

Stručni članak

## UZROCI NEPRAVILNOG DRŽANJA TELA DECE I MOGUĆNOST PREVENCIJE

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Marta Dedaj<sup>1</sup>

Visoka škola strukovnih studija za vaspitače i poslovne informatičare –  
Sirmijum, Sremska Mitrovica, Srbija

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**Apstrakt:** Savremen način života koji karakteriše nedovoljno kretanje najčešće dovodi do nepravilnog držanja tela. Deca i mladi sve manje fizički vežbaju, a sve više vremena provode u pasivnim položajima sedenja i ležanju. Takve navike ih udaljavaju od prirodnih potreba za kretanjem (hipokinezija) i bitno smanjuju većinu fizičkih i funkcionalnih sposobnosti. Postavlja se pitanje zašto veliki broj dece sedi s tako lošim držanjem tela? Navika je jedan od glavnih razloga, ali ne i jedini faktor lošeg držanja tela prilikom sedenja. U radu se posebno razmatraju ambijentalni faktori koji mogu da ukažu na uzroke nepravilnog držanja tela, a javljaju se u periodu školovanja: višecha-sovno sedenje u školskim klupama, velik broj nastavnih časova, kratki odmori, nefunkcionalan i neprilagođen nastavni nameštaj, nedovoljna osvetljenost radne površine, težina školske torbe i nepravilan način nošenja školske torbe. Zbog uticaja različitih faktora: porodice, predškolske ustanove, škole i drugih u formiranju pravilnog držanja tela, potrebno je od najranijeg uzrasta stvoriti sistem preventivnih mera koji obuhvata i vaspitni rad sa decom. Prevencijom se ne utiče samo na uspeh u nastavi, već i na promenu odnosa prema sebi, vršnjacima i drugim osobama, što doprinosi razvoju pozitivnih osobina i karakteristika ličnosti i njene uspešne socijalizacije.

**Ključne reči:** *uzroci nepravilnog držanja tela, deca, prevencija*

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<sup>1</sup> ✉ vs.marta.dedaj@gmail.com

## UVOD

Najveće promene u životu deteta odigravaju se u periodu kada ono polazi u školu. Iz bezbrižnog perioda, punog igre i pokreta, dete se podvrgava režimu školskog života: dugotrajno sedenje u klupi, izradi domaćih zadataka, učenju – što neuporedivo više mobilizuje njegovu psihu i zahteva od njega adaptacione promene životnog tonusa. Taj prelaz od igre na školski rad, od slobodne i svestrane aktivnosti na jednostavnu intelektualnu aktivnost, ponekad se loše odražava na razvitak deteta, naročito na držanje tela učenika. To je period relativno brzog rasta, kada bi detetu odgovarao mnogo aktivniji život i veoma mu je teško da se podvrgne potrebnoj školskoj disciplini.

Držanje tela dece i mladih je globalni i uvek aktuelni problem svih zemalja u svetu, a u prilog tome govori i velika zainteresovanost i domaćih i stranih stručnjaka iz raznih oblasti za ovaj problem. U radu „*Pregled domaćih i inostranih istraživanja iz oblasti posturalnih poremećaja - period od 2000. do 2007. godine*”, Purenović (2007) upoređuje metodologiju rada i rezultate istraživanja u prostoru držanja tela, između studija domaćih i stranih autora. Istraživanjem je obuhvaćeno 50 studija (25 domaćih i 25 stranih). Komparacijom rezultata radova, koji su ispitivali nepravilno držanje tela zapaža se sledeće: na uzrastu dece od 7 do 10 godina, lordotično loše držanje tela je procentualno prisutnije kod dece iz Brazila (57,25%) (Penha i sar, 2005, prema: Purenović, 2007), u odnosu na decu iz Srbije (33,5%) (Milenković i sar, 2003, prema: Purenović, 2007), a kada se govori o kifotično lošem držanju tela, situacija je suprotna, kod nas deca imaju više problema sa ovim poremećajem kičmenog stuba u sagitalnoj ravni (51,4%) (Milenković i sar, 2003, prema: Purenović, 2007), za razliku od dece iz Brazila (33,75%) (Penha i sar, 2005, prema: Purenović, 2007). Nepravilnom držanju tela (skolioza) kod sportista pažnju su posvetili strani autori. Istraživanja sprovedena na domaćoj populaciji na uzorku učenika osnovnih škola, rađena u stranim studijama, ukazuju na sledeće podatke: lordotično držanje tela imaju deca od 7 godina - 55%, 8 godina - 61%, 9 godina - 51%, 10 godina - 61%, dok je kifotično držanje zastupljeno kod dece od 7 godina - 21%, 8 godina - 27%, 9 godina - 45%, 10 godina - 42% (Penha i sar, 2005, prema: Purenović, 2007). Bogdanović (2005) i Purenović (2006) nalaze vezu između načina nošenja školske torbe i držanja tela – kifotično loše držanje tela je najprisutnije kod dece koja torbu nose na oba ramena. Strani autori su se više bavili štetnim uticajem težine školske torbe i zaključili da ista ima negativan uticaj na rad respiratornog sistema (Chow i sar, 2005) i na pojavu bola u leđima (Korovesis i sar, 2004). Domaći i strani autori došli su do istog zaključka: dominantnost ruke, odnosno veće angažovanje jedne ruke, povezano je sa skoliozičnim držanjem tela (Milenković i sar, 2004; Grivas i sar, 2006, prema: Purenović, 2007).

Pregled rezultata brojnih dosadašnjih istraživanja upućuje na potrebu daljeg razvijanja prikladnih multidisciplinarnih i interdisciplinarnih pristu-

pa u vezi sa problemskim područjem: formiranja pravilnog držanja tela dece mlađeg školskog uzrasta.

## UZROCI NEPRAVILNOG DRŽANJA TELA DECE

Veliki procenat nepravilnog držanja tela dece podstakao je više istraživača da utvrde uzroke koji uslovljavaju ovu masovnu pojavu. Uzroci koji mogu na direktan ili indirektan način uticati na narušavanje pravilnog držanja tela, mogu se svrstati u više grupa. Najčešći uzroci nastanka lošeg držanja tela dele se na urođene i stečene, odnosno na unutrašnje (endogene) i spoljašnje (egzogene) (Kosinac, 1998). S obzirom da je u radu prostor proučavanja vezan za motoriku i pokret, kao osnovna sredstva u fizičkom vaspitanju, pažnja će biti usmerena na spoljašnje uzroke nepravilnog držanja tela dece. Važnu ulogu u tome imaju svi oni faktori koji uslovljavaju prirodu čoveka: bio-tipološki, psihološki, ambijentalni, a koji mogu ukazati na uzroke lošeg držanja tela dece. Kod dece posebnu ulogu u nastajanju nepravilnog držanja tela mogu imati poremećaji statike i razne loše navike koje deca usvajaju i protiv kojih se treba odlučno boriti, a koje možemo nazvati spoljašnjim ambijentalnim faktorima (Kosinac, 1998). Jedan od ambijenata koji utiče na razvoj deteta je škola. U ovom radu opisaćemo samo one koji se javljaju u periodu školovanja:

- viščasovno sedenje u školskim klupama,
- velik broj nastavnih časova,
- kratki odmori,
- nefunkcionalan i neprilagođen nastavni nameštaj,
- nedovoljna osvetljenost radne površine,
- težina školske torbe i
- nepravilan način nošenja školske torbe.

Najčešće do pojave lošeg držanja tela dece dolazi usled slabosti određenih grupa mišića tonostatičke muskulature, i to: opružača vrata i trupa, mišića primicača lopatica, opružača natkolenica i potkolenica i mišića stopala. Hipotonija tonostatičke muskulature štetno deluje na održavanje normalnog uspravnog stava, jer slabljenjem ovih mišića, iz bilo kog razloga, dolazi do poremećaja „dobrog držanja tela“ - uspravnog stava. Ova pojava se može objasniti sa dva aspekta. To je period kada je dete polaskom u školu, izloženo povećanom stato-dinamičkom opterećenju - dugotrajno sedenje u školskoj klupi, pisanje u povijenom položaju, nošenje teških školskih torbi. Sa druge strane, deca su usredsređena na usavršavanje fine motorike distalnih delova gornjih ekstremiteta, na funkciju šake u cilju poboljšanja pisanja, te dolazi do izvesne preraspodele bazičnog i akcionog tonusa (Kosinac, 1998).

Današnje urbano dete sve više slobodnu igru i prirodne oblike kretanja zamenjuje aktivnostima u sedećem položaju ili u zatvorenim prostorijama. Kao posledica

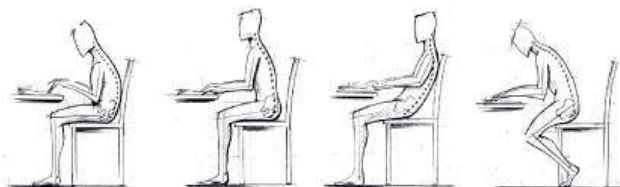
psihosomatskog naprezanja i emocionalne neprilagođenosti kod dužih aktivnosti u sedećem položaju vremenom se javljaju različite subjektivne tegobe, pa postignuti rezultati u učenju često nisu u skladu s očekivanim. Postavlja se pitanje zašto veliki broj učenika sedi s tako lošim držanjem tela? Navika je jedan od glavnih razloga, ali ne i jedini faktor lošeg držanja tela prilikom sedenja. Dugogodišnjim sedenjem sa savijenom kičmom telo se navikava na takav položaj. Naime, istraživanja pokazuju da samo sedenje nije toliko naporan rad, koliko je aktivnost mišića koji moraju pri sedenju održati traženi položaj (Kosinac, 1998). Deci je potrebna mogućnost ostvarenja dinamičnog i aktivnog položaja tela pri sedenju. U tom smislu, učitelji ne bi trebalo da ovo protumače kao „vrpoljenje na času“. Problem postaje još veći i zbog spoljašnjih faktora kao što su: potrebe svake pojedine učionice koju dnevno promeni i po nekoliko razreda različitih uzrasnih grupa. Sedeći položaji koji deca zauzimaju su često nepravilni, jer školski nameštaj u mnogim slučajevima ne odgovara uzrastu dece, te su ona prinuđena da zauzimaju takve položaje.

Učenik sedi u školi ili kod kuće na neprikladnim stolicama, klupama i piše na stolu koji je neprilagođen njegovim antropometrijskim obeležjima i građi tela. U zavisnosti od uzrasta učenika prva tri časa u principu mogu pravilno da sede i uglavnom zainteresovano prate nastavu. Krize se pojavljuju nakon trećeg časa, kao posledica psihičke i fizičke nepodnošljivosti na produžena statička opterećenja. Psihičke i fizičke smetnje kao što su: umor, pad koncentracije, bol u glavi, vratu i leđima, smanjena preciznost i koordinacija često su posledica dužeg nepravilnog sedenja (Kosinac, 1998).

Dobar sedeći položaj podrazumeva položaj kada je telo uspravno ili lagano nagnuto napred, glava pravilno uzdignuta, te na taj način stimuliše lagano i stalno napetost drugih mišića kičme i kratkih mišića vrata. Gornji i donji udovi su u simetričnom položaju, stopala su paralelno postavljena i celom se površinom oslanjaju na pod. Ovakav položaj obezbeđuje najbolju udaljenost očiju od površine čitanja i manji zamor (Kosinac, 1998).

Istraživanja potvrđuju da je problem i neusklađenost antropometrijskih vrednosti učenika određenog uzrasta s dimenzijama školske stolice u tesnoj vezi sa lošim držanjem tela učenika, zbog kojeg se javlja i zamor organizma (Domljan i sar. 2005). Postoji više nepravilnih položaja sedenja koje učenici za vreme pisanja, učenja svesno ili nesvesno zauzimaju.

**Slika 1.** *Nepravilno sedenje*



(Preuzeto od: Domljan, Jazbec, Bogner, 2005)

Nepravilan položaj glave koja naglašeno visi prema napred ili je savijena u jednu stranu veoma je čest kod učenika za vreme izrade domaćih zadataka ili učenja. Teži oblik nepravilnog sedenja je kada je jedna noga savijena ili opružena bez čvrstog oslonca o podlogu i jedna ruka opružena napred ili u stranu, koja dovodi do višestrukog iskrivljenja kičme. Jedan od čestih nepravilnih položaja sedenja kod učenika je tzv. "nisko sedenje" na stolici za vreme čitanja ili gledanja TV programa. Obeležje ovog položaja je povijenost celog tela s opuštenom i isturenom glavom napred i dole. Noge su opružene bez čvrstog oslonca o podlogu. Podržavanje ovakvog nepravilnog položaja sedenja postaje loša navika, koja vremenom prerasta u kifotično držanje tela (Domljan i sar., 2005).

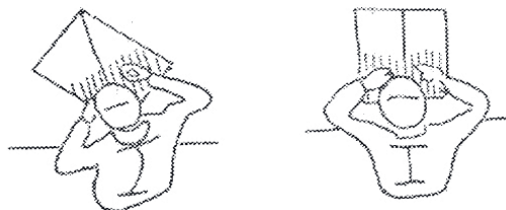
Sedeći položaji koje deca zauzimaju u toku nastave i kod kuće su veoma raznovrsni i nažalost često nepravilni. Školski nameštaj u mnogim slučajevima ne odgovara visini i uzrastu dece, te su ona prinuđena da zauzimaju nepravilne položaje. Neodgovarajuća visina i udaljenost radnog stola na kojoj se nalazi pribor za pisanje, sveska, knjiga, primoravaju decu da preko četiri puta po 30-45 minuta u toku dana sede u nepravilnom položaju (Grbac i Domljan, 2007).

Veoma čest položaj koji deca zauzimaju u jednom od sedećih položaja (Slika 1) može se opisati na sledeći način: glava sa vratom pomerenjena je napred i savijena prema svesci ili knjizi čime se izlaže jačem dejstvu sile gravitacije. Na ovaj način se opterećuje tonična muskulatura glave i vrata, te njihovo duže zadržavanje u ovom položaju dovodi do zamora mišića i pasivnijeg položaja normalne fiziološke krivine leđnog dela kičme. Naviknuto na takav položaj pri sedenju, učenik ga zadržava i u stojećem položaju i u svakodnevnim aktivnostima. Gornji segmenti: glava, vrat, ramena, grudni koš i ruke koje su povučene napred, svojom težinom još više potenciraju leđnu krivinu (Jeričević, 1969). Sve ovo dovodi do neujednačenog opterećenja stopala, te su česta i prateća pojava loših držanja - ravna stopala.

Postoje i drugi načini sedenja koji isto tako negativno deluju na položaje viših segmenata tela. Prilikom posmatranja učenika kako sede u školskoj klupi može se uočiti da često drže desnu ruku na stolu, a levu nešto niže (Slika 2). Ovakav položaj ruku prati kičmeni stub povijajući se prema desnoj ruci koja je na višoj ravni u odnosu na levu ruku. Glava se zbog takvog položaja kičme i nejednakog nivoa ramena naginje prema levoj strani i na taj način potencira se krivljenje kičmenog stuba. Ovakvo zadržavanje nepravilnog položaja u ostalim školskim i svakodnevnim aktivnostima dovodi do toga da je u stojećem položaju glava malo savijena u stranu, do asimetrije u rameno-lopatičnom pojasu, asimetrije u prostoru koji zaklapaju ruke ležerno opuštene niz telo, grudni koš i karlica i asimetrije glutealne regije (Jeričević, 1969). Korekcija skoliotičnog držanja je mnogo teža u odnosu na spomenuto kifotično i lordotično držanje tela, jer je došlo do asimetrije tonusa mišića jedne polovine tela u odnosu na druge.

Nepravilan sedeći položaj, pogotovo kod učenika mlađeg školskog uzrasta može biti rizičan, jer su na tom uzrastu kosti i mišići veoma podložni promenama koje mogu brzo i lako da poprime patološku formu držanja. Svaki položaj u kojem učenik mora da bude duže vreme, uzrokuje umor. Menjanjem položaja i držanja tela, učenik pokušava da otkloni osećaj umora. Za učenike osnovnoškolskog uzrasta, veoma je važna konstrukcija nameštaja i o tome u poslednjih nekoliko decenija brigu vodi čitav niz stručnjaka. Međutim, činjenica je da učenici mogu loše da sede u lošim klupama, ali i da dobro sede u loše napravljenom nameštaju.

**Slika 2.** *Forme lošeg držanja u situacijama izrade školskih i domaćih zadataka*



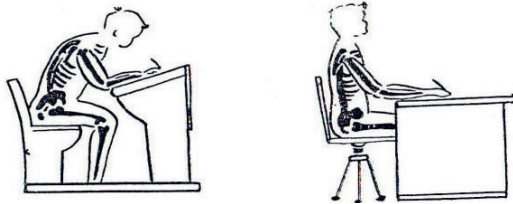
(Preuzeto od: Jeričević, 1969)

Jedan od uslova pravilnog razvoja tela, prvenstveno kičme je menjanje položaja držanja tela i udova. Pri sedenju čovek ima labilnu ravnotežu, te je komotnije sedenje ako se deo tela naslanja na naslon sedišta. Ukoliko se slabinski deo kičmenog stuba naslanja na naslon potrebna je minimalna mišićna snaga za sedenje, grudni koš je upravan, disanje je mirno, a ne potiskuju se ni organi trbušne duplje. Pravilno sedenje u velikoj meri zavisi od veličine i oblika nameštaja, sedište treba da prati oblik i veličinu butine i karlice. Ukoliko je položaj vrata uspravan, vratni i leđni mišići se najmanje zamaraju (Cekuš, 1996).

Najvažniji deo školskog nameštaja koji ima veliki uticaj na pravilan položaj pri sedenju su stolica i sto. Nameštaj treba da prati stav tela koji odgovara čitanju ili pisanju. Visina stola i stolice treba da budu u skladu sa visinom učenika, da su ivice zaobljene, visina sedišta promenljiva. Optimalna *visina sedišta* treba da iznosi 28% telesne visine. Kada učenik sedi, stopala treba da mu leže na tlu i veći deo bedara je položen na sedište. *Dubina sedišta* predstavlja rastojanje od ivice sedišta do naslona i iznosi 20% telesne visine. Ovakva dubina sedišta obezbeđuje širi oslonac tela i nesmetanu cirkulaciju krvi u donjim ekstremitetima. Blag nagib sedišta prema unazad, takođe, sprečava klizanje tela. *Naslon* treba da se lagano naginje prema nazad 10-15 stepeni prateći krivinu kičmenog stuba. Ukoliko je razmak od naslona do pulta velik, učenik ne može da se nasloni i savije unapred, te dolazi do nepravilnog držanja tela. Razmak naslona od pulta treba da iznosi 17% telesne visine i on se menja prilikom sedenja i ustajanja. Kakav će položaj učenik zauzeti pri sedenju ili stajanju, zavisi od *distance klupe* koja predstavlja rastojanje između vertikale spuštene sa prednje ivice stola i prednje ivice

sedišta. Za pisanje i čitanje je povoljna negativna distanca, kada se sedište malo podvuče ispod stola, jer se učenik može nasloniti na naslon. Pozitivna distanca je opravdana jedino pri ustajanju i stajanju u klupi, jer se trup inače jako savije što dovodi do umora. Dobra *diferencijacija* podrazumeva da se laktovi, kao i obe podlaktice, nalaze u visini prednje ivice stola i da pri tom položaju ramena nisu ni spuštена ni podignuta (Slika 3b). Učenik pravilno sedi ukoliko su prilikom pisanja ili čitanja oči 30 cm od površine stola. Najpogodnija diferencija iznosi 17% telesne visine učenica, odnosno 16% telesne visine učenika (Cekuš, 1996).

**Slika 3.** a) *Nepravilno držanje učenika* b) *Pravilno držanje tela učenika*



(Preuzeto od: Cekuš, 1996)

Uz pozitivne posledice uvođenja informacione tehnologije sve se više uočavaju i negativne posledice ovih medija na zdravlje dece. Ukoliko telo duži period provodi u jednom sedećem položaju određena grupa mišića je neprestano aktivna, kako bi održala telo u tom položaju. S vremenom se ti mišići umore jer nemaju priliku za odmor i opuštanje. Primena novih tehnologija - računara, podrazumeva duže provođenje vremena u sedećem položaju, pri čemu se kod deteta postupno razvija kifotično držanje tela kao posledica stalne napetosti pojedinih mišića.

Pravilan sedeći položaj za kompjuterom podrazumeva da je kičma prava, vrat u produžetku ravan, ruke pravilno savijene u laktovima. Donji deo leđa je oslonjen na stolicu, kukovi i telo; telo i kolena su pod uglom od 90 stepeni dok su stopala na podlozi. Dinamično sedenje koje je podržano individualno podesivim stolicama pružaju deci i mladima veću ravnotežu položaja tela s mentalnom aktivnošću (Slika 4b) (Kosinac, 1998).

**Slika 4.** a) *nepravilno sedenje* b) *pravilno sedenje*



(Preuzeto od: Kosinac, 1998)

Dugotrajno naprezanje organa vida kod čitanja, pisanja, crtanja, praćenja rada učitelja na školskoj tabli, dugotrajno gledanje TV i rad na kompjuteru, nepravilan položaj sedenja i držanja glave, umaraju mišiće - pokretače očiju. Činjenica je da oko 90% utisaka iz spoljašnjeg okruženja primamo preko organa vida. Učestalost nošenja korektivnog pomagala, naočara kreće se od 20 do 35% (Kosinac, 1998). U želji da uspostavi ili održi aktivnu komunikaciju s okruženjem vrši akomodaciju sočiva, pri tom premeštajući pojedine delove tela zauzima često nepravilan položaj sedenja. Preventivno delovanje bi se sastojalo u izboru radnog mesta u odeljenju, da kratkovidi budu bliže tabli i stolu, a dalekovidi da su udaljeniji od table, televizora. Za razliku od oslabljenog vida, učenici koji slabije čuju ne primete se odmah. Ukoliko oštećenje nije zahvatilo oba slušna organa, učenik često okreće glavu prema izvoru zvuka menjajući položaj tela - sedenja koji je najčešće nepravilan.

Može se zaključiti, da ponavljane greške sedenja dovode do nepravilnog držanja tela, a vremenom i do deformiteta kičme. Tako se izneseni argumenti mogu opisati shemom: umor potpomaže opterećenje mišića, to pojačava nepravilan položaj sedenja, koji izaziva veliko opterećenje mišića. Na ovaj način dolazi do formiranja nepravilnog držanja tela (Kosinac, 1998).

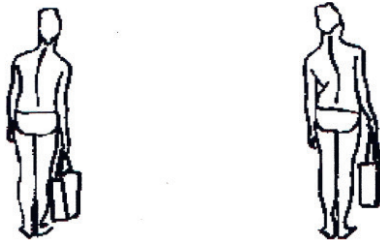
Nepravilna sedenja, stajanja, nošenje (pre)teške školske torbe, neadekvatan krevet i jastuk za spavanje, različiti oblici kretnih aktivnosti, kao i određeni endogeni faktori, sistematski deluju na kičmeni stub izazivajući opterećenja kičme. Kumulativnim delovanjem kroz ponavljajuće i dugotrajne položaje i pokrete dolazi do skraćanja ili slabljenja određene muskulature dovodeći do mišićnog disbalansa, koji predstavlja primaran faktor za pojavu loših držanja tela i razvoj telesnih deformiteta. Smatra se da su nepravilno sedenje i školska torba u velikoj meri povezani sa pojavom nepravilnog držanja tela. Navode se razni činioci, kao što su: uzrast i pol, umor, vreme opterećenja, težina, oblik i način nošenja školske torbe, asimetrično opterećenje, emocionalna stanja i sl. (Kosinac, 2004).

Često se mogu videti deca koja nose velike ili preteške školske torbe u ruci ili na ramenu, zato što roditelji, ali ni učitelji ne vode dovoljno računa o tome da teška i nepravilno nošena torba može uticati na pravilno držanje tela i podsticati razvoj deformiteta kičme.

Školsku torbu učenici nose pasivno ili aktivno. Uzimajući u obzir težinu, veličinu, oblik, uzrast deteta, postoji više različitih načina nošenja iste: u jednoj ruci, na leđima, na jednom ramenu, preko ramena i suprotnog boka. Kada se torba nosi u jednoj ruci ili na jednom ramenu, govorimo o pasivnom nošenju školske torbe. Tada je jedno rame spušteno u odnosu na drugo i u odnosu na anatomsku građu i konstituciju, vremenom se može kod većeg broja učenika formirati nepravilno držanje tela prvenstveno u frontalnoj ravni (Slika 5a). Aktivno nošenje torbe podrazumeva da su oba ramena u istoj ravni (Slika 5b) (Kosinac, 1996).



**Slika 5.** a) Pasivno nošenje torbe u jednoj ruci b) Aktivno nošenje torbe u jednoj ruci



(Preuzeto od: Kosinac, 1996)

Učenci razredne nastave često nose torbu na leđima (Slika 6a). Kako bi se uspostavila ravnoteža, telo i glava se saginju prema napred, jer težina školske torbe vuče gornji deo tela unazad i dole. Ukoliko se duže vremena nosi na ovaj način školska torba dolazi do zamaranja leđnih, prsnih i ramenih mišića čime se otežava disanje. Ukoliko torba nije dovoljno zategnuta i pripijena uz telo dolazi do pojave lordotičnog držanja tela jer školska torba visi duboko niz leđa. S biomehaničkog stanovišta najprihvatljivije je nošenje torbe preko ramena ili suprotnog boka (Slika 6b). Sila težišta u ovakvom načinu nošenja torbe ne opterećuje isto oba kuka, ali je ovo delovanje prihvatljivije u odnosu na prethodne navedene primere (Kosinac, 1996).

**Slika 6.** a) Nošenje torbe na leđima b) Nošenje torbe preko ramena i suprotnog kuka



(Preuzeto od: Kosinac, 1996)

Rezultati istraživanja Kosinca 1976, 1986. i 1996. godine, koji je inspekcijom školskih torbi na uzorku od 24 učenika mlađih razreda osnovne škole i na uzorku od 480 učenika i učenica od I do VIII razreda osnovne škole u Splitu ustanovio koja je optimalna težina školskih torbi, mogu poslužiti učenicima, roditeljima, učiteljima, proizvođačima školskih torbi kao preventivna mera u suzbijanju nepravilnog telesnog držanja (Kosinac, 1996). Korisna preventivna mera je zahtev da školska torba ne prelazi težinu od 2 kg, koju je potrebno da uvažavaju roditelji i učitelji dece razredne nastave i na taj način spreče pojavu

nepravilnog držanja tela. Dakle, od velike je važnosti rano otkrivanje i preduzimanje preventivnih mera. Prevencijom ne utičemo samo na uspeh u nastavi, već i na promenu odnosa prema sebi, vršnjacima i drugim osobama, što doprinosi razvoju pozitivnih osobina i karakteristika ličnosti i njene uspešne socijalizacije.

## PREVENCIJA NEPRAVILNOG DRŽENJA TELA DECE

U prevenciji nastanka nepravilnog držanja tela važno je uticati na neprestano pravilno držanje tela u svakodnevnom životnim aktivnostima: sedenju, ležanju, hodu. Sve ove mere same po sebi nisu dovoljne ukoliko ne postoji dovoljna fizička aktivnost deteta. Lični primer vaspitača, učitelja i roditelja, može da probudi želju kod deteta za poistovećivanjem i podstiče želju za izgradnjom ličnog osećaja i navike za pravilno držanje tela. Treba pre svega, obezbediti potpuno slobodan razvoj deteta i razvijati osećaj za pravilno držanje tela.

Uloga roditelja, učitelja i nastavnika fizičkog vaspitanja je od posebnog značaja. Nastavnici bi na časovima fizičkog vaspitanja odabranim vežbama sprečili nastajanje lošeg držanja tela. Uloga učitelja ogledala bi se u ukazivanju deci i roditeljima na značaj pravilnog držanja tela prilikom sedenja, stajanja i davanju uputstava i objašnjenja kako i zašto treba voditi računa o pravilnom nošenju školske torbe i koje su moguće posledice.

U sistemu fizičkog vaspitanja, faktori koji direktno ili indirektno utiču na prevenciju nepravilnog držanja tela su (Kosinac, 1997):

- sistemsko praćenje i kontrola rasta i razvoja dece kojima utvrđujemo promene u držanju tela;
- adekvatan izbor vežbi i aktivnosti za određeni uzrast;
- pravilno izvođenje elementarnih i složenih motornih zadataka, čime obezbeđujemo ispravnu motornu kontrolu pokreta;
- permanentno stručno usavršavanje nastavnog osoblja (ocena držanja tela i mogućnost prevencije nepravilnog držanja tela);
- stručnost i doslednost u realizaciji i
- apsolutna odgovornost za zdravlje dece.

*Prevencija nepravilnog držanja tela dece obuhvata sledeće* (Kosinac, 1997; Domljan i Grbac, 2003):

- S obzirom da je jedan od uzročnika lošeg držanja tela i sedeći položaj potrebno je učitelje upoznati sa tim. Upozoravati ih da obrate pažnju na stav učenika za vreme nastave. Na taj način će se smanjiti broj učenika sa lošim držanjem tela za vreme školovanja.
- Veoma važni saradnici su i roditelji, koji će kod kuće kontrolisati i korigovati položaje segmenata tela pri učenju, i drugim aktivnostima. Na taj način će deca biti kontrolisana ceo dan, što je svakako korisno u cilju prevencije i korekcije.

- Učenici znatan deo svog radnog vremena provode sedeći za radnim stolom u školi, odnosno kod kuće prilikom izrade domaćih zadataka. Zato je neophodno kontinuirano pratiti način sedenja i raditi na formiranju pravilnog držanja tela, navikavati decu za zauzimanje takvog položaja tela koji najmanje zamara.
- Kako bi se postigao optimalan položaj bez štetnih pokreta drugih delova tela, potrebno je detetu omogućiti da površina radnog stola na kome učenik piše bude malo nagnuta - kao stalak za čitanje.
- Nameštaj u svakodnevnoj upotrebi mora da bude u skladu sa medicinskim zahtevima, ali i biološkim, anatomskim, psihološkim, sociološkim ili emotivnim karakteristikama učenika s obzirom na kičmu kao stub tela. Dimenzije nameštaja u učionicama treba da prate antropometrijske promene učenika, jer je u poslednjih nekoliko decenija visina dece istog uzrasta sve veća, prosečna visina dece od 7 do 10 godina porasla je u proseku za 5-7 cm, dok je visina dece od 11 do 14 godina porasla čak 7-10 cm (Domljan i Grbac, 2003). Sa podacima koji se dobiju prilikom merenja učenika na sistematskim pregledima trebalo bi upoznati i školsko osoblje, jer na taj način mogu imati uvid u antropometrijske promene učenika pri donošenju odluke o nabavci nameštaja određenih dimenzija. Nameštaj treba da je maksimalno prilagođen položaju deteta u školskoj klupi i antropometrijskim dimenzijama s obzirom na uzrast (Domljan i Grbac, 2002).
- Najvažniji činilac formiranja pravilnog držanja tela učenika jesu znanja o načinu sedenja. Potrebno je ukazati na značaj rasta i razvoja deteta, njegove visine tela i držanja tela pri sedenju. Prevencija, takođe, obuhvata i edukaciju o načinu sedenja u školskoj klupi i držanju tela pri pisanju, čitanju i praćenju nastave.
- Potrebno je da škola, pedagozi, učitelji, nastavnici, autori udžbenika i proizvođači školske opreme i drugi stručnjaci imaju na umu sadržaj i težinu školske torbe.
- Propagandno-edukativno delovanje proizvođača školskih torbi je jedan od mogućih oblika preventivnog delovanja: demonstracije, leci o pravilnom nošenju školske torbe koristili bi deci, roditeljima i učiteljima.
- Jedna od preventivnih mera sastojala bi se u tome da učenici udžbenike i sveske ostavljaju u školi u za to predviđene ormariće. Ukoliko se školska torba mora nositi potrebno je imati u vidu da se u školskoj torbi nose samo oni didaktički materijali koji su prema dnevnom rasporedu predviđeni. Težina torbe koja bi iznosila oko 2-3 kg je podnošljivo opterećenje koje ne bi izazvalo negativne uticaje na pravilno držanje tela učenika (10% telesne težine deteta). Ukoliko učenik prvog razreda ima 20 kg, torba ne sme da bude teža od 2 kg.

- Jedna od važnih preventivnih mera za rasterećenje kičme je stvaranje navike kod učenika da u školskoj torbi ima mesta samo za onaj didaktički materijal koji će se tog dana koristiti u školi. Velika je uloga roditelja u stvaranju ove navike koji moraju biti aktivni učesnici u tome, pogotovu kod učenika mlađih razreda.
- Od preventivnih postupaka mogu se sprovesti sledeći: prilikom hodanja potrebno je menjati opterećenje torbe s jednog ramena ili ruke na drugo. Veoma povoljno delovanje na suzbijanje nepravilnog držanja tela imaju vežbe za jačanje mišića leđa i trbušnih mišića (Kosinac, 1997). Umorni mišići se mogu rasteretiti i oporaviti ukoliko se praktikuju mali odmor sa odloženom torbom.
- Svrishodne vežbe oblikovanja i disanja u trajanju od 10 do 15 minuta dnevno mogu osigurati da se ostvari pretpostavka pravilnog sedenja učenika.
- Veoma veliko motivaciono dejstvo imaju vežbe hodanja i vizuelna samokontrola dece ispred ogledala čime se angažuje njihova pažnja u korigovanju položaja pojedinih segmenata tela u cilju otklanjanja loših navika.
- Jedan od načina preventivnih mera je dobra iskorišćenost komparativne prednosti muzike i plesa. U formiranju pravilnog držanja tela pored abdominalnog disanja ispred ogledala uz brojanje i muziku, višestruko je koristan i ples kao sredstvo koje podstiče pravilno, skladno i lepo držanje kod dece.
- Nepravilan izgled, napetost mišića i bolna leđa mogu se prevladati kroz adekvatno vežbanje mišića i vaspitanjem navike držanja. Efikasnost vežbi za jačanje dubokih leđnih mišića i trbušnih mišića je veoma velika u suzbijanju nepravilnog držanja.
- Mogućnost preventivnog delovanja može se proširiti i davanjem domaćih zadataka. U ovim slučajevima, veoma je važna uloga nastavnika fizičkog vaspitanja koji utvrđivanjem držanja tela i u saradnji sa roditeljima i učiteljem može pridoneti sprečavanju nepravilnog držanja tela. Funkcija domaćih zadataka je velika, izvršenje domaćih zadataka kontroliše učitelj u školi na osnovu postignutog uspeha, a roditelji su dužni da stvaraju uslove za rad kod kuće i kontrolišu decu u izvršavanju domaćih zadataka iz fizičkog vaspitanja.

## ZAKLJUČNA RAZMATRANJA

Veliki broj autora kod nas i u svetu bavio se istraživanjem nepravilnog držanja tela kod dece mlađeg i starijeg školskog uzrasta, kako na njihovom utvrđivanju, tako i na njihovoj prevenciji i otklanjanju. Na osnovu dobijenih

rezultata tih istraživanja, zaključuje se da je procenat dece, mlađeg i starijeg školskog uzrasta sa nepravilnim držanjem tela veoma velik. Istraživači su tražili uzroke koji doprinose narušavanju pravilnog držanja tela i kritičnog doba početka stvaranja uslova pojave nepravilnog držanja tela. Sasvim su izvesni i jasni negativni uticaji određenih endogenih i egzogenih faktora koji doprinose nastanku lošeg držanja tela, kao i uzrasne dobi pogodne za sticanje loših navika, a samim tim i nastanku nepravilnog držanja tela.

Pravilno držanje tela sve manje zauzima svoje mesto u dečjim svakodnevnim aktivnostima. Jedan od primarnih preduslova za nastajanje lošeg držanja tela je nedovoljno kretanje. Automatizacija i kompjuterizacija u svim sferama života dovodi do hipokinezije. Shodno tome, neophodno je osigurati uslove i motivisati decu na fizičku aktivnost jer se na mlađem školskom uzrastu najlakše usvaja ova pozitivna navika. Zbog uticaja različitih faktora: porodice, predškolske ustanove, škole i drugih u formiranju pravilnog držanja tela, potrebno je od najranijeg uzrasta stvoriti sistem preventivnih mera koji obuhvata i vaspitni rad sa decom. U tom smislu, sugeriše se roditeljima, vaspitačima, učiteljima, nastavnicima, pedagogima, psiholozima da strpljivo i uporno rade sa decom na svesnom stvaranju navike za pravilno držanje tela.

Rano usvojena znanja o značaju fizičkog vežbanja, kao i usvajanje navike redovnog fizičkog vežbanja, značajno doprinose kvalitetu zdravlja tokom detinjstva i predstavljaju osnovu za formiranje pravilnog držanja tela. Fizička vežba je moćno sredstvo prevencije nepravilnog držanja tela. Svi poznatiji filozofi starog veka zagovarali su u osnovi humanističke ideje o potrebi harmoničnog razvoja ličnosti, o simbiozi tela i duha. Od starovekovne Kine i Indije, Asirije i Persije, sumeransko i kritsko-mikenske kulture do Atine i Rima, pored formiranja određenih ljudskih vrlina, sastavni deo vaspitanja je i fizičko vežbanje. Misli Konfučija, Homera, Sokrata, Platona i Aristotela mogle bi se sumirati u poruci da je zdravlje i formiranje čoveka nužno povezano s mišićnom aktivnošću. „Brojna dela mislilaca i pedagoga, a posebno Žan-Žaka Rusoa, ističu potrebu harmoničnog razvoja ličnosti i značenje procesa vežbanja za optimalan i skladan razvoj čoveka, smatrajući da je „telo važno vežbati“, te da se vežbanjem ostvaruju vaspitne komponente i estetske, emocionalne i moralne vrednosti“ (Dedaj, 2011, 346).

Može se zaključiti da složenost obrazovno-vaspitnog rada uopšte, a posebno specifičnosti i kompleksnost rada u karakterističnom području nastave fizičkog vaspitanja nameće potrebu drugačijem prilazu učeniku. Ovo podrazumeva, pored saradnje sa roditeljima, koja treba da bude deo razvojnog plana svake škole i individualizovan pristup učeniku, uzimajući u obzir njegove potrebe, intresovanja i sposobnosti uopšte. Dakle, potrebno je sadržaje fizičkog vaspitanja koncipirati na taj način da učenik uvidi smisao, vrednost, oseti zadovoljstvo u vežbanju i na taj način će biti motivisan za vežbanje i razvijanje svojih motoričkih sposobnosti. Tada do nepravilnog držanja tela

neće doći. Potrebno je motivisati učenike za aktivno učešće u ličnoj korisnoj aktivnosti i strpljivo graditi pozitivne stavove prema vežbanju.

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Professional paper

## CAUSES OF IMPROPER BODY POSTURE IN CHILDREN AND POSSIBILITY OF PREVENTION

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**Marta Dedaj<sup>1</sup>**

Preschool Teacher Training and Business Informatics College of Applied  
Studies - Sirmium, Sremska Mitrovica, Serbia

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**Abstract:** The modern way of life, which is characterized by insufficient movement, most often leads to poor posture. Children and young people exercise less and less and spend more and more time in passive sitting and lying positions. Such habits take them away from their natural needs for movement (hypokinesia) and significantly reduce most of their physical and functional abilities. The question is why do so many children sit with such poor posture? Habit is one of the main reasons, but not the only factor of poor posture when sitting. The article especially discusses the environment factors that may indicate the causes of improper posture, and occur during school: several hours of sitting in school desks, a large number of classes, short breaks, dysfunctional and inadequate classroom furniture, insufficient lighting of the work surface, heavy school bags and improper way of carrying one. Due to the influence of various factors: family, preschools, schools, and others in the formation of proper posture, it is necessary to create a system of preventative measures from an early age, which includes educating children. Prevention not only affects school success but also changes the attitude towards oneself, peers, and other people, which contributes to the development of positive traits and characteristics of the person and their successful socialization.

**Keywords:** *causes of improper posture, children, prevention*

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<sup>1</sup> ✉ [vs.marta.dedaj@gmail.com](mailto:vs.marta.dedaj@gmail.com)

## INTRODUCTION

The biggest changes in a child's life take place in the period when they start school. From a carefree period, full of play and movement, a child undergoes a regime of school life: long sitting at a desk, doing homework, studying - which incomparably more mobilizes their mind and requires them to adapt changes in lifestyle. This transition from play to school work, from free and versatile activity to simple intellectual activity, sometimes has a bad effect on a child's development, especially on the posture of a pupil's body. It is a period of relatively fast growth when a much more active life would suit the child, and it is very difficult for them to keep up with the necessary school discipline.

Posture in children and young people is a global and always current problem of all countries in the world, causing great interest of both domestic and foreign experts from various fields. In the paper "*Review of domestic and foreign research in the field of postural disorders - from 2000 to 2007*", Purenović (2007) compares the methodology of work and research results in the field of posture, between studies of domestic and foreign authors. The research covered 50 studies (25 domestic and 25 foreign). Comparing the results of the studies, which examined poor posture, the following is observed: in case of children aged 7-10, lordotic poor posture is more present in children from Brazil (57.25%) (Penha et al., 2005, according to: Purenović, 2007), than in children from Serbia (33.5%) (Milenković et al., 2003, according to: Purenović, 2007), and when it comes to kyphotic poor posture, the situation is the opposite – Serbian children have more problems with this disorder of the spinal column in the sagittal plane (51.4%) (Milenković et al., 2003, according to: Purenović, 2007), than children from Brazil (33.75%) (Penha et al., 2005, according to: Purenović, 2007). Foreign authors have paid attention to improper posture (scoliosis) in athletes. Studies conducted on the domestic population on a sample of primary school students, conducted in foreign studies, indicate the following data: lordotic posture have children aged 7 years - 55%, 8 years - 61%, 9 years - 51%, 10 years - 61% , while kyphotic posture is represented in children aged 7 years - 21%, 8 years - 27%, 9 years - 45%, 10 years - 42% (Penha et al., 2005, according to: Purenović, 2007). Bogdanović (2005) and Purenović (2006) find a connection between the way of carrying a school bag and posture - kyphotic poor posture is most present in children who carry the bag on both shoulders.

Foreign authors have dealt more with the harmful effects of school bag weight and concluded that it has a negative impact on the work of the respiratory system (Chow et al., 2005) and on the occurrence of back pain (Korovessis et al., 2004). Domestic and foreign authors have reached the same



conclusion: the dominance of the one hand, in fact greater engagement of the one hand, is associated with scoliotic posture (Milenković et al., 2004; Grivas et al., 2006, according to: Purenović, 2007).

A review of the results of numerous previous studies points to the need to further develop appropriate multidisciplinary and interdisciplinary approaches in relation to the problem area: the formation of the correct posture of children of younger school age.

## CAUSES OF IMPROPER BODY POSITION

The high percentage of children's improper posture has encouraged several researchers to determine the causes of this mass phenomenon. The causes that can directly or indirectly affect the disruption of proper posture can be classified into several groups. The most common causes of poor posture are divided into congenital and acquired, intrinsic (endogenous) and extrinsic (exogenous) (Kosinac, 1998). Since the study space is related to motor skills and movement, as a basic tool in physical education, attention will be focused on the external causes of improper posture of children. All those factors that condition human nature play an important role in this: bio-typological, psychological, environmental, and and they can indicate the causes of poor posture in children. In children, a special role in the development of improper posture can be played by static disorders and various bad habits that children adopt and that should be resolutely fought against, which can be called intrinsic environmental factors (Kosinac, 1998). One of the environments that affects a child's development is its school. In this paper, we will describe only those that occur during at school age:

- several hours of sitting at school desks,
- a large number of classes,
- short breaks,
- dysfunctional and unadapted classroom furniture,
- insufficient lighting of the work surface,
- school bag weight
- improper way of carrying a school bag.

The most common occurrence of poor posture in children is due to the weakness of certain muscle groups of the tonostatic musculature, namely: neck and trunk extensors, shoulder girdle muscles, thigh and lower leg extensors, and foot muscles. Hypotonia of the tonostatic muscles has a detrimental effect on maintaining a normal upright posture, because the weakening of these muscles, for any reason, leads to a disorder of "good posture" - an upright posture. This phenomenon can be explained in two aspects. This is the period when the child, when going to school, is exposed to an increased

stato-dynamic load - prolonged sitting at a school desk, writing in a bent position, carrying heavy school bags. On the other hand, children are focused on improving the fine motor skills of the distal parts of the upper extremities, on the function of the hand to improve writing, and there is a certain redistribution of basic and action tone (Kosinac, 1998).

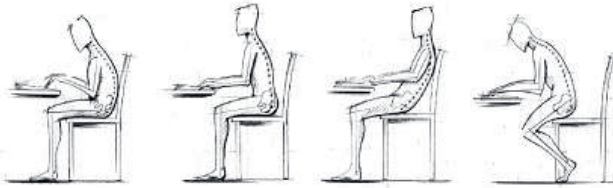
Today's urban child is increasingly replacing free play and natural forms of movement with sedentary or indoor activities. As a consequence of psychosomatic stress and emotional adaptation during longer sedentary activities, various subjective difficulties appear over time, so school results are often not in line with expectations. The question is why do so many students sit in such poor posture? Habit is one of the main reasons, but not the only factor of poor posture when sitting. After sitting with a bent spine for many years, the body gets used to such a position. Namely, research shows that sitting alone is not so much hard work as the activity of muscles that must maintain the required position when sitting (Kosinac, 1998). Children need the ability to achieve a dynamic and active body position while sitting. In that sense, teachers should not interpret this as "fidgeting in class". The problem becomes even bigger due to external factors such as: the needs of each classroom, which is attended daily by several classes of different age groups. The sitting positions that children occupy are often incorrect, because classroom furniture in many cases does not correspond to the age of the children, and they are forced to occupy such positions.

The student sits at school or at home on inadequate chairs, benches, and writes on a table that is not adapted to their anthropometric features and body structure. Depending on the students' age, in the first three classes they can, in principle, sit properly and generally follow the lessons with interest. It becomes critical after the third hour, as a consequence of mental and physical intolerance to prolonged static loads. Mental and physical disorders such as fatigue, decreased concentration, pain in the head, neck and back, decreased precision and coordination are often the results of prolonged incorrect sitting positions (Kosinac, 1998).

A good sitting position implies a position when the body is upright or slightly tilted forward, the head is properly raised and thus stimulates light and constant tension of other muscles of the spine and short muscles of the neck. The upper and lower limbs are in a symmetrical position, the feet are placed parallel and the entire surface rests on the floor. This position provides the best distance of the eyes from the reading surface and less fatigue (Kosinac, 1998).

Research confirms that the problem and inconsistency of anthropometric values of students of a certain age with the dimensions of the school chair are closely related to the poor posture of students, which causes fatigue (Domljan et al. 2005). There are several incorrect sitting positions that students consciously or unconsciously take while writing or studying.

**Figure 1.** *Incorrect sitting*



(Taken from: Domljan, Jazbec, Bogner, 2005)

The incorrect position of the head, which hangs forward emphatically or is bent to one side, is very common for students when they are doing homework or studying. A more severe form of incorrect sitting is when one leg is bent or stretched without a firm support on the ground and one arm is stretched forward or to the side, which leads to multiple curvatures of the spine. One of the frequent irregular sitting positions in students is the so-called "Low seating" in a chair while reading or watching TV. A feature of this position is the bending of the whole body with the head relaxed and protruding forward and down. The legs are stretched without firm support on the ground. Maintaining this incorrect sitting position becomes a bad habit, which over time grows into a kyphotic posture (Domljan et al., 2005).

The sitting positions that children take during classes and at home are very diverse and, unfortunately, often irregular. In many cases, school furniture does not correspond to the height and age of the children, so they are forced to take incorrect positions. Inadequate height and distance of the desk on which there are writing utensils, notebooks, books, force children to sit in an incorrect position for more than 4 times for 30-45 minutes during the day (Grbac and Domljan, 2007).

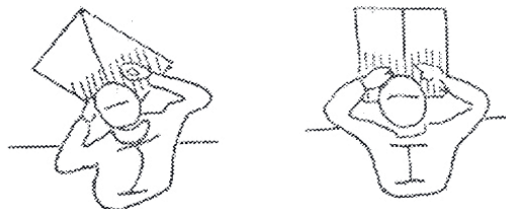
A very common position that children occupy in one of the sitting positions (Figure 1) can be described as follows: the head with the neck is moved forward and bent towards the notebook, book, etc., which exposes it to the stronger action of gravity. In this way, the tonic muscles of the head and neck are burdened. Their longer retention in this position leads to muscle fatigue and a more passive position of the normal physiological curve of the dorsal part of the spine. Accustomed to such a sitting position, a student maintains it while standing and throughout daily activities. The upper segments: head, neck, shoulders, chest and arms that are pulled forward, with their weight further emphasize the back curve (Jeričević, 1969). All this leads to an uneven load on the feet, and the common and accompanying occurrence of poor postures is flat feet.

There are other ways of sitting that also have a negative effect on the positions of the upper body segments. When observing students sitting at a school desk, it can be noticed that they often keep their right hand on the

desk, and the left one slightly lower (Figure 2). This position of the arms follows the spinal column, bending towards the right arm, which is on a higher plane in relation to the left arm. Due to such a position of the spine and uneven level of the shoulders, the head is tilted towards the left side and in that way, the curvature of the spinal column is emphasized. This retention of poor posture in other school and daily activities leads to the head being slightly bent to the side in a standing position, to asymmetry in the shoulder-scapular girdle, asymmetry in the area covered by the arms when they are casually relaxed across the body, chest and pelvis, and gluteal asymmetry regions (Jeričević, 1969). The correction of the scoliotic posture is much more difficult in relation to the mentioned kyphotic and lordotic posture of the body because there is an asymmetry of the muscle tone of one half of the body in relation to the other.

Incorrect sitting position, especially in students of younger school age, can be risky because, at that age, bones and muscles are very susceptible to changes that can quickly and easily take a pathological form of the posture. Any position in which a student has to be for a long time, causes fatigue. By changing the position and posture, the student tries to eliminate the feeling of fatigue. For elementary school students, furniture design is very important, and in the last few decades, experts are in charge of designing it. However, the fact is that students can sit badly in bad desks, but also sit well in badly designed furniture.

**Figure 2.** *Forms of poor posture during schoolwork and homework*

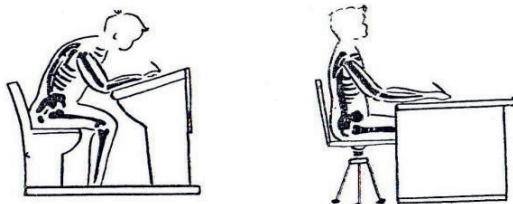


(Taken from: Jeričević, 1969)

One of the conditions for the proper development of the body, primarily the spine, is changing the position of the body and limbs. When sitting, a person has a labile balance, so it is more comfortable to sit if a part of the body leans against the back of the seat. If the lumbar part of the spine leans against the backrest, minimal muscular strength is needed for sitting, the chest is straight, breathing is calm, and the organs of the abdominal cavity are not suppressed. Proper sitting largely depends on the size and shape of the furniture, the seat should follow the shape and size of the thigh and pelvis. If the position of the neck is upright, the neck and back muscles are the least tired (Cekuš, 1996).

The most important part of classroom furniture that has a great influence on the correct sitting position is the chair and the desk. The furniture should be adequate for the posture of the body that corresponds to reading or writing. The height of the table and chairs should be in accordance with the height of the student, the edges should be rounded, and the height of the seat should be variable. The optimal seat height should be 28% of the body height. When a student is sitting, their feet should lie on the ground and most of their thighs should be placed on the seat. Seat depth is the distance from the edge of the seat to the backrest and should be 20% of the body height. This depth of the seat provides wider support for the body and unimpeded blood circulation in the lower extremities. The slight tilt of the seat backward also prevents the body from slipping. The backrest should be slightly tilted backward by 10-15 degrees and follow the curve of the spine. If the distance from the backrest to the counter is large, the student cannot lean back and bend forward and a poor posture emerges. The backrest distance from the counter should be 17% of the body height and it changes when sitting and getting up. What position the student will take when sitting or standing depends on the *distance of the desk*, which represents the distance between the vertical lowered from the front edge of the desk and the front edge of the seat. Negative distance is favorable for writing and reading when the seat is slightly underlined under the table because the student can lean on the backrest. Positive distance is justified only when getting up and standing at a desk because the torso bends a lot, which leads to fatigue. *Good differentiation* means that the elbows, as well as both forearms, are at the height of the front edge of the table and that in this position the shoulders are neither lowered nor raised (Figure 3b). A student sits correctly if their eyes are 30 cm away from the table surface when writing or reading. The most suitable difference is 17% of female student's body height, and 16% of male students' body height (Cekuš, 1996).

**Figure 3.** a) *Poor posture of students* b) *Correct posture of students' bodies*



(Taken from: Cekuš, 1996)

In addition to the positive consequences of the introduction of information technology, the negative consequences of these media on the health of children are increasingly noticeable. If the body spends a long period in one sedentary position, a certain group of muscles is constantly active, to keep the

body in that position. Over time, these muscles get tired because they do not have the opportunity to rest and relax. The application of new technologies - computers, implies longer time spent in a sedentary position, during which the child gradually develops a kyphotic posture as a consequence of the constant tension of certain muscles.

Proper sitting position behind the computer means that the spine is straight, the neck is straight in extension, and the arms are properly bent at the elbows. The lower back rests on the chair, the hips, and the body; the body and the knees are at a 90-degree angle while the feet are on the ground. Dynamic sitting supported by individually adjustable chairs provides children and young people with greater balance between body posture and mental activity (Figure 4b) (Kosinac, 1998).

**Figure 4.** a) *Incorrect sitting* b) *Correct sitting*



(Retrieved from: Kosinac, 1998)

The prolonged strain on the organs of sight when reading, writing, drawing, looking at the blackboard, prolonged TV watching and working on the computer, incorrect sitting and holding the head, tire the muscles - the eye movers. The fact is that about 90% of impressions from the external environment is received through the organs of sight. The frequency of wearing a corrective aid, glasses ranges from 20-35% (Kosinac, 1998). In order to establish or maintain active communication with the environment, the student accommodates the lens, while moving certain parts of the body, and often takes an incorrect sitting position. Preventative action would consist of choosing a proper place in the classroom so that the short-sighted students are closer to the board and the table and the far-sighted ones are further away from the board or the TV. Unlike visually impaired students, those who have hearing difficulties are not noticed immediately. If the damage does not affect both hearing organs, the student often turns their head towards the sound source, changing the position of the body - sitting, which is usually incorrect.

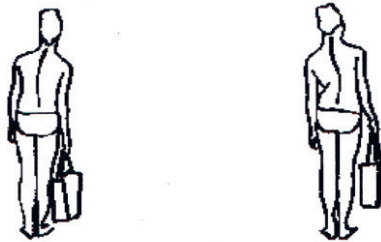
It can be concluded that repeated incorrect sitting leads to poor posture and, over time, to spinal deformities. The arguments presented in this way can be described by the scheme: fatigue supports the burden on the muscles, this intensifies incorrect sitting position, which causes a large burden on the muscles. In this way, a poor posture is formed (Kosinac, 1998).

Incorrect sitting, standing, carrying (too) heavy school bags, inadequate bed and sleeping pillow, various forms of movement activities, as well as certain endogenous factors, systematically act on the spinal column, burdening the spine. Cumulative action through repetitive and long-lasting positions and movements leads to shortening or weakening of certain muscles, leading to muscle imbalance, which is the primary factor for the appearance of poor posture and the development of body deformities. Incorrect sitting and school bags are considered to be largely related to the occurrence of poor posture. Various factors are listed, such as age and gender, fatigue, load time, weight, shape, and manner of carrying a school bag, asymmetric load, emotional conditions, etc. (Kosinac, 2004).

Children can often be seen carrying large or too heavy school bags in their hands or on their shoulders because parents and teachers do not pay enough attention to the fact that a heavy and incorrectly carried bag can affect proper posture and stimulate the development of spinal deformities.

Students carry school bags passively or actively. Considering the weight, size, shape, age of the child, there are several different ways of wearing the same: in one arm, on the back, on one shoulder, over the shoulder, and on the opposite side. When a bag is carried in one hand or on one shoulder, we are talking about passive carrying of a school bag. Then, one shoulder is lowered in relation to the other and in relation to the anatomical structure and constitution. Over time, a larger number of students can form a poor posture of the body, primarily in the frontal plane (Figure 5a). Actively carrying the bag implies that both shoulders are in the same plane (Figure 5b) (Kosinac, 1996).

**Figure 5.** *a) Carrying a bag passively in one hand*  
*b) Carrying a bag actively in one hand*



(Retrieved from: Kosinac, 1996)

Students often carry a bag on their back (Figure 6a). To establish balance, the body and the head are bent forward, because the weight of the school bag pulls the upper part of the body back and down. If the school bag is carried in this way for a long time, the back, chest and shoulder muscles get tired,

which makes it difficult to breathe. If the bag is not tightened enough and is close to the body, lordotic posture occurs, because the school bag hangs deep down the back. From a biomechanical point of view, carrying a bag over the shoulder or on the opposite hip is the most acceptable (Figure 6b). The force of gravity in this way of carrying the bag does not burden both hips the same, but this action is more acceptable in relation to the previously mentioned examples (Kosinac, 1996).

**Figure 6.** *a) Carrying the bag on the back*  
*b) Carrying the bag over the shoulder and the opposite hip*



(Retrieved from: Kosinac, 1996)

The results of the research of Kosinac in 1976, 1986, and 1996, who, by inspecting school bags on a sample of 24 primary school students and a sample of 480 male and female students from I to VIII grade of elementary school in Split, determined the optimal weight of school bags that can serve to students, parents, teachers, school bag manufacturers as a preventative measure in combating poor posture (Kosinac, 1996). A useful preventative measure is a requirement that a school bag does not exceed the weight of 2 kg, which parents and teachers of primary school children need to respect and this can prevent the occurrence of poor posture. Therefore, early detection and preventative measures are of great importance. With prevention, we not only influence the success in teaching but also change the attitude towards ourselves, peers, and other people, which contributes to the development of positive traits and characteristics of a person and its successful socialization.

## **PREVENTION OF IMPROPER POSTURE OF CHILDREN'S BODIES**

In the prevention of improper posture, it is important to influence the constant proper posture in everyday life activities: sitting, lying down, walking. All these measures alone are not enough if a child does not engage in



enough physical activity. The personal example of educators, teachers, and parents can arouse a child's desire for identification and encourage them to build a personal feeling and the habit of holding the body properly. Above all, it is necessary to ensure a child's completely free development and to develop a sense of proper posture.

The role of parents, teachers, and physical education teachers is of special importance. Teachers can prevent poor body posture with selected exercises during physical education classes. The role of the teacher would be reflected in pointing out to children and parents the importance of proper posture when sitting, standing, and giving instructions and explanations on how and why to take care of the proper carrying of a school bag and what the possible consequences are.

In the system of physical education, the factors that directly or indirectly affect the prevention of improper posture are (Kosinac, 1997):

- systematic monitoring and control of the growth and development of children for whom we determine changes in body posture;
- adequate choice of exercises and activities for a certain age;
- proper performance of elementary and complex motor tasks, ensuring proper motor movement control;
- permanent professional training of teaching staff (assessment of posture and the possibility of preventing improper posture);
- expertise and consistency in implementation and
- absolute responsibility for children's health.

*Prevention of improper posture of children includes the following* (Kosinac, 1997; Domljan and Grbac, 2003):

- Considering that one of the causes of poor posture is a child's sitting position, it is necessary that teachers are familiar with this. They should be warned to pay attention to the posture of students during classes. This will reduce the number of students with poor posture during schooling.
- Parents are also very important collaborators, who will control and correct the positions of body segments at home while a child is studying or performing other activities. In that way, children will be controlled all day, which is certainly useful for prevention and correction.
- Students spend a significant part of their school time sitting at a desk, or doing homework at home. That is why it is necessary to continuously monitor the way of sitting and work on the formation of the correct posture, to get children used to taking such a posture that will cause the least fatigue.
- To achieve an optimal position without harmful movements of other parts of the body, it is necessary to have the surface of the desk on which the student writes slightly inclined - like a reading stand.

- Furniture in everyday use must be in accordance with medical requirements, but also biological, anatomical, psychological, sociological, or emotional characteristics of students with regard to the spine as a pillar of the body. The dimensions of the furniture in the classrooms should follow the anthropometric changes of the students. Because in the last few decades the height of children of the same age is increasing, the average height of children aged 7 to 10 has increased by an average of 5-7 cm, while the height of children from 11 to 14 years of age has increased by as much as 7-10 cm (Domljan and Grbac, 2003). The staff at school should also be acquainted with the data obtained during the measurement of students at systematic examinations because in that way they can have an insight into the anthropometric changes of students when making a decision on the purchase of furniture of certain dimensions. The furniture should be maximally adjusted to the child's position in the school desk and anthropometric dimensions with regard to age (Domljan and Grbac, 2002).
- The most important factor in forming the correct posture of students is knowing how to sit. It is necessary to point out the importance of a child's growth and development, their body height, and posture when sitting. Prevention also includes education on how to sit at a school desk and how to hold one's body when writing, reading, and following classes.
- It is necessary that the school, pedagogues, teachers, textbook authors, and manufacturers of classroom equipment, and other experts keep in mind the contents and weight of the school bag.
- Propaganda-educational action of school bag manufacturers is one of the possible forms of preventative action: demonstrations, leaflets on how to properly carry a school bag would be of use to children, parents, and teachers.
- One of the preventative measures would be that students leave textbooks and notebooks at school in lockers provided for that purpose. If a school bag must be carried, it is necessary to keep in mind that only those didactic materials that are provided according to the daily schedule are carried in the school bag. The weight of the bag, which would be about 2-3 kg, is a tolerable load that would not cause negative effects on the proper posture of a student's body (10% of the child's body weight). If a first-grader weighs 20 kg, the bag must not weigh more than 2 kg.
- One of the important preventative measures for relieving the spine is to create a habit in students that there is room in the school bag only for the didactic material that will be used at school that day. The role

- of parents is great in creating this habit, so they must be active participants in it, especially in case of younger students.
- The following preventative procedures can be performed: when walking, it is necessary to change the load of the bag from one shoulder or arm to the other. Exercises for strengthening the back muscles and abdominal muscles have a very favorable effect on the suppression of poor posture (Kosinac, 1997). Tired muscles can be relieved and recovered if a small rest with a delayed bag is practiced.
  - Purposeful shaping and breathing exercises lasting 10-15 minutes a day can ensure proper sitting of students is realized.
  - Walking exercises and visual self-control of children in front of the mirror have a very great motivating effect, which engages their attention in correcting the position of certain body segments to eliminate bad habits.
  - One of the ways of preventive measures is a good use of the comparative advantage of music and dance. In the formation of proper posture in addition to abdominal breathing in front of a mirror with counting and music, dancing is also useful in many ways as a means of encouraging proper, harmonious, and correct posture in children.
  - Irregular appearance, muscle tension, and sore back can be overcome through adequate muscle exercise and posture. The effectiveness of exercises for strengthening the deep back muscles and abdominal muscles is very high in combating poor posture.
  - The possibility of preventative actions can be expanded by giving homework. In these cases, the role of the physical education teacher is very important, who, by determining the status of the posture, in cooperation with the parents and the teacher, can contribute to the prevention of poor posture. The function of homework is great, the execution of homework is controlled by the teacher at school based on the achieved success, and parents are obliged to create conditions for work at home and to control children in doing their PE homework.

## CONCLUSIONS

A large number of authors in our country and the world have been engaged in research into the poor posture of school children of younger and older school-age, both in their identification and in their prevention and elimination. Based on the obtained results of this researches, it is concluded that the percentage of children of younger and older school-age with poor posture is very high. The researchers looked for causes that contribute to the disruption of proper posture and the critical period of the beginning of the creation of

conditions for the appearance of improper posture. The negative influences of certain endogenous and exogenous factors that contribute to the development of poor posture, as well as the age suitable for acquiring bad habits, and the occurrence of poor posture, are quite certain. Proper posture is less and less taking present in children's daily activities. One of the primary preconditions for poor posture is insufficient movement. Automation and computerization in all spheres of life lead to hyperkinesia. Accordingly, it is necessary to provide conditions and motivate children to physical activity, because this positive habit is most easily adopted at younger school age. Due to the influence of various factors: families, preschools, schools, and others in the formation of proper posture, it is necessary to create a system of preventative measures from an early age, which includes educational work with children. In that sense, it is suggested to parents, educators, teachers, pedagogues, and psychologists to work patiently and persistently with children on consciously creating the habit of maintaining proper posture.

Early acquired knowledge about the importance of physical exercise, as well as the adoption of the habit of regular physical exercise, significantly contribute to the quality of health during childhood and represent the basis for the formation of proper posture. Physical exercise is a powerful means of preventing poor posture. All the famous ancient philosophers advocated basically humanistic ideas of the need for a harmonious development of the personality, of the symbiosis of body and spirit. From ancient China and India, Assyria and Persia, Sumerian and Cretan-Mycenaean culture to Athens and Rome, in addition to the formation of certain human virtues, physical exercise is an integral part of education. The thoughts of Confucius, Homer, Socrates, Plato, and Aristotle could be summarized in the message that human health and formation are necessarily related to muscle activity. "Numerous works by thinkers and pedagogues, especially Jean-Jacques Rousseau, emphasize the need for harmonious personality development and the importance of the exercise process for optimal and harmonious human development, believing that "it is important that your body exercises" and that exercise achieves educational components and aesthetic, emotional and moral values" (Dedaj, 2011, 346).

It can be concluded that the complexity of educational work in general, and especially the specifics and complexity of work in the characteristic area of physical education, imposes the need for a different approach to the student. This includes, in addition to cooperation with parents, which should be part of the development plan of each school, an individualized approach to the student, taking into account their needs, interests, and abilities in general. Therefore, it is necessary to conceptualize the contents of physical education in such a way that the student sees a point in it, its value, finds pleasure in exercising, and in that way, they will be motivated to exercise and develop their

motor skills. Then, poor posture will not occur. It is necessary to motivate students to take an active part in a personally beneficial activity and patiently build positive attitudes towards exercise.

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