

REVIEW PAPER

Status of the feet of preschool children

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Abstract

The postural status of preschool children is at great risk. Without timely detection, poor posture in preschool children can cause extremely serious health problems later in life, so prevention and early diagnosis are very important. The aim of this review is to analyze the research that studied the foot status of preschool children in the period from 2000 to 2022 in the territory of Serbia and Republika Srpska. A descriptive method and theoretical analysis were used for the collection, classification and analysis of targeted research, and the material was searched on: Google, Google Scholar, PubMed and Kobson. The search is limited to works published in the period from 2000 to 2022. In total, we collected 15 studies, 13 of which were conducted in the territory of the Republic of Serbia, and two in the territory of Republika Srpska. All research included preschool children aged 3 to 7 years. Previous research shows that foot deformities of preschool children are present in a high percentage in both sexes. Decreased movement due to an increasing amount of time spent near modern means of communication has negative consequences for the growth and development of preschool children. Educators, parents and the system as a whole must deal with the prevention of the mentioned postural disorders much more than they did before in order to stop the trend of their growth.

Keywords: *foot, deformities, preschool children, pes planus, pes cavus*

Introduction

Preschool age represents the period in which the foundations for human development are acquired, and at the same time provides a prerequisite for further successful education and upbringing (Koničanin, 2011). The postural status of children in this age period is exposed to great risk (Mihajlović & Tončev, 2008). From early childhood, the child's posture goes through significant changes (Civkaroski & Milenković, 2022), and there are three critical periods susceptible to postural deviation: the child standing up, starting school, and puberty (Maksimović & Lertua, 2018). Without timely detection, poor posture in preschool children can cause extremely serious health problems later in life (Ivanović, Gajević, Gajić & Atanasov, 2018; Miletić, Milić, Savićević & Ujsasi, 2022), so prevention and early diagnosis are very important (Maksimović & Lertua, 2018). Children mostly rest passively with video games and computers, so a large percentage of deformities in the preschool population is a fact that parents and pedagogical workers encounter every day (Mihajlović & Tončev, 2008). Weak muscle development, caused by insufficient physical activity, often causes

improper body posture (Biševac, Mahmutović, Mekić & Dolićanin, 2021). One of the primary reasons for the unsatisfactory postural status of preschool children is foot deformity (Mihajlović & Tončev, 2008). Foot deformities are a health challenge of the 21st century. A large percentage of children of preschool age have some form of foot deformity, most often, a lowered arch of the foot (Mitrović & Stević, 2017). The frequency of this deformity occurs in 40-75% of cases. The function of the foot depends on the state of the active and passive elements of the biomotor apparatus. First, the muscles relax, then the ligaments and joints cannot stop it, so it stops at the bone segments, which are deformed in morphology and structure (Živković, 2009). The aim of this review is to analyze the research that studied the foot status of preschool children in the period from 2000 to 2022 in the territory of Serbia and Republika Srpska.

Method

A descriptive method and theoretical analysis were used for the collection, classification and analysis of targeted research, and the material was searched on: Google, Google Scholar, PubMed

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and Kobson. The search is limited to works published in the period from 2000 to 2022. Key words used during the search are: foot status, preschool children, flat foot, postural disorders. References from all papers were also reviewed in order to find more studies dealing with this topic.

All research is shown in Table 1. In total, we collected 15 research works, 13 of which were conducted in the territory of the Republic of Serbia, and two in the territory of Republika Srpska. The largest number of surveys was conducted in the territory of Vojvodina - six surveys, namely: Vojvodina -1; Novi Sad - 4; Sombor, Sremska Mitrovica, Bačka Palanka - 1. Then follow: Serbia - 2 (no cities listed); Užice, Prijepolje, Nova Varoš - 1; Le-

skovac - 1; Tutin - 1; Kruševac - 1; Šabac - 1. Two surveys from the territory of Republika Srpska were conducted in Bjeljina. The oldest research is by Sabo (2006), and the most recent by Kojić et al. (2021). The number of respondents in the analyzed papers ranged from 50 respondents in the study by Mitrović & Stević (2017), to 1259 respondents in the research by Sabo (2006). The total number of respondents included in all works is 5265 children. All research included preschool children aged 3 to 7 years.

