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Studia Kinanthropologica, vědecký časopis pro kinantropologii. Vydává Jihočeská univerzita v Českých Budějovicích, Pedagogická fakulta, katedra tělesné výchovy a sportu. **Od roku 2019 vychází třikrát ročně**. Příspěvky jsou přijímány průběžně. Katedra tělesné výchovy a sportu začala vydávat odborné periodikum již v roce 1996, které od roku 2000 nese název Studia Kinanthropologica a splňuje požadavky na recenzovaný časopis. **V roce 2010 Rada pro výzkum, vývoj a inovace zařadila Studia Kinanthropologica na Seznam recenzovaných neimpaktovaných periodik vydávaných v České republice**, které uvedla v oborech Národního referenčního rámce excelence (NRRE). Časopis je nadále uveden i v aktualizovaném Seznamu recenzovaných neimpaktovaných periodik vydávaných v ČR v roce 2014. Časopis Studia Kinanthropologica je indexován v databázi Medvik – Bibliographia medica Čechoslovaca (BMČ), Národní lékařské knihovny Praha. **Dne 29. dubna 2016 byl zařazen do databáze ERIH PLUS** (European Reference Index for the Humanities and the Social Sciences).

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Zaměření časopisu:

Sportovní trénink	Humanitní vědy ve sportu
Aplikované pohybové aktivity	Fyzioterapie
Biomechanika	Behaviorální aspekty sportu
Zdravotní aspekty TVS	Dýchání ve sportu
Pedagogika TVS	Psychologie TVS

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Scientific Journal for Kinanthropology is mainly a place for publishing reports of empirical studies, review articles, or theoretical articles. Articles are published in Czech, Slovak, and/or English language. The author (senior author) is responsible for special and formal part of the article. All texts are subject to review process and assessed by at least two expert referees. The review procedure is authorless. Board of editors decide about article´s publishing having regard to scientific importance and review process. For content and linguistic correctness is responsible author, authors of individual contributions.

Aims and Scope:

Sports training	Humanities in Sport
Applied physical activities	Physiotherapy
Biomechanics	Behavioural aspects of sport
Health aspects of physical education and sport	Breathing in Sport
Sport pedagogy	Sport psychology

Obsah

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VPLYV SILOVO-VYTRVALOSTNÉHO TRÉNINGU NA ZMENY V SKÓRE FUNKČNEJ POHYBOVEJ DIAGNOSTIKY U TRIATLONISTOV

THE INFLUENCE OF STRENGTH-CONDITIONING TRAINING ON CHANGES IN THE FUNCTIONAL MOVEMENT SCREEN SCORE OF TRIATHLETES

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Abstract

The rivalry of triathletes and the effort to push their performance limits forces them to think through their entire preparation in detail, to use time efficiently, to prepare their bodies not only for maximum performance, but also to analyse the occurrence of possible injuries. For this reason, it is necessary to include triathlon diagnostics in the training process which serves as feedback for the triathlete and the coach on how they train and at what performance level they are.

Based on this knowledge, the study verifies the impact of strength-endurance training on score changes of Functional Movement Screen of triathletes.

The research included 8 performance triathletes from TRIAN ŠK UMB triathlon club Banská Bystrica whose age was 17.26 ± 0.59 years with a body height of 175.8 ± 7.4 cm and a body weight of 63.2 ± 5.8 kg. To obtain information about the triathletes, the Functional Movement Screen (FMS) was used and was performed without warm up, so that the obtained values were not affected. 3 external examiners who are certified experts in Functional Movement Screen were included to ensure the testing objectivity. Data recording was done manually and registered into the Functional Movement Screen Score Sheet. Input and output testing took place in the morning hours under the same conditions. The training program ran for 8 weeks in the preparatory period from 16/01/2024 to 07/03/2024 and was implemented 2 times a week.

When comparing the input and output data, the experimental group recorded a significant improvement in the average point score of the triathletes from 12.25 ± 2.17 points to 15.75 ± 1.92 points which represents an improvement in the FMS score by 28.6%. The control group also registered an average improvement from 12.25 ± 1.92 to 13 ± 1.22 points which represents an improvement of 6.1%.

The results show that a strength-endurance training program will have a higher effect on changes in Functional Movement Screen scores in triathletes than a uniform training method. Due to lower number of the triathletes the further and wider investigation of the issue is recommended.

Keywords: functional movement screen; circuit training; preparatory period; triathlon

Súhrn

Rivalita triatlonistov a snaha posúvať svoje hranice výkonnosti ich núti premyslieť celú svoju prípravu do detailov, aby využívali čas efektívne, pripravili svoje telo nielen na maximálny výkon, ale aj analyzovali výskyt možných zranení. Z daného dôvodu je preto nutné zaradiť diagnostiku v triatlone do tréningového procesu, ktorá slúži pre triatlonistu a trénera ako spätná väzba toho, ako trénujú a na akej výkonnostnej úrovni sú.

Na základe týchto poznatkov sme sa rozhodli verifikovať vplyv silovo-vytrvalostného tréningu na zmeny v skóre funkčnej pohybovej diagnostiky u triatlonistov.

Vo výskume bolo zahrnutých 8 výkonnostných triatlonistov z triatlonového klubu TRIAN ŠK UMB Banská Bystrica, ktorých vek bol 17,26 ± 0,59 rokov s telesnou výškou 175,8 ± 7,4 cm a telesnou hmotnosťou 63,2 ± 5,8 kg. Na získanie informácií o triatlonistoch sme použili funkčnú pohybovú

diagnostiku (Functional movement screen – FMS), ktorú vykonávali bez rozohriatia a rozcvičenia, aby neboli ovplyvnené nadobudnuté hodnoty. Na zabezpečenie objektivity testovania boli oslovení 3 externí examinátori, ktorí sú certifikovaní odborníci funkčnej pohybovej diagnostiky. Zaznamenávanie údajov sme vykonali ručne a boli zapísané do „Functional Movement Screen Score Sheet“. Vstupné a výstupné testovanie prebiehalo v doobedných hodinách za tých istých podmienok. Tréningový program prebiehal 8 týždňov v prípravnom období od 16. 01. 2024 do 07. 03. 2024 a realizovali sme ho 2-krát v týždni.

Pri porovnaní vstupných a výstupných údajov zaznamenal experimentálny súbor výraznejšie zlepšenie priemeru bodového skóre triatlonistov z 12,25 ± 2,17 bodov na 15,75 ± 1,92 bodov, čo predstavuje zlepšenie FMS skóre o 28,6 %, pričom kontrolný súbor zaregistroval taktiež priemerné zlepšenie, a to z 12,25 ± 1,92 na 13 ± 1,22 bodov, čo predstavuje zlepšenie o 6,1 %.

Z výsledkov vyplýva, že silovo-vytrvalostný tréningový program bude mať vyšší efekt na zmeny v skóre funkčnej pohybovej diagnostike u triatlonistov ako metóda rovnomerného tréningu. Z hľadiska nižšieho počtu probandov, odporúčame širšie skúmanie danej problematiky.

Kľúčové slová: funkčná pohybová diagnostika; kruhový tréning; prípravné obdobie; triatlon

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Úvod

Triatlon je synonymom vytrvalostného viacboja, počas ktorého vykonávame 3 športové disciplíny (plávanie, cyklistika a beh), ktoré nasledujú bezprostredne po sebe a poradie sa nemôže meniť (O′Toole, Douglas & Hiller, 1989).

Vzhľadom na náročnosť vytrvalostných športov je úlohou každého trénera nájsť ten správny vzorec, aby športovci boli rýchlejší, silnejší a hlavne vytrvalejší a nadobudnuté schopnosti preniesli zo športového tréningu priamo do súťaže (Boyle, 2017).

Aby sme mohli začať riešiť a hodnotiť štruktúru športového výkonu vo vytrvalostnom športe, je nutné stanoviť si hlavné aspekty, ktoré sú primárne zastúpené (v našom prípade v triatlone) na základe čoho ich rozvíjame v nasledujúcich tréningových cykloch (Kampmiller et al., 2012). K rozvoju jednotlivých aspektov je potrebné získať informácie z diagnostiky, ktorá nám poskytne ucelený obraz o aktuálnom stave trénovanosti jednotlivých triatlonistov (Suchý & Bunc, 2012).

Diagnostika je v triatlone nevyhnutnou súčasťou tréningového procesu. Testy sú pre triatlonistu a trénera spätnou väzbou toho, ako trénujú a na akej výkonnostnej úrovni sú (Formánek, 2003). K veľkému množstvu testov a metód funkčnej záťažovej diagnostiky je potrebné zvoliť testy s čo najväčšou špecifickou výpovednou hodnotou pre triatlonistu. Taktiež je potrebné zvoliť správne obdobie a zabezpečiť totožné podmienky (Formánek, 2003). Triatlonisti potrebujú dobre rozvinutú rovnováhu, stabilitu telesného jadra (core) a neuromuskulárnu kontrolu na bezpečné a efektívne vykonávanie potrebných pohybov v troch disciplínach športu, ktorú môžeme otestovať funkčnou pohybovou diagnostikou – FMS (García-Jaén et al., 2018).

Dnešní športovci tvrdšie pracujú na tom, aby sa stali silnejšími a zdravšími tým, že pracujú na zlepšení svojej flexibility, sily a vytrvalosti. Autori Cook et al. (2014a) sú presvedčení, že mnohí športovci a jednotlivci vykonávajú pohybové činnosti na vysokej úrovni napriek tomu, že sú neefektívne v ich základných pohybových vzoroch bez toho, aby o tom vedeli, a tak sa títo športovci pokúšajú pridať kondíciu k dysfunkcii. Mnohí športovci trénujú okolo už existujúceho problému alebo jednoducho ignorujú svoje slabé stránky počas silovej a kondičnej prípravy. Na dnešnom rozvíjajúcom sa trhu v oblasti športu a rehabilitácie majú tréneri a zdravotníci prístup k veľkému množstvu vybavenia a cvičebných programov. Aj tie najlepšie tréningové programy však nemôžu zlepšiť kondíciu a zdravotný stav, ak sa neodhalia základné slabiny (Cook et al., 2014b). Keď sa neposilnia slabé pohybové vzorce, ktoré môžu ovplyvniť efektivitu pohybu, tak by to mohlo viesť k zlej biomechanike a v konečnom dôsledku zvýšiť potenciál mikro alebo makrotraumatického poranenia.

Funkčná pohybová diagnostika (FMS) sa skladá zo siedmich základných pohybových vzorov (testov), ktoré vyžadujú rovnováhu mobility a stability (vrátane neuromuskulárnej/motorickej kontroly). Medzi testy zaraďujeme hlboký drep, prekážkový krok, in-line výpad, pohyblivosť ramien, aktívne prednoženie rovných nôh, stabilita trupu pri kľuku a rotačná stabilita. Testy umiestňujú športovca do pozícií, kde sa prejavia slabiny a nerovnováha, ak sa nevyužije primeraná stabilita a pohyblivosť (Cook et al., 2014a).

Na zlepšenie jednotlivých testov boli navrhnuté korekčné cvičenia, ktoré umožnia zvýšiť bodové skóre FMS (Cook, 2013). Vanderka (2016) však poukazuje svojim výskumom aj na to, že na zlepšenie bodového skóre vo funkčnej pohybovej diagnostike nemusíme používať len korekčné cvičenia navrhnuté Gray Cookom, ale k cieľu sa dokážeme dopracovať aj inou cestou, čo bolo v jeho prípade využitie silového tréningu, ktoré zlepšilo bodové skóre v FMS. Zaradenie silovej prípravy môže pozitívne ovplyvniť celú prípravu triatlonistu z hľadiska zlepšenia ekonomiky behu, zníženiu rizika a množstva zranení a prispieť k navýšeniu športového výkonu (Brűnn et al., 2018; Collins et al., 1989; Beckinsale, 2016; Červený & Mihálik, 2023).

Na základe vyššie uvedených poznatkov, sme sa rozhodli stanoviť si cieľ a to, či vplyvom silovo-vytrvalostného tréningu dokážeme pozitívne ovplyvniť zmeny v skóre funkčnej pohybovej diagnostiky u triatlonistov. Prezentované výsledky tvoria časť výskumu, ktorý bol realizovaný a následne publikovaný v rámci úspešnej obhajoby dizertačnej práce (Bako, 2024).

Metodika

Náš výskumný súbor pozostával z 8 triatlonistov z triatlonového klubu TRIAN ŠK UMB so sídlom v Banskej Bystrici, ktorých vek bol 17,26 ± 0,59 rokov. Triatlonisti sú na výkonnostnej úrovni (2 reprezentanti, zvyšní sa umiestnili na MSR v triatlone, duatlone a akvatlone do 6. miesta), ktorí reprezentujú klub na národnej a medzinárodnej úrovni. Probandi boli rozdelení na 4-členný experimentálny a 4-členný kontrolný súbor, pričom podľa Shapiro-Wilkovho testu sa neporušila normalita rozdelenia. Všetci triatlonisti pred začiatkom výskumu dobrovoľne podpísali informovaný súhlas o konaní výskumu, ktorý bol spojený s dizertačnou prácou. Náš výskumný projekt bol posúdený z etického hľadiska Etickou komisiou Univerzity Mateja Bela v Banskej Bystrici, ktorá ho schválila a je evidovaný pod číslom 1079/2024.

Na získanie údajov sme využili vo výskume metódu testovania a to diagnostický test – funkčnú pohybovú diagnostiku (Functional Movement Screen) – FMS. Vstupná funkčná pohybová diagnostika (FMS) bola vykonávaná v doobedných hodinách od 09:00 v dňoch od 10. 01. 2024 do 12. 01. 2024. Testovanie FMS prebiehalo bez rozohriatia a rozcvičenia, aby neboli ovplyvnené nadobudnuté hodnoty probandov. S cieľom zabezpečiť objektivitu testovania (keďže v teste sa využíva škálové hodnotenie) sme oslovili 3 externých examinátorov, ktorí disponujú odbornou certifikáciou funkčnej pohybovej diagnostiky. Zaznamenávanie údajov sme vykonali ručne a boli zapísané do „Functional Movement Screen Score Sheet“.

Táto diagnostika pozostáva zo siedmych pohybových vzorov, pričom každý z týchto pohybových vzorov je hodnotený na škále 0 až 3 body. Medzi testy zaraďujeme hlboký drep, prekážkový krok, inline výpad, pohyblivosť ramien, aktívne prednoženie rovných nôh, stabilita trupu pri kľuku a rotačná stabilita. Taktiež sa hodnotí celkové bodové skóre a súčasne aj funkcia jednotlivých segmentov tela (Cook, 2003):

0 – pohyb je bolestivý, odporúča sa spolupráca s lekárom
1 – neschopnosť vykonať pohybový vzor
2 – schopnosť predviesť pohybový vzor, ale s malou kompenzáciou
3 – úplná schopnosť predviesť správne pohybový vzor

Výstupné testovanie funkčnej pohybovej diagnostiky prebiehalo po silovo-vytrvalostnom tréningovom programe a to v dňoch 13. 03. 2024 – 15. 03. 2024 za tých istých podmienok.

Silovo-vytrvalostný tréningový program bol zaradený v prípravnom období od 16. 01. – 07.03. 2024, čo predstavuje 8 týždňov. Úlohou silovo-vytrvalostného tréningového programu formou kruhového tréningu bolo verifikovať účinnosť tréningového programu v porovnaní s kontrolným tréningovým programom vykonávaným metódou rovnomerného tréningu a zistiť, ktorá metóda je prínosnejšia z hľadiska zmien v skóre funkčnej pohybovej diagnostiky (FMS). Daný podnet bol aplikovaný v tréningovom programe výskumného súboru 2-krát v týždni v utorok od 08:45 a štvrtok od 14:45, v ktorom tréningová jednotka experimentálneho súboru predstavovala približne 1 h a 5 min a pri kontrolnom súbore to bolo 1 h a 25 min. Kruhový tréning pozostával z 12-tich cvičení, ktoré boli rozdelené do dvoch tréningových jednotiek po 6 cvičení. Počas týchto cvičení probandi precvičovali celé telo. Medzi 12 cvičení, ktoré sme si zvolili patrí drep s činkou na chrbte alebo pohárový drep s kettlebellom, mŕtvy chrobák „dead-bug“, jednonožný rumunský mŕtvy ťah, príťahy na hrazde podhmatom, výpony v sede,

jednoručný tlak nad hlavu v kľaku vo výpade, mŕtvy ťah, pallof press v stoji, jednonožný drep vo výpade s vyloženou nohou na vyvýšenej ploche (bulharský drep), tlaky na vodorovnej lavičke, výpony v stoji, jednoručný príťah v kľaku vo výpade. Každé cvičenie bolo vykonávané pri intervale 30 s zaťaženie a 30 s odpočinok. Doba zaťaženia sa každý týždeň navyšovala o 5 sekúnd, pričom v 4. týždni to predstavovalo 45 s zaťaženie a 30 s odpočinok. Nasledujúce 4 týždne sme celý cyklus zopakovali, ale pri vyššom odpore. Po celom okruhu cvičení nasledoval odpočinok 2 min. Daný kruhový tréning sme každú tréningovú jednotku zopakovali 3-krát. Intenzita a interval cvičení boli stanovené podľa Feč a Feč (2013) a Formánek (2003) a to na úrovni 45 až 55 % z 1 RM. Odpor cvičení bol stanovený na základe viacrazového maxima (6 RM) z ktorého môžeme vychádzať pri tvorbe tréningových programov pri cvičeniach ako mŕtvy ťah, drep, tlaky na vodorovnej lavičke a príťahy na hrazde podhmatom (Vanderka, 2016; Klion et al., 2015; Stoppani, 2008). Cvičenia v kruhovom tréningu boli zvolené na základe štúdií a poznatkov autorov Klion et al. (2015), Hung et al. (2019), Boyle (2016), Bohm et al. (2021), Current (2021), Feč a Feč (2013), Mullane, Turner a Bishop (2021), Stephens et al. (2021) a Stoppani (2008), ktorí hovoria o pozitívnom prínose a význame zaradenie cvičení do silovej prípravy, ktorá pozitívne dokáže ovplyvniť výkon v jednotlivých disciplínach triatlonu. Protokol nebol v tomto znení v žiadnej štúdií použitý, preto je tento podnet svojim vzorom originálny.

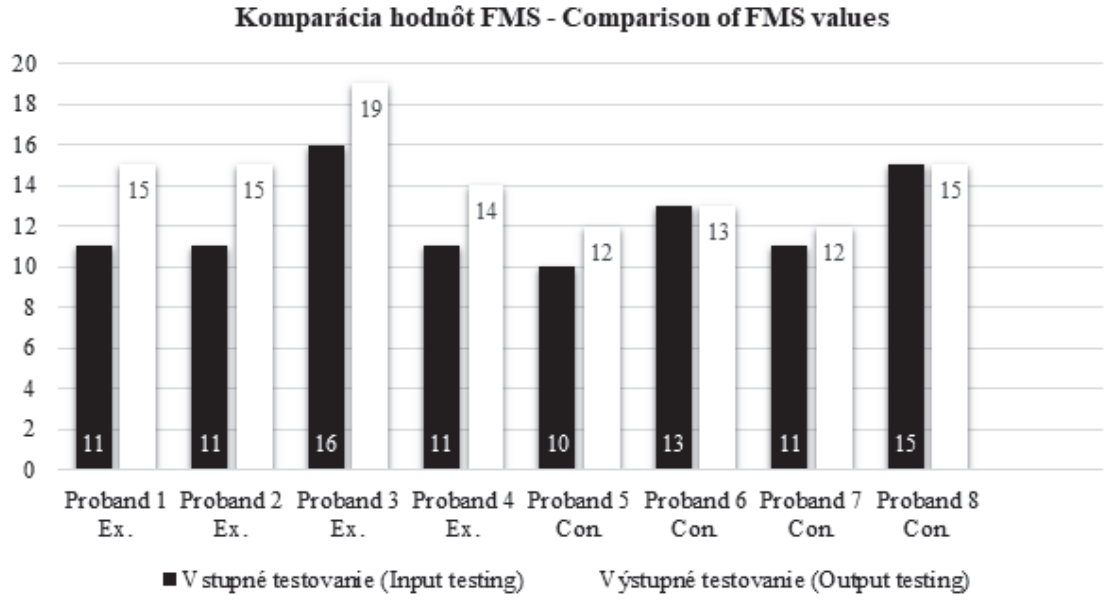
Kontrolný súbor využíval metódu rovnomerného tréningu v behu s dobou trvania 60 min, pričom intenzita behu bola pod úrovňou ANP, ktorá bola stanovená na základe laktátovej krivky. Pred hlavnou časťou bola vykonávaná myofasciálna masáž celého tela, aktivácia stredu tela, aktivácia sedacích svalov a dynamický strečing na vrchnú a dolnú časť tela. Po hlavnej časti probandi vykonali výklus v dobe zaťaženia 10 min.

