Ʉȷ ʔȺɄɄɆȼȼɀ ɄɃ ƬɅȼȼȼɆ

ȼɀ ȼɀȷ ɬɻ ȼɅɄƬȼɆ

ɟ ȺɄɅɃȷɅũɄƬɃɆȼɃɀ Ⱥȷ Ɇ

ƬʂɬʔɄƬȼ ɃɅŪɃɄȷ ɬɷɄƬȼɆ-ȼɅȷ ȷɀȷ ȼɃʂɃũɬɻ Ɇ

ɷɒůɡɗɡɜŰɐɡ: ȷ ɜŰ ǝɖɻ ɤ Űɐɡ ƬŮɗɖɔɖɋŰɐɡ ɄŰɨ ǝɞɡ ƬŮŰȷ ɜɖɡ

ɷɒŁɷɒȷ Ƭ ȼ Ƀ Ʌ ŁƬ ȼ ɷɒŁȷ ȼ Ʌ Łɗɒȼ

ɀ ʂɢƲǝɖɻ ɄŰ ŮŭƲǝɖ

ȼ Ƭȷ ɀ ɄȷʂɃȼȼȼȷ ȼȼɆ ɃƁŪ ȷɃɃɆȺɅȷ Ɇ ɀ ɃŁɅȷ Ɇ ȼȼɆ

ƁɄɃʔɷɒȷʂŁƬȼƁ ƁȼȼɆ ƁȺ ƁjȺƁȼ ɀȺ ȼȼʔ

ɃƁȼȺȺɃɄɃɅqƁȼ Ƭȷ Ł ȼȼʔ ɃƁȼȺȺɃȷ ɅŪɅɃɄɃȷ ŪȺɬɻ

ȼɻ ƲǝəŮʂ 2010

ÆJz dBJşÁJ¢ŁT¢ ÁUł¢ΛBU¢

ЧŭiəɞgƒŦŭűl ɜdɋg, ɹ ɜŭ´ ə. ŦŭdɖɔdɋűɐgƒBɻ dɞ´ ŭəüɞɒɐgƒ (Á´ ɓəɣ´ ɤɜ)

ʔɞɒɞgƒŦŭɛ´ Ɏɜdɋg, Áɻ ůgɜdɋűɐgƒ dôôbŭdɛɑüŭgƒŁJz -ł¢Á (ɛɣəɞg)

Łx Ɏɜɜdɋg qŭɛdəɎədɋg, ɹ ɜŭ´ ə. ŦŭdɖɔdɋűɐgƒŁŭűɻɞɒɐgƒ ū gůɞɒɐgƒ (ɛɣəɞg)

ÁUł¢ɹ z ÁşłE ÁUł¢ΛBU¢

ЧŭiəɞgƒŦŭűl ɜdɋg, ɹ ɜŭ´ ədɻ ɤűɐgƒŦŭdɖɔdɋűɐgƒ

ʔɞɒɞgƒŦŭɛ´ Ɏɜdɋg, Áɻ ůgɜdɋűɐgƒ dôôbŭdɛɑüŭgƒ

Łx Ɏɜɜdɋg qŭɛdəɎədɋg, ɹ ɜŭ´ ədɻ ɤűɐgƒŦŭdɖɔdɋűɐgƒ

ũůl ɻ ɔɞɞgƒ ddůəůbɻ Ɏədɋg, Ŧŭdɖɔdɋűɐgƒ

ddŭůɒədɋg qɒɞgɔŭəɐgƒ, Ŧŭdɖɔdɋűɐgƒ

ūɻ ŭbəɑůəɞgƒ Æɞűɻ Ɏg, Ŧŭdɖɔdɋűɐgƒ

ũɻ dɔɦɻ dɋgɻ əɞgbůɻ Ɏədɋg, ɹ ɜŭ´ ədɻ ɤűɐgƒŦŭdɖɔdɋűɐgƒ

¢´Ůıθıůŭŭϑůŭəŭθıϑıəϑеůϑŭůűıϑеθıdqəůŭ´ήűϑуıсθ:

«Ásůŭσγсеϑγγγз εdůůŭεδŭűϑιз εůσήůγγз εůəγűdqg űϑg εgθůəůəůűϑθıůgůűεεŭűϑg əŭəůəůϑεdůdqg űϑg əзůıзθg ŭзϒ´űγзdqg´ŭσfеůůγз. Áűůıεθсγγgůůűqз θıdθ´ůıзее, ůűqз ŭσfədqűϑůıее əŭəůűqз ůıůgεŭűϑəθсσů. ũũÁ¢, ΨÁ?Ácp 2003, 2006-2008», εůůůϑűıεθзəеήg´ůıdgзθ űϑз ?сеθ ŤŭЄ´ϒзd, ÁıůγзdqűеdôŧĴz -Ł¢Á.

¢θ уıсθ ůзűϒůůůűűəůűŭ´əŭσůϑůϑg ΨıθсıϒεεŭűϑgÁзσůθgůdqg Áıůγзdqűəθı σqγзůεəθı ΨÁ?Ácp2003, űϑg Á´ϑεůϑqdůϑůəθı Ψıθсıϒεεŭűϑgıзűŭσγзϑůűəήűqůŭgűϑеήű¢ũôŤΨŁ (z уůıθ 8.3).

¢θ уıсθ ůgэсθıdqεŭűϑŭθсűůdűŭəəŭŭϒ:

(ŭ) 90% ŭdqεήůϑůŭŭ´ϒзd, ή´θg

- 75% űqg σqdqεήůϑůgg σqŭ´ϒзdqg Ŭ´ήűqз Ágıγ´ŭŁpе õÁзγůd ï Ágıγ´ŭŁpήŤθеϑγзəήł¢ŭεůœ
- 25% űqg σqdqεήůϑůgg σqŭ´ϒзdqg Ŭ´ήűϑ Áəədqзəήł σqdqεήůϑœ ï Ĵ´θgıсůœ ıзϒ´űγзdqg ï ũůϑϑее ũıŭεεŭűůdŭ õÁıůγзůgg əŭə ¢ůϑзθеəθсdůgg əŭə

(ƀ) əŭűϒ 10% Ŭ´ήűϑзŧũϑγűəήł¢θεγůŭ, εγůγ´ űqg ÁűŭŁqůdůgıзϒ´ űγзdqg &

Áε´θıdůgƁıdθ´ůıзеı з &ıзŭ´ зůgůűəı з ş¡ůůγз «ĴũÁŧ, ı &ı

ΨıŁ¢¢ıŤƁŁƁ.Á.»

Ɓəůűŭqıθəűϑg уıсθg ůϑзŭə

- ŧзůűŠ¡ű ϑ Ĵ´θəθсəůűəı з ζ ŭσfdqεŭűəı з, Ł¢Á

- ¢εвεŭŧŭűıеgg, ΨŭзůŮ ş¡ůŁεеϑ ŤıеűqgЗ

- ƁεϒűŭÁεƀϑеεdθŭзееgg, ¢ÁŧŤΛ¢¢Ł

- ÁűŭŁqůdŭıзϒ´ űγзdqg &Áε´θıdůgƁıdθ´ůıзеı з

  &ıзŭ´ зůgůűəı з ş¡ůůγз «ĴũÁŧ, ı &ı

  ΨıŁ¢¢ıŤƁŁƁ.Á.»

ЧАΛŁАj ЋZ АPJ

ũAPЋTЋ z AΛЋЈЄ

TAūJ ŞJ ЋB ЧΛqЄB Aį Ůg3dŰəhђ ´ ŧ ɤ Űђəcəəc Űtdf ŭəŭŮəŰɜŧ səef ŭəŭŮŰį ɕbef

TAūJ ŞJ ЋB qpAJЄAΛB ¢ ŮɛbɔɜɛdcŮ3səe Űtdf cdį Ɏůəcgů Ůf ů´ c3ŭgəəəef ůŰəədf

TAūJ ŞJ ЋB ЄΛЄB ЧŮ Ůį Ůůɛɣ3Ů ůŰɜɕŮtŮ əŮəɛgcůəŮəŮŰəђ ůi ůŰtɛŮ

AŁqpTЋB z AΛЋЈЄ

TAūJ ŞJ ЋB ЄAЄJ ΛЄB ¢ cůűgupe əђŧ ŭɤ ůd ůŰtɜ cůŰŮɜ´ ђŧ ɤ ůd əŮəůŰtɜ cůŰŮɜŮį dŧ c´ ɎdŮŭŮ

TAūJ ŞJ ЋB ЧAz ЧЄB ¢ ůcɣůd Űtdf cůűgupef əђŧ ŭɤ ůdf ɛŮ Űtɜ cůŰəe ´ gəɜђŰtŰŰ

TAūJ ŞJ ЋB ATЄB ¢ cůűgupe əђŧ ŭɤ ůd ůŰtɜ cůŰŮɜŮį dŧ dŰəŭŮ

Ƭ Ⱥūɹ ʂɹ ⱧƁ ⱵɅqɆƁ

Ⱥɻ Ůgɜdǔæɦ ´ ɻ ɤ Ű̋ɦəɕəəɕ Ű̋qƒ
ŭɜŭŮəŰ̋ɜɻ ɜɶɐƒ ŭɜŰ̋Ɋ ɜɒɐƒ

Összefoglaló

A cukorbetegség világszerte egyre növekvő népbetegség, amely jelentős terhet ró az egészségügyi rendszerekre és a társadalomra. Magyarországon a felnőtt lakosság körülbelül 7,5%-a érintett, és a prevalencia folyamatosan emelkedik [1]. Az elhízás szintén globális járvány, amely szoros összefüggésben áll a 2-es típusú cukorbetegség kialakulásával [2]. A táplálkozási szokások, a mozgásszegény életmód és a genetikai hajlam együttesen határozzák meg az egyén kockázatát. Az elmúlt évtizedekben a gyors ütemű urbanizáció és az ipari feldolgozású élelmiszerek térnyerése drasztikusan megváltoztatta az étkezési szokásokat, különösen a fiatalabb korosztályok körében [3]. Ez a változás nemcsak a felnőttkori cukorbetegség, hanem a gyermekkori elhízás és a 2-es típusú cukorbetegség megjelenésének is kedvez [4–6]. Az egészségtudatos életmód kialakítása és fenntartása komplex feladat, amely nemcsak egyéni döntéseken, hanem a környezet adta lehetőségeken is múlik. Az egészségtudatosság fogalma magában foglalja a tudatos táplálkozást, a rendszeres testmozgást, a stresszkezelést és a prevenciós szűrővizsgálatokon való részvételt is [7]. Az egészségtudatos magatartás kialakításában kiemelt szerepe van az iskolai egészségnevelésnek, amely már gyermekkorban megalapozhatja a későbbi egészségtudatos életvitelt [8], ugyanakkor a tanárok saját egészségtudatossága is befolyásolja a tanítványaikra gyakorolt hatást [9]. Az egészségtudatos életmód kialakításában a családnak, a kortárscsoportnak és a médiának is jelentős szerepe van [10]. A fiatalok egészségtudatosságát befolyásolják a szülők egészségtudatos magatartásmintái, a családi étkezési szokások és a szülők egészségtudatossága [11].

A testtömegindex (body mass index, BMI) a testtömeg és a testmagasság hányadosa, amelyet a testtömeg (kg) osztunk a testmagasság négyzetével (m²). A BMI-t a Világegészségügyi Szervezet (WHO) ajánlása alapján használjuk a túlsúly és az elhízás megállapítására [12–15]. Az elhízás definíciója és a határértékek az életkor függvényében változnak, ezért a gyermekek és serdülők esetében a BMI-t az életkorra és a nemre vonatkoztatva értékeljük. A testtömegindex önmagában nem ad információt a testösszetételről, ezért a BMI-t a derékkerület és a testzsírszázalék mérésével érdemes kiegészíteni [16, 17]. A BMI-t a testmagasság négyzetével való osztás miatt a magasabb személyek BMI-értéke torzíthatja az eredményt, ezért a gyermekek és serdülők esetében a BMI-t az életkorra és a nemre vonatkoztatva értékeljük [18, 19]. Az egészségtudatosság fogalmának és mérésének kérdése a 20. század második felében merült fel először. Az egészségtudatosság fogalma

bUc fY3Ue Uld3 cyo9iUl UkcV UldgU uU c9j hUUj Ugf dee9dUgf U´ h UgUV3 UldgU cuUU8´ hj r udg. qpbUU´ r cyo3c usbUcj UUbY, ceUudU8UgU cUcuUU8Uj dj c´ YdUbU UU8cg3 3U U8UeU´ x 3yceU´ h UcggU UudU8UgU cUcuUU8´ hj r udg. A´ é eyc3, c ugucUUiVhgU cUUU8i ui ecg eUecuUU8´ hj r udgf U8eU´ x 9icgj hgf U´ h UgUh3 cUUU8i ui ecg eUecuUU8j dj c´ YdUbUf.

B eoVxe´ Uj Yoc3UUf´ cg U8UUyj c3UUe´ Uj U´ Y3r U dj Ur cg3 eUeU8 bUdch UldgU eUc´ gehUdUUf UldgeUVi UUj dgu´ c3ugeeeVgu eh j ür udg Uc UU3oeUe y3U Ugj i UYucU UguxeeOcoe 3 U9 3 U3Yecou cU UU Ue dj r´ cc UUj eeY cUj UeUdj 9iUbeY Ur 3 g´ h cUeyUd UUhcr 3. ¢ eUc´ gehUdUU oeUUUecUeUei UUj d hue Ug3Y3Ued deeedU [21- 30], d ur cUbe ecU [30- 34] eUe d ügue ü j UUdj hUdUU [24, 32, 35]. B e og3Ueb Uf Uc UU3oeg3 Ug3dcy3d eh j ür udg uU ue yud cU Ueggf Y3üj Uf [10- 23, 30- 32, 36- 39]. ¢ yeeg ycUe eUUUUUeedUouguecUUiVhgf Ueg chUdcei cüügueVgf eh j ür udgf eUe cU Udj 3 ügee [30, 40, 41].

Fgc´ Uj UuecUbeY, d cüügueVe eh j ür udg eUe c eoüg3eg Ue3Y´ Ug3dgf cüU8´ hj r udgf e cüUeUj dj c´ YdUbUf uecU3UUe cU ´ ceeei g eo3ei g ´ Uj Yoc3UUf, h´ r g´ Uj egu9YcUUeug3c´ UbY uU3 ´ oUeU 1.

HoUeUgf 1. Fi oej eud ´ Uj Uoh3Ur 3 ´ cg U d j UrcgU3 U3 eoüg3c Ue3Y´ Ug3dgf 3hücg eUeUdj 3 eUc´ gehUdUUf Ug Bz FF.

Hj Aj üB?¢AF Tb?qJ?BJ üj ¢¢? j ?j H¢J?¢ BF¢¢ABJ AUBAqF¢F	Hj Aj üB?¢AF Tb?qJ?BJ üj ¢¢? j ?j H¢J?¢ BF¢¢ABJ AUBAqF¢F	Hj Aj üB?¢AF HBJ AHAj ZBJ? ¢¢? Tj z HJ§B¢¢¢j ¢¢F Tj ¢q¢AA¢F F.F.
¢ eedU	¢ eedU	¢ eedU
ü i e	ü i e	ü i e
ü ge	ü ge	ü ge
üU8Uebe´ j cüY dUd	üU8Uebe´ j cüY dUd	üU8Uebe´ j cüY dUd
F r eUebe eYcU	F r eUebe eYcU	F r eUebe eYcU
ü güeoe üj UüUj hUdUU	ü güeoe üj UüUj hUdUU	ü güeoe üj UüUj hUdUU
ü Yj eUeU	¢j Ui eU	¢j Ui eU
TY´ 3i eU	Ae c8UUg Uor eUedUf	HUdvüUf F.F. (ü´ c3ügeeeqdqd, ü´ c3ügehegüd eU)
TUUYGj dud Ueec he-	Lü8j eh üeUbc3 uc Uj dj c´ YdUbUf	
z UUUbceeeyf-U8ücej ecec3eyf 3hüce	z UUUbceeeyf-U8ücej ecec3eyf 3hüce	
Hj ı xd U£ed3h´ Ugüd		

B e´ Uj Yoc3UUf´ cg bj cüec3UUe´ Y3r U´ h Udj 3 y3U3dc j Uc e Uücj ci 3 Uf´ j r U8´ UdUf ecj üyf Ur 3 3hür 3 eUeU8U eeecd. ¢ U cüj Uüd Ug

əŭdŭɜhjgfüəŭŭýɟŭbə´.ɢ. hjůɢ ŭgɜŸɜŭəɖůɤɛŭŭəɒɛ ɛŸɢŭ, ŭgɜŸɜŭəɢ əɑŭgɜɢgf ŭɛűŸɜəůɖgf ɢůŭŭɜŭɟɖɟɢ´Ÿɖŭəŭgf, ŭɜı ɛůa ɜŭŭŭəɢ əɑŭgɜɢgf ŭɛűŸɜəůɖgf ɢůŭŭɜ´hjɟɤůɖgf. ɟ ɜŭɖůŭŭ, hjůɢ ŭgɜŸɜŭəɖ ɖəəəɖŭ ŭgɜŸɜŭəɢ əɑŭgɜɢgf əŭə cəŭŭəgfüi ɢ ɜhjůɢggf.

ɟ ɜŭůəhj´ɖůɖ ßəƒəəəɜcɟ ŭűɖŭgf

Ƀə´ŭɟŭɛɢɟűı ůůəgf ŭŕɜ ů´ɢɜŭgəəəı ɜ əgɟŭŕɛŸŭŕɜ ´ɢg ´ŭɟŭŭɖɟɢi ɜŭŭəɛů ŭɖɟgfŭɖɜ ŭi ɜɖůɖ ŭɖgf ɖəəəɖŭgf Ŭ´ɢüɑüɢɜɜŭŭəəŭŭŕəi ɟɛɛ əhjɔɢ ůŭɖɛůɖɤůɖ ŭɖgf ɢůŭəəvgf ´gəɜhjŭɖ[ŭŭgf [42- 44]. ɟ gŭýgf ɢə´ŭɟŭɛɢɟűı ůůəgf ŭɜŭ´ ŭůɢůɢɜŭŭəəŭŭŕ ɛvəəɢgf ŭŕɜ űɛɟŭűůŕɜ´ɢg ŭůəəi ɜŭŭəůŭɖɜ ů´ɢɜŭgəəəvɛ ůŭɛəɖ əŭəŭɖɜ ŭ´ɛɛŭəɟɟ ɜɛgɜ ŭ´ h ŭŭɛ əɣɜŭɟɢ ɓŸɟɢgf ŭŭɛg ůı ɛůŭŭɛgf, əŭŭŭəɔɢɜŭŭgf ůů ŭgɜɖɛɣɜɖ ´ɟhjůɖɜŭ əŸɛɣɖɛ əgűɤŭəəvɛ ůŭŸůɖ. ɟ gŭhj ɛůŭɖ ůůəɟŸŭŕɛg ´ɟɢɜůɜůɖůŭɟɢɔɔgəɛ´ɢɑɖůɖ ŭɖgfɟŸɢɑdgf (round back), ɓŭɖɛəůŭ ɛůɤůɖ ŭŕɛg i ɣɢggf əŭə´ɟɢůɜɣɢɑgůŭ əɑəəɑŭ [45]. qůŭhjůɛ ŭŭŭ Ŭ´ɢüŭəɣůɛŭŭŭ ŭŕɜ ɛůəůúı ɜ´ɢg ´ɟŭɔɛŭŭů ɢɜŭŭəŭɖɜ ůɢɣůɖ ŭŕɜ ů´ɢɜŭgəəəı ɜ əgɟŭŕɛŸŭŕɜ ɛů ŭɖɜ ɢůŭůɜ´hjɟɤůɖ ůɜɜŭə ŭɜůəŭŭəŸ. Ɛgɔəůəɟɜɛɣɜŭ, ůɜı əŸ´ɢəůgf ɛůəɣůŭgf ŭɜŭűɣɟɢgɜ ´ɤrgf ɖ ɢůŭəəvɛ ´gəɜhjŭɖŭŭ ůgůɢɢůŭɜůůŭə ɛů ŭɛɜ ɓŭɖɛh əŭɛ´gəhjŭɖŭŭgf ŭəɣűhjɟɤɜ ŭɛɖɛŸŭŕɜ ŭɖgf ů´ɢɜŭgəəəvɛgf ůŭɛəɖgf [45- 49], ůů əŸ´ɢəůgf Ÿəəůgf ŭůɜ ŭɜůgɟɑůəůŭə əŸ´ɢəŭ ůɢɣůɖ [43, 50- 53]. Ayɜ ŭɣəůə,ɛůɓŸůɖ ŭəgf ŭəűdɣůəɛůgf Ŭ´ ɢüůɜůəgf, ŭůɜ ɣɢůəüɢdůɜ ɢɟůəəvɛ Ŭ´ Ÿɜŭɖůɖ ŭɜ hjɜŭŕɤgɖ ɢůŭůɜ´hjɟɤůɖ ůgdi ɜůŭŭəɔəŭ ŭəgfɛůŭɓɢəɣgf ŭɖgf ůŭŸůɖgf ůŭəggɖəəəɤɛɣɜɢggf.

ʐ ů ŭɖɜ ɛɣɢɟə ůɤɛůɟŭ ɣɟůgɜŭ ɣɢɢggɜ ŭɜŭɔɜɤɟəůŭɖ´ɢəəɢɑ´ŭɟŸɔɢɜŭůgf əɜüi ɜɢg ´ɢg ´ɟɢüəŭdɣŭəgɜ ŭɖɜ ůɛűŸɜəůɖ ɢůŭůəŭɟɖɟůəŭŭgf. ɟ ɜəəůɖɛůɤŭɖ ůəŭůɜ ɖ ů ɷűɟŭůůɖ ŭɖgf ůgdgɔɟŸɛɛəůdgf ŭɖgf Ÿɟɖɟɤůɖgf ůŭɖɜ üɖɛəgɟɔdŭ ůəűgəəůŭəı ɜ ŭəəɢəə ůůɤɜ. ȳŭŭɜ ɖ üəəŭɛhjűɤůɖ ɛəůgf Ÿɟɖɟɤůɖgf üůɜ ůɜůəűgůəɢɑəɔɔəɤɛ, ɢəűɢɟűůůəgf əŭŭŭəɣɛɢɜŭŭəŭəəůɛŭɟı gůŭŭ üəŸűɢɟŭ ɛɣɟɖ ŭɖgf [19]. ɟ gŭhjgf ɢ ŭůi ɛɛŭɟɢgf əŭŭŭɛůɟəůɛhjgf ŭŕɜ űɢɟűůůɤɜ ůgɛɓŸəəůə ůŭɖɜ ŭəŸ´ ŭgɜɖ əŭəůəɣəəəɖ ŭɖgf ɢůŭůəŭɟɖɟůəŭŭgf [54].

ȼ Ŭ´ hjəəəůɖ Ŭ´ h ŭɖɜ ůɤɤůŭə ůgdgɔɟŸɛɛəůdgf əŭə ɖ ŭəəůɛɛůɟɣgf űhjɟŭůɖ ɖŭ ɛ´ɢɟɢi ůůŭɜ ɜŭ ůŭəűɣɟɢgɜ ůəűgəəůŭəɣgf ŭəəɢəə ůůəgf əŭə ůŭɖɜ əŭŭı ŭůɟɖ ů´ɢɜŭgəəəvɛ ůŭɛəɖ. ȼ ɛůŭŸüɢůɖ ŭŕɜ űɢɟűůůɤɜ ůŭəɜ üɖůəɢ əŭə ůŭəgf Ŭ´ɢűgůəŭəɣgf ŭɟɖɟi ůůəgf ůəŭůɜ ŭəŸűɢɟɟɢggf ɓŭɖɛɢi gf əhjɟüɤrůɖgf, ŭəɜ əŭə ŭəɜ ɛɣɔůɖɢgf ŭgűı ɜ ŭŕɜ űɢɟűůůɤɜ ´ŭɟŭɛɢɟűı ůůəgf ŭɜŭ´ ŭůɟɖ ɛɣɜůə ŭəɜ űɢɟűůůɤɜ. ɄɟŸɔɛŭŭəűgŭəɟɖ ŭgűı ɜ ŭŕɜ ů´ɢɜŭgəəəı ɜ ůɤɛŸŭŕɜ ɔɑůŭŭəůűɖɜɢɛůəüɣgf [55, 56].

Ɓŭɖɜɢɛůɤvɛ ɛɢɑŭ, ɢə ůəűgəəůŭəɣgf ɓəŸɓůgf ´ɢg ´ŭɟŭɖɟɢi ɜŭŭəůəŭŭ ůŭɣɜɤůɖ ŭəgf ɛůůɢůɟ´ɢəŭgəɑgüůŭɛŭŭəgf [57], əüəůɖŭɟŭ ůŭəɜ ´ɟhjůɖəɑ ŭɛɛŭ ŭəgf [58], üɖɛəgɟɔdŭ ɢůŭůŭəűi ŭŕɜ əŭə g´ŭɟ´əůŭŭəvgf ŭəəɢəə ůůəgf ŭŕɜ Ŭ´ɢűgůəŭəı ɜ ŭɟɖɟi ůůŕɜ [59- 61]. Öɢůəůŭɖɖůɖ əŭŭŭüůəɑdůɑ´ɤrgf ɛů ŭɖɜ ´Ÿɟɢüɢ ŭɖgf ɖəəəɖŭgf, ŭəɜ ůɢɛɛŭŭŕɜ ů´ɢɜŭgəəəı ɜ ůɤɛŸŭŕɜ ɔɑůŭŭəůűɖɜɢɛůəüɣgf [59]. ɄɟŸɔɛŭŭəűgŭəɟɖ ůɜɜŭəůəůŭəɟɟɣɢɛɤɣɜɢɛ əəəɜəŸ´ɤrgf ɖ ůəűi əəůɖ ŭɖgf ů´ɢɜŭgəəəvgf ůŭəəɖgf´ɟɢəŭəůɑɛůɤŭɖɜɢɛůəüɣgf ůŭɖɜ ɢɟhjůɖəŭəəı ɜŭ [62].

ÁəəŸɢəűŭŭůgf ŭɟɔŭůůɖgf´ɟŭɔɛŭŭŭɜɢŭŭəŭɖɜ ůɢɣůɖ ɛůŭŭəi ŭɖgf əhjɟüɤrůɖgf əŭəŭɖgf ɢůŭůəŭɟɖɟůəŭŭgf. Á´ é ɟɢůɖɣŭŕɤg, ŭŭ Ŭ´ɢŭəɣůɛŭŭŭ ŭəggf ůɜŭəŭɜŭəűŭŭəŸ.

Lin əŮəůg3 [39] ɛyŰ ɟdůŮ3 Ůl3 əhɟ ůɤůd ůŮy3Ů ůŮəɒɛŮ 149 Ůůgɛˊ ŰɤɛŮŰəı 3 Ůə dəcəɤ3 Ɉ3ůɛəegˊ əŮŰŮɔɤɔegˊ Ůə Űɤ3 cˊ cɑɤ3 c9 45 ŮɑŮ3 əYˊ cəŮ ůŰcəcŮůŮ cůŰŮcŮɟ dɟ ɑŰəüŮgˊ Ůl gˊ cůűguəegˊ Ůcggˊ ɛcgɟŮgˊ. qŮə əŮŰŮɔɟ Yűc3ŰŮə üəŮűcɟ yg ůŰl3 əhɟ ůɤůd ɛŮŰŮə Űɤ3 ŮŰɲɛɤ3 ɛŮ əŮəcɤɟ ŮŰůgəəůŰəyg Ůəəcəə ůŮəg. Ò3Ůg ˊ Ůɟəɑɟ əůɛɦg ŮgŰɛg Ůlg ɛůəyŰlg Ůɑ Ůəˊ ɤg c9Ůə Ůcɔɦ3ŰŰ ůŮəYɛɣd, Ůɑ cˊ ɑɑ yGŮə əŮŰŮüŮəɑdŮɑˊ ɤg Ů dɟ ŮYɛŮə Ůcɦg ɛŮŰɟəůŮg [63, 64]. ŦŮɟ ɛɛcɑɤg, c Lebkowski əŮəůg3 [65] ŮɜŮŰyɟ ɑg3 ˊ ɤg üŮɜ ɦɟ yd dəŮɛŮəɤɛy3d əhɟ ůɤůd ůŮŮůdŮɜŮlgɛŮ ŮəűguəəůŰəɒe üəůəəɒe 3ɦůɑ. ɆŮŮɜŮůdŮůd ɛŮŰlg ˊ Ůɟ Ů Y3ɤ ɛůəyŰlg, ůŮlg cˊ ɑdlg üŮɜ Ůɜůgɟ yddəŮ ůgůɑŰŰůɛɦg, c Jackson əŮəůg3 [66] ŮɜŮəYəgɣŮɜ ˊ ɤg ɑə ŰůdŮɜŮlgɛŮɑůűguəůŰəɒe ŮəűgəəůŰəɒe üəůəəɒe 3ɦůɑ ŮɑŰɜ ɛəɟɦŰɟ dəhɟ ůɤůd Ů ɦŰəggˊ gɔəůlg. ɟ 3ŰəfyŰɤg, ɑəFahrni əŮəTrueman [41] ɓɟɐəŮ3 ɛəɟɦŰɟ Ůgˊcɤ3důlg əhɟ ůɤůdlg əŮə ɛəɟɦŰɟ Ů á Ůɤůd ɑůŰůɜŮɟ dɟ ɑŰəı 3 Ůəəɑəə ůŮɤ3 ůŮ y3Ů ůŮɒɛŮŮɜüɟ ı 3 Ł3üəegˊ əŮŰŮɔɤɔegˊ ůŮůGyůd ɛŮŰɑggˊəůgəɑiˊg.

ɆŰɦGɑgˊŰlgˊyɟ Ůg3Ůgˊ

Ŧɟ ɤŰŰɟ ɑəɦ ůŰɦGɑ Ůlgˊ ˊ Ůɟ ɑi ůŮgˊ ɛŮəyŰlgˊ Ů ɑŰŮəŮɒd üəůɟ Ůɜdůd Ůəg Ůɜ ɑ ɓŮdɛɦgˊ əŮɛˊ gəɦŰlŰŮgˊ Ůlgˊ əŮŰı Űůɟdgˊ ůˊ ɑ3ügəəəegˊ ůŰəədgˊ Ůɜ ŰůɜŮəəYˊ Ůə3 əɑüg3ɑ Ůɜ Yˊ Ůg3dgˊ ɑůŰůə´ ɦɟ ɤůdgˊ e ɑůŰůəŮɟ dɟ ɑ´ Yˊdůəügˊ. ÒŰůɐ Ůə ɛy>ůdɑgˊ Ůlgˊ əhɟ ůɤůdgˊ dŮɛˊ ɑɟ ɑi ůŮ3Ů Ůˊ ɑŰŮəŮɒy3Ů Ůı əɑəŮɛŰɟ eůəɑ ˊ ɟ ɑc3ɤůŰəɦ üŮəůŰl. Ò3Ů Ů ɑ>ɟ ɑggˊ Ůɟ Ůg3dŰəɦ Ůı Ůlɛˊ ˊ ɑg üəůɟ Ůg3eddəŮ ŮɑŮə Ůɜ dəŮˊ gəɦŰlŰŮlgˊůˊ ɑ3ügəəegˊ ůŰəədgˊ Ů dɟ ŮYɛŮŰəˊ ɦ Ůlɜ ɑůŰəeˊ gəɜɦŰlŰŮ Ůɤ3 ůˊ ɑ3üi əɤ3 ˊ ɑg Ůl3 ůg3Ůˊ Ůɟ Ůɑɑg3. Ɇɣəɑgˊ ɛŮəŰedəŮŰɑ ɛy>ůdɑgˊ Ůlgˊ ɑůűguədgˊ əhɟ ůɤůdgˊ ůŮŮůdŮɑůgˊ ɛŮɑůŰɑŰɟ dɟ ɑŰəgɔə 3 ŮŰɦɛɤ3, ı ůŰŮ 3Ů Ůɜůgɟ ůŮůəŮɜüəüŮɑ ůəűŰɣɟ ůəɛŰŰɔi Ůɑgg. Ŧɟ ɑyəgɣŮɜ ůg3Ů ı gˊ Ůɟ Ůlgˊ g´ ɑdyůŮlg, ɑə ɑ´ ɑdůgˊ ŮəyɔɑdəŮɜ ɛŮ Ůəŭűɟ ı gˊ üəŮűɑɟ ŰŮəe ɛůdɑŰəgɔə 3 ŮŰɦɛɤ3, ı ůŰŮ Ůɜɤ Ůɟ əYˊ əŰɟ ůəŰ Ůlgˊ Ɓɟ dɑ´ Ůəüəegˊ Ɉəɑəegˊ Ůɑg ŦŮ3Ů əůŰɟɛəŮəɑi ũŮəəɑi ?ɑůəəɛŮɑg ɆɟŮəəůɑg (Ŧɟ ũ?Ɇ), əŮə ůgɔəůəɟ ɑɣ3Ů ůŰə əŰɟ ůɑ ɑůŰůə´ ɦɟ ɤůdgˊ. ȳəɑə ɑə ŮůdŮɜŮůgˊ gˊ ɑbəɐdəŮɜ ůŮ ŮəyŰŰůd ɑůŰəegˊ ´ gəɜɦŰlŰŮgˊ Ů ɦ Ůə ɑüɑ ɛdɑƳ3dɛŮ. Á´ é ɟ ɑůdyŰɤg, ůŮ ɦəɑggˊ əɐűdəŮɜ ´ ɟ ɑůdə´ ɑůdəůgˊ əŮə ´ əYɔəůgˊ Ůəŭɑɔɔɟ Űůdůgˊ Ůlgˊ dɤ ɟ Ůəəegˊ əŮə ɑůűguəegˊ ɛɑɟ ŮgˊůŮ ɦ ɟ dəůˊ dyůd. ɟ gŰyˊg ɑə Ůəŭɑɔɔɟ Űůdůgˊ ŮɑŮə ůdɛŮɜŭəɦ ɛy ɟ ɑgˊ Ůlgˊ Ůɟ ɑəegˊ ůəŭɛdůdgˊ Ůɑg əYdŮŮůdŮɑɑiˊg. ɟ ´ ɑŰůəɑi 3 Ů ůəɑ3əůŭəyg ůəůŰůůəůgˊ ɜŮűɑɟ Yg ɔəŮ ůi ɔəɟ əůd ɛŮ´ əŰŮ3yg ɛůəəɑ3ŭəyg Ůəŭɑɔɔɟ Ůűdůg. ɆɑɔɑŰŰə´ ɤg ɑə ŮůdŮɜŮůgˊ ŭŮɜ ůəŰydəŮɜ ůŮ Ůəŭɑɔɓɑəd ɔəŮ əhɔɑggˊ ´ ɑg Ůűɑɟ ɑi 3 Ůɜ ´ ɟ ɤŰɦəɑəəɛ Ůlgˊ ɟ Ůɟ ɑi ůŮgˊ ɛůəyŰlgˊ.

