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Restytucja wielkości cech postawy w płaszczyźnie czołowej po obciążenia masą transportowanych przyborów szkolnych w trybie ciągu lewą i prawą ręką uczniów obojga płci w wieku 7 lat

Restitution of the size of postural features in the frontal plane after loading with the weight of school items carried with the right and left hand in 7-year-old pupils of both sexes

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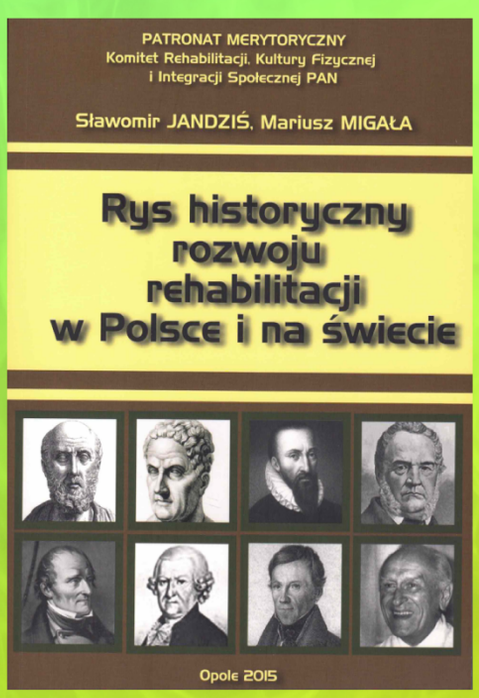

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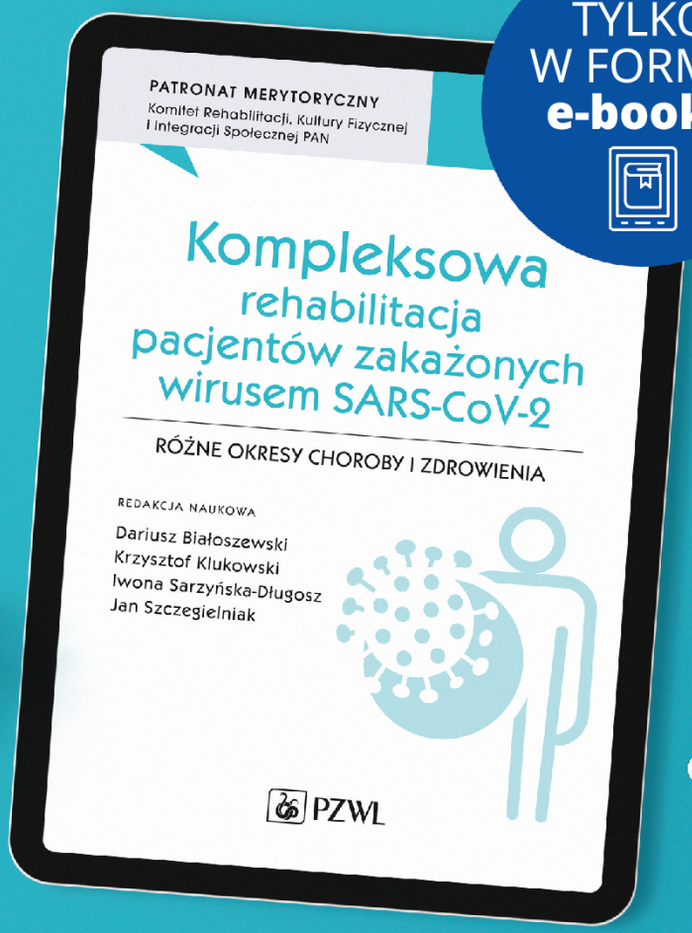

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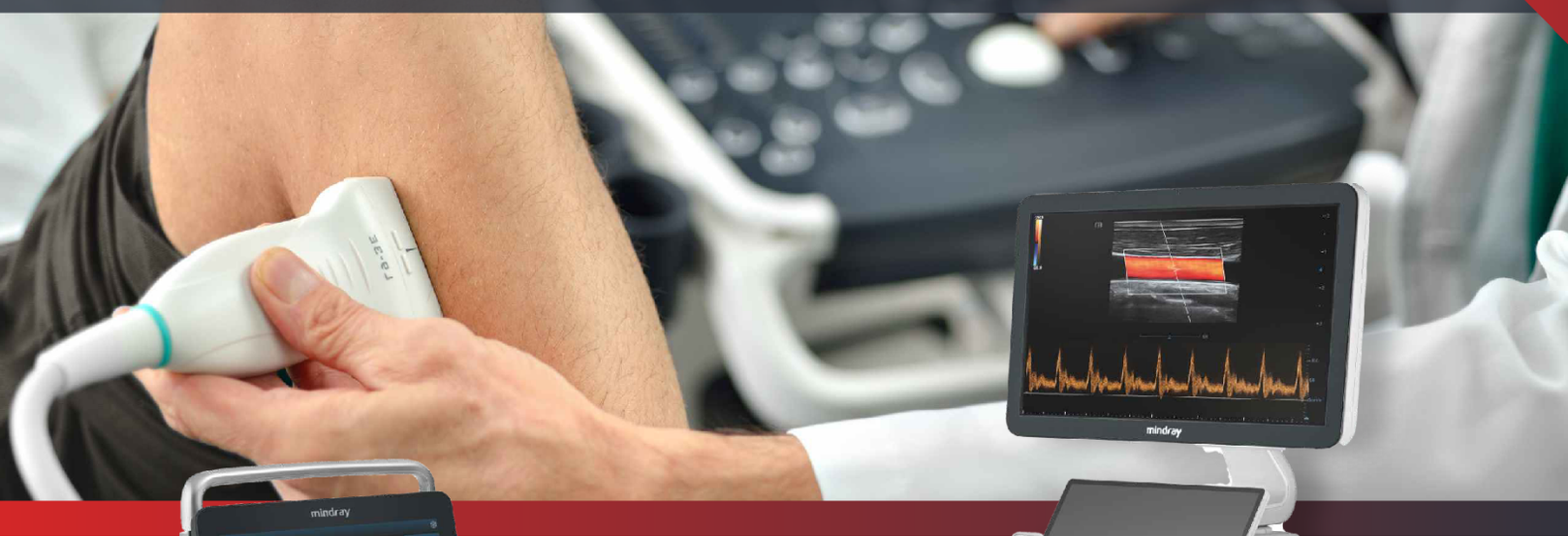

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Rehabilitacja kardiologiczna i fizjologia wysiłku – zapraszamy do rejestracji na wyjątkową konferencję w Wiśle

W dniach 11–13 maja w Hotelu Stok Wiśle odbędzie się wyjątkowe i interdyscyplinarne spotkanie specjalistów z całej Polski – 26. Sympozjum Sekcji Rehabilitacji Kardiologicznej i Fizjologii Wysiłku Polskiego Towarzystwa Kardiologicznego. Serdecznie zapraszamy do rejestracji.

26. Sympozjum Sekcji Rehabilitacji Kardiologicznej i Fizjologii Wysiłku Polskiego Towarzystwa Kardiologicznego to coroczne spotkanie specjalistów, zajmujących się rehabilitacją kardiologiczną, prewencją chorób układu krążenia i innymi formami aktywności fizycznej, która ma prowadzić do poprawy stanu naszego zdrowia.