Pre interpretáciu výsledkov jednotlivých skupín sme použili okrem bodových zmien aj percentuálne zmeny a taktiež sme počítali aj vecnú významnosť. Rozpätie hodnôt vecnej významnosti môžeme podľa Soukupa (2013) slovne označiť a to od 0,2 do 0,5 ako malý efekt, od 0,5 do 0,8 ako stredný efekt a od 0,8 a vyššie môžeme hovoriť o veľkom efekte.

Výsledky

V nasledujúcich obrázkoch znázorníme a zhrnieme výsledky nášho výskumu, vykonávaného na 8 výkonnostných triatlonistov vo veku 17,26 ± 0,59 rokov z klubu TRIAN ŠK UMB Banská Bystrica.

Obrázok 1./ Figure 1.
Intraindividuálna komparácia vstupných a výstupných hodnôt FMS experimentálneho a kontrolného súboru./ Intra-individual comparison of FMS input and output values of the experimental and control group.



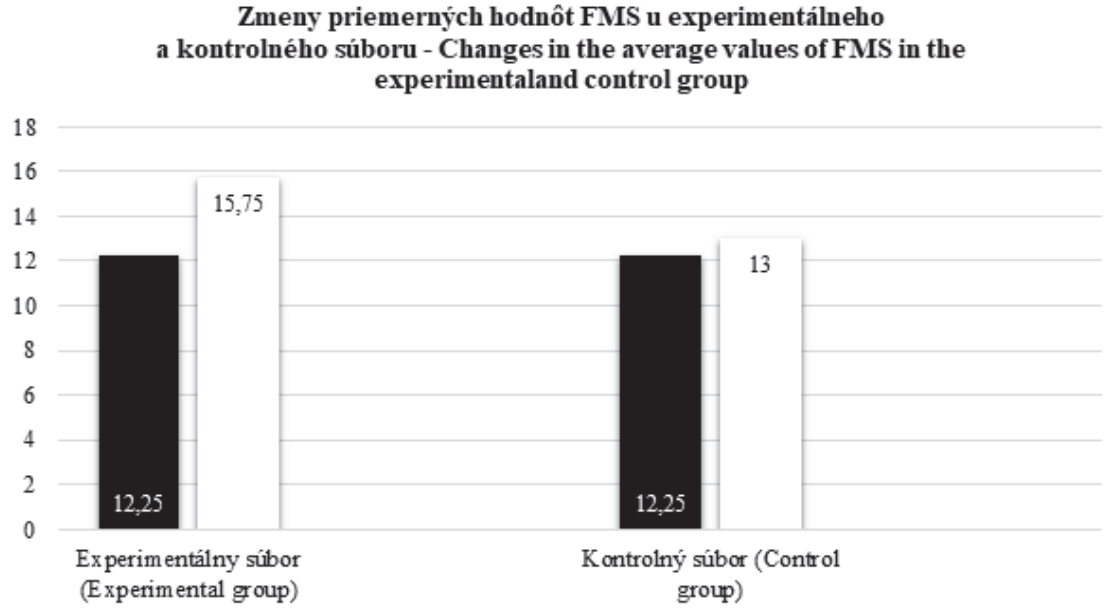
Na obrázku 1 porovnávame individuálne nadobudnuté hodnoty z FMS testov 8 probandov, ktoré boli vykonané v dňoch 10. 01. 2024 – 12. 01. 2024 a následne zopakované testovanie po 8-týždňovom tréningovom programe v dňoch 13. 03. 2024 – 15. 03. 2024. Probandi 1 až 4 predstavovali experimentálny súbor, zatiaľ čo probandi 5 až 8 tvorili kontrolný súbor.

U všetkých probandov experimentálneho súboru nastalo priemerné zlepšenie, a to o 3,5 ± 0,5 bodov, zatiaľ čo priemerné zlepšenie probandov kontrolného súboru bolo o 0,75 ± 0,80 bodov.

Tabuľka 1./ Table 1.
Individuálne zmeny probandov v jednotlivých testoch FMS diagnostiky./ Individual changes of probands in individual FMS diagnostic tests.

	Zlepšenie v testoch FMS – Improvement in FMS tests
Proband 1	In-line výpad, prekážkový krok, rotačná stabilita, stabilita trupu pri kľuku – In-line lunge, hurdle step, rotary stability, trunk stability push up
Proband 2	In-line výpad, prekážkový krok, aktívne prednoženie nôh, hlboký drep – In-line lunge, hurdle step, active straight leg raise, deep squat
Proband 3	In-line výpad, rotačná stabilita, hlboký drep – In-line lunge, rotary stability, deep squat
Proband 4	In-line výpad, aktívne prednoženie nôh, pohyblivosť ramien – In-line lunge, active straight leg raise, shoulder mobility
Proband 5	Aktívne prednoženie nôh, stabilita trupu pri kľuku – Active straight leg raise, trunk stability push up
Proband 6	-
Proband 7	Aktívne prednoženie nôh – Active straight leg raise
Proband 8	-

Obrázok 2./ Figure 2.
Komparácia zmien priemerných hodnôt funkčnej pohybovej diagnostiky u experimentálneho a kontrolného súboru./ Comparison of changes in the average values of functional movement screen in the experimental and control group.



U všetkých probandov experimentálneho súboru nastalo zlepšenie v in-line výpade o 1 bod. Probandi 1 a 2 zaznamenali taktiež totožné zlepšenie pri prekážkovom kroku. Zlepšenie v rotačnej stabilite zaznamenali probandi 1 a 3. Proband 1 okrem vyššie spomenutých zlepšení, zaznamenal zlepšenie ešte

pri teste stabilita trupu pri kľuku. Proband 2 taktiež okrem vyššie spomenutého zlepšenia, v testoch zaregistroval pozitívnu zmenu aj pri teste aktívne prednoženie rovných nôh a pri hlbokom drepe. Proband 3 s najvyšším 19 bodovým hodnotením, sa okrem vyššie spomenutých výsledkov testov zlepšil aj v hlbokom drepe. Zlepšenie z 11 bodov na 14 zaznamenal proband 4. V jeho prípade došlo okrem zlepšenia v teste in-line výpade aj k zlepšeniu pri aktívnom prednožení rovných nôh a pohyblivosti ramien.

V kontrolnom súbore u probandov 5 a 7 nastalo zlepšenie, zatiaľ čo u probandov 6 a 8 nedošlo k žiadnej zmene. Z pohľadu testov nastalo u probandov 5 a 7 zlepšeniu pri aktívnom prednožení vystretých nôh o 1 bod. Proband 5 však dosiahol zlepšenie aj pri teste stabilita trupu pri kľuku o 1 bod. Probandi 6 a 8 nezaznamenali ani pri jednom teste zlepšenie alebo zhoršenie, čo by spôsobilo rozdielne bodovanie pri jednotlivých testoch, aj keď by bol súčet bodov rovnaký.

Obrázok 2 porovnáva zmeny hodnôt funkčnej pohybovej diagnostiky experimentálneho a kontrolného súboru. Pri porovnaní priemerných hodnôt experimentálneho súboru z vstupného testovania bolo bodové skóre pri výstupnom testovaní navýšené z 12,25 ± 2,17 bodov na 15,75 ± 1,92 bodov.

Priemerné hodnoty kontrolného súboru pri vstupnom testovaní sa z 12,25 ± 1,92 bodov sa zmenili pri výstupnom testovaní, a to na 13 ± 1,22 bodov.

Z percentuálneho hľadiska môžeme hovoriť o zlepšení vo výkone FMS u experimentálneho súboru o 28,6 %, zatiaľ čo kontrolný súbor zaznamenal zlepšenie o 6,1 %.

Z pohľadu vecnej významnosti sme zaznamenali v experimentálnom súbore pri FMS veľmi veľký efekt (d = 1,7), zatiaľ čo kontrolný súbor zaznamenal malý efekt (d = 0,47).

Diskusia

Z nadobudnutých výsledkov môžeme zhodnotiť, že významné zmeny z hľadiska zlepšenia bodového skóre funkčnej pohybovej diagnostiky nastalo u probandov v experimentálnom súbore, a tak metódu hodnotíme pozitívne.

Zaradenie silovej prípravy môže v konečnom dôsledku kladne ovplyvniť celú prípravu triatlonistu ako zníženie rizika zranení a množstva zranení v behu podľa tvrdení autorov Brűnn et al., 2018, Collins et al. (1989), Beckinsale (2016), Červený a Mihálik (2023). Hotta et al. (2015) poukazuje vo svojej štúdií aj na to, že celkové skóre FMS má nízku predvídateľnosť pri zraneniach behu, ale táto štúdia zároveň zistila, že skóre pre hlboký drep a aktívne prednoženie v ľahu sa javí ako účinnejšia metóda oproti celkovému skóre FMS na analýzu rizika bežeckých zranení. Pri porovnaní tejto informácie s našim experimentálnym súborom nastalo zlepšenie v teste hlboký drep o 1 bod u probandov 2 a 3 a taktiež zlepšenie o 1 bod pri aktívnom prednožení v ľahu sa zlepšil proband 2 a proband 4. U všetkých probandov experimentálneho súboru nastalo zlepšenie v in-line výpade o 1 bod. Dôvodom tohto zlepšenia podľa Cooka et al. (2014a) je zvýšená pohyblivosť členkového kĺbu, bedrového kĺbu a zlepšenie stability kolena pri kontrolovanej abdukcii s uzavretým kinetickým reťazcom. Probandi 5 a 7 v kontrolnom súbore zaznamenali zlepšenie iba pri jednom teste a to aktívne prednoženie v ľahu.

Vanderka (2016) poukazuje vo svojej štúdií aj na to, že na zlepšenie bodového skóre vo funkčnej pohybovej diagnostike nemusíme používať len korekčné cvičenia navrhnuté Gray Cookom, ale k cieľu sa dokážeme dopracovať aj inou cestou, akou v našom prípade bola forma kruhového tréningu.

Táto štúdia nám ukázala, že existuje aj iná možnosť ako dosiahnuť výraznejšie zmeny v skóre funkčnej pohybovej diagnostiky, čo z hľadiska vedy hodnotíme pozitívne. Dosiahnutie pozitívneho výsledku nie je možné prisudzovať opakovateľnosti testu, keďže probandi dané testy vykonávali iba na začiatku a po ukončení intervencie a taktiež nevedeli čo konkrétne sledujeme pri jednotlivých testoch. Limitom výskumu je početnosť probandov, a tak pre zovšeobecnenie výsledkov odporúčame širšie skúmanie danej problematiky.

Záver

Cieľom výskumu bolo verifikovať vplyv silovo-vytrvalostného tréningu na zmeny v skóre funkčnej pohybovej diagnostiky u triatlonistov. Výskum predstavoval kazuistiku 8 výkonnostných triatlonistov z klubu TRIAN ŠK UMB Banská Bystrica. Po 8-týždňovom intervenčnom programe zaznamenali triatlonisti v experimentálnom súbore priemerné zlepšenie v bodovom skóre funkčnej pohybovej diagnostiky o 3,5 ± 0,5 bodov (d = 1,7), zatiaľ čo v kontrolnom súbore nastali priemerné zmeny o 0,75 ± 0,80 bodov (d = 0,47).

V závere príspevku by sme sa chceli poďakovať celému klubu TRIAN ŠK UMB a Fakulte telesnej výchovy, športu a zdravia pretože bez ich pomoci by nevznikol tento príspevok, ktorý je súčasťou dizertačnej práce a taktiež by sme neboli schopní prispieť novými poznatkami v tejto oblasti.

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TEACHING BASKETBALL FROM THE PERSPECTIVE OF MEN AND WOMEN PHYSICAL AND SPORT EDUCATION TEACHERS IN UPPER PRIMARY SCHOOLS IN EASTERN SLOVAKIA

VYUČOVANIE BASKETBALU V NÁZOROCH UČITEĽOV A UČITELIEK TELESNEJ A ŠPORTOVEJ VÝCHOVY NA 2. STUPNI ZÁKLADNÝCH ŠKÔL NA VÝCHODNOM SLOVENSKU

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Abstract

The authors of the study used a questionnaire to find out whether there are significant differences in teachers' views on teaching basketball from a point of view of gender differences. The sample consisted of 450 physical and sport education teachers (274 men and 176 women) who teach in 17 districts in eastern Slovakia, in upper primary schools. Significant differences at the $p<0.01$ level were found in the popularity of teaching basketball. While for 20.45% of women, basketball is the second most popular taught sport after volleyball (39.77%), for 13.14% of men, basketball is the fourth most popular taught sport after football (40.51%), volleyball (21.90%), and floorball (19.71%). Despite significant differences ($p<0.01$), more than 54% of men and 48% of women teach basketball most often for 6-10 hours within a single thematic unit. A negative finding is that 3.28% of men and 11.36% of women do not teach basketball. Game-oriented didactic approach dominates in teaching for both genders (54.72% of men and 55.77% of women). According to 32.85% of men and 40.91% of women, the main disadvantage of teaching basketball is the low interest of pupils in learning the sport. The second most frequently chosen shortcoming of basketball teaching was the low time allocation of the subject (29.59% of men and 28.41% of women).

Keywords: didactic approaches; teaching shortcomings; teaching scope; sport games

Súhrn

Autori príspevku zisťovali prostredníctvom dotazníka či existujú signifikantné rozdiely v názoroch učiteľov na vyučovanie basketbalu z pohľadu intersexuálnych rozdielov. Skúmaný súbor tvorilo 450 učiteľov telesnej a športovej výchovy (274 mužov a 176 žien), ktorí vyučujú na 2. stupni základných škôl zo 17 okresov východného Slovenska. Signifikantné rozdiely na hladine $p<0,01$ boli zaznamenané v obľúbenosti vyučovania basketbalu. Zatiaľ čo u 20,45 % žien je basketbal po volejbale (39,77 %) druhou najradšej vyučovanou športovou hrou, tak u 13,14 % mužov bol basketbal po futbale (40,51 %), volejbale (21,90 %) a florbale (19,71 %) až štvrtou najradšej vyučovanou športovou hrou. Napriek signifikantným rozdielom ($p<0,01$) viac ako 54 % mužov a 48 % žien vyučuje basketbal najčastejšie v rozsahu 6 – 10 hodín v rámci jedného tematického celku. Negatívnym zistením je, že basketbal nevyučuje 3,28 % mužov a až 11,36 % žien. Pri vyučovaní dominuje u oboch pohlaví (54,72 % mužov a 55,77 % žien) herne orientovaný didaktický prístup. Podľa 32,85 % mužov a 40,91 % žien je hlavným nedostatkom vyučovania basketbalu nízky záujem žiakov o vyučovanie tejto športovej hry. Druhým najčastejšie zvoleným nedostatkom vyučovania basketbalu bola nízka časová dotácia predmetu (29,59 % mužov a 28,41 % žien).

Kľúčové slová: didaktické prístupy; nedostatky vyučovania; rozsah vyučovania; športové hry

Introduction

Sport games are characterized by interactions between teammates and opponents in a game situation with or without a ball, with the aim to achieve a defined goal of the match (Duarte et al., 2016). As for the popularity, sport games are often identified as the most popular thematic unit in the perspectives of both students and teachers (Tillinger, 1994; Paugschová & Jančoková, 2008), and they are an inseparable part of the curriculum in Slovakia, holding a significant position in schools since 1946 (Slovík et al., 1993). Despite the fact that for both genders of teachers, sports games are the most popular subject unit, so in terms of comparing the views of men and women, there are differences in the popularity of teaching a particular sports game. This is evidenced by several research studies such as Adamčák et al (2018a) or Adamčák & Beťák (2018).

Pursuant to the educational standard of physical and sport education, which is anchored in the state educational program ISCED 2, sport games belong to the part called "Sport activities of the movement regime", with a proposed time allocation of 25% (National Institute for Education, 2015). The national educational program defines 4 mandatory sport games (basketball, football, handball, and volleyball), which, based on their long-standing position in physical and sport education, can also be marked as traditional. Sports games are often taught in the traditional way, and it is primarily the objective side of teaching and learning that is taught, forgetting the procedural side. In this way of teaching, perceptual mechanisms and cognitive processes are left behind (Dobrý, 2010). In contrast to traditional teaching, most alternative approaches to teaching sports games (Velenský, 2001) rely on the requirement that the conditions in the acquisition of the movement skill match the target form of realisation right from the start. In the use of modified games, according to Light (2010), the requirements for technique are reduced so that all pupils can participate in the game, emphasising the tactics of the game with the simultaneous development of movement skills.

Based on the above, we consider it appropriate to focus on investigating whether there are differences in views between genders also in the set of upper primary schools physical and sport education teachers who were involved in our survey. We were predominantly interested in the teaching of which sports game men and women prefer with a primary focus on the teaching of the sports game of basketball, the extent to which basketball is taught within a thematic unit as well as the preferred didactic approach to teaching this sports game.

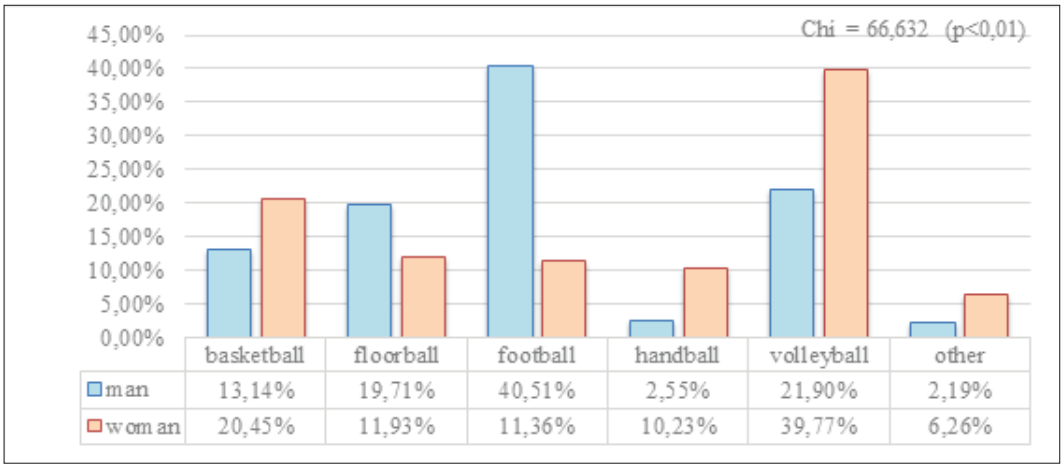
Methodology

The research sample consisted of 450 physical and sport education teachers (274 men and 176 women) working in upper primary schools in 17 districts of the eastern Slovakia. The research was realized during the school year 2022/2023. A non-standardized questionnaire with 39 items, created by Beťák & Popelka in 2022 for the needs of the grant project KEGA No. 005UMB-4/2023, was the main research method. The questionnaire was distributed to teachers in a combined form (in person or electronically). All teachers contacted completed the questionnaire correctly. Students of the Faculty of Sports Science and Health of the Matej Bel University in Banská Bystrica helped with the distribution of the questionnaire. The paper presents selected questions from the questionnaire, evaluated in terms of gender. Teachers' responses were subjected to statistical processing using chi-square test, at significance levels of $p<0.05$ and $p<0.01$. The results of statistical processing are presented in figures. The research is part of the grant project KEGA No. 005UMB-4/2023 Creation of didactic multimedia textbooks focused on teaching basketball and volleyball within physical and sport education in upper primary schools.

Results

Initially, we were interested in which sport game teachers enjoy teaching the most in physical and sport education classes. We present the results in Figure 1. While women predominantly taught volleyball (39.77%), men predominantly taught football (40.51%). Basketball was the second most popular sport among women with 20.45%, followed by floorball and football. For men, volleyball was the second most popular sport (21.90%), followed by floorball (19.71%) and basketball (13.14%). In the category "other", teachers of both genders indicated that they enjoy teaching all sports equally or do not have a particular sport they enjoy teaching the most. For this question we found significant differences in the responses of men and women at the $p<0.01$ significance level.

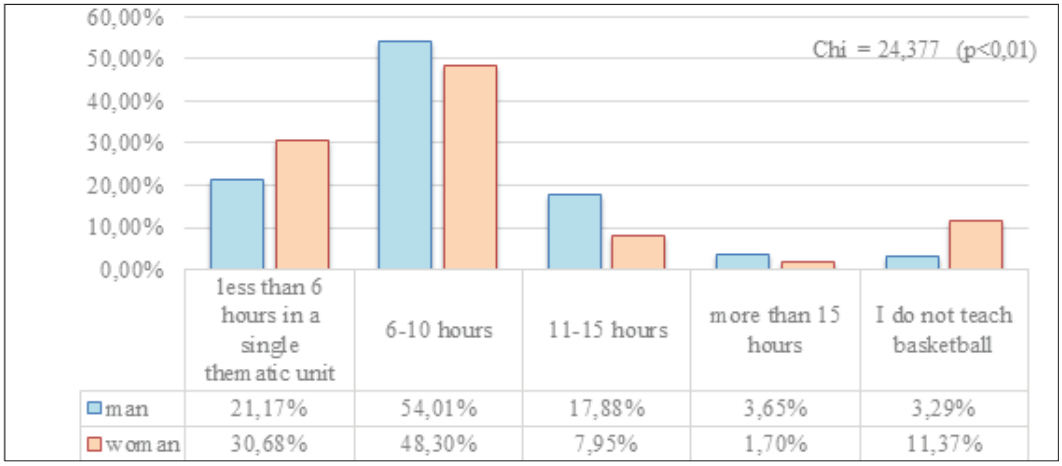
Obrázok 1./ Figure 1.
Najradšej vyučovaná športová hra./ Most popular sport game taught by teachers.



	basketball	floorball	football	handball	volleyball	other
man	13,14%	19,71%	40,51%	2,55%	21,90%	2,19%
woman	20,45%	11,93%	11,36%	10,23%	39,77%	6,26%

Further, we were interested in the number of hours teachers dedicate to teaching basketball within a single thematic unit. Differences in responses were significant at the $p<0.01$ significance level. As many as 54.01% of men and 48.30% of women teach basketball for 6-10 hours in a single thematic unit (Figure 2). More than 21% of men and 30% of women teach basketball for less than 6 hours within a single thematic unit. It is worth noting that 3.29% of men and as many as 11.37% of women, which represents a total of 29 teachers in upper primary schools, do not teach basketball at all.

Obrázok 2./ Figure 2.
Rozsah vyučovania basketbalu./ Time allocation for basketball teaching.

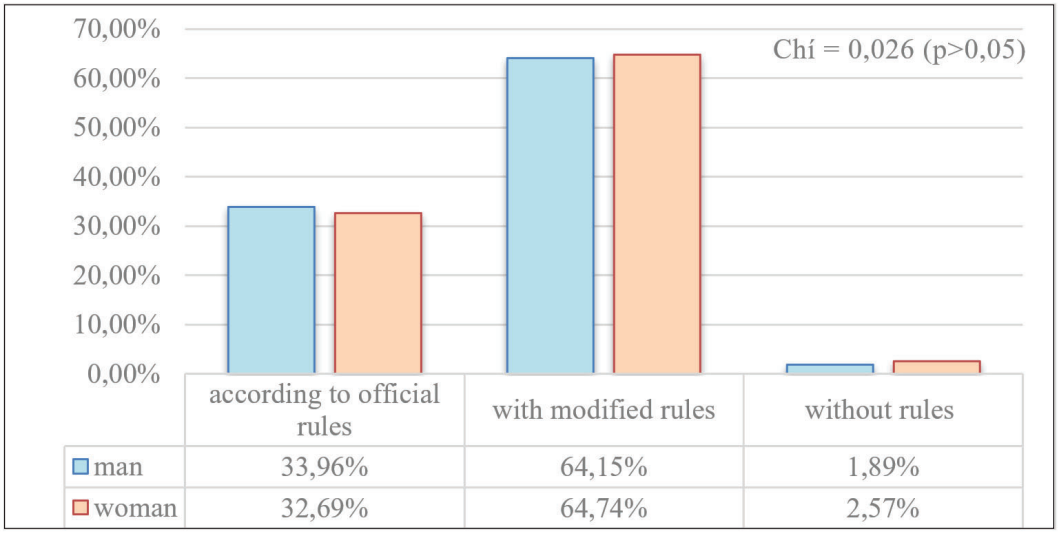


	less than 6 hours in a single thematic unit	6-10 hours	11-15 hours	more than 15 hours	I do not teach basketball
man	21,17%	54,01%	17,88%	3,65%	3,29%
woman	30,68%	48,30%	7,95%	1,70%	11,37%

We were also interested in whether students play basketball according to official rules, modified rules, or without rules. More than 64% of both men and women stated that students play basketball with modified rules in their classes (Figure 3). Approximately one-third of respondents reported that students play basketball according to the official rules.

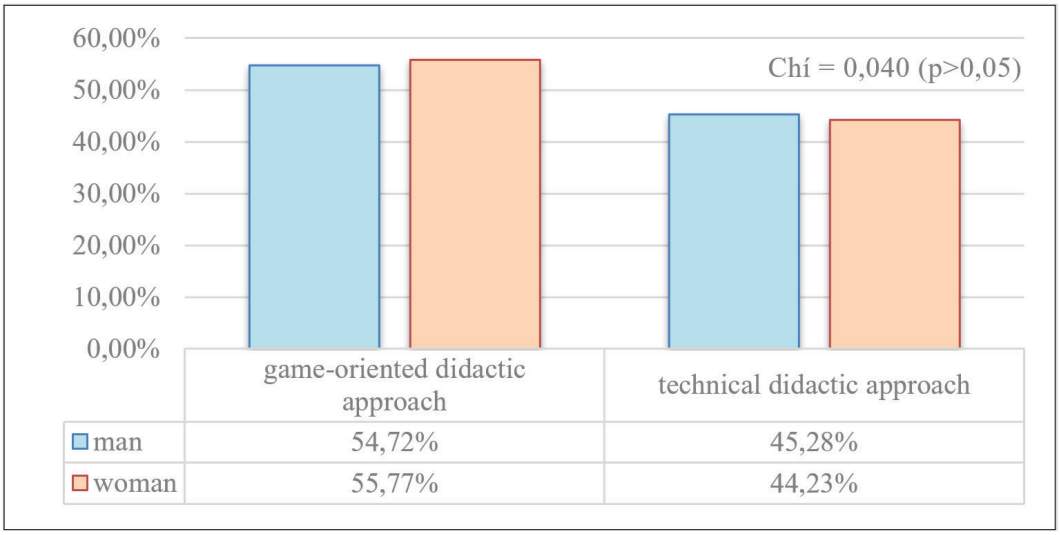
There may be significant differences between genders in terms of the diversity of content and the use of didactic approaches in teaching basketball. Therefore, we were interested in which didactic approach teachers of different genders prefer when teaching basketball. There were two options to choose: a technically oriented didactic approach, which is focused on practicing and improving technical skills outside of the game, or a game-oriented didactic approach, which is focused on practicing and improving technical skills within the game. More than 54% of men and 55% of women predominantly use a game-oriented didactic approach (Figure 4).

Obrázok 3./ Figure 3.
Pri vyučovaní hrajú žiaci basketbal najčastejšie./ Students most often play basketball.



	according to official rules	with modified rules	without rules
man	33,96%	64,15%	1,89%
woman	32,69%	64,74%	2,57%

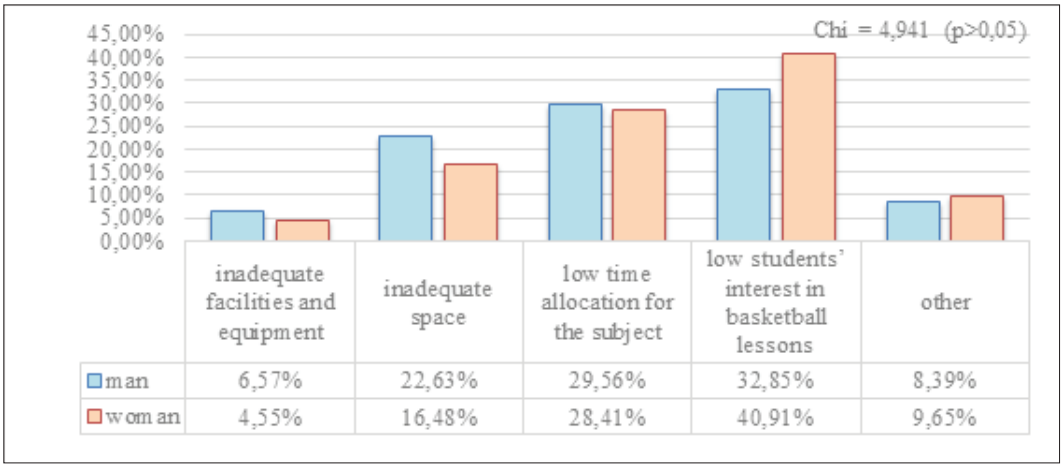
Obrázok 4./ Figure 4.
Preferovaný didaktický prístup pri vyučovaní basketbalu./ Preferred didactic approach in basketball teaching.



	game-oriented didactic approach	technical didactic approach
man	54,72%	45,28%
woman	55,77%	44,23%

Every teaching has its own limitations. In the research, we were interested in what teachers consider to be the main shortcoming for teaching basketball at the school where they teach. The ranking of shortcomings was the same for both genders. Students' low interest in basketball lessons was the dominant shortcoming, followed by a low time allocation for the subject and insufficient space. Within the category "other", most teachers stated that they do not see any shortcomings, however, some stated that they consider the low level of students' motor skills and abilities to be the biggest shortcoming (Figure 5).

Obrázok 5./ Figure 5.
Hlavný nedostatok pre vyučovanie basketbalu./ The primary limitation of teaching basketball.



	inadequate facilities and equipment	inadequate space	low time allocation for the subject	low students' interest in basketball lessons	other
man	6,57%	22,63%	29,56%	32,85%	8,39%
woman	4,55%	16,48%	28,41%	40,91%	9,65%

Discussion

In the long-term perspective, sport games appear to be the most popular thematic unit for both teachers and students. This is proved by several researches (e.g., Paugschová & Jančoková, 2008; Dismore & Bailey, 2011; Bendíková et al., 2016). In our research, 40.51% of men identified football and 39.77% of women identified volleyball as their most popular sport game to teach. Adamčák et al. (2018b) also found a preference for teaching football among men and volleyball among women in their research. Antala et al. (2012) found high popularity of these sport games among students of upper primary schools. Basketball ranked second among women and fourth among men. The reason behind may be the fact that teachers consider basketball to be a sport game with the most complex rules (Adamčák et al., 2018a).

When examining the scope of basketball teaching within a single thematic unit, we found that teachers of both genders (54.01% of men and 48.30% of women) most often teach basketball for 6-10 hours. An interesting finding was presented by Adamčák et al. (2018a), who found in their research that two-thirds of men and more than half of women teach sport games within a single thematic unit for 11-16 hours. We believe that the teachers in our research allocate more time to sport games that they prefer teaching over basketball. We consider it negative that 3.28% of men and up to 11.36% of women, which is a total of up to 29 teachers, do not teach basketball at the second level of primary school.

Physical and sport education teachers can positively influence students using various teaching strategies (Bulger et al., 2001). Therefore, we were interested in which didactic approach teachers prefer when teaching basketball. There were two options to choose from: a technical didactic approach (focused on practicing and improving skills outside of the game) or a game-oriented didactic approach (focused on practicing and improving skills within the game). We are aware of the existence of multiple didactic approaches but we chose to provide these two options for the purpose of making a clear decision, recognizing that a game-oriented approach naturally involves exercises predominantly associated with a technical approach. Our results show that over 54% of respondents prefer a game-oriented approach, while differences between men and women were minimal. The effectiveness of various didactic approaches in teaching sport games has been examined by Balakrishnan et al. (2011).

Several experts have examined the state of physical and sport education as well as the teaching of sport games. Common shortcomings include students' lack of interest (Antala et al., 2012), insufficient staffing (Mesiarik, 2012), low time allocation (Lehocký, 2010; Šimonek, 2011), and inadequate facilities and equipment for physical and sport education (Slezák & Melicher, 2008; Šimonek, 2011). We were interested in what shortcoming teachers in our study face when teaching basketball. The most significant shortcoming for 32.85% of men and 40.91% of women was students' low interest in basketball lessons. Antala et al. (2012) investigated the reasons behind students' disinterest in physical and sport education, finding that 40.8% of girls and 24% of boys stated laziness and convenience. For

boys, the most common reason was unattractive lesson content (stated by 30.2% of boys and 28.8% of girls). The content of basketball lessons should be diversified with movement games that would make the pupils more involved in the lessons. Teachers also identified insufficient time allocation for the subject as another shortcoming. This issue has been the subject of a rather heated debate in recent years. Opponents of a mandatory third hour of physical and sport education argue that 40% of primary schools lack a gym, however this statistic is skewed by schools with small numbers of students, as around 85% of students have access to a gym (Pietová, 2023). Without strengthened government support for physical and sport education position, significant changes in this area cannot be expected. Many teachers perceive insufficient space or equipment of schools as a shortcoming when teaching basketball. We believe that state support is essential in this regard.

We see the limitations of the findings presented in the size of the research sample. Further attention should be paid to this issue and the research sample should be expanded to include teachers from other parts of Slovakia. The questionnaire can also be considered as partly limited and it would be useful to add a few more questions. For example, men teachers state that they prefer to teach football. An additional question could be focused on whether they actually teach it or just throw the ball to the pupils to play football.

Conclusion

In this paper, we focused on the teaching of basketball as perceived by 450 physical and sport education teachers working in upper primary schools in 17 districts of the eastern Slovakia. On the basis of the analysis of Beťák & Popelka questionnaire from 2022, we found the following within the framework of the grant project KEGA No. 005UMB-4/2023:

- Significant differences ($p < 0.01$) between men and women's responses regarding the popularity of teaching sport game and the extent of basketball teaching within a single thematic unit;
- Teaching basketball with modified rules and a game-oriented didactic approach predominates for both genders;
- Both men and women identified low interest of students in basketball and insufficient time allocation for the subject as the main shortcomings.

We perceive the presented findings only as preliminary/partial and they cannot be generalized. It is necessary to continue in research on a larger sample of teachers and in other regions of Slovakia.

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POSTURÁLNA STABILITA V ZÁKLADNOM STRELECKOM POSTOJI S A BEZ ZBRANE V DISCIPLÍNE SKEET

POSTURAL STABILITY IN BASIC SHOOTING STANCE WITH AND WITHOUT SKEET SHOTGUN

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Abstract

In this work, we point out the level and interactions of postural stability (PS) with the sports performance of shooters (SP) in the Skeet discipline. 86 men and 20 women participated in the research. Active sports shooters ranged in age from 12 to 45 years old from Slovakia. We determined PS in the ready shooting position with and without a weapon using the Star Excursion Balance Test (SEBT). The sporting performances of the shooters were recorded from the system of the Slovak Shooting Association. PS level was characterized by descriptive statistics. The differences between the dominant and non-dominant leg, or with a weapon and without a weapon were assessed statistically (t-test) as well as objectively (Cohen's d). We determined the relationship between PS and SV using the correlation coefficient „r" according to Pearson.

The results showed differences in PS with and without a weapon in all directions, with unarmed shooters achieving greater ranges. The ranges between the dominant and non-dominant leg were the same for both armed and non-armed exercises.

Interactions of SP with PS are rare. When testing without a weapon on the non-dominant standing leg, we find interactions in the tested position Posterior ($p<0.05$), Posteromedial ($p<0.05$) and Anteriolateral ($p=0.05$). With the weapon on the dominant standing leg, we noted positive interactions of SV with PS in the tested Posterior position ($p<0.05$) and on the non-dominant leg with the Lateral position ($p<0.05$).

Differences in PS in the standby shooting position with a weapon and without a weapon, or rare interactions with the SP point to the need for a balanced and stable shooting stance in both cases. The perfect balance and stability of the shooter limit the swings created by holding the weapon and the shooting movement (stance - aiming - aiming - aiming - triggering) and facilitate their execution without any changes in the stabilized position.

The contribution is part of the project VEGA 1/0460/23, Postural health in children and adolescents and the possibilities of influencing it.

Keywords: skeet; postural stability; weapon; dominance; sports performance; differences; interactions

Súhrn

V práci poukazujeme na úroveň a interakcie posturálnej stability (PS) so športovou výkonnosťou strelcov (ŠV) v disciplíne Skeet. Výskum bol realizovaný na súbore športových strelcov zo SR. PS v pohotovostnom streleckom postavení so zbraňou a bez zbrane sme zisťovali pomocou Star Excursion Balance Test (SEBT). Športové výkony strelcov boli evidované zo systému Slovenského streleckého zväzu. Úroveň PS bola charakterizovaná deskriptívnymi štatistikami. Rozdiely medzi dominantnou a nedominantnou nohou, resp. so zbraňou a bez zbrane boli posúdené štatisticky (t-test) ako aj vecne (Cohenovo d). Vzťahy medzi PS a ŠV sme zisťovali korelačným koeficientom „r" podľa Pearsona.

Výsledky preukázali rozdiely v PS so zbraňou a bez zbrane vo všetkých smeroch, pričom bez zbrane dosahovali strelci väčšie rozsahy. Pri cvičení so zbraňou aj bez zbrane boli rozsahy medzi dominantnou a nedominantnou nohou rovnaké.

Interakcie ŠV s PS sú ojedinelé. Pri testovaní bez zbrane na nedominantnej stojnej nohe nachádzame interakcie v testovanej pozícii Posterior ($p<0,05$), Posteromedial ($p<0,05$) a Anteriolateral ($p=0,05$). So zbraňou na dominantnej stojnej nohe sme zaznamenali pozitívne interakcie ŠV s PS v testovanej pozícii Posterior ($p<0,05$) a na nedominantnej nohe s pozíciou Lateral ($p<0,05$).

Rozdiely v PS v pohotovostnom streleckom postavení so zbraňou a bez zbrane, resp. ojedinelé interakcie so ŠV poukazujú na potrebu vyváženého a stabilného streleckého postoja v oboch prípadoch. Dokonalá rovnováha a stabilita strelca obmedzujú výkyvy vytvárané držaním zbrane a streleckým pohybom (postoj - zalícenie - mierenie - zamierenie - spúšťanie) a uľahčujú ich vykonanie bez akýchkoľvek zmien v stabilizovanej polohe.

Príspevok je súčasťou projektu VEGA 1/0460/23, Posturálne zdravie u detí a adolescentov a možnosti jeho ovplyvňovania.

Kľúčové slová: skeet; posturálna stabilita; zbraň; sominancia; športový výkon; diferencie; interakcie

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Úvod

Shooting is a sport where the difference between success and failure represents stability (Čech, 2010).

Postural stability is a key element in the success of sports shooters. It represents the ability to maintain and control the correct position of the body during the entire shooting process, which includes holding the weapon, aiming at the target and the shot itself. The ability to maintain a stable position without unnecessary movements or jerks allows shooters to achieve greater accuracy and consistency of their shots (Ball, Best, & Wrigley, 2003).

Experienced shooters have better body posture and can stabilize the body in the last seconds before the actual shot (Era et al. 1996).

This stability is the result of a combination of physical fitness, muscle strength, coordination and neuromuscular control. In practice, this means that the shooter must effectively use his body to minimize the influence of external and internal distractions, thereby maximizing his performance (McGinnis, 2020).

Thus, postural stability is not only about a firm stance, but also about dynamic balance, which enables quick and accurate response to different conditions during competition or training (Zatsiorsky & Aktov, 1990).

Balance and stability are closely related concepts that relate to the body's ability to maintain balance and stability in various postural situations (Kasa 2004; Vařeka 2002a). A correct understanding of the following two terms is important: balance is the act of achieving or maintaining a state of equilibrium, while stability is the ability to maintain balance by resisting external forces and stresses (Vařeka 2002b).

Instability can be caused by various factors such as biomechanical parameters, sensory components, central nervous system, chronic pain, age and gender. Postural stability is the body's ability to maintain balance and stability in various situations, which is important for ensuring overall stability and increasing movement efficiency (Zemková, 2004).

