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Compliance of Preschool Chair Dimensions

Usklađenost dimenzija stolica za djecu predškolske dobi

Preliminary paper • Prethodno priopćenje
Received – prispjelo: 12. 11. 2018.
Accepted – prihvaćeno: 5. 3. 2019.
*UDK: 630*836.1*
https://doi.org/10.5552/drvind.2019.1850

ABSTRACT • *The proper growth and development of children is conditioned by many factors. One of the most overlooked prerequisite is the proper posture of the body in a seated position, which could be disrupted by the incorrectly dimensioned chairs used in kindergartens. To authenticate dimensions of preschool chairs in relation with contemporary European Standard 1729-1:2015, the research has been conducted in 14 public kindergartens in three European countries: Republic of Croatia, Republic of North Macedonia and Republic of Bulgaria. The results lead to the conclusion that a small number of chairs fulfil dimensional requirements. From the obtained data of the analysed chairs used by preschool children certain deficiencies can be identified. The stated findings could be the basis for new suggestions and improvements of outdated furniture design with the aim to improve relevant regulations, standards and guidelines in order to present new preschool furniture quality parameters related to contemporary needs of children in kindergartens to the local authorities, furniture manufacturers and investors.*

Keywords: *preschool furniture, kindergartens, EN 1729-1, functional dimensions of furniture*

SAŽETAK • *Pravilan rast i razvoj djece uvjetovani su mnogim čimbenicima. Jedan od često previđanih preduvjeta pravilnog razvoja jest ispravno držanje tijela u sjedećem položaju, što može dovesti do pogrešnog dimenzioniranja stolica na kojima djeca sjede u dječjim vrtićima. Kako bi se dokazala usklađenost dimenzija stolica namijenjenih djeci predškolske dobi sa suvremenom europskom normom EN 1729-1:2015, istraživanja su provedena u 14 javnih dječjih vrtića u tri europske države: Republici Hrvatskoj, Republici Sjevernoj Makedoniji i Republici Bugarskoj. Rezultati upućuju na zaključak da samo mali broj stolica u cijelosti ispunjava dimenzijske zahtjeve. Iz dobivenih podataka analiziranih stolica kojima se koriste djeca predškolske dobi mogu se identificirati određeni nedostatci. Navedeni zaključci mogu biti osnova za nove prijedloge i poboljšanja dizajna zastarjelog namještaja te bi trebali biti usmjereni na poboljšanje relevantnih propisa, standarda i smjernica kako bi se lokalnim vlastima, proizvođačima namještaja i investitorima predstavili novi parametri kvalitete namještaja za djecu predškolske dobi, što se ponajprije odnosi na suvremene potrebe djece u vrtićima.*

Ključne riječi: *namještaj za djecu predškolske dobi, vrtići, EN 1729-1, funkcionalne dimenzije namještaja*

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1 INTRODUCTION
1. UVOD

Today's children aged from 1 to 7 years (in some countries from 6 months to 7.5 years) spend in kindergartens six to eight hours a day, mostly playing, learning, sleeping or eating. All these activities are usually taken in sitting, standing or lying positions of the body (Domljan *et al*., 2015). The playrooms, in which almost all the activities during the day are carried out, should be adapted to different children's needs and susceptible to easy changes, transformations and adaptations (Dudek, 2005). Adequate design of equipment and furniture as well as proper spatial organization could improve or aggravate children's social, mental, cognitive and physical behaviour and development (Bajbutović, 1983; Prebeg and Prebeg, 1985; Pisareva, 1999; Auf-Franić *et al*., 2003; Iliev, 2011; Domljan, 2011).

In order to design adequate furniture and other equipment in kindergartens and enable proper growth and development of preschool children, there are some contemporary problems and aspects that have to be pointed out when equipping of kindergartens:
- children's anthropometry and furniture dimensions
- posture of children's body while sitting, and
- furniture procurement and production.

This research deals with the analysis of compliance of the observed preschool chair with relevant standards, in three different countries and their capital cities: Zagreb (Republic of Croatia), Skopje (Republic of North Macedonia) and Sofia (Republic of Bulgaria).

The aim of the research was to investigate whether the dimensions of the chairs used in observed preschool institutions are in compliance with the standard EN 1729-1:2015 Furniture – Chairs and tables for educational institutions – Part 1: Functional dimensions (2015).

1.1 Children's anthropometry and furniture dimensions
1.1. Antropometrija djece i dimenzije namještaja

The main requirement in designing children's furniture is to pay attention to the children's anthropometry (Iliev and Domljan, 2016). Anthropometric data of the children's body has to be used respecting the age and sex of the child (Iliev *et al*., 2018). In the earliest years of childhood, the spinal column, as all other bones, are not sufficiently formed (Prebeg and Prebeg, 1985). If the chair is designed according to the shapes of the children's body, it is expected that the body will be developed properly (Domljan, 2011). The second aspect is the size (dimensions) of the furniture, especially chairs and tables that are most widely used. The surveys showed a mismatch between dimensions of furniture in educational institutions and anthropometric dimensions of children (Hedge and Lueder, 2007; Domljan *et al*., 2008; Iliev and Domljan, 2017). Inappropriate furniture, which is not compatible with the children's body dimensions, could be one of the key factors for musculoskeletal disorders and back pain in the future (MSD/BP) (Hedge and Lueder, 2007; Domljan *et al*., 2010a).

1.2 Posture of children's body while sitting
1.2. Držanje tijela djece pri sjedenju

One of the key requirements for the psychophysical development of children is the proper way of sitting and performing tasks in a sitting position (Knight and Noyes, 1999; Troussier *et al*., 1999). The chair is one of the furniture elements that is compulsory when equipping kindergartens (Domljan *et al*., 2015). Although a number of considerations and researches proved that the chair will never be enough comfortable for sitting (Cranz, 1998), children already in kindergarten learn "proper" sitting and "correct" posture when sitting. The anatomy of the child's body, the dimension of individual body variables, and the position of the body that the child takes in each activity in the kindergarten have a great influence on the design and construction of the chair for preschool upbringing. For now, unfortunately, the child's body has to adjust to the shape and curves of the chair when sitting, and not the other way round (Domljan *et al*., 2010b).

1.3 Furniture production and procurement
1.3. Proizvodnja i nabava namještaja

There are a few problems in production and procurement of preschool furniture, such as: the low price of the equipment procured through public tendering, low quality of the furniture mostly because of the low price, scarce number of references, standards and guidelines for designing contemporary furniture, etc.

Furniture used in public preschool institutions is always procured through public procurement (Domljan *et al*., 2015). Until recently, free choice in procurement and equipping public preschool institutions used to be limited by insufficient specifications directed towards only one criterion: the lowest price of the furniture and other equipment. This means that the financial factor was decisive for the procurement, while all others (e.g. ergonomic, quality or contemporary methods in education process) were neglected (Vlaović *et al*., 2003). As each municipality does not have the same financial resources, the differences are more prominent. Private kindergartens usually do not have such financial issues, but they also lack the proper knowledge for furnishing kindergartens with quality furniture (Domljan *et al*., 2015).

There are a few relevant documents in the Republic of Croatia (National Pedagogical Standard for Pre-School Education, 2008), in the Republic of North Macedonia (Regulations of Activities in Children's Educational Institutions, 2009) and in the Republic of Bulgaria (Ordinance No. 3 on Health Requirements for Kindergartens, 2007), which superficially describe the procedures in equipping kindergartens, types and number of furniture, and give information about how interiors and exteriors of kindergartens should look like. Unfortunately, the appearance and descriptions of the furniture, prescribed in those public regulations, are very much general. As the details are not defined, it leads to a great diversity in the design process among investors, producers and other subjects involved in the process. One of the problems in educational institu-

tions is the lack of investments for quality furniture. Neither the city government nor the local authorities want to invest a much more significant amount of money into design, production or procurement of quality furniture. Kindergartens and schools are sometimes equipped with the furniture older than 50 years (Domljan *et al*., 2015).

2 MATERIALS AND METHODS
2. MATERIJALI I METODE

2.1 Polygons
2.1. Poligoni

The research was performed in three countries in their capital towns in 14 public kindergartens (polygons), from March to September 2017 (Table 1).
The polygons were selected by the following criteria:

i. Geographical position and public regulations of kindergartens:

The kindergartens in all three polygons covered either the central or suburban areas of each city. Depending on the city regulations, analysed kindergartens have different administrative and procurement regulations. For instance, in Skopje each kindergarten belongs to different municipalities in the city with different administrative units. In Zagreb and Sofia kindergartens are under the competence of the city government with the same administrative regulations of the local authority. In terms of different criteria arranged from i to vi, polygons were selected as presented in Table 2:

ii. Architecture style:
A – facilities intended for carrying out preschool activities only
B – facilities repurposed into preschool institutions
iii. Age of facility:
C – facilities from the 20th century and older than 20 years
D – new modern facilities build in the last 20 years
iv. Size of kindergarten group:
SG – small group (less than 15 children in the group)
NG – normal group (16 to 30 children in the group)
LG – large group (30 to 45 children in the group)
v. Children's age in kindergarten group:
HE – heterogeneous group (different age of children (from 3 to 7 years)
HO – homogeneous group (similar age of children (+/- 1 year)
vi. Age of furniture used in kindergartens:
O – old (older than 30 years)
CT – contemporary (from 30 to 5 years old)
N – new (no older than 5 years)

2.2 Samples
2.2. Uzorci

The samples were preschool chairs, used by the children at the polygons. The samples were observed and analysed in all three polygon groups. The main characteristics of the selected types of chairs are stated below, with the code given to each type of chair.
Polygon group I:
B – material: solid beech wood (legs, armrests), beech veneer plywood (seat, backrest), plywood thickness:

Table 1 Polygons
Tablica 1. Poligoni

Polygon group *Grupa poligona*	**State** / *Država*	**City** / *Grad*	**Number of polygons** *Broj poligona*
I	Republic of North Macedonia	Skopje	8
II	Republic of Croatia	Zagreb	3
III	Republic of Bulgaria	Sofia	3
Total number of polygons / *Ukupan broj poligona*			14

Table 2 Polygons and their descriptions
Tablica 2. Poligoni i njihovi opisi

Polygon group *Grupa poligona*	**Kindergarten code** *Oznaka vrtića*	**Name of kindergarten, municipality, address** *Ime vrtića, općina, adresa*	**Facility style** *Stil zgrade*	**Age of facility** *Starost zgrade*	**Group size** *Veličina grupe*	**Age of children** *Starost djece*	**Age of furniture** *Starost namještaja*
I	1	*Majski cvet* / Mun. Karposh	A	C	NG	HO	O/N
	2	*11-ti Oktomvri* / Mun. Butel	A	C	NG	HE	O
	3	*Koco Racin* / Mun. Center	A	D	NG	HO	N
	4	*Tashko Karadža* / Mun. Butel	A	C	NG	HO	O
	5	*13-ti Noemvri* / Mun. Center	A	C	LG	HO	N
	6	*Park* / Municipality Center	A	C	NG	HO	CT
	7	*Buba Mara* / Mun. Aerodrom	A	C	NG	HO	O/CT
	8	*Sonce* / Municipality Aerodrom	A	D	NG	HO	N
II	9	*Različak* /Petrinjska str.	A	C	NG	HO	O/CT
	10	*Različak* / Jurišićeva str.	A	C	NG	HE	O/CT
	11	*Različak* / Amruševa str.	A	C	NG	HE	O/CT
III	12	*Bratja Mormarevi* / Vrbacha str.	B	C	LG	HO	O/CT
	13	*Bratja Mormarevi* / Pobeda str.	A	D	NG	HE	O/N
	14	*Mojot svet* / Tsar Simeon str.	A	C	NG	HO	O/CT

seat - 7 mm / backrest 6 mm; surface: PU colourless vanish, visible screws; rounded front of the seat; backrest without a pronounced lumbar support; inclination of backrest 10°; negative seat slope; armrest as constructional part of legs; stackable chair.
C – material: solid beech wood (legs, backrest), beech veneer plywood (seat); surface: stained wood, PU vanish; turned legs and backrest carriers; visible screws; backrest without a pronounced lumbar support, inclination 0°; curved seat; non stackable chair.
D – material: solid beech wood (legs), beech veneer plywood (seat and backrest), plywood thickness: seat - 7 mm / backrest 6 mm; surface: red coloured plywood, PU colourless vanish; visible screws; rounded front of the seat; backrest without a pronounced lumbar support; inclination of backrest 5°; negative seat slope; non stackable chair.
F – material: moulded plastic; surface: slippery, shinny, green coloured; rounded edges; seat inclination 0°; backrest inclination 0°, without a pronounced lumbar support; adaptable sitting height (plastic caps at the bottom of legs); stackable chair.
H – material: solid beech wood (legs, armrest), beech upholstered plywood (seat, backrest); chipboard (working top); surface: PU colourless vanish, laminated chipboard; vinyl upholstery; seat and backrest inclination 0°; visible screws; non stackable chair.
Polygon group II:
K – material: solid beech wood (legs, armrests), beech veneer plywood (seat, backrest), plywood thickness seat - 7 mm / backrest 6 mm; surface: PU colourless vanish; rounded front of the seat; backrest without a pronounced lumbar support; inclination of backrest 5°-7°; negative seat slope; visible screws; non stackable chair.
L – material: solid beech wood (legs, armrests), beech veneer plywood (seat, backrest), plywood thickness seat - 7 mm / backrest 6 mm; surface: PU colourless vanish; rounded front of the seat; backrest without a pronounced lumbar support; inclination of backrest 15°; negative seat slope; visible screws; stackable chair.
Polygon group III:
N – material: moulded plastic; surface: slippery, shinny, red coloured; rounded edges; seat inclination 0°; backrest inclination 10°, without a pronounced lumbar support; stackable chair.
P – material: solid fir wood (seat, legs, backrest); surface: stained wood, PU colourless vanish; non rounded front of the seat; backrest without a pronounced lumbar support; seat and backrest inclination 0° inclination of backrest and seat 0°; visible screws (wooden construction with tenon and groove); non stackable chair.
Q – material: solid beech wood (legs), beech veneer plywood (seat, backrest), plywood thickness seat - 10 mm / backrest 8 mm; surface: PU colourless vanish (legs), painted floral motifs (seat, backrest); rounded edges 10 mm; backrest without a pronounced lumbar support; inclination of backrest 10°; seat slope 0°; non visible screws; (wooden construction with tenon and groove); non stackable chair.

2.3 Methods
2.3. Metode

Two main types of methods have been used in the research:
- objective method of direct measurement of the samples, and
- method of observing, recording and photographing the samples

The samples have been selected, analysed and measured directly at the polygons (Table 2). Nine variables have been measured according to EN 1729-1:2015 (Table 3).

3 RESULTS AND DISCUSSION
3. REZULTATI I RASPRAVA

Most kindergartens in one polygon have the same or similar chairs, depending on manufacturers and procurement regulations in the city. Regardless of those similarities, large differences were found in each kindergarten with respect to types, shape and construction, functionality, dimensions, materials and colours of chairs.

It was found that a total of 20 different types of chairs were used by children in polygons. Generally, all types of chairs were made in two sizes:
- the higher chair, used in all kindergarten groups (children aged 3 to 7 years)
- the lower chair, used in nursery groups (children aged 6 months to 3 years)

Among all 20 types, only 10 types of chairs were selected for future analysis and measurement. These 10 types were in the group of armchairs or chairs made from foams and could not be observed and measured in accordance with EN 1729-1:2015. Also, the reason for the selection was the measuring procedure. Namely,

Table 3 Variables measured on the samples, according to EN 1729-1:2015
Tablica 3. Varijable izmjerene na uzorcima, prema EN 1729-1:2015

Symbol / *Oznaka*	**Description** / *Opis*
h8	seat height / *visina sjedala*
b3	seat width / *širina sjedala*
t4	effective depth of seat / *efektivna dubina sjedala*
b4	backrest width / *širina naslona*
h7	height to highest point of backrest / *visina do najviše točke naslona*
α	inclination of (single-sloped) seat, degrees / *nagib sjedala u stupnjevima*
γ	angle between seat and backrest / *kut između sjedala i naslona*
p	height of armrest above seat / *visina naslonā za ruke iznad sjedala*
r	width between armrests / *razmak između naslonā za ruke*

Table 4 Results of functional dimensions of samples
Tablica 4. Rezultati funkcionalnih dimenzija uzoraka

Polygon group *Grupa poligona*	**Chair code** *Šifra stolice*	**Dimensions** / *Dimenzije,* mm								
		h8	*b3*	*t4*	*b4*	*h7*	α	γ	*p*	*r*
I	B	270	300	280	320	125	5°	100°	1,5	300
	C	290	330	300	290	40	(-)5°	95°	/	/
	D	290	300	300	320	120	3°	95°	/	/
	F	270	300	300	300	130	0°	93°	/	/
	H	240	300	250	300	270	0°	105°	130	300
II	K	290	290	270	305	150	0°	113°	110	290
	L	270	300	266	310	270	(-)3°	95°	133	310
III	N	300	310	250	310	300	0°	105°	/	/
	P	305	240	290	220	40	0°	90°	/	/
	Q	285	280	290	320	130	0°	100°	/	/

according to EN 1729-1:2015, Annex F, furniture sizes 3 to 7 have to be measured with special equipment, like SCMD (School Chair Measuring Device), which was not used in kindergartens.

The size of the selected 10 chairs was 0, 1 and 2, marked with letters B to Q, as described in chapter 2.2. The results of measured functional dimensions of chairs are given in Table 4.

3.1 Comparison of samples dimensions and requirements of EN 1729-1:2015
3.1. Usporedba dimenzija uzoraka sa zahtjevima norme EN 1729-1:2015

The European Standard EN 1729-1:2015 *Furniture – Chairs and tables for educational institutions – Part 1: Functional dimensions* (***, 2015) is applied by the national technical committee in all three countries considered in this study. Thanks to this fact, it was possible to compare the analysed samples in all polygons.

The results of the measured variables and the relation with the standard are shown in Table 5.

The inconsistency and deviation from the standard are indicated with **bold-underlined** or marked with *minus* sign (-).

The comparison is aimed to determine whether the measured dimensions correspond to the standard, whether the furniture is correctly marked, whether the instructions for use are provided and whether the differences in children's height are taken into consideration.

Besides the applicable but not mandatory standard EN 1729-1, each country has its own regulations / guidelines / normatives for equipping preschool institutions.

The problem with the regulations or guidelines mostly lies in very short and cursory descriptions of detailed product design. For example, the applicable *Regulations of Activities in Children's Educational Institutions* (2009) in the Republic of North Macedonia describe the furniture as follows: "Equipment and furniture in kindergartens should be functional, portable, stable, made of quality material, preferably natural one, easy to maintain and with aesthetic appearance and adjusted for the children's age".

The meaning of "quality material" or "aesthetic appearance" is not clear enough. In the Republic of Croatia, the currently applicable *National Pedagogical Standard for Pre-School Education* (2008) has almost the same description.

In the Republic of Bulgaria, the description for chairs is given in the *Ordinance No. 3* (2007) related to health requirements in kindergartens. It reads as follows: "The playroom is equipped with tables and chairs adapted to the anatomical and physiological features of children of the respective age group. A dining corner shall be set up with tables and chairs adapted to the anatomical and physiological characteristics of children of the respective age group".

Similarly as above, the meaning of "adapted to the anatomical and physiological characteristics" is not quite clear.

The comparison of the samples used in all three polygons shows wide deviations. The main problem is that majority of chairs in some polygons are older than 30 years. It belongs to the time when EN 1729 did not even exist.

Based on three analysed groups of chairs (size marks 0, 1 and 2), it can be concluded that only three types of chairs fit the prescribed dimensions *h8* and *b3* (chair code B, L and M). Other dimensions, such as effective depth of seat (*t4*), backrest width (*b4*), seat inclination (α), angle between seat and backrest (γ), height of armrest above seat (*p*), width between arms (*r*), to mention only a few, are not in accordance with the European Standard for size marks 0, 1 and 2. Therefore, it is necessary to make extensive anthropometric analyses and researches of children of preschool age in order to resolve the diversity of furniture dimensions.

Some samples (chair codes C, D, H, K, P and Q) fulfil neither the dimensions *h8* (height of the seat) nor *b3* (seat width) prescribed in the standard. The largest differences were observed in the dimension of the seat height of all chairs.

It should be pointed out that the dimensions prescribed in the standard are not fully respected.

Regarding the dimensions, two main sizes of chairs, high and low, are found in all preschool facilities. The higher chairs are commonly used by children aged from 3 to 7 in kindergarten groups (except in North Macedonia, where according to the public law, children aged from 2 to 3 years belong to the kinder-

Table 5 Deviations of measured sample variables in relation to EN 1729-1:2015
Tablica 5. Odstupanja mjerenih varijabli uzoraka od norme EN 1729-1:2015

Chair code *Šifra stolice*		 B	 C	 D	 F	 H	 K	 L	 N	 P	 Q
Size (colour) according to EN 1729-1 / *Veličina (boja) prema EN 1729-1*		2 (violet)	2 (violet)	2 (violet)	1 (orange)	1 (orange)	2 (violet)	1 (orange)	2 (violet)	2 (violet)	1 (orange)
Dimensions, mm *dimenzije,* mm	*h8*	+ (-10)	- **(-20)**	- **(-20)**	+ (+10)	- **(-20)**	- **(+20)**	+ (+10)	+ (-10)	+ (+5)	- **(-15)**
	b3	+ (+60)	+ (+90)	+ (+20)	+ (+60)	+ (+20)	+ (+50)	+ (+60)	+ (+30)	+ **(-40)**	±
	h7	+	+	+	+	+	+	+	+	+	+
	t4, b4, α, γ, p, r	n/a (not applicable)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Marking *označivanje*	Colouring or size marking according to EN 1729-1 / *obojeno ili označeno prema EN 1729-1*	no (nature wood)	no (nature wood)	no (red)	no (green)	no (nature wood)	no (nature wood)	no (nature wood)	no (orange)	no (nature wood)	no (colorful)
	Manufacturer and year / *proizvođač i godina proizvodnje*	n/a (not available)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

garten group, and not nursery group as in other countries). The lower type of chairs is used in nursery groups. In some preschool facilities, there is no the lower type of chairs, so kids only use chairs of one size.

In all polygons, it was found that children were divided into two main types of age groups: homogeneous (HO) and heterogeneous (HE). Homogeneous (HO) groups included children of the same age, and were divided into the following groups: a) children from 2 to 3 years old; b) children from 3 to 4 years old; c) children from 4 to 5 years old, d) children from 5 to 6 years old, and e) mostly 7 or 7,5 years old kids (school age). Accordingly, children who actively use chairs could be divided into four or maximum five age groups. The situation was different in heterogeneous (HE) groups, where children aged from 3 to 7 years were staying in one playroom. According to most kindergarten educators, heterogeneous groups are a very good solution from pedagogical point of view – e.g. small kids learn from the older, the older kids learn how to be attentive. There is, however, the problem of the chair size. Almost all kids have been using only one size chair, which is not in accordance with the requirements of their healthy physical growth.

According to the results of this research, the chairs should be dimensioned according to children's anthropometric dimensions and growth, regardless of whether the children were in homogenous or heterogeneous type of group.

The usual procedure in furnishing kindergartens is to provide two-size furniture (Domljan *et al.*, 2015). This procedure should be changed in accordance with EN standards, which recommend to purchase at least four size marks (size 0 to 3). No matter what age the child belongs to, the dimensions of the furniture should be adapted to the anthropometric dimensions of each child.

To obtain the size of the chairs, comprehensive anthropometric research needs to be done to compare and match children's body dimensions with the size of the furniture. On the other hand, EN 1729-1:2015 can be used in the section for chairs for preschool children, which is divided into four sizes from 0 to 3. In order to distinguish one type of the chair from another, the colours prescribed in the European standard can be used.

4 CONCLUSIONS
4. ZAKLJUČAK

Based on the results of the analysed types of chairs, as well as the comparison with the current standard EN 1729-1:2015, deviations and mismatches in functional dimensions and marks were found in all three polygons. The following conclusions and recommendations could be pointed out:

Generally, the analysed chairs do not correspond at all to the applicable standard for individual kindergarten groups in all polygons (chair codes C, D, H, K, P and Q).

Particularly, some chairs do not fulfil the requirements related to the seat height (chair codes C, D, H, K and Q), some samples do not fulfil the requirements related to the seat width (chair code N), and chairs are not marked correctly as prescribed in the standard (all chairs).

The biggest problem regarding the dimensions of the chair and its comparison to children's dimensions prescribed in the same standard is that they are not compatible. Namely, according to the EN 1729-1:2015, each size group of the chair is prescribed for certain height group of children, regardless of age. The children are divided into some groups by age, not by their body dimensions. Children of the same age and gender grow unevenly, which depends on numerous factors. Regardless of the group that a child is attending in a kindergarten due to his/her age, it does not have to mean that the child's height belongs to his/her kindergarten group. Therefore, in one kindergarten group, it is possible to notice large differences in the children's height.

Each kindergarten group should have several chair dimensions, ranging from 0 to 2, and for older groups, it has to be size 3 (and even 4) according to the standard. This should precede the anthropometric survey of children in kindergarten at the beginning of the new season (every September), so that a selection of required chairs can be made by groups. Only in this way, the dimensions of furniture that comply with the standard can be consistent with the anthropometrics of children in each kindergarten group.

Some state regulations and guidelines for equipping preschool institutions are too general in describing furniture and equipment. By a comprehensive analysis that would include interdisciplinary teams of experts, the regulations should be improved and provide detailed technical descriptions and sketches, before starting the process of procurement. Although in the Republic of Croatia such a manual already exists (Domljan *et al.*, 2015), relevant users should take it into account.

The process of equipping preschool institutions is carried out in a procedure regulated by state law and public procurement, where the "most economically advantageous tender" (which sometimes includes even the lowest price) are mostly the basic criterion for procurement, and not the quality of the furniture or the dimensions of children who are attending the corresponding (age) group in kindergartens. This has to be changed by new laws.

The findings in this paper could make a new basis for proposing solutions aimed at reducing the detected mismatches and improving the process of designing preschool furniture and procurement system of equipping preschool facilities. It has to be adapted to the up-to-date anthropometrics and children's dimensions in kindergartens.

Acknowledgements – Zahvala

Authors are thankful to the City Office for Education in Zagreb, Department of Public Works in municipalities in Skopje and Departure of Education in

Sofia, as well as all employees in kindergartens for their help and assistance in this research.

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