Ta trzydniowa konferencja przeznaczona jest dla lekarzy kardiologów, specjalistów rehabilitacji medycznej oraz innych specjalności, którzy w swojej codziennej praktyce zajmują się rehabilitacją i fizjologią wysiłku, ale także dla fizjoterapeutów, pielęgniarek, techników i przedstawicieli innych zawodów medycznych, zainteresowanych tematyką spotkania, oraz studentów.

Jakie tematy zostaną poruszone podczas konferencji?

26. Sympozjum Sekcji Rehabilitacji Kardiologicznej i Fizjologii Wysiłku to konferencja, na którą zaproszeni zostali wybitni specjaliści z dziedziny kardiologii i nie tylko. Podczas wydarzenia wygłoszonych zostanie prawie 100 wykładów merytorycznych w ciągu aż 20 sesji. Uczestnicy będą mieli również szansę na udział w sesjach przypadków klinicznych, intensywnych warsztatach, a także panelach dyskusyjnych. To wydarzenie cechujące się dużą interdyscyplinarnością, dlatego z pewnością każdy znajdzie coś dla siebie.

Podczas wydarzenia kompleksowo pochylimy się nad dziedziną rehabilitacji kardiologicznej i fizjologii wysiłku. Wśród tematów wiodących znajdują się:

- rehabilitacja w dobie pandemii i po pandemii COVID-19;
- telerehebilitacja i rehabilitacja hybrydowa;
- rehabilitacja kardiologiczna w specyficznych grupach pacjentów;
- programy KOS-zawał i KONS;
- nowe standardy ESC, PTK i SRKiFW;
- Testy wysiłkowe i testy spiroergometryczne
- monitorowanie wysiłku fizycznego;
- prewencja pierwotna i wtórna chorób sercowo-naczyniowych;
- farmakoterapia pacjentów rehabilitowanych kardiologicznie i nie tylko;
- sport i aktywność sportowa w kardiologii;
- czynniki ryzyka chorób układu krążenia.

Program merytoryczny wydarzenia jest niezwykle bogaty i angażujący. Warto podkreślić także, iż na konferencji pojawią się specjalne sesje wykładów prowadzone przez zaproszone sekcje i asocjacje Polskiego Towarzystwa Kardiologicznego, m.in. Sekcję Kardiologii Sportowej, Asocjację Niewydolności Serca, Asocjację Elektrokardiologii Nieinwazyjnej i Telemedycyny, Sekcję Pielęgniarstwa Kardiologicznego i Pokrewnych Zawodów Medycznych, „Klub 30”, Sekcję Farmakoterapii Sercowo-Naczyniowej, Sekcję Prewencji i Epidemiologii, a także Polskie Towarzystwo Medycyny Sportowej.

„Pandemia wymusiła na nas zmianę paradygmatu rehabilitacji kardiologicznej”

Organizatorami wydarzenia są wydawnictwo naukowe Evereth Publishing oraz Sekcja Rehabilitacji Kardiologicznej i Fizjologii Wysiłku Polskiego Towarzystwa Kardiologicznego (SRKiFW). Przewodniczącą Komitetu Naukowego jest prof. dr hab. n. med. Małgorzata Kurpesa, Wiceprzewodniczącymi – prof. dr hab. n. med. Anna Jagier, dr hab. n. med. Dominika Szalewska, a Komitetu Organizacyjnego – dr n. med. Bartosz Szafran.

Dr n. med. Agnieszka Mawlichanów, Przewodnicząca SRKiFW, podkreśla, iż ostatnie Sympozjum miało miejsce w 2019 r. w Wiśle. W tym czasie udało się zorganizować wydarzenie w formule online, jednak zdaniem Przewodniczącej obecnie „wszyscy spragnieni jesteśmy spotkania osobistego, wymiany doświadczeń i bezpośrednich rozmów, nie tylko na sali wykładowej, ale i w kuluarach”.

– Cztery lata w sporcie to pełna olimpiada, a w naszej dziedzinie kardiologii można powiedzieć – cała wieczność. Pandemia wymusiła na nas zmianę paradygmatu rehabilitacji kardiologicznej, między innymi stworzyła pole dla rozwoju modelu hybrydowego i monitorowanego telemedycznie. W tym czasie ukazało się wiele ważnych dokumentów, stworzonych przez polskie i europejskie towarzystwa kardiologiczne, dotyczące rehabilitacji, prewencji i aktywności fizycznej. Dynamicznie w naszym kraju rozwija się też program KOS-zawał, przynoszący liczne korzyści, ale też budzący kontrowersje. O tym wszystkim i jeszcze wielu innych sprawach pragniemy podyskutować w czasie naszego majowego spotkania – zapowiedziała dr Mawlichanów.

Rejestracja na 26. Sympozjum Sekcji Rehabilitacji Kardiologicznej i Fizjologii Wysiłku możliwa jest na stronie internetowej konferencji rehabilitacja-2023ptk.pl/rejestracja/. Informacje na temat opłaty zjazdowej i wydarzeń towarzyszących znajdują się tutaj: rehabilitacja2023ptk.pl/oplata-konferencyjna/.

Informujemy jednocześnie, iż liczba miejsc na konferencji jest ograniczona, dlatego warto zarejestrować się już dzisiaj.

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Restitution of the size of postural features in the frontal plane after loading with the weight of school items carried with the right and left hand in 7-year-old pupils of both sexes

Restytucja wielkości cech postawy w płaszczyźnie czołowej po obciążeniu masą transportowanych przyborów szkolnych w trybie ciągu lewą i prawą ręką uczniów obojga płci w wieku 7 lat

Mirosław Mrozkowiak[A,B,C,D,E,F,G]

Gabinet Fizjoterapii AKTON, Warszawa / Physiotherapy Office AKTON, Warsaw, Poland

Abstract

Introduction. The analysis of the pupil's environment is a set of stressors in the field of human ecology consisting not only of the genetic factor but also of the epigenetic one. Material and methods. The study of body posture was carried out in a group of 65 pupils at the age of 7, using the mora projection method in the following eight positions: (four positions for the right-hand thrust and four for the left-hand thrust): 1- habitual posture, 2 - posture after pulling a container with school supplies with one hand for 10 minutes, 3 – one minute after removing the load, 4 - two minutes after removing the load. The measurement of physical fitness was performed using the Sekita test. Results. The significance of differences between measurement 1, 2, 3, and 4 was analysed to determine the restitution of the size of traits after loading and their correlation with physical fitness to examine the relationship with the studied differences. Conclusions. (1) After removing the load, statistically significant restitution occurred after the first and second minute. Restitution was incomplete. (2) In right-hand carriage by boys, endurance significantly correlated with restitution, and among girls it was additionally speed and agility. As regards girls, physical fitness revealed more frequent relationships with restitution. (3) In left-hand carriage by boys, after the first minute, restitution correlated with endurance, power, agility and overall physical fitness, and after two minutes, additionally with strength, while among girls with strength, power, and endurance. After two minutes, restitution correlated with speed and agility in addition to the abovementioned postural features. As far as girls are concerned, physical fitness more often correlated with restitution. (4) Due to incomplete restitution after one and two minutes, asymmetrical carriage is not recommended to children aged 7 years. Physical fitness demonstrated by children does not lead to full restitution of the examined postural features, which suggests its low level and immature correctional and compensational processes.