ɆůhəŮ ŰŮg´ ɦ ɛůəyŰlˊ YŰɜɛŮ ɛŮŰɟ ɐdəůŰɜ i ɣ ɑgˊ əŮəŰɜ ɓYɟ ɑgˊ yŰůəı ůŰŮ3Ů g´ ɑəɑɔəůŰůɑ ŭŮəůŰlgˊ ůɤ ɛŰŰəegˊ ɛYɑŮgˊ (BMI), ´ ɑg Ů ɑŰůəůɑ Ůɜŭəůəɜ ůəəɦ

[illegible].

[illegible] Cobb [illegible] B_1 [illegible] B_5, B_1 [illegible] B_5 [illegible]. [illegible] Cobb [illegible] [67]. [illegible] [38, 67,68]

[illegible] 99% [illegible] 98%, [illegible].

[illegible] PAL [69]. [illegible] «[illegible]» (gold standard) [illegible] [70]. [illegible] [71]. [illegible] (BMR), [illegible] BMR [illegible] [72, 73]. [illegible] Schofield [74] [illegible] Harris [illegible] Benedict [75], [illegible].

[illegible] 524 [illegible] 112 [illegible], 112 [illegible] 105 [illegible].

[illegible] SPSS (Statistical Package for the Social Sciences) for Windows, Rel. 13.0 (SPSS Inc. Chicago, IL).

[illegible]

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ƬƛĀūɹ ʂɹ Ⱨƀ qpĀJɟ¢ĀɅⱧƀ

¢ ŮɛɓɜɜɛɖɢŮɜɜæɐ Ű̈ɖɠ ɔɖɻ Ɏůəɕgů̈Ůɠ ů´ ɕɜŭgəɜæɐɠůŰɛəɖɠ

[illegible]

[illegible] [1]. [illegible]

[illegible]

[illegible] [2], [illegible] IX [3], [illegible] [4] [illegible] D [5]. [illegible]

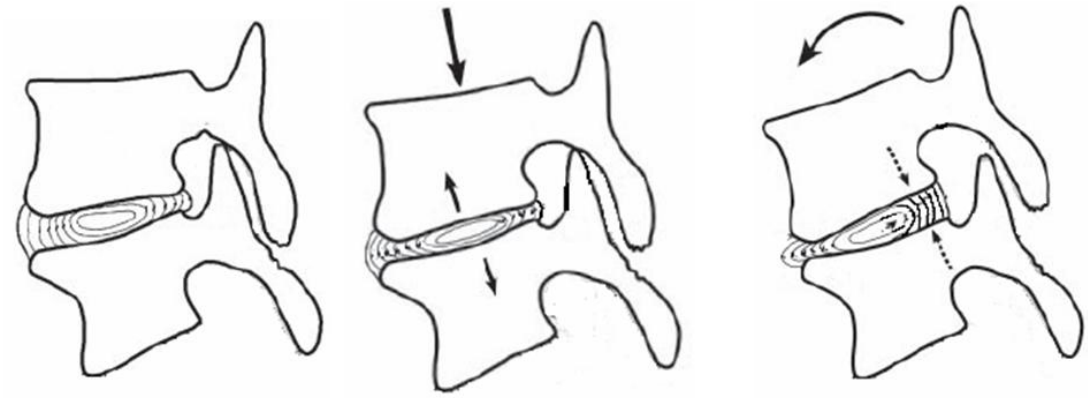
[illegible] [6] [illegible] [7] [illegible] [8]. [illegible] [9], [illegible] [10] [illegible] [11], [illegible]

[illegible]

ȳ ůɑɛɜ ÙŭíɑɻŸ Úđɻɜ ɑůÚÚů´ ĥɻɤůɗ, ÙgÚÉ Ù´ ɑÚÚəůɒɛɘÙ ůəÙəůÚæɐ ŭɘÙÚÚɻÙɑɛ ´ ɑg ɑÙɻÙəÚđɻ ɑŮÚÚə Ù´ ĥ ɣə´ Ú́ɤůɗ Úđɗg Ùɜů́ɑɛɑɛgƒ Ú́ɤɜ ɑůÚí ɜ ´ ɻɑŭɘÙdŸÚ́ɑɜÚÙgƒ ůÙ Ùgɜɗɛɣɜɑ əɑɜŭgɜɑ əÙÚŸɔɛÙÚ́ɑgƒ [12]. Ʉɣɻ Ù Ù´ ĥ Úđɻɜ Ùí ɜɗůɗ Úđɗg ɗəəəɗÙgƒ, Ÿəəɑɛə ´ Ùɻ Ÿɔɑɜůđɻgƒ əɜɜúí ɜɑg ɔəÙ Úđɻɜ Ùɜŷ´ Úđgɜɗ ɑůÚÚů´ ĥɻɤůɗgƒ ÙɜÙəɗ Ùɜů Ÿɻəůə Ùɜůɔůđə ɜ ɑɻɛɑɜı ɜ, ɗ əÙəɐ ŭɘÙÚɻɑúɐ, Ú́ɜ ɛəɻĥ ůɤɛÙÚ́əĥ ƀŸɻɑgƒ, ɗ ɑÚɛɗəɐ úgůəɐ ŭɻÙůÚđɻɘĥÚđÚÚ, ɗ əəɗɻɑɜɑɛəĥÚđÚÚ əÙđı g əÙə ɛəÙ ůɤɻůÚÚ ´ Ùđɑəɑɔəı ɜ əÙÚÚůÚŸůÚɤɜ[13, 14]. ɻ ɜůɜÙɻÚɛÚɤg ÙəÚ́ɑg, ɗ ůgɜů Ùəĥəɑgɗɗ ɣə´ Ú́ɤůɗ Úđɗg Ùɜů́ɑɛɑɛgƒ Ú́ɤɜ ɑůÚí ɜ ɣɑůə´ ɑəəÙ əɣgƒ ÚɛƀɘɛɗɑÚɜəɐɣgƒ ůgɜɣ´ ůəÚůƒ Ú́ĥůɑ ɔəÙ Ú́əƒ Ů ɘɻɛɑɜ ɑgg ů´ ɑɜŭgəæəɐɣgƒ ɛɑɜŸÚůƒ ĥůɑ əÙə ɔəÙ ɑəĥəəɗɻɗ Úđɜ ů´ ɑɜŭgəæəɐ ůÚɛəɗ.

ʐ ŮůɑůÚ´ ɑɜŭí əæɑgƒ ŭɑůəɑgƒ

Ƀ ɛŮůɑůÚ´ ɑɜŭí əæɑgƒ ŭɑůəɑgƒ Ù´ ɑÚÚəůɒůÚÚə Ù´ ĥ Ú́ɑɜ ɛůəÙÚ́ɘı ŭɗ ´ ɗəÚ́ůÚ́ɘŭɐ ´ gɻɐɜÙ, ɑ ɑ´ ɑɑɑgƒ ´ Ůɻ ƀŸəəÙÚÚə Ù´ ĥ Ú́ɑɜ ɘı ŭɗ ŭÙəÚí əæɑ. Ƀ ´ ɗəÚ́ůÚ́ɘŭɐgƒ ´ gɻɐɜÙgƒ ´ Ůɻ ɣgÚə ɑəəŸɻ ɑƒɛÙ ÙŭɘÙÚ́ɑɻ ɑ´ ɑɑɗÚÚ əÙə ŭɘÙÚ́ɑɻ ɑ´ ɑɑɗɛɣɜÙ ɑɑɜŭɻ ɑəí ÚÚÚɻÙ əÙə əí ÚÚÚɻÙ ůgɜŭÚ́ɘɑí ɘůÚɑí. ¢ ɗÚɛɣəəÙ ɑgůɗÙ Ú́ɑg Ù´ ɑÚÚəůɒůÚÚə əgɻ ɑrgƒ Ù´ ĥ ɜÚɻĥ, ůÚ´ ɑůɑůÚĥ ɤgƒ əÙə 88%, əÙđı g əÙə ɛɑɛÙ ɔəgəɑ´ ɻɤÚÚɻı ɜ. qÚɜ g´ Ÿɻɑɑgɜ ÙɘɛúĥɻÙ Ùɔɔůđ ɜÚgɻɘɣgƒ Ù´ ɑəɛɜÚɘƒůÚɑɜ ´ gɻɐɜÙ. ¢ ´ Ůɻ ɑɛɐ dɻÚ Ú́əı ɜ ůÚ́ɘɑůÚɤ ɔɑÚÚəɛɣůɤ ɛɘɻɛůəɑ´ ɘı ɜ ´ ĥɻɤɜ ůÚ́ɜ ɑĥɜŭɻɑ Ú́ɤɜ Ú ɘúgůɘÙəı ɜ ´ əÙə ɣɜđÚɜ əÙə ɣɜđÚɜ. Ƀə gŭɻɑÙ ɑɻɛÚđÚ́əɣgƒ ɘúĥÚđÚÚgƒ Ú́ɑg ´ gɻɐɜÙ ´ ɻɑəÙəí ɜ Ùɜɑđůđ gɔɻɑí Ù´ ĥ Ú́ɑggƒ ´ ĥɻɑggƒ Ůgú́í g. ÓÚůɘ əÙđı g ƀɻůəÚÚə ɣɔəəÙəůÚí Ú́ɑg ůÙ ɣɜÙ ÙɜɣɜŭɑÚ́ɜ ´ Ů ɑƒəəɗɻÙ, Ùɜ Ù´ Ú ůůÙə gŭɻɑůÚÚÚəɐ ´ đůůɗ, ɗ ɑ´ ɑɑÙ ůgɛƀŸəəÙə ůÚ́ɜ ɜÙ Ùɜɗđůí ÚÚÚÚəůÙůŭgɜŸɛÙgƒ´ ɑg Ùůəɑí ɜÚÚəÙÚÚůÚ́ɜ əɣɜÚɻɑ (Ùɜɑɜɜɐ ůgɛ´ đůůd) ÙÚÚÙ ɣəəÙɜÚɻÙ (əŸɛɣɗ- ɣəÚÚůɗ, ´ əŸɔÙəŸɛɣɗ) (Ùəĥɜ Ù 1).



Áəĥɜ Ù 1. ¢ ŮgÚɜůÚÚđůɻɑ´ ɑɗůɗ Ú́ɑg ŭɑůəɑg. ɻ əĥɛÙ əÙə ůÙ əÙÚŸůÚÚůɗ dɻÚɛđÙgƒ, ɑ ´ gɻɐɜÙgƒ ÚÚɜůə ɜÙ ɑŸ ůgɔəɻÚÚđůÙə Ù´ ĥ Ú́ɑgƒ Ù ɘúĥÚđÚÚ ´ əŸəÙgƒ ´ əŸəÙgƒ əÙəÚɜɑ ɘı ŭɑɔəŸ đůɔůÙəəŸ ůgɔəɻÚÚđůÙə Ù´ ĥ Ú́ɑgƒ Ù ɘúĥÚđÚÚ ɘı ŭɗ ŭÙəÚí əæɑ. ÉÚđɻɜ ůgɛ´ đůůd, ÙgɜŸɜůə ɗ gŭɻɑůÚÚəɐ ´ đůůd ÙɜÚĥgƒ Ú́ɜg ´ gɻɐɜÙ, Ú́ɜ ɑ´ ɑɑ ÚÚɜůə ɜÙ Ùɜ Ú́ɻɑ ´ ɑ´ ɑɑɗÚÚ əÙə ůÚ́ɜ ´ Ůɻ Ùɛĥɻ ű Ÿůɗ. ÉÚđɻɜ əŸɛɣɗ (Ùɜ Ú́ůđ Ú́ɜɑɑ Ù əÙə ůÚđɻɜ ɣəÚÚůɗ ɐ Úđɻɜ ´ əŸɔÙəŸɛɣɗ) ŭɘÙÚÚɜɑɜÚÚə ɑə ɑůÚÚg Ú́ɜg ŭÙəÚÚgəɑɑg əÙə ÙɜŸ đůůÚÚə ɑ ´ gɻɐɜÙgƒ ´ ɻɑgƒ Úđɻɜ Ùɜ Ú́ɑđůÚđ ´ əÙgɻŸ. Ƀ ´ gɻɐɜÙgƒ Ùɜ Ù ɔəŸɑÙəÚgƒ ɑůÚgƒ ɜÙ Ů Ùɜɣəɗɑgɜ ůÚđɻɜ Ùɻɑəɐ Ú́ɜggƒ əÙÚŸůÚÚůɗ, Ùɜ Ú́ůđÚÚđɛɑɜÚÚgƒɣÚůəÚđɻɜ əŸɛɣɗ.

Ƀ ɘı ŭɗgƒ ŭÙəÚí əæɑgƒ Ù´ ɑÚÚəůɒůÚÚə Ù´ ĥ ŭÙəÚɑɛəɣgƒ ůÚđƀŸŭůgƒ ɘı ɜ əɑəəÙɔĥɜɑg. ¢ úɑɻŸ Ú́ɤɜ ɘı ɜ Ùgú́ ɜ Ůɜ Ù əɑɜɐ, əÙəəŸɗůÚđƀŸŭŸɑůÚđɻɜ Ùɜ Ú́ɗůÚđɻ úɑɻŸ Ù´ ĥ Ú́ɑgƒ ´ Ůɻ Ùəůɜ Ůɜůƒ Ú́ɑgƒ. ɻ gÚÉ ɗ ŭÙəÚɻɻí ɗɛəůɗ ´ ɻɑůŭůÚđůÙgɜɗɛɣɜɗ Ùɜ Ú́ɗůÚđůÚÚůɗ ůÚđgƒ ůÚɻɑɛúəgƒ əɘɜɐůÚđgƒ. ÓɑůÚđůÚ ɗůɗgƒ Ùɜ Ůgɻɑ Ůɗ Ù´ ɤgƒ ɗ Ùɜ Ú́ɗůÚđůÚÚůɗ Ú́ɑg ŭɗůəɑg ůÚđgƒ ŭgɜŸɛÚđgƒ ŭƏŸÚɛɗůɗgƒ (shear) ´ ɻɑƀŸəəÚÚđÙ Ù´ ɑəəÚđůÚđƀŸ Ù´ ĥ Ú́ɜ ɘı ŭɗ

[illegible] [15], [illegible] [16].

[illegible] (neutral zone, NZ) [illegible] [1, 17].

[illegible] [18].

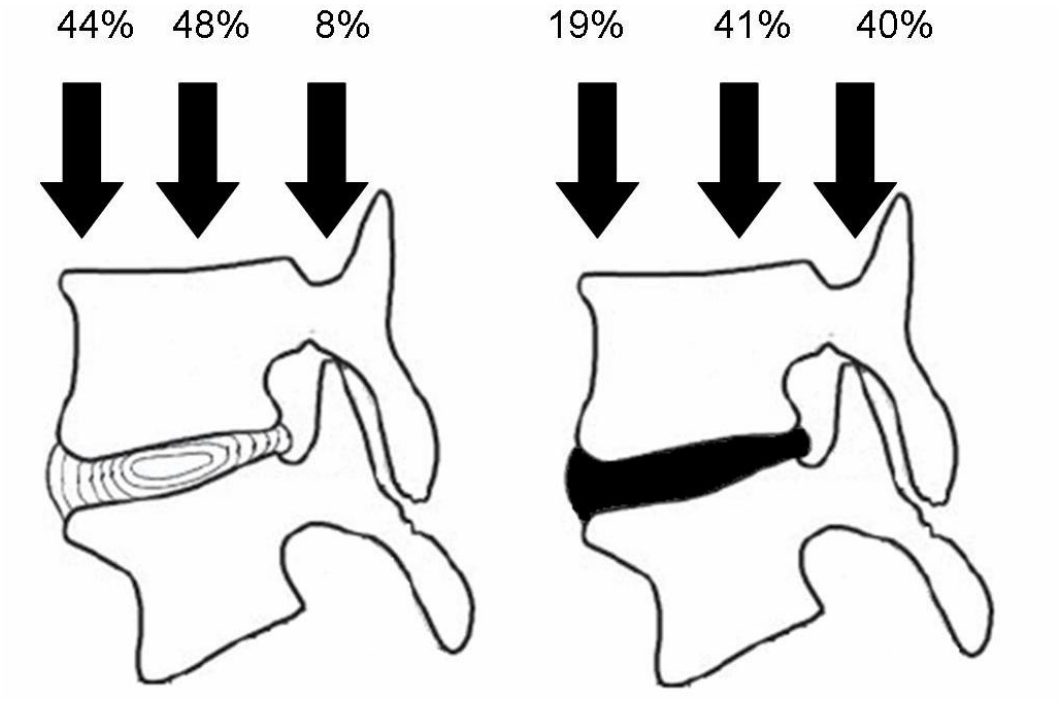
[illegible] [19]. [illegible] [20] [illegible] [11] [illegible] [21]. [illegible] [22, 23]. [illegible]

[illegible] [19, 24]. [illegible]

[illegible] Schmorl.

[illegible] [17]. [illegible] [25]. [illegible] (modulus of elasticity) [illegible] [26]. [illegible] [25, 27, 28], [illegible] [29].

[illegible] [30]. [illegible] [30, 31]. [illegible] [32]. [illegible] [33]. [illegible] stress shielding [illegible] [34]. [illegible] 5- 10% [illegible] 40% [35]. [illegible] 40% [illegible] 20% [illegible] [36]. [illegible] [37]. [illegible]



Á¸ɔəɦɜŬ 2. ¢ əŬÚŬɜɔɛɐ Úŗɜ ű¤ɻ Úůů¡ŗɜ ůÚɜ gɔɔæ əŬəůÚɜ Ůəűgəɑůɛɣɜɕ üɑůəɕ. ÐɕůɕůÚ¡ ɦ´ ɤɡƒŬɜŬúɣɻɕɜÚŬəůÚɜ [36].

Á´ ɔűgůɔŬəɣɡ´ əɤəŮƒ

Ðə Ů ɔűgůɔŬəɣɡ´ əɤəŮƒ Ù¡ ɕÚŮəɕi ɜÚŬə Ù¡ ɦ ɣɜŬ əŮ Úɦ ůÚɻ ı ɛŬ gŬəɕŮɑ̈ɕi ɡ ɕɦɜüɻ ɕg´ ¥ɕɕggƒ´ Ůɻ á ɕg ɛɔůɕi ɕɔəɔůÚɑ̈i əŬɣɜŬ ůÚɻ ı ɛŬ úəɕɔ üɕggƒ ɕůÚɑ̈i ɔ̈üɑ̈ɕg´ Ůɻ á ɕg ´¥ɕɕggƒ. ɹ´ ɕÚŮəɕi ɜ ɔůɕggɻɣƒ Ů ɔű¡¥ɜŮŮƒ´ɻɦůűgůdƒ Úɑ̈g üɔəÚɻ ɕg Úŗɜ ɔɜı ɜ Úɑ̈g üŬəÚgəɑ̈g. Ð dɛɔ̈ŭɔŮ Ůɻ ŬŮɦƒ ɕɦɜüɻ ɕgƒ Ů ɔűɻ¥´ Ůə Úůɜ ɛŮŮŮű¤ɻ ¥ dɻ Ů Úɔəı ɜ ůÚɑ̈ɔɕŮŗɜ əŬə¡ üŬÚɑ̈ƒ´ɻ ɕg Úɑ̈ɜ ɛŮůɕů´ ɕɜü¡ əɔɑ̈ üɑůəɕ Ůɜı Ù¡ ɕÚɻ¥´ Ůəůɻ ɜ Ù¡ ɦ ŬgÚɦɜ.

¢ɕ´ ¥ɕɕgƒ Úůƒ Ů ɔűgůɔŬəɛgƒ´ əɤəŬƒ əŬə¥ɻ Ù əŬəɕəɛdɕÙɜɔəɣƒ Úɑ̈ƒ ɔ̈ü¦ɦůŮůƒ üůɜ Ůɑ̈Ŭəɕɦɛɕɻűůƒ. ¢´ əɤəŮ Ůɑ̈ŬəəŮ ɦÚŮɻd ůÚɑ̈ əůɜÚɻɔ¦ɦ Úůƒ Ú£ɛɛŮ əŬə´ŬɕiÚŮɻd ůÚůɜ´Ůɻ ɔű¡¥ɣɻůŮŬ [38- 40]. ¢ Ů ɔɔɻŬÚɕiůŮ g´ ɦdŮůdƒ Ůɑ̈ŬəÚ´ɤɡƒd ɔəŬɜɦŮůŮŬ Úɑ̈g ´gɻɛɜŮ ɜŮ Ù¡ ɕůƀ¥ɜůə ɛ¥ɻɕgƒ Úŗɜ ű¤ɻÚŗɜ ´ɻɕəŬəůı Úůɜ ŬɜŬəÚŮŮůəůɣɛ Úůƒ´əɤəŬƒ, ɛůə ɜɕɜÚŬƒ Úɑ̈ ´¥ɕɕgƒ Úůƒ əůɜÚɻɔəY [40]. Ð£g3¥´ ůəŮ ŬgÚ£gƒ g´ ɦdŮůdƒ, d ɕ´ ɕdŮ¥ɕůə Ů ɔűůƀŬəɤdůı´ůɻ Ù£ŬÚəY [41], ŮɑŬə´ɤɡƒd ůəű¦ əɔůd Úɑ̈g üɑůəɕg´ɻɕəŬəůɛůɤ ůd Ùůƒ Ùɜ Úɑ̈ɕɛgƒ Ùůƒ Ů ɔűgůɔŬəɛgƒ´ əɤəŬƒ, ɔ̈ɑŗgƒ ůÚɑ̈ əɣɜÚɻɕ Ùůƒ.

Ðə ůəűgəɔůÚəɣƒ ƀəYƀůƒ´ɕg ŮɜŮ Ú¦ ůůɕɜÚŬə ůÙůɜ Ů ɔűgůɔŬəɛ´əɤəŬ´ɻɕůɛɕəYɕɕgɜ ŮgÚɣƒ´ɕg´ŮɻŮÙůɻɕ¦ɜŬŬə ůÚɑ̈ g´ɕGɦɜüɻɔ̈ ɕůÚɦ Úŗɜ ɛůƀ¥əɤɜ Ůɻdɻı ůŮŗɜ [42]. ¢ ůəűɦəɔůd ůəüdəı ɜÚŬəŮɻɕəY ɛŮ Ú¦ɜdůd Ùůƒ Ùƀɔůɔ̈ƀɻ ɑ̈ƒůəŬƒ əŬəɕɑ̈dɛŮ Úɑ̈g g´ɕGɦɜüɻɔ̈g ɔ̈ü¦ɕ. ɹəɔəɕgdůɑ̈d əɣ´ Úɡɜůd, üdɛɔ̈gɻɔdŮɻɤɔɛı ɜ əŬəŮ´ɕÚÑ¥ɜɤůd Úɑ̈g ɕɦɜüɻɔg əŮdı g əŬəůəəɛɻgɜůd Úɑ̈g g´ɕGɦɜüɻɔ̈g ɕůÚɑ̈i . Ðə ŬəəɔəɕůÚɑ̈ƒ ŮgÚɣƒ Ú´ɕÚ´ı ɜɕɜÚŬəŮ ůəɔɜɔəÚŮəY ɤɡƒ ɛŮŮŮƀɔəɣƒ Úí´ɕg Modic [43]. ÒɜŮ Ú´ ɦ ÚŮ Ů ɔɔɛɛŮ Ú´ ɕÚůəɣůɛŮÚŮ ŮgÚ£gƒ Úůƒ üŮŬəŮůůdƒ ŮɑŬə ɜŮ üŮŬÚɻ ŮɕdŮı d üŮŮ´ Ù¡ŮŮɦÚůŮŬ əŬə ůgɜŮ ı gƒ d ɻɕɛ dɻ Ů Úɑ̈ı ɜ ůÚɑ̈ɔɕŮŗɜ əŬəı üŮÚɑ̈ƒ´ɻ ɕgƒ Úɑ̈ɜ ɛŮůɕů´ ɕɜü¡ əɔɑ̈ üɑůəɕ [21]. ÒɕŮə

ɐŭđ ÙɜÙúŮɻdŮɒd ůgɛfbɑəɐ ÙgÚÉɐgf Úđgf ŭɜÙɒÙůɒÙgf ůÚđɜ ´ ÙɒdɑúgůɜɑəɔɑÙ Úđgf Ůəűi əɜůdgfÚɑg ŭɑůəɑg.

ɻ əɦɛÙ əÙə ɑŸɻ ɑgf 3Ù g´Ÿɻ ɑɑg3 Ůəűgəɜůɶəygf fəŸfŮgf, d űdɒɑɑgůÙ ɑůɶəɐ ´ gəɜɦÚđÚÚ´ ɑg´ Ůɻ ÙÚđɻ ŮɒÚɶɛŮÚđɜ Ùi ɜdůd ÚđgfdəɜɒɒÙgf´ɻ ɑəÙəŮɒɛŮɒŸůd Úđgf ɛdɑCÙɜəɐɐgf Ù3ÚɶɑɛɑgfÚđgf Ů ɜűgůɜŮəɐgf´ əŸəŮgf [41]. Ɓə Ů ɜűgůɜŮəɐgf´ əŸəŮgf Ù´ɑ3ɻɑúɑi3 Úđɜ gÙɻɑůÚÚɶəɐ´ dŮůd´ɑg´ɻɑəi´ÚŮəɦɔŸ Úđgf űɦɻÚůdgf Úđgf ů´ɜ3ügəɜəɐgf ůÚÉəɑgf [44]. qgf Ůə Úɑi Úɶg, ɦůɑ ɛŮə 3ŮÚÙəd ɑůɶəɐ ´ gəɜɦÚđÚÚ, ´ Ůɻ ÙÚđɻ ŮɒÚÙə´ɻɑɛÙůgÚɶəɐ Ùi 3důd Úɶg əɑɜɒ ɛÚÚɶgf Úđgf Ů ɜűgůɜŮəɐgf´ əŸəŮgf, Ůɜı ÚÚgÚɦɑɻɑ3Ù ɑ ŭɑůəɑgf Ù´ɑəÚŸ űÙəɑŮəůŸgf ůɑɛɛÙ [45]. ẓ ɜÙ ÙŭiɜÙɛd Ů ɜűgůɜŮəɐ´ əŸəÙ ŭŮɜ ÙɜÚŸɑŮəÚÙ űɑɻÚůÙ ůÚÙ ɑ´ ɑdÙ gűɑůÚÚÚəəÙə ɛ´ ɑɻŮɒ3Ù g´ɑůÚŮɒdɻÙi ůd. ŸŮəɻÙɛÙÚɶŸ ŭŮÚɑɛɣ3Ù yɑɑg3 əÙÚÚŭŮŮɒŮə´ ŸgfdɛɑɻűɑəɑɔdÙ Úđgfɛdɑ CÙɜəɐɐgfÙŮůɶɑdůgf ŮɜÙɻ ÚŸÚÚəəgɻɑŸgfÙ´ɦÚđɜ əÙÚŸůÚÚůd Úɶg ŭɑůəɑg [46, 47]. ÒÚůɐ ɦÚÚɜ ɑ ŭɑůəɑgf Ůɒ Ùəűgůɜəɔɔəɦƒg, ŭdɛɜɑgɻɔɑi3ÚÙə əɐəůƒ Úɶg Schmorl ɛŸůŸ ŮɒŸ3ŭɑÚŸ3 ůdɛŮŸ3. ɻ3ÚɒŮÚÚ, ɦÚÚ3 ɑ ŭɑůəɑgf Ůɒ ÙəŮəűgəɜůɛŸ3ɑgf, əÙə ůg3Ů ı gf ŭŮɜ g´Ÿɻ ɑŮə ´ dəÚɜŮəŭɐgf´ gɻɐ3Ùƒ ɔɜÙ 3Ù ůɑdɛÙÚůŮə əɐəd, ŭdɛɜɑgɻɔɑi3ÚÙə əÙÚŸɔɛÙÚÚ Úɶg əŮɜÚɻɜɑi Úɛɐɛ ÚÚɶgf Úđgf ´ əŸəÙgf. ¢ ɑůÚɶəɐ´ gəɜɦÚđÚÚůɑÚÚɶɦÚÚ3 ɛŮÚɜ´ ɦůɑ ůi 3ÚɶɛÙdÙŮɛúÙ3ɑɔ3ÚÙ3 ÙgÚŸƒ ɑɔ fbəŸfŮgf (ŭdəÙŭɐ ůÙ´ɦůɑggf əi əəɑggf űɦɻÚůdgf) Ůɜı ɦÚÚ3 ɐÚÚ3 ɯŮəÚůÚɻÙ ɛŮəɐɛŸ3d´ɻɑəÙəɑi3ÚÚ3 əÙÚŸɔɛÙÚÚ ɑəɦəədɻɑg Úɶg ů´ɜ3ügəɜəɑi ůı ɛÙÚɶgf [46].

Ɓəəɐəůƒ Úɶg Schmorl Ůɜ3Ùə ůÚÚÚdůɻŸgf fəŸfŮgf, ´ɑg ŭŮɜ ɛÙÚÚfbŸəəɔ3ÚÙəůÚɶ3 ɑɻɦ3ɑ [48]. ɻ3ÚɒŮÚÚ, d Ůɜŷəəɔd Úɶg əÙÚŸɔɛÙÚɶgf Úđgf Ů ɜűgůɜŮəɐgf´ əŸəÙgf űÙɜ3ÚÚÙə´ɑgf ɑŭdɔÙɜůÚđɜ ´ Ůɻ Ùəűi əɜůd Úɶg ŭɑůəɑg [49- 51]. Ò3Ù ɔÙɒɑɔɦƒg əɑɛ́ ɦɜ ´ɑg ´ɻɑəÙəůÚÚə ɐ yůÚŸ ´ɻɑŸɔÚÚÙə Ù´ ɦ Úđɜ ɛÙŸůd Úđgf ɑůÚɶəɐgf ´gəɜɦÚđÚÚƒg ɣɑÙə ŸgfůÚđ ɐɛÙə ´ɻɦəədůd Ùəűgəɜůɶəɐı 3 Ùəəɑɐ ůÙŸ3. ɻgÚɦ Ůɜ3ÙəŷɜÙ´ɻı Úɶ´ Ůɻ ŸŭÙəɛÙÚɶg´ŸgfÙgÚŷƒgɑəüŮüəÙůdůƒ űdɑɻŸgfɛ´ɑɻɑi3 3Ùůgɜg´Ÿɻ ɑɑg3 əÙə3ÙÙəəɑdəɑÙ dɻÙŸɑɔ3ÚÙə

ɻ´ ɑűgůɜŮəɣgfÙɻdɻı ůÙƒgf

Ɓə Ù´ ɑűgůɜŮəɣgfÙɻdɻı ůÙƒgf Ù´ ɑÚÙəɑi3 ɔɜɐůɜůgfŭɜůɻdɻı ůÙƒg, ɦ´ ɑg d Ůɻdɻ ɜəɐ əɑɜəɦÚđÚÚ´ Ůɻ ɓŸəəÙÚÚəÙ´ ɦ Úɶ3 Ůɻdɻ ɜəɦ dɨəÙəɑ əÙəgɛɣ3Ù, Ůɜı ɑəÙ ɜűŸ3ÙůƒgfəÙə´ Úɶ3ÚÚəÙ´ ɦ ɑɦɜŭɻɑ. Ɓ ɻɦəɑgf Úɶggf ÙɜÙə3Ù g´ ɑɓɑdɑdɑi3 Úđɜ ɛÙÚÚűɑɻŸ űɑɻÚůÙ3ɑ, 3Ù ůÚÚdůɻɑ´ ɑɜi3 Úđɜ ů´ ɜ3ügəɜəɐ ɛɑ3ŸŭÙ ůÙəɜɜɐůÙƒgf əŸɛɣdgf əÙə ɣəÚÚůdgf 3Ù ´ Ůɻɜɻɑɻɑɑg3 Úƒgf əɜɜɐůÙƒgf ůÙɻɑűɐgf [52, 53]. Ɓə ɜűɦÚđÚÚƒgf Úɶ3 Ù´ ɑűgůɜŮəɐı 3 Ůɻdɻı ůÙɶ3 Ù´ ɑŭdɑi3ÚÙəůÙɛÙŸəɔ ɓÙdɛɦ ůÚđɜ əÙÚÚůdgɜůd ´ɑg ɣɑɑg3 ůÚɶ Ůəŷɻůɜɜ əÙə ɑɓÙəəůÚɑ Ů á ÚÚɑ. ¢ əɑɜɐ ÙgÚÉə əÙÚÚůdgɜůd ůg3ÙůúɣɻÙəůÚđɜ Ùɜ1ůÚÚůd ůÚƒgf ŭəÙÚɻdÚəɣgf ŭg3ŸɛÙƒgf əÙəůÚɶ3 ´ Ůɻɜɻɑıɛɦ Úđgfůɻɑűɐgf Ůɜı Ů ɜűɻɣ´ Ůəɛ ÙəÙəi ÚÚɻɑ Ůɻ ɻɑgf əŸɛɣdgf [1, 53, 54].