A balanced and stable position allows the shooter to maintain perfect balance in the waiting position, which minimizes the natural fluctuations of the body, which are naturally created, to a minimum, which facilitates the execution of the entire movement without any changes in the position itself (Aalto et al. 1990; Brych 2008; Nováková 1996). Furthermore, the possibility of shortening the activation time of muscle chains involved in technical gestures and improving recoil control increases (Sližik et al. 2017).

Sports shooting is now part of the program of the modern Olympic Games and is divided into three disciplines - rifle, pistol and shotgun (Brych, 2008).

Skeet is a discipline in which you shoot with a shotgun at flying asphalt targets that are thrown from two towers (high and low) in the same direction. The shooter moves along the shooting stations arranged in a semicircle and shoots at targets alternately from left and right, or at two targets at

once, which are simultaneously thrown from a high and a low tower. The shooter can only fire one shot at each target (Valter, 2006).

Shooting is a sport requiring high precision, where success at the top level depends on controlling all body movements. Skeet performance is influenced by many factors, such as the shooter's experience and skill, upper limb and core strength, postural control, proper posture, and coordination between the eye, nervous system, and musculoskeletal system. Heart rate, anxiety level, anthropometric measurements, health status, and sport-specific physical performance parameters such as endurance, balance, coordination, and reaction time are also believed to directly affect shooting (İskender, 2010).

In terms of movement, shooting, with the exception of Trap and especially Skeet, is characterized by a small number of movement skills, but is very demanding on accuracy, coordination and concentration. High finesse and precision require perfect concentration and sensorimotor coordination. The workload of a sports shooter is complex, affecting both the somatic and psychological aspects (Valter, 2006).

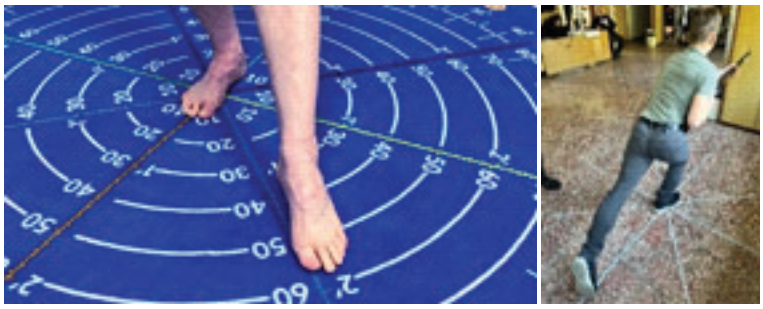
The evaluation of the level of physical abilities is one of the key issues in contemporary sports, while tests are used to monitor the effectiveness of training programs. An objective method of identifying deficiencies and improving dynamic postural stability is the Star Excursion Balance Test (SEBT) performed in eight directions, which is also used in clinical research.

Methods

The research was carried out on a group of sports shooters from Slovakia (n=106). Dynamic postural stability was determined using the eight-position Star Excursion Balance Test (SEBT), and the shooters' sports performances (maximum number of targets shot) were taken from the system of the Slovak Shooting Association.

The SEBT test was performed in the directions Posterior, Posteromedial, Medial, Anteromedial, Anterior, Anterolateral, Lateral, Posterolateral on the dominant and non-dominant training leg (Figure 1) without a shotgun and in the skeet standby position with a shotgun. Measurements of both legs were assessed from the point of view of the maximum measured value (cm).

Obrázok 1./ Figure 1.
Osemsmerový test Star Excursion Balance Test (SEBT)./ Eight-way Star Excursion Balance Test (SEBT).



The level of PS and sports performance of the shooters was characterized by descriptive statistics (M, SD, Max, Min). Statistical and material significance of the differences between the dominant and non-dominant training leg, respectively. between unarmed and armed DPS was assessed by t-test and Cohen's „d".

We determined the relationships between the individual directions of PS and SP using Pearson's correlation coefficient „r". Statistical significance of differences and relationships was assessed at the 5% and 1% significance levels. The substantive significance of the „d" coefficient was assessed according to $d<0.2$ trivial effect, $d>0.2$ small effect, $d>0.5$ medium effect and $d>0.8$ large effect.

Results

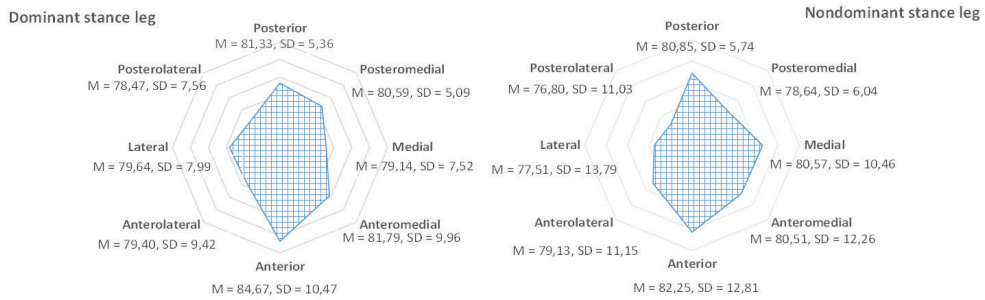
The results showed differences in the postural stability of the shooters when practicing with a weapon and without a weapon in all diagnosed directions (Table 1 and 2; Figure 2 and 3). Differences between positions were confirmed statistically as well as objectively (Table 4).

No significant differences were found between the dominant and non-dominant standing leg (p=n.s., d<0.2) when exercising in the ready stance with a weapon (Table 3).

Tabuľka 1./ Table 1.
Úroveň posturálnej stability bez zbrane a športovej výkonnosti u strelcov v skeete./ Level of postural stability without a weapon and sports performance in skeet shooters.

	SEBT without weapon							
	Dominant standing leg				**Non-dominant standing leg**			
	M	SD	Max	Min	M	SD	Max	Min
Anterior (cm)	84.67	8.71	103.40	63.40	82.25	10.05	102.40	60.00
AnteroLateral (cm)	79.40	11.12	102.60	33.50	79.13	10.20	100.00	55.40
Lateral (cm)	79.64	12.82	100.50	37.00	77.51	12.21	100.10	36.40
PosteroLateral (cm)	78.47	11.08	99.40	54.80	76.80	9.19	98.00	54.10
Posterior (cm)	81.33	11.59	103.60	32.50	80.85	9.65	100.20	45.30
PosteroMedial (cm)	80.59	10.02	101.20	54.00	78.64	8.79	98.60	58.30
Medial (cm)	79.14	12.00	100.30	31.40	80.57	11.41	107.70	45.30
Anteromedial (cm)	81.79	10.40	102.40	59.50	80.51	10.33	100.00	49.00
Sports performance (n)	111.52	7.00	123.00	65.00				

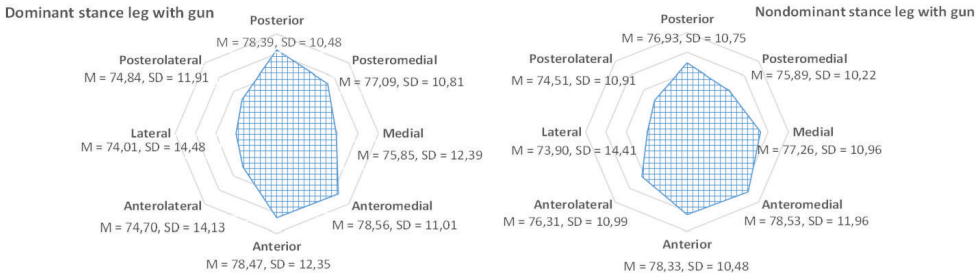
Obrázok 2./ Figure 2.
Úroveň posturálnej stability strelcov v disciplíne Skeet./ Postural stability level of shooters in Skeet discipline.



Tabuľka 2./ Table 2.
Úroveň posturálnej stability so zbraňou a športový výkon strelcov v disciplíne Skeet./ Level of postural stability with a weapon and sports performance of shooters in the Skeet discipline.

	SEBT with weapon							
	Dominant standing leg				**Non-dominant standing leg**			
	M	SD	Max	Min	M	SD	Max	Min
Anterior (cm)	78.47	12.35	102.40	42.30	78.33	10.48	101.40	40.60
AnteroLateral (cm)	74.70	14.13	100.30	26.30	76.31	10.99	100.20	43.50
Lateral (cm)	74.01	14.48	99.60	25.60	73.90	14.41	99.00	25.40
PosteroLateral (cm)	74.84	11.91	97.00	40.20	74.51	10.91	98.40	45.20
Posterior (cm)	78.39	10.48	101.70	53.40	76.93	10.75	98.70	35.70
PosteroMedial (cm)	77.09	10.81	95.60	38.60	75.89	10.22	98.70	40.90
Medial (cm)	75.85	12.39	98.60	35.00	77.26	10.96	99.60	53.40
Anteromedial (cm)	78.56	11.01	102.4	46.80	78.53	11.96	105.20	33.70
Sports performance SKEET (n)	111.52	7.00	123.00	65.00				

Obrázok 3./ Figure 3.
Úroveň posturálnej stability strelcov v disciplíne Skeet./ Postural stability level of shooters in Skeet discipline.



Tabuľka 3./ Table 3.
Rozdiely v posturálnej stabilite medzi dominantnou a nedominantnou nohou./ Differences in postural stability between dominant and non-dominant leg.

	Differences between dominant and non-dominant standing leg					
	With weapon			**Without weapon**		
	t	p	d	t	p	d
Posterior	**2.72**	**0.008**	**0.258**	0.13	0.900	0.012
Posteromedial	0.27	0.787	0.026	1.68	0.097	0.127
Medial	**2.00**	**0.048**	**0.170**	0.10	0.920	0.008
Anteromedial	1.93	0.057	0.164	0.31	0.761	0.029
Anterior	0.44	0.659	0.045	1.52	0.130	0.138
Anterolateral	**2.26**	**0.026**	**0.207**	1.37	0.175	0.114
Lateral	1.23	0.221	0.122	1.46	0.148	0.121
Posterolateral	1.41	0.163	0.123	0.04	0.971	0.003

Explanations. t - t-test; p - value; Cohen d

Tabuľka 4./ Table 4.
Rozdiely v posturálnej stabilite medzi dominantnou a nedominantnou nohou./ Differences in postural stability between dominant and non-dominant leg.

	Differences without a weapon and with a weapon					
	Dominant			**Non-dominant standing leg**		
	t	p	d	t	p	d
Posterior	6.93	0.000	0.581	4.87	0.000	0.382
Posteromedial	5.32	0.000	0.370	3.63	0.000	0.266
Medial	5.08	0.000	0.411	4.99	0.000	0.270
Anteromedial	5.36	0.000	0.315	2.55	0.012	0.227
Anterior	4.32	0.000	0.266	3.86	0.000	0.384
Anterolateral	4.10	0.000	0.335	3.08	0.003	0.288
Lateral	3.76	0.000	0.270	4.20	0.000	0.296
Posterolateral	4.17	0.000	0.301	2.52	0.013	0.178

Explanations. t - t-test; p - value; Cohen d

While exercising without a weapon (table 3), we did note statistically significant differences in favor of the range on the dominant standing leg in the tested position Posterior ($p<0.008$; $d=0.258$)

and Anterolateral (p<0.026; d=0.207), respectively. in favor of the extent of the non-dominant leg in the Medial direction (p<0.048; d=0.170), however, due to the very low factual significance of the „d“ coefficient, we cannot practically confirm the observed differences.

By correlating the values of postural stability and sports performance in the Skeet discipline, rare significant relationships were found (Table 5, Figure 4 and 5). The expected higher frequency of interactions (p<0.05) in the more stable dominant standing leg compared to the non-dominant leg was not confirmed either in the exercise with or without a weapon.

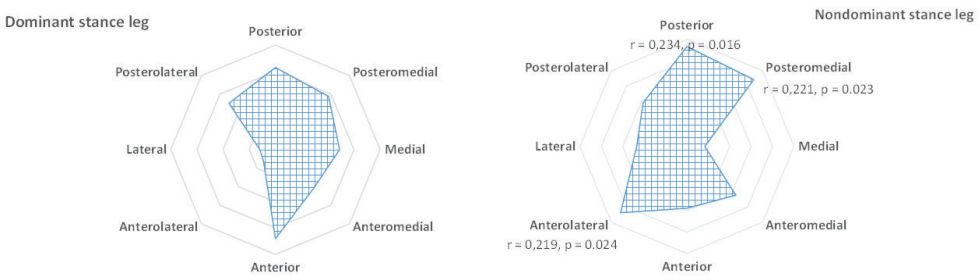
Interactions of sports performance with postural stability values when testing without a weapon on the non-dominant standing leg are found in the Posterior (r = 0.234; p = 0.016), Posteromedial (r = 0.221; p = 0.023) and Anteriolateral (r = 0.219; p = 0.024) positions.

In the standby position with a weapon on the dominant standing leg, we noted positive interactions of sports performance with postural stability in the tested Posterior position (r = 0.198; p = 0.042) and on the non-dominant leg with the Lateral position (r = 0.228; p = 0.019).

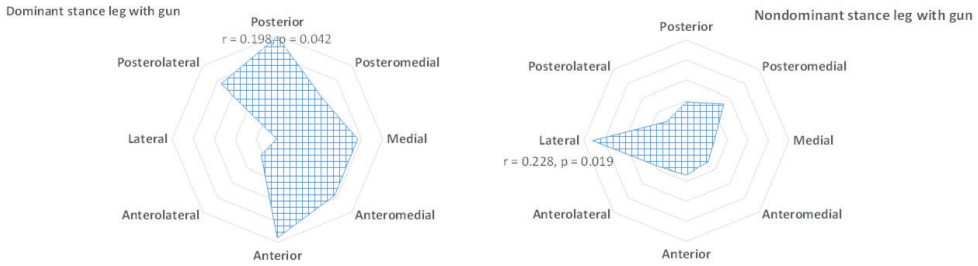
Tabuľka 5./ Table 5.
Korelácie medzi DPS a športovou výkonnosťou strelcov bez zbrane a so zbraňou (Pearsonov korelačný koeficient „r“, p<0.05⋆⋆)./ Correlations between DPS and sports performance of shooters without a weapon and with a weapon (Pearson's correlation coefficient „r“, p<0.05⋆⋆).

		Without weapon	With weapon		
		Dominant	Non-dominant	Dominant	Non-dominant
Posterior	r	0.157	**0.234⋆⋆**	**0.198⋆⋆**	0.097
	p	0.109	**0.016**	**0.042**	0.324
Posteromedial	r	0.144	**0.221⋆⋆**	0.096	0.129
	p	0.142	**0.023**	0.327	0.186
Medial	r	0.123	0.042	0.141	0.068
	p	0.211	0.671	0.150	0.490
Anteromedial	r	0.104	0.161	0.142	0.075
	p	0.289	0.099	0.146	0.446
Anterior	r	0.170	0.144	0.189	0.084
	p	0.081	0.141	0.052	0.393
Anterolateral	r	0.032	**0.219⋆⋆**	0.004	0.092
	p	0.742	**0.024**	0.968	0.346
Lateral	r	0.030	0.117	-0.049	**0.228⋆⋆**
	p	0.760	0.231	0.621	**0.019**
Posterolateral	r	0.125	0.145	0.138	0.067
	p	0.200	0.139	0.157	0.492

Obrázok 4./ Figure 4.
Štatisticky významné korelácie posturálnej stability so športovou výkonnosťou strelcov v disciplíne Skeet bez zbrane (p<0.05)./ Statistically significant correlations of postural stability with the sports performance of shooters in the Skeet discipline without a weapon (p<0.05).



Obrázok 5./ Figure 5.
Štatisticky významné korelácie posturálnej stability so športovou výkonnosťou strelcov v disciplíne Skeet so zbraňou (p<0.05)./ Statistically significant correlations of postural stability with sports performance of shooters in the Skeet discipline with a weapon (p<0.05).



Discussion

Controlling postural stability and weapon stability is a hallmark of sport shooting.

Peljha et al. (2021) investigated the relationships between selected anthropometric and fitness parameters with the shooting performance of Olympic clay target shooters and possible differences depending on skill level. 19 members of the Cyprus Shooting Federation participated in the research. The results showed significant, strong and moderately strong correlations between shooting performance and bilateral symmetry in shoulder mobility ($r = 0.80$, $p < 0.001$) and grip strength ($r = 0.61$, $p = 0.01$). When skill level was taken into account, significant differences in height ($p = 0.01$), weight ($p = 0.03$), posterior muscle chain flexibility ($p < 0.001$), dynamic ($p = 0.01$) and static balance ($p = 0.01$). In addition, increasing the symmetry of the upper body could improve shooting scores.

Čech (2010) assessed the influence of indicators of shooters' postural stability on aiming point fluctuation. The goal was to contribute to the expansion of knowledge in the field of stability of shooters and the possibility of its indirect influence on the result of shooting through the fluctuation of the aiming point in the interval of 5s and 1.5s before the shot. The study was conducted on shooters ($n = 8$) aged in the corresponding junior category. Using the stabilometric method, examination on the stabilometric platform of the FiTRONiC company and the fluctuation of the aiming point using the shooting analysis system SCATT Professional, he observed selected indicators of stability. The author found significant differences in the level of stability between the basic stabilometric examination and the stabilometric examination with shooting on the SCATT shooting simulator. The dependence between shooter stability and aiming point fluctuation was also confirmed.

Optoelectronic training systems provide the shooter with data and graphical information about the crosshair coordinates of the aiming point on the target. The SCATT system indicates the prognostic result of the actual shot, taking into account the time period from the trigger to the moment when the bullet leaves the barrel, as well as the lateral movement of the muzzle, since the bullet continues to move in the same direction as the muzzle after leaving the barrel.

The SCATT system was also used in their research by the authors Korostylova & Zanevkyy (2009), who tried to imitate the accuracy of shooting results using an optoelectronic training system. The aim of their research was to compare the coordinates of the bullet on the target with the coordinates of the imitation of the SCATT system trace within the framework of stability. The study method involves firing a Steyr LP-10 air pistol and 4.49mm Finale Match bullets using simultaneous recording on the SCATT system and firing the gun in a vise with bullets from the same box. A highly qualified shooter fired 10 shots from a distance of 10 m. T-test showed a big difference in average distances ($p<0.003$), i.e. j. imitation of the bullet mark on the target by the SCATT system is not relevant enough. However, this could be due to the incorrect modeling of the trajectory of the barrel as an imitation of the track, since the angular movement of the barrel relative to the barrel falsifies the calculation of its lateral velocity, and not the actual disturbance of the stability of the racer.

In early research by Era et al. (1996) investigated postural stability and skilled performance in professional and amateur shooters. They checked the aiming posture during the 7.5 seconds before the shot was conducted among national elite rifle shooters, as well as among national-level shooters

and amateur rifle shooters. Center of force (COF) movement was analyzed in terms of velocity and amplitude of movement. These calculations were performed in 1.5-s windows, with the first window starting 7.5 s and ending 6.0 s before the shot. The last window ended when the shutter was pressed. The postural control data distinguished the studied groups according to their level in competitive shooting. Male top-level shooters were able to stabilize their stance significantly better than female top-level shooters or male national-level shooters, who in turn were much more stable than amateur shooters. Experienced shooters were able to stabilize their posture even better during the last seconds before firing, while amateur shooters showed no significant differences when comparing consecutive windows. The authors concluded that among highly trained elite shooters, failure to stabilize the whole body position appears to be rarely the cause of a poor outcome.

The application of the dynamic balance test of the lower limbs (SEBT) appears to be an interesting parameter for determining the relationship with the sports performance of shooters in the discipline of Skeet or Trap. Postural stability can be disturbed by internal influences, such as heartbeats and respiratory muscle activity (Zemková, 2005). Inadequate cardiorespiratory adaptation may be one of the causes, especially in the case of the need to hold the breath during the shot.

A number of parameters affect the shooter's performance. Muscular strength, postural control, accuracy, experience, skill of the shooter, and strength of the upper limbs and core of the body can determine the accuracy of his shooting (Yapici et al., 2018).

Conclusion

The results showed differences in postural stability tested with and without a weapon in shooters competing in the Skeet discipline.

In the standby stance with a weapon on the dominant and non-dominant standing leg, smaller ranges in the tested directions were diagnosed than in the diagnosis of postural stability without a weapon. The ranges between the dominant and non-dominant standing leg were the same for both armed and unarmed exercises.

Interactions between sports performance and postural stability were rare. When testing without a weapon on the non-dominant standing leg, we find interactions in the tested posteroral and posteromedial directions as well as with the frontal anterolateral direction. With the weapon on the dominant standing leg, we recorded positive interactions in the posteroral direction and on the non-dominant leg in the lateral direction.