Results

Table 1 presents all the research by chronological age, as well as the results obtained by the corresponding research.

Table 1. Research results - list of all papers

Reference	Sample of respondents					FOOT STATUS			Σ
	N	M	F	P	Y	BOYS	GIRLS		
Sabo (2006)	1259	656	603	Vojvodina	3,5-7	PP1 (301) 23,9% PP2 (21) 1,7%	PP1 (226) 18% PP2 (5) 0,4%	PP1 (527) 41,9% PP2 (26) 2,1%	
Sabo (2007)	280	141	139	Sombor, Sremska Mitrovica, Bačka Palanka	4-7	PP1 (80) 56,7% PP2 (1) 0,7%	PP1 (60) 43,2% PP2 (0) 0%	PP1 (140) 50% PP2 (1) 0,4%	
Mihajlović & Tončev (2008)	559	287	272	Novi Sad	4-6	PP1 (25) 8,7% PP2 (79) 27,5% PP3 (76) 26,5% PP4 (55) 19,2%	PP1 (51) 18,8% PP2 (68) 25% PP3 (62) 22,8% PP4 (32) 11,8%	PT (520) 93,02% CV (518) 92,67% PP1 (77) 13,77% PP2 (147) 26,3% PP3 (139) 24,87% PP4 (86) 15,38%	
Mihajlović, Smajić & Sente (2010)	272	0	272	Novi Sad	4-7	/	PC (44) 16,7% PT (253) 93,38% CV (253) 93,38% PP (213) 78,31%	/	
					4	/	PC (5) 9,4% PT (51) 96,2% CV (51) 96,2% PP1 (8) 15,1% PP2 (11) 20,8% PP3 (17) 32,1% PP4 (10) 18,9%	/	
					5	/	PC (17) 15% PT (106) 93,8% CV (106) 93,8% PP1 (24) 21,2% PP2 (28) 24,8% PP3 (24) 21,2% PP4 (16) 14,2%	/	
					6	/	PC (18) 21,4% PT (77) 91,7% CV (76) 90,5% PP1 (13) 15,5% PP2 (26) 31,0% PP3 (16) 19,0% PP4 (5) 6,0%	/	
					7	/	PC (4) 18,2% PT (19) 86,4% CV (19) 86,4% PP1 (6) 27,3% PP2 (3) 13,6% PP3 (5) 22,7% PP4 (1) 4,5%	/	

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Reference	FOOT STATUS								Σ	
	Sample of respondents					BOYS		GIRLS		
	N	M	F	P	Y					
Simov, Minić & Stojanović (2011)	968	/	/	Leskovac	6-7	/	/		PP1 (171) 17,66% PP2 (81) 8,37% PP3 (38) 3,92% PP4 (8) 0,83% PPΣ (298) 30,78%	
Koničanin (2011)	220	92	128	Tutin	6-7	PP (17) 18,47%	PP (16) 12,05%		PP (33) 15%	
Pavlović (2012)	638	/	/	Užice, Prijepolje, Nova Varoš	6-7	PP (104) 16,3%	PP (62) 9,72%		PP (166) 26,01%	
Romanov, Stupar, Međedović & Brkin (2014)	423	213	210	Novi Sad	6-7	PC L (22) 10,3% PC R (19) 8,9% PP1 L (90) 42,3% PP2 L (46) 21,6% PP1 R (97) 45,5% PP2 R (44) 20,6%	PC L (25) 11,9% PC R (20) 9,52% PP1 L (91) 43,3% PP2 L (26) 12,4% PP1 R (89) 42,4% PP2 R (25) 11,9%		PC L (47) 11,0% PC R (39) 9,2% PP1 L (181) 42,8% PP2 L (72) 17,0% PP1 R (186) 43,9% PP2 R (69) 16,3%	
Stanišić, Đorđević & Maksimović (2014)	60	21	39	Kruševac	6	PP1 (3) 14,3% PP2 (1) 4,7%	PP1 (15) 38,5% PP2 (3) 7,7%		PP1 (18) 30% PP2 (4) 6,7%	
Drljačić, Tirić, Đupovac & Arsić (2016)	52	30	22	Srbija	5	/	/		PP1 (22) 42,3% PP2 (5) 9,6%	
Galić (2017)	120	/	/	Novi Sad	5-7	/	/		PT1 (33) 27,5% PT2 (3) 2,5% PP1 (34) 28,33% PP2 (21) 17,5% PC1 (0) 0% PC2 (0) 0%	
Mitrović & Stević (2017)	50	25	25	Bijeljina	/	PP1 (7) 28% PP2 (10) 40% PP3 (5) 20% PP4 (3) 12%	PP1 (5) 20% PP2 (7) 28% PP3 (4) 16% PP4 (4) 16%		PP1 (12) 24% PP2 (17) 34% PP3 (9) 18% PP4 (7) 14%	
Maksimović & Lertua (2018)	70	/	/	Šabac	5	/	/		PP1 (12) 34,3% PP2 (19) 54,3%	
					6,5	/	/		PP1 (14) 40% PP2 (4) 11,4%	
					Σ	/	/		PP1 (26) 37,1% PP2 (23) 32,9%	
Mitrović, Dragosavljević, Cvejić & Zrnzević (2021)	92	45	47	Bijeljina	6	/	/		PP1 (1) 1,1% PP2 (42) 45,7% PP3 (34) 37% PP4 (8) 8,7%	
Kojić, Protić Gava, Bajin, Vasiljević, Bašić, Stojaković & Ilić (2021)	202	141	61	Srbija	4-6,5	PP (32) 22,7%	PP (9) 14,8%		PC (90) 44,6% PP (41) 20,3%	