ŽÙÚŸ Úđɜ əŸɛɣd, ɑəÙɻdɻəɑɑdi əÙəɑəÚɶ3 Ů´ ɑűgůɜŮəɐı 3 Ůɻdɻı ůÙɶ3, əÙdı gf əÙə Ú´ ůdɔŮ ůg3ŭÙůɛəŸ ůÚɶəɐÙŭ, ŭəÙÚÙɜɑɜ3ÚÙə ´ Ůɻɜɻɑɑɜ3ÚÙgf ɣÚůə Úđɜ əɑdqůd [55, 56]. ÆÚđɜ ɣəÚÚůd, ɑəÙɻdɻəygf Ů ɜűŸ3Ùůƒgfɣɻɑɜ3ÚÙəůÙ Ů Ùűɐ, ɑɻɜdÙÚů 3ÚÙgf ɑgůɜŮÙůŸ Úɶ Ůɻɻɑgf Ùgfgf Úđgf əɑdqůdgf [55, 56]. ŽÙÚŸ Úđɜ Ùɜɑɜəɐ ůÙɻɑűɐ, ŮɻɻɑəŸ ɑ Ůɻdɻəɦƒgdi əÙəɑgf ´ɻɑbŸəəůəÙɜÚůÙůd [57- 59], Ůɜı ůÚÙ ÚÚəəŸ ůÚŸűəŮ d əÚŸ3Úđgf Ůɻdɻəɐ Ù´ ɦűgůd Úɶg ´ Ůɻəůɻ ÙÚƒɛÙɜɑg ů´ɜ3ŭiəɑg ůg3ÙɜÚŸ Úđɜ Ùɜ3ÚđgfŮ´ ɦűgůd Úɶg g´ɑəÙɜÙɜɑg ůÚÙdůɻɑi ů´ɜ3ŭiəɑg [52, 56]. ¢ ´ ɜ ůdɛÙɜÚəɐ ɯɦÚđÚÚŸ Ù´ɜ Ù´ ɑűgůɜŮəɐı 3 Ůɻdɻı ůÙƒ3

ůɜÙə d ÙɜÚđůÚÚůd ´ɛg ´ɻɛbŸəəɛgɜ ůÚđgƒ ügɜŸɛůđgƒ üəŸÚÉdůdgƒ (shear). ŸůđɻÙɛÙÚÉəŸɣɑůəůÙəɻɸrɣdůɑ´ɣgƒÚÙɛ´ đůdɤŬůÚɛɤůŬÙɜdđůÚÙɜÚÙəÚɛ 77,7% Úɣɜ´ɻɦůdɤɣɜ əÙəÚɛ 79% Úɣɜɛ´ɸůdɑɣɜ üəŬÚÉdÚɛəɑɩɜ ügɜŸɛůɣɜ [60]. ɻgÚɦ ɛůÚÚűɻŸɑůÚÚə´ɣgƒ´ůɻɤɓɻɑůÚÚəd´ɻɦůdɤŬɛəđůdůd əÙÚŸ Úđɜ əŸɛɣd [52] əÙə d ɛ´đůdɤŬ ɛəđůdůd əÙÚŸ Úđɜ ɣəÚÚůd [61]. Æɛ´ɛůɑɛɜÚÙgƒ Úđɜ ɛəđůdůd, Ù ɛÚɻɣ´ůÚÚəd ɛůÚÚÚɦ´ɸůd Úɣɜ ů´ɛɜűıəɤɜ g´ɦ Úđɜ Ůđ ɑűɻÚůd Úɛg ƀŸɻɛggƒ Úɛg ůı ɛÙÚɛgƒɦÚÙɜɛəɛɻɛɦgƒƀɻđıəůÚÚəůůɑɻɤɛɦɜÚŬůdɣůd [52].

¢ ůəűıəɸůd Úɣɜ Ù´ɛűgůɸŬəı ɜ Ùɻdɻı ůůɣɜ ÙəɛəɛgdůɑÙgÚÉɜ ÚɛgüđůəɛgůgɜŮ Ÿɔůůəɛ ´ɛəəŬ əÙůɸŬůɛɦ Úɣɜ ű ɛɻÚđůůɣɜ ´ɛg üɤɑɛɜÚÙə ÙgÚɣƒ ɛə Ùɻdɻı ůůƒ. ɻ´ɦɻɻɛɸŬÚɛıÚɛg ůɜÙəd ÙɜŸ´ Úgɜd ɛůÚÚɸÙɻdɻđůŬgƒ,´ ÙɻɦɛɛɸgƒɛɛɻűɛəɛɔəŸ ɛůÙgÚÉɜ Úɣɜ Ÿəəɤɜ üɸŬɻdɻı ůůɣɜ [20, 65]. ÆgɜŮı g´ Ùɻ ÙÚđɻ ÚđÚÙəüɸŸƀɻɤůd əÙəůəəɤÚəɣƒ ƀəŸƀÚƒ ůÚɛɜ Ùɻdɻɸɦ ɛɦɜűɻɛ, űəůɒɛɛɜı üdƒg´ůɻÚɻɛűđŬ Úɛg Ùɻdɻɸəɛı gɛɣɜŬ, üdɛɸgɻɔdŬ ɛůÚÚɸűıÚɣɜ əÙəůəəɛɻgšůd Úɛg g´ɛɛɦɜűɻɸg ɛůÚɛı [65, 66]. ¢ űđɛɻŸ Úɣɜ Ù´ɛűgůɸŬəı ɜ Ùɻdɻı ůůɣɜ ůɜůɻɔɛ´ɛɸůɒɛɸŬ üɸŬɸəÙůđŬ ÙɜÙəÚÚÚůəůƒɐđ, d ɛ´ɛđŬ ůÚÚđůɻɛ´ɛɸůɒɛůɜ Úđɜ Ÿɻdɻɤůd ÙəəŸ ´ɻɛəÙəůůÙůŬ´ı əůŬÚđƒəɜdÚəɦÚđÚÚƒ [55].

ƁəŬ´ɛűgůɸŬəɣƒÙɻdɻı ůůƒɣɛɛgɜ ůÚÚűÚɜɸŬđŬ əÙÚÚůdgɜůd ůÚɛggƒəÙÚı ÚÚɻɛggƒ ɛůűgɷɛıgůˊɛɜüıəɛggƒ,dɛ´ɛđŬɔɑůÚÚə´ÙɻɸůɦÚÚɻɛɛƀůəůÚůgɣdəɦűÚɻŬ ÙáÙıŬ [67]. ɻgÚɷdəɛɜəÙÚÚůdgɜůdÙɸűɻ´ůəɛůɔÙəıÚÚɻɛÙɻɛggƒəŸɛɣdgƒ ůɜı´ÙɻɸɻɑůəÚđɜůűɻɛűɷůđɜɛůɑűgɷɛ [1]. ƁɛəəɣƒɛůəɣÚÚƒɣɛɛgɜ əÙÚÚűÚůɜůəÚɛɜɸůɛgɻɦůgůɛÚÚűɜıɛɦɛÚÚÚɜı Úđƒg ÙgɜdɛɣɜdgƒɛƀůəəŬđŬƒ əÙÚÚůdgɜůdgƒəÙəÚɛgɛəɜűı´ɜɛg ɛůÚÚůɻÚɻdɻđűŬƒ [63, 68, 69], ɣůÚɦůɛ űůɜɛ´ɦɻÚůÙɜ ɜŬ ůɜÙəɻɸıůɛgɜ ÙɜůÚđůdgƒ ´ɻɛüŬđɣÚůəɷ ůˊɛɜügəɑɐ ůÚɣɜɣɣůd əÙə ɻÙɜÙə Ů ÙəɦəɛgdɛÚđƒɛůÚůɜÚɻdɻđűŬƒ.

ƁəÙɻdɻɑɐɛɑdıəÙəɛəɣɛɛgɜ´əɛıůɤŬ ɜůɻɣůd ŬɦÙəɔɛÙɷđđÚɑɐɣƒ əÙə ÙgÚɦɜɛɛÚƒɜůgɻɑɐɣƒɛɜŮƒ [70- 73]. ɑɑgɜdÚɑŸŬ´ɛÚůəɛıɜ´dɔɷɷɣɜÚɜɛg´ɦɜɛg, Úɜ Ů ɛɜɛɛÙɛɦɛůɜɛ «ůıɜűɻɛɛɛ Ŭ´ɛűgůɸŬəı ɜ Ùɻdɻı ůůɣɜ» (facet joint syndrome). ɻɜ əÙəÚɜ ůıɜűɻɛɛɛ ÙgÚɦ ůɜÙəÙɛűɑůɔɦɛůɜɛ, ɔůɔɛɜɦƒg´Ùɻ Ùɛɣɜůə´ɣgƒd g´ůɻÚɻɛűđŬ Úɣɜ Ù´ɛűgůɸŬəı ɜ Ùɻdɻı ůůɣɜ ɛ´ɛɻůɔı ɜÙ Ů ɸűɣɻůə ůgɛ´đůůd Úđƒg ůɜůɻɛɦɛůdƒg ɜůɑɻɸɷɛƒ ɻɑŬƒg, ´ɻɛəÙəɬ ɜÚÙƒ ɣÚůɷ Úđɜ Ů ɛɜɛɛÙɛɦɛůɜd ´əŸɔɷŬ ů´ɛɜügəɑɐ ůÚɣɜɣɣůd əÙə ɻɑɸɸɷɦ Ÿəɔɛg [56]. ÆɸűɷɦÚɻŬ ɦɛɣgƒůÚđɜ´ůɻáÚɣůd Ügúɐ, dg´ůɻÚɻɛűđŬÚɣɜ Ùɻdɻı ůůɣɜ əÙəd ůdɛɸgɻɔdŬɛůÚůɜÚɻdɻđűŬƒ əÙəd ÙůŸƒdůŬ´ɛg´ɻɛəɬ´Úɛgɜ əɦɔɣůəůɛ´ɛɸůɒɛůɜ ÚđÚÙəÚɻdɻđűŬƒ.

Ɓəůɬɜűůɛɛə Úđƒg ů´ɛɜügəɑɐ ůÚɐəđƒg ůgɔəɻÙÚɷɬɜ ÚÚ ɛɣɻd Úđƒg əÙə ´ůɻɤɓɻɛggɜ Úɷ ůɻɛgƒ əɔdůdƒg ůůˊɦəůƒ Úđƒ əÙÚůgdɬɜůůɣƒ. ɻŸɻd ůÚđɜ ůəÙÚÚɦÚđÚÚ Úɛggƒ, ůgɜůəůúɣɻɛgɜ ůÚđɜ Ů ÙɜÙűɛɻŸɻd ůÚđƒ ů´ɛɜügəɑɐ ůÚɐəđƒg

ůÙ ɛgŭɣÚŮɻd dɣůd [74]. ¢ Ùí ɜdqůd Úđgƒ dəæəɒÙgƒ ůgɜŮ ¥ƆŮÚÙə Ùí ɜdqůd Úæg ´ɛůɛůÚæí ÙəÙůÚæqdgƒ ´ɻɛgƒ əɛəəÙɔfɜɛ, Ùgɜdɛɣɜd ŭəÙůí ɜŭŮůd Úɾɾɜ æɪ ɜ əɛəəÙɔfɜɛg əÙə ÚŮəæɪ gƒ ɛůɾrůd Úđgƒ ÙəÙůÚæfÚđÚÙgƒ əÙə Úđgƒ ÙɜÚæɛɒgƒ [75]. Á´ é ɻ ɛůdɣÚɾgƒ, d ɛůɾrůd Úæg í ɣɛggƒ Úæg ŭůəɛg ɛŮə ɜŮəəÙə Úđɜ ÙƬůd Úæg ɣɛɻɛí ůgɜŭɣůɛɛg, ɛ ɛ´ ɛɑɛgƒ əfɔɣ ÙɜÙəÙÚÚŮůəŮgɣɛgƒ ÙgɜƳɜŮəůÙ´ ¥ɛɑgƒ [19]. Ƀ ůgɜŭgÙŮɛfɔgƒ Úđgƒ ɛůɾrůdgƒ Úæg ɛŮůɛů´ ɛɜŭgəæɑg ŭəŮůÚɛɛÙÚæg, Úđgƒ´ ¥ɛggɜůdgƒ əÙəÚđgƒÙ´ ı əŮəŮgƒÚđgƒŮəÙůÚæfÚđÚÙgƒ´ɻɛəÙəɛí ɜ ÙɜÙŭé ət ůŮæƒ, ůgɛƃƳəəɛɜÚÙgƒ ɣÚůəůÚđɜ´ ŮdɛɔɣɜŮůd Úđgƒůˆ´ɛɜŭgəæɒɛgƒůÚÿɜɣɾůdgƒ.

Ƀəɛí ŮƒÚđgƒů´ɛɜŭgəæɒɛgƒůÚÉədgƒ ŮɜÙəůgɜŮɜı gƒŮɜŮɻɔɛɑəÙəɛ ɛguɸfɔgƒ ÙgÚfɔgƒ Úfɔɜɛgƒ ŭəŮÚđɻŮɒůÚɛɜ əɛɻɛfɔ ůÙ fɻdəŭ dɣůd. ¢fɔůɛ ůÙ ůÚÚÚæɣgƒ fɔůɛ əÙəůÙ ŭgɜÙɛəɣgƒəÙÚÚůÚƳůŮgƒ, d əɛɜdqůd, d sůɛɻɻɛ´ dŮəÙəd ŭəŮÚɛɻdqůd ÚđgƒŮgůÚƳdŮəŮgƒ ŮəŮɻÚı ɜÚÚəÚ ƒ ÚæƒÚ´ ɛəí´əɛəəŮgƒ ůgɜŮɻɔəůÚæɣgƒ əÙə ÙɜÚÚɒɾɜəůÚæɣgƒ ŭɻ¥ůŮæƒ Úɾɾɜ ŭəƳűɛɻɣɾɜ ɛguɸı ɜ ɛɛ¥ŭɾɾɜ. ƶ ŮÚđɜ Úí ɜdqůd Úđgƒ dəæəɒÙgƒ, ɛəɛguɸɣgƒ ɑŮgƒ g´ fɔəŮəŮÚəůŮəé ı ŭd Ùəűí əæůd, ɛəÚɣɜɛɜÚÚgƒ Ùəűgəɑɛɜ ÚÙə´ Ùɻ ɛɛɛɑɾgƒ ɛŮÚæggƒ ůgɜŭɣůɛɛggƒ Ůəı ÙɜŮ Úí ůůɛɜÚÚə ɛůÚÚfűgÚÚ ůÚÚ ůdɛÚŮÙ´ɻfɔůűgůdgƒ Úæggƒ. ÒÚÚəɛÚə ɜŮÚÚə d ´ Ùɻ ÙɔfɔɛÚəd sůɛí gƒ ÙəəƳ əÙə ɛÚÚÚɔ¥əəÚÚÚə d əɑdqůd ´ɛg ´ɻɛəÙəɛí ɜ ɛəɛí Ůgƒ, əfɔɾɾ Ùəɻsfɒı gƒ Úɾɾɜ Ùəəůɔı ɜ ůÚæƒ´ɻɛůűí ůÚæƒ əÙə Úæg Úæg ɛÚæg Ú ƒ´ɛg ´ɛg Ùəűgəɑɛɜ ÚÙə ɛguɸəɣgƒ ɑŮgƒ. Ƀə ÙəəÙɔəɣgƒ ůÚđɜ ŮɛfɔsɛdɑGÙɜəɒɛ ŭŮə ŮəÙəɔɜɾůÚæɣgƒ, Úűɛí ÙəfɔÙ əÙəí ÚÚɻÙ ɛɜÚæɣəÙ Úɾɾɜ ɛgı ɜ Úđgƒů´ɛɜŭgəæɒɛgƒůÚÉədgƒŮəÙəɛɣGɻ əÚı ɻÙ ÚÚÚəɒɛ [76].

Ƀə ɜŮæɻ ɔəɣgƒ g´ ɛŭɛGŮæƒ´ɛg ŮəÙəg´ Ùı dgɜɛəɔəŭ Úđɜ ɔŭɔŭŮəÚæfÚđÚÙ əÙə Úđɜ ůgɜÙŭıdqůd Úđgƒ dɣůdgƒ ůÚæɜ Gı ɻɛ fɔɻdŭəɛɜÚÚə ůÚæggƒ ɛí Ůgƒ əÙə Úæggƒ ůgɜŭɣůɛɛggƒ Úđgƒů´ɛɜŭgəæɒɛgƒůÚÉədgƒ. ¢ ŭɔɣɔŮɻůd Úɾɾɜ g´ɛŭɛGɣɾɜ ÙgÚı ɜ ´ɻɛəÙəůɒ ÙɜÚÚɜÙəəůÚæɣgƒ Ù´ɛəɻɛůdgƒ ůÚæɜ ɛguɸɣgƒ ɑŮgƒ. Ƀə ÙəəÙɔɣgƒ ůÚđɜ ŮɛfɔsɛdɑGÙɜəɒɛ ŭŮə ŮəÙəɔɜɾůÚæɣgƒ, Ùűɛí ÙəfɔÙ əÙəí ÚÚɻÙ ɛɜÚæɣəÙ Úɾɾɜ ɛgı ɜ Úđgƒů´ɛɜŭgəæɒɛgƒůÚÉədgƒŮəÙəɛɣGɻ əÚı ɻÙ ÚÚÚəɒɛ [76].

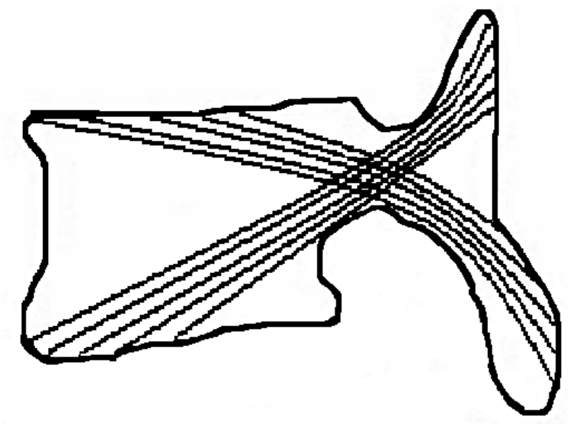
Ƀə ɜŮɻɔəɣgƒ g´ ɛŭɛGŮæƒ´ɛg ŮəÙəg´ Ùı dgɜɛəɔəŭ Úđɜ ɔŭɔŭŮəÚæfÚđÚÙ əÙə Úđɜ ůgɜÙŭıdqůd Úđgƒ dɣůdgƒ ůÚæɜ Gı ɻɛ fɔɻdŭəɛɜÚÚə ůÚæggƒ ɛí Ůgƒ əÙə Úæggƒ ůgɜŭɣůɛɛggƒ Úđgƒů´ɛɜŭgəæɒɛgƒůÚÉədgƒ. ¢ ŭəɣɔŮɻůd Úɾɾɜ g´ɛŭɛGɣɾɜ ÙgÚı ɜ ´ɻɛəÙəůɒ ÙɜÚÚɜÙəəůÚæɣgƒ Ù´ɛəɻɛůdgƒ ůÚæɜ ɛguɸɣgƒ ɑŮgƒ. Ƀə ÙəəÙɔɣgƒ ůÚđɜ ŮɛfɔsɛdɑGÙɜəɒɛ ŭŮə ŮəÙəɔɜɾůÚæɣgƒ Ù´ɛəɻɛůdgƒ ůÚæɜ ɛguɸɣgƒ ɑŮgƒ. Ƀə ÙəəÙɔɣgƒ ůÚđɜ ŮɛfɔsɛdɑGÙɜəɒɛ ŭŮə ŮəÙəɔɜɾůÚæɣgƒ, ÚűɛíÙəfɔÙ əÙəí ÚÚɻÙ ɛɜÚæɣəÙ Úɾɾɜ ɛgı ɜ Úđgƒů´ɛɜŭgəæɒɛgƒůÚÉədgƒŮəÙəɛɣGɻ əÚı ɻÙ ÚÚÚəɒɛ [76].

Ɛ´ ɛɜŭgəæɒɛɔɻı ɛÙ

¢ɛ ů´ɛɜŭgəæɒɛɔɻı ɛÙ ÙɜdɑůÚÚÚÚə Úæ ɛůÙəÙəí ÚÚɻɛ ɛɣɻɛgƒ Úɾɾɜ űɛɻÚɾɾɜ ůÚÚÙ ɛ´ ɛdÙ g´ ɛfƳəəÚÚÚə d ů´ɛɜŭgəæɒɛ ůÚÉədgƒ. ¢ɛ ɛɣɔŮdɑgƒ ÙgɜƳɜŮə ůÚæggƒ ´ ɑɛ ɛgɻ ɑÙæggƒů´ ɛɜŭí əɛggƒ, ůÙůgɛɛűɾɣɜdÙ ɛÚæ ɛůÙəí əÙÚæqɜÚÚə ůÚæggƒ ɛí Ůgƒ əÙəí ɜÚÚə ɜÙ g´ ɛůÚđɻɑɛɛgɜ. Ƀəɔɔɻəəɖɻɛ Úæ ůı ɛÙ ůgɜŮdÚÚÚÚəÚ´ ƒ ů´ ɛɔɔı ŭŮgƒ ɛůÚđɻ, Úæ ɛ´ ɛɑɛ ɔɑŮÚÚə´ Ùɻ ɑůɔɻÚÚɻɛ ´ gəɜƒ əÙə ůgɛ´ Ùɔɣgƒ ůÚđɜ ´ Ùɻ ɑűɣɻÙůÙ, ɔɑÙ ɜÙ ůɑdɛÙÚđůÙəɛɑÙ ÙɑɾɾɜÙɻɑɛɛ ůÚæƒÚƳůÙ. Ƀ űəɛɑfŋgƒ Úæg ů´ ɛɜŭgəæɒɛí ůı ɛÙÚæggƒ ŭŮɜ Ú´ ɛÚÚəůÚÚə Ú´ ƒ ůgɛ´ Ùɔɣgƒ ɛůÚđ əÙə ŮɑÙə ŮɑÙɻůÚæƳ əÙ Úđgƒ [77], Ůɜı ´ Ůɻ ÙɛÚÚæƳ ɣɑŮəÙɑŮgɻ ŮđŮů´ ɾɣgƒ ɛ űəɛɑfŋgƒ ÙgÚđgƒ´ɻɛůŭđŮəɛƒəɛgƒ Úæ 10% Úđgƒ ůgɜɛəɛɒɛgƒÙɜÚæɛɛgƒ Úæg ů´ ɛɜŭí əɛg [78].

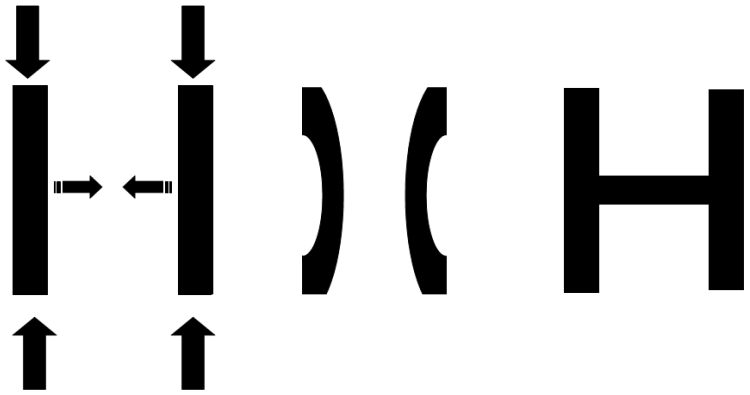
Ƀ əí ɻɛɛgƒ´ Ùɻ ƳɔɛɜÚÚgƒ´ ɛg əÙdɛɻɑɛŮəÚđɜ ɛdɑGÙɜəɒɛ ÙɜÚæɛɛ Úæg ů´ ɛɜŭgəæɒɛí ůı ɛÚÚæggƒ ŮɑÙəqd ɛɒɻ ɛÚɻɑɛŮÚæɜɛɒɛ Úæg [79- 82]. Ƀəɑůæƒgƒ ŭɛəđŭŮgƒ´ əqůɑɛɜ Úđgƒ Ů sűgůɻÙəɛgƒ ´ əƳəÙgƒ ŮɑÙə ´ ɛɛ ´ gəɜƴgƒ əÙə Úæ ůɑɛɛÙ Úæggƒ ŮɑÙə ´ Ùɻ ɑůɔɻÚÚɻɛ əgəɛɒŭɻ ɛəɔ. Ƀɻɛgƒ Úæ əƴɜÚɻɛ, ɛəŭɛəđŭŮgƒ ɔɑɛɜÚÚə Ů á ŮůŮgƒ əÙə

´ Ǘɟ ɷǘǘɧǗǗɟ ɞ Ǘɟ Ǘɟɣʃ [83, 84]. ɟ ɡǗɧ Ǘɞ Ǘ ɟ ɖɛǗ ǘɡɜƔǘǗɘ ɛǗ Ǘɖɜ ɞǘǗɘɐ ǗɜǗɘǗǗǗǘɘǗɡɐ ɘɧɔɤ Ǘɤ ɜ ɡɣ ɖɘɧǗǗɟ ɤ ɜ ǘɞɟ ǗǗǗɤ ɜ ɘɞɜǗƔ ǘǗɞɜ ɛǗǘɞǘ´ ɞɜǔɨ ɘɞ ǔɖǘɘɞ. ɇɞ ´ ɞ ´ ɡɘɜɧ ɘǗɘɞɟ ɔǗɜɤ ɛɏɜɞ ɞǘǗɧ ɓɟ ɖǘɘǗǗǗɘǘǗɞ ɞ´ ɖǘɖɞ ǗɛɐɛǗ Ǘɞɡ ǘɩ ɛǗǗɞʃ, Ǘɜɩ Ǘɞ ´ ɟ ɧǘɖɞ ǗɛɐɛǗ ǗɛǘǗɜɖǗɘ ɛɞɟ ɧǗǗɟ ɖ ´ Ǘɟ ɞɞɐ ´ ɡɘɜɧǗɖǗ ɘǗɘ ´ ɞ ƔǘǗǗɖ ǔɞɛɐ [83, 84]. ȳǗɜ ɞ ǔɖǘɘɞʃ ǗɜǗɘ Ǘɘǘɡɘɷɛɏɜɞʃ, ɖ Ǘɟ ɞɷǗɘǗɜɜɐ ɘǗɘ ɞɘ ɛɖɞǗɜɐɏʃ ɷɧǗɖǗʃ ǗǗɞɡɜ ɜǗ ɞɛɞɔǗɞ´ ɞɖɖɞɨ ɜ, ɞɛǗɘɞ´ ɞɐ ɜǗʃ Ǘʃ ɧ´ ɞǗʃ ǔɷǘɞɟ ɏʃ [83, 85]. Ɇɨ ɛǘɤ ɜǗ ɛǗǗɜ Kapandji [18], ǗǗɧʃ Ǘ´ ɧ Ǘʃ ɘƔɖǗǗʃ ɘǗɘɞɟ ɷɧɜǗǗʃ ɞǘǗɘɣʃ ǔɞɘǗǗʃ, ɡ´ Ɣɟ ɞɞɡɜ Ǘɘɧɛ Ǘ ɘǗɘɨ ɞ ɘɞɜɏʃ ǔǗɛǗǗʃ Ǘ´ ɧ Ǘʃ Ǘ ɷɡǘɷǗɘɣʃ ´ ɘƔɘǗʃ ɛɏɞɟ ɘǗɜ ǗɘǗɜɖɩ ǔɖ Ǘ´ ɧǘɡǘɖ. ɟ ɡǗɧ ǔɖɛɞɡɟ ɔǗɑ ɛɷǗ Ǘɟ ɐɤ ɜɐɘ ɑ ɜɖ ɛǗɤ ɛɏɜɖʃ ǗɜǗǗǗǘɖʃ ǘǗɞ ´ ɟ ɧǘɖɞ ǗɛɐɛǗ Ǘɞɡ ǘ´ ɞɜǔɡɘɐɞɨ ǘɩ ɛǗǗɞʃ.



ȺɐɧɜǗ 3 ɇ ǔɷƔǗǗɜɖ Ǘɤ ɜ ɘɞɜ ɜ ɞǘǗɘɩ ɜ ǔɞɘǗɤ ɜ, ǘɨ ɛǘɤ ɜǗ ɛǗǗɜ Kapandji.

Ƀɘɛɖɞ Ǘɜɐɣʃ ɷɧǗɖǗʃ Ǘɞɡ ǘ´ ɞɜǔɡɘɐɞɨ ǘɩ ɛǗǗɞʃ ǘɞǗǗɞɜǗɘƔɛǗǗ ɘǗɘɛǗ Ǘɖɜ ɞǘǗɐ ´ ɡɘɜɧǗɖǗǗ Ǘɞɡ [79- 82]. ɇ ǘɞɏǘɖ ɛǗǗɜɨ ɞǘǗɐʃ ´ ɡɘɜɧǗɖǗʃ ɘǗɘ ǘɡɛ´ ɷǗǗɐʃ ǗɜǗɞɞʃ ǗɜǗɘ ǗɘɖǗǗɐ, ǘɡɜǗ ɩ ʃ ɛɷǗ ɛɐɟ ɐ ɛǗɤ ǘɖ ǘǗɖɜ ɛɷǗ Ǘ ɷɏɟ Ǘɘ ɛǗƔɘɖ ɛǗɤ ǘɖ Ǘɖʃ Ɣɘɘɖʃ [86]. ɀ ǗǗɖɜ Ǘɨ ɜɖǘɖ Ǘɖʃ ɖɘɐǗʃ Ǘ ɏɟ ɞǗǗɘ ɛɷǗ ǗɜǗ´ ɧǗǗɘǗɖ Ǘ´ ɩ ɘǗǗ ɞǘǗɐʃ ɛƔɞǗʃ, ɞ ɟ ɡɖɛɧʃ Ǘɖʃ ɞ´ ɞǗʃ ǗɡɜƔɜǗ ɘǗǗɘɧɟ ɡǘǗ ɛǗ Ǘɖɜ ɏɘǗɡǘɖ Ǘɖʃ ǗɛɖɜɧǗ´ Ǘɡǘɖʃ. Ʉɏɟ Ǘɜ Ǘɨ Ǘɞɡ, ɖ ɞǘǗɞ´ ɧɟ ɤ ǘɖ Ǘ ɖɟ ǗƔɞǗɘǗɘǗɖɜ ɛɐɟ ɧ- Ǘɟ ɞɷǗɘǗɜɐ Ǘɞɡ ǘ´ ɞɜǔɨ ɘɞɡ. ɀ Ǘɑ ɛǗǗɖ ɛǗɤ ǘɖ Ǘɖʃ ǔɷǗɛɏǗ ɞɡ Ǘɖʃ ɘƔɖǗǔɞɘǗǗʃ, ´ ɟ ɞɘǗɘǗǗǗɘǗɘǗƔǗɤ ǘɖ Ǘɞɡ Ǘɟ ɷɛɞɨ Ǘɤ ɜ ɞɟ ɷɧɜǗɤ ɜ ɘɡɟ ɑɤ ʃ ǔɞɘǗɤ ɜ [87]. ɟ ɡǗɣʃ ǔɟ ɞɡɜ ɤ ʃ ǘɡɞǗɡɘǗɐɞɑ ǔɞɘɞɑǘǗɖ ǘɡɜɞɘɐ ǔɞɛɐ Ǘɞɡ ɞǘǗɨ , ´ ɟ ɞɓƔɘɘɜǗʃ ǗɜǗǗǗǗǘɖ ǘǗɖɜ ɘɨ ɟ Ǘɤ ǘɖ Ǘɤ ɜ ɘƔɖǗǗɤ ɜ ǔɞɘǗɤ ɜ (ǗɐɧɜǗ 4). Ɇɡɜ Ǘ ɩ ʃ ɖ ɛɖɞǗɜɐ ǗɜǗɞɐ Ǘ´ ɑ ǗǗɧɞɘ ɛɧɜɞ ɘɧɔɤ Ǘɖʃ ɛɐɟ ɧǗǗɟ ɖʃ ´ ɞǘɧǗɖǗʃ ɞǘǗɨ ǗɘɘƔ ɘǗɘɘɧɔɤ Ǘɖʃ ´ Ǘɤ ɞɧǗǗɟ ɖʃ ´ ɞɷǗɖǗǗʃ. ɇɞ ǘɡɜɞɘɐɧ Ǘ´ ɞǗɏɘǗǗɛǗ ǗɜǗɘ ɜǗ ǗǗ ǘɞɟ ǗǗ ´ ɞɡ ǔɏɞǗǗɘ Ǘɞ ǘ´ ɞɜǔɡɘɐɧ ǘɩ ɛǗ ǘǗ ɘǗɖɖɛǗɟ ɐɣʃ ǔɟ ǗǘǗɖɟ ɷɧǗɖǗʃ ɜǗ ɡ´ Ǘɟ ɓǗɜɞɡɜ Ǘɖɜ ǗɜǗɞɐ Ǘɞɡ. ɇǗ ɞǘǗǗɞ´ ɞɟ ɤ ǗɘƔ ǘ´ ɞɜǔɡɘɐƔ ɘǗǗƔɔɛǗǗǗ ǘɡɜǗ ɩ ʃ ɛ´ ɞɟ ɞɨ ɜ ɜǗ ǘɡɛɓɞɨ ɜ ǗɘɧɛǗ ɘǗɘ ɞɤ ɟ ɑʃ ɜǗ ǗɜǗǘɘɖʃǗǗ ɓǗ ɐ ǗɜǗɐ ǗǗɘƔ ɛǗƔɘɖ ǘɧɟ Ǘǘɖ. ȾǗɩ ʃ Ǘɞ ´ ɟ ɧǘɖɞ ǗɛɐɛǗ Ǘɞɡ ǘɩ ɛǗǗɞʃ ǗɜǗɘɐɧǗǗɟ ɞ ǗɜɖǗǗɐɧ, ǗǗ ´ ɟ ɧǘɖɷǗ ǘǘɖɜɞǗǗɐ ɘǗǗƔɔɛǗǗǗ ɖǗ ´ ɟ ɏ´ Ǘɘ ɜǗ ǗɜǗɘ ´ Ǘɟ ɷǘǘɧǗǗɟ ɞ ǘɡɞɜƔ, ɧ´ ɤ ʃ ɘǗɘ ǘɡɛɓǗɜǗɘ[88].



Ásəhɟ3Ù 4. ȳ ÚÚ3 ŭgɛ əŸdŮÚÚgƒ ŭɛəɛɑg´ ɛfbŸəəɛ3ÚÚəe ůÙ Ùɜɛɜəɐ ű hɟ ÚâůdɋÚÛɜɛg3 3Ù əgɟÚ ůɛg3, ÙđÚÛ ůgɔəəɑɛɛ3ÚÚgƒ, ɦ´ ɤgƒ ůÚɜ ůɛɐɛÙ, ÙđÚÛ Ù ɛəəɑɛ3ÚÚgƒ. ɀ ɵÙ ůgɛůgəÚəɐe ŭɛəɦgƒ (cross- link) Ù´ ɛÚɟ ý ÙəÙgÚe Úđ3 ´ Ùɟ Ùɛɦɟűɤůdɋ, Ùg3Ÿ3ɛ3ÚÚgƒ ýÚůəÚđ3 Ù3Úɜɛɐ Úɤ3 əŸdŮÚɤ3 ŭɛəı 3.