Postural stability is a significant factor affecting final performance in shotgun shooting, either directly or indirectly. Stability training should not be underestimated and implemented only as a partial component within some training sessions. Stability should be developed specifically from the point of view of laterality, dominance, with or without a weapon.

The perfect balance and stability of the shooter limit the fluctuations created by holding the weapon and the shooting movement (stance - aiming - aiming - aiming - triggering). They improve the efficient execution of a chain of movements without any changes in the stabilized position. Increased movement efficiency should subsequently be reflected in the improvement of the sports performance of shooters.

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PEDAGOGICKÉ PRAXE V RÁMCI STUDIA TĚLESNÉ VÝCHOVY NA PEDAGOGICKÉ FAKULTĚ JIHOČESKÉ UNIVERZITY V ČESKÝCH BUDĚJOVICÍCH

PEDAGOGICAL PRACTICES WITHIN THE STUDY OF PHYSICAL EDUCATION AT THE FACULTY OF EDUCATION, UNIVERSITY OF SOUTH BOHEMIA IN ČESKÉ BUDĚJOVICE

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Abstract

Teaching practice plays a crucial role in the preparation of future physical education teachers. It enables students to apply the theoretical knowledge acquired during their studies directly in practical settings, facilitating the acquisition and development of professional competences. Additionally, it enhances social and communication skills, which are essential for success in the teaching profession, all under the guidance of experienced educators. The aim of this paper is to present and analysis the concept of field practice at the Department of Physical Education and Sport at the Faculty of Education of the University of South Bohemia České Budějovice. We focus on assistant and continuous practices, which are designed to align with current European and global trends in teacher training, in accordance with the professionalization of the teaching profession. In the actual implementation of these types of practice, we also emphasize the importance of a reflective approach and the introduction of students to the realities of a genuine school environment.

Keywords: pedagogical practices; professional competences; student; teacher; physical education

Souhrn

Pedagogické praxe hrají klíčovou roli v přípravě budoucích učitelů tělesné výchovy. Umožňují studentům aplikovat teoretické znalosti získané během studia přímo v praxi, získávat a rozvíjet odborné kompetence, zdokonalovat sociální a komunikační dovednosti v přípravě na výkon pedagogické profese pod vedením zkušených učitelů. Cílem příspěvku je představit a analyzovat koncepci oborových praxí na Katedře tělesné výchovy a sportu Pedagogické fakulty Jihočeské univerzity v Českých Budějovicích. Zaměřujeme se na asistentské, průběžné a souvislé praxe, jejichž záměrem je plně respektovat aktuální evropské a světové trendy přípravy učitelů v souladu s trendy profesionalizace učitelské profese. V rámci vlastní realizace uvedených druhů praxí zdůrazňujeme i význam reflexivního pojetí a uvedení studenta do podmínek reálného školního prostředí.

Klíčová slova: pedagogické praxe; odborné kompetence; student; učitel; tělesná výchova

Introduction

At present, significant advancements are being made in the fields of science, technology, and the development of information and communication technologies. These advancements bring about an increase in new knowledge and information, consequently raising the demands on the teaching profession. A modern educator must be a person equipped with extensive knowledge and specific skills, enabling them to respond effectively to situations arising in the course of teaching (Bendl & Kucharská, 2008; Vítečková, 2018). Teachers have a direct influence on the selection of teaching methods, play a significant role in motivating students, determine the content of lessons, and their approach significantly shapes students' skills and habits (Průcha, 2017; Švec & Bradová, 2013). Novice teachers

often face professional challenges due to their limited prior experience in schools. For this reason, there is no need to question the importance and relevance of teaching (subject-specific) practice as part of the professional education of students in faculties of education. In 2023, the Ministry of Education, Youth, and Sports (2023) defined the common professional competences required of teaching graduates. This document represents a shared vision for the quality of teacher preparation and aims to further professionalize the teaching profession. The foundation for this document was the Framework of Professional Teacher Qualities (Tomková et al., 2012).

It is an objective fact that the professional competences of teaching graduates cannot be developed solely through transmissive methods (lectures) or independent study of scholarly resources. Rather, they are primarily cultivated through interaction, hands-on activities, collaboration, imitation, and reflection on personal experiences (Kursová, 2021). The competence framework for teaching graduates is divided into six areas. These represent professional competences developed across all components of teacher training, including pedagogical foundations, general and subject-specific didactics, pedagogy, psychology, the taught disciplines, and, importantly, teaching practice. Teaching practice provides a critical opportunity for teacher training students to understand, apply, and enhance their professional competences. However, learning these competences also depends on quality reflection on practice experiences and a strong integration of these experiences with theoretical concepts from academic studies and professional resources (MŠMT, 2023).

Pedagogical practices provide students with a valuable opportunity to engage in teaching within a real school environment under the guidance of experienced educators. Students have the chance to observe and assist in physical education classes, gradually taking on the leadership of instructional units and developing their pedagogical skills. Experiences arise from spontaneous perception and the lived experience of acquired empirical knowledge in practical activities. Types of experiences can be categorized as follows: individual experience (insights gained through individual practical activities and direct interactions with others), group experience (knowledge and experiences acquired through collaborative activities within a similar environment), socio-historical experience (collection of knowledge, methods, operational procedures, behavioral norms, customs, and traditions specific to a particular socio-cultural context) and students' experiences in teaching (these experiences are a result of the individual's socialization process, social learning, incidental learning, as well as intentional activities outside of the school environment). An important component of these practices is also reflection and feedback from supervising teachers and faculty didactics. This feedback assists students in identifying their strengths and areas for improvement, which contributes to their personal and professional growth (Flemr et al., 2021; Spilková et al., 2015; Vališová & Kovaříková, 2021).

The results of the National Survey on the teaching competencies of beginning teachers unequivocally support the effort to provide teacher education students with pedagogical practices that allow them to work continuously with pupils, understand their needs, and develop competencies primarily grounded in interaction with pupils (Ministerstvo školství, mládeže a tělovýchovy, 2024).

The concept of pedagogical practices at the Faculty of Education of the University of South Bohemia in České Budějovice aligns with current European and global trends in teacher's preparation, consistent with the trends of professionalization within the teaching profession that emphasize a reflective approach - specifically, a reflective model of teacher education. The aim of pedagogical practices is to integrate theory and practice across all components of higher education training and to immerse students in the conditions of a real school environment. Significant emphasis is placed on academic reflection and systematic facilitation of experiential learning processes. Another important aspect of the pedagogical practice concept is the collaborative partnership between the faculty and the actual school environment.

In our article we will present the implementation and assurance of the existing practices at the Department of Physical Education and Sport of the Faculty of Education at the University of South Bohemia within the framework of undergraduate studies.

Theoretical Foundations of Teaching Practice

Teaching practice, as an integral part of the pregraduate curriculum, represents a complex domain that addresses various conceptual, methodological, organizational, and implementation challenges. It is one of the most crucial elements in the preparation of future teachers. Its significance lies not

only in enabling students to apply theoretical knowledge in real school environments but also in providing opportunities for the development of key professional competences. The essence of teaching practice is closely linked to issues of current educational legislation (Kratochvílová & Svojanovský, 2020; Mazáčová, 2014; Wiegerová, 2011). The theoretical foundations of teaching practice at the Department of Physical Education and Sport, Faculty of Education, University of South Bohemia, are based on several pedagogical theories that complement each other and support the development of students' skills.

1. Experiential Learning Theory (ELT)

One of the key theoretical approaches applied in teaching practice is Experiential Learning Theory, primarily developed by David A. Kolb. Experiential learning is based on the idea that the most effective way to learn is through personal experiences, which actively engage students in the learning process. Kolb's theory emphasizes a four-phase cycle: concrete experience, reflection, abstract conceptualization, and active experimentation. In a broader sense, this approach is particularly effective when the goal of education is to change so-called action theories—individual or group beliefs about the most effective ways to solve a given task. The ideal in this context becomes teacher education that integrates educational theory into actual teaching practice. The challenges of teaching practice can only be effectively addressed within the framework of undergraduate preparation as a whole. Fragmented and unsystematic measures that do not consistently and functionally integrate theory with practice throughout the entire study period cannot significantly improve the quality of professional teacher training (Henderson, 2019; Johnson & Johnson, 2006; Lunenberg, Korthagen & Swennen, 2007; Šimoník, 2004; Šťáva, 2004; Valenta, 2020). In the context of teaching practice, students learn to conduct physical education lessons through direct experience. Experiential learning also involves active experimentation, where students try new teaching strategies, analyse their impact on pupils, and adjust their methods accordingly. This continuous cycle of learning through experience is a key element of teaching practice at the Faculty of Education, University of South Bohemia, as it provides students with a real opportunity to experiment with different approaches and identify the most effective teaching methods. They gain concrete experiences, which they subsequently analyse and reflect upon during seminars. This reflection allows them to understand how to improve their performance and prepare for further pedagogical challenges. Importantly, experiential learning does not occur in isolation-it requires interaction with other students, teachers, and pupils, which fosters the development of social skills and teamwork abilities. Teaching and professional practice should never be viewed as a one-sided process. On the contrary, teachers in primary and secondary schools often express satisfaction that students bring new forms of warm-ups, preparatory games, and other trends in the field. Moreover, schools and teachers appreciate visits from faculty instructors (Flemr et al., 2021; Reitmayerová & Broumová, 2007).

2. Theory of Social Constructivism

Another significant theoretical approach reflected in teaching practice is social constructivism. According to this theory, learning is a social process that occurs through interaction with others. The constructivist view of learning emphasizes the active role of the learner, suggesting that knowledge is not passively received but actively constructed. The way this construction takes place is context-dependent, influenced by the learner's environment and personal biography. The development of teachers' knowledge can also be approached from a constructivist perspective. The constructivist approach to education highlights the need to employ methods that activate and engage students, encouraging them to acquire knowledge through active involvement and communication rather than passive reception. Constructivist theories, which aim to move beyond transmissive teaching, stress the process of knowledge construction by the learner. Constructivists focus on how the learning process is conditioned by the learner's abilities, prior knowledge, and the learning process itself. Since constructivists advocate studying learning as it pertains to specific content, they concentrate on the specifics of learning within individual subjects, making them particularly interested in subject didactics and psychodidactics. Constructivist teaching assumes the use of appropriate teaching strategies-those that activate the learner's cognitive processes and foster the development of independence, imagination, creativity, logical thinking, and other intellectual and creative abilities. This approach is associated with complex and engaging teaching methods, such as dialogue, discussion, problem-solving methods,

brainstorming, educational games, dramatization and situational methods, project-based learning, group and cooperative teaching, computer-supported instruction, critical thinking, open learning, and learning in real-life contexts. Interaction, in this context, refers to a reflection of the activities and social relationships of individuals-not only within the school or classroom but in all social contact. Collaborative activities, mutual relationships, and interactions are associated with the exchange, receipt, and processing of information, leading to social communication. A specific form of this is pedagogical communication, which occurs according to certain rules based on the social roles of the guiding subject and the guided subject. This type of communication usually takes place during the teaching process as instructional communication. In the context of teaching practice, this means that students learn not only through personal experience but also through interaction with mentor teachers, colleagues, and pupils (Kotlík & Jansa, 2017; Maňák & Švec, 2003; Maňák et al., 2017; Pecina & Marinič, 2021; Zormanová, 2012).

3. Reflective Model of Education

Another essential theoretical framework influencing teaching practice at the Department of Physical Education and Sport, Faculty of Education, University of South Bohemia, is the reflective model of education. Reflective practice, rooted in the works of John Dewey and Donald Schön, emphasizes teachers' ability to analyse their pedagogical methods, identify areas for improvement, and systematically work on their professional development. Reflective thinking is a fundamental prerequisite for effective problem-solving and enhancing teaching strategies. Reflection involves uncovering opinions, attitudes, perspectives, as well as prior knowledge and experiences. It is an intentional process aimed at evaluating various situations and outcomes using feedback, with the goal of uncovering broader connections and meanings. In pedagogy, the purpose of reflection is to improve the quality of teaching (Avis et al., 2019; Bochníček & Hališka, 2013; Nehyba, 2014; Podpera et al., 2023; Valenta, 2020). In this context, teaching practice is designed to encourage systematic reflection. During their practice, students not only apply theoretical knowledge but also analyse their pedagogical decisions. This process includes multiple steps, from reflecting on specific lessons to deeper analysis of their own teaching identity and educational approach. Under the guidance of mentor teachers and faculty didacticians, students are given opportunities to discuss their performance, evaluate strengths and weaknesses, and formulate specific steps for improvement. In tripartite reflection, students often appreciate receiving a new perspective and feedback on their performance. The goal should be to provide constructive feedback rather than excessive criticism. Reflection is not merely about evaluating what worked or did not work in teaching; it is a deeper process that addresses pedagogical values, attitudes towards students, and even the broader societal and cultural context of education. Students are deliberately encouraged to consider how their teaching methods can influence pupils not only in terms of physical fitness but also on emotional and social levels (Flemr et al., 2021; Janderková, 2019; Janík et al., 2016; Kursová, 2021; Podpera et al., 2023; Procházka & Žlábková, 2013; Stuchlíková, 2002; Stuchlíková et al., 2023; Vaculík Pravdová, 2022).

4. Teaching Practice and the Competency-Based Approach

Teaching practice at the Faculty of Education, University of South Bohemia, is firmly rooted in the competency-based approach to education, which emphasizes the development of specific professional competences. The competency model assumes that a successful teacher must possess not only specialized knowledge but also a wide range of practical skills, attitudes, and values that enable them to function effectively in real school environments (MŠMT, 2023). The competency framework on which teaching practice at the Faculty is based encompasses six main areas of professional competences: pedagogical and psychological knowledge, didactic skills, the ability to organize lessons, communication with pupils, reflection and self-reflection, and collaboration with other teachers and parents. During their practice, students have the opportunity to systematically develop these competences. Teaching practice thus serves not only as a means to apply theoretical knowledge but also as a tool for fostering students' personal and professional growth. In the context of physical education, particular emphasis is placed on skills related to lesson organization and safety. Physical education teachers must be able to effectively structure classes, ensure the safety of pupils, and conduct lessons that are both motivating and tailored to the needs of various age groups and levels of physical fitness. The competency-based approach supports the development of these skills through concrete experiences ga-

ined during practice (Flemr et al., 2021; Kratochvílová & Svojanovský, 2020; Mazáčová, 2014; Spilková et al., 2015; Tomková et al., 2012; Vališová & Kovaříková, 2021).

5. Modern Trends in Education and Their Impact on Practice

Current educational trends emphasize the need for innovation and the integration of modern technologies into teaching. Digital technologies are frequently used in physical education, particularly to support purposeful physical activity. These technologies include photo or video documentation, allowing students to observe their own performance and movement execution. Video studies serve as excellent visual materials, enabling reflective assessment and self-evaluation under a teacher's guidance. Instructional videos and the incorporation of portable devices (such as smartphones, smart bracelets, and watches) into physical activities are also highly beneficial. These tools are primarily used for leveraging sensor technologies combined with appropriate software, allowing users to monitor their activity and evaluate it based on recommendations provided. Physical education teachers have a unique opportunity to introduce these tools to students during lessons and guide them on how to use them effectively to enhance physical activity. Another category includes educational applications, which focus on teaching specific motor skills or explaining the principles of particular movements. These applications, which typically do not rely on sensor technologies, often utilize video and audio, including instructional videos and graphic content. The final category consists of sports social networks, which are often responsive websites with mobile app outputs. These platforms enable users to organize joint activities, arrange sports events, or locate facilities and venues. Such web applications can be effectively incorporated into project-based learning in school physical education, where students can communicate, share content, and organize events similarly to traditional social networks. This approach is also reflected in teaching practice at the Faculty of Education, University of South Bohemia, where students are encouraged to utilize modern tools and technologies to enhance teaching efficiency and reflection. The use of video recordings, interactive educational platforms, and other technologies allows students to analyse their pedagogical methods and receive feedback to facilitate continuous improvement. Technologies not only improve the quality of reflection but also open new opportunities for teaching innovation. During their practice, students experiment with various teaching methods, such as using online tools to communicate with parents or interactive technologies to motivate students during physical education lessons. These trends mirror broader changes in education, emphasizing individualized and personalized instruction and fostering creative thinking (Kudláček et al., 2013; Palička et al., 2017; Stuchlíková et al., 2023).

The Structure of Teaching Practice at the Department of Physical Education and Sport, Faculty of Education, University of South Bohemia

Teaching practice at the Faculty of Education, University of South Bohemia, is divided into several phases, allowing students to gradually gain experience in teaching physical education. This system includes subject-specific assistant practice, continuous subject-specific practice, and comprehensive subject-specific practice, each with its specific objectives and content.

1. Subject-Specific Assistant Practice and Its Reflection: Subject-specific assistant practice is introduced as a mandatory course in the third year of the bachelor's degree programs focusing on education for lower secondary schools and physical education for secondary schools. This course serves as the entry point into the model of subject-specific teaching practice. Students familiarize themselves with the environments of several primary and secondary schools and, through reflective observation sessions, gain insight into teaching in at least five classes or grades, with lesson durations of 45 and 90 minutes. Under the guidance of mentor teachers, students learn about the functioning of schools in relation to classroom management strategies and the resolution of educational and instructional issues. They also attend lectures by practicing teachers on topics such as the role of homeroom teachers, the implementation of guided physical activities in both school and extracurricular settings, methods of physical interventions, organization and safety during training camps, and more. If interested, students may participate in homeroom hours or parent-teacher meetings and assist the mentor teacher with lesson organization or preparation. As part of these practices, students are offered the opportunity to engage in tandem teaching with faculty instructors during the practical lessons of first-year students. It is believed that the familiar environment of the Department of Physical Education and

Sport and collaboration with subject-specific didacticians provide students with an easier transition to their initial teaching experiences compared to practice in primary or secondary schools. Each activity is subsequently evaluated in reflective seminars through supervisory discussions.

2. Continuous Subject-Specific Practice and Its Reflection is conducted over one semester as a mandatory course in the first year of the master's degree programs for teaching at lower secondary schools and secondary schools. It builds on assistant practice and focuses on the deeper development of students' professional competences. This practice is carried out in schools similar to those used for assistant practice and includes 13 teaching hours under the supervision of a mentor teacher and a faculty subject-specific didacticians. At this stage, students assume greater responsibility for conducting physical education lessons and independently organizing individual parts of the teaching process. A limitation is the minimum group size of five students (the 13 semester hours effectively apply to the group), with one student delivering the practical output while the others observe the lesson through intentional observation. Due to the fact that the university semester does not align precisely with the academic semesters of primary or secondary schools, and the timing of the practice depends on the schools' academic calendars (e.g., autumn or spring breaks), each individual student typically delivers their practical output a maximum of twice. A key component of continuous subject-specific practice is the feedback from mentor teachers and supervisory seminars, which support students' reflection and self-reflection. Students analyse their experiences and learn to effectively plan and organize physical education lessons.

3. The contextual practice at the end of the master's program focusing on education represents the pinnacle of teaching practice. Students may select any primary or secondary school aligned with their study program and undertake their practice there for four weeks, encompassing complete preparation, organization, and instruction of physical education lessons. This phase provides students with the opportunity to fully assume the role of a teacher, not only in teaching but also in the organizational and administrative tasks associated with school operations. Activities include participation in pedagogical meetings, parent-teacher conferences, and collaboration with parents. Comprehensive practice offers students a holistic experience in teaching physical education, enabling them to fully integrate theoretical knowledge with practical experience. Collaboration with the mentor teacher is indispensable during this phase. The mentor assists with the preparation of individual teaching units in accordance with thematic blocks, provides immediate reflective feedback, and offers the faculty subject-specific didacticians an overall evaluation of the student's performance at the school.

Discussion

Teaching practice represents an indispensable component of teacher training at the Department of Physical Education and Sport, Faculty of Education, University of South Bohemia. Its primary aim is to develop students' professional competences, encompassing not only the mastery of theoretical knowledge but also its application in practice, the ability to organize and lead lessons, work with diverse groups of pupils, and reflect on their own teaching performance. The importance of these practices is affirmed by both students and mentor teachers involved in their implementation. The significance of teaching practice is regularly discussed at the Faculty of Education, not only during meetings of the Council of Subject Didacticians for Lower Secondary and Secondary Schools but also in presentations at the Pro Futuro conferences, with the 7th edition held on November 1, 2024. A clinical semester is also part of professional accreditation related to teaching practice.

The results of studies and questionnaire surveys indicate that teaching practice significantly contributes to the development of professional competences in future teachers. Students consistently report that their practice provided them with the opportunity to better understand the practical aspects of teaching, such as lesson planning, working with teaching aids, effectively managing the teaching process, and addressing unexpected pedagogical situations (Flemr et al., 2021; Spilková et al., 2015; Vališová & Kovaříková, 2021; Kratochvílová & Svojanovský, 2020; Ministry of Education, Youth, and Sports, 2024). In connection with teaching practice, the Standard of Quality for Professional Competences of Teaching Students at the University of South Bohemia in České Budějovice was developed (Nohavová & Žlábková, 2022), based on the Standard of Quality for Professional Competences of Teaching Students. According to Kratochvílová & Svojanovský (2020):

The Standard of Quality for Professional Competences of Teaching Students serves as a tool for comprehensive formative self-assessment and evaluation of the professional competences of teaching students (for primary and secondary schools) throughout their undergraduate professional preparation. Professional competences are understood as a set of professional knowledge, skills, attitudes, values, and personal characteristics. The purpose of the Standard is to support the professional development of students (future teachers) during their undergraduate preparation. It represents an initial standard preceding the future professional teacher standard and guides students, in collaboration with others (mentor teachers, academic staff, and peers), towards self-regulation of their professional growth (p. 3).

The authors of the revised version (Nohavová & Žlábková, 2022) recommend the following approach for teaching students to work with the Standard:

The Standard is designed to assess the state of professional competences necessary for lesson planning, implementation, and evaluation, as well as to monitor the development of professional competences during teaching practice. The Standard serves for the long-term evaluation of individual teaching practices as a whole (reflecting on which student competences were developed) and also for evaluation across semesters (reflecting on how student competences were developed throughout the entire study period). For the purpose of reflection, the Standard may be used multiple times during the course of study. The Standard can be utilized by subject-specific didacticians, practice supervisors, primary and secondary school teachers, and academic staff from the Department of Pedagogy and the Department of Psychology at the Faculty of Education, University of South Bohemia. It is not primarily intended for the evaluation of individual lessons (it does not serve as an observation form), but, as stated earlier, it is intended primarily for self-reflection and the reflection of practice as a whole. The Standard includes 26 quality criteria for professional competences necessary for lesson planning, implementation, and evaluation. These criteria are formulated from the perspective of the teaching student and are divided into five thematic areas: (1) Lesson Planning, (2) Conditions for Learning, (3) Support for Learning, (4) Feedback and Evaluation of Student Outcomes, and (5) Reflection on Teaching. At the end of the Standard, students have access to a self-reflection table for assessing the quality of their professional competences. In this table, students record whether their competences were developed during practice or whether they had the opportunity to develop their competences, as individual practices may focus on developing different competences. If students had the opportunity to develop their competences, they assess the level of development (A, B, or C) based on the Standard and, if applicable, provide an example from their practice illustrating how the competence was developed (p. 1–2).

During teaching practice, students face challenges that they do not encounter in an academic environment; they must adapt to different types of school settings, work with varying levels of physical fitness among pupils, and address potential reluctance toward physical activities. This process of adaptation is crucial for their professional growth as it teaches them flexibility and the ability to respond quickly to new situations. Teaching practice allows students to apply their theoretical knowledge more effectively. Physical education is not just about knowledge of physical activities and didactic approaches but also involves the ability to adapt to students' needs. During practice, students encounter a diverse range of pupils, from those who are highly physically fit and motivated to those with low levels of physical fitness or no interest in physical education classes. This diverse pedagogical context places high demands on future teachers but simultaneously fosters the development of individual approaches and differentiated teaching methods. One of the key elements of practice is reflection. The reflective model of education helps students analyses their performance, identify strengths and weaknesses, and plan their further professional development accordingly. This reflection occurs in several stages-during the practice itself, students have the opportunity to discuss their experiences with mentor teachers and faculty didacticians. Subsequently, in seminars focused on supervision and reflection, students analyse specific situations from their teaching, evaluate their decision-making processes, and explore areas for improvement. Reflection not only enhances self-regulation and critical thinking but also supports students' ability to adapt to different school conditions. Many students acknowledge that reflection helped them better understand their pupils' needs and respond to their specific requirements more effectively. The reflective process also leads to improved communication skills-students must analyse not only their pedagogical decisions but also their communication strategies with pupils, colleagues, and parents. Another challenge is working with the material conditions of schools, which can vary

significantly. Some schools have small gymnasiums or limited equipment, which forces students to find alternative teaching methods. However, this aspect of teaching practice is seen positively, as it teaches future teachers' creativity and flexibility, which are essential competences for their professional careers (Flemr, 2021; Kotlík & Jansa, 2017; Kursová, 2021; Kursová & Tlustý, 2024; Vališová & Kovaříková, 2021).

The results of supervisory interviews conducted during the reflective seminars of subject-specific practice at the Department of Physical Education and Sport, Faculty of Education, University of South Bohemia, confirm the increasing need for practice to be conducted in schools, followed by reflection. In these interviews, questions are grouped into thematic areas such as: What activities and situations did you find conducive to good collaboration with your mentor teacher? What surprised you about the practice, especially if it unfolded differently than you expected? Please indicate whether (and how) you were able to maintain students' attention during lessons. What organizational forms of teaching did you use? Did you use motivational methods in your teaching? If so, which ones? Were you able to develop your professional competences during the practice? Please indicate what you still need to learn. What key observations, insights, and impressions do you take away from the teaching experience for your future profession? After completing the comprehensive practice, students work with the Standard of Quality for Professional Competences of Teaching Students at the University of South Bohemia in České Budějovice. Students report that the practice helped them gain a real understanding of physical education teaching, taught them how to organize lessons effectively, and helped them develop skills such as motivating students to actively participate in physical education. These experiences are especially valuable in the context of the growing demands on the teaching profession, which requires a high level of flexibility, creativity, and the ability to respond to the individual needs of students.

In the future, it is essential for teaching practice to remain at the core of preparing future physical education teachers, while also continuing to evolve. This includes the integration of new pedagogical methods and technologies that can enhance the effectiveness of teaching and support an individualized approach to students. Emphasis on feedback and reflection should be maintained, as these elements are crucial for students' professional growth and their ability to become high-quality and innovative teachers.

Conclusion

Teaching practice at the Department of Physical Education and Sport, Faculty of Education, University of South Bohemia, is a key component in preparing future physical education teachers. By providing students with a comprehensive opportunity to connect theoretical knowledge with practical experience, it contributes to their professional growth and equips them with the skills necessary for the teaching profession. During these practices, students not only learn essential organizational and didactic skills but also develop the abilities needed to guide pupils, motivate them to engage in physical activities, and communicate effectively within the educational process. In this way, teaching practice becomes an indispensable tool for developing professional competences, encompassing not only subject-specific knowledge but also the ability to adapt to diverse educational conditions and the needs of individual pupils. Teaching practice at the Department of Physical Education and Sport supports innovative approaches to teaching physical education. Students are encouraged to utilize modern technologies during their practice, such as providing instructional videos to mentor teachers and pupils and assigning challenges as part of physical activity implementation. It can be concluded that subject-specific teaching practices fully align with modern trends in education and contribute to the professionalization of the teaching profession. The Department of Physical Education and Sport fully identifies with the teacher preparation concept Teacher Pro Futuro, which envisions a motivated, empathetic, and inspiring teacher-one who supports their pupils and fosters their well-rounded competences. This integrated approach to teacher preparation ensures that graduates of the Faculty of Education, University of South Bohemia, will be capable of delivering high-quality and competent physical education lessons, inspiring their pupils to pursue lifelong interest in physical activities, and contributing to the overall development of the educational process.

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PREFERENCES OF PHYSICAL EDUCATION TEACHERS IN TEACHING WINTER SEASONAL PHYSICAL ACTIVITIES

PREFERENCIE UČITEĽOV TELESNEJ A ŠPORTOVEJ VÝCHOVY VO VYUČOVANÍ ZIMNÝCH SEZÓNNYCH POHYBOVÝCH ČINNOSTÍ

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Abstract

The aim of the study was to investigate and highlight the preferences of physical and sport education teachers in teaching winter seasonal physical activities. The survey involved 653 primary school teachers who annually participate in teaching winter seasonal physical activities. To obtain the necessary information, we used a custom-designed questionnaire for primary school teachers, focusing on questions related to favourite winter sports, preferred forms of organizing winter seasonal physical activities, and materials used during these activities. Through statistical analysis (Chi-square), we found a gender difference in the preferred form of participation in winter seasonal physical activities. On the basis of the obtained results, we can state that most of the primary school teachers, 86.68%, who are involved in teaching winter seasonal physical activities prefer downhill skiing in their free time and are of the same opinion, that ski training is popular among pupils and they like to participate in ski training organized by the school This study was conducted within the KEGA grant task 032UMB-4/2022 Innovative teaching materials for teachers of physical and sport education in primary schools with a focus on winter seasonal physical activities.

Keywords: physical education; teacher; primary school; winter seasonal physical activities

Súhrn

Cieľom štúdie bolo zistiť a poukázať na preferencie učiteľov telesnej a športovej výchovy vo vyučovaní zimných sezónnych pohybových činností. Prieskumu sa zúčastnilo 653 učiteľov základných škôl, ktorí sa každoročne podieľajú na vyučovaní zimných sezónnych pohybových činností. K získaniu potrebných informácií sme použili nami vytvorený dotazník pre učiteľov základných škôl, ktorý bol zameraný na otázky súvisiace s obľúbeným zimným športom, uprednostnenou formou organizovania zimným sezónnych pohybových činností a využívaným materiálom počas zimných sezónnych pohybových činností. Štatistickou analýzou (Chí-kvadrát) sme zistili, že z hľadiska pohlavia sa objavuje rozdiel v preferovanej forme účasti na zimných sezónnych pohybových činnostiach. Na základe získaných výsledkov môžeme konštatovať, že najviac učiteľov základných škôl a to až 86,68 %, ktorí sa podieľajú na vyučovaní zimných sezónnych pohybových činností preferuje vo svojom voľnom čase zjazdové lyžovanie a zároveň sú toho názoru, že lyžiarske výcviky sú u žiakov obľúbené a radi sa zúčastňujú lyžiarskych výcvikov organizovaných školou Táto štúdia bola riešená v rámci grantovej úlohy KEGA 032UMB-4/2022 Inovatívne učebné materiály pre učiteľov telesnej a športovej výchovy na základných školách so zameraním na zimné sezónne pohybové činností.

Kľúčové slová: telesná a športová výchova; učiteľ; základná škola; zimné sezónne pohybové činností

Introduction

Winter seasonal physical activities are within the National Educational Programme included in the thematic unit of Seasonal Physical Activities, which is part of the core curriculum for the subject

of physical education in primary schools. Among other winter sports, alpine skiing is also included. As Michal et al. (2019) point out, alpine skiing is a very popular winter sport due to the variety it offers. It is a sport enjoyed by various age groups as part of active leisure time. We align with Kippu's (2011) view, which suggests that skiing is suitable for all age groups. We also agree with Blahútová (2017), who states that skiing is a sport that can be enjoyed by children from an early age to older individuals, not only at a recreational level but also at a performance level. Although alpine skiing is one of the most beautiful winter sports, it is the responsibility of physical education teachers to teach students how to ski and to help them develop a positive relationship with skiing (Michal & Kunkela, 2014). According to Michal (2001), alpine skiing is the foundation of the physical education curriculum in the second stage of primary schools because, in addition to developing skiing skills, it also shapes an individual's personality. Several authors have dealt with the topic of winter seasonal physical activities, such as Adamčák & Kozaňáková (2013), Dobay (2009), Novotná & Vladovičová (2011), and many others. In addition to Slovak authors, various international authors have also explored the issue of winter seasonal activities. Hrůšová (2018), whose research was conducted at T. G. Masaryk Primary School in Vimperk (Czech Republic), focused on methodological approaches to teaching alpine skiing and incorporating the skiing alphabet into alpine skiing lessons. Dosek (2016) examined alpine skiing instruction in Hungary, where alpine skiing is not included in the curriculum. Another contributor to the study of skiing is Demeter & Ozsváth (2016), who primarily focus on the development of teaching aids and materials for ski instructors.

Methodology

The survey aimed at identifying and highlighting the preferences of physical education teachers in teaching winter seasonal physical activities was conducted between March 2023 and March 2024. The primary research method used to collect the necessary information was a custom-designed questionnaire consisting of 37 questions, administered online. The questions focused on assessing the attitudes of physical education teachers toward winter sports, their opinions on the popularity of skiing courses among students, and also their views on state subsidies and the possibility of students attending ski courses multiple times during their schooling. The research sample consisted of 653 primary school teachers who annually participate in organizing winter seasonal physical activities. Descriptive statistics and testing of hypotheses were carried out using IBM® SPSS® Statistics v29 software. To determine the significance of differences between the examined variables, we applied the asymptotic version of the Chi-square test of independence for r x s contingency tables in the inferential data analysis. In cases where the conditions for the asymptotic version were not met, we employed the exact Fisher-Freeman-Halton test, calculated using the Monte Carlo method. Cramér's V coefficient was used as the effect size measure, with the following interpretation based on minimum threshold values: V = 0.10 – small effect, V = 0.30 – medium effect, and V = 0.50 – large effect. The probability of a Type I error was set at $\alpha = 0.05$ and $\alpha = 0.01$.

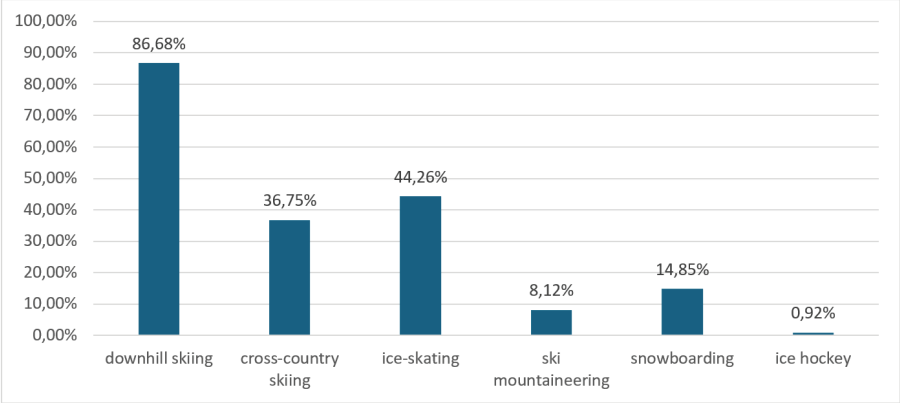
Results

In our survey, we first focused on which winter sports physical education teachers most frequently prefer during their free time. As shown in Figure 1, our respondents predominantly engage in downhill skiing in their free time (86.68%). The second most common response was that they rather practice ice skating in their free time, counting 44.26% of respondents. The third most frequently chosen winter sport was cross-country skiing, favoured by 36.75% of respondents.

In addition to the question which winter sports are preferred by our respondents, i.e. teachers of physical and sports education, or those teachers who have the necessary education to be able to act as ski instructors, we were interested in how the students perceive winter sports from their point of view, that is, whether they are popular or not. We evaluated this question based on the location of the school, that is, whether the school is situated in an urban or rural area. Depending on the school's location, we asked teachers for their opinions on how they believe students perceive or enjoy winter sports. As seen in Figure 2 and Table 1, the majority of respondents (58.81%, n=384) believe that students view winter sports very positively or positively (34.76%, n=227). It is encouraging to note that only a minimal number of respondents think that students perceive winter sports negatively or very negatively. Some teachers feel that students are indifferent, viewing winter sports as neither positive nor negative (5.91%, n=38). In this hypothesis, we assumed that there are statistically significant

differences at the significance level $p < 0.05$ between the school's location and teachers' views on how students perceive or enjoy winter courses. Based on our calculations, we can conclude that from the perspective of the school's location (urban-rural), there is a statistically significant difference in the popularity of winter skiing courses among students ($F = 8.903$, $p < 0.05$, $V = 0.123$, $p < 0.05$).

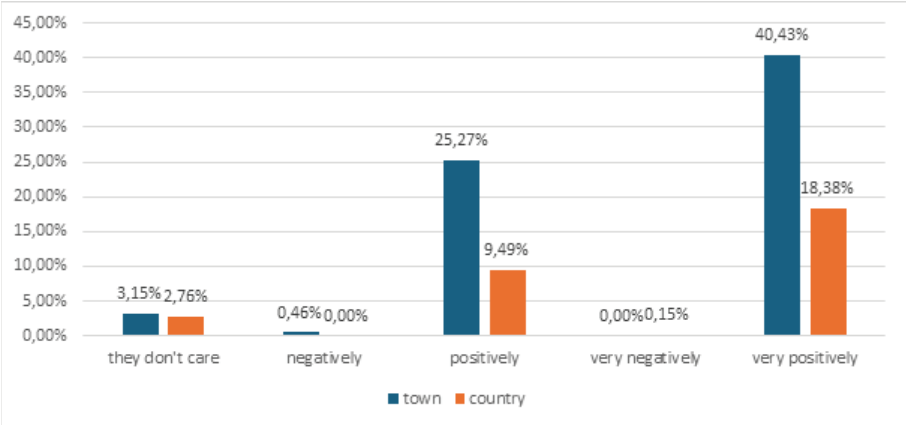
Obrázok 1./ Figure 1.
Preferovaný zimný šport respondentmi./ Winter Sports preferred by respondents.



Tabuľka 1./ Table 1.
Obľúbenosť zimných športov u žiakov z pohľadu učiteľov podľa sídla školy./ Popularity of Winter Sports among Students from the Teachers' Perspective Based on the location of school.

School location ⋆ In your opinion, how do students perceive and like winter courses							
		In your opinion, how do students perceive - do they like winter courses					
		they don't care	negatively	positively	very negatively	very positively	Total
Location of school	town	20	3	165	0	264	452
	country	18	0	62	1	120	201
Total		38	3	227	1	384	653

Obrázok 2./ Figure 2.
Obľúbenosť zimných športov u žiakov z pohľadu učiteľov podľa sídla školy./ Popularity of winter sports among pupils from the point of view of teachers according to school location.



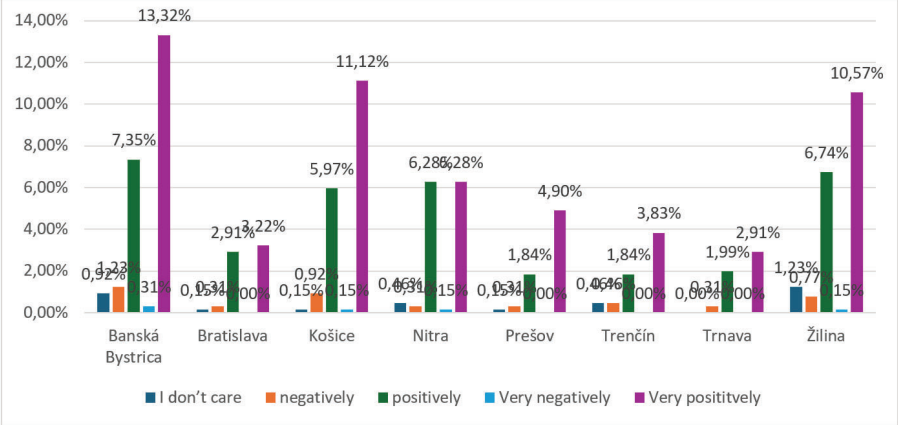
In the context of teachers' preferences for winter sports, we also wanted to determine how teachers evaluate the state funding for winter sports. We analysed this question based on the school's location, specifically the region in which the school is situated, as we conducted the survey across all of Slovakia. As presented in Figure 3 and Table 2, 56.20% (n=367) of respondents evaluate the state funding very

positively. We are also pleased that the second most common response was that they assess the state funding positively, chosen by 34.92% (n=228) of respondents. Among our respondents, 3.52% (n=23) of teachers are indifferent about whether the school receives state funding for ski course, while some expressed that they evaluate this funding negatively (4.59%, n=30), and five respondents rated it very negatively.

Tabuľka 2./ Table 2.
Hodnotenie štátneho príspevku učiteľmi na zimné kurzy podľa kraja kde sídli škola./ Evaluation of the state contribution by teachers for winter courses according to the region where the school is located.

Self-governing region where the school is located ⋆ How do you rate the state subsidy for winter courses							
		How do you evaluate the state subsidy for winter courses					
		I don't care	Negatively	Positively	Very negatively	Very posititvely	Total
Self-governing region where the school is located	Banská Bystrica	6	8	48	2	87	151
	Bratislava	1	2	19	0	21	43
	Košice	1	6	39	1	73	120
	Nitra	3	2	41	1	41	88
	Prešov	1	2	12	0	32	47
	Trenčín	3	3	12	0	25	43
	Trnava	0	2	13	0	19	34
	Žilina	8	5	44	1	69	127
Total		23	30	228	5	367	653

Obrázok 3./ Figure 3.
Hodnotenie štátneho príspevku učiteľmi na zimné kurzy podľa kraja kde sídli škola./ Evaluation of the state contribution by teachers for winter courses according to the region where the school is located.



When we look more closely at the respondents' answers based on the school's location, specifically the region where the school is situated, we see that the highest number of respondents was from the Banská Bystrica Region, where the largest proportion expressed a very positive evaluation of state funding. Out of the total, 23.12% of respondents were from the Banská Bystrica Region, and more than half of them (57.62%, n=87) evaluated the state funding very positively. The second most represented region was the Žilina Region, with 127 (19.45%) respondents participating in the survey from this area. Respondents from this region also mostly rated the state funding very positively (54.33%, n=69) or positively (34.65%, n=44). The Košice Region had 120 respondents, accounting for 18.38% of the total number, and they also mostly rated the state funding very positively or positively. Respondents from the other regions of Slovakia generally evaluated the state funding for ski course as very positive or positive, with only a few expressing negative opinions, which we consider a reassuring finding. In terms of the region where the school is located and the evaluation of state funding for ski course, we did not find a statistically significant difference ($F = 22.610$, $p > 0.05$, $V = 0.094$, $p > 0.05$). Therefore,

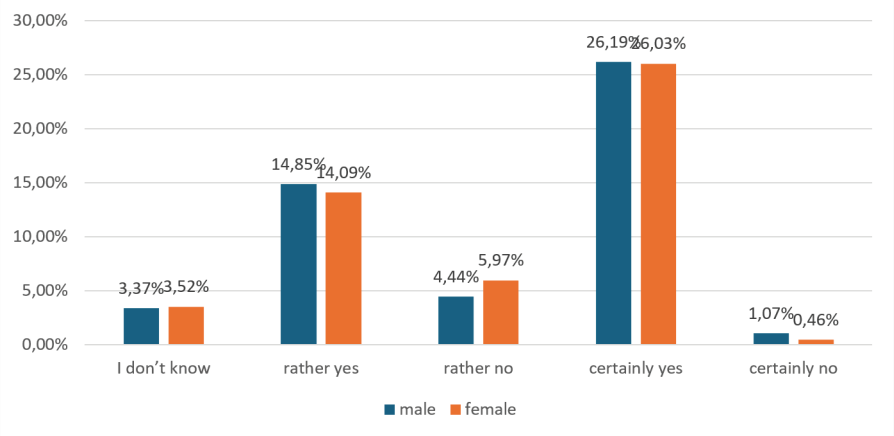
we reject the hypothesis where we presumed that there are statistically significant differences in the evaluation of state funding for winter courses based on the school's location (region).

At the same time, we wanted to find out what the teachers' opinion is about students taking ski course more than once in one year during their studies. We evaluated this question from the perspective of the teachers' gender. Based on the results presented in table 3 and figure 4, we can state that the teachers mostly expressed themselves positively. Almost the same number of male teachers (n=171,52.45%) and female teachers (n=170, 51.99%) are inclined to the possibility that they would definitely like the pupils to have ski course more times during their studies. Also, 29.75% of male teachers and 28.13% of female teachers choose the option of answering "rather yes", that is, a positive statement to a specific question. A total of 45 respondents gave their opinion for the answer option "I don't know", which represents 6.89% of the total number of respondents. Among the respondents there are also those who do not identify with the possibility of students completing ski course more than once during their studies, and the answer "rather not" was chosen by 10.41% of respondents and "definitely not" by 0.15% of respondents. We assess positively that most respondents can imagine and would be in favour of students having ski course more than once during their studies. We assumed that, from the point of view of gender, there is a statistically significant difference in terms of the inclusion of more winter courses at schools. Based on the results $F = 3.165$, $p > 0.05$, $V = 0.070$, $p > 0.05$, we reject the hypothesis.

Tabuľka 3./ Table 3.
Názory učiteľov na absolvovanie lyžiarskeho kurzu viackrát počas štúdia./ Teachers' opinions on taking a skiing course more than once during their studies.

Gender ⋆ Would you like the students to have the winter course several times during their studies at school							
		You would like the students to have the winter course several times during their studies at school					
		I don't know	rather yes	rather no	certainly yes	certainly no	Total
Gender	male	22	97	29	171	7	326
	female	23	92	39	170	3	327
Total		45	189	68	341	10	653

Obrázok 4./ Figure 4.
Názory učiteľov na absolvovanie lyžiarskeho kurzu viackrát počas štúdia./ Teachers' opinions on taking a ski course more than once during their studies.



Discussion

Just as our respondents prefer downhill skiing in their free time, several authors, such as Reichert & Musil (2008), Michal (2016), and Straňavská & Michal (2022), have also concluded that downhill skiing is among the most popular winter activities for leisure. Just as the overwhelming majority

of our respondents expressed that students enjoy winter sports, similar results have been reported by several authors who also surveyed students about their preferences for winter sports. Straňavská (2019) states in her study that a positive relationship toward winter sports prevails among students in the 7th to 9th grades in the Žilina region. Authors Kresta & Cihlář (2011) and Mlynařik (2012), who conducted research in the Czech Republic, also found that winter sports are popular among students. In contrast, Dosek (2016), who conducted research in Hungary, found that alpine skiing is not among the most popular sports activities. In Germany, alpine skiing is much more widespread and popular compared to Hungary (Enzinger, 2008). Pieberl (2018) examined the aspect of integrating skiing into the school system in Austria and concluded that skiing is very popular among the Austrian population. In relation to the state contribution, Straňavská & Michal (2022) in their study dealt specifically with the question of whether pupils would have received ski training if the state had not contributed. They concluded that while interest among students would decrease, nearly 40% of students would still definitely participate in the ski course. We believe that since several authors, either in Slovakia or abroad, have found pupils' interest in winter sports, that pupils would also show interest in participating in ski course several times during their studies. Among others, Kovács (2020), whose research was carried out in the city of Szombathely, found that the majority of pupils who participated in ski course would like to participate in the training again.

A limitation of our study is that we were not able to reach all teachers involved in the provision of winter seasonal movement activities, or that only primary school teachers were included in our research.

Conclusion

The aim of this contribution was to find out the preferences of physical and sports education teachers in teaching winter seasonal physical activities. In conclusion, we can state that among the most popular winter sports that teachers prefer in their free time is clearly downhill (alpine) skiing, which almost 87% of respondents do in their free time. In addition to downhill skiing, ice skating and cross-country skiing are among the most popular winter sports. We found out that teachers are of the opinion that ski training is popular with pupils and they like to participate in ski training organized by the school. Considering the state contribution, which is worth €150 per pupil, we came to the conclusion in our survey that teachers evaluate this contribution positively and at the same time they would welcome if pupils at their schools had the opportunity to take ski training more than once during their studies.

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INFRADIÁNNE OSOBITOSTI HEMATOLOGICKEJ VARIÁCIE ŠPORTOVKÝŇ

INFRADIAN SPECIFICITIES OF HAEMATOLOGICAL VARIATION IN FEMALE ATHLETES

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Abstract

The aim of the present research was to define the infradian peculiarities of hematological variation in female athletes. The research was conducted in the form of a case study on four female endurance elite athletes (18-24 years old). Each female athlete underwent 4-5 tests, which were performed on each of them individually according to the phases of the menstrual cycle. The testing was carried out chronologically in the following time sequence: T1 10-8 days before menstruation (hereafter M), T2 4-3 days before M, T3 during M, T4 1-2 days after M, T5 9-10 days after M. All testing was carried out under the same conditions and according to the WADA rules. Collections were performed at 8:00 h ± 30 min fasting. The results demonstrated the fact that there was a significant hormonal response in female athletes who were menstruating and, on the contrary, there was only moderate hormone variability in female athletes who were not menstruating during the study. The results of the research demonstrate that more pronounced hematological variability was noted in female athletes with menstruation. Based on the results, it can be concluded that strict recording of the phase of the menstrual cycle should be considered when assessing the results in the biological passport of female athletes.

Keywords: infradian variation; hemoglobin; reticulocytes; hormones

Súhrn

Cieľom predloženého výskumu bolo zadefinovať infradiánne osobitosti hematologickej variácie športovkýň. Výskum bol realizovaný formou kazuistiky na štyroch vytrvalostných vrcholových športovkyniach (18-24 rokov). Každá športovkyňa absolvovala 4 – 5 testovaní, ktoré sa realizovali u každej z nich individuálne podľa fáz menštruačného cyklu. Testovania prebiehali chronologicky v časovom slede: T^1 10 – 8 dní pred menštruáciou (ďalej M), T^2 4 – 3 dni pred M, T^3 počas M, T^4 1 – 2dni po M, T^5 9 – 10 dní po M. Všetky testovania boli realizované za rovnakých podmienok a podľa pravidiel WADA. Odbery boli realizované o 8:00 hod. ± 30min nalačno. Vo výsledkoch sa preukázal fakt, že u športovkýň, ktoré mali menštruáciu bola zaznamenaná výrazná hormonálna odozva a naopak u športovkýň, ktoré počas výskumu menštruáciu nemali, bola variabilita hormónov len mierna. Výsledky výskumu preukazujú, že u športovkýň s menštruáciou bola zaznamenaná výraznejšie hematologických variabilita. Na základe výsledkov možno konštatovať, že pri posudzovaní výsledkov v biologickom pase športovkýň by sa mala zvážiť striktná evidencia fázy menštruačného cyklu.

Kľúčové slová: infradiánna variácia; hemoglobín; retikulocyty; hormóny

Úvod

Športová príprava ako aj boj proti dopingu prechádzajú neustále inováciami a vývojom. Hematologické ukazovatele sú predmetom záujmu výskumov v športu už niekoľko desaťročí a to z rôznych dôvodov, pričom ani súčasná úroveň poznania nedospela k jednoznačným záverom. Aktuálne sa zvý-

šená pozornosť venuje tejto oblasti najmä v dôsledku aplikácie hematologického modulu využívaného pri interpretácii výsledkov v biologickom pase športovca. Athlete Biological Passport – biologický pas športovca (ďalej ABP) bol prvýkrát oficiálne predstavený v roku 2009 a obsahoval výlučne hematologický modul (WADA, 2017). Tento hematologický modul zhromažďuje informácie o jednotlivých krvných parametroch, ktorých hodnota môže signalizovať požitie zakázaných látok alebo používanie zakázaných metód na zlepšenie prenosu, či dodávania kyslíka, vrátane použitia akejkoľvek formy manipulácie s krvou či aplikáciu krvnej transfúzie (Pupiš, 2021). Pri interpretácii výsledkov sa posudzovatelia zameriavajú najmä na hladinu hemoglobínu, retikulocytov a OFF-score. V tejto súvislosti treba pripomenúť, že ide o nepriamy ukazovateľ možnej aplikácie krvného dopingu. Viaceré prípady však ukazujú, že v tejto oblasti ostáva stále veľké množstvo nejasností (čo potvrdzujú prípady Romana Kreuzigera, Mateja Tótha, Claudie Pechstain atď.), preto by sme chceli v nadväznosti na tieto skúsenosti rozšíriť poznatky o infradiánnej variácii vybraných hematologických ukazovateľov v športe. Mullen et al. (2020) síce vo svojom výskume „zľahčujú“ potenciálny vplyv menštruácie na výsledky v ABP, avšak 2 „rizikové“ výsledky zo 17 v ich výskume nemožno opomenúť. Podobne nemožno opomenúť infradiánne cykly u mužov, ako aj ich potenciálny vplyv na hematologické ukazovatele, keďže už Celec et al. (2003, 2007) popisujú infradiánnu hormonálnu odozvu (podobnú ženskému menštruačnému cyklu) aj u mužov. V zmysle tohto je možné očakávať vzťah medzi hormonálnou odozvou a hladinou hemoglobínu, či podielom retikulocytov. Bachman et. al. (2014) a Cervi & Balitsky (2017) popisujú vzťah medzi hladinou testosterónu a hemoglobínom, ako aj retikulocytmi. V kontexte týchto súvislostí je možné očakávať pozitívny vzťah medzi hladinou testosterónu (najmä u mužov) smerom k hemoglobínu, retikulocytov, čo by malo logicky súvisieť aj produkciou erytropoetínu a na druhej strane je možné očakávať negatívnu koreláciu vo vzťahu s kortizolom (Brownlee et al., 2005). V zmysle výraznejšej hormonálnej odozvy žien a to najmä vo vzťahu k menštruačnému cyklu, možno očakávať určité hematologické zmeny, ktoré by za určitých okolností mohli ovplyvniť aj výsledky v biologickom pase športovkyne. V rámci projektu VEGA1/0707/22 (Špecifiká variability hematologických ukazovateľov sledovaných v biologickom pase športovca) sme sa zamerali na posúdenie potenciálneho vplyvu menštruácie na výsledky v ABP.

Metodika

Výskum bol realizovaný formou kazuistiky na štyroch vytrvalostných vrcholových športovkyniach (18-24 rokov), ktoré sa venujú atletickej chôdzi, resp. biatlonu. Každá športovkyňa absolvovala 4 – 5 testovaní, ktoré sa realizovali u každej z nich individuálne na základe menštruačného cyklu. Testovania prebiehali chronologicky v časovom slede: T^1 10 – 8 dní pred menštruáciou (ďalej M), T^2 4 – 3 dni pred M, T^3 počas M, T^4 1 – 2dni po M, T^5 9 – 10 dní po M. Všetky testovania boli realizované za rovnakých podmienok a podľa pravidiel WADA. Odbery boli realizované o 8:00 hod. ± 30min nalačno. Porovnávaná bola hladina hemoglobínu, retikulocytov, OFF-skóre (Hb.10-60x($\sqrt{}$retikulocyty %)), erytropoetínu, progesterónu a estradiolu športovkýň. Využité boli vysoko spoľahlivé analyzátory Mindray BC 6200, resp. Mindray BC 6000.

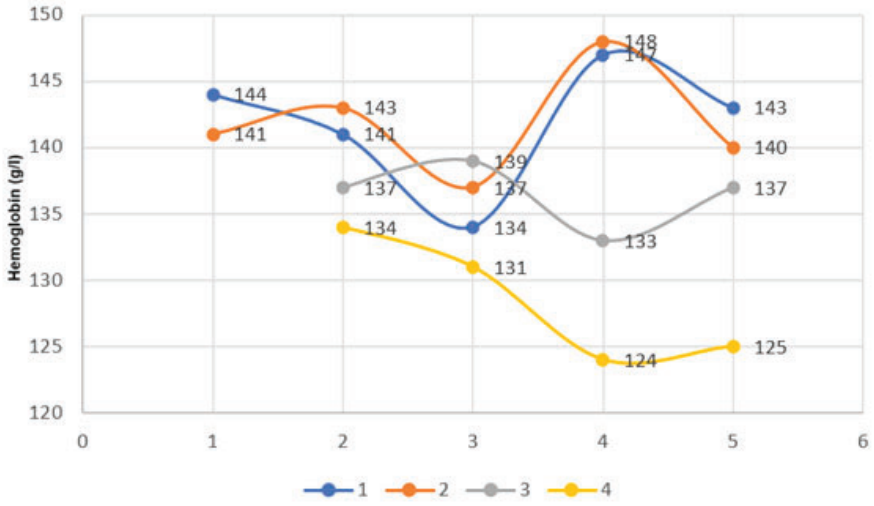
Výsledky výskumu

Výsledky výskumu ukazujú, že menštruačný cyklus môže u niektorých športovkýň zásadne ovplyvniť údaje, ktoré sú sledované v biologickom pase športovca. Ako vidíme na obrázku 1, u športovkýň 1,2 bol zaznamenaný maximálny rozdiel v hladine hemoglobínu medzi meraním počas menštruácie (odber T^3) kedy bola namerané hladina 134, resp. 137 $g.l^{-1}$ a odberom po menštruácii (T^4), kedy boli namerané hodnoty 147, resp. 148 $g.l^{-1}$, čo znamená, že bola zaznamenaná zmena o 13, resp. 11 $g.l^{-1}$.

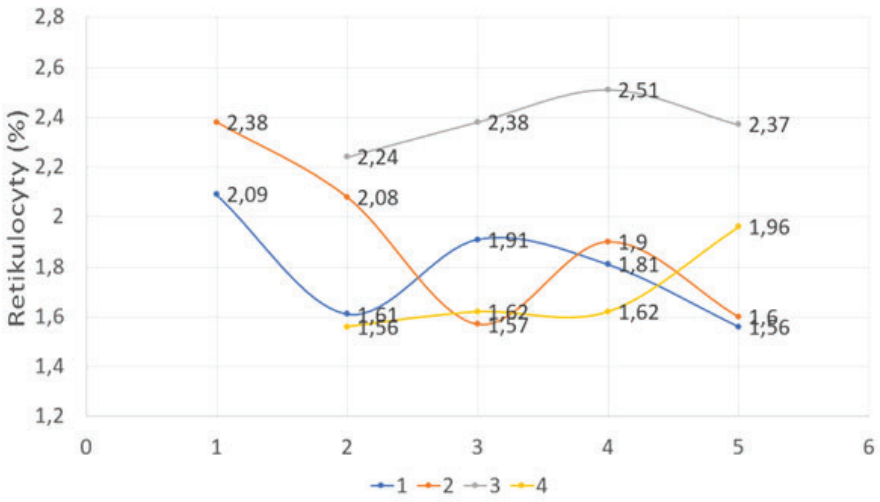
V prípade športovkýň 1,2 ide o športovkyne, ktoré mali menštruáciu. Športovkyne 3,4 nemali menštruáciu, teda v ich prípade išlo o očakávaný priebeh menštruácie, podľa predchádzajúceho cyklu. V ich prípade bol zaznamenaný opačný trend, keďže u nich v období po očakávanej menštruácii (ktorú napokon nemali) došlo k poklesu hladiny hemoglobínu.

Pri ďalšom sledovanom ukazovateli a to retikulocytoch sme nezaznamenali jednoznačný trend, ale ako vidíme na obrázku 2, u športovkýň 1,2 sme opäť zaznamenali vyššiu variáciu.

Obrázok 1./ Figure 1.
Porovnanie hladiny hemoglobínu (1=T¹ 10 – 8 dní pred M, 2=T² 4 – 3 dni pred M, 3=T³ počas M, 4=T⁴ 1 – 2dni po M, 5=T⁵ 9 – 10 dní po M)./ Comparison of hemoglobin levels (1=T1 10-8 days before M, 2=T2 4-3 days before M, 3=T3 during M, 4=T4 1-2 days after M, 5=T5 9-10 days after M).



Obrázok 2./ Figure 2.
Porovnanie podielu retikulocytov (1=T¹ 10 – 8 dní pred M, 2=T² 4 – 3 dni pred M, 3=T³ počas M, 4=T⁴ 1 – 2dni po M, 5=T⁵ 9 – 10 dní po M)./ Comparison of the proportion of reticulocytes (1=T1 10 - 8 days before M, 2=T2 4 - 3 days before M, 3=T3 during M, 4=T4 1 - 2 days after M, 5=T5 9 - 10 days after M).



Obe mali maximum retikulocytov pri T1 a to 2,38, resp. 2,09 %, pričom ich najnižšie hodnoty retikulocytov boli 1,57, resp. 1,56 %, avšak v iných fázach menštruačného cyklu. Teda v ich prípade išlo o zmenu o 0,81, resp. 0,53 percentuálneho bodu. U športovkýň 3,4, ktoré nemali menštruáciu boli zmeny menšie a to 0,4, resp. len 0,27 percentuálneho bodu.

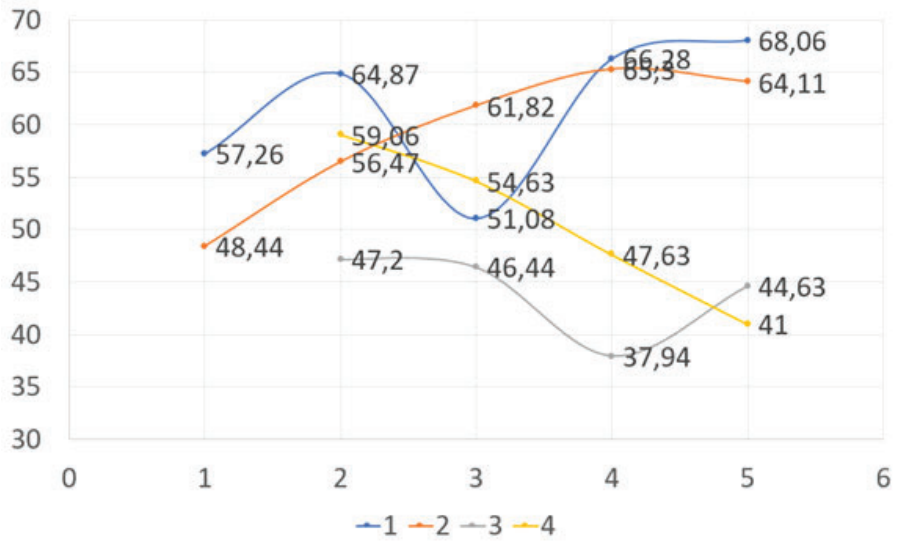
V prípade OFF- skóre sme rovnako nezaznamenali jednoznačný trend. Na obrázku 3 vidíme, že zmeny skóre dosahovali 10-18.

Okrem týchto troch ukazovateľov, ktoré sa sledujú v biologickom pase športovca sme na dokreslenie sledovali aj hormonálnu odozvu, kde sme sa zamerali na erytropoetín, estradiol a progesterón. Pri hormonálnych zmenách môžeme konštatovať, že športovkyne 1,2 (ktoré mali menštruáciu) mali

výraznejšiu hormonálnu variáciu oproti športovkyniam 3,4 (ktoré nemali menštruáciu). Pri estradiole bol u športovkýň 1,2 rozdiel 1751,6 pmol.l^{-1} (min. 149 max. 1900,6 pmol.l^{-1}), resp. 1435,46 pmol.l^{-1} (min. 83,84 max. 1519,3 pmol.l^{-1}), kým u športovkýň 3,4 bol rozdiel len 191,7 pmol.l^{-1} (min. 191,9 max. 383,6 pmol.l^{-1}), resp. 117,17 pmol.l^{-1} (min. 57,03 max. 174,2 pmol.l^{-1}).

Pri progestróne bol u športovkýň 1,2 rozdiel 20,98 nmol.l^{-1} (min. 2,82 max. 23,8 nmol.l^{-1}), resp. 2,38 nmol.l^{-1} (min. 1,49 max. 3,87 nmol.l^{-1}), kým u športovkýň 3,4 bol rozdiel len 0,39 nmol.l^{-1} (min. 1,51 max. 1,9 nmol.l^{-1}), resp. 0,27 nmol.l^{-1} (min. 0,84 max. 1,11 nmol.l^{-1}). Pri progestróne tiež môžeme konštatovať výraznejšiu variáciu u športovkýň s menštruáciou.

Obrázok 3./ Figure 3.
Porovnanie zmien OFF-skóre (1=T^1 10 – 8 dní pred M, 2=T^2 4 – 3 dni pred M, 3=T^3 počas M, 4=T^4 1 – 2dni po M, 5=T^5 9 – 10 dní po M)./ Comparison of OFF-score changes (1=T1 10 - 8 days before M, 2=T2 4 - 3 days before M, 3=T3 during M, 4=T4 1 - 2 days after M, 5=T5 9 - 10 days after M).



Podobný trend rozdielov medzi športovkyňami s menštruáciou a športovkyňami, ktoré menštruáciu nemali vidíme aj pri erytropoetíne, keďže u športovkýň 1,2 bol rozdiel 9,1 mlU.ml^{-1} (min. 10,7 max. 19,8 mlU.ml^{-1}), resp. 7,1 mlU.ml^{-1} (min. 11,5 max. 18,6 mlU.ml^{-1}), kým u športovkýň 3,4 bol rozdiel len 1,8 mlU.ml^{-1} (min. 6,21 max. 8,01 mlU.ml^{-1}), resp. 5,6 mlU.ml^{-1} (min. 12,5 max. 18,1 mlU.ml^{-1}). Pri erytropoetíne tiež môžeme konštatovať výraznejšiu variáciu u športovkýň s menštruáciou.

Diskusia

Výsledky výskumu naznačujú dve pozoruhodné zistenia, ktoré je samozrejme potrebné overiť na širšej skupine športovkýň. Hoci Mullen et al. (2020) naznačujú, že vplyv menštruácie na ukazovatele monitorované v ABP je zanedbateľný, naše zistenia naopak ukazujú, že najmä u športovkýň s menštruáciou sú hematologické zmeny v priebehu menštruačného cyklu na úrovni, ktoré môže signalizovať falošnú pozitivitu z pohľadu interpretácie dát v ABP.

Pri hemoglobíne počíta ABP s rozptylom hladiny cca 28-29 g.l^{-1}, teda od prípadnej stredovej hodnoty by zmena nemala presiahnuť 14 g.l^{-1}. Samozrejme, hodnoty hemoglobínu sa môžu meniť v celom predikovanom rozsahu a tak môžu byť bližšie k dolnej, alebo hornej hranici. V takom prípade aj nami zaznamenané zmeny 11 a 13 g.l^{-1} môžu zvýrazniť možnosť falošnej pozitivity.

Podobne ako pri hemoglobíne, tak aj pri retikulocytoch nepôsobia zmien počas menštruačného cyklu až tak výrazne, avšak ak si uvedomíme, maximálny predikovaný rozptyl je na úrovni jedného percentuálneho bodu, teda pol percentuálneho bodu od stredu, tak rozdiely o 0,53, resp. 0,81 percentuálneho bodu u športovkýň 1,2 nie sú z pohľadu ABP vôbec zanedbateľné.

Pri OFF-skóre počíta ABP z rozptylom skóre do 45, teda od prípadnej stredovej hodnoty by zmena nemala presiahnuť 22. Samozrejme, hodnoty OFF-skóre sa môžu meniť v celom predikovanom rozsahu

a tak môžu byť bližšie k dolnej, alebo hornej hranici. V takom prípade aj nami zaznamenané zmeny skóre viac ako 10-18 môžu zvýrazniť možnosť falošnej pozitivity.

Z výsledkov výskumu vyplýva, že hematologická variácia je výraznejšia u športovkýň, ktoré majú menštruáciu. U týchto športovkýň sa pochopiteľne prejavila aj vyššia hormonálna variácia. Na základe týchto zistení je nutné konštatovať, že menštruačný cyklus u športovkýň by mohol v niektorých prípadoch zásadne ovplyvniť výsledky v ABP a to až tak, že by to mohlo signalizovať falošnú pozitivitu. V súlade so zisteniami Celeca et al. (2003, 2010) je potrebné uvažovať o podobnom vplyve aj na mužský organizmus. Celkovo možno vnímať biologický pas športovca ako vhodný nástroj naznačujúci porušenie antidopingových pravidiel, avšak v súlade s viacerými autormi treba veľmi citlivo pristupovať k interpretácii záverov s dôrazom na potenciálne limity (Banfi 2011, Banfi et al., 2011, Lippi et al., 2012).

Závery

Biologický pas športovca je vhodný ukazovateľ na identifikáciu potenciálnej indikácie krvného dopingu, avšak ako ukazujú mnohé prípady z posledných rokov, pomerne často dochádza k prejavom falošnej pozitivity, ktorú musia športovci neraz zdĺhavo a náročne odôvodňovať. Hoci je jednoznačné, že ABP je relatívne spoľahlivý, aj výsledky nášho výskumu naznačujú potenciálne riziká nesprávnej interpretácie dát. Dáta, ktoré boli analyzované vo vzťahu k menštruačnému cyklu naznačujú, že infradiánna variácia, hlavne u športovkýň s pravidelnou menštruáciou môže zásadne vplývať na hematologické parametre monitorované v biologickom pase športovkýň. Zaznamenané rozdiely v prípade hemoglobínu až na úrovni 13, resp. 11 $g.l^{-1}$ a v prípade retikulocytov o 0,81, resp. 0,53 percentuálneho bodu v prípade športovkýň, ktoré mali menštruáciu ukazujú významné rozdiely z pohľadu interpretácie výsledkov v ABP. Hoci interpretáciu výsledkov limituje početnosť výskumnej vzorky, na základe našich zistení odporúčame, aby boli v biologickom pase jednoznačne zaznamenávané fázy menštruačného cyklu, pričom pokladáme za nevyhnutné, aby bol vplyv menštruačného cyklu naďalej monitorovaný na širšej skupine športovkýň, keďže cieľom WADA a aplikácie biologického pasu športovca je čistý šport a nie vystavenie riziku falošného obvinenia nevinných športovcov. Z uvedeného vyplýva, že ABP je vhodným nástrojom pre boj proti dopingu, avšak je nevyhnutné prihliadať na jeho limity, ktoré treba naďalej skúmať.

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Do seznamu se zařazují všechny práce citované v textu, na práce uvedené v seznamu literatury musí být v textu odkaz. Pro citaci příspěvku uveřejněného v tomto časopisu se používá plných názvů. U *historických textů* je požadována přesná citace (př.: poznámka pod čarou).

(g) *Adresa prvního autora* (kontaktní adresa) se uvádí jako poslední údaj v příspěvku. Obsahuje plné jméno, příjmení, tituly, přesnou adresu s PSČ, číslo telefonu, faxu, příp. e-mail.

Technická úprava rukopisu

Příspěvky jsou přijímány ve formě zpracované textovým editorem, nejlépe Microsoft Word (popř. editorem s ním plně kompatibilním) při dodržení následujícího nastavení a úprav:
– formát A4
– všechny okraje 2,5 cm
– název práce (česky, resp. slovensky a anglicky) 11, ostatní 10
– písmo pro název práce (česky, resp. slovensky a anglicky) Arial pro ostatní text Times New Roman
– řádkování 1,0
– odsazení prvního řádku odstavce 0,5 cm

Název práce, souhrn a klíčová slova (česky, resp. slovensky a anglicky), jméno autora (autorů). **Ne velkými písmeny**.
– text a přílohy (tj. tabulky, grafy apod.) musí být zpracovány s využitím jednotek SI (ČSN 01 1300).
– zkratky se používají pouze pokud se jedná o mezinárodně platnou symboliku. Prvně použitou zkratku je nutno v závorce vysvětlit. V názvu práce není vhodné zkratek používat.

– latinské názvy se píší kurzívou, netučné, a to i v názvu příspěvku. Na tabulky, grafy atd. musí být v textu odkazy. Předkládaný rukopis vědecké práce by neměl přesáhnout 15 stran včetně příloh. Tabulky, obrázky a grafy se zařazují do přílohy.
– **rozlišujte:** 15% – patnáctiprocentní a 15 % – patnáct procent, dále pomlčku (–) a spojovník (-). Dlouhá se užívá pro vyjádření číselného rozpětí (5–11 let, 1918–1938), jako znaménko minus (–5, –0,3), jako prostá pomlčka v textu (utkání Sparta–Slavia, Praha 6 – Ruzyně) či pokud se používá k vytvoření seznamu (odrážky). Spojovník užíváme tehdy, chceme-li vyjádřit, že jím spojené výrazy tvoří těsný významový celek (Garmisch-Partenkirchen, je-li, technicko-ekonomický, Marie Curie-Skłodowska).
– **neužívejte**, (s výjimkou) anglického textu, desetinnou tečku, ale desetinnou čárku. Desetinná čísla pište ve tvaru: 9,8 či 0,678.

Tabulky – rozměry musí respektovat vymezenou stránku. Názvy tabulek a textů v tabulkách se uvádí dvojjazyčně, tj. česky, resp. slovensky a anglicky, přičemž je možné využít indexování českých textů v tabulce a uvést seznam anglických překladů pod tabulkou. Doplňující informace se uvádějí pod tabulku.

Table 1
Money Towards Cancer Research in 2008

Type	National Cancer Institute	American Cancer Society
Lung	$247.6 million	$20.4 million
Breast	$572.6 million	$35.5 million
Prostate	$285.4 million	$15.8 million
Colorectal	$273.7 million	$26 million
Melanoma	$110.8 million	$10.3 million

Note. Adapted from "Cancer Research: Where the Funding Goes," by Everyday Health, updated in 2010, Retrieved from https://www.everydayhealth.com/cancer/cancer-research-where-funding goes.aspx.

Grafy, obrázky apod. jsou zpravidla samostatnými listy zpracovanými v kvalitě, která odpovídá požadavkům přímé předlohy pro tisk (černobílé obrázky a grafy a tomu odpovídající popisky, rozlišení min. 300 dpi). Rozměry musí respektovat vymezenou stránku. Použité názvy a popisy musí být uvedené rovněž dvojjazyčně, tj. česky, resp. slovensky a anglicky. Doplňující informace se uvádějí pod obrázek či graf. Obrázky a grafy mají souhrnný charakter a nerámují se. Grafy a obrázky mohou být v barevném provedení.

Počet tabulek, grafů a obrázků musí být volen takový, aby na jednu stranu časopisu vycházela maximálně jedna tabulka, graf nebo obrázek (tzn. maximálně jedna tabulka, obrázek nebo graf na 50 řádků textu).

Autoři, jejichž příspěvek má vazbu na projekt *grantové agentury* a je součástí dílčí nebo závěrečné *zprávy výzkumného projektu* musí toto uvést. Např.: Empirická data byla získána v rámci řešení grantového projektu např. GAČR (název a číslo).

Příspěvky k oponentnímu řízení pošlou autoři elektronicky na adresu redakce: studiakin@pf.jcu.cz.

Po úpravách vyvolaných oponentním řízením pošlou autoři na adresu redakce opravené rukopisy v elektronické podobě.

Upozornění: Od roku 2011 je vybírán manipulační poplatek za příspěvek do časopisu Studia Kinanthropologica ve výši 500 Kč nebo 20 €, číslo účtu: 104725778/0300, Specifický symbol: 1214.

INSTRUCTIONS FOR THE AUTHORS OF THE ARTICLES

Scientific Journal for Kinanthropology is mainly a place for publishing reports of empirical studies, review articles, or theoretical articles. Articles are published in Czech, Slovak, and/or English language. The author (senior author) is responsible for special and formal part of the article. All texts are subject to review process and assessed by at least two expert referees. The review procedure is authorless. Board of editors decide about article´s publishing having regard to scientific importance and review process.

Most journal articles published in kinanthropology are reports of empirical studies, and therefore the next section emphasizes their preparation.

Parts of a Manuscript

1. Title page consists of

(a) *Title*. A title should summarize the main idea of the paper simply and, if possible, with style. It should be a concise statement of the main topic and should identify the actual variables or theoretical issues under investigation and the relation between them. The recommendated length for a title is 8 to 10 words. A title should be fully explanatory when standing alone.
(b) *Author´s name and affiliation*
(c) *Abstract*. An abstract is brief, comprehensive summary of the contents of the article. A good abstract is accurate, self-contained, concise and specific, nonevaluative, coherent and readable. An abstract of a report of an empirical study should describe in 150 to 200 words
• the problem under investigation, in one sentence if possible;
• the subjects, specifying pertinent characteristics, such as number, type, age, sex, and species;
• the experimental method, including the apparatus, data-gathering, and complete test names, etc.
• the findings, including statistical significant levels, and
• the conclusions, and the implications or applications.

(d) *Keywords*. Not more than 5.

2. Next pages

(a) *Introduction*. The body the paper body of a paper opens with an introduction that presents the specific problem under study and describes the research strategy. Definition of variables and formal statement of your hypotheses give clarity. Because the introduction is clearly identified by its position in article, it is not labeled.
(b) *Method*. The Method section describes in detail how the study was conducted. Such a description enables the reader to evaluate the appropriateness of your method and the reliability and the validity of your results. It also permits experienced investigators to replicate the study if they so desire. Method section is devided into labeled subsections. These usually include description of subject, the apparatus (measures or materials), and the procedure. If the design of the experiment is complex or the stimuli require detailed description, additional subsections or subheadings to devide the subsections may be waranted to help readers find specific information, include in this subsections only the information essential to comprehend and replicate the study. Given insufficient detail, the reader is left with questions, given to much detail, the reader is burneded with irrelevant information. Method section is usually devided into: Subject; Measures (Apparatus or Materials) and Procedure.
(c) *Results*. This section summarizes the data collected and the statistical treatment of them. First, briefly state the main results or findings. Then report the data in sufficient detail to justify the conclusions. Mention all relevant results, including those that run counter the hypothesis. Do not include individual scores or raw data, with the exception, e.g. of single-subject designs or illustrative samples.
(d) *Tables and figures*. To report data, choose the medium that presents them clearly and economically. Tables provide exact values and can efficiently illustrate main effects. Figures of professional quality attract the reader´s eye and best illustrate interactions and general comparisons. Although summarizing the results and the analysis in tables or figures may be helpful, avoid repeating the same data in several places and using tables for data that can be easily presented in the text. Refer to all tables as tables, and to all graphs, pictures, or drawings as figures. Tables and figures supplemented

the text; they cannot do the entire job of communication. Always tell the reader what to look for in tables and figures and provide sufficient explanation to make them readily intelligible.
(e) *Discussion*. After presenting the results, you are in a position to evaluate and interpret their implications, especially with respect to examine, interpret, and qualify the results, as well as to draw inferences from them. Emphasize any theoretical consequences of the results and the validity of your conclusions. When the discussion is relatively brief and straightforward, some authors prefere to combine it with the previous Result section, yielding Results and Conclusion or Results and Discussion).
(f) *Conclusion*. Conclusion part contrary to Abstract is not obligatory. This part could also be in section Results and Conclusions.
(g) *References*. Just as data in the paper support interpretations and conclusions, so reference citation document statements made about the literature. All citations in the ms. must appear in the reference list, and all references must be cited in text. Choose refferences judiciously and cite them accuratly. The standard procedur for citations ensure that refferences are accurate, complete, and useful to investigators and readers. In references section follow the APA-Publication Manual (6th edition, 2010).
(h) *Appendix*. Appendix is although seldom used, is helpful if the detailed description of certain material is distracting in, or inappropriate to the body of this paper. Some examples of material suitable for an appendix are (1.) new computer program specifically designed for your research and unvalaible elsewhere, (2.) an unpublished test and its validation, (3.) a completed mathe-matical proof, (4.) list of stimulus material (e. g. those used in psycholinguistic research), or (5.) detailed description of a complexe piece of equipment. Include an appendix only if it helps readers to understand, evaluate, or replicate the study.
(i) *Author´s address* (contact address) – the author presents his/her address and address of his/her co-workers as the last information in the article. He/she presents family name, first name, degrees, complete address, City Code, telephon number and mainly e-mail.

Technical form of (hand) writing

Articles are basically accepted in the form of text editor, Microsoft Word or by editoring, keeping following setting and arrangements:
– form A4
– all outsides 2.5 cm
– size of letters 11, for the name of work a 10 for the other text
– single lines
– letters Times New Roman CE
– distance from the first line of the column – 0.5 cm
– gaps behind the headlines – 6 points
– all headlines extra bald and situated in the centre, Tables can be presented direct in the manuscript or mostly are presented as supplement enclosures of the article.

Dimensions of the *tables* (including title) can´t be over width and height of the page limited by above mentioned page´s appearence. The name of the Table and all languages, in English and in Czech, it is possible to use English text in the Table and the list of Czech translations is presented under the table (or contrary).

Figures (graphs, pictures, drawings, etc.) are regularly sheets in the quality replying to the requirements of the sample for print (black and white images and graphs with the corresponding descriptions, resolution min. 300 dpi). The figure´s dimension including all descriptions can´t be bigger than above mentioned page´s dimension. The name of figure and all descriptions used in figure are also in two languages – in English and Czech.

To the authors, whose articles are connected with the project of some Grant Agency, is recommended to emphasize this fact (i. e. name of the project and its number).

Please note: From January 2011 there will be a handling fee of 500 Kč (or 20 €) for articles accepted by Studia Kinantropologica, Account number: 104725778/0300, Specific symbol: 1214.

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Upozornění

Od roku 2011 je vybírán manipulační poplatek za příspěvek
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