Legend: N - sample of respondents; M - male; F - female; Y - years of age; P - place; PP - pes planus; PP1 - pes planus first degree; PP2 - pes planus second degree; PP1 L - pes planus first degree left foot; PP1 R - pes planus first degree right foot; PP2 L - pes planus second degree left foot; PP2 R - pes planus second degree right foot; PP3 - pes planus third degree; PP4 - pes planus fourth degree; PT - pes transversoplanus; PT1 - pes transversoplanus first degree; PT2 - pes transversoplanus second degree; CV - calcaneo valgi; PC - pes cavus.

The results shown in Table 1 show that the condition of the feet of preschool children in Serbia is alarming. On a sample of preschool children in Vojvodina aged 3.5 to 7 years, Sabo (2006) found that 41.9% of children have smaller and 2.1% of children

have larger deviations from the normal arch of the foot (pes planus). The findings of Sabo (2006) indicate that boys have significantly greater deviation from the normal foot status than girls. Indeed, 23.9% of the boys have minor deviations from the normal

foot arch versus 18% in girls, while 1.7% of boys have greater deviations from the normal foot status versus 0.4% in girls. Sabo (2007) obtained similar results a year later in the cities: Sombor, Sremska Mitrovica, Bačka Palanka. The data show that 50% of the children have smaller and 0.4% of the children have larger deviations from the normal arch of the foot. In this research, the author showed that boys have significantly greater deviation from the normal foot status than girls. In boys, 56.7% have minor deviations from the normal foot arch versus 43.2% in girls, while 0.7% of boys have greater deviations from the normal foot status versus 0% in girls. The results of the aforementioned research showed that a far greater number of children have deviations from the normal status of the feet, which are in the form of functional deformity, and their removal requires corrective work (Sabo, 2007). Mihajlović & Tončev (2008) obtained even more alarming data on a sample of preschool children from Novi Sad, aged 4 to 6 years. The authors found that as many as 93% of children have pes transversoplanus, 92.67% calcaneo valgi, while 80.32% have some degree of pes planus, namely: 13.77% pes planus 1; 26.3% pes planus 2; 24.87% pes planus 3; 15.38% pes planus 4. Lowered arch of the foot occurs in both boys and girls. The prevalence of pes planus 1 in boys is 8.7%, and in girls 18.8%; pes planus 2 in boys 27.5%, and in girls 25%; pes planus 3 in boys 26.5% and in girls 22.8%; pes planus 4 in boys 19.2% and in girls 11.8%. Mihajlović, Smajić & Sente (2010) reported similar results on a sample of preschool girls from Novi Sad, aged 4 to 7 years, and determined that the percentage of foot deformities is very high: pes cavus 16.7%; pes transversoplanus 93.38%; calcaneo valgi 93.38% and pes planus 78.31%. Somewhat better, but still worrisome, data on the foot status of preschool children were obtained by Simov, Minić & Stojanović (2011) on a sample of preschool children aged 6-7 years from Leskovac. The authors determined that 30.78% of children have a lowered foot arch, namely: 17.66% pes planus 1; 8.37% pes planus 2; 3.92% pes planus 3; 0.83% pes planus 4. Lower percentages of deviations from the normal status of the feet in relation to the aforementioned studies were obtained by Koničanin (2011) on a sample of preschool children aged 6-7 years from Tutin. The author indicates that 15% of children have pes planus and confirms some previous research which shows that flat feet are more prevalent in boys than in girls, namely: 18.47% in boys and 12.05% in girls. Pavlović (2012) found that pes planus was present in 26.01% of preschool children aged 6-7 years from Užice, Prijepolje and Nova Varoš. The author also found that flat feet were more prevalent in boys (16.3%) than in girls (9.72%). Romanov, Stupar, Mededović & Brkin (2014) reported similar results on a sample of children from Novi Sad. They suggested that there is a need for the application of corrective gymnastics as part of activities in a preschool institution with the aim of correcting and preventing postural disorders. These authors determined that pes planus I degree is represented by 43.23%, and pes planus II degree by 16.66%, while pes cavus is represented by 10.16%. Furthermore, Stanišić, Đorđević & Maksimović (2014) determined on a sample of preschool children from Kruševac that 30% of children have pes planus I degree, while 6.7% of children have pes planus II degree. It is interesting that the authors, in contrast to the previous research by Sabo (2006), Sabo (2007), Koničanin (2011) and Pavlović (2012), found that pes planus I and II degree are more common in girls than in boys. The results show that pes planus I degree is represented by 38.5% in girls and 14.3% in boys, while pes planus II degree in girls is represented by 7.7% and in boys by 4.7%. Drljačić, Tirić, Đupovac & Arsić (2016) confirmed previous research and determined that a large percentage of children have a lowered foot arch, namely: pes planus I degree 42.3% of children, and pes planus II degree 9.6% of children. Galić (2017) also found on a sample of preschool children from Novi Sad that 68.3% had

elements of bad posture, and the most frequent deviations from the normal position were in the form of lowered feet, i.e. 45.8%. The author determined that pes planus I degree is represented by 28.33%, pes planus II degree by 17.5%, pes transversoplanus I degree by 27.5%, pes transversoplanus II degree by 2.5%, while there were no children with pes cavus. Mitrović & Stević (2017) found on a sample of preschool children from Bjeljina that most of the analyzed children have a lowered foot arch, namely: pes planus I degree 24% of children, pes planus II degree 34% of children, pes planus III degree 18% of children and pes planus IV degree 14% of children. Maksimović & Lertua (2018) showed similar results on a sample of preschool children from Šabac that are in line with the devastating results of the previous research. The results of their research show that 37.1% of children have pes planus I degree, and 32.9% pes planus II degree. Mitrović, Dragosavljević, Cvejić & Zrnzević (2021) also show that 1.1% of the children from Bjeljina have pes planus I degree, 45.7% have pes planus II degree, 37% have pes planus III degree and 8, 7% have pes planus IV degree. Kojić, Protić Gava, Bajin, Vasiljević, Bašić, Stojaković & Ilić (2021) found that 20.3% of children have a lowered arch of the foot, and 44.6% have pes cavus. Their research is in line with the findings of Sabo (2006), Sabo (2007), Koničanin (2011) and Pavlović (2012), and indicate that a lowered arch of the foot is more pronounced in boys (22.7%) than in girls (14.8%).

Discussion

Previous research shows that foot deformities of preschool children are present in a high percentage in both sexes. Koničanin (2011) points out that in the work on the physical development of children there are still a number of shortcomings that need to be removed, with which we can agree if we look at the results of the presented research, which showed that there is a very high percentage of preschool children who have some form of foot deformity, and in the research of Mihajlović & Tončev (2008) that percentage is even 93%. Galić (2017) finds that the most common deviations from the normal postural position of preschool children are in the form of lowered feet, and that is 45.8%. Mitrović & Stević (2017) believe that foot deformities represent a health challenge of the 21st century. Most often, a lowered foot arch (pes planus) occurs, but most of it is still in the functional stage, which means that a well-planned corrective treatment would have a positive effect on the normalization of the foot arch condition. However, it would be more important to have a preventive effect on the occurrence of postural disorders of the feet of preschool children through adequate physical education activities. Therefore, Romanov, Stupar, Mededović & Brkin (2014) point to the need to apply corrective gymnastics in order to correct and prevent postural disorders by introducing the same as daily directed activities of the preschool population. In order for this to be feasible, it is necessary to train students and future teachers about planning and tailoring programs in physical education aiming to improve postural status of children. Similar directions were provided by Maksimović & Lertua (2018). Stanišić, Đorđević & Maksimović (2014) showed that corrective treatment within the framework of directed activities in the physical education of preschool children has a positive effect on the status of the feet of preschool children. The authors applied exercises with six-year-old preschool children as part of targeted activities for the correction of leg and arch irregularities. The treatment lasted two months and was performed three times a week. After the treatment, the authors concluded that the corrective exercise program within the directed activities has a positive effect on the correction of foot arch disorders. Mihajlović, Smajić & Sente (2010) found that the percentage of pes transversoplanus and calcaneo valgi foot deformities is very high in girls. Also, it was established that pes planus in girls is very high, but that there

is an improvement with age. The authors believe that there is a significant connection between the age of children and pes planus, and that the formation of the arches of the feet most likely does not end from the age of 3 to 4, but continues until school age. This raises the need and the importance of physical education activities that should contribute to encouraging the proper development of children's feet in the preschool period. This can only be achieved if the development of foot and leg muscles is encouraged through play and movement. Mitrović, Dragosavljević, Cvejić & Zrnzević (2021) indicate that the physical activity and movement of children has a positive effect on the status of the feet of preschool children. The authors examined the influence of the training process according to the "school of sport" model on changes in the status of the arch of the foot. The treatment lasted three months, twice a week for 45 minutes. Although the percentage of children with foot deformity at the final measurement was the same as at the initial measurement, there were slight improvements in certain categories of the assessed variable. More precisely, the number of children in the third and second degrees has decreased. However, it is yet not clear whether the program based on the model of the sports school had a positive effect on the resulting changes, because the improvements were visible in both the experimental and control groups. Feet grow faster than other parts of the body and their growth is completed before adolescence, so early detection during regular systematic examinations and controls by parents, educators, etc. is the most important for their successful treatment. Kojić, Protić Gava, Bajin, Vasiljević, Bašić, Stojaković & Ilić (2021) showed that the status of the foot has a significant influence on the results of motor tests. The authors concluded that motor development is the most turbulent in the preschool period and that what is missed then is difficult to make up during future growth and development, and that it is important to stimulate the function and development of the arches of the feet. Simov, Minić & Stojanović (2011) believe that there is an obligation on the part of educators and parents at home to instruct children on proper posture when sitting, walking and doing physical activities. Drljačić, Tirić, Đupovac & Arsić (2016) believe that it is necessary to apply systematic exercise in working with children at an early age, which has a positive effect on the postural status of children, in the form of its preservation, but also the elimination of functional deformities that in a later period could leave permanent consequences on children's body. Pavlović (2012) suggests that the presence of a large number of physical deformities can be reduced by engaging a greater number of experts in the field of physical education, in order to complete the needs of children for proper and adequate exercise. Previous works (Sabo, 2006 and Sabo, 2007) also show that a large number of children (boys and girls) have a functional stage of deformity, i.e. a certain deviation from normal, good posture and that this represents a potential danger for the formation of the so-called structural changes, which to a lesser or greater extent threaten health, the general functioning of the organism and his ability to work. The author believes that the functional stage of the deformity can be successfully removed by corrective work in the kindergarten.

Conclusion

Previous research shows that foot deformities of preschool children are present in a high percentage in both sexes. Decreased movement due to an increasing amount of time spent near modern means of communication has negative consequences for the

growth and development of preschool children. Educators, parents and the system as a whole must deal with the prevention of the mentioned postural disorders much more than they did before in order to stop the trend of their growth.

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Conflicts of interest:

The authors have no conflicts of interest to declare.

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References

- Biševac, E. M., Mahmutović, E. H., Mekić, R. H., & Dolićanin, Z. Č. (2021). Effect of corrective exercises on functional spinal deformities in preschool and school-aged children. *Specijalna edukacija i rehabilitacija*, 20 (1), 51-63.
- Civkaroski, D., & Milenković, S. (2022). The prevalence of spinal deformities in children and difference between pre school and school children. *Knowledge-international journal*, 51 (4), 591-594.
- Drljačić, D., Tirić, N., Đupovac, M., & Arsić, N. (2016). Uticaj programiranog vežbanja u okviru predškolske ustanove na posturalni status dece. *PONS - medicinski časopis*, 13 (1), 9-12.
- Galić, M. (2017). Minor neurological dysfunction and bad posture in children at preschool age. Doctoral dissertation. *Medical Faculty*, University of Novi Sad.
- Ivanović, J., Gajević, A., Gajić, I., & Atanasov, D. (2018). Sagittal plane poor posture among seven-year-old children. In Lence A. Velickovska (Ed.), *3rd International scientific conference, research in physical education, sport, and health* (pp.101-111). Skopje: Ss. Cyril and Methodius University in Skopje, Faculty of Physical Education, Sport, and Health, Skopje.
- Konićanin, A. (2011). Ravna stopala kod dece predškolskog uzrasta. *Časopis za sport, fizičko vaspitanje i zdravlje - Sport mont*, 8 (25,26,27), 450 - 453.
- Kojić, M., Protić Gava, B., Bajin, M., Vasiljević, M., Bašić, J., Stojaković, D., & Ilić, M. P. (2021). The relationship between foot status and motor status in preschool children: a simple, comparative observational study. *Healthcare*, 9 (8), 936-948.
- Maksimović, S., i Lertua, S. (2018). Posturalni status kao faktor planiranja u fizičkom vaspitanju predškolske dece. *Inovacije u nastavi*, 1, 119-128.
- Mihajlović, I., & Tončev, I. (2008). Establishment of the foot arch initial status in pre-school children. *Sport Science*, 1 (2), 44-49.
- Mihajlović, I., Smajić, M., & Sente, J. (2010). Učestalost deformiteta stopala kod devojčica predškolskog uzrasta. *Vojnosanitetski pregled*, 67 (11), 928-932.
- Mitrović, N., & Stević, D. (2017). Razlike u statusu svoda stopala između dečaka i devojčica predškolskog uzrasta iz Bijeljine. *Nova škola*. 12 (1), 46-53.
- Mitrović, N., Dragosavljević, S., Cvejić, D., & Zrnzević, N. (2021). The changes in the status of the foot arch, motor abilities and morphological characteristics under the influence of training processes of sports school. *Sports science & health*, 11 (1), 94-107.
- Pavlović, S. (2012). Prisustvo telesnih deformiteta dece predškolskog uzrasta. *Univerzitetska misao*, (11), 6-14.
- Romanov, R., Stupar, D., Međedović, B., & Brkin, D. (2014). Posturalni status dece predškolskog uzrasta na teritoriji Novog Sada. *Tims. Acta: naučni časopis za sport, turizam i velnes*, 8 (2), 129-135.
- Sabo, E. (2006). Postural state of preschool children on territory of Vojvodina. *Fizička kultura*, 60 (2), 157-164.
- Sabo, E. (2007). Postural status in children of preschool age in areas of Sombor, Sremska Mitrovica and Backa Palanka municipalities. *Norma*, 12 (1), 125-134.
- Simov, S. B., Minić, S. M., & Stojanović, D. O. (2011). Učestalost pojave lošeg držanja tela i ravnih stopala kod dece predškolskog uzrasta. *Apollinem medicum et aesculapium*, 9 (2), 5-8.
- Stanišić, I., Đorđević, M., & Maksimović, S. (2014). Posturalni status nogu i svoda stopala kod dece predškolskog uzrasta i efekti korektivnog vežbanja u okviru usmerenih aktivnosti. *Sinteze*, 5, 63-71.
- Živković, D. (2009). *Osnove kineziologije sa elementima kliničke kineziologije*. Niš: Fakultet sporta i fizičkog vaspitanja.