Key words:
schoolbags, body posture, mora projection, physical fitness, restitution

Streszczenie

Wstęp. Analiza środowiska ucznia to zbiór stresorów pola ekologii człowieka, mieszczący w swoich granicach nie tylko czynnik genetyczny, ale także epigenetyczny.
Materiał, metoda. Badania postawy ciała przeprowadzono w grupie 65 uczniów w wieku 7 lat metodą mory projekcyjnej w 8 pozycjach (4 dla ciągu ręką prawą i 4 dla ciągu lewą): 1 – postawie habitualnej, 2 – postawie po 10-minutowym ciągnięciu pojemnika z przyborami szkolnymi jednorącz, 3 – po jednej minucie od zdjęcia obciążenia, 4 – po dwóch minutach od zdjęcia obciążenia. Dokonano pomiaru sprawności fizycznej testem Sekity.
Wyniki. Analizowano istotność różnic między 1 a 2, 3 i 4 pomiarem dla określenia restytucji wielkości cech po obciążeniu oraz ich korelacji ze sprawnością fizyczną dla zbadania związku z badanymi różnicami.
Wnioski. 1. Po wykluczeniu obciążenia nastąpiła istotna statystycznie restytucja po pierwszej i drugiej minucie. Restytucja była niepełna. 2. W transporcie prawą ręką przez chłopców z restytucją istotnie związana jest wytrzymałość, wśród dziewcząt dodatkowo szybkość i zwinność. W przypadku dziewcząt sprawność fizyczna wykazuje częstsze związki z restytucją. 3. W transporcie lewą ręką przez chłopców z restytucją po pierwszej minucie związana jest wytrzymałość, moc, zwinność i ogólna sprawność fizyczna, po drugiej dodatkowo z siłą, wśród dziewcząt z siłą, mocą i wytrzymałością. Po drugiej dodatkowo z szybkością i zwinnością. W przypadku dziewcząt sprawność fizyczna wykazuje nieco częstsze związki z restytucją. 4. Ze względu na niepełną restytucję po 1 i 2 minucie asymetryczny transport nie jest wskazany przez dzieci w wieku 7 lat. Posiadana przez dzieci sprawność fizyczna nie doprowadza do pełnej restytucji badanych cech postawy, co świadczy o jej niskim poziomie i niedojrzałych procesach korekcyjno-kompensacyjnych.

Słowa kluczowe:
plecak, postawa ciała, mora projekcyjna, sprawność fizyczna, restytucja

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Introduction

"According to the Institute of Mother and Child, the average pupil must carry on its back up to 10 kg each day, while the weight of its backpack should not exceed 4.5-5 kg, which is 10-15% of its body weight. As indicated by the Department of Protection and Promotion of Child and Youth Health at the Institute of Mother and Child, currently, as many as 90% of children in Poland suffer from postural defects, especially regarding the spine, knees and feet. The visit of the State Sanitary Inspection (Sanepid) in 2009 showed that student schoolbags were two kilos heavier on average than they should have been. The studies conducted by the Krakow Sanepid in 2010 revealed that schoolbags were too heavy at every stage of school education. The weight of schoolbags increases as the pupils' body weight goes up. In one of Warsaw's schools, students do not have schoolbags at all. Children's desks have a special desk top with books and necessary school accessories underneath. Although observations have revealed that most public primary schools have special lockers, children's schoolbags do not weigh radically less. Practical experience has shown that students take most books home due to their homework." [1]. The issue concerning the effects of the weight load of school supplies has been dealt with by Bogdanowicz [1], Hagner et al. [3], and Annetts [4]. The literature review has demonstrated that the restitution of the size of postural features after loading has been already discussed by Mrozkowiak et al. [5, 6, 7] and Romanowska [8]. Other authors have studied mainly the impact of load on the selected values of body posture features, among others, Bajorek et al. [9], Barczyk-Pawelec et al. [10], Dolata-Łubkowska et al. [11], Drzał-Grabiec et al. [12], Grabara et al. [13, 14], Słoniewski et al. [15], Ślężyński et al. [16], Utake et al. [17], Wojtków et al. [18], Zeyland-Malawka [19], and Żurek et al. [20]. Based on the above-cited works, a general conclusion can be drawn that the course of posturogenesis is modulated by every physical effort, and particularly intensively by sports training. It is the body posture that becomes typical for a sports discipline; therefore, a different posture can be observed in gymnasts, swimmers, athletes, horse-riders, shooters or archers.

The author's interest in this topic stems from the persistently high percentage of static posture disorders in the oldest group of pre-school children and the primary grades 1–3, from the permanently expressed opinion on the negative effects of the carriage of school supplies on static posture and from the lack of unequivocal recommendations for optimal carriage and contraindications of the negative transporting of school supplies. The general purpose of the research program is an attempt to determine the influence of the weight load of school supplies transported in the school way, that is, on the right shoulder, on the left shoulder, on the back, on the chest, on the back and chest, obliquely on the left shoulder and on the right hip, and obliquely on the right shoulder and on the left hip. The partial goal is to show the restitution of the values of selected postural features after removing the weight load of the container with school supplies pulled with the left or right hand in the frontal plane.

Research material

The research was conducted in accordance with the principles of the Helsinki Declaration, and for research purposes the

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consent of: a pupil, its legal guardian, tutor, kindergarten management, and bioethics committee (KEBN 2/2018, UKW Bydgoszcz) was obtained. The type of biomechanical body static disorders was not an exclusion criterion for participation in the research program. The division of respondents into rural and urban environment was abandoned due to the fact that this feature would never determine the homogeneity of the group, but only the blurred cultural and economic border of both environments. The age of the children was defined by the number of completed months of life on the day of each test. The study included 65 children from randomly selected kindergartens of the Zachodnio-Pomorskie and Wielkopolskie Voivodships. The research was carried out from 27 May 2019 for nine consecutive days, always between 9 a.m. and 2 p.m. and in the same properly prepared room. On the first day, all children participated in the training during which they were provided by the researcher with the necessary information on the purpose, course and behaviour during the study. Children were also encouraged to maintain the anthropometric points marked on the skin. During the measurements, the preschool teacher's assistant of the examined group was always present, which was to ensure the emotional stability of the children. The accepted rules of the research procedure were observed during the study.

The total of 65 pupils participated in the program with 53.84% (35 individuals) being girls and 46.15% being boys (30 individuals). The average body weight (Mc) among girls was 24.46 kg and body height (Wc) was 123.87, whereas among boys the values were 24.56, kg, 123 cm, respectively. All children had a slender body type according to Rohrer's weight-height ratio (IR).

Research methods

Overall physical fitness

The Wroclaw fitness test for children between the age of 3 to 7 years was used to diagnose children's physical fitness [22]. According to the author, the test has a high degree of reliability and is adequate in terms of discrimination power and difficulty level [23]. The proposed test consists of four trials conducted in the form of the Sport Day, which significantly increased their motivation to exercise in the presence of parents. The author added the fifth test - endurance. P.w. – standing start, Movement – a 300-meter run. The running time from start to finish was assessed. If the child did not finish the race, it received "0" points. The race took place on the recreational path with a hardened surface, observing all safety rules.

Body posture

The measurements were carried out according to the developed procedure, always with the same tools and by the same people. The presence of the teacher's assistant was dictated by the need to minimize the time elapsing from removing the load until the second recording of the postural feature values. The load time for children was the average time taken to travel from home to school and was 10 minutes as specified in the survey by the pupil's guardian. On the other

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hand, the load was determined by averaging the mass of school supplies carried by first grade children from a randomly selected primary school. In the second position a spring dynamometer was used. The proximal end with a handle was held by the examined person, and the distal end with the cord was stabilized. The manner of holding and thrust of the dynamometer handle imitating the handle of the pulled container was in no way affected. The angle of the cord line corresponded to the individual inclination angle of the handle of the carried container with school supplies and was from 40° to 45°. The pulling force indicated by the dynamometer ranged from 1 kg to 2 kg.

The measurement of the selected postural features was conducted in four positions related to the left-hand thrust (Fig. 1) and four positions related to the right-hand thrust (Fig. 2):

Position 1: habitual posture (Fig. 3).

Position 2: posture with asymmetric load pulled with one hand (Fig. 1, 2).

Position 3: posture after one minute from removing the load (Fig. 3).

Position 4. posture after two minutes from removing the load (Fig. 3),

Fig. 1. Position 2: demonstration of a posture with asymmetrical loading pulled with the left hand

Fig. 2. Position 2: demonstration of a posture with asymmetrical loading pulled with the right hand

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Fig. 3. Position 1: Habitual posture

Each research day, children were subjected to four positions of load. On the first day, measurements included all children in positions 1, 2, 3 and 4 with the right-hand thrust and on the following day - in positions 1, 2, 3 and 4 using the left-hand thrust. In this way, the authors tried to exclude overlapping of postural muscle fatigue during examination from one position to another. On each day, the first recording of the values of postural features took place in a habitual posture, and the second one in the last 5 seconds of the assumed time of the current posture with load. The third recording took place in the habitual posture one minute after the load was removed, and the fourth one in the existing posture two minutes after removing the load. This is in line with the author's previous research results which have shown that after this time the traits can have the initial values. When diagnosing the habitual posture in the first edition, it could be assumed that the position was appropriate and relatively constant for each student. However, to maintain research reliability, it was assumed that any inconsistency with the feature values from the first edition of measurements could influence the final test result. Therefore, before applying the body posture load provided for in the procedure, the characteristics of habitual posture were always identified as a reference for subsequent dynamic changes in the diagnosed postural features. The height and weight of children as well as the weight of carried school accessories were measured with a medical scale before the first day of the study.

The measuring stand dedicated for the assessment of selected postural features consisted a computer, a card, software, a display monitor, a printer and a projection-reception device with a camera to measure selected parameters of the pelvis-spine

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complex. The test site and the camera were levelled in the sagittal and frontal planes according to the camera's spirit levels and in the transverse plane in relation to the child's toe lines. Obtaining the spatial picture was possible thanks to displaying the lines of strictly defined parameters on a child's back. The lines, falling on the skin of the child got distorted depending on the configuration of the surface. The applied lens ensured that the imaging of the subject could be received by a special optical system with a camera, then transmitted to the computer monitor. The distortions of the line imaging recorded in the computer memory were processed through a numerical algorithm on the topographic map of the investigated surface [24]. The obtained image of the back surface enabled multi-faceted interpretation of body posture. In addition to assessing the torso asymmetry in the frontal plane, it is possible to determine the values of angular and linear features describing the pelvis and physiological curvatures in the sagittal and transverse plane. The most important thing in this method is the simultaneous measurement of all real values of the spatial location of individual body sections. Due to the research methodology, the authors resigned from examining a child standing on the strain gauge mat. In this method it is vital to measure all real values of the spatial location of individual body sections simultaneously.

To minimize the risk of measurement errors as regards selected postural features, the following test procedure was developed [21]:

1. The habitual posture of the subject with a thin and bright necklace against the background of a white, slightly illuminated sheet: free, unforced posture, with feet slightly spaced apart, extended knee and hip joints, arms dangling along the torso and eyes directed straight ahead, back to the camera in the appropriate distance from it.
2. Marking the following points on the skin of the child's back: the peak of the spinous process of the last cervical vertebra (C_7), the spinous process at the peak of thoracic kyphosis (KP), the spinous process at the peak of lumbar lordosis (LL), the place where thoracic kyphosis goes into lumbar lordosis (PL), lower shoulder blades (Łl and Łp), upper posterior iliac spines (Ml and Mp), vertebra S1 and point SP. A white necklace was placed on the neck of the subject for the purpose of unambiguous marking of points B1 and B3, and long hair was tied.
3. After entering the necessary data about the respondent (name and surname, year of birth, body weight and height, remarks on: the condition of knees and heels, chest, injuries, surgical procedures, musculoskeletal disorders, gait, etc.), a digital image of the back and feet is recorded in the computer memory in each of the four positions from the middle phase of exhalation.
4. Having saved the mathematical characteristics of photos into the computer memory, the size of the features describing the body posture spatially is printed, Fig. 4.
5. The recorded images are processed without the participation of the examined individual.

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KOMPUTEROWE BADANIE POSTAWY CIAŁA

Nazwisko: [redacted] Wzrost: 119 cm, Rok ur. 1993 ,
Dane: 1SP1MK\0CIOLL00, Data badania: 2000-12-02, Wydruk dnia,2001-01-23
Wywiad: Uwagi:

Parametry globalne
Długość kręgosłupa DCK 346.6 [mm] czyli 29.1 % wzrostu
Kąty pochylenia [st] : ALFA 10.1, BETA 15.2, GAMMA 13.9, Łącznie: 39.2 [st]
Kąt pochylenia tułowia: KPT 6.3 [st]. Wskaźnik kompensacji 3.8 [st]

Kifoza piersiowa
D.LL_C7 DKP 309.9 [mm] (89.4%) Kąt KKP 150.9 [st]
D.PL_C7 RKP 195.7 [mm] (56.5%) Głębokość GKP 32.7 [mm] (WKP 0.167)

Lordoza lędźwiowa
D.S1_KP DLL 271.2 [mm] (78.2%) Kąt KLL 154.7 [st]
D.S1_PL RLL 150.9 [mm] (43.5%) Głębokość GLL -30.8 [mm] (WLL -0.204)

Płaszczyzna czołowa
Kat nachylenia tułowia KNT 1.4 [st]
Lewy bark wyżej o 8.2 [mm] Kąt linii barków KLB -1.7 [st]
L.łopatka wyżej o 6.1[mm] (-2.4st)(UL), bliżej o 20.6[mm] (-8.0st)(UB)
R. oddal. łopatek od kręgosłupa OL: 2.4 [mm] (1.7%)
Lewy tr.talii wyższy o -46.2 [mm] (TT) szerszy o -14.7 [mm] (TS)
Miednica: kąt nachylenia KNM 1.5 [st], kąt skręcenia KSM -6.4 [st]
Wsp.asym.barków względem KK WBS=-10.5 (-3.8%), wzg.C7 WBC= 6.3 (2.3%)
Wsp.asym.bark-miednica pion WBK= 10.2 (1.9%) poziom WBX= -10.5 (-5.3%)
Maks. odch. l.wyrost. kol. od C7_S1 UK 11.1 [mm] na wys.Th6

OPIS

Producent aparatury do Komputerowego Badania Postawy Ciała, stóp,...:
CQ Elektronik System, mgr inż. Artur Świerc, ul.Na Niskich Łąkach 19/2, Wrocław, tel. 0601 794162