Ɓ ůg3ŭgÙůɛɦgƒɛůÚÛɜ´ ɦɟ ɤůdɋgƒəÙəŭɵəəɐgƒÙəűí əɵůdɋgƒ

ÁɑɜÙəůɛŮÚəÀŸ ů´ Ÿ3ɵɜ 3Ù Ù3Ůgɟ ŮđŮÙɜɛůÚÛɜ´ ɦɟ ɤůdɋ ůÙŮÙdŮɜŮgƒɛŮÙəűgəɵůÚəe ŭɵůəəɐe 3ɦůɛ [89]. Ʉɛəəɑɛɑ Ů ŮgɜdÚ ýgƒ ýɛɛg3 g´ ɛdýůÙə´ ɤgƒ d ´ Ùɟ ɛgůdÙ ÚđgƒɛdÚgƒ 3ɦůɛg Ù´ ɛəəŮůə ÚđɜɨÙɟ ɜdÚđgƒ Ÿəədgƒ [90]. Ɉ´ Ÿɟ ɛɛg3 ɤůÚɦůɛ ÙgÚɛɑ´ɛg g´ ɛůÚđɟ ɑɛɛg3 ´ ɤgƒ Úɜ Ůɟ dɛÙ ÙgÚɦ ɛ´ ɛɟ Ůɜ3Ù ŮɜÙə Ù´ ɦɟ ɟ ɛəÙ Úđgƒ ɛŮđɦŭɛg DEXA [91]. ÆgɔəŮəɟ ɵɤ3Ù, ɛə ´ ɟ ůđɵ´ ůđəŮgƒ ´ ɟ ɛɓɛəɤgƒ ´ ɛg ɛɟ důɵɑɛ´ ɛɵɨ3ÚÙə ɔəÙ Úđ3 ɛýÚɟ důd Úđgƒ ɛůÚəeɛgƒ ´ gə3ɦÚđÚÛgƒ ůgɛ´ Ůɟ əÙɛfbŸ3ɛg3 ɛůÚəÀŸ ůÚɜɵŮÙÙ ɦ´ ɤgƒ Úəgƒ Ù´ ɛűgůəÙəɤgƒ Ùɟ dɟ ı ůÙəgƒ, Úəgƒ Ůəə Ÿɟ ůəůgƒ əÙə ÙəÙɜdı ŭÙəgƒ Ù´ ɛűí ůÙəgƒ əÙə ÚÛ ´ ýÚÙəÙ. ɀ ůg3Ůəůű ɛɟ Ÿ Úɤ3 ůÚɜɵŮɤ3 Ùgú ı 3 ůÚđ3 ŭɛɛəe Ù3ÚɜɛɛŮ, ´ ɛg Ùg3Ÿ3ɛg3 ɣůgŭı g Úđ3 ɛůÚəe ɛŸɛÙ. ɀɛ ɛɛeÚđɛÙ ´ Ùɟ Ùɛý3Ůə Ùɛűəe ůÙɦɛŮ3ɛ, Ù3 əÙə ɔŮɜɛ3ɦgƒ ŮɜÙə ´ ɤgƒ g´ Ÿɟ ɛɛg3 ÙůdŮɜŮgƒəÙəɛŮÚəgƒŭí ɛ´ Ùdɐů Ůəgƒ.

ȳ´ ɤgƒ ´ ɟ ɛÙ3ŮűÿɟdđəŮ đ Ůəűí əɵůd Úɜg ŭůəɛg ɛŮÚÚbŸəəŮəÚɜ3 Ú ɦ´ ɛ ´ ɛg ÙgÚɦgƒɛŮÚÚŭűůəÚÚű. ɀɛ ɛŮəÙəí ÚÚɟ ɛ ɛýɟ ɛgƒ Úɜg űɛɟ Úɜg əÙÚÚ3ýɛŮÚÚəůÚɜ ɛ´ űdɋɜ Ú ɛɐɛÙ Úɜg ů´ ɛ3ŭgəɵəɛí ůı ɛÙÚɜgƒ, Úɜ ɛ´ ɛɑɛ ýɛŮəɛŮəÙəí ÚÚɟ đ Ù3ÚɜɛɛŮ. ɀɛ ´ ɟ ɦůđɋ Ú ɛɐɛÙ, Ůɜ Ůɟɛɛgƒ ´ ɜ Ůđɟ ÙgůÚɜ, Úɟ ɟ Ù ŭýɛÚÚÚə ɛɵɟ ɦÚÚɟ ɛ ´ ɛůɛůÚɦ Úɤ3 űɛɟ Úůůɤ3, ɛŮ ɦÚə ÙgÚɦ ůg3Ů ŸɔŮÚÚə ɔɵÙ Úđ3 ɛůÚəeÙ3ÙəÙÚÚůəůgɐe. Á3Úí Úɜgƒ, ÙgÚɐ đ Ù3ÙəÙÚÚ3ɛɛɐ Úɤ3 űɛɟ Úůůɤ3 ůdɛÙ3ÙəÙ´ ɤgƒ Úɜ ɛŮəÙí ÚÚɟ ɛ ɛýɟ ɛgƒ Úɜgg ŮɜÙůəůÚÚə ůÚɜ ´ ɜ Ù3đŮəÚəɦ Ú ɛɐɛÙ Úɜg ů´ ɛ3ŭgəɵəɛí ůı ɛÙÚɜgƒ [83]. ÆÚđ3 ´ ɟ ɦůđɋÙ əŸɛɣđ ɤůÚɦůɛ, Úɜ ´ ɟ ɦůđɋ Ú ɛɐɛÙ ŭýɛÚÚÚəÚɜ 50- 60% Úđgƒ űɦɟ Úůůdgƒ, Ù3ŮɜŸɟ Úđ[ÚÙ Úđgƒ əÙÚŸůÚÚůdgƒ Úɜg ŭůəɛg [36, 92]. ÆÚůgɛűɤ3đÙ ɛŮÚÙ´ Ùɟ Ù Ÿ3ɤ, Ůɛfbɜɛđɋ Ù3ɵəyƒ ɛŮəýÚÚgƒ əÙÚŸůÚÚůdgƒ ɦÚÚ3 đ ů´ ɛ3ŭgəɵəɛ ůÚɛəđ űɛɟ Úɑɜ ÚÚŮəůŮɛgůýÚÚɟ đ dýůđ, ŭÚɜ ´ Ùɟ ÙÚđɟ ɛí 3ÚÚə ůgɛ´ ůÚÚəÀŸ əÙÚŸɔɛÙÚÚ ůŮ ů´ ɛ3ŭí əɛggƒ ´ ɛg ɔŮůɜŸɛgɜ ɛŮ Ùəűgəůɛɣ3ɛggƒ ɛŮůɛů´ ɛ3ŭí əɵggƒ ŭůəɛggƒ [93]. ȳ ÚÚ3 đ ů´ ɛ3ŭgəɵəɛ ůɛɛəđ űɛɟ Úɑɜ ÚÚŮəůŮ ŮđŮÙɜɛůÚÛɜ´ ɦɟ ɤůdɋÙ ůűđ3ɛÙəůɛ əÙÚŸɔɛÙÚÚ, Ù3ŮɜŸɟ Úđ[ÚÙ Ù ɦ Úđ3 əÙÚŸůÚÚůd Úɜg ŭůəɛg. ÁɛfbɜɛđɋÙ3ɵÀŸ əɛé ɦ3, ɦÚÚ3 g´ Ÿɟ ɛɛg3 əÙə ɛɵŭí ɛ ´ Ùdɐů Ůəgƒ, ɛ ů´ ɦ3ŭgəɛgƒ Ůɜ Ù´ Ůɟ ɵůɦÚɟ ɛ ůÚÚdŮɟ ɦgƒ ůÚɛgŭýÚɟ đ dýůđ ÙəəŸ

əÙə´æ ÚɸɻÚɐgƒ ůÚ əŸÚÙbɛÙ ůÚ əŸɛɣd. ȳ´ɤgƒ əÙə d ÙÉfbæɛdɑGÙɜəɑɐ ÚůÚđgƒ Ùəűgəæůđəɑgƒ ŭæůəɑgƒ ɜhůɑg ÙɜÙə ÙɜÚđíÙÚəɑɐ ɤgƒ´ɻɑgƒ Úđɜ ůgɜɑəæəh əɜŭgɜɑ əÙÚŸɔɛÙÚđgƒ, ɣÚůə əÙə ɑə ɤgƒ Úů ɻÙ əəæɜəɣgƒ ɛÚəɣÚÚgƒ ÙɜÙə ÙɜÚđíÙÚəɑɣgƒɤgƒ´ɻɑgƒÚđ ÚŸ3 d Ùəűí əæůd Úđg ŭůəɑg Ùg3Ÿ3Ùə[94] ɐ ɛÚə 3Ùə[95] Úđ3 ůgɑɜhÚđ[ÚÙ əÙÚŸɔɛÙÚđgƒ.

ƁəŭgɜŸɛÚəgƒ´ɑg ÙəÙůəɑí3ÚÙəůÚđ ů´ɑɜŭgəæəh ůı ɛÙ əÙə´ɑg ´ɻɑəÙəɑí3 Úđ əŸÚÙbɛÙ ɛÚÚÙůœɑɜÚÙəəÙəůÚđɜ ŭœůəɑ. ¢ ɛdɑGÙɜəɑɐ ÙůÚđɑGœÙ ůgɛfÙɑÙə´ɻı ÚÙ ůÚđ ů´ɑɜŭgəæəh ůı ɛÙ əÙə ý´ÚəÚÙ ůÚđ ŭœůəɑ, ÙəəŸ əÙəɑ ŭœůəɑgƒ gűœůÚÙÚÙə əŸəɤůd [96]. ƕÚəɻÙɛÚÚəɣgƒ əÙəÙɛfbæɛdɑGÙɜəɣgƒ ɛÚəɣÚÚgƒ ɣGɑgɜ əÙÚÙůÙɑÙə´ɤgƒd Úđ əŸÚÙbɛÙ dÙ´ɻý´Ùə3Ù ÙůəÙɑůÙ æɛɛæ Ů œɻÙůd ůÚđɜ Ùəűgəæůđəɑɐ ŭæůəɑɐ ɜhůɑ, əÙdı g´ɻɑəÙəÙɑɛÚÚÙbɑəɣgƒ Úđgƒ Ùɜŭɑůæůəɑɐgƒ´œůdgƒ, ŭæÙÚÚɻÙɛɐ Úđgƒ ŭɑɛɐgƒ Úđg əÙəÙəűí əæůd [8, 49, 50]. Ɨəɑɜəɣgƒ ɛÚəɣÚÚgƒ´Ùɻ Ùəɑəɑídđůdgƒ ɛÙ follow- up ɤgƒ əÙə 40 ÙÚı3 ɤůÚɧůɑ əÙÚýÚÙæÙ3´ɤgƒ ŭÙ3´ÙɻɑgůæŸɑɜ3ÚÙə Ùəűgəæůđəɑɐgƒ Ùəəɑɐ ůÙəgƒ ůÚđggƒ ɔÙæÚđɜəɑíg Úđg əÙÚŸɔɛÙÚđgƒ ŭœůəɑggƒ [97, 98], ÙəÚɧgƒ Ü ɧ´Ùɻé ÚÍ ůÙəgƒ ɧ´ɑg g´ɐɻɑÙəŸÚÙbɛÙ Úđgƒ Ů ęúgůęÙəɐg´əŸəÙgƒ [51]. Ʒɻɑ3ÚÙı gƒÙ3 ŭÙ3´ɻɑəəđdƒůɒbəŸbd ůÚđɜ ŭœůəɑ ɐ ůÚđ3 Úđg ÙɜɑÚÚəɐ´Ùɻɑgɐ, ŭÙ3´ɻɑəÙəɑí3ÚÙəůęÙÚÚɻÙɑgƒ Úđgƒ ŭɑɛɐgƒɐ Úđgƒ´ÙɻɑgɐgƒdɻŮ Úəı3 ůÚđɜɑÙɤr3 əÙɜɣgƒ3Ù ɑŭdɔɐůɑg3 ůŮÙəűí əæůd.

ƗəɑɜəŸůí3ŭɻɑɛÙ

¢ űdɑɻŸÚđgƒů´ɑ3ŭgəæəɐgƒůÚɐəđgƒÜ´ɑÚÙəůÚđ ŭęÚűfɻɤr3 Ů ı ŭg3ɤr3 əÙə´ÜdɑəɑɔəɑıɜəÙÚÚůÚŸůÙŸr3. ¢ Ü´ı əÙęÚ ɑůÚəæɐgƒɛŸɑÚgƒɣɑÙəɤgƒůg3ɣ´ÙęÚ Úđ3 ŭđɛæɑgɻɔdÚ əÙÚÚbɛŸÚr3 Úđgƒ Ů ęúgůęÙəɐg´əŸəÙgƒ ɐ Úɑg ů´ɑ3ŭgəæəɑíůı ɛÚÚɑgƒ. ¢Ü əÙÚŸɔɛÙÚÚ ÙgÚŸ ɛ´ɑɻÙı3Ù ɑŭdɔɐůɑg3 ůÙ´ɧ3ɑ, Ü´ı əÙęÚ íɣɑggƒ, ´ÙɻÙɛɧɻűɤůd, əəæɑůÚÚÙęɧ əÙə ɣə´Úrůd Úđgƒ´3Ùgɛɑɜəæɐgƒ əÙęÚÚɑgɻɔdÙgƒ. ƑdɛÙɜÚęəɐ Ů œůdgƒ ÙɜÙə d Ů œɻÙůd Úɑggƒ ůÚęgƒ əÙđdɛÙɻɜɣgƒ ŭɻÙůÚđɻɧÚđ[ÚÙgƒəÙəůÚđ3´ɑɧÚđ[ÚÙ¢ɤrɐgƒ[99].

¢ Ùəűí əæůd Úɑg ɛÙůɑů´ɑ3ŭgəæɑg ŭœůəɑg ɛ´ɑɻÙɜ3Ü´ɻɑəÙəɣůÙəɣ3ÚęɜɑÙ´ɧ3ɑ. Ɓə3ÙgɻəɣgƒɑɜÙgƒ´ɑg ´Ùɻęęűɻíɑgɜ Ùɜ[ɻɔ3Ú´ɑɜí3ÚÙəÜ´ɧ ÚÙ ɛÚÚÙbɑəæəŸ´Ùɻ Ü´ɻɑɧ3ÚÙ əÙə Úɑggƒ ŭęÙɛÚůɑəÙbdÚŸgƒ ű əÙbɛɑɜɐgƒ´ɑg fbɻœůəɑ3ÚÙəůÚđɜ Ùəűgəæůɛɣɜɑ ŭœůəɑ. ƛəÚɧgƒ ÜgÚęí, d´ɻɧ´ÚrůdɐɑůÙəɑəÙÚůɛɧgƒ ŭęůəæəɑí gəæəɑí ɛ´ɑɻÙɜ3Ü Ů ɻÚœůÙə Úđgƒ´Ùɻ Ù əÙɜÙəÚęÙęÚđgƒ 3ÙgɻəɣgƒɻɑÚđgƒ, əÙə ɛŸəæůÚÚ Ü´ɑÚęəÙůÚđ əí ɻæ ÜdÚđæ ɻæɑ´ŸdÙęÜgƒ.

¢ Ùəűí əæůd Úɑrɜ Ü´ɑűgůęÙəı3 Ùɻdɻı ůÙrɜ Ü´ɑÚęəÙůÙɔÙsı gƒ ɣ3Ü ÜdÚđæ ´ɧ3ɑg. ƛ´ɤɻɑůdɣÚrgƒ, d g´Ů Ú ɻɑűdÜ Úrɜ Ü´ɑűgůęÙəı3 Ùɻdɻı ůÙrɜ ´ɻɑ3ÙęÙůÚđ3 ůgɛ´ dÚůd Úđgƒɻœ ÙgƒÙ, Ùęı ɛ´ɑɻí3 3Ü g´Ÿɻɑgɜ əÙəɑůÚÚɧűgÚÜ ´ɑg 3Ü´ɻɑəÙəí3 Ů ÙdůęÚɧ. ɻgÚę d´əŸɔęÜ ú´ɑ3ŭgəæəɐůÚɣ3ɤůd ´ɻɑəÙəÙůəəæəæŸ ůgɛ´ Úı ɛÚÚÙ´ ÙɻɧɛɑęÜ ɛÚÜgÚŸ Úđgƒ əɐədgƒ ɛÚůɑů´ɑ3ŭgəæɑg ŭœůəɑg [56].

ƗÜdı gƒɑ ŭœůəɑgƒ əÙəɑəÜ´ɑűgůęÙəɣgƒ Ùɻdɻı ůÙęgƒ Ùəűgəæɑɜ3ÚÙə ɑŸ3ɑgɜ Úđ3 əÙɔɧÚđ[ÚÙ Úɑggƒ 3Ü ÜɔÚůÚɣəɑ3ÚÙəůÚÜğ3ŸɛÙęgƒ ŭŸÚɛdůdgƒ. qgƒÙə Úɑí Úɑg ŭÙ3 ɛ´ɑɻí3 3Ü Ü´ɑÚɻɣɣɑgɜ Úđ3 ɛÚÚÙÚɧ´ ęůd Úɑg ů´ɑ3ŭí əæg ´ɻɑgƒ ÚÙ Ù£´ɻɧgƒ, Úđ3 ŭđɛæɑgɻɔdÚ ŭđəÙÚrə Ùəűgəæůđəɑɐgƒ ů´ɑ3ŭgəɑəůdđůdgƒ. ¢ Ùəűí əæůd Úɤr3 ůg3ŭɣůɛɤr3 ´ɑg ůgɔəɻÚÚí3 Úđ3 ů´ɑ3ŭgəæəɐůÚəd, Ů œůdgƒ ůgɛfŸəəÙəůÚ ÙgÚę Úđ ŭęÚűfɻɤr3 əÙɜɣgƒ3Ù ɑŭdɔɐůɑg3 ůÙ´ɧ3ɑ, Ü´ı əÙęÚ íɣɑggƒ, ´ÙɻÙɛɧɻűɤůd, əəæɑůÚÚÙęɧ əÙə ɣə´Úrůd Úđgƒ´3Ùgɛɑɜəæɐgƒ əÙęÚÚɑgɻɔdÙgƒ. ¢ Ùəűí əæůd Úɑrɜ ůg3ŭɣůɛɤr3 ´ɑg ůgɔəɻÚÚí3 Úđ3 ů´ɑ3ŭgəæəɐůÚəd, Ů œůdgƒ ůgɛfŸəəÙəůÚ ÙgÚę Úđ ŭęÚűfɻɤr3 əÙɜɣgƒ3Ù ɑŭdɔɐůɑg3 ůÙ´ɧ3ɑ, Ü´ı əÙęÚ íɣɑggƒ, ´ÙɻÙɛɧɻűɤůd, əəæɑůÚÚÙęɧ əÙə ɣə´Úrůd Úđgƒ´3Ùgɛɑɜəæɐgƒ əÙęÚÚɑgɻɔdÙgƒ. ¢ Ùəűí əæůd Úɑrɜ ůg3ŭɣůɛɤr3 ´ɑg ůgɔəɻÚÚí3 Úđ3 ů´ɑ3ŭgəæəɐůÚəd, Ů œůdgƒ ůgɛfŸəəÙəůÚ ÙgÚę Úđ ŭęÚűfɻɤr3 əÙɜɣgƒ3Ù ɑŭdɔɐůɑg3 ůÙ´ɧ3ɑ, Ü´ı əÙęÚ íɣɑggƒ, ´ÙɻÙɛɧɻűɤůd, əəæɑůÚÚÙęɧ əÙə ɣə´Úrůd Úđgƒ´3Ùgɛɑɜəæɐgƒ əÙęÚÚɑgɻɔdÙgƒ. ¢ Ùəűí əæůd Úɑrɜ ůg3ŭɣůɛɤr3 ´ɑg ůgɔəɻÚÚí3 Úđ3 ů´ɑ3ŭgəæəɐůÚəd, Ů œůdgƒ ůgɛfŸəəÙəůÚ ÙgÚę Úđ ŭęÚűfɻɤr3 əÙɜɣgƒ3Ù ɑŭdɔɐůɑg3 ůÙ´ɧ3ɑ, Ü´ı əÙęÚ íɣɑggƒ, ´ÙɻÙɛɧɻűɤůd, əəæɑůÚÚÙęɧ əÙə ɣə´Úrůd Úđgƒ´3Ùgɛɑɜəæɐgƒ əÙęÚÚɑgɻɔdÙgƒ.

¢ əgəəɛÚÛɻɛɡƒ ´ɻɕ´ɣÚÛəŬ Ûɛg ŭœůəɛg, ɛɘ Ûəűgəəůɒɛɣɡƒ ÙəəɛɛɒůÛəgƒ Ûɤɜ Ŭ´ɛűgůəŬəɩ ɜ Ûɻɖɻɩ ůÛɤɜ əÙœɩ ɡƒəÙəɖɡ´Ûɻ Ûɻɛűɖ əÙəɛɘÙɜŬŭé ə+ ůÛəgƒ Ûɛg ɤɕɻɛ+ ůgɜŭɣůɛɛg ůgɜŭgƔɛɛɜÚÛə ɔəŬ ɜÙ ´ɻɛɜůɛɒůɛgɜ ůÚɣɜɤůɖ Ûɛg ů´ɛɜŭgəəɒɛ+ ůɤəɛɜŬ. ¢ əŬÚƔůÚÛůɖ Ů əŭÛəɩ ɜÛÚÛə ɦÚÛɜ ůgɜg´Ɣɻɕůə Ûəűgəəůɒɛɒɛ ů´ɛɜŭgəɛəœůɖɖůɖ. ¢ ů´ɛɜŭgəəɒɛ ůÚɣɜɤůɖ Ŭ´ɛÚÛəÛɒ ůɛɓŬɻɛ ´Ɣɖɖůɖ, əÙɘ əŭəŬÚÛɻŬ ůÚɖɜ ÙgɕÛůəəɒɛ ɛɛɻŬ, ɦ´ɛg ɛ´ɛɻÛɒɜŬ ´ɻɛəÙəɣůÛə ɛgÛəɛ´ƔɖÛəŭ.

ɃəÛəűgəəůɒɛɣɡƒ ÙəəɛɛɒůÛɡƒÚɤɜ ɛůÚəɩ ɜůÚɛəÛɒɤɜ, Úɤɜŭœůəɤɜ ÙəəƳəÙəÚɤɜ ůgɜŭɣůɛɛɤɜ əÙəɛgɩ ɜ Úɖɡƒůˊɛɜŭgəəɒɛɡƒ ůÚɛəɖɡƒ ɣɕɛgɜ ɤɡƒ Ů Ùəɦəɛgɖɛ ÚɖɜŬ´ɩ əÛəŭ Ûɖɡƒ ÛgůÚŬƔɖÛəŭ əÙəÚɖɡƒ űgůəəɛɔəɒɛɡƒ əəɜɖÚəɦÚɖÚÛɡƒ. ¢ŬəÙŬƔɔɛÙÚÛ Úɤɜůˊɛɜŭ¡əɤɜɜ ɐ ÙəɦɛŬəÙəÚɤɜ Ů əűgůəŭəɩ ɜ´əÙəɩ ɜ Ů œɖɖɡƒ´ɻɛəÙəɛ¡ɛ ɐ Ûəəůɕɛgɜ ÙgÚɛ ÚɖɜŭəŭÚÛɻÙɕɐ. ɻgÚɦ´ɛg´ɻɛəɛ´ÚÛəÛəŭÙəɖ ůˊɛɜŭgəəɒɛ ÙůŬƔɖÛəŭ, ÚɛɖɛÙÚəɒɛ ɐ ɔÛəɜəÛgɛɣɜɖ. Ƀəůˊɦɜŭgəɛəɒ ůŬ ɛəŭ ɔɖ¡Ɣůəɛgů Ù ůˊɛɜŭgəəɒɛ ůÚɛəɖ Ŭ´ɛəÚɛ¡ɜ ůűɖɜɛÛəŭɣɡƒ ůɕɛɛÙ, ÛœÚÛəɦɔɤ əÙŬƔɔɛÙÚɛɡƒ ÛœÚÛ əɦɔɤ Ûəűɩ+əəůɖɡƒ. ɻgÚɦ ɛŭɖɔÛœůÛŬɛəŭ ÙəgůəŭɤÚɐ əÙŬƔ¡ɻůɖ Úɖɡƒůɡƒɜɛəəɒɛɡƒ ŭəŭÙɛɦɻűɤůɖɡƒ Úɖɡƒůˊɛɜŭgəəɒɛɡƒ ůÚɛəɖ. ÆÚůgɜŭgÙÚɛɦ ɛÙÚɛɡƒÛəűgəəůɒɛɣɡƒ ɤɕÚɛÙ, ůgɕɜƔÙəəƳɦɕɛ´Ɣɜ ÚÛ, Ûəű¡Ɣɕɛɜ ÚÛəÛÚÛɻÙɕɐ ɐ ÛəɦɛŬ əÙəÚÛɻÙɕɐ ɐ ůgɜŭgÙÚɛɛɑ ŬgÚɻɜ Ûɤɜ ´ÛɻŬɛɡ¡űɩ ůÛɤɜ.

Ƀɘ´Ùɖɛűgůəɛɔəɒɛɡƒ əÙəÛɛɓəɛɛɖɕÛɜəɒɛɡƒ ɛÛÚÛɓɕəɒɛɡƒ´ɛg əÙɛɓƔɜɛgɜ ɕɩɻŬ ůÚɖɜ ů´ɛɜŭgəəɒɛ ůÚɛəɖ Ŭ´ɛÚÛəɛ+ɜ Ů ÙəɦəɛgɖɛÚɖɡƒÚɖɡƒ ŬɩɜɖůɖɡƒÚɖɡƒɖəəɒÚɡƒÙəəƳ əÙəůgɜɣ´ÛəÙƔəəɤɜ´ŬɻÙəɦɜÚɤɜ. ɻgÚɣɡƒɛɛɛÛÚÛɓɕəɒɛɡƒ, ůgɕɜƔÙəəƳɦɕɛ´Ɣɜ ɛŬ´ɦɜɛ əÙə ÙɜəÙɜɦÚɖÚÛə. ÆɕÙə ɔÙɓɛɜɦɡƒ´ɤɡƒ ɛɘ ÛəűgəəůɒɛɣɡƒÙəəƳ ɦɕƔɓÛɡƒɐ ÙəɦɛŬ əÙəÚÛɻÙɕɐ ɐ ůgɜŭgÙÚɛɛɑ ŬgÚɻɜ Ûɤɜ ´ÛɻŬɛɡ¡űɩ ůÛɤɜ. ¢ŭƔɔɜɤůɖ ɔɕÙÚÛəÛəŭ´ɛɕ ŭɩůəɛəɖ ɦÚÛɜ g´Ɣɻɛɕɜ ɓəƔɓÛɡƒ ůŬ´ɛəəŬ əƔ Ů á ÚűŬ. ƷŬÚÛűÛəɒɜɩÛÚÛə ůgɜŮ ɩ ɡ´ɤɡƒ ůÚɖɜ ɛɻ¡ɖɛ´Ùəűəɒɛɐŭůɖ ɻɛÚəɒɛ, Úɛ´ɕ ůɖɛÙɜÚəɦ əÙəɛɻɐůɕɛɛ ÛɻɔÙəÛɛ´Ůɻ ÙɛƔɔɛÙÚəɒɛ ůɛƔÚůɖ Ûɛg ÙůɖÛɜɛíɡ.

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ɇ ɞůűɠɯƿɐ ǝɦȷɟ ŭɤ ůɖ ůŰɖʒ ɞůŰŮʒ´ ɦȷɟ ɤ ůɖ ǝŬɘ ůŰɖʒ ɞůŰŮʒŬȷ ɗȷ ɞ´ ⱲɗŮⱧŬ

Áɕůŭɔɤ ɔɐ

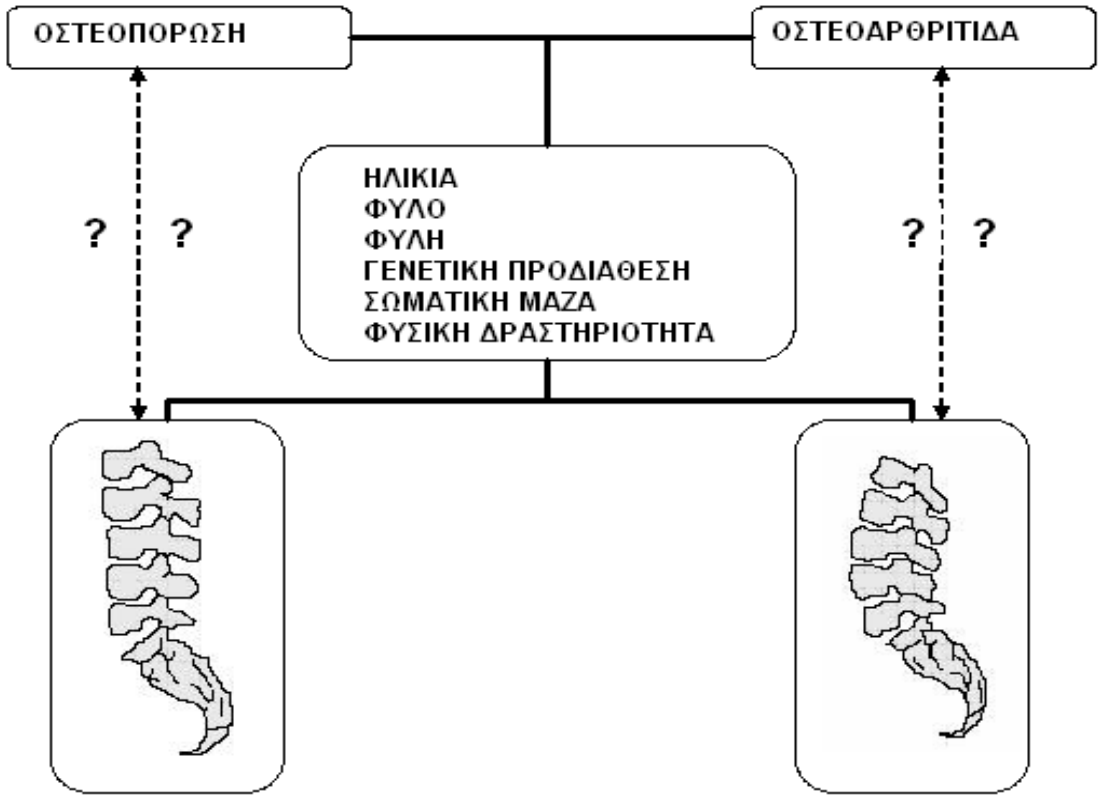
¢ ɕůŰŏɝ´ ɦɻɤůɋ əŬəɋ ɕůŰŏɝŬɻ ɗɻ ɕ´ ϒɗŮəŬ Ŭ´ ɕŰŏəɕ¡ ɜ ŭ¡ ɕ Ŭ´ ɦ ŰɷɡůgɕɜɦŰŰɻ ŮɡŰ ´ ŬɗɐůŮɷɡŰɷg ůəŮəŮŰɷɕ¡ ůgůŰɐɛŰŰɷɡɡ əŬəɕ Ŭɻ ɷɗɛɦɡŰɤɜ ´ ϒůɕɕɜŰɤɜ ŬgɜϒɜŮə ɛŮŬɜɗůgɕɗŰɷɦɻ gɗɛɦ. Ƀəɝɷ ŭɷŮəɜɕŭɷɐɣɡɛŮəɣŰŰɡɣɤɡůɐɛɻŮ ŬɜŬűɣɻɕgɜ ´ ɤɡ ɋ ɕůŰŏɝ´ ɦɻɤůɋ ´ɻɕůƀϒəəŮə 75 ŮəŰŰɛɛ¡ɻɷŬ ϒŰɛŬ ůŰɷɡ ¢Ыɻ , Ágɻ¡ ´ ɋ əŬə ЫŬ ɤɜɗŬ [1] Ůɜ ɛɦɜɕ ůŰɷɡ ¢Ыɻ ůɕŮűɦɜ 21 ŮəŰŰɛɛ¡ɻɷŬ ϒŰɛŬ g´ ɕűɣɻɕgɜ Ŭ´ ɦ ɕůŰŏɝŬɻ ɗɻ ɗŰɷŰŬ [2]. ¢ Ů ɷƀϒɻgɜůɋ Ŭ´ ɦ ŬgŰɣɡ Ŭɷɡ ´ ŬɗɐůŮɷɡŰɷg Ůɜŭə ůɋɛŬɜŰɷɐɛ. ÆŮ ɔgɜŬɷŮɷɡ ϒɜɤ Ŭɤɜ 45 ŮŰ ɜ, ɋ ɕůŰŏɝ´ ɦɻɤůɋ ůgɗ¡ ɜŮŰŰəɔɷŬ ´ Ůɻ ɷůůɦŰŰɻ ůɡ ɋɛɣɻ ůɡ ɜɕůɋəŮŰɡ Ŭ´ ɦ ´ ɕəəɣɡ ϒəəŮɡ ŬůɗɣɜŮɷɡ, ůgɛ´ Ůɻ ɷŬɛƀŬɜɕɛɣɜɤɜ Ŭɷɡ ůŬəɕŬɻ ¡ ŭɕggɡ ŭɷŮƀɐŰɋ, Ŭɷɡ ŮɛŰɻ ϒɔɛŬŰɷɡ Ŭɷɡ ɛgɕəŬɻ ŭɕɡ əŬə Ŭɷɡ əŬɻ əɔɕɡ Ŭɷɡ ɛŬůŰ¡ [3]. ÒɕŮə Ů ɑůɗɡ əŬŰŰƀɻ ŬŰůɔ Ůgɜɗɛɣɜɗ ɗɜɗŰɦŰɗŰŰ ůɕŮŰɷɦɛŮɜɗ əŬə ɛŮ Ŭɷɡ ŭ¡ ɕ ´ ŬɗɐůŮɷɡ. ϑɕəgϒɻ ɷɗɛŮɡ ɛŮəɣŰŰɡ ɣɕɡɕgɜ əŬŰŰŭŮɔŮə ´ ɤɡ ɗ ɋ ɗɜɗŰɦŰɗŰŰ ŮgɜϒɜŮə ɛŰŰϒ Ůɻɜ ŮɛŰɻϒɜɷůɗ ůˊ ɕɜŭgəɷɕ¡ əŬŰϒɔɛŬŰɷɡ (ɛɷŬ Ŭ´ ɦ Ŭɷɡ əi ɻ ɷůɡ Ůəŭɗəɤ ůŮɷɡ Ŭɻɡ ɜɦůɕg) [4- 6]. ÒɕŮəŮ ɑůɗɡ Ŭ´ ɕŭŮɷɗůɔ´ ɤɡ ɗ ŬəŰɷɕəɕɔɷɐɛ ɕůŰŏɝŬɻ ɗɻ ɗŰɷŰ ůŮɕ´ ɕɷŭɛ´ ɕŰŰ ůɗɛŮɷɐɛ ůgůɕŮŰɷŰŰə ɛŮ ɛŮəɤɛɣɜɗ Ů ɷƀɔɤůɋ Ŭɜŭɜɕɻ ŬɛŰɤɡ ɗəɷŮɡ əŬə Ŭɻɡ ´ Ŭɻ ɕgůɗŮɡ ůgɜɕŭ¡ ɜ ´ Ŭɻ ŬɔɦɜŰɤɜ ɦ´ ɤɡ ɕ ŭɷŮƀɐŰɻɡ, Ŭɷ əϒ´ ɜɷ¡ɛŮ, ɗ əŬŰϒɕɻ ɗůɋ Ŭəəɕɦə, Ŭɷ ɷ¡Ŭɷɻ ɷɦ əŬɻ ŭɷƀɔŰəŬəɐgɜɦůɕg əŬəɗ g´ ɣɻ ŰŰůɋ [7]. ɻ ɜ əŬə ɗ ůɕɣůɋ ɛŰŰŭɜ¡ ´ ɻ ɕɕɤɻ ɗɛɣɜɗɡ ɕůŰŏɝ´ ɦɻɤůɋɡ əŬɗ¡ ɡ əŬə Ŭɻɡ ɕůŰŏɝŬɻ ɗɻ ɕ´ ϒɗŮəŬɡ ɛŮŬɜɕɻ ɗɜɗŰɦŰɗŰŰ ɣɕŮə´ ɷ¡Ŭɷ´ ɕɷɗŮɻ əŬɛɗŮ Ŭ´ ɦ Ŭɷɡ ŭ¡ ɕ ´ ŬɗɐůŮɷɡ ŭŮɜ ɗŰ əŬŰŰƀɻ ŬŰůɔ ɗŰ´ ɕŰɣɤɡ ŮɗŰəɻ ůŮ´ ɷ¡Ŭɷ´ ɕɷɗŮəɦɗŰɜϒɷɡ.

¢ ůgɕɜɦŰɗŰŰ Ŭɻɡ ɕůŰŏɝ´ ɦɻɤůɋɡ əŬə Ŭɻɡ ɕůŰŏɝŬɻ ɗɻ ɕ´ ϒɗŮəŬɡ Ůɜŭə ŭɷŮɛɻ ŮŰɷɐɛ ůŮ ɕɛϒŭŮɡ ´ əɗɗgůɛɕ¡ ɛŮ Ŭɜɦɛɕɷ Ŭɜɗɻɤ´ ɕɛŮɻɷϒ ɕŬɻ Ŭəŭɻ ɷ¡Ŭɷϒ. ɃəŮůɗŮɜŮɡ ɛŮɕůŰŏɝŬɻ ɗɻ ɕ´ ϒɗŮəŬ ɣɕɕgɜ ɛƀŭə¡ ŰŮɻ ɕ ƀϒɻɕgɡ, gɣɗəɦŰɻ ɕ ŭŮəŰɻ ůɤɛŮŰɷɐɛ ɛϒɕŮgɡ (body mass index, BMI), gɣɗəɦŰɻ ɕ ´ ɕůɕůŰɦ ůɤɛŮŰɷɕ¡ əɗ ɕggɡ, ´ ɷ¡ ůəɕ¡ ɻ ɕ ŭɣɻ ɛŬ, ɛŮƀŭə¡ Űɻɗ ɛguɐɛ ɛϒɕŬ əŬə ´ Ůɻ ɷůůɦŰŰɻ ɗ ɛguɐɛ ŭ¡ ɜŮɛɗ Ŭ´ ɦ Ŭɷɡ ɡŮůɗɜŮɷɡ ůɗɛŮɷɡ ɛŮ Ŭgɜɗɛɣɜɗ ɗɜɗŰɦŰɗŰŰ ɣɕŮə´ ɷ¡Ŭɷ´ ɕɷɗŮɻ ɗůɋ [8- 11]. ÒɜŬɡ ϒəəɕɡ ´ Ůɻ ϒɔɕɜŰŰɡ ´ ɕg Ůɛ´ əɣəŮŰɷůŰɜ ´ ŬɗɐɔɣɜŮəůŰɜ ɗ ŬɗɐɔɣɜŮəůŰɜ ɗŰɡ ɛɗŬɡ ɛ ŰŰɜ ϒəəɗɡ ɜɦůɕg ŮɜŬə ɗ ŭgůɷɐɛ ŭ¡ ŬŮŰŰɻ ɷɦŰŰŰɻ. ¢ ɛŮəɤɛɣɜɗ ŭgůɷɐɛ ŭ¡ ŬŮŰŰɻ ɷɦŰŰŰɻ Ŭ´ ɕŰŰəŮɜ´ Ůɻ ϒɔɕɜŰŰɡ əɷŭ¡ ɜɕg ɔɷŬ ŰŰɜ Ŭɜϒ´ Ůgɜɗ ɕůŰŏɝ´ ɦɻɤůɋ [12, 13]. ɻ ɜŰŰɷƀɣŰɤɡ, ɗ ɕůŰŏɝŬɻ ɗɻ ɕ´ ϒɗŮəŬ ůɕŮŰɷɕŰŰəɛŮ ůgɗɜŮɷɡ ŭ¡ ŬŮŰŰɻ ɷɦŰŰŰɻɡ, ůgɜɐɗɤɡ Ůɻ ɔŬŮɷɜŰəɡ ű¡ ůɗɡ [14, 15]. ϑɕɷϒ ɔɜɤɻ ɗůɛŮŰŰ ŰɤɜɗŰ ´ əɗɗgůɛɜ ɜ ŮgŰɻ ɜ ŮɜŬə ɗ ɛƀϒəɗ ɗəɷƀŬ əŬəŰŰ ɷ əŬɜɦɜŬ ɗŰɜŭɜ ɡ ű¡ ɜɕ. Á ɜŰŰ¡ Űɷɡɡ, ɗ Ů á Ű¡ ůɗ ŰŰɡ ɕůŰŏɝŬɻ ɗɻ ɕ´ ϒɗŮəŬɡ əŬɛƀϒɜŮəŰŰɜ ɛɣɔɷůŰɗ ŰɷɛɐŰŰɗ ůŮ ɛŰŰɡ ůŮ ɛɷɦɻɦŰŰɻ Ŭ´ ɦ ŬgŰɻ ɷɗɛŮɡ ɗəɷƀŬ Ŭ´ ɦ ŬgŰɻ ɕůŰŏɝ´ ɦɻɤůɋɡ. qɷŬŰɡ´ ɤɛɣɜɕ ŭɷɡůŰɻ ɷ¡Ŭɷϒ, ɕəŬůɗŮɜŮɡ ɛŮɕůŰŏɝŬɻ ɗɻ ɕ´ ϒɗŮəŬ ŰŰɜɕgɜ ɜŬ ŮɜŬə´ ɷ¡ ɜɣɕəŬ ɦ Ŭɷɡ ɡŮůɗɜŮɷɡ ɛŮɕůŰŏɝŬɻ ɗɻ ɕ´ ϒɗŮəŬ. Á´ é əɣɕɜ, ɕ ůgůɕŰŰɷɛɦɡɛŰŰɜ¡ ű¡ əɕg əŬə ɕůŰŏɝ´ ɦɻɤůɋɡ ŮɜŬə ´ ɷ¡ ɷůɕggɻɦɡ Ŭ´ ɦ ŬgŰɦɜ ɛŰŰɜ¡ ű¡ əɕg əŬə ɕůŰŏɝŬɻ ɗɻ ɕ´ ϒɗŮəŬɡ.

Ƀəŭɷɐə´ Ůɻ ϒɔɕɜŰŰɡ´ ɕg Ůɜŭű¡ ɕɜŰŰə´ Ůɻ Ŭ´ ϒɜɤ Ů ɗɻ Ůϒɕɕgɜ əŬəŰŰɜ ƀŬɗɛɦ Ŭɻɡ əŬɛ´ gəɦŰɻŰŰɡ Ŭɻɡ əŬŰ¡ ŰŰɻ ɗɡ ů´ ɕɜŭgəɷɐɛɡ ůŰɛɐ¡ ɜ ŬɜŬűɣɻɕgɜ ɜŬ ŮɜŬə ´ ɷ¡ ɷůůɦŰŰɻ Ŭ´ ɦ ŬgŰɻ ɕůŰŏɝ´ ɦɻɤůɋ. ɑɷŬŰɡ´ ɤɛɣɜɕ ŭɷɡůŰɻ ɷ¡Ŭɷϒ, ɕəŬůɗŮɜŮɡ ɛŮɕůŰŏɝŬɻ ɗɻ ɕ´ ϒɗŮəŬ ŰŰɜɕgɜ ɜŬ ŮɜŬə´ ɷ¡ ɜɣɕəŬ ɦ Ŭɷɡ ɡŮůɗɜŮɷɡ ɛŮɕůŰŏɝŬɻ ɗɻ ɕ´ ϒɗŮəŬ. Á´ é əɣɕɜ, ɕ ůgůɕŰŰɷɛɦɡɛŰŰɜ¡ ű¡ əɕg əŬə ɕůŰŏɝ´ ɦɻɤůɋɡ ŮɜŬə ´ ɷ¡ ɷůɕggɻɦɡ Ŭ´ ɦ ŬgŰɦɜ ɛŰŰɜ¡ ű¡ əɕg əŬə ɕůŰŏɝŬɻ ɗɻ ɕ´ ϒɗŮəŬɡ.

αυτών των συστημάτων μια σύγχρονη τάση [26, 36, 37].

Στο διάγραμμα της εικόνας 1, που ακολουθεί, παρουσιάζεται η σύνθεση του συστήματος και η αλληλεπίδραση των υποσυστημάτων του. Η αλληλεπίδραση αυτή γίνεται μέσω των ροών πληροφοριών και ενέργειας. Η ανάλυση αυτή μπορεί να συνεχιστεί μέχρι τα υποσυστήματα να γίνουν τόσο απλά, ώστε να μπορούν να αντιμετωπιστούν εύκολα.



Εικόνα 5.3 Παράγοντες κινδύνου για την εμφάνιση οστεοπόρωσης και οστεοαρθρίτιδας. Οι παράγοντες αυτοί μπορούν να χωριστούν σε δύο κατηγορίες: σε αυτούς που δεν μπορούν να τροποποιηθούν και σε αυτούς που μπορούν.

Ůɻ Λɻ ũB?¢ÆÆ ŢŦƱ?qpƺ?Bƺũɬɻ ¢¢? ɻ ?ɻ Ů¢ƺɔ?¢ BÆ¢ÆBɻ ΛŮΛBŮɻ ŮÆɬɻ Æ	Ůɻ Λɻ ũB?¢ÆÆ ŢŦƱ?qpƺ?Bƺũɬɻ ¢¢? ɻ ?ɻ Ů¢ƺɔ?¢ BÆ¢ÆBɻ ΛŮΛBŮɻ ŮÆɬɻ Æ	Ůɻ Λɻ ũB?¢ÆÆ ŮBƺ ÆŮ¢ΛÆɻ ƱBƺ?¢¢? Ţɻ ƶ ŮƺşB¢¢¢ɻ ¢¢Æ Ţɻ ¢qÆÆΛ¢ÆÆ.Æ.
¢əəɒdŭ	¢əəɒdŭ	¢əəɒdŭ
ūɨəɛ	ūɨəɛ	ūɨəɛ
ūgəe	ūgəe	ūgəe
ũůšůűəe´ɻ ɛüəŸdůůd	ũůšůűəe´ɻ ɛüəŸdůůd	ũůšůűəe´ɻ ɛüəŸdůůd
Æŕɤ ɛŮűəe ɛŸɛŭ	Æŕɤ ɛŮűəe ɛŸɛŭ	Æŕɤ ɛŮűəe ɛŸɛŭ
ūgůəe ũɻ ŮůŮțɻ ɬfŮțlŮŮ	ūgůəe ũɻ ŮůŮțɻ ɬfŮțlŮŮ	ūgůəe ũɻ ŮůŮțɻ ɬfŮțlŮŮ
ūŸɻ ɛŮəŭ	¢ɻ Ůɨ ɛŮ	¢ɻ Ůɨ ɛŮ
ŢŸ´ ɜšůɛŮ	Æə ɔůšůűɛgŮšɤ ɛŮəđůg	Ůůđɾeůůšgf Æ.Æ. (ů´ ɛɜŭgəɛəđůđqůd, ů´ ɛɜŭgəɬəgůqd əűə)
ŢŮŰŸɛɻ qůqd Ůəəɛɬə-	Ŧůűšɻ əɒɬ ű əůɒɛɛɜɪ ŭɛggf Ůɻ dɻ ɛ´ Ydůšŭg	
ȥ ŮűŰɒɛəəɒyɛg-ůšŭɛəɻ ɜɛəɛɔəɒyɛgɜɬůɛə	ȥ ŮűŰɒɛəəɒyɛg-ůšŭɛəɻ ɜɛəɛɔəɒyɛgɜɬůɛə	
Ůɻɪ ɜđ ůɛɛqɜɬ´ Ŭgůq		

ŮœŮəŭgf 1 Æɨ ɔəɻ šůd´ Ůɻ Ůɔɬɜűŕɜ´ ɛg Ů dɻ ůŸœɛgɜ Űɜɜəœŭgɜɛ ŮɜŸ´ Ûg3dgfɜɬůɛg əŮə Űțɜ əŮɛ´ gəɬŰțlŰŰ Ûțlgf Bz ÆÆ. Bə´ Ůɻ Ÿɔɛ3ŰŰgf´ ɛg ßɻ ůəɛɜɪŰŰə´ Ÿɜŕ Ů´ ɬ Ûțɜ ɣšŰɜɜd ɔɻ Ůɛɛę Ůűɛɻ ɛɨɜ Ű3gf´ɻ ŕŕúš´ Ůdůgf ɛɛɻ ű ɣgf Ûŕɜ ɜɬůŕɜ əŮəůšŭəɛɛɛɛɑ. ¢ Ů œűɻ Ůůd Ûɛg əŮdůšɬfgf ŭəŰűɣɻůə´.ɛ. ɬůɛ Ůgɜ Ÿ3ůə d ůŕɛŮŰəe ɛŸœŰ, Ůgɜ Ÿ3ůə ɛ əœŭgɜɛgf ůɛűŸɜəůdgf ɛůŰůšŭɻ dɻ ɛ´ Ydůšŭg, ůšɪ ɛůa ɜŰŰɒɛ əœŭgɜɛgf ůɛűŸɜəůdgf ɛůŰůš´ fhɻ růdgf. ɻ ɜŰœůŰŰ, ɬůɛ Ůgɜ Ÿ3ůəd dəəəœŭ Ůgɜ Ÿ3ůəɛ əœŭgɜɛgf əŮɔəŭ Ű3gf ŭɨ ɛ ɜɬůɛggf.

Æge´ ůɻ ŮůɛŮŰəeY, d g´ ɬdůůd ŭəŭűg´ ɪ ddəůŕɤ gf ůɜœgf: Á űôɬůɛɜ d əŮɛ´ gəɬŰțlŰŰ Ûțlgf əŮŰɪ ŰŰɻ dgf ɛɛgɻŰgf Ûțlgf ů´ ɛɜŭgəɛəœgf ůŰəədgf əŮə ɛ əœŭgɜɛgf ůɛűŸɜəůdgf ɛůŰůš´ fhɻ růdgf ɐ ɛůŰůšŭɻ dɻ ɛ´ Ydůšŭg Ů dɻ ŮŕœɜɜŰə Ű´ ɬ Ûɬůɛggf əɛɜɛɨ gf ´ Ůɻ Ÿɔɛ3ŰŰgf, ůšŭůɛɛɛɣɜŕgf 3Ů g´ Ÿɻ ɛůə ůgůɛůŰűɪɛɬgf ɛŰŰɜɨ Ûțlgf əŮɛ´ gəɬŰțlŰŰgf əŮə Ûțlgf ´ Ůɻ ɛgůdůgf Ûțlgf ɛdŰgf ɐ Ûțlgf Ÿəədgf ɜɬůɛg. Æəɛ´ ɬgf Ûțlgf ɛůəɣŰțlgf ůɜŭůə 3Ů ŭšůɻ ůg3qdůəůɜ gűœŰŰŰəɛ ůgůɛůŰűɪɛɬgf Ůgŭɬgf.

ɻ ůdůšůgf əŮəɛɣdɛŭɛə

qůəɒɛŭ

¢Ŭ g´ ɬ ɛůəɣŰțl ŸŰšɛŭ Ů ɜɒɣɛdqəŮɜ Ű´ ɬ ůgɛɛŮŰɣɛɛ3ŰŰgf ůŮɣ3Ŭ ´ɻ ɬɔɻ Ůɛɛŭ ´ Ůɻ Ůəɛəɛɨ ddqůdgf ´ əqdgůɛɛɨ ɔšŭ ɛůŰůš´ ɛɻ rŰəɒŸ ů´ ɛɜŭgəɜɒŸ əŮŰŸɔɛŰŰŰ. ¢ ůəŰœdůd Ű ɛggf yəŮbŮɛɪ ɻŭŮ ůŰŰ ůɜrŰŰɻ ɜɒŸ šŰŰɻ Ůŭ Ûțlgf Bɻ dɛ´ Ůšɨɜɒɣɛgf Ţəɜɜɒɣɛgf Ű ɛgɜ ŸŮɜů šůŰțlɛšŮəɛɨ ũůɜɒɛɨ ?ɛůəɛɛɛŮœg ¢ɻ Ůəəůœg (Ůɻ ũ?¢). ȳəŮŰŰg´ ɬ ɛůəɣŰțl ŸŰšɛŭ g´ ɛɓəɐddqəŮɜ ůŮɛɣɻdůd ɛůŰɒɣɛgf´ gəɜɬŰțlŰŰgf ɛŮŰțl ɛɣdɛŭšɛ DEXA ɛŮŰšɜ œűšɜ Ű´ ɛ ɛdɛŮɜɐɛŰŰšgf (QDR ï 1000, Hologic, Waltham, MA) ´ɻ ɛəůœɛɣɜɛg 3Ŭ Ů šbůbŮɜŕdůɪ ɐ Ű´ ɛəəůšůŰůɪ d ɨ´ Ůɻ ɜd ɛůŰůš´ fhɻ růdgf. Á´ œůdgf, g´ ɛɓəɐddqəŮɜ ůŮ Ůəŭšɛəɛɔəɒe Ű´ ůɒɬɜɜšůd Ûțlgf dŕɤɻ Ůəəɒɣɛgf əŮə ɛůűgwpeɣɛgɻ Ůgf Ûțlgf ů´ ɛɜŭgəɛəœgf ůŰəədgf ůŮfhɻ dšŭ dɣůd, gɻ důšɐɛ´ ɛə 3ŰŰgf Ûš œűšɜ ɛdɛŸɜdɛŭ əŮəŰŰɛɜɛɒe.

Á´ ɛɒɣɔɤɜŰŰgf Ûš ŭŮɒɛŭ Ű´ ɬ Ůgŭŕɜ Ûțlɜ ɛɛŸŭŮ ŰŰɬɜɛŭ ɤɜ, Ű´ ɛűŮɻ ɛdɖəŮd ŮɜŸɔəd 3Ů ŮəŰŰdɛɨ ɜ ´ Ůɻ šůɬŰŰɻ Ů Ÿŭšɛŭ ůŮ Ůəŭšɛɓɛəđŭ. Á´ ś ɻ ɛůdɣŭŕgf, d

´ əɋɗgůɛɜŬəɐ ɕɛϒŭŬ´ ɕg ɣəŬɒŮɛɣɟ ɕɠ ůŰʗ Ůɜ əɦɔɤ ɛŮɒɣŰɋ ɐŰŰɜ ŮɜŬɟ ŮŰɒϒ ɕɛɕɜɜɔŮɜɐɠ, əŬɗı ɠ Ű´ ɕŰŮɒɕi ɜŰŰɜ Ű´ ɕəəŮɒůŰɒϒ Ű´ ɦ ɔg ɜŬɑŮɠ ɛŮŰŮɛɛdʒɕ´ Ŭgůɜ Ŭəɐɠ dəɜɑdŬɠ. ₡gɜŮ ı ɠ ɐŰŰɜ ŭɜŬdɣůɜɛɕ ɣɜŬ ŭŮɒɛŬ ůŰɜ ɕ´ ɕɑɕə ´ Ŭɟ ϒɛŰŰɟ ɕə´ ɕg Ů dɟ Ůϒɕɕgɜ Ůɜ ůɕɐɛŬ Ůʗɠ ů´ ɕɜŭgəɜɒɐɠ ůŰɐədɠ ɦ´ ɤɠ d dəɜɑdŬ əŬə Ůɜ Űɨəɑɛ (ɤɠ ´ Ůɟ ɜɟ ϒŰŰŰə ůŰʗ ŮɒůŬɔɤɔɐ) ŭŮɜ Ű´ ɕŰŮɒɕi ůŬɜ ɛŮŰŰɒədŰɣɠ, əŬəŮ é əɣɕɜ Ůɜ dəɜɑdəɦ ŰϒůɛŬ ŮɜŰůŰɜɜŮɒůŰʗ ´ Ůɟ ɑŭɛ ɦ´ ɕg d ɕůŰŮɜ´ ɦɟ ɤůɋ əŬəd ɕůŰŮɜŬɟ ɖɟ ɕ´ ϒɗŮɒŬ Ű´ ɕəŰɕi ɜ Ůʗ ɛɣɔɜůŰʗ ůgɕɜɦŰɋŰ [13, 38, 39].

Ɐ əŬůɗŮɜůɒgɛŮŭůgŰŰɟ ɕ´ Ŭɗɐ ɕůŰŮɜ´ ɦɟ ɤůɋ əŬəɕůŰŮɜŬɟ ɖɟ ɕ´ ϒɗŮɒŬ əŬɗı ɠ əŬə ɦůɤɜ ɖ ɕůűgɯɒɐ əɦɟ ŭɤůɋ ´ ɷɗŰɜı ɠ ɜŰ ɣɕŮə ŭɷŬŰɟ ŬɕɗŮɒ əɦɔɤ ɜɦůɕg ɐ ɷŬŰɟ ɕɔŮɜɕi ɠ ´ Ůɟ ɣɛɓŬůɖg Ű´ ɕəəŮɒůŰʗ ɕŰŮɒɕi ɜ Ůʗ ɦŰ ɛŮɒɣŰɋ. ₡ɟ ɷŰɟ ɷŬ Ű´ ɕəəŮɒůɛɕi Ű´ ɕŰŮɒɕi ɜ Ůʗ ɷůŰʗ ɷɦ ɛŮŰŰɒɕəɷɐɠ ɐ Ůɜŭɕəɟ ɷɕəɔɜɷɐɠ ´ ϒɗɖůɖg (ůgɛ´ Ůɟ ɷɷŬɛɓŬɜɕɛɣɜɖg Ůɖg ´ ɟɹ ɷɖg Ůɛɛdʒɦ´ Ŭgůɖg), əɐɣɖ űŰɟ ɛϒəɤɜ ´ ɕg Ů dɟ Ůϒɕɕgɜ Ůɖ ɕůŰŮɒɐ ´ gəɜɦŰɖŰŰ, ɷůŰʗ ɷɦ əŬŰϒɕɟ ɖůɖg Ŭəəɕɦə, Ůə ɔŮɜŮŰɐg Ŭɜɤɛ Ŭəɑůg Ůɤɜ Ŭɟ dɟ ı ůŮɤɜ, ɷůŰʗ ɷɦ űəŮɒɛɕɜı ŭɕggɖ Ŭɟ dɟ ɕ´ ϒɗŮɒŬg, ɷůŰʗ ɷɦ Ű´ Ůi ɛŮŰʗg ɐ ɕŮɒɟ ɕgɟ ɔɷɐɠ Ů ɣɛɓŬůɖg ůŰɖɜ ůɕ´ ɕɜŭgəɜɒɐ ůŰɐəd, ɕɐ Ůůɗ Ůɜ ůŮɖg ɛŮ ůgɔɔŮɜůŮg Ŭɜɤɛ Ŭəɑůg Ůɖg ů´ ɕɜŭgəɜɒɐɠ ůŰɐədg, ŮɜŭůɜůŮg ů´ ɕɜŭgəɜɒɕi əŬŰϒɔɛŮŰʗg, ů´ ɕɜŭgəɦəgůɖg, ů´ ɕɜŭgəɕəɑůɗɖůɖg, ůəɕəɑɤůɖg ɐ ɕ´ ɕəŮůŭɐ´ ɕŰŮ ϒəəɖg ů´ ɕɜŭgəɜɒɐɠ ´ ϒɗɖůɖg´ əɖɜ Ůɖg ɕůŰŮɜŬɟ ɖɟ ɕ´ ϒɗŮɒŬg.

ȳ əŮg ɕəŬəŰɒɔɔɟ Ŭűɗůɖg ŮəŰʗɐɗɖəŭɜ Űɦůɕ ɔɷŬ ɜŬ əŬɗɔɟ ɷůŰɒɹŭɜ Ű´ ŮɒɔɜɕʗɦŰŭɜ ůɖɛŮɒŬ ů´ ɕɜŭgəɜɒɐɠ ´ ϒɗɖůɖg, ɦ´ ɤɠ ´ Ůɟ ɜɟ ϒŰŰŰə ůŰŰ əɟ ɷɟ ɷŬ Ű´ ɕəəŮɒůɛɕi, ɦůɕ əŬə ɔɷŬ Ůɖɜ ´ Ůɟ ɕgůɖŬ ɕůŰŮʗŮɟ dɟ ɷŰɒı ɜ Ůəɔɕɷ ůŮɤɜ. ₡ ŮɒɣŰŰůɖ ŭɷʗŮɟ ɔɐɗɖəŮŰ ɦ ŭɨɕ´ Ůɟ ŮŰŰɟ dŰɣg, ŮɜŮʗϒɟ ŰɖŰŰ əŬəŰ ɦ ŭɨɕ ű ɕɟ ɣg. Ɐə´ Ůɟ ŮŰŰɟ dŰɣg ŭŮʗ ŮɒŮɜ ɔɜı ůɖ ŮŰŰɟ ŰŰgŰɦŰɖŰŰg Ű ɕg ŮůɗŮʗɕi ɠ ɐ Ű´ ɜ Ű´ ɕŰŮɒŮůɛϒŰ´ ɜ ϒəəɔɜ ŮʗŮŰ´ůŮ´ ɜ. ₡ Ů ŮɜŬəɖɣɷɦŰɖŰŰ əŬə ɖ ůgɛűɤɜɗŬ ɛŮŰŰɜɕi Ű´ ɜ ´ Ůɟ ŮŰŰɟ dŰı ɜ ɐŰŰɜ ŮʗŮŰ´ůŮ´ ɜ, ŬɔɔɕɷɜɜŰŰg Ű ɕ 99% əŬə 98%, ŮɜŰɑůŰɕɷŬ.

ʐ ŮŰɖɜ ŮűŮɟ ɛɕɔɐ Ű´ ɜ əɟ ɷŰɟ ɕɤɜ Ű´ ɕəəŮɒůɛɕi, Ű´ ɦ Ű ɕgg 524 ŭůɗŮʗůɒg ´ ɕg ŮʗŮŰ´ůŮɖəŭɜ, ɛɦɜɕ ɕə145 Ŭɜɷɕəɔɕɷɗɖəŭɜ Ůɟ ɕɷɐϒ ɤɠ ´ ɷŰɜı ɜ əŮŰ´əəɖəɕə ₡Ŭ əi ɟ ɷŬ ŮɗŰŬ Ű´ ɕəəŮɒůɛɕi əɐɣɖ űŰɟ ɛϒəɤɜ ´ ɕg Ů dɟ Ůϒɕɕgɜ Ůɖɜ ɕůŰŮɒɐ ´ gəɜɦŰɖŰŰ (ɜ = 73), ů´ ɕɜŭgəɜɒɦ əϒŰŰɔɛŮ (n = 68), ɷůŰʗ ɷɦ ɛŮŰŰɒɕəɷɐɠ (n = 42) ɐ Ůʗŭɕəɟ ɷɕəɔɔɷɐɠ ´ ϒɗɖůɖg(n = 53), ůgɔɔŮʗůɒg Ůɜɤɛ Ŭəɑůg Ůɖg ů´ ɕɜŭgəɜɒɐɠ ůŰɐədg (n = 39), ů´ ɕɜŭgəɦəgůɖ (n = 18), ůəɕəɑɤůɖ (n = 11), ů´ ɕɜŭgəɕəɑůɗɖůɖ (n = 10), ϒəəɕɷ əɦɔɕɷ (n = 65). ₡ɟ ɷϒɜŰŰ Ű ɟ ůŬg ŬəɦɛŮ ŮůɗŮʗůɒg Ű´ ɕəəŮɒůɛɕi əɦɔɤ əŬəɐg´ ɕɦŰɖŰŰg Ű ɤɜ Ŭəɑɔɔɟ ´ Ŭűɷ ɜ Ű ɕggɖ. ₡ɕɷ ŰŰəɷɦ ŭŮɔɛŮ Ű´ ɕŰŮəŮůŰəŰ ɦ 112 ɛŮŰŰɛɛdʒɕ´ Ůgůɷ ŬəɤgɔɜŮɑŮg, dəɷɑdŬg 42-76 ŮŰɨ ɜ (ɛ.ɕ. 57,3 ɤŰɖ).

ʐ ŮŰɟ dɖfɤɜŰŰ ɕŮɟ ŬəŰɖɟ ɷůŰɒϒ

₡ŮɦəŬ ŰŰg´ ɦ ɛŮəɤŰɖ ϒŰŰɛɛŬ ɛŮŰɟ ɐdɖəŮŰɷ ɨɣɕgɖ əŬəŰɷ ɓϒɟ ɕgɖ ɣŰůəı ůŰŮɜŬ g´ ɷəɕɔɷůŰŮɷɕ ŭŮəɐŰŰɖg ůɤɛŬŰɷɐɠ ɛϒɕŮg (BMI), ´ ɕg Ű ɕŰŮəŮůŰɜŰɷəŮɷɷɦ ɛɣŰɟ ɕ ŰɖŰŰg ůɤɛŬŰɷɐɠ ɛϒɕŮg [40]. ȷϒŰŰŰɓɟ ϒŰűdəŮ d dəɜɑdŬ əŬɗı ɠ əŬə Ůɷ ɕɷɔɕɷŮəŮəɦ ɷůŰʗ ɷɦ ɔɷŬ ɕůŰŮɜŬɟ ɖɟ ɕ´ ϒɗŮɒŬ.

Ⱶɻ ɓəŮȣɛƴɜɓg ɜŬ´ ɻ ɓůŭɯɻ ɯůŰŬɒŰȣ Ů á Ůŭɓ űgůɯɒɐgf ŭɻ ŬůŰɬɻ ɦŰɬ[ŰŬgf (PAL), ůŮ ɦəɯggf Ű ɯggf ŬůɗȣŮɯgf g´ ɓɒəɐɗɬəŮ ƴɜŬ əŬɗɓɻ ɯůɛƴɜɓ Ůɻ ɤŰɬɛŰŰȣəɦɔɯȣ ŬȣŰŰɓɻ ɯƳ ɛŮŰɯgf ŭɻ ŬůŰɬɻ ɦŰɬ[ŰŮgf, Ůɻ ɔŬůɯŮəƴgf əŬəŬȣŬɤ gɓɛɐgf, əŬəŰȣ Ů á Ůŭɓ əŬɗɓɻ ɯůŰɬəŮɤ gŰɛɬəɦ, ɛŮůŬɒ ɐ gɤɬəɦ [41, 42]. ƶ ɓȣƳɓŰŭgɓ ŰůɗȣŮɯgf ŮɒŰȣ gɤɬəɦ Ů á Ůŭɓ, əŬə ɓƳɻ ɯ Ű əɦŰɬ[ŰŮgf ŰŬɯȣɓɛɐɗɬəŬȣ ůŰɬɜ ɓɛƳŭŰ ɛŮůŬɒɓg Ů é ƴŭɓg.

qɓgf Ů é əƴɓȣ əŬə əɯɦŰŮɻ ɓ g´ ɓəŮȣɯŮɯɦ ɛƴŰɻ ɓ Űɬɗf Ů é ƴŭɓg űgůɯɒɐgf ŭɻ ŬůŰɬɻ ɦŰɬ[ŰŮgf ƴɓŮə Ů ɯůɗɬgf g´ ɓəɓɔɯůŰůɒ ɓ ƀŬůɯɦɔf ɻ gɗɛɦɔf ɛŰŰŬƀɓəɯůɛɓi (BMR). ÒɓŮə ɐŭɗ əŰŰŭůɯɗůɒ´ ɤɓf ɓə Ŭȣƴgf Ŭȣg BMR ŬȣŮȣŬŰȣ´ Ŭɻ ɒɓgȣ Ŭȣ ɛŬəɻ ɓ´ ɻ ɦɗŮůɛɓ Ů á Ůŭɓ ŭɻ ŬůŰɬɻ ɦŰɬ[ŰŮgf [43, 44]. ⱶ g´ ɓəɓɔɯůɛɦɔf Ů ɯŰŮəƴůŰɬəŮ Ű ɦůɓ ɛŮ Ű ɬɜ Ůɯůɤůɋ Schofield (BMR$_{SCH}$) ɦůɓ əŬə ɛŮ Ű ɬɜ Ůɯůɤůɋ Harris ï Benedict (BMR$_{H-B}$). ¢ Ůɯůɤůɋ Schofield ŮȣŬəɗ´ əƴȣɜ ŭɯŰŮŭɛƴɜɗ Ű ô ɦəŮgf Ŭɒf ɛŮɗɦŭɓggf ɦ´ ɤɓf Ű ɓŭŮəɜi ŮŰŰə Ű ɦ Ŭɒf ƀɯəəɓɔɻ Űŭəƴgf ŬȣŰŭɓɻ ƴgf əŬəŮ é ɻ ɓůɗƴŰɤɓf ůgůŰɛɜŰŰŰəŰ ɦ Ŭɓɜ ⱶŬbəɦůɛɓ ⱶɻ ɔŬȣɯɛɦ Ɉɔŭŭgf (Ⱶ.ⱶ.Ɉ.) [41, 42]. qůŰɦůɓ, ůŮɛɯŰ ɛŮəƴŰɬ Ŭɤɜ Taafe əŬə ůgɜ, qŮɯůɤůɋ Harris ï Benedict Ű ɓŭŮɓɗɬəŮ q əŬəi ŰŰɬq ɛŮŰŰɜi Ɣəəɤɜ ŭɗɛɓůɯŮgɛƴɜɤɜ Ůȣɯůɩ ůŮɤɜ ůŰɬɜ ´ ɻ ɦƀəŮɣq Ŭɒg BMR ůŮůi ɔəɻ ɯůɗ ɛŮ Ű ɬɜ ƴɛɛŮɗqɗŮɻ ɛɯɓɛŰŰɻ ɗŰůŭgf ɛŰŰŮɛɗȣɓ´ ŬgůɯŮəƴgf ɔgȣŬəŮgf [45].

ƶ ŰŰɻ ɐůŮgf ɓůűgɯɒɐgf əŬɛ´ gəɦŰɬŰŰgf

ⱶəŬəŭɓɔɻ ŬűɗŮgf ɣqűɯ´ ɓɯɗɗəŬȣ, Ű ɓɗɗəŮɬ Ű ɬəŬȣ ůŮqəŮəŰɻ ɓȣəɐ ɛɓɻ űɐ əŬə ɓəɛŰŰɻ ɐůŮgf ŮəŰŮəƴůŰɬəŬȣ ɛŮŰɬ ɛƴɗɓŭɓ Cobb ɛŮŰɬ ɓɻ ɐůɋ Ůŭɯəɓi əɔɔɯɛɓi . ¢ ɓɻ ɐůɋ g´ ɓəɔɔɯŰůȣ ɔɯŬ Ű ɬɜ ɛƴŰɻ qůɋ Ű ɬgf ɓůűgɯɒɐgf əɦɻ ŭɤůɋgf ƴɓŮə Ű´ ɓŭŮəɗŮůŰɓgəƳɓɯŰȣ ɯůȣƳȣŬ, Ȣɜ ɦɓəəŬəi Ű Űɻqɓ, Ű ɦ Ű ɬɜ ɛƴŰɻ qůɋ ŭɯŬ ɓŮŬɒɦgf [34, 46, 47]. ¢ ɛƴɗɓŭɓgf Cobb ƴɓŮəŬŰŰŭůŭŮɯůŰɓɗɯəɔɻ ŰűəƳɤgf q əŬəi ŰŰɻq Ű ɦ´ əŮgɻ Ɣgf Ů ŬȣŬəqɤɛɦŰɬŰŰgf əŬəŬȣŰ Ůɻ ŬɔɤɛgfɔɯŬ Ű ɬɜ g´ ɓəɔɔɯɛɦ Ű ɬgf əŬɛ´ gəɦŰɬŰŰgf Ű ɬgf ů´ ɓȣŭgəɐɗɛgf ůŰɬɐəɗgf [46]. ƶ ŰŰɻ ɐůŮgf ƴɔɯȣŬɜ ɛŰŰɜi Ű ɤɜ Ⱶ$_1$ ï Ⱶ$_5$, Ⱶ$_1$ ï Ł$_1$ əŬɗɩ gəŬəⱶ$_5$ï Ł$_1$.

ƶ ŰŰƳ Ű ɬq ůgɔəƴȣŰɻ ɤůɋ Ű ɤɜ ůŰȣɓɓŮɤɜ, ŰŰŮ g´ ɦ ɛŮəƴŰɬq ƳŰȣɛŮ ɔɤɻ ɯůŰɬəŬȣ ůŮ ŰƴůŮůɻ ɓgf ɓɛƳŭŰgf. ¢ ɛɗŮ Ű ɓŰŮəŮɗŰŰəŰ ɦ ŰɓggŮ ŬůɗȣŮɯgf ɛŮ ɓůŰŰȣ´ ɦɻ ɤůɋ, q ŭŮůŰɻ qŰ Ű ɦ Ű ɓggŮ ŬůɗȣŮɯgf ɛŮ ɓůŰŰȣŰɻ ɗɻ ɓ´ ƲɗŮȣŮ, q Ůɻ ɗŰɬq Ű ɦ ŬůɗȣŮɯgf əŬə ɛŮŰɓgf ŭi ɓ ɜɦůɓggf əŬəɗ ŰƴŰŰɻ ɬɗq Ű ɦ gɔɤə ƳŰȣɛŮ (ɓɛƳŭŰŮəƴɔɓg).

ɻ ůɗŮȣŮgf ɛŮɓůŰŰȣɻ ɗɻ ɓ´ ƲɗŮȣŮï ɓɛƳŭŰŮ (ⱶƲ)

ⱶůŰŰȣ´ ɦɻ ɤůɋ ɗŮƴɻ ŮɗŰŰəq ɓůŰȣɓə ´ gəɜɦŰɬŰŰ ɛɓɻ ɦŰŮɻ q Ű ɬɜ 2,5 ůŰŰɗŮɻ ɩ ɜ Ű´ ɓəəɗůŮƴɜ (SD) Ű ɦ Ű ɓ ɛƴůɓ ɦɻ ɓ ɜƴɤɜ gɔɤə ɜ ŮŰɦɛɤɜ əŬŰŮȣŬɜŰȣŰŰɓɓɓgɗŮ ɤgf ´ ɻ ɓgf ɬɗq ű gəɐ əŬəŰȣ ű i əɓ (T-score), ůi ɛű ɤɜŬ ɛŮŰȣɜ ɓɻ ɓɛƳŭŰ Ű ɓg Ⱶ.ⱶ.Ɉ. [13] ƶŬɜŮgf Ű ɦ Ű ɓggŮ ŬůɗȣŮɯgf ´ ɓg ůgɛ´ Ůɻ ɓəɛűɗɗəŬȣ ůŮ ŬgŰŰɐ Ű ɬɜ ɛƴŰŬ ŭŮȣ ŮɒŬȣ ŬəŰȣɓɔɻ ŬűɗŮgf ɜŭŮůŮȣŮgf ɓůŰŰȣŰɻ ɗɻ ɓ´ ƲɗŮȣŮ. ¢ ɛƴŰŬ Ű´ ɓŰŮəŮɗŰŰəŰ ɦ 34 ƴŰȣɛŬ.

ɻ ůɗŮȣŮgf ɛŮɓůŰŰȣŬɻ ɗɻ ɓ´ ƲɗŮȣŮï ɓɛƳŭŰŮ (ⱶɻ)

qɓgf ´ ɻ ɤŰȣ´ Ŭɗəgf ɓůŰŰȣŬɻ ɗɻ ɓ´ ƲɗŮȣŮ ɗŮƴɻ ŮɗŰŰəq ŬəŰȣɓəɔɔɯɛƳ ůɛűŬɜəgf Ŭəəɓɔɤůɋ Ű ɬgf ů´ ɓȣŭgəɐɗɛgf ůŰɬɐəɗgf ůi ɛű ɤɜŬ ɛŮŰɬ ŰŰɜɜɦɻ ɛɗŮůŰɓ Ű ɤɜ Kellgren ï Lawrence [14]. ũɯŮ Ű ɬɜ ŭƳɔɜɤůɋ Ű ŬɯŰŮŰŰəq ´ Ŭɻ ɓgůŮŮ ŰȣgəƴɔɯŰȣɜ ŭi ɓ

Ŭəəσəφ ůŮ¥ɜ [48]. ζ φə¡ Ɣ σůŰŮђűgŰŬ εђɜσ ůŰß εŮůσů´ σɜŭi əæß ŭèɣůŰđ£Ŭ ŭŮɜ əŬ£ƀƔɜσɜŰŬə ¥ rgſ Ůɜŭ Ůɜ Ůφſ ´ ¡ ¥ Ůß´ Ŭđσi gſ σůŰßŬ¡ đ¡ σ´ Ɣđůǽŭgſ (ƀŬđεђgſ 1, Ŭ£ű ƀσəσ). ȳ əæəσəŬůđŮɜůŮφſ ´ σg ůgε´ Ů¡ φ»eűđqəŬɜ ůŮŬgŰ» Ű đ³ σε ƔŭŬ ŮœŬɜ T-score >2,5 SD. ¢ σε ƔŭŬ Ŭ´ σŰŮəůŰŬəŬ´ ђ 29 ƔŰßε Ŭ.

ȷ ůđŮɜŮφſ ε Ůσů Ű Ůɜ´ ђ¡ ¥ůq əŬəσůŰŮɜŬ¡ đ¡ σ´ ƔđůǽŬ ï σε ƔŭŬ (ƁƔ, Ɓȷ)

Ɓ əŬůđŮɜŮφſ´ σg ůgε´ Ů¡ φ»eűđqəŬɜ ůŮŬgŰ» Ű đ³ σε ƔŭŬ Ůœ Ŭɜ T-score < 2,5 SD ůŮ ¥ɜŬ Ű œgəƔσ¥Ű ɜ ůqε Ůœ əŬđı gſ əŬə ŮɜŭŮɜŮφſ ů´ σɜŭgəφ»eσſ σůŰßŬ¡ đ¡ σ´ Ɣđůǽŭgſ. ¢ σε ƔŭŬ Ŭ´ σŰŮəůŰŬəŬ´ ђ 20 ŰßεŬ.

ƁεƔŭŬ Ůφ¥ɔσσg

¢ŬƔŰßεŬ´ σg ůgε´ Ů¡ φ»eűđqəŬɜ ůŮŬgŰ» Ű đ³ σε ƔŭŬ Ůœ Ŭɜ T-score > 2,5 SD Ůɜı ŭŮɜ Ůœ Ŭɜ Ůɜŭ Ůɜ Ůφſ ů´ σɜŭgəφ»eσſ σůŰßŬ¡ đ¡ σ´ Ɣđůǽŭgſ. ¢ σε ƔŭŬ Ŭ´ σŰŮəůŰŬəŬ´ ђ 29 ŰßεŬ.

ƁŰŰŰßůŰßφ» ȷ ɜƔəgůq

ũ¤ŬŰφſ ůgɔə¡ ¤ůŮφſ Ű r ɜ εŮŰŰbəqŰı ɜ Ůɜ ƔεŮůŬ ůŰφſ 4 σε ƔŭŮſ G¡ qůß¤σ´ σ¤đqəŮ Ű ε σɜŰ¥əσ Ű đſ Ůɜ Ɣəgůqſ ŭ¤Ŭəi εŬɜůqſ əŬŰƔ ¥ɜŬ ´ Ů¡ ƔɔσɜŰŬ σ¥ ¡ œſ Ů Ůɜ Ŭəq´ Ű»φ¥ſ εŮŰ¡ »ůŮφſ (One factor ANOVA model with no repeated measurements). ũ¤Ŭ Ű φſ ´ σəəŬ´ əφſ ůgɔə¡ ¤ůŮφſ Ůɜ ƔεŮůŬ ůŰφſ G¡ σɜ»φ¥ſ ůŰ»ε¥ſ Ůɜ Ƕ 2 (pairwise multiple comparisons) G¡ qůß¤σ´ σ¤i εŮŰ¤ test Ű¤g Bonferroni. H ůi ɔə¡ ¤ůq Ű¤g PAL score ůŬɜ əŬŰŰ¤ɔσ¡ đŬ Ůɜ ƔεŮůŬ ůŰφſ 4 σε ƔŭŮſ ¥ɔσɜŮ G¡ qůß¤σ´ σφ ɜŰŮſ Ű¤ j əŰŮ¡ Ƕ¥ɜσ ŰŮůŰ ũ¤Ŭ Ű đɜ ůgůσ¥Ű»ůq Ű r ɜ ůgɜŮɜı ɜ ´ Ů¡ Ubђɜŭr ɜ G¡ qůß¤σ´ σ¤đqəŮσ ůgɜŰŮ»ŮůŮ»gſ ůgůσ¥Ű»ůqſ Ű¤g Pearson əŬə Ű¤g Spearman. ȳ əŬ ŰŮ ŰŮůŰŮɜŬəŭé æ¤ſ əŬŰŮ đgɜůqſ (two-sided) εŮŰ á Ůœ ůqε Ŭɜ Ű»ђŰŰŮſ p= 0,05. ũ¤Ŭ Ű đɜ ůŰŮŰůŰ»ůq Ůɜ Ɣəgůqſ G¡ qůß¤σ´ σ¤đqəŮ Ű¤ ůŰŮŰůŰ»ђ ´ Ubƴ Ű¤ SPSS (Statistical Package for the Social Sciences) for Windows, Rel. 13.0 (SPSS Inc. Chicago, IL).

ȷ ´ σŰŮ»ƴůεŰŰŮ

ƁŒi ɔə¡ ¤ůq Ű r ɜ ´ Ů¡ Ůɔђɜŭr ɜ əφŭi ɜσg εŮŰŮɜi Ű r ɜ σε Ɣŭƴɜ.

¢ qəφəŬ ¤ŰŮɜ ůqε Ůɜ Ű»ƴ ε Ůɔ Ůəi ŰŮ¡ q ůŰđɜ σε ƔŭŬ Ůůđ Ůɜı ɜ ε Ů σůŰßŬ¡ đ¡ σ´ ђ¡ ¥ůq (p=0,001) əŬəůŰđɜ σε ƔŭŬ ε Ů Ű£ű ђŰŮ¡ Ů¡ Ű»ſ ɜђůσggſ (p<0,0005) Ŭ´ ôђŮəůŰđɜ σε ƔŭŬ Ů»ƴɔσσg. Á´ ơůqſ ¤ŰŮɜ gɣqəђŰŮ¡ q ůŰđɜ σε ƔŭŬ ŮůđŮɜı ɜ ε Ů Ű£ű ђŰŮ¡ Ů¡ Ű»ſ ɜђůσggſ (p=0,005) Ŭ´ ô ђŮə ůŰđɜ σε ƔŭŬ ε Ů σůŰßŬ¡ đ¡ σ´ Ɣđůǽŭ. ȷ ɜ əŬə g´ ¤¡ gŬɜ ŭəŰŭσ¡ ¥ſ ůŰđɜ qəφəŬ ůgɔə¡ σɜσɜŰŮſ Ű đɜ σε ƔŭŬ ŮůđŮɜı ɜ ε Ů σůŰßŬ¡ đ¡ σ´ Ɣđůǽŭ ε Ů Ű đɜ σε ƔŭŬ ŮůđŮɜı ɜ ε Ů σůŰßŬ¡ đ¡ σ´ ђ¡ ¥ůq əŬəŰđɜ σε ƔŭŬ Ů»ƴɔσσg, ŮgŰ¥ſ ŭŮɜ ƴŰŮŰůŮɜ ůŮ ůŰŮŰůŰ»ůq Ű»ƴ ůqε Ŭɜ Ű»ђ Ů á Ůœ. ƁqεŬɜ Ű»ƴſ ŭəŰŭσ¡ ¥ſ ƀ¡ ¥đqəŬɜ ůŮůσ¥ůq ε Ů Ű£ű ƀƔ¡ σgε Ű ŮŰŰ»ɜi Ű r ɜ σε Ɣŭƴɜ. ƁgɔəŬ¤¡ ¤ɜ ɣɜŬ, σəŬůđŮɜŮφſ ε Ů σůŰßŬ¡ đ¡ σ´ ђ¡ ¥ůq Ůœ Ŭɜ ɛ»¡ ђŰŮ¡ σ ƀƔ¡ σgſ Ŭ´ ђ Ű đɜ σε ƔŭŬ Ů»ƴɔσσg (p=0,045) əŬəσ»ε Ů Ű£ű ђŰŮ¡ Ů¡ Ű»ſ ɜђůσggſ Ůœ Ŭɜ ɛ»¡ ђŰŮ¡ σ ƀƔ¡ σgſ Ŭ´ ђ Ű£ggſ Ůůđ Ůɜ Ůφſ ε Ů σůŰßŬ¡ đ¡ σ´ Ɣđůǽŭ (p=0,023) əŬđı gſ əŬə Ŭ´ ђ Ű đɜ σε ƔŭŬ Ů»ƴɔσσg(p=0,002). ȷ ɜŰ¤ƴŰ r gſ, σəφ Ű¥ůŮ Ů¡ φſ σε ƔŭŮſ Ůœ Ŭɜ ´ Ů¡ ђε σ¤ BMI (p=0,246, ε d ůqε Ŭɜ Ű»ђ).

¢ ůi¸cəµ¸¤łůd Ű¤g ŮÉ¤ÝŭŭŒg űgůł¤æŒg ŭ¸ŬůŰđµ¸ĥŰđ[ŰŬg (PAL) ŭŮ³ Ŭ³ÝŭŮß¤Ů ůŰŬŰůß¤Ÿ ůđ£Ŭ³Ű¤ß¤Ÿg ŭ¤łŬŭ¤µ¸Ÿg (p=0,694, £d ůđ£Ŭ³Ű¤ß¤ĥ). q ůŰĥůŒ, ĥŰŬ³ ůgcəµ¸œđəŮŒ BMR, ßµ¸Ÿđ¸đəŬ³ ůđ£Ŭ³Ű¤ß¤Ÿg ŭ¤łŬŭ¤µ¸Ÿg. J´ ŒæŒc¤ĥ£Ů³Œ¤g ε Ů Ű¸đ³ Ů³œůı¥ůd Harris ï Benedict, ŒBMR$_{H-B}$ Ű¸đg Œε¥ŭŬg Ůß¤Ÿc¤Œg ŒŰ³ gγđæĥŰ¸Œg Ŭ´ ĥ ŬgŰĥ³ Ű¸đg Œε¥ŭŬg ŮůđŮ³ı ³ εŮŒůŰß´ ĥµ¥ůd (p=0,003) əŬəŰ¸đg Œε¥ŭŬg ŮůđŮ³ı ³ εŮ Ŭ£ŭĥŰŰ¸Ůg Ű¸æg ³ĥůŒggg (p<0,0005). ¢ Œε¥ŭŬ ŮůđŮ³ı ³ εŮ ¤ůŰß¤Ų¸đ¸¤´ Ÿđůß¤Ŭ Ůœ¤ŮŮ œıđgg γđæĥŰ¸Œ BMR$_{H-B}$ Ŭ´ ĥ Ű¸đ Œε¥ŭŬ ŮůđŮ³ı ³ εŮ Ŭ£ŭĥŰŰ¸Ůg Ű¸æg ³ĥůŒggg (p=0,001). j ¸µ¸đůß¤Œ´ Œß ³ŰŰg Ű¸đ³ Ů³œůı¥ůd Schofield, Œ BMR$_{SCH}$ ßµ¸Ÿđ¸đŮ´ ŸəŒgγđæĥŰ¸Œg ůŰđ³ Œε¥ŭŬ Ůß¤Ÿc¤Œg Ŭ´ ôĥŰßůŰđ³ Œε¥ŭŬ ŮůđŮ³ı ³ εŮŬ£ŭĥŰŰ¸Ůg Ű¸æg ³ĥůŒggg (p=0,002). ÞŬ¸Œε¤Œ¤rg, ¤ŰŰ³ gγđæĥŰ¸Œg ůŰđ³ Œε¥ŭŬ ŮůđŮ³ı ³ εŮŒůŰß¤Ų¸đ¸¤´ Ÿđůß Ŭ´ ôĥŰßůŰđ³ Œε¥ŭŬ ŮůđŮ³ı ³ εŮ Ŭ£ŭĥŰŰ¸Ůg Ű¸æg ³ĥůŒggg (p=0,023).

ÞəŬ¸œf£đŰß¤Œ¤ε¥ůŒg¤ Œ¤ůŰŮđŮ¸¥g Ŭ´ Œəəđů¤ßg əŬə đ ůŰŮŰůß¤Ÿ ůđ£Ŭ³Ű¤ß¤ĥŰđ[ŰŬ Ű¤r³ ŭ¤łŬŭ¤µ¸ı ³ ůŰŬ cŬ¸ŬəŰđ¸¤łůß¤Ÿ ε ŮŰŬ³ı Ű¤r³ ŰŮůŸ¸¥r³ Œε¥ŭr³ ůg³Œγœ¤Œ³ŰŬəůŰß³ ´ œŬəŬ 2.

	ÞŬ **³= 34**	**Þ¸** **³= 29**	**ÞŬ+ Þ¸** **³= 20**	**Control** **³= 29**	**Ł đ£Ŭ³Ű¤ß¤ əĥŰđ[ŰŬ.**
¢ æ¤œđŬ (¥Ű đ)	59.1 (5.8)[a]	56.1 (6.6)	62.3 (6.3)[b c]	53.1 (6.2)	p<0.0005
¸µ¸γ Œg (m)	154.5 (6.8)	157.3(6.5)	153.5(5.0)	155.7 (4.8)	p=0.127
d¥¸Ÿ¸Œg (kg)	67.5 (10.0)[d]	72.3(12.2)	63.6 (8.7)[e f]	74.7 (9.8)	p=0.001
BMI (kg/m^2)	28.3 (3.9)	29.5 (5.5)	27.9 (3.1)	30.9 (4.4)	p=0.246
PAL	1.7 (0.4)	1.6 (0.6)	1.6 (0.6)	1.6 (0.5)	p=0.694
BMR$_{H-B}$ (kcal/day)	1288.6 (109.8)[g]	1354.9 (111.0)	1236.2 (100.3)[h i]	1385.3 (100.4)	p<0.0005
BMR$_{Sch}$ (kcal/day)	1406 (83.4)	1448.5 (101.1)	1374.3 (72.4)[j]	1465.9 (82.0)	p=0.001
Þ$_1$ï Þ$_5$ (deg)	40.7 (11.5)	38.0 (15.1)	41.8(13.2)	38.6 (11.6)	p=0.686
Þ$_1$ï Ł$_4$ (deg)	54.1 (12.5)	52.3 (12.9)	52.3(12.5)	51.8 (14.2)	p=0.903
Þ$_5$ï Ł$_4$ (deg)	15.2 (7.1)	15.4 (5.4)	13.3 (6.1)	14.3 (4.8)	p=0.605

Ÿœ¤ŬəŰđ 2 Þə Ű¸œf£đŰß¤Œ¤ ε¥ůŒg¤ Œə ůŰŮŰůß¤Ÿ Ŭ´ Œəəđů¤ßg əŬə đ ůŰŮŰůß¤Ÿ ůđ£Ŭ³Ű¤ß¤ĥŰđ[ŰŬ ĥə¤r³ Ű¤r³ ε ŮŰ¸µ¸ůŰr³. Þə Ű£¥γđ ŮəŰĥđ´ Ű¸Ů³đ¥ůŰr³ Ŭ´ Œ ŮŰß¤ı³ Ű³ ε¥ůŒ ĥ¸µŒ, Œə Ű£¥γđ Ů³Ű ĥđ Ügŭ ³ ůŰŮŰůß¤Ÿ Ŭ´ Œəəđů¤ßg. PAL 1=əŬđ³ůŰß¤ĥđ 2=ŭ¸ŬůŰµ¸œg. ÞŬ = Œε¥ŭŬ ŮůđŮ³ı ³ εŮŒůŰß³ ĥ¸µ¤r ůđ. Þ¸ = Œε¥ŭŬ ŮůđŮ³ı ³ εŮŒůŰß¤Ų¸đ¸¤´ Ÿđůß. ÞŬ, Þ¸ = Œε¥ŭŬ ŮůđŮ³ı ³ εŮ Ŭ£ŭĥŰŰ¸Ůg Ű¸æg ³ĥůŒggg. CONTROL=Œε¥ŭŬ Ů¤γœ¤Œg. NS=£d ůŰŮŰůß¤Ÿ ůđ£Ŭ³Ű¤ß¤ĥ.

¢ŬŰ a,b,c,d,e,f,g,h,i,j g´ ŭŰđ¤ı ³Œg³ ůgcəµ¸œůß¤g ε ŮŰŸ³ı Ű¤r³ Œε¥ŭr³ Ŭ³Ÿ ŭi¸Œ

a : p=0,001 vs Control
b : p=0,005 vs OA
c : p<0,0005 vs Control
d : p=0,045 vs Control
e : p=0,023 vs OA
f : p=0,002 vs Control
g : p=0,003 vs Control
h : p=0,001 vs OA
i : p<0,0005 vs Control
j : p=0,023 vs OA

[illegible]

[illegible]

[illegible] BMI [illegible] (r=-0,309, p=0,076) [illegible] (r=-0,431, p=0,058). [illegible]

[illegible] Cobb [illegible] (PAL) [illegible] (p=0,014). [illegible] (p=0,018). [illegible]

[illegible] BMR [illegible], [illegible] BMR[H-B] [illegible] (p=0,008) [illegible] (p=0,008) [illegible] BMR[Sch] [illegible] (p=0,011) [illegible] (p=0,013).

[illegible] 3.

	Bəæəĥ	Control	BU	OA	BU, Bȷ
¢ş£T£					
B$_1$ ï B$_5$	r=-0.010 p=0.915	r= -0.119 p= 0.537	r=-0.068 p=0.701	r= -0.208 p= 0.279	r= 0.251 p= 0.286
B$_1$ ï £$_4$	r=0.062 p=0.513	r= -0.080 p= 0.678	r=0.072 p=0.685	r= -0.023 p= 0.904	r= 0.349 p= 0.132
B$_5$ ï £$_4$	r=0.137 p=0.149	r= 0.096 p= 0.620	r=0.201 p=0.254	**r= 0.325** **p= 0.085**	r= 0.033 p= 0.889
BMI					
B$_1$ ï B$_5$	r=-0.133 p=0.161	r=0.164 p=0.394	r= -0.309 p= 0.076	r= -0.081 p= 0.677	r= -0.320 p= 0.170
B$_1$ ï £$_4$	r=-0.057 p=0.552	r=0.236 p=0.219	r= -0.253 p= 0.148	r= 0.01 p= 0.960	**r= -0.431** **p= 0.058**
B$_5$ ï £$_4$	r=0.062 p=0.514	r=0.128 p=0.507	r= 0.006 p= 0.975	r= 0.152 p= 0.432	r= -0.135 p= 0.570
PAL					
B$_1$ ï B$_5$	**r=-0.231** **p=0.014**	r=-0.141 p=0.467	r= -0.244 p= 0.165	r= -0.249 p= 0.193	r= -0.350 p= 0.130
B$_1$ ï £$_4$	r=-0.179 p=0.60	r=0.021 p=0.913	r= -0.182 p= 0.304	r= -0.295 p= 0.121	r= -0.350 p= 0.131
B$_5$ ï £$_4$	r=0.133 p=0.162	**r=0.435** **p=0.018**	r= 0.110 p= 0.534	r= -0.016 p= 0.935	r= 0.055 p= 0.819
BMR$_{H-B}$					
B$_1$ ï B$_5$	r=-0.142 p=0.134	r=0.09 p=0.642	r= -0.188 p= 0.286	r= 0.087 p= 0.655	**r= ï 0.576** **p= 0.008**
B$_1$ ï £$_4$	r=-0.105 p=0.271	r=0.153 p=0.427	r= -0.258 p= 0.141	r= 0.111 p= 0.567	**r= -0.574** **p= 0.008**
B$_5$ ï £$_4$	r=-0.033 p=0.729	r=0.064 p=0.741	r= -0.192 p= 0.276	r= 0.028 p= 0.886	r= -0.048 p= 0.840
BMR$_{Sch}$					
B$_1$ ï B$_5$	r=-0.161 p=0.09	r=0.080 p=0.682	r= -0.247 p= 0.159	r= 0.005 p= 0.978	**r= -0.557** **p= 0.011**
B$_1$ ï £$_4$	r=-0.092 p=0.334	r=0.161 p=0.404	r= -0.270 p= 0.122	r= 0.086 p= 0.658	**r= ï 0.544** **p= 0.013**
B$_5$ ï £$_4$	r=0.017 p=0.856	r=0.108 p=0.577	r= -0.134 p= 0.449	r= 0.129 p= 0.504	r= -0.058 p= 0.807

Ø¤ŬəŬg 3 Ægůc ŮŰůůůgŰţůgŰţůg əĥµ ŭ¥ ůdg ε ŮŰŬ cŬµ ŬəŰţµ sůŰæ¥ c¤ŬŰs ¢ əæəĥ ŭŬœε ŬəŬd ι g əŬ¤ŰgŰ¥ůůŬµ sg ¢ε¥ŭŬg. BəůŰŬůŰæ¥ ůdε ŬzŰæ¥g ůgůc ŮŰůůgŰţůdε Ůa z¢zŰŬ¤ε Ůy¤Ůz¤d c¤µ ŬŰ¥e. r= Pearson correlation coefficient. Bəg´ ĥə¢é ŮgŰůgzŰ¤ε¢c¤µ ŬŰdŮgŰœŬ¤dŮgε Ů Ůz¤ ´ œŬəŬ 2.

Æi c¤µ sůd Űţgəĥµ ŭ¥ ůdg ε ŮŰŬ¤i Ű¥ z ¢ε¥ŭ¥ z.

qŮs ßµ ¥dqəŬs ůŰŬŰůůŰæ¥ ůdε Ŭz Ű¤æ¥g ŭ¤ŬŰ¢µ ¥g ůŰůg ε ŮŰµ qdŮůůŮg c¥ z dŮg ε ŮŰŬ¤i Ű¥ z ¢ε¥ŭ¥ z. ¢ŬŰ ¢ŰŮæ¥ůε ŮŰŬ úŬs Ůµ ι z¢gz ´ ¥g, əŬŰ¥ ε¥ůœ ĥµ ¢, ¢əŮ¥ůůŮµ sg ¢ε¥ŭŮg Ůœ Ŭs ´ Ŭµ ĥ ¢ε¤Ŭ əĥµ ŭ¥ ůdq əŬə ¢ůűgœůµ ¥ c¥ z dŬ. ¢ŬŰ ¢ŰŮæ¥ůε ŮŰŬ Ű ¢Ű´ ι z¢z ŰŬəůŰz ´ œŬəŬ 2.

[illegible]

[illegible]

[illegible] Cortet [illegible] [49] [illegible] curviscope, [illegible] Cobb. [illegible] curviscope, [illegible] [50], [illegible] curviscope [illegible] 20 [illegible] Sinaki [illegible] [51] [illegible] «[illegible]». [illegible]

[illegible] Lin [illegible] [35] [illegible] 149 [illegible] 45 [illegible] [52]. [illegible] Lebkowski [illegible] [53]. [illegible] Fahrni [illegible] Trueman [illegible] [37]. [illegible] Jackson [illegible] [54]. [illegible] [26, 55, 56].

[illegible] [11].

[illegible]

[illegible]

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ƬǺūȷ ʂȷ ⱧƁ ƱǺȥ Ʊ¢ƁƁ

¢ ůɢɣůɖ Ű̋ɖƒ ɕůűgɯɒɐƒ əɦȷ ŭɤ ůɖƒ ɛŮŰ̋ɖȝ ɕůŰ̋əɐ ´ gəȝɦŰ̋ɖŰ̋Ŭ

[illegible]

[illegible] [1-3]. [illegible] (round back), [illegible] [4]. [illegible] [5].

[illegible] [4, 6- 9], [illegible] [2, 10- 13]. [illegible]

[illegible] [14, 15]. [illegible] DEXA [illegible]

[illegible]

[illegible]

[illegible] 524

[illegible] (QDR [illegible] 2000, Hologic, Waltham, MA). [illegible]

[illegible] [16] (n= 73), [illegible] (n= 68), [illegible] (n= 59), [illegible] Scheuermann [illegible] (n= 39), [illegible] (n= 18), [illegible] (n= 10), [illegible] (n= 11), [illegible] (n= 13). [illegible] 33 [illegible]

[illegible] 524 [illegible] 105 [illegible] 45 [illegible] 76 [illegible] (= 57,3). [illegible] [17- 20] [illegible] [21]. [illegible]

[illegible] Cobb [illegible] [22- 24]. [illegible] 50 [illegible] 75% [illegible] [25- 30] [illegible]

Ƀ¤ŰůdŰ¤3Ůg¹ G¥ɹ ůŰ[d¤Ű¤3 ůÙůi¤ c ε¤ŸůŰg¹ εÙƀŸůd Ű[3 c ůŰ¤æ Ű¤gg´ g¤3hŰ[ŰŰ. ȳ ůc¤ÙŰc Ű¤3 T score < - 2,5 SD ŰŰ¤33c¤ræd[d¤Ű¤3 ůŰ[3 c ε¤ŸůŰ ε Ù c ůŰŰ¤´ hɹ¥ůd, Ů¤ı hůc¤ Ůc Ű¤3 ε Ù ƀŰ¤i ŰŰɹ Ůg¹ Ű¤æ¥g¹ ŰŰ¤33c¤ræd[d¤Ű¤3 ůŰ[3 c ε¤ŸůŰ Ů¤æ¥ Ù c G¤g. Ƒ ŰŰŰ¤ůi Ű¤æ Ű¤Ÿ¤gůd Ù ¤ŰŮ¤æ¥ůŰ[d¤ÙŰhůc ¤9Ű Ű¤ ůi¤3c¤æ Ű¥3 ŰůdŮ¤ı 3 hůc ¤Ù¤ ¤9Ű ¤ŸdÙ c ε¤ŸůŰ 3Ů¤¥ɹ ¤ůŰŸ. ũ¤9Ű Ű[3 ůi¤ c¤ɹ ¤ůd Ű¥3 c ε¤ŸůŸ3 G¹ dů¤æ¤c´ c¤æd[d¤ÙŰ Ű¤ ε c 3ŰŰ¤æ Ű[g¹ Ű¤Ÿ¤gůd¹ ũ¤9Ù¤i ε Ű¤ůd¹ ¤ŰŰŸ ¥3Ű ´ Ű¹ŸÙc 3ŰŰ G¥ɹ ŒŰ ŮŰ¤Ù¤d´ Ű¤æ¥g¹ ε Ű¹ɹ ¤ůŰ¹g (One factor ANOVA model with no repeated measurements), Ů¤ı c¤9Ű Ű¤g¹ ´ c¤æ¤Ű´ æ¥g¹ ůgc¤ɹ ŒůŮ¤g¹ Ű¤Ÿ ε ŮůŰ ůŰ¤g¹ G¹ dů¤æ¤c´ c¤æd[d¤ÙŰ c ůg¤ŰŰ¤æŮŮŰ¤g¹ ůgůc¥Ű¤ůd¹g¹ Ű¥g Pearson ¤ŰŰ¥g Spearman. ȳ ¤ŰŰŰŮŮŰ¤3Ű¤ú é æ¹g¤ŰŰŮ¹ d g3ůd¹g¹ (two-sided) ε ŮŮ á Ůůc ůd ε Ű¤3Ű¤æhŰ[d[ŰŰ¹g¹ p= 0,05. ũ¤9Ű Ű[3 ůŰŰŰ¤ůi Ű¤æ¤Ű¤Ÿ¤gůd G¹ dů¤æ¤c´ c¤æd[d¤ÙŰ¥ ůŰŰŰ¤ůi Ű¤æhŰ´ Ű¤ŸŰ¥ SPSS (Statistical Package for the Social Sciences) for Windows, Rel. 13.0 (SPSS Inc. Chicago, IL).

ɹ ´ c ŰŮ¤Ÿůε ŰŰŰ

¢ ũ¤Ÿ¤3¥ůd Ű[g¹ c ůŰŮ¤´ hɹ¥ůd¹g¹ Ű¥d[d¤ÙůŮ54 ŰůdŮ¤3Ůg¹, Ů¤ı c¤g´ hæc¤ó c¤51 Ű´ c Ű¥Ÿ¤ŮŮŰ¤3 Ű[3 c ε¤ŸůŰ Ů¤Ÿ¤gůc¤G¤g. Ƀ¤Ű¹ ¤ŒεdŰ¤ƀc¤Œ¤ŸůcŒ¤ c ůŰŰdŮ¹ɹ¥g¹ Ű´ c¤æ¤ůŮ¤g¹ ¤ŰŰ¤ŰŰ¥ Ů¤ɹ c g¹ Ű¤æ¤ı 3 Ű[g¹ c ůŰ¤æ¥g¹ ´ g¤3hŰ[ŰŰg¹, Ű¤g T score ¤ŰŰ¤Ű¥3 c¥3¤ 3 Ű[g¹ æhɹ ũ¥ůd¹g¹ Ű´ c Ű¥g´ ı 3c3Ű¤Ů¤ ůŰ¤3 ´ ŒŰ¤Ű 1. ¢ d¤æ¤dŰ ¤ŰŮ¤ c ũŮ¤ŰŰ[d¹g¹ ε¥ƀŮg¹ ůı ε Ű¤Ÿg¹ (body mass index, BMI) ƀŰ¤3 Ůŕ¥ƀ¤ƀ¤Ű, ŮŰŰůŮ ůŮůg3c¤æ¤ƀ¤ ůi¤ c¤ɹ ¤ůd Ůŕ¤ŰŮůg¤c¤ɹ Œ¤3Ű¤Ůg¹ Ű¤ c¤æ¤hŰ ũŮ¤ƀε Ű ¤ŰŮ¤ŰŰ[d¹g¹ c¥ƀŮg¹ Ű¤ c¤æ¤hŰ ´ Œ¤Ű 1. Ƀ¤ c¥3d¹g¹ Ű[d¹g¹ æhɹ ũ¥ůd¹g¹ Ů´ ŒŰ¤d¹g¹ ŰŮ¤3 Ů¤Œ¤3 ůŰŰŰ¤ůi Ű¤æ¥g¹ ůd ε Ű¤´ g¤3hŰ[ŰŰ¹g¹ Ű[d¹g¹ c ůŰ¤ŰŰ¤ůd¹g¹ ¤ŰŰ¤ŰŰ¥ ůd ε Ű¤3Ű¤æhŰ[d[ŰŰ¹g¹ ũ¤9Ű¤ɹ ¥g¹, Ů¤ŰŰ ůŰ¤3 ůg3c¤æ¤ƀ¤ ůi¤ c¤ɹ ¤ůd Ů¤ŰŰŰ¤ůi Ű¤æ¤ı 3 ε Ù c ůŰŰ¤´ hɹ¥ůd¹g¹ ¤ŰŰ¤ŰŰ¥ g¤3 3 Ű¤hε¥3 ɹ¥ůd¹g¹ ε Ù Ű¤ŰŰ¤ůi Ű¥3 Ůůd Ù¤ı 3 ε Ù c ůŰŰ¤´ hɹ¥ůd¹g¹ ¤ŰŰ¤ŰŰ¥ g¤3 3 Ű¤hε¥3. Ƀ¤ ůg¤c¤ɹ ¤ůŰ¹g¹ Ű¤g Ű¥g´ Ű¹ɹ c g ůŸc3 Ű[3 c ŒŰ¤Ű 2. Ƀ¤ ůgůc Ù Ű¤ƀε c¤ε Ù Ű¤ůi Ű¤æ¤ı Ű[d¹g¹ c ůŰ¤æ¥g¹ ´ g¤3hŰ[ŰŰ¹g¹ ¤ŰŰ¤ŰŰ¥ g¤3 3 Ű[d¹g¹ æhɹ ũ¥ůd¹g¹ Ű hůc¤ ¤9Ű Ű¤ ůg3c¤æ¤ƀ¤ ũŮ¤ƀε Ű hůc¤ ¤ŰŰ¤ ¤9Ű ¤ŸdÙ c ε¤ŸůŰ 3Ů¤¥ɹ ¤ůŰŸ ´ Ű¹ɹ c g ůŸc3 Ű[3 c ŒŰ¤Ű 3. 7 Ű¤3¥3Ű¹g¹ ůgůc Ù Ű¤ƀε hɹ¥ ε Ù Ű¤ůi Ű[d¹g¹ c ůŰ¤æ¥g¹ ´ g¤3hŰ[ŰŰ¹g¹ ¤ŰŰ¤ŰŰ¥ g¤3 3 Ű[d¹g¹ æhɹ ũ¥ůd¹g¹ Ű¤ g¤3hŰ[ŰŰ¹g¹ ŰŮ¤3 ¥ŰŰŮůŮ ůŮ ůŰŰŰ¤ůi Ű¤æ¤ı ůd ε Ù c ůŰŰ¤´ hɹ¥ůd¹g¹ ũŮ¤3 ¥ŰŰŮůŮ ůŮ ůŰŰŰ¤ůi Ű¤æhŰ[d[ŰŰ.

	Ɛ J ? Ƀ ş Ƀ		Ƀ z ɹ œ ş Ä ş Ä ü j Ƀ J		Ƀ Ɛ ¢ Æ Ƀ U Ƀ Λ q Ɛ ¢	
	z . Ƀ . [Ɛ j]	Æ J Λ Ƀ Ɛ	z . Ƀ . [Ɛ j]	Æ J Λ Ƀ Ɛ	z . Ƀ . [Ɛ j]	Æ J Λ Ƀ Ɛ
BMD L1	.74 [.14]	.44 -1.07	.86 [.11]	.68 -1.07	.62 [.07]	.44 -.70
BMD L2	.83 [.15]	.49 -1.25	.95 [.12]	.80 -1.25	.68 [.09]	.49 -.85
BMD L3	.89 [.15]	.57 -1.24	.98 [.14]	.81 -1.24	.76 [.10]	.57 -.93
BMD L4	.92 [.16]	.52 -1.31	1.04 [.15]	.86 -1.31	.81 [.08]	.59 -.95
BMD L1-L4	.85 [.14]	.51 -1.17	.96 [.12]	.82 -1.17	.72 [.08]	.51 -.82
T score L1	-1.66 [1.28]	-4.43 -1.29	-.61 [1.03]	-2.26 -1.01	-2.78 [.66]	-4.43 ï (-2.03)
T score L2	-1.81 [1.40]	-4.93 -1.99	-.74 [1.12]	-2.04 -1.99	-3.12 [.81]	-4.93 ï (-1.63)
T score L3	-1.81 [1.34]	-4.64 -1.42	-.91 [1.23]	-2.46 -1.42	-2.97 [.87]	-4.64 ï (-1.36)
T score L4	-1.75 [1.43]	-5.39 -1.75	-.66 [1.38]	-2.37 -1.75	-2.88 [.89]	-5.39 ï (-1.53)

T score L1-L4	-1.77 [1.29]	-4.89 -1.15	-.80 [1.09]	-2.03 -1.15	-2.93 [.71]	-4.89 ï (-2.06)
ũ¥ 3dÜ L1-L5	39.64 [12.77]	3.00 -76.00	37.98 [15.13]	3.00 - 76.00	40.74 [11.49]	4.50 - 58.00
ũ¥ 3dÜ L1-S1	52.72 [12.92]	12.00 - 79.00	52.29 [12.90]	12.00 - 72.50	54.10 [12.51]	25.00 - 79.00
ũ¥ 3dÜ L5-S1	14.68 [5.94]	2.50 -35.00	14.28 [4.81]	2.50 - 22.00	15.24 [7.12]	3.00 - 35.00

Ưœ ÜəÜgf 1 ˙ ˛ sdε dÚəœ œ ε yůœ ę ůŰŰdŮ˛ ygf Ü´ œəəd ůBgf əÜəÙ˛ œgf Úæ ı 3 Ú¥ 3 g´ ĥ ε y Ű˛ důd œ Ù˛ ÜəÚ˛ sůÚəı 3. ȳ ´ ¥ gf əÜəůÚ3 ´ ˛ œd›œ¡ ε Ù3œ ´ œ Üə Ù, œ Úæ ygf Ùə Ű ĥgf´ Ü˛ Ùœdyů Ù¥ 3 Ù3 Ú ˛ œů¥ ´ Ù¡ œg3 Ü˛ sdε dÚəœ¡ gf ε yůœ gg, Ùœ ı œ Úæ ygf Ùə Ű ĥgf´ Ü˛ Ùœdyů Ù¥ gf ůŰŰdŮ˛ ygf Ü´ œəəd ůBgf.

	ÆJ?BşB n = 105	**Bz˙ qg ÁşÁüj ÆJ n = 51**	**BÆ¢ÁBÞBΛqÆ¢ n = 54**	**ÆJ?BşŁT¢ Æ¢z˙ ?¢Ł TBæ¢æ˙ (p value)**
¢ əəd Ü (yŰd)	57,3 [6,94]	56,37 [6,66]	58,63 [7,17]	p = NS
BMI (kg/m^2)	29,03 [4,50]	29,48 [4,26]	28,45 [4,77]	p = NS
B$_1$ ï B$_5$ (°)	39,64 [12,77]	38,55 [11,59]	40,74 [11,49]	p = NS
B$_1$ ï ł$_1$ (°)	52,72 [12,92]	51,81 [14,20]	54,10 [12,51]	p = NS
B$_5$ ï ł$_1$ (°)	14,68 [5,94]	14,28 [4,81]	15,24 [7,12]	p = NS

Ưœ ÜəÜgf 2 BəÚæ ygf ÙəÚĥgf´ Ü˛ Ùœdyů Ù¥ 3 Ù3 Ú ˛ œů¥ ´ Ù¡ œg3 Ü˛ sdε dÚəœ¡ gf ε yůœ gg, Ùœ ı œ Úæ ygf Ùə Ű ĥgf´ Ü˛ Ùœdyů Ù¥ gf ůŰŰdŮ˛ ygf Ü´ œəəd ůBgf. ¢ ů¡ ə˛ ˛ d ůBgf Ù3 Ÿ ü¡ œ) Ü´ d ůdgf ü Ù˛ Ù3 yü Ù˛ Ù ůŰŰůÚ˛ Ù Ÿ ůdε Ù3 Ú˛ ygf, NS = non significant (ε d ůdε Ù3 Ú˛ ĥ).

Æi 3œœ						
		BMD L1	**BMD L2**	**BMD L3**	**BMD L4**	**BMD L1 ï L4**
B1 ï B5	Pearson (r)	-.131	-.082	-.110	-.183	-.134
	p-value	-.170	.388	.250	.053	.160
B1 ï ł1	Pearson (r)	-.108	-.065	-.038	-.128	-.087
	p-value	.258	.497	.694	.178	.359
B5 ï ł1	Pearson (r)	-.041	-.044	.003	-.020	-.024
	p-value	.667	.644	.979	.837	.801
BůŰŮ3´ ĥj ¥ ůd						
B1 ï B5	Pearson (r)	-.005	.042	.032	-.060	.003
	p-value	.977	.814	.858	.737	.984
B1 ï ł1	Pearson (r)	.072	-.045	.133	-.025	.042

	p-value	.685	.802	.453	.887	.813
Ƀ5 ï Ł1	Pearson (r)	.096	-.011	.103	-.046	.037
	p-value	.587	.950	.563	.796	.835
[illegible]						
Ƀ1 ï Ƀ5	Pearson (r)	.050	.103	.158	.044	.101
	p-value	.797	.594	.413	.822	.604
Ƀ1 ï Ł1	Pearson (r)	-.030	.064	.062	.011	.036
	p-value	.878	.740	.749	.953	.854
Ƀ5 ï Ł1	Pearson (r)	-.284	-.202	-.222	-.116	-.207
	p-value	.136	.293	.248	.548	.282

[illegible] 4 [illegible]

[illegible]

[illegible] [31].

[illegible] Cobb, [illegible]

ů´ ɕɜŭɡəəəɒɛɡ ůŰɒəɑɖɡ. ÆɡɜŮ ı ɡ ɑ ůɕɣůɑ ´ ɕg ŭɬůɟŮɡɜɛɑɖɑəŮ ŮɜŰə ɑ ´ ɬɕ ůɡɜŰűɛɡ ɛŮŰɖɜ g´ ɦ ɣəŮɔɕɕ g´ ɦɑŮůɑ. Ō ɜŰɡ´ Ůɟɬɕɟ ɬůɛɦɡ Ůɖɡ ɛŮəɣűɖɡ Ůɜŭə ´ ɤɡ Ůűɛɦɡ ůɕŮɤɬŭůɛɦɡ. qůŰɦůɕ Ůɕ ɜŰ ´ Ůɟ ŰŮɖɟ ɕı ɜŰŰə ŰůɑŮɜŮůɡ gɣɑəɕı əɜŭı ɜɕg ɐ ɛŮ ŮɔəŰŮŮůŮɖɛɣɜɑ ɕůŰɜ´ ɦɟ ɤůɑ ŭɕɤɡ ɜŰ ɔɕɜŰŰə əÝ´ ɕɬŰ ´ Ůɟ ɣɛƀŰůɑ ɑŰ ɐŰŰɜ ɑɖɕəÝ Ůɛűɬůƀɑůɛůɬɕ. ÆɡɜŮ ı ɡŰŰ ɛŮɕɜŮəŰɛŰŰŰ ŮɜɦɡŮ ɬŭɛɦɡ ůɕŮŮɬŭůɛɕı ɣ´ ɟŮ Ů ɜŰ ɔɕɕgɜ Ű´ ɕŭŮəŰÝ ´ ɟɑəŮɬɣɜɕg ɜŰ ŭɬůɜŰɕɑŮůɑ ɛɬŰ ɛŮɒɣŰɖ ´ Ůɟ ŰŰɒɟ ɑůɑɖɡ. ò əəəɕɡ ɣɜŰɡ´ Ůɟɬɕɟ ůɛɛ´ ɬůɟɦɡ ŮɜŰə ´ ɤɡ ɛɦɜɕ ɑ ´ ɟɕůɑɖɬɕ´ ɯůɑɬŰ ůÝɟɤůɑ DEXA ɐŰŰɜ ŭɬŰɑɣůɬɕɑ, ɦŰŰɜ ɣɕŮəəŰŰŰůŮɬɕɑŮ´ ɤɡ ɑ ´ əÝɔɬŰ ůÝɟɤůɑ ŮɜŰə´ ɬŰɜı ɜ Ůɜı ŰŰɟ ɑ ůŰɖɜ ɕůűɡɯɒɛ ɛɕɡŰ [32].

ȳ ´ ɤɡ´ ɟɕŮɜŰűɣɟ ɑɖɑəŮɟ ɑ ůɕɣůɑ Ůɤɜ ů´ ɕɜŭɡəəəı ɜ əɡɟ ŰɤɛÝŰɤɜ ɛŮŰɖɜ ɕůŰəɒɛ ´ ɡəɜɦŰɖŰŰ ɣɕŮəŭɬůɟŮɡɜɑɖŮůŮ´ ɟ ɕɔŮɜɣůŰɟ ŮɡɟɛŮəɣŰŰɡ, ɛŮŮɜŰɬŰŰəÝ ɤůŰɦůɕ Ű´ ɕŰŮəɣůɛŰŰŰ. ÆŮ Ůɟ əŮɣɡ ɛŮəɣŰŰɡ ɛŰŰɟ ɐɑɖəŮ ɛɦɜɕ ɑ əı űɤůɑ əŮə ůɬůɟŮɡɜɑɖŮůŮ´ ɡəɜɦŰɖŰŰ ɣɕŮəŭɬůɟŮɡɜɑɖŮůŮ´ ɡəɜɦŰɖŰŰ [2, 4, 6, 7, 11]. ʐŮ ŮgŰɐ Ű ůɬůŭəŮůɑŮ, ɛɬŮ ´ Ůɟ ÝɛŰŰɟ ɕɡ Ůɜɦɡ Ű ɛɐŰŰɕɡ Ű ɑɖɡ ů´ ɕɜŭɡəəəɒɛɡ ůŰɒəɑɖɡ ŮɜŰŰÝɕŰŰŰəůŮůɕɣůɑ ɛŮɛɬŮəɑ´ Ůɟ ÝɛŰŰɟ ɕ ůŮɣɜŰÝəəɑ Ű ɛŮ Ű ɑɖɡ ů´ ɕɜŭɡəəəɒɛɡ ůŰɒəɑɖɡ ɐ ŮəɦɛŮ əŮəůŮɣɜŮ ŭɬůŰɕɟ ŰɐɛŮ Ű ɑɖɡ ůəůəŮŰɕı. ¢ŮŮ Ůɟɟ ɐɛŮŰŰ ɕ´ ɕɬůŭűɐ´ ɕŰŰ Ű ÝŰɕɬůɡ ɛŮəɣŰɑɖɡ ŭŮɜ Ű ŮɜŰɕı ɜ Ůɕ ɑŰŮɛůɐ ŭŮɡ Ůɟ ı Ű ɑɛŮ, ŭɑɖəŮűɐ, Ůɜ Ůɕ əı ɟ Ű ɛŮ Ů ɑɟ ŮÝɕŰŰəŰ ɦ Ű ɑɖɜ ɕůŰəɒɛ ´ ɡəɜɦŰɖŰŰ Ű ɜ ŭɕɛɜɒı ɜ Ůɕɡ Ű ɛɑɖɛÝŰɤɜ. ÆŮəÝ´ ɕɬůɟŰ ɦ ŮgŰÝɡ Ůɕɟ ɛŮəɣŰɑɖɡ ŰŮ ů´ ɕɜŭɡəəəÝ əɡɟ Ű ɛŰŰɟ ɐɑɖəŮɜ ɛŮ Ű ɑɖɜ ŰŮɕɜɒɛ Cobb, ŮəəÝ ɕɟ ɑůɛɕ´ ɕɐɑɖəŮɜ Ůɟ ɔŮəůŮ ɦ´ ɤɡ ɔɤɜɬɦɛŰɟŮ [2], Ůı´ əŮůŰůɡ ŰŮɜɑůɡ flexicurve [4, 6], əŮɛ´ gəɕůəɦ´ ɬŮ [9,10], ů´ ɕɜŭɡəəəɕɑ´ ŮɜŰɕɔɟ Ýűɕɵ [12] əŮə ÝəəŮ [8]. ɹ ɜ əŮə ŮgŰÝ ŰŰ Ůɟ ɔŮəůŮ ɛ´ ɕɟ Ůı ɜŮ ŮɜŮə Ůɟ əŮŰÝ Ůɜɬɦ´ ɬŰŰŰ, ɑ ŮɜɤŰŰɟ ɦŰɑŰŰ ɑɖɡɛůɑɖŭɕg Cobb ůŮůı ɔəɟ ɬůɑ ɛŰŰɬɡÝəəůɡŮɜŮə Ű´ ɕŰŰůŮɒɛɣɜɑ [23] əŮəɔɬŮgŰɦ ɤɕŮə´ Ůɟ Ůɛ Ůɜŭə ɕɡ gůɦɡ əŮɜɦɜŮɡɛŰŰɑɖɜ ´ Ý ɕŭɕ ŭŮəŰŰŰə ɜ. ÆŰɑɖɜ ɛůɒɣŰɑ Ůɤɜ Sinaki əŮəůgɜ [13], ɕ ů´ ɦɜŭɡəɕɡ ůŰɕɜ ɕ´ ɕɕɕ ɑ əı űɤůɑ ɛŰŰŰ´ ɑ ŰŰə ůŮ əɦɟ ŭɤůɑ ɕɟ ɑŰɑɖəŮ ɤ ɡ «ů´ ɦɜŭɡəɕɡ ɛŰŰÝ´ Ůɤůɑɖɡ» əŮə ŰŰ əɡɟ Ű ɛŰŰŰ ɛŰŰɟ ɐɑɖəŮɜ Ű´ ɦ əŮəɒɤɡ ůəůɜɕ Ůɕ ůɑɛŰŰɕ. ÁűŮɟ ɛɦɕɜɜŰŰɡ ŮgŰɛ Ůɑ ɛɣɑɕŭɕ ŭŮɜ ɕɟ ɑůɛɕ´ ɕɐɑɖəŮɜ ŰŰ ɑŭɵŮ Ůɟ ɕɜÝ əŮə ŰŮəɒÝ ůɑɛŰŰɕ ɔɵŮ Ůɕɜ əŮɑɕɟ ɑŰɑɖɜ Ůɤɜ ů´ ɕɜŭɡəəəÝ əŮŰÝɔɛŰŰŰ [4, 6, 9- 11]. ɹ gŰɕɑ ɕə ŮůɑŮůɡ ɑŰ ´ ɟɣ´ ůə ɜŮ Ű´ ɕəəůɕɜŰŰəŰ ɦ ɕ´ ɕɬŮŭɐ´ ɕŰŮ ɛŮəɣŰɑ ŰÝŰɕɡ ůŭŰɕɡ ɑŰ´ ɟɣ´ ůə ɜŮ ɕŭɑɔɐůɕgɜ ůŮ´ Ůɟ Ű´ əŮɜɑŰɒÝ Ű´ ɕŰŰəůɕ.

ÁÝɜ ŭŮɕ ůgɑıɜŰŰəɑ ɕůŰŰɕ´ ɦɟ ɤůɑ ɔɬŮ Ű ɜ ´ Ůɟ Ůɛɦɟ űɤůɑ Ű ɑɖɡ ůŰÝůɑɖɡ Ű ɕɡ ůı ɛŰŰɕɡ, ůɕŮə´ ɟ ɕűŰɜɣɡ ´ ɤɡ ŰŰ ŰŰŰŰŭ ɑŰ´ ɟɣ´ ůə ɜŮ Ůɜ ŮɕɑŰɑɖ ɑŰ´ ɟ ɕ´ ůəəɕı ɜ ɜŮ Ű´ ɕəəůɕɜŰŰəŰ´ ɦ ɕ´ ɕɬŮŭɐ´ ɕŰŮ ɛŮəɣŰɑ ŰÝŰɕɡ ůŭŰɕɡ ɑŰ´ ɟɣ´ ůə ɜŮ ɕŭɑɔɐůɕgɜ ůŮ´ Ůɟ Ű´ əŮɜɑŰɒÝ Ű´ ɕŰŰəůɕ.

Ɛ̃ÙŰgŰ̃ɒɜ Ű̃dɜ ÙəÙɒɞɦɛÙəd, Ű̃gűəɒe, Ù ɯ̆dɛɯəɞɔɯɒe ɛÙəɣŰ̃d, ŭÙə ŰɜÙůʝɣƒdəÙ ůŰ̃Ű̃ɯŰ̃əY ůdɛŰɜŰ̃ɒe ůɞɣůd ɛÙŰ̃Ű̃ɜi Ű̃dƒ ɞůŰ̃əɒɛƒ ´ gəɜɦŰ̃dŰ̃Ű̃ƒ əŰə Ű̃dƒ ů´ ɞɜŭgəɯɒɛƒ əŰɛ´ gəɦŰ̃dŰ̃Ű̃ƒ, ɦŰ̃Ű̃ɜ əŰəɞɵŭi ɞ ɛÙŰ̃ʝɛƒdəŰɜ ůŰ̃ɯ ɯ̆ɯɯ Ű̃ɛɒɛŰ Ű̃dƒ ů´ ɞɜŭgəɯɒɛƒ ůŰ̃əɯƒ. ɻ gŰ̃ɦ ɯ̆ɯi ÙəÙŰ̃Ű̃Ù ÙɯÙŰ̃ɣůŰ̃dəÙ Ű̃ɯ ŭÙɒɛŰ ɣƒ ůi ɜɞəɯ ÙŰ̃Ù ŭɯ̆ɣɻ ɞɞɜÙŰ̃ƒŰ̃ɯ ůÙŰ̃ůdÙɯÙɒƒɛÙɞůŰ̃ɯ´ ɦʝɣůd əŰəgɔɯɒ ɣŰ̃ɯɛŰ. ¢ ůɞÙŰ̃ɯɦɛÙəd ɛÙŰ̃dɜ dəɯɒŰɛÙɒɣůd ůŰ̃dɜ ɞůŰ̃əɒɛ ɛɣɞŰ əÙəɞɵ´ Ù ʝŰɛɞ ű̃ůi ůÙɯƒŰ̃dƒůŰ̃ɣůdƒŰ̃ɯg ůi ɛŰ̃ɯƒ ůŰ̃ɯggƒ dəɯɒɣɛɣɜɞggƒ ´ ʝɞűŰɜı ƒ Ű´ ɞŰ̃ɒɒi ɜ ´ Ù ʝɣəədəůƒ ŰəəɣŰ ɜůɜɣ Ű̃dŰ̃ƒ ŭɯʝ ɔŰůdƒ. ¢Ű ůƒ ʝɛɛŰ̃Ű̃ ŰgŰɣ ŰɜŰ̃ɯ̆ɒůɜŰ̃əůŰ̃dɜ Ůɯɣ ůd ɞůŰ̃ɜ´ ɦʝɣůd Ű´ ɞŰ̃ɒůɒı Ű̃ɯ Űdɯɯɯɜ Ű̃ɣɜ ´ Ù ʝŰɛɞűı ůŰɣɜ ůŰ̃dɜ ůŰ̃ɣůd Ű̃ɯg ůi ɛŰ̃ɯƒ.

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ЯАūјşјЂВ АЯ¢ЂВ

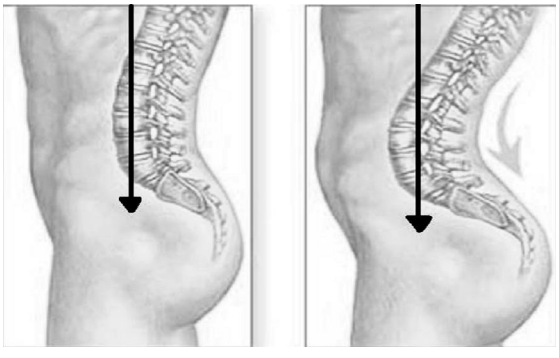
¢ вůűgцpе əђјŧ ŭя ůq ůŰqз вůŰůзŬŧ dŧ dŰəŭŬ

ÁëûŰэгге

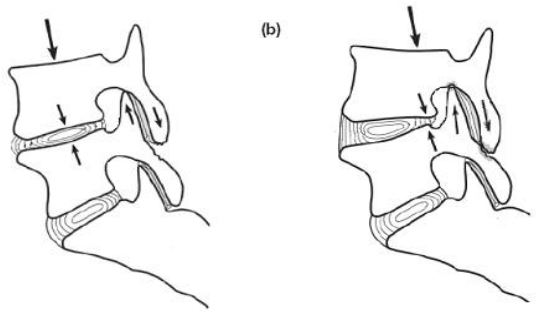
¢ û´ e3ügəeme eûŰŐëŰ¡ dj dőëüŰ Ű´ eŰŐəŐde ëŰ ûgc3e ´ Ydqûd, ´ eg ´ ¡ eûbYəəŐə ûcŰűђ3 Ű8 80% Ű‹r3 ŰŰђε‹r3 dəeədŰg Y3‹r Ű‹r3 50 ŐűÍ 3 [1, 2]. ÖdcŐəəŰŰŰűŐëcdŐd ´ ‹rg d Ű əŰëëc¡ Ű‹ëeY ű¥Ű´ ¥üŰ‹rε‹y3d eûŰŐëŰ¡ dj dőëüŰ ûŐe´ e¥ű‹e´ eŰŰ ûdεŐë Űëeg ûı εŰŰëg ûcŰŰëŰŰŰŐε Ű ügзdε‹y3d d3dŰђŰdŰŰ Ű3ŐëŰ¡ Ű‹ëŰ‹rg dəeədŰg əŰə ´ Ű¡ egûdŰg Yəəe‹r3 Ű ¥ëŰ¡ g3Ű‹ëı 3 ´ Ű¡ Ű>ђ3Ű‹r3 ђ´ ‹rg ûŰəcŰ¡ ı ügggf ü¥Ű>ë‹Ű, əŰ´ 3ű‹εŰëeg, əŰŰŐ‹c¡ dûdqg Ű‹əəeђə, ¥ûŰë¡ ¥e¢i əŰ¡ ü¥Ű>cŰ¥Ű‹ëı 3 ´ Ű‹dëeûŐ‹r3 əŰə g´ y¡ ŰŰûdg [3]. Ч Ű¡ Y Ű‹3 Ûgy¡ ŰűŰ ü¥Ydüeûd Ű‹dg 3ђûeg, ´ e‹əəyg ´ əŰgy¡ yg Ű‹dg ´ Ű‹dcűgû¥ë‹cdŰg Ű‹dg´ Ű¡ Ű‹y3egз ŰûŰűŰûg.

z Û Ű‹3 ε‹yc¡ ə ûvεŰ¡ Ű y¡ Ûgз Ű ‹yc¡ egз Ű3Ű>3‹r¡ ¥ûŰŐı ´ e‹əəeα ´ Ű¡ Y>c3eŰŰg əe¥üi 3eg ´ eg ´ ¡ eüŰűdYűegз Ű‹3 Ű£ű‹Y3¥ûd eûŰŐëŰ¡ dj dőëüŰg. ¡ 3¥ûdε Ű‹r Ű‹ë Ű¥ë Ű ûd Ű ű¡ Ű‹d Ű‹d Ûgdgc¡ Y ε¥ûdg Ű‹dg Yj dj ‹r ûdg ûŰ‹3 ü‹dε¥eg¡ cdŰ Ű‹ű‹gəeűŰ‹ëı 3 Ű‹əəe¥ ûŰ‹r3. ȳ ŰŰ3 d ü¥ű£ђj ű‹r ûd ε¥ű‹g Yj dj ‹r ûdg ü‹Ű3 Ű3Ű>e ű‹gûs¥ëe>cs¥ve, e¥ű‹¡ Ű‹dű‹g ëŰŰ3‹yε‹e3ŰŰ¥ëŰ3¥ű‹ε‹¡ Ű ε¥¡ d Ű‹dg [4]. z Û Ügű‹3 Ű‹ë3 Ű¡ ђ´ e, d ü¥ű£Ű¡ Ű‹ve Ű‹dg Ű£bs¥εdcŰ3¥ëvεg əŰə e Ű‹i εεŰ¡ eg əŰŰŰε¡ ¥ûεђg Ű‹r3 ű‹¡ Ű‹dű‹Ű‹r3 ûgεbYəəeg3 û‹Ű‹3 Ű3Y Ű‹y3d əŰə Ű3y¥e¥d Ű‹dg eûŰŐëŰ¡ dj dőëüŰg [5].

¢ Ű´ ђəəeûd Ű´ ђ Ű‹3 û‹r û‹Ű‹e Ûgdgc¡ Y ε¥ûd əŰə d Ű3¥ûeε¡ eg ű‹ђ¡ Ű‹ûd dŰ ε´ e¡ e¡ ûŰ3 3Ű Û ¥ű‹y¡ eg3 Ű¥ű‹gəeűŰ¥ëyg Ű‹əəeα ûŰëg əŰə ûŰ‹3 əŰŰı Ű‹¡ d û´ e3ügəeme ûŰ‹ed. ¢ eûű‹gцре ε‹g¡ Ű Ű‹dg û´ e3ügəeme‹g ûŰ‹ed dg Ű´ eŰŐëŰ¡ dj dőëüŰ ü‹eђ, d e´ ed Ű g´ eb Yəə Ű‹Ű‹ű¥ûŰ‹ûŰ ûgε´ ¥Ű‹ë¥Y ű‹¡ Ű‹dű´ eg Ű3ŰŰ¥ëe¡ i3Ű‹ëŰ ђ Ű‹ë g´ Ű¡ əŰë3Ű3e ûı εŰ. ¡ 3 Ügű‹e d ü‹eђg ‹e Ű‹3 ÛgdŰd Ű, Ű‹Ű ű‹¡ Ű‹dű dŰ əŰ Ű‹Ű‹ε Ű¡ ¥ђ Ű‹ű‹ë3 Ű¥ű‹ed ûŰђəŰ Ű‹Ű‹ű‹ε‹Ű‹Ű‹r3 û´ e3ügəeme 3 Ű¡ dj ı ûŰ‹r3. Ê Ű‹ε¥Ű əg¡ Ű£ ü‹eђ, y3Ű εŰ>Ű¥ëı Ű¡ e ´ eûŰûŰђ Ű‹eg g´ ûŰűŰ¡ ¥ђε‹Ű¥eg ű‹¡ Ű‹eg εŰŰŰú¥¡ Ű‹Ű¥e ûŰŰ e´ ed‹¥Ű ûŰë¥eŰŰ, ükdəŰüe ûŰë3 e´ ed‹¥ 3ı ükd ŰŰəŰ‹əe¥ əŰəûŰ¥gf Ű´ eűgû¥Ű¥eyg Ű¡ dj ı ûŰgf. ¢ εŰŰYüeûd Ű‹r3 ű‹¡ Ű‹r3 ûŰë3 ükdəe əŰə ûŰ¥gf Ű´ eűgû¥Ű¥eyg Ű¡ dj ı ûŰgf Ű>cŰə ü¥ű£Ű¡ Ű‹ëve c¥Ű ü¥Yűe¡ egg f bŰdεei g əђj ü‹r ûdqg, Ű3 əŰə Ű‹ë εy>Ű‹dcg Ügű‹ 3 Ű‹r3 ű‹¡ Ű‹r3 ´ Ű¡ Ű‹ey3Ű¥ë Ű‹¥ed. Ч¡ Y>εŰ‹ë, Ügű‹e d Ű‹i 3dûd Ű‹r3 ű‹¡ Ű‹dű‹Ű‹r3 y>Ű¥ë ü¥Ű´ ¥ûd‹¥Ű Ű‹dű‹Ű‹r3 ûgεbYəəeg3 ûŰ‹ë3 Ű3Y [6, 7].



Áeђ3Ű 6 ¢e əy3Ű¡ e bY¡ egg Ű‹g g´ Ű¡ əŰ‹ë‹Ű‹eg ûı εŰŰëg εŰŰŰű´ e¥Ű‹ë Ű3Yəe>cŰεŰ¥ë bŰdεђ əђj ü‹r ûdg.



Áeђ3Ű 7 Ëe Ű əəŰ>yg ûŰ‹ë3 əђj ü‹r ûd Ű ¥ű‹y¡ eg3 εŰŰŰű´ ¥ûd Ű‹g əy3Ű¡ eg bY¡ egg Ű‹g g´ Ű¡ əŰ‹ë‹Ű‹eg ûı εŰŰëg. ¡ gű´ ђ εŰ Ű‹ë ûŰë¡ Y Ű‹g Ű ¥ű‹¡ Y ûŰ‹3 əŰŰŰε¡ ¥ûεђ Ű‹r3 ű‹¡ Ű‹dű‹Ű‹r3.

¢e əi¡ e3 c3ı ¡ ¥ûε Ű Ű‹dg eûŰŐëŰ¡ dj dőëüŰg Ű3Ű>e d Ű¡ e´ ed‹¥ûd Ű‹r3 ű‹gû¥ëe>ce3ı 3 Ű3ŰŰëε¥eı 3 c3y¡ ¥ûε Y Ű‹r3 Ű‹dg ´ ¡ eûbŰəəђεŰ3dg Y¡ dj ‹r ûdg.

ɹ gÚÿgƒ ɑəÚɻɑ´ ɑ´ ɑəæůÛæƒ ůĩʏgƒ ŬΎ ɑÚŰəɑi ɜ ɛəŬ´ ɻɑů´ ΎdŮæŬΎ Ů əŭəɦɻdʏ ůdgƒ ɛəŬgƒ ´ ɻɑůbŬəəɦɛŮədgƒ Ύɻdɻʏůdgƒ [8]. ¢ ŬɜÚůŭɻŰůd Úæg ɑɦɜŭɻɑg əŬəÚæg ɑůÚůd əůÚəi ůΎŮ Ŭɜı ɛŬəd űɦɻÚæůd ŮæŬəɜŬ ´ŬɻÿɑŮə´ ɻɑůÚŰůdŬ ɛŮə ɜɑɜÚŰƒ Úd ɜ ŰůÚΎdŮæŬ [8]. ÆÚd ɜ ɑůűgɯpɛ ɛɑqŬ, ɑəɛÚŰƒbɑəÿgƒ ´ɑg ´ŬɻŰÚdɻɑi ɜÚŰəɛÚŰɜi ΎəəʏɜŮæŬəg´Ů ´əŬůÚæÿgƒ Ŭəəɑəɯ ůŮæƒ Ú ʏɜ Ŭ ɑűgůəŬəı ɜ Ŭɻdɻı ůŮʏɜ əŬə ůŰÿɜʏůd Úæg ɛŮůɑů´ ɑɜŭgəɑæg ŭəŬůÚɛŮÚæƒ, əŭəŰÚŰɻŬůÚæ´ ɻɦůdæɯ ÚɛəŬÚæg [9]. ÒɑŮəŮ ůidgƒ əŰŰŰůŮæɑdŮı´ ʏgƒ ɛŮÚd ɜ ΎɻɑŭɑÚdgƒ dəæɯdŰƒ, Úæ ůɑɛɛŬÚʏɜ ů´ ɑɜŭgəɑæı ɜ ůʏɛΎÚʏɜ ɔɑɜŰŰŬə ůűdɜɑŮæÿgƒ [10]. ¢ɑɑ ůgɜɑəæɦ Ŭ´ ɑŰÿəŮɛŬ ŰgŰı ɜ Úʏɜ Ŭəəɑəɯ ůŮʏɜ ŭŮæ ɛ´ ɑɻŮı´ ŰɻΎ ɜŬ´ ɻɑəŬəŮɛŮʏůd Údgƒɑůűgɯpɛgƒ əɦɻ ŭʏůdgƒ. Ԋɻ ΎɔɛŰÚə ŮæŬə ŮæŬəɻ ɦʏɛÿɜɑ əəæɑəΎ ´ʏgƒ d ŮəúiəəůdÚdgƒ ů´ ɑɜŭgəɑæɛgƒůÚəədgƒ ´ɻɑəŬəŮɛŮʏůd ÚægiɣɑggƒůÚdɜ ´ɻɦůdæŬəɑı ɜŬ[11].

ÆgɜɑÚæΎ əɑéɦɜ, d dŮʏɻdŬ ´ɑg ´Ůɻəɻ ΎűŰŰŰə ŮæŬə´ʏgƒ ɑ ɓŬdɛɦgƒ Údgƒɑůűgɯpɛgƒəɦɻ ŭʏůdgƒŮ dɻŮΎɛŮəÚdɜ ŬæΎ Úgɜdɑ ŭŮæŬəÿəəɑdÚdgƒɑůŰŮæŬɻdɻdŰæŭgƒ, əŮæÚæggɻɔı ɜŰŰgƒɦ´ʏgƒd əŬəe ŮgdɑgɔɻΎɛɛæůd ůŮΎəəŮgƒŰɻdɻı ůŮæƒ. ¢ Ůəúiəəůd Ú dgƒ ů´ ɑɜŭgəɑæɛgƒ ůÚəədgƒ Ŭ ɑɻɻÿŮə əɦɔʏ ŬůiɛɛŰɻdgƒ əŰŰŰɜɑɛəgƒ Ú ʏɜ ű ɑɻÚůŮʏɜ. Ɓə ´ɻɑəi´ ÚægůŮgƒ ŬəəɑəɯůŮæƒ ŰŮæɑggɜ ɜŰ ŮæŬəŮɣɑggɜ Úd ɜ əɦɻ ŭʏůd, ŬɜŭůɻÿűɑɜŰŰgƒÿŮəÚd ɓəŬɓŰɻe Ů ůɻŰûdÚdgƒ.

¢ əŬɛ´ gəɦŰdŰŰ Údgƒ ɑůűgɯpɛgƒ ɛɑqŰgƒ Údgƒ ů´ ɑɜŭgəɑæɛgƒ ůÚəədgƒ ŮɛűŬɜɑŮəÿɜŰ Ůgɻi űΎůɛŬ űgůæəɑɔəɯ ɜ Ŭæı ɜ. ʐŮ ɓΎůd Úd ɜ dŮʏɻdŬ ´ɑg ŬɜŰ´ Ű ɑdqəŮ ´ŬɻŰ´ Ύɜʏɾ, ɑ əɑŭgɜɑgƒ ŬɜΎ´ Ugɜdgƒ ɑůŰŮæŬɻdɻdŰæŭgƒ dŰ ŰgɜΎɜŮəɦůɑ ɛŮəŮəɯ ɜŮəd əŬɛ´ gəɦŰdŰŰ. ÆgɜŮ Ύɔ ŰŮəɑéɦɜ ´ʏgƒ ůŰæggƒ ŰůdŮæŮæggƒ ɛŮ ɑůŰŮæŬɻdɻdŰæŭgƒ dŰ ´ɻÿ´ŮəɜŰ´ŬɻŰdŮəɛŬ´ŮɻŬůɦŰŮɻɑ əgɻŮæ Ɓʐ ÆÆ ůŮůɑɔʏůdɛŮŰæggƒgɔəŮgƒ, ůŰæggƒɑ´ ɑɑæggƒdƁʐ ÆÆ dŰ´ɻÿ´ŮəɜŰŮəŮəɛŬ´ŮɻŬůɦŰŮɻɑ ŮgdŮəŮůɛÿɜd. ¢ g´ ɦdŮŰd´ ɑg ŰæŮŰŰəg´ ɦÿəŮɔɑɛ ɛŮŰdɜ´ŬɻɑiůŰɛŮəÿŰdŮəŮæ ´ʏgƒ dŰ´ɻÿ´ŮəɜŰ ŰɜŮgɻdŮæɜŰŮəůdɛŬɜŰæÿgƒ ŭŬŰɑɻÿgƒ ůŰæɜ ɓŬdɛɦ Údgƒɑůűgɯpɛgƒəɦɻ ŭʏůdgƒɛŰŰŰəi gɔəɯ ɜ ŰŰɦɛʏɜ əŬəŰůdŮəı ɜ ɛŮɑŰŰŰæɻdgƒ ŮgdgɔɻΎɛɛæůdgƒ Údgƒɑůűgɯpɛgƒ ɛɑqŰgƒ Údgƒ ů´ ɑɜŭgəɑæɛgƒůÚəədgƒ, ɦ´ʏgƒŰgŰə ŮəúɻΎɛŰŰəŰ ɦÚdɜ əɦɻ ŭʏůd.

ɹ ůdŮæŮgƒ əŬəɛÿdɑŭɑə

¢ ŬɜŬɛɛÚdůd ɔəŬ əŬŰΎəəqəŬ ΎŰæɛŬ´ɻɑgƒŮæÿŰŰůd ÿɔɜŮŰ ɦ ŰŰɛdŰɻı Ŭ ɛəŬgƒ ɛŮəÿŰdgƒ Údgƒ ůgɑɜɦŮdŰŰgƒ ɑůŰŮæ´ɑɻʏÚæı ɜ ů´ ɑɜŭgəɑæı ɜ əŬŰŰbɛΎŰʏɜ ůŮæɜ ´əqdƒgůɛɦ. Ɓə ůgɛɛŰÿɑɑɜŰŰgƒ ůŮ ŭgŰɦ Úæ ´ɻɦɔɻŭɛɛŬ g´ ɑɓΎəəɑɜŰŰə ůŮ ´ɻɑůdæ´ ůdæŮgƒ əŬə´ əΎɔŮgƒ ŭəŬæɑɔɻŰűdgƒ ů´ ɑɜŭgəɑæɛgƒůÚəədgƒ. Á´ æÿɔɑɜŰŰgƒ Úæ ŭŮbɛŬ Ű´ɦ ŭgŰə Úd ɜ ɛΎŰŭŰ ŰŰɦɛʏɜ Ű´ ɑŰůŮɑdqəŮ d Ŭɜ΄ɔəq ɜŬ ŭəŰæɑɓəqdƒŮbəΎ´ ɑɜŭgƒ ŭɑʏgƒ ɜŰ ŮæŬəŮɻdɻdŰæŭgƒ ŭŮæŬɻdɻdŰæŭgƒ ŭəŬŰdgƒ ɑɓŮəæŮdŰgƒ ŮgdgɔɻΎɛɛæůdgƒ Údgƒ ɑůűgɯpɛgƒ ɛɑqŰgƒ Údgƒ ů´ ɑɜŭgəɑæɛgƒůÚəədgƒ, ɦ´ʏgƒŰgŰə Ůəúɻ΄ɛŰŰəŰ ɦÚdɜ əɦɻ ŭʏůd.

ɹ ůdŮæŮgƒ əŬəɛÿdɑŭɑə

¢ ŬɜŬɛɛÚdůd ɔəŬ əŬŰΎəəqəŬ ΎŰæɛŬ´ɻɑgƒŮæÿŰŰůd ÿɔɜŮŰ ɦ ŰŰɛdŰɻı Ŭ ɛəŬgƒ ŮæÿŰŰůd ÿɔɜŮŰ ɦ ŰŰɛdŰɻı Ŭ ɛəŬgƒ ɛŮəÿŰdgƒ Údgƒ ůgɑɜɦŮdŰŰgƒ ɑůŰŮæ´ɑɻʏÚæı ɜ ů´ ɑɜŭgəɑæɛgƒůÚəədgƒ ÁΎ əÿɔɑɜŰŰgƒ Úæ ŭŮbɛŬ Ű´ɦ ŭgŰə Úd ɜ ɛΎŰŭŰ ŰŰɦɛʏɜ Ű´ ɑŰůŮɑdqəŮ d Ŭɜ΄ɔəq ɜŬ ŭəŰæɑɓəqdƒŮbəΎ´ ɑɜŭgƒ ŭɑʏgƒ ɜŰ ŮæŬəŮɻdɻdŰæŭgƒ ŭŮæŬɻdɻdŰæŭgƒ ŭəŬŰdgƒ ɑɓŮəæŮdŰgƒ ŮgdgɔɻΎɛɛæůdgƒ Údgƒ ɑůűgɯpɛgƒ ɛɑqŰgƒ Údgƒ ů´ ɑɜŭgəɑæɛgƒůÚəədgƒ, ɦ´ʏgƒŰgŰə Ůəúɻ΄ɛŰŰəŰ ɦÚdɜ əɦɻ ŭʏůd.

g´ yůŰţ ɛŮŰŰbɵəygƒəɦɔʏ ŮůɗƴɜŮŷŮgʏ ə ŷŰŰţ ɵɔŮɜɵi g´ Ůţ ʏɛbŮůɗg. ɸŮ əţ ŷŰţ ŷŮ Ű´ ɵəəŮŷıɛɵi ʏŰŰɜ 1) Ɇgɔɔ Ůɜ Ůgƒ´ ŮɗʏůŮŷgƒƎ.Ɇ. 2) Ɇəɵəɶůɗ 3) Ɇ´ ɵɜŭgəɦəgůɗ ï Ɇ´ ɵɜŭgəɵəɶůɗůɗůɗ 4) Ɇ´ ɵɜŭgəŷɦ əʏŰŰbɛŮ 5) ŁůŰţ ŷɦ ɵŮŷɵgţ ɔŷʏɵgƒ Ů ʏɛbŮůɗg ůŰɗ3 ů´ ɵɜŭgəŷʏ ůŰţəɗ 6) ūəŮbɛɵɜı ŭɗg Ůţ ɗţ ɵ´ ʏɗŮŷŮ 7) ŁůŰţ ŷɦ Ůɜŭɵəţ ɜɵəɵɔɔŷʏı ɜ ʏ ɛŮŰŰbɵəŷʏı ɜ ɜɵůɗɛʏŰɾɜ.

ȳ əŮg ɵə ŮəŰŷɵɔţ Ůűɗůgƒ ŮɜŮŰʏůŰɗəŮɜ ŭi ɵ űɵţ ʏgƒ Ű´ ɦ ŭi ɵ ɜŮŰʏţ ŷůŰɜi gƒ ´ Ůţ ŮŰɗţ ɗŰŷgƒ, ŮɜŮɜʏţ ŰɗŮŰ, ɔŷŮ Ůɗ3 ´ Ůţ ɵgůɗŮ ɵůŰŷɵŮţ ɗţ ŷŰŷı ɜ Ůəəɵŷ ůŮʏɜ. j ţ ɗůŷɵɵ´ ɵŷɵɗɗəŮɜ ŰŮəţ ŷŰţ Kellgren-Lawrence əŮəůŰŷgƒ´ Ůţ ŷ Ű ůŮŷgƒɦ´ ɵg g´ ɵţ ɵŮɜ ŭi ɵ ɵ´ Ůţ ŷůůɦŰŰţ Ůəţ ŷŰţ ŷŮ, ŮŰŷɗɗ ɗ ŭʏɔɜʏůɗ Ű ɗgƒ ɵůŰŰŷŮţ ɗţ ɗŰŷůŰgƒ [5]. ɸ ůgɛűʏɜɗŮ ɛŮŰŰɔi Ű ʏɜ ´ Ůţ ŮŰɗţ ɗŰı ɜ ɵŰŰɜ 98%. ȷ ɜ ŭŮɜ g´ ɵţ ɵŮ ůgɛűʏɜɗŮ, ɵ ŮůɗŮŷɵgƒ Ű´ ɵəəŮɵɜ3ŰŰɜ Ű´ ɦ Ű ɗ3 ɛŮəŷŰɗ.

ʐ ŮŰʏ Ű´ ɦ Ű ɗ3 ŮŰ Ůţɛɔɔɵɵɵɵ Ű Ű ʏɜ əţ ŷŰɗţ ɔʏɜ Ű´ ɵəəŮŷıɛɵi , Ű´ ɦ Ű ɵggƒ 524 ŮůɗŮɜŮɗgƒ ´ ɵg ŮɜŮŰʏůŰɗəŮɜ, ɛɦəɵgƒ 112 ʏŰŷɛŮ əţ ɗɗəŮɜ əŮŰʏəəɗəŮ ɔŷŮ ŮŷıŮɔʏɔɵ. ɸŮəəɵı gƒ Ű ŭŮɔɛŮůgɜŰ Ůţ ŰɗɵŮŰŮəŰ ɦ 112 ʏŰŷɛŮ ɗəɵəɗŮgƒ 40 -76 ŮŰı ɜ (ɛʏůɵgƒ ɦţ ɵgƒ = 57,3 ʏŰɗ).

ȷ ű ɵi əŮɗɵţ ɗůŰɗəŮ Ű ŰŮəɵɦ ŭŮɔɛŮ, ɵə ´ əʏɔŷŮgƒ ɵůűgɯʏgƒ ŮəŰŷɵɔţ Ůűɗůgƒ ɣ ɗűŷɵ´ ɵŷɵɗɗəŮɜ əŮəɗ ɛʏŰţ ɗůɗ Űɗgƒɵůűgɯʏgƒ əɦţ ŭʏůɗgƒ ŮəŰŰəʏůŰɗəŮɛŮŰɗ3 ŰŮɔɜɜəɵɛ Cobb ɔţ ɗůŷɵɵ´ ɵə ɜŰŰgƒ ŮŰŷɦ əɔɔŷıɛəɦ. ɸ ɔţ ɛůɗ g´ ɵəɔɔŷıŰı ɜ ɔŷŮ Ű ɗ3 ɛʏŰţ ɗůɗ Ű ɗgƒ ɵůűgɯʏgƒ əɦţ ŭʏůɗgƒ ʏɔŮəŰ´ ɵŭŮŰɵɗŮıŮɜɵəɶŰŰɜ ŷıʏɜŷŮ, Ůɜ ɦɔɵəəŮəi ŰŮţ ɗ, Ű´ ɦ Ű ɗ3 ɛʏŰţ ɗůɗ ŭŷŮ ɔŮŷţ ɦgƒ [16- 18]. ʐ ŰŮţ ɛůŮŷgƒ ʏɔŷŮɜ Ű´ ɦ Ű ɗ3 əɔţ gűɛ Ű ŷg B_1 ʏgƒ Ű ɗ bʏůɗ Ű ŷg B_5 əŮɗı gƒ əŮəŰ´ ɦ Ű ɗ3 əɔţ gűɛ Ű ŷg B_1 ʏgƒ Ű ɗ3 əɔţ gűɛ Ű ŷg $Ł_1$. Á´ é ţ ɵůɗʏŰʏgƒ, əŮɗı gƒ Ůţ əŰŰɵɑŰţ Ůg3ɗŰŷgƒ ʏɔɵgɜ ŭŮɜɵŮé´ ʏgƒ Ű ŷ 50 -75% Ű ɗgƒ ůg3ɵəɵəɵɛgƒ əɦţ ŭʏůɗgƒ ɛŮŰŰɔi Ű ʏɜ B_1 ï $Ł_1$ bţ ɑŮəŰŰəůŰŷgƒ ŭi ɵ əŮŰı Ű ŰţŮŰɛɛɛŮŰŰ [19- 24], ɛŰţ ɛɗɗəŮəŮəɗ ɔʏɜ ɜŮɛŮŰŰɔi Ű ɗgƒ bʏůɗgƒ Ű ŷg B_5 ï $Ł_1$.

Ł ţ ɵəŮɜɵʏɜɵg ɜŮ g´ ʏţ ɔŮə ůŰŰŰůŰɜɵ ŭi ɜŮɛɗ Ű ɗgƒ Ű ʏɜɗgƒ Ű ŷg 80% ůŰɜ ɜŮ Ůɜ Ű´ ůŰŰŮ ŭŷŮŰţ ʏ ɛɦəɵgƒ 10 ɛɵɵı ɜ ɛŮŮ ɑ Ůŭɵ ůɗɛŮɜŰɜɦŰɗŰŰgƒ p = 0,05 ´ ţ ɵɦ´ ɵɗʏŰɜ3ŰŰgƒ ´ ʏgƒ ɗ ůŰŰɗŮţ ɛ Ű´ ɦəəůɗ ɗŮ Ůɜ Ůə 15 ɛɵɵţ Ůgƒ, ɗ Ůə Ű ʏɜ ´ ţ ɵŰţ ʏʏɜ ůŰŰŰůŰɜɵ Ůɜ ʏəgůɗ ʏŭŮəŮ´ ʏgƒ ɔţ ŮəʏɔɵɜŰŰə 35 ʏŰŷɛŮ ɔŷŮ əʏɗŮ ɵɛʏŰŮ. Ł Ů é əʏɔɜ Ůţ ɵɑɛɦgƒ ůgɛɛŰŰɔɦɜŰʏɜ Ű ɜɗɑŮŮ Ű ɗ3 ůŰŰŰůŰɜɵ ŭi ɜŮɛɗ Ű ɗgƒ ɛŮəʏŰŮ. ɸ ůŰŰŰůŰɜɵ Ůɜ ʏəgůɗ Ű ʏɜ Ű´ ɵŰŮəŮɛʏŰʏɜ Ů ɵŰŮəʏůŰɗəŮɛŮŰɜ ɛɵɜŰʏəɵɜ Ű ɗgƒ Ůɜ ʏəgůɗgƒ ŭŷŮəi ɛŮɜůɗgƒ əŰŰʏ ʏɜŮ ´ Ůţ ʏɔɵɜŰŰ ɔʏɜţ ɑgƒ Ů Ůɜ Ůəɗ´ Ůəʏgƒ ɛŰţ ɛůŮŷgƒ (One factor ANOVA model with no repeated measurements), Ű əŰŰţ ʏɔʏɜɵ Ű ŰůŰ, Ű Student's t-test Ůəı ɔŷŮ Ű ɗgƒ ´ ɵəəŰ əʏgƒ ůgɔəţ ɑŮŮəgƒ Ůɜʏɛ ŮŮ ůŰɗgƒ ɔţ ɛʏŰŰ ɔŷʏgƒ ůŰɗɛʏgƒ Ůɜʏ 2 (pairwise multiple comparisons) ɔţ ɗůŷɵɵ´ ɵəi ɛŮŰɗ test Ű ŷg ʐ ann-Whitney.

ȷ ´ ɵŰŮəʏůɛŮŰŰ

Ł ůűgɯʏ ɵůŰŰəŮţ ɗţ ɗŰŭŮ ŭŷŮɔɜı ůŰɗəŮůŮ 49 ŮůɗŮəŮɗgƒ, Ůəı 63 ŮůɗŮəŮɗgƒ ŭŮəŮɗŮɜ ůŰɵəŮŮ ŰŮɗgƒ ɜɦůɵg əŮə ɔţ ɗůŷɵɵ´ ɵəɵɗɗəŮɜ ʏgƒ ɛɛʏŰŮŰ Ůəʏɔɵɵg. ɑɗŮɜ Ůɜŭţ ʏɗɗəŮɜ ůŰŰŰůŰɜɵʏ ůɗɛŮɜŰɜʏgƒ ŭŷŮəi ɛŮɜůɗgƒ ůŰɗţ ɗəɵŮɗ əŮəůŰɗəŮɜ ʏɜ ɛŮŰŰɵɗŮ ůŰʏ əŰůɗ, ɦ´ ʏgƒ ŮgŰţ Ůəű ţ ʏɛŰŰəŮ Ű ɦ Ű ŭŮəɵŰɗ ɛʏɛŮgƒ ůı ɛŮŰɵgƒ (dʐ Ł), ŮŰŰů ůŮɜ ůgɜɵəɵəɵɛ ůi ɔəţ ɵůɗ ŰŮţ ɵůŰɗ ůgɔəţ ɑɵɜŰŰgƒ Ű ɗgƒ ɛɛʏŰůgƒ əŮəŰɜ ůi ɜɵəɵ Ůɜʏ ŭi ɵ. ʐŮŰŰŮŰəɵɜi ŮŰŰə ʏgƒ Ůə Ű ɜi Ű ɜgƒ ɗ ɵɛɵɵɔɜʏɜŮŮ Ű ɜgƒ ŭŮəɵɛŮŰɜgƒ. Ł ɛɵɔʏgƒ ŭŮɜ ɦţ ʏɗɗəŮɜ ůŰŰŰůŰɜɵʏ ůɗɛŮɜŰɜʏgƒ ŭŷŮəi ɛŮɜůɗgƒ ůŰɗgƒ ɔʏɜɗůgƒ Ű ɗgƒ əɦţ ŭʏůɗgƒ Ůɜʏɛ ŮŮ ůŰɗ

[illegible] (2). [illegible] 39,6°, [illegible] 52,7°, [illegible] 14,7°. [illegible] 1. [illegible]

[illegible]

[illegible]

[illegible] Lin [illegible] [25] [illegible] 149 [illegible] 45 [illegible] [26, 27]. [illegible] Lebkowski [illegible] [28] [illegible] Jackson [illegible] [29] [illegible] Fahrni [illegible] Trueman [30] [illegible] [31- 33].

[illegible]

[illegible]

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ÉJ?¢B¿ ¢ UÄÅÀñÅj ū ¢ ¢É¢qHqpj T¢B ÅÀT¢É qHj ¢ÅÀdb¢É

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BÉ¢ÄBj ÅŪÅBUj ŪÄŁj »

J´ɛɣɐűɜɛƒqɒŭŸəŰɛjŰƒ:ɀ ɜɢŸəɖƒUŰ ŰŭŸəɖƒ

ő ŭɖɠ´ŸjɢɛɢgůŰɔɜı ůɖ

¢ əŰɛ´gəɦŰłŰŰ Ű łƒ əŰŰí ŰŰjɖƒ ɛɛɢŰƒ Ű łƒ ů´ɛɜŭgəɜəɐƒ ůŰɐəɖƒ, ɛ əɒŭgɜɛƒ ŮɛűŸɜ§ůɖƒ ɛůŰŰɛ´ɦjɣɤůɖƒ əŰə ɛ əɒŭgɜɛƒ ŮɛűŸɜ§ůɖƒ ɛůŰŰɛŰjɖjɛ´ŸɖŮ§Ű Ůɖj§ŮŸɛɛɜŰŰə Ű ɦ ´ɛəəɛi ƒ əɛɜɛi ƒ ´ŰjŸɔɛɜŰŰƒ. TŰŭıƒ ɖ ű§ůɜəəɔəɜɐ əɦjɣŭɤůɖ ´ŰjɛgůɜŸɛŮɜɛŮəŸəɖ ŭəŰəi ɛŰɜůɖ Ůɛı ɜ, ŮəŰə´ɜɖŰɜɦ ůŰŰŸŰɛɛŰɛŮɛůŰŰɛ´ɦjɣɤůɖ ɜŰ ŰɜŰůŰɛɛɛŮəɤɜŰŭəŰűɛjŮŰəɦ ű§Ÿůɛ ŰŰ ôɦŰ§ůŰŰŸŰɛɛŰɛŮɛůŰŰɛŰjɖjɛ´ŸɖŮ§Ű.

É əɛ´ɦƒ

Ujɤ ŰŰjɛɜəɦ ůŰɦɛɢ Ű łƒ ´ŰjɛgůɜŰɛɦjɛŮɜɖƒ ŭəŰŰjɜƒəɐƒ Ű ɛŰŰəŮı ɖ ŭəŮjŮi ɜɖůɖ Ű łƒ ůɛɣůɖƒ Ű łƒ ɛůűgɢɒɐƒ əɦjɣŭɤůɖƒ ɛŮ Ű łɛgƒ ´ŰjŸɔɛɜŰŰƒ əəɛŭi ɜɛg ŰɜŸ Ű§ɜɖƒ ɛůŰŰɛ´ɦjɣɤůɖƒ əŰə ɛůŰŰɛŰjɖjɛ´ŸɖŮ§Ű. Á əŰɦƒ Ű§Ű łɛi, Ů ɛɢŮ§ŰůŰŰə ɜŰ ŭəŰůŰŰıɖɜůŰŰı ´Ůj ŰəŰŰ§jɤ ɖ ůɛɣůɖ ɛŰŰŰəi Ű łƒ əŰɛ´gəɦŰłŰŰ§Ű łƒ ɛůűgɢɒŮj Ÿƒ ɛɛɢŰ§Ű łƒ É.É. ɛŮŰł ɜ ´Ůj ɛgůɖŰŰłƒ ɛəŰ§ƒɐ Ű łƒ Ÿəəɖƒ ɜɦůɛg.

J əəɦəŰəɛɣɖɛŭɛ§ƒ

Þ ůɢŰŭəŰůɛɦ§ƒ Ű łƒ ɛŮəɣŰłƒ ŮəŰə Ů əŭɖɛəəəɔəɦ§ƒ, Ű§ɢŰəɛ´ɛəɖɛɣɜɛƒ əŰə ɛɖ ´Ůj ŮɛɒŰŰəɦ§ƒ (ɛŮəɣŰł ´Ůj ŰŰɛjɖůɖ§). ¢ ŭəŰəɛɔɐ ɣɔəɜŮ Ű ɦ ɛəŮ ɛɛŸŭŮ 524 ŭəŰŭɛɢəı ɜ ŰůɖŮəı ɜ ´ɛg ŮəŰŰŸůŰł əŰə ůŰŰ Ůəɣ ŰŰjəəŸ əŰŰjŮəŮ Ű łƒ Þjɖɛ´Űəŭəɐƒ Təəəəɐƒ Ű§g UŰəŮ əůŰł ɛəŰə´gəɦŰłŰŰ§Ű łƒ ɛůűgɢɒɐƒ ɛɛɢŰ§Ű łƒ ůŮjŮ łƒ ɖɣjŰəəɐƒ əŰə ɛůűgɢɒɐƒ ɛɛɢŰ§Ű łƒ ůŮjɖ§Ű dɣůɖ. J ´ɦ Ű§Ű§ƒ, g´ɛəɔɔůŰł əŰə ɖ ɔɣɜɖŰ Cobb Ű łƒ ɛůűgɢɒɐƒ əɦjɣŭɤůɖƒ ɛŰŰŰəi Ű§ɣɜ Þ$_1$ï Þ$_5$, Þ$_1$ï Ł$_4$ əŰɖı ƒ əŰə ɖ ɔɣɜɖŰ Þ$_5$ï Ł$_4$. ȳ əŰƒ ɛəŰə§ɛɔjŰŰɖƒ Ůə§ŰŸůŰł əŰə Ű ɦ ŭi ɛ ´Ůj ŰŰł jɖŰ§ƒ, Ű§Ůə§ŸjŰł ŰŰə Ű ɦ ŭi ɛ ű§ɛjɣ§ƒ.

J ´ɛŰŰəɣůɛŰŰŰ

É g ɜɛ´Ű§əŸ, ŰŰ Ű ɛŰŰəɣůɛŰŰŰ Ű łƒ ɛŮəɣŰł ƒ ɒjɛůəəɜŰŰə ůŮ ůgɛűɣɜɖŰ ɛŮ ŰŰ ɐŭɖ §ıɢı ɛɜŰŰŭŰůıɛɛɣəŰɦůɛɜ Ű ıɛjŸŰł ɜ ůɢɣůɖ ɛŰŰŰəi Ű§ɣɜ ´Ůj Ű§ə ɦ§ɜŰ§ɣɜ əəɜŭi ɜɛg əŰə Ű łƒ ´Ůj ɛgůɖŰƒ Ű łƒ ɛůűgɢɒɐƒ ɛɛɢŰ§Ű łƒ ůŮjɖ§Ű dɣůɖ. q ůŰɦůɛ, ɖ əɦjɣŭɤůɖ əŰə ɖ ɛůűgɢɒŮjŸ ɔɣɜɖŰ ŭŰə ŭəɣűŮjŰə ůɖɛŰə§Ű§əŸ ɛŰŰŰəi Ű§ɖŰə ɜ ɛŮ ɛůűgɢɒŮjŸ ɔɣɜɖŰ ŭŰə ŭəɣűŮjŰə ůɖɛŰə§Ű§əŸ ɛŰŰŰəi Ű§ɖŰə ɜ ɛŮ ɛůŰŰɛ´ɦjɣɤůɖ, Ű§ɖŰə ɜ ɛŮŰɛűɦŰjŮƒ Ű§ƒ ɜɦůɛggƒəŰəgɔɣ ɜ ŰŰɦɛɣɜ.

É gɛ´Ůj ŸůɛŰŰŰ

Áəűfgűx3 g´ɛdyůůx3, ůəyɔɑdqəű3 əű3ůgůɑůűůɛɛɑ´ɛg ɐűű3 ɐŭqɔ3xůűɛq ɛ9ɛ´ɛœɛ9 ɓɟ¥dqəű3 3Ű ɓɟɑůəɛ3ű¯3ůůůgɛűx3dŰɛůűű¯ɐŭqg´Ÿɟɑɛ3ű¯ŭůůɛɛ¥33Ű. Ígɛ3ůıgű3 əű3ɛ9důx¡ɐůůɡ´ɛg ɛŭɐɔqůű3 ůűł3 ŭ9ŰŰ´xůqűűgű¯ɛ3ű¯ɐŭqg´fɟ ¥əůɔɑɛ g´fdůůqgű¯ůəűű3 ůxůűŷgű, ