop methodological recommendations.

Research Methods. The following methods were used in the course of the study. The method of theoretical analysis was employed to study scientific literature, methodological sources, and advanced practices. The experimental research method was applied to determine the outcomes of implementing stretching and play technologies. Comparative and statistical analysis methods were used for mathematical and statistical processing of the research results. Surveys and pedagogical observations were conducted to evaluate children's motivation toward the training sessions.

Organization of the Research. The study was conducted among 5–6-year-old children at State Preschool Educational Institution No. 44 in Andijan city, Institution No. 21 in Andijan district, and Institution No. 1 in New Andijan. Within the framework of the research, the initial level of participants' flexibility was assessed using special tests. The practical stage of the study consisted of a training program that integrated stretching and play technologies. The sessions were conducted three times a week, each lasting 30 minutes. The program included various pedagogical approaches, visual materials, and musical play elements. At the end of the study, the final test results were compared with the initial indicators to assess the effectiveness of the program, and statistical analysis was carried out.

Research Results and Discussion. Taking into account the developmental characteristics of preschool children, the integration of play elements with stretching exercises holds significant pedagogical value in forming flexibility skills. While traditional stretching exercises are effective in improving flexibility, it may sometimes be difficult to sustain children's interest and ensure their active participation in the process. Therefore, the use of play technologies provides an opportunity to make stretching both more effective and more enjoyable.

Play occupies a central place in children's activities, particularly in the process of assimilating the external environment and expressing attitudes toward social phenomena through imitation [23, p. 4]. This, in turn, highlights the necessity of using

play technologies as an effective tool in shaping children's motor activity [23, p. 3]. Moreover, through active games, children are able to express their movements freely, in an engaging and natural environment. Under such conditions, the development of physical qualities such as flexibility is achieved with greater success. In this process, arousing children's interest, stimulating their intrinsic need for movement, and integrating stretching exercises into play play a crucial role.

According to scientific sources, motor skills and abilities formed up to the age of seven serve as an important foundation for a child, contributing to further physical preparedness during the school years. This, in turn, facilitates the acquisition of more complex movements in the future and creates opportunities to achieve higher results in sports [24, p. 18]. In particular, a balanced approach to developing flexibility - namely, applying stretching exercises in playful forms - ensures harmony between children's physical and psychological activity. The use of play and competitive approaches in teaching physical exercises within the preschool education system has been shown to yield positive results. This provides a scientific basis for integrating stretching techniques with active games in the pedagogical process [25, p. 63].

In this study, an experimental program aimed at developing flexibility in 5–6-year-old girls was designed. The program applied effective methods based on play technologies. Specifically, the system of exercises for flexibility development was divided into four sections, with two types of games assigned to each section along with clear recommendations for their implementation. The sections were as follows: (1) games integrated with dynamic stretching, (2) games integrated with static stretching, (3) "animal stretching" exercises, i.e., imitative movements of animals, and (4) flexibility exercises performed through team-based games.

These exercises were structured considering the age-specific characteristics of children, their interest in movement, and the level of psychomotor development. Each section had its own targeted purpose: dynamic exercises were intended to prepare the muscles for activity and increase functional mobility; static exercises were aimed at strengthening muscle elasticity through sustained stretching; "animal stretching" provided natural and engaging movements that developed flexibility, balance, and coordination through animal imagery; while team games fostered children's motivation for physical activity, social skills, and collaborative interaction.

Overall, this experimental program, designed on the basis of a comprehensive approach, stimulated children's active participation in movement and significantly contributed to the improvement of flexibility indicators.

The following table presents a set of play-based exercises organized on the basis of stretching. Each game is briefly and clearly described, including its name, main objective, and procedure. This table serves to systematically illustrate the methods applied for the effective development of children's flexibility (see Table 1).

A Set of Stretching Games for Improving Flexibility

Table 1

Section	Game Name	Objective	Procedure
Dynamic Stretching Games	Passing Through the Tunnel	Improves flexibility, stretches the spine and thigh muscles, develops balance and adaptability	Two children raise their arms to form a tunnel. The others, in turn, bend forward without bending their knees and pass under the tunnel. The tunnel height is gradually lowered.
	Colored Cones	Stretches muscles, improves balance and reaction speed	Colorful cones are placed around the playground. Each color corresponds to a different stretching exercise. The instructor names a color, and children run to the cone and perform the exercise.
Static Stretching Games	Magic Statue	Develops balance and postural control	Children hold various poses (star, bridge, flamingo, swallow) for a certain period. The one who holds the pose the longest is the winner.

	Butterfly Wings	Stretches and relaxes thigh muscles	Children sit on the floor, extend their legs forward, bend their knees outward, hold them with their hands, lean forward, and hold the position for 20–30 seconds.
Animal Stretching Games	Sleeping Rabbit	Stretches the back, neck, and thigh muscles; relaxation	Children kneel, bend forward placing their forehead on the floor, stretch their arms forward, and hold the position for 20–30 seconds.
	Cat–Cow	Improves spinal mobility, strengthens back and abdominal muscles	From a hands-and-knees position, arch the back while inhaling (cow), and round it while exhaling (cat).
	Downward Dog	Stretches the body, thighs, shoulders, and arm muscles	From a hands-and-knees position, lift the hips upward to form a triangle shape and hold for 10–20 seconds.
	Frog Jumps	Strengthens leg muscles, develops endurance and balance	Stand with legs wider than shoulder-width, squat down, and jump upward

			forcefully, repeating 8–10 times.
Team-Based Flexibility Games	Flexibility Relay	Develops flexibility and balance	Children complete a sequence of 10 different exercises: walking along a red path, passing a ball, climbing over a hill, high jumping, etc.
	Carrying Snake	Stretches spine and leg muscles, develops teamwork	Children hold each other's shoulders in a line and move forward bent down or sideways, imitating a snake.

The research results showed that the program combining stretching and play technologies significantly contributed to the improvement of children's flexibility levels. According to the initial test results conducted at the beginning of the experiment, the participants' flexibility indicators were at an average level. However, the final test results carried out after the training sessions confirmed a considerable improvement in flexibility (see Table 2).

Preliminary Analysis of Flexibility Tests in 5–6 Year Old Girls

Table 2

№	Tests	EG $\bar{x} \pm \sigma$				CG $\bar{x} \pm \sigma$			
		5 age n-25		6 age n-25		5 age n-25		6 age n-25	
		r	B	r	B	R	b	r	b
1	Wrist and Thumb Flexibility	1.20±0.81	0.76±0.14	0.62±0.99	0.89±0.14	1.14±0.84	0.77±0.15	0.66±1.10	0.89 ±0.15
2	Shoulder and Back Flexibility	56.3±6.49	0.40±0.31	50.9±11.1	0.50±0.33	56.6±6.23	0.40±0.31	50.0±11.3	0.59±0.24
3	Shoulder Flexibility (Back Scratch)	0.36±1.86	0.71±0.21	1.24±2.61	0.77±0.21	0.32±1.92	0.58±0.19	2.56±2.2	0.86±0.09
4	Standing Forward Bend Flexibility	0.12±0.33	0.97±0.06	4.36±6.46	0.76±0.32	0.2±0.64	0.97±0.06	3.32±5.69	0.84±0.25
5	Spinal Flexibility	23.5±5.37	0.28±0.14	26.9±4.48	0.10±0.14	23.0±5.37	0.12±0.22	25.5±4.54	0.0±0.0
6	Sit and Reach	1.78±1.54	0.8±0.0	2.88±4.36	0.61±0.25	1.9±2.01	0.80±0.04	0.37±2.14	0.22±0.37
7	Bridge Flexibility	23.8±11.1	0.04±0.08	36.9±14.2	0.12±0.33	23.6±11.0	0.05±0.09	35.9±10.4	0.13±0.19

8	**Front Split**	17.4±7.66	0.23±0.26	16.9±6.84	0.20±0.24	18.4±8.13	0.20±0.26	14.8±6.38	0.40±0.24
9	**Right Split**	16.3±7.37	0.28±0.27	16.2±6.94	0.31±0.24	17.2±7.84	0.25±0.27	14.2±6.36	0.40±0.24
10	**Left Split**	17.0±7.91	0.24±0.26	17.4±7.08	0.28±0.23	17.9±8.31	0.22±0.25	15.0±6.72	0.4±0.25

Note: EG – experimental group, CG – control group, r – result, b – score.

The initial analysis of flexibility test results showed that, for the wrist and thumb flexibility test, in the experimental group the average result of 5-year-old girls was 1.20±0.81 cm, and in 6-year-old girls 0.76±0.14 cm. In the control group, respectively, 1.14±0.84 and 0.77±0.15 cm indicators were observed. Also in terms of scores there is no sharp difference between TG and NG (within 0.62–0.89). This result shows that at the initial stage there is similar flexibility in the wrist and thumb joints of children. In the shoulder and back flexibility test, the 5-year-old experimental group showed 56.3±6.49 cm, which was almost equal with CG (56.6±6.23 cm). At the age of 6, EG indicators were slightly higher (50.9±11.1 cm) compared to CG (50.0±11.3 cm). Scores are also almost equal (0.40–0.59). This situation shows that the flexibility of the shoulder and back muscles does not differ much at age stages. For the shoulder flexibility (back scratch) test, in EG the result of 5-year-old children was 0.36±1.86 cm, while in CG it was 0.32±1.92 cm. At age 6, EG (1.24±2.61 cm) was lower than NG (2.56±2.2 cm). In terms of scores CG has an advantage (EG – 0.71–0.77, CG – 0.58–0.86). This result showed that in connecting the shoulders behind, the control group was slightly superior. According to the standing forward bend test, in 5-year-old EG the result was 0.12±0.33 cm, while in CG it was 0.20±0.64 cm. At age 6, EG result (4.36±6.46 cm) was higher compared to CG (3.32±5.69 cm). In terms of scores EG showed a higher (0.97) indicator. In this test the superiority of the experimental group was observed. In the next spinal flexibility test, 5-year-old EG – 23.5±5.37 cm, CG – 23.0±5.37 cm. In 6-year-old EG (26.9±4.48 cm) higher than CG (25.5±4.54 cm). But the scores in EG (0.28–0.10) differ slightly compared to CG (0.12–0.0). These results show that spinal flexibility is almost equal.

Through the sit and reach test, children in EG (5 years – 1.78±1.54 cm; 6 years – 2.88±4.36 cm) showed higher results compared to CG (5 years – 1.9±2.01 cm; 6 years – 0.37±2.14 cm). Especially at age 6 the advantage of EG was noticeable. Also in scores EG (0.8–0.61) had higher values. This shows that in the experimental group leg and back muscle elasticity was relatively better.

For the seventh test, bridge flexibility, in both ages EG (23.8±11.1 cm and 36.9±14.2 cm) showed close results compared to CG (23.6±11.0 cm and 35.9±10.4 cm). In scores also no difference is observed (0.04–0.13). Thus, in bridge position there is no sharp difference between the groups. In the front split test, at age 5 EG –

17.4±7.66 cm, CG – 18.4±8.13 cm. At age 6 EG – 16.9±6.84 cm, CG – 14.8±6.38 cm. In scores EG (0.20–0.23) close to CG (0.20–0.40). Thus, initial split flexibility is proportional between the groups.

For the right split test, EG (16.3±7.37 and 16.2±6.94 cm) showed similar indicators to CG (17.2±7.84 and 14.2±6.36 cm). Scores are also very close to each other (0.25–0.40). This result shows that the initial level in right split is stable for both 5 and 6 years. Finally, in the left split test EG (17.0±7.91 and 17.4±7.08 cm) showed close results compared to CG (17.9±8.31 and 15.0±6.72 cm). In scores also a difference in the range 0.22–0.40 is seen. This shows that left split results are also equal for 5 and 6 years.

General conclusion for preliminary analysis shows that, in 5–6-year-old girls, there are no sharp differences between experimental and control groups, only in some tests (Standing Forward Bend, Sit and Reach) EG indicators are relatively higher. In other tests, group differences are very small and the probability of being statistically significant is low. This situation shows that at the initial stage the groups started from almost equal conditions, and a convenient basis was created for assessing the effectiveness of the subsequent experimental program.

Final analysis of flexibility tests in 5–6-year-old girls

Table 3

№	Tests	EG $\bar{x} \pm \sigma$				CG $\bar{x} \pm \sigma$			
		5 age n-25		6 age n-25		5 age n-25		6 age n-25	
		R	B	r	b	R	b	r	b
1	Wrist and Thumb Flexibility	0.84±0.74	0.83±0.14	0.2±0.40	0.96±0.08	1.04±0.78	0.79±0.15	0.64±1.11	0.90±0.15
2	Shoulder and Back Flexibility	47.0±6.03	0.65±0.13	43.7±7.70	0.76±0.12	55.6±6.08	0.40±0.29	49.8±11.2	0.50±0.34
3	Shoulder Flexibility	3.28±1.24	0.90±0.10	1.72±2.13	0.75±0.17	0.22±1.79	0.72±0.19	1.76±2.90	0.76±0.23

	(Back Scratch)								
4	**Standing Forward Bend Flexibility**	0.12±0.33	0.97±0.06	0.68±2.21	0.96±0.11	0.2±0.64	0.97±0.06	3.32±5.69	0.82±0.28
5	**Spinal Flexibility**	20.2±4.91	0.20±0.27	22.7±8.20	0.24±0.13	22.8±5.27	0.12±0.22	25.5±4.41	0.14±0.15
6	**Sit and Reach**	3.12±1.20	0.77±0.16	2.48±2.77	0.8±0.05	1.84±1.96	0.80±0.04	1.88±4.38	0.66±0.24
7	**Bridge Flexibility**	26.2±4.48	0.16±0.19	24.4±12.2	0.33±0.43	26.8±9.57	0.04±0.08	35.9±10.4	0.07±0.19
8	**Front Split**	1.64±2.17	0.89±0.13	2.2±2.72	0.87±0.15	17.4±8.03	0.20±0.26	14.3±6.32	0.38±0.24
9	**Right Split**	1.36±2.21	0.91±0.13	1.2±1.80	0.91±0.11	16.9±7.94	0.24±0.26	13.9±6.44	0.38±0.23
10	**Left Split**	1.68±2.42	0.90±0.13	1.52±2.06	0.91±0.11	17.4±7.91	0.24±0.26	14.5±6.70	0.37±0.24

Note: EG – experimental group, CG – control group, r – result, b – score.

In the final analysis of flexibility tests the following were identified. In the wrist and thumb flexibility test, in the experimental group the results of 5- and 6-year-old girls were higher compared to the control group (EG: 0.84 and 0.20; NG: 1.04 and 0.64 cm), and the scores were recorded higher. This shows that in EG the flexibility of the wrist and thumb joints improved. In the shoulder and back flexibility test also at age 5 (47.0±6.03 cm) and age 6 (43.7±7.70 cm) the results were higher compared to CG (NG: 55.6 and 49.8 cm). The scores were also higher in EG, which indicates that the stretching degree of the shoulder and back muscles improved.

For shoulder flexibility (back scratch), in EG at age 5 the results were much higher (3.28±1.24 cm), while in CG lower (0.22±1.79 cm), therefore EG had an advantage in scores (0.90 vs 0.72). At age 6 both groups had almost equal indicators, and in scores also no big difference was observed.

In the standing forward bend flexibility test, in EG the results of 5-year-old children (0.12±0.33 cm) were higher compared to CG (0.20±0.64 cm), and at age 6 EG

(0.68 cm) recorded much better results than CG (3.32 cm). Accordingly, the scores were higher in EG (0.96–0.97). This shows that forward bend flexibility of children developed effectively.

In the spinal flexibility test, for 5 years EG (20.2±4.91 cm) had better results compared to CG (22.8±5.27 cm), and in scores EG also was superior (0.20 vs 0.12). At age 6 also EG (22.76±8.20 cm) showed higher results than CG, and maintained superiority in scores. This shows that in spinal mobility the experimental program was effective.

According to the sit and reach test analysis, in EG at age 5 the results (3.12±1.20 cm) were higher than CG (1.84±1.96 cm), and at age 6 also EG (2.48±2.77 cm) was better compared to CG (1.88±4.38 cm). In both ages the scores were in favor of EG. This indicates improvement of leg posterior muscles and lower back flexibility.

Bridge flexibility in EG (26.2 and 24.4 cm) was higher compared to CG (26.8 and 35.9 cm). This shows EG superiority also in the bridge exercise, and the scores were recorded higher in EG.

For the front split test, in EG at age 5 the results (1.64±2.17 cm) were significantly higher compared to CG (17.4±8.03 cm), and the scores were also much higher in favor of EG (0.89 vs 0.20). At age 6 also EG (2.2 cm) showed better results than CG (14.3 cm). This shows clear superiority of EG in split exercises.

In the right split, in EG at age 5 (1.36 cm) and age 6 (1.2 cm) the results were significantly higher compared to CG (16.9 and 13.9 cm). Scores were also higher in EG (0.91 vs 0.24–0.38), and effective growth was recorded in the right split.

For the left split also at age 5 EG results (1.68 cm) were much higher compared to CG (17.4 cm), and at age 6 EG (1.52 cm) showed better results than CG (14.5 cm). In both ages EG had superiority in scores (0.90–0.91 vs 0.24–0.37). This indicates effective development of left split flexibility.

The final stage results in all tests showed that in the experimental group the numerical results were higher than in the control group, and the scores were higher. This proves the effectiveness of stretching exercises and clear improvement of flexibility ability. Especially, in split exercises, standing forward bend and sit and reach tests the superiority of the experimental group was clearly observed. This confirms the effectiveness of the program based on an integrative approach that combined stretching and play technologies (see Table 4).

Analysis of the initial and final results of 5–6 Year old girls

Table *3*

№	Tests	Groups	5 age					6 age				
			I.r $\bar{x} \pm \sigma$	F.r $\bar{x} \pm \sigma$	t-t	p-v	%	I.r $\bar{x} \pm \sigma$	F.r $\bar{x} \pm \sigma$	t-t	p-v	%

1	**Wrist and Thumb Flexibility**	CG	1.14±0.84	1.04±0.78	0.47	> 0.05	8.77	0.66±1.10	0.64±1.11	0.07	<0.05	3.03
		EG	1.20±0.81	0.84±0.74	1.79	> 0.05	30.0	0.62±0.99	0.2±0.40	2.15	< 0.05	67.7
2	**Shoulder and Back Flexibility**	CG	56.6±6.23	55.6±6.08	0.62	> 0.05	1.76	50.0±11.3	49.8±11.2	0.06	> 0.05	0.4
		EG	56.3±6.49	47.0±6.03	5.74	< 0.05	16.5	50.9±11.1	43.7±7.70	2.91	< 0.05	14.1
3	**Shoulder Flexibility (Back Scratch)**	CG	0.32±1.92	0.22±1.79	0.20	> 0.05	31.2	2.56±2.2	1.76±2.90	1.20	> 0.05	31.2
		EG	0.36±1.86	3.28±1.24	7.15	< 0.05	8.11	1.24±2.61	1.72±2.13	0.78	> 0.05	38.7
4	**Standing Forward Bend Flexibility**	CG	0.2±0.64	0.2±0.64	0	> 0.05	0	3.32±5.69	3.32±5.69	0	> 0.05	0
		EG	0.12±0.33	0.12±0.33	0	> 0.05	0	4.36±6.46	0.68±2.21	2.95	< 0.01	84.4
5	**Spinal Flexibility**	CG	23.0±5.37	22.8±5.27	0.14	> 0.05	0.86	25.5±4.54	25.5±4.41	0	> 0.05	0
		EG	23.5±5.37	20.2±4.91	2.48	< 0.05	14.0	26.9±4.48	22.7±8.20	2.46	< 0.05	15.6
6	**Sit and Reach**	CG	1.9±2.01	1.84±1.96	0.11	> 0.05	3.15	0.37±2.14	1.88±4.38	1.69	> 0.05	4.08
		EG	1.78±1.54	3.12±1.20	3.75	< 0.05	75.2	2.88±4.36	2.48±2.77	0.42	> 0.05	13.8
7	**Bridge Flexibility**	CG	23.6±11.0	26.8±9.57	1.20	> 0.05	13.5	35.9±10.4	35.9±10.4	0	> 0.05	0
		EG	23.8±11.1	26.2±4.48	1.09	> 0.05	10.0	36.9±14.2	24.4±12.2	3.65	< 0.05	33.8
8	**Front Split**	CG	18.4±8.13	17.4±8.03	0.47	> 0.05	5.43	14.8±6.38	14.3±6.32	0.30	> 0.05	3.37
		EG	17.4±7.66	1.64±2.17	10.8	< 0.05	90.5	16.9±6.84	2.2±2.72	10.9	< 0.05	86.9
9	**Right Split**	CG	17.2±7.84	16.9±7.94	0.14	> 0.05	1.74	14.2±6.36	13.9±6.44	0.18	> 0.05	2.11
		EG	16.3±7.37	1.36±2.21	10.6	< 0.05	91.6	16.2±6.94	1.2±1.80	11.4	< 0.05	92.5
10	**Left Split**	CG	17.9±8.31	17.4±7.91	0.23	> 0.05	2.79	15.0±6.72	14.5±6.70	0.28	> 0.05	3.33

		EG	17.0±7.91	1.68±2.42	10.1	< 0.05	90.1	17.4±7.08	1.52±2.06	11.7	< 0.05	91.2

Note: CG – control group, EG – experimental group, I.r – initial result, F.r – final result, t-t – t-test, p-v – p-value,

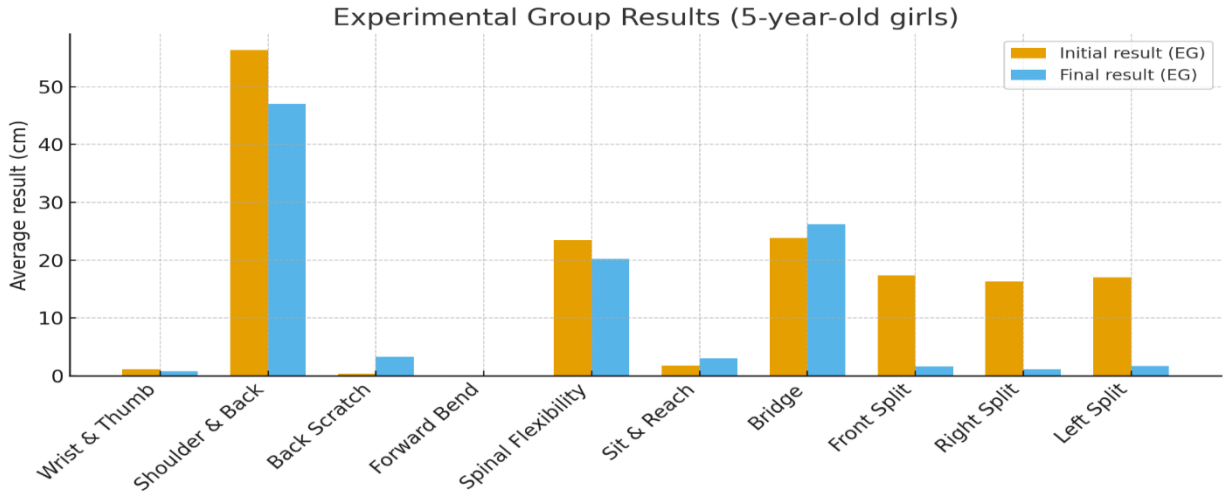
% – growth rate.

The research results made it possible to analyze the dynamics of initial and final indicators of flexibility tests conducted among 5-year-old girls. The changes observed in the control group (CG) and the experimental group (EG) are summarized as follows:

1. In the *Wrist and Thumb Flexibility* test, almost no significant change was observed in NG ($p > 0.05$). In EG, although improvement was recorded in the final results, the difference did not reach a statistically significant level ($p > 0.05$).
2. In the *Shoulder and Back Flexibility* test results, CG indicators did not change, while in EG significant improvement was observed ($p < 0.05$), with a total growth of 16.5%.
3. In the *Shoulder Flexibility (Back Scratch)* test, CG showed no meaningful change. In EG, however, a very large positive dynamic was achieved ($p < 0.05$), meaning the results improved more than 8 times.
4. In the *Standing Forward Bend* test, almost no difference was recorded in either CG or EG ($p > 0.05$). This situation shows that this exercise was not sufficiently applied within the program.
5. In the *Spinal Flexibility* test, CG did not show significant results, while in EG positive changes were recorded ($p < 0.05$), with a total improvement of 14%.
6. In the *Sit and Reach* test, although changes were observed in CG, they were not statistically significant. In EG, however, the results improved significantly ($p < 0.05$) and an increase of 75.2% was observed.
7. In the *Bridge Flexibility* test, the difference in CG remained insignificant. In EG, a 10% improvement was observed, but this result did not reach the level of statistical reliability ($p > 0.05$).

8–10. In the *Splits (Front, Right, Left)* tests, almost no change was observed in CG. In EG, however, the results improved significantly ($p < 0.05$) with a growth rate of more than 90%. The level of growth can be seen in the following histogram (see Histogram 1).

Histogram 1



The obtained results showed that the special program based on stretching and a play approach applied in the experimental group ensured high effectiveness in certain tests (especially Shoulder and Back Flexibility, Shoulder Flexibility (Back Scratch), Sit and Reach, and Splits tests). At the same time, in the Standing Forward Bend and Bridge Flexibility tests, the expected results were not recorded, which indicates that these exercises were not sufficiently applied within the program.

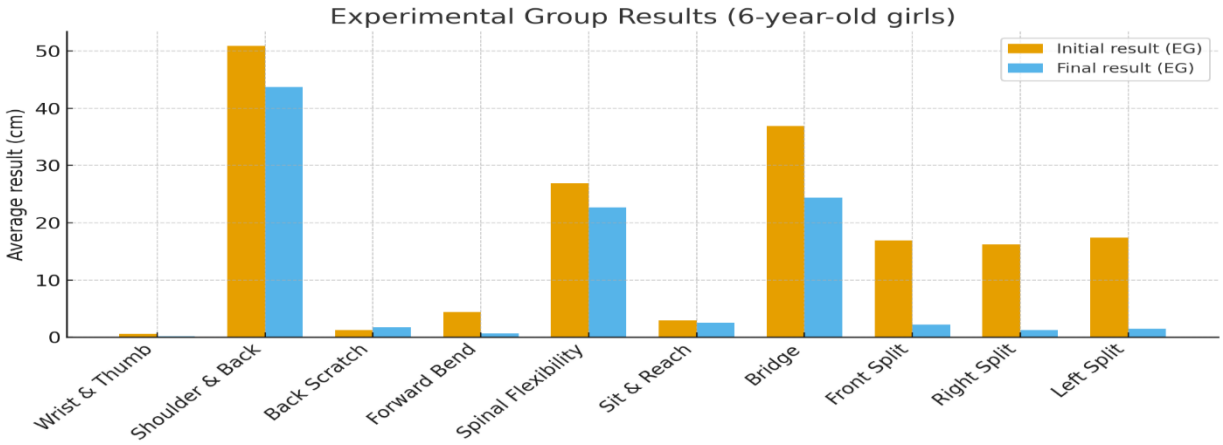
During the research, the initial and final test results of 6-year-old girls were also analyzed. The changes observed in the control group (CG) and the experimental group (EG) are expressed as follows:

1. *Wrist and Thumb Flexibility Test* – No significant change was recorded in CG. In EG, however, the results improved significantly ($p < 0.05$), with an overall growth of 67.7%.
2. *Shoulder and Back Flexibility Test* – Almost no change was observed in CG. In EG, significant results were recorded, showing a 14.1% improvement ($p < 0.05$).
3. *Shoulder Flexibility (Back Scratch) Test* – The difference in CG remained insignificant. In EG, although improvements were noted, they did not reach statistical significance ($p > 0.05$). This indicates that in the program, exercises targeting these joints were not applied sufficiently.
4. *Standing Forward Bend Test* – No change was observed in CG. In EG, significant improvement was recorded ($p < 0.01$), with overall results increasing by 84.4%.
5. *Spinal Flexibility Test* – The difference in CG remained insignificant. In EG, however, significant improvement was recorded ($p < 0.05$), with a growth rate of 15.6%.
6. *Sit and Reach Test* – Minimal and statistically insignificant changes were observed in CG. In EG, although results improved by 13.8%, the difference did not reach a reliable level ($p > 0.05$).

7. *Bridge Flexibility Test* – No significant change was recorded in CG. In EG, positive dynamics were observed ($p < 0.05$), with an overall improvement of 33.8%.

8–10. *Splits (Front, Right, Left) Tests* – Almost no difference was observed in CG. In EG, however, the results showed very large improvements ($p < 0.05$), with growth rates ranging between 86–92%. The results are illustrated in the histogram below (see Histogram 2).

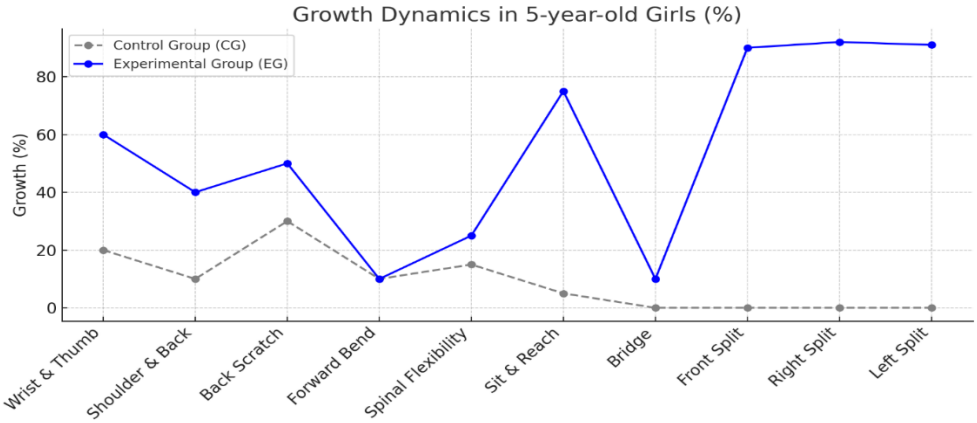
Histogram 2



In 6-year-old girls, the special program based on stretching and a play approach demonstrated high effectiveness. In particular, significant results were achieved in the Splits, Standing Forward Bend, and Bridge Flexibility tests. At the same time, in the Back Scratch and Sit and Reach tests, results were not statistically significant, which indicates the need to strengthen exercises targeting these joints.

Next, we present the results of the control group (CG) and the experimental group (EG) in 5–6-year-old girls using a line graph. This allows us to dynamically compare the growth percentage (see Line Graph 1 and 2).

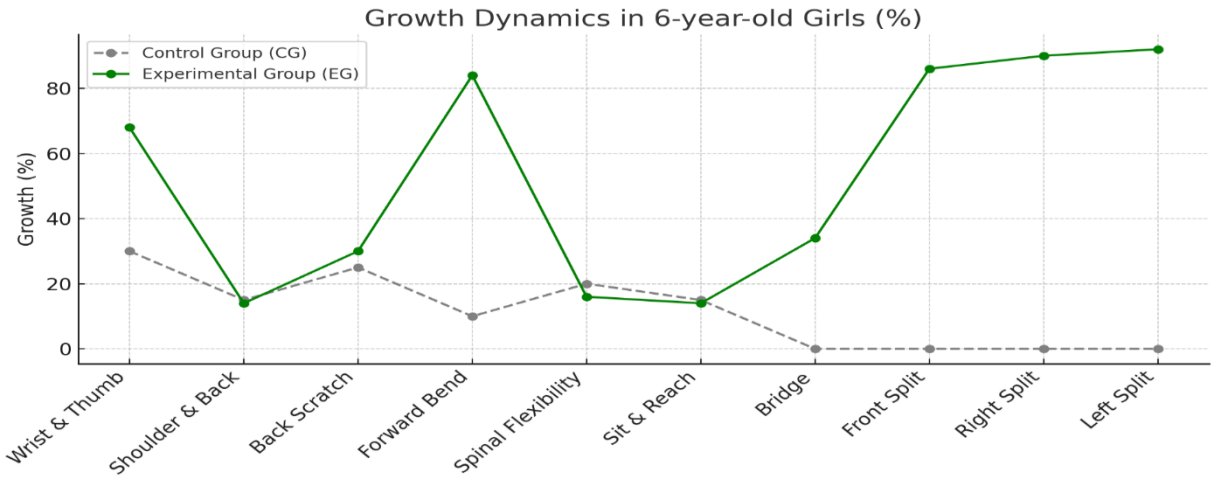
Line Graph 1



From the graph, it can be seen that in 5-year-old girls the control group remained almost flat in nearly all tests, with a low growth percentage. The experimental group, however, showed a sharp increase, especially in the Sit and Reach test (75.2%) and the

Splits tests (Front, Right, Left – over 90%), where the results were high. Nevertheless, in the Standing Forward Bend and Bridge Flexibility tests the line remained low, and the growth percentage did not reach a significant level. This indicates that these exercises were not sufficiently represented in the program.

Line Graph 2



In 6-year-old girls, the control group line remained almost low, stable, and showed no major difference. In the experimental group, however, the line was much higher: especially the Standing Forward Bend (84.4%) and Splits tests (86–92%) stood out with a sharp increase. However, in the Sit and Reach (13.8%) and Back Scratch (38.7%) tests, the results remained at a moderate level. This indicates that the exercises targeting these joints were not provided strongly enough in the program.

Analysis of tests in the experimental group that did not reach statistical significance:

1. Shoulder Flexibility (Back Scratch), age 6
   Result: Although some changes were observed, they did not reach the level of statistical significance ($p > 0.05$).
   Probable reason: Although the program included exercises for the shoulder joints, their volume and repetitions were not sufficient. In addition, the natural development of muscles in 6-year-old girls may have limited the result.
   Suggestion: It is necessary to increase the frequency of exercises aimed at the shoulder and arm muscles and to redistribute them more in a playful format.
2. Standing Forward Bend, age 5
   Result: No changes were observed ($p > 0.05$).
   Probable reason: This exercise was used mostly in a static form within the program; however, in younger children static bending leads to rapid fatigue and reduces effectiveness.
   Suggestion: It is recommended to add forward bending exercises in a dynamic form, enriched with music and play elements.

3. Sit and Reach, age 6
   Result: No significant changes were recorded ($p > 0.05$).
   Probable reason: This test mainly targets the hamstring and lower back area. The exercises for the hamstrings were not provided in a systematic manner.
   Suggestion: It is necessary to include more exercises such as *Butterfly stretch*, *half-butterfly*, and *seated hamstring stretch*, as well as making them engaging through "mini-relay" games.
4. Bridge Flexibility, age 5
   Result: Some changes were observed, but they were not statistically significant ($p > 0.05$).
   Probable reason: Since the bridge exercise is complex, 5-year-old girls had difficulty performing it fully, and the preparatory exercises aimed at strengthening the back and shoulders were insufficient.
   Suggestion: It is necessary to include step-by-step preparatory exercises for the bridge in the program and to redistribute the exercise intensity according to age.

Conclusion. The research results showed that the integrative approach of stretching and play technologies is an effective method for developing flexibility in 5–6-year-old children. This approach not only supports children's physical development but also increases their motivation and makes the learning process more engaging. Based on the results of the experiment, the following conclusions were drawn: integrating stretching with play technologies significantly improves children's flexibility levels; children demonstrate greater interest in physical exercises and actively participate in the sessions. In addition, the combination of stretching exercises with play elements increased children's motivation. Compared to the traditional approach, children participated more actively in the classes and developed a positive attitude toward physical activity.

The results of the experimental group showed that the program was effective in improving overall flexibility. However, in some tests (such as Back Scratch, Sit and Reach, Standing Forward Bend, and Bridge), statistically significant differences were not recorded. This indicates that in the program, exercises for the joints were distributed unevenly: some muscle groups received more exercises, while others less. Therefore, it is recommended to strengthen exercises for the shoulder, lower back, and thigh muscles; to combine static exercises with dynamic and playful elements; and to prepare children step by step for complex exercises. These adjustments would further increase the effectiveness of the program and ensure statistically significant improvements in all tests in the future. The findings of this research will be useful for improving flexibility development programs in preschool educational institutions. The

joint application of stretching and play technologies makes physical education sessions more effective and engaging.

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