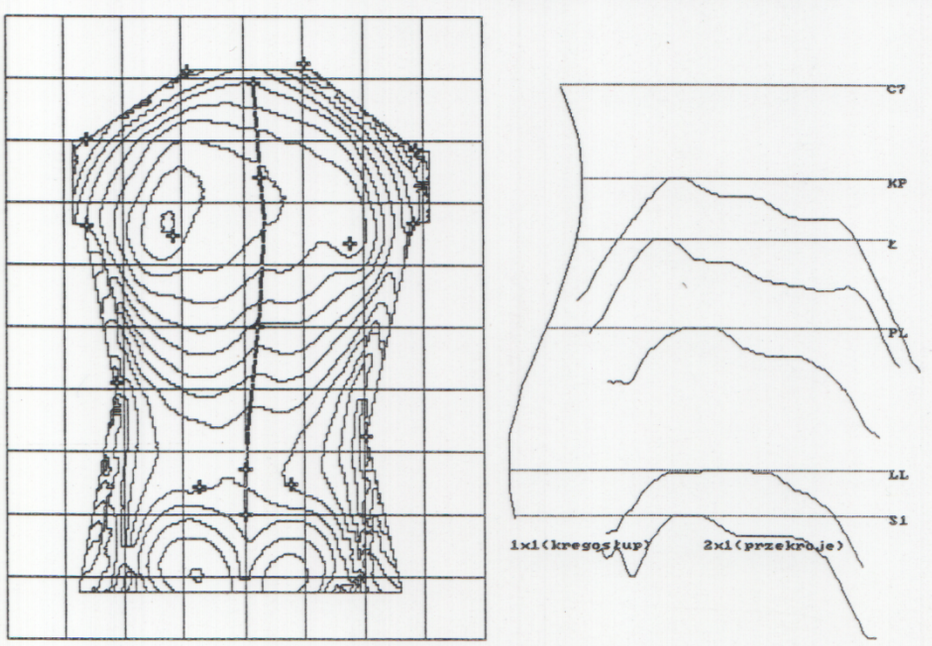

Fig. 4. Worksheet of measurement results for body posture features of the pelvis-spine complex

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Research subject

The Wrocław fitness test allows one to determine the level of strength, power, speed and agility of preschool children. The author enriched the Sekita test with an endurance test. Definitions of examined conditioning and comprehensive motor skills are generally available in the literature.

The measuring device defines several dozen postural features. Sixteen angular and linear features of the spine, pelvis and torso in the frontal plane as well as body mass and height were selected for statistical analysis. The authors appreciated the need for the most reliable and spatially full view of the child's body posture, which allowed full identification of the measured factors, Fig. 4, Tab. 1.

Research questions and hypotheses

The following research questions arise from the research objective:

1. Does the adopted method of carrying the mass of school supplies, significantly affecting the static body posture in the frontal plane, cause the subsequent restitution of the values of disturbed postural features?
2. Which element of physical fitness significantly affects the value of restitution after the first and which after the second minute and does it depend on the right or left hand thrust?

My own study results and the analysis of available literature suggest that:

1. The adopted method of carrying the mass of school supplies, significantly affecting the static body posture in the frontal plane, causes restitution of the values of disturbed postural features after the first and second minute.
2. Restitution of the values of postural features after the first and second minute is affected most significantly by endurance, agility, power, and speed and least significantly by strength.

Statistical methods

Only the results achieved in accordance with the adopted procedure were qualified for statistical analysis and were implemented in the IBM SPSS Statistics 26 program. At the initial stage, Shapiro-Wilk and Kolmogorov-Smirnov tests were used to check whether the distributions of the analysed variables were consistent with the normal distribution. For most variables, statistically significant deviations from the normal distribution were found at $p < 0.05$. Therefore, it was decided to apply nonparametric tests and coefficients in statistical analysis. The Wilcoxon rank test was used to determine whether there was a statistically significant difference (change) between the two measurements of quotient variable (in the same group) the distribution of which significantly deviated from the normal. The following symbols were used in the tables: M – arithmetic mean, Me - median, SD – standard deviation, Z – Wilcoxon test statistics, "p" – significance of the Wilcoxon test. Spearman's rho correlation coefficient was applied to establish any statistically significant correlations between variables measured at the quotient level whose distribution significantly deviated from normal. Significance levels were set at $p < 0.05$. If correlation is statistically significant at the level of $p < 0.05$, then the correlation coefficient rho should be interpreted. It may range

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Tab. 1. List of registered features of the torso, body weight and height

No.	Parameters: Symbol	Unit	Name	Description
			Frontal plane	
1	KNT−	degrees	Angle of body bent to the side	Defined as deviation of the C_7-S_1 line from the vertical axis to the left
2	KNT	degrees		Defined as deviation of the C_7-S_1 line from the vertical axis to the right
3	KLB	degrees	Angle of shoulder line, right shoulder up	Angle between the horizontal line and the straight line passing through points B2 and B4 PLBW = LBW − PBW
4	KLB−	degrees	Angle of shoulder line, left shoulder up	
5	UL	degrees	Angle of scapula line, right scapula up	Angle between the horizontal line and the straight line passing through points Ł1 and Łp
6	UL−	degrees	Angle of scapula line, left scapula up	
7	OL	mm	Lower angle of left scapula more distant	Difference in the distance of lower angles of scapulas from the line of spinous processes measured horizontally along the lines passing through points Ł1 and Łp
8	OL−	mm	Lower angle of right scapula more distant	
9	TT	mm	Left waist triangle up	Difference in the distance measured vertically between points T1 and T2 and points T3 and T4 PLTT = LTT − PTT
10	TT−	mm	Right waist triangle up	
11	TS	mm	Left waist triangle wider	Difference in the distance measured horizontally between straight lines passing through points T1 and T2 and points T3 and T4
12	TS−	mm	Right waist triangle wider	
13	KNM	degrees	Pelvis tilt, right ilium up	Angle between the horizontal line and the straight line passing through points M1 and Mp
14	KNM−	degrees	Pelvis tilt, left ilium up	
15	UK	mm	Maximum inclination of the spinous process to the right	Maximal deviation of the spinous process from the line from S_1. The distance is measured in horizontal line
16	UK−	mm	Maximum inclination of the spinous process to the left	
			Cechy morfologiczne / Morphological features	
17	Mc	kg	Body mass	Measurement of body height and weight conducted by means of a digital medical scale
18	Wc	cm	Body height	

All tables – own source

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from −1 to +1. The more distant the coefficient is from 0 and the closer it is to −1 or +1, the stronger the correlation. Negative values mean that as the value of one variable increases, the value of the other variable decreases. On the other hand, positive values show that as the value of one variable increases, the value of the other variable increases.
There was also made an analysis of the correlation between the results of five physical fitness tests and the average difference between measurement 2 and 3 and measurement 3 and 4 relating to the values of features in the posture assumed during the right and left hand thrust, broken down by sex. The difference between the measurements was given in absolute values, so that negative differences would also indicate the size of the change. We took into account only those pupils who had been subjected to both physical fitness tests and body posture measurements, which considerably reduced the size of the group involved in the study. For this reason, it was impossible to calculate correlations for some variables. If this is the case, there are empty cells in the tables. Statistically significant correlations are marked with a grey background.
Individual values of postural traits are expressed in various ranges so it is not possible to calculate the average difference for all these variables between two measurements. An analysis conducted in such a way would distort the results and increase the significance of the variables where values are higher by definition, and reduce the significance of those variables with values lower by definition. Therefore, the assessment of correlations between the average difference in the values of postural features between measurement 2 and 3, and measurement 3 and 4 of postures using the right-hand and left-hand thrust, and physical fitness was made separately for girls and boys, using absolute quantities, i.e. the ratio of the difference to the initial value was used in the calculations instead of exact quantities. Owing to such an approach no variables are over- or underrepresented in the average result.

Results

The total of 65 subjects of both genders at the age of 7 were involved in the study, which allowed to record 4615 values of features describing body posture in habitual position and dynamic positions, body weight and height as well as physical fitness.
The average body weight (Mc) among girls was 24.46 kg and body height (Wc) was 123.87, whereas among boys the values were 24.56, kg and 123 cm, respectively. All children had a slender body type according to Rohrer's weight-height ratio (IR) [26].
The analysis of the differences in the values of postural features between measurement 2 and 3 in the carriage of school supplies using the right-hand thrust to pull the container by boys showed the significance of differences in all analysed variables except the variable
KNT+. All differences in the postural feature values between measurement 3 and 4 are significant. The analysis of differences in the values of postural features between measurement 2 and 3 in the transport of school supplies pulled in the container with the left hand by boys suggested the significance of differences in all analysed variables except the TS- variable. All differences in the values of features between measurement 3 and 4 are significant, Tab. 2. The analysis of differences in the values of

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postural traits between measurement 2 and 3 and measurement 3 and 4 in the carriage of school supplies in a container using the right or left-hand thrust by girls showed the significance of differences in all variables, Tab. 3.

Tab. 2. Restitution of the values of body postural features in the frontal plane between measurement 2 and 3, and measurement 3 and 4 among boys

No	Variable	Right hand					Left hand				
		Measurement			Wilcoxon Test		Measurement			Wilcoxon Test	
		1	2	3			1	2	3		
		Me	Me	Me	2/3 p	3/4 p	Me	Me	Me	2/3 p	3/4 p
1	DCK	287.60	296.50	307.05	< 0.001	< 0.001	298.00	302.90	308.30	< 0.001	< 0.001
2	KNT−	0.20	0.70	1.05	< 0.001	< 0.001	13.55	6.70	3.80	< 0.001	< 0.001
3	KNT+	12.80	6.50	4.30	0.161	0.012	0.25	0.85	1.20	0.012	0.027
4	KLB−	10.65	6.50	4.00	0.025	0.012	0.40	1.05	1.50	0.012	0.028
5	KLB+	0.30	0.45	0.75	< 0.001	< 0.001	13.15	6.60	3.25	< 0.001	< 0.001
6	UL−	10.50	6.15	4.10	0.012	0.012	0.65	1.40	3.15	0.043	0.012
7	UL+	0.50	0.90	1.20	< 0.001	< 0.001	12.60	7.55	3.70	< 0.001	< 0.001
8	OL−	1.20	2.80	4.20	< 0.001	< 0.001	14.30	12.50	10.10	< 0.001	< 0.001
9	OL+	10.85	6.50	5.25	0.012	0.012	0.70	2.10	2.75	0.018	0.012
10	TT−	12.65	6.55	5.40	0.012	0.012	0.90	1.70	2.90	0.012	0.012
11	TT+	0.70	2.45	4.70	< 0.001	< 0.001	22.45	14.55	10.35	< 0.001	< 0.001
12	TS−	17.60	9.65	7.15	0.012	0.012	7.60	7.35	5.40	0.161	0.012
13	TS+	0.85	2.45	5.95	< 0.001	< 0.001	17.20	11.25	9.30	< 0.001	< 0.001
14	KNM−	1.10	2.80	5.80	< 0.001	< 0.001	16.50	12.40	9.40	< 0.001	< 0.001
15	KNM+	14.60	10.40	4.30	0.008	0.008	0.20	2.10	3.10	0.008	0.012
16	UK−	13.00	7.60	3.75	0.012	0.012	0.40	0.70	1.10	0.016	0.010
17	UK+	0.75	3.70	4.85	< 0.001	< 0.001	19.10	12.95	10.35	< 0.001	< 0.001

Tab. 3. Restitution of the values of body postural features in the frontal plane between measurement 2 and 3, and measurement 3 and 4 among girls

No	Variable	Right hand					Left hand				
		Measurement			Wilcoxon Test		Measurement			Wilcoxon Test	
		1	2	3			1	2	3		
		Me	Me	Me	2/3 p	3/4 p	Me	Me	Me	2/3 p	3/4 p
1	DCK	271.35	281.45	289.90	< 0.001	< 0.001	278.40	284.45	288.70	< 0.001	< 0.001
2	KNT−	0.10	0.20	0.30	0.005	< 0.001	13.60	7.60	3.20	0.001	0.001
3	KNT+	11.50	5.40	2.70	< 0.001	< 0.001	0.20	0.40	0.60	< 0.001	0.001
4	KLB−	10.50	5.40	3.20	< 0.001	< 0.001	0.30	0.70	1.10	< 0.001	< 0.001
5	KLB+	0.20	0.60	1.10	0.001	0.001	13.60	6.50	3.10	0.001	0.001
6	UL−	10.50	5.40	3.60	< 0.001	< 0.001	0.40	1.00	1.90	< 0.001	0.005
7	UL+	0.70	1.10	2.10	0.001	0.001	12.50	6.90	5.30	0.001	0.001
8	OL−	1.10	2.40	3.20	0.001	0.001	15.40	11.80	9.40	0.001	0.001
9	OL+	11.50	7.60	6.20	< 0.001	< 0.001	0.50	1.90	3.20	< 0.001	< 0.001
10	TT−	14.30	7.30	5.80	< 0.001	<0.001	0.90	2.10	2.80	< 0.001	< 0.001
11	TT+	0.80	1.50	2.90	0.001	0.001	20.40	13.50	6.50	0.002	0.001
12	TS−	16.50	9.90	6.50	< 0.001	< 0.001	6.90	6.40	5.10	0.002	< 0.001
13	TS+	0.80	1.50	3.10	0.001	0.001	14.80	7.80	6.80	0.001	0.001
14	KNM−	0.70	1.50	2.40	0.001	0.001	16.50	12.10	5.40	0.001	0.001
15	KNM+	13.80	8.40	5.10	< 0.001	< 0.001	0.20	1.40	2.50	0.001	< 0.001
16	UK−	12.80	7.60	4.70	< 0.001	< 0.001	0.50	1.30	2.10	< 0.001	< 0.001
17	UK+	0.50	1.70	2.90	0.001	0.001	18.60	12.10	5.70	0.001	0.001

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An analysis of correlations between the results of five Sekita physical fitness tests and significant differences in the values of postural characteristics between measurement 2 and 3 and measurement 3 and 4 was also conducted, broken down by sex, and including pulling the container with a heteronymous hand. The difference between the measurements was given in absolute values so that negative differences would also indicate the size of the change. We took into account only those individuals who had been subjected to both physical fitness tests and body posture measurements, which significantly reduced the size of the examined group. For this reason, in some variables there are complete correlations (1.00 or −1.00), but for which statistical significance cannot be determined. They apply to groups of only 3 or 4 people. Statistically significant correlations at $p < 0.05$ are marked with *, statistically significant correlations at $p < 0.01$ are marked with **, and statistically significant correlations at $p < 0.001$ with ***.

When looking at the correlation of significant differences between measurement 2 and 3 using the right hand thrust to carry a container among boys, it turned out that the bigger endurance, the greater differences in the variable KLB +. In turn, considering the differences between measurement 3 and 4, we noticed that the greater endurance, the greater the difference in the variable KLB +. Overall physical fitness does not correlate with any significant difference in postural features. As far as the differences between measurement 2 and 3 in the left-hand thrust are concerned, we observed that the greater endurance, the greater difference in the variable KNM +. The bigger power, the smaller differences in the variables: KNT− and TT−. The greater the agility, the smaller the difference in the variable TT−, the greater overall physical fitness the smaller the difference in the variable TT−. Then, taking into account the differences between measurement 3 and 4, it was revealed that the bigger endurance, the smaller differences in variables KNM +. The greater strength, the smaller differences in variables: KLB+, UL− and TT−. The higher power, the smaller differences in variables TT− and UK+. Moreover, the greater agility the smaller the difference in variables KLB + and TT−. In turn, the greater the overall physical fitness the smaller differences in variables KLB + and TT− (Tab. 4, 5).

Analysis of correlations of significant differences in the values of postural features between measurement 2 and 3 using the right hand thrust to carry a container among girls, showed that the greater endurance and speed, the greater the difference in the variable TS +. Besides, the greater agility, the greater the difference in the variable KNM-. Overall physical fitness did not correlate with any significant difference in the values of postural features. The differences between measurement 3 and 4 did not correlate with overall fitness or any of its capabilities. With regard to girls and differences between measurement 2 and 3 when the left-hand thrust is applied, it turned out that the bigger endurance, the smaller differences in variable OL− and the greater differences in TS +. The greater strength, the greater the difference in variables OL + and UK−. The greater power, the greater differences in variables: KLB−, UL−, OL + and TT+. The greater agility, the greater difference in variables: KLB-, OL+, TT + and UL−. In turn, the greater overall physical fitness, the bigger difference in variables: KLB-, OL + and UK−. Analysis of correlations concerning differences between measurement 3 and 4 showed that the greater endurance, the greater the difference in KLB+ and KNM−.

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Tab. 4. Physical fitness and restitution correlations between measurement 2 and 3 and measurement 3 and 4 concerning postural features in the right-hand thrust among boys

No	Variable	Difference between measurement 2 and 3						Difference between measurement 3 and 4					
		WY	SZ	SI	MO	ZW	OG	WY	SZ	SI	MO	ZW	OG
1	DCK	0.11	0.16	0.20	−0.36	0.11	0.11	0.01	0.04	−0.03	0.16	−0.18	0.03
2	KNT−	0.41	0.35	0.42	−0.12	0.61	0.55	0.20	−0.09	−0.25	−0.42	−0.01	−0.21
3	KNT+	0.87	0.87	−0.50	0.00	0.00	0.00	−1.00	−0.50	0.00	−0.50	−0.50	−0.50
4	KLB−	0.50	1.00	−0.87	−0.50	−0.50	−0.50	0.50	1.00	−0.87	−0.50	−0.50	−0.50
5	KLB+	0.63*	0.33	0.54	−0.15	0.37	0.53	0.62*	0.12	0.08	−0.36	0.09	0.17
6	UL−	0.50	1.00	−0.87	−0.50	−0.50	−0.50	−0.50	0.50	−0.87	−1.00	−1.00	−1.00
7	UL+	0.29	0.55	0.19	−0.18	−0.08	0.17	−0.21	0.15	0.14	−0.26	0.33	0.09
8	OL−	0.17	−0.10	0.24	0.24	0.06	0.13	0.35	0.06	0.31	−0.10	0.48	0.33
9	OL+	1.00	0.50	0.00	0.50	0.50	0.50	−0.50	0.50	−0.87	−1.00	−1.00	−1.00
10	TT−	−0.50	0.50	−0.87	−1.00	−1.00	−1.00	1.00	0.50	0.00	0.50	0.50	0.50
11	TT+	−0.07	−0.21	−0.09	−0.17	0.15	−0.12	0.10	−0.31	−0.40	−0.54	0.12	−0.31
12	TS−	−0.50	0.50	−0.87	−1.00	−1.00	−1.00	−1.00	−0.50	0.00	−0.50	−0.50	−0.50
13	TS+	0.37	0.21	0.07	−0.39	0.45	0.17	−0.35	−0.45	−0.06	0.09	−0.10	−0.12
14	KNM−	−0.10	−0.19	−0.26	0.00	−0.07	−0.28	0.44	0.08	−0.06	0.28	−0.17	−0.01
15	KNM+	1.00	0.32	0.32	0.32	0.60	0.60	−1.00	−0.32	−0.32	−0.32	−0.60	−0.60
16	UK−	0.50	−0.50	0.87	1.00	1.00	1.00	−0.50	0.50	−0.87	−1.00	−1.00	−1.00
17	UK+	0.22	−0.07	−0.06	−0.21	0.27	0.02	−0.33	−0.38	−0.02	0.02	−0.09	−0.16

Tab. 5. Physical fitness and restitution correlations between measurement 2 and 3 and measurement 3 and 4 concerning postural features in the left-hand thrust among boys

No	Variable	Difference between measurement 2 and 3						Difference between measurement 3 and 4					
		WY	SZ	SI	MO	ZW	OG	WY	SZ	SI	MO	ZW	OG
1	DCK	0.11	0.30	0.25	−0.23	0.08	0.12	0.02	−0.08	0.16	0.20	0.12	−0.04
2	KNT−	−0.25	0.18	0.51	−0.91**	0.51	0.23	0.32	0.40	0.33	0.00	0.40	0.32
3	KNT+	−0.70	0.00	−0.16	−0.22	−0.40	−0.40	0.87	0.67	0.43	0.23	0.62	0.62
4	KLB−	0.05	−0.82	0.14	0.46	0.15	0.15	0.67	−0.10	0.08	0.23	0.36	0.36
5	KLB+	0.31	−0.16	−0.24	0.20	−0.49	−0.15	−0.41	−0.55	−0.93**	0.45	−0.98***	−0.84*
6	UL−	0.00	−0.30	0.37	0.34	0.20	0.20	−0.50	−0.30	−0.95*	−0.78	−0.80	−0.80
7	UL+	−0.41	−0.14	0.26	−0.35	0.49	0.11	−0.22	0.37	−0.23	−0.29	−0.13	−0.26
8	OL−	0.04	−0.02	−0.02	−0.59	0.00	−0.18	−0.06	−0.28	−0.69	0.62	−0.53	−0.55
9	OL+	0.30	0.50	0.11	−0.22	0.10	0.10	−0.50	−0.70	−0.11	0.22	−0.20	−0.20
10	TT−	−0.80	−0.10	−0.79	−0.89*	−0.90*	−0.90*	−0.70	−0.10	−0.95*	−0.894*	−0.90*	−0.90*
11	TT+	−0.31	0.22	0.41	−0.23	0.55	0.27	−0.39	−0.57	−0.22	−0.50	−0.17	−0.44
12	TS−	−0.10	−0.70	−0.11	0.34	0.00	0.00	−0.30	0.60	−0.26	−0.67	−0.40	−0.40
13	TS+	−0.67	−0.13	0.08	−0.44	0.04	−0.14	0.09	0.70	0.39	−0.59	0.46	0.29
14	KNM−	−0.13	−0.04	−0.34	0.07	−0.11	−0.36	−0.41	0.11	−0.26	−0.20	−0.15	−0.36
15	KNM+	0.90*	0.30	0.53	0.45	0.70	0.70	−0.90*	−0.70	−0.53	−0.34	−0.70	−0.70
16	UK−	0.80	0.60	0.32	0.11	0.50	0.50	0.21	−0.21	0.65	0.80	0.56	0.56
17	UK+	0.38	0.05	0.09	−0.13	0.31	0.07	−0.44	−0.25	−0.17	−0.757*	−0.10	−0.42

Additionally, the higher speed, the smaller difference in variable UK− and the greater in KLB−. The higher power, the greater differences in variables UL− and KNM+. The greater agility, the greater differences in variable UL−. In turn, the greater overall physical fitness, t

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Tab. 6. Physical fitness and restitution correlations between measurement 2 and 3 and measurement 3 and 4 concerning postural features in the right-hand thrust among girls

No	Variable	Difference between measurement 2 and 3						Difference between measurement 3 and 4					
		WY	SZ	SI	MO	ZW	OG	WY	SZ	SI	MO	ZW	OG
1	DCK	−0.18	0.19	0.02	−0.06	−0.20	−0.04	−0.04	0.03	−0.11	0.33	−0.27	−0.14
2	KNT−	0.25	0.13	0.18	−0.07	0.22	0.23	−0.46	−0.19	−0.06	0.04	−0.09	−0.18
3	KNT+	0.50	−0.50	0.87	1.00	1.00	1.00	0.50	1.00	−0.87	−0.50	−0.50	−0.50
4	KLB−	0.50	−0.50	0.87	1.00	1.00	1.00	0.50	−0.50	0.87	1.00	1.00	1.00
5	KLB+	0.44	0.40	0.53	−0.08	0.35	0.53	−0.58	−0.49	−0.35	0.25	−0.09	−0.38
6	UL−	0.50	−0.50	0.87	1.00	1.00	1.00	−0.50	0.50	−0.87	−1.00	−1.00	−1.00
7	UL+	0.20	0.09	−0.17	0.08	−0.15	0.03	−0.22	−0.44	−0.08	0.14	0.03	−0.15
8	OL−	−0.26	−0.03	0.30	0.03	0.13	0.12	−0.16	−0.06	−0.30	−0.10	−0.06	−0.26
9	OL+	0.50	−0.50	0.87	1.00	1.00	1.00	0.50	−0.50	0.87	1.00	1.00	1.00
10	TT−	0.50	−0.50	0.87	1.00	1.00	1.00	1.00	0.50	0.00	0.50	0.50	0.50
11	TT+	0.30	0.04	0.06	0.27	−0.26	−0.01	−0.24	−0.03	−0.20	−0.43	0.09	−0.22
12	TS−	−1.00	−0.50	0.00	−0.50	−0.50	−0.50	−1.00	−0.50	0.00	−0.50	−0.50	−0.50
13	TS+	0.61*	0.66*	0.03	−0.26	−0.20	0.11	0.17	0.23	0.42	0.15	0.38	0.46
14	KNM−	0.29	0.36	0.31	−0.01	0.70*	0.48	−0.30	−0.21	−0.35	−0.28	−0.36	−0.41
15	KNM+	0.80	0.63	0.63	−0.21	0.80	0.80	0.60	0.11	0.95	0.11	1.00	1.00
16	UK−	0.50	−0.50	0.87	1.00	1.00	1.00	0.50	−0.50	0.87	1.00	1.00	1.00
17	UK+	0.21	0.33	−0.03	−0.26	0.14	−0.06	−0.50	−0.18	−0.05	−0.01	−0.09	−0.18

Tab. 7. Physical fitness and restitution correlations between measurement 2 and 3 and measurement 3 and 4 concerning postural features in the left-hand thrust among girls

No	Variable	Difference between measurement 2 and 3						Difference between measurement 3 and 4					
		WY	SZ	SI	MO	ZW	OG	WY	SZ	SI	MO	ZW	OG
1	DCK	−0.09	0.41	−0.21	−0.19	−0.21	−0.20	0.09	−0.50	0.19	0.50	−0.06	0.06
2	KNT−	0.33	−0.09	−0.04	−0.09	−0.28	−0.02	−0.29	0.20	0.01	0.02	0.24	−0.02
3	KNT+	−0.45	−0.45	0.00	0.00	−0.22	−0.22	0.11	−0.22	0.65	0.63	0.45	0.45
4	KLB−	0.70	0.10	0.95	0.89*	0.90*	0.90*	0.30	0.90*	0.11	−0.34	0.10	0.10
5	KLB+	0.38	−0.04	0.26	−0.32	0.16	0.23	0.78*	0.25	0.39	0.44	0.49	0.54
6	UL−	0.40	−0.30	0.79	0.89*	0.70	0.70	0.80	0.10	0.79	0.89*	0.90*	0.90*
7	UL+	0.51	−0.23	0.19	0.66	0.26	0.32	0.59	0.35	−0.02	0.06	−0.22	0.09
8	OL−	−0.78*	−0.32	−0.02	−0.62	−0.02	−0.29	0.67	0.14	0.23	0.28	0.26	0.39
9	OL+	0.70	0.10	0.95*	0.89*	0.90*	0.90*	0.20	0.40	0.74	0.45	0.50	0.50
10	TT−	0.05	−0.87	0.16	0.57	0.21	0.21	−0.10	0.00	0.58	0.45	0.30	0.30
11	TT+	0.29	−0.31	−0.51	0.77*	−0.55	−0.32	0.34	0.75	0.54	−0.26	0.29	0.60
12	TS−	0.40	1.00	0.32	−0.11	0.30	0.30	−0.05	−0.67	−0.43	0.00	−0.21	−0.21
13	TS+	0.85*	0.23	0.30	0.26	0.33	0.46	0.00	−0.54	−0.24	0.53	−0.40	−0.14
14	KNM−	−0.22	−0.33	0.28	−0.43	0.22	0.09	0.76*	−0.02	−0.06	0.59	−0.20	0.18
15	KNM+	0.10	−0.70	0.21	0.45	0.20	0.20	0.40	−0.30	0.79	0.89*	0.70	0.70
16	UK−	0.70	0.50	0.95*	0.78	0.90*	0.90*	−0.70	−0.90*	−0.53	−0.22	−0.60	−0.60
17	UK+	−0.02	−0.32	−0.23	0.29	−0.02	−0.14	0.42	0.01	−0.03	0.29	−0.32	0.09

he greater difference in UL− (Tab. 6, 7).

Discussion

The literature review has not shown any inquiries into the restitution of significantly changed body posture features under the influence of load connected with the carriage of school supplies using the right or left hand thrust by a 7-year-

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old pupil. It should be strongly emphasized that the carriage methods adopted in the studies do not cause the same changes in body posture. The authors referred to in the introduction focused more on exploring the consequences of loading with the weight of school supplies carried on one of the shoulders, back or on the effects of different weight of school items only. The research undertaken, as it should be supposed, is the first attempt to determine the restitution of static body posture disorders, an attempt to pay attention not only to the consequences of asymmetrical loading, but also to the time of return to individual stability.

Conclusions

1. After removing the load, statistically significant restitution occurred after the first and second minute. Restitution was incomplete.
2. In right-hand carriage by boys, endurance significantly correlated with restitution, and among girls it was additionally speed and agility. As regards girls, physical fitness revealed more frequent relationships with restitution.
3. In left-hand carriage by boys, after the first minute, restitution correlated with strength, power, agility and overall physical fitness, and after two minutes, additionally with strength, while among girls with strength, power, and endurance. After two minutes, restitution correlated with speed and agility in addition to the abovementioned postural features. As far as girls are concerned, physical fitness more often correlated with restitution.
4. Due to incomplete restitution after one and two minutes, asymmetrical carriage is not recommended to children aged 7 years. Physical fitness demonstrated by children does not lead to full restitution of the examined postural features, which suggests its low level and immature correctional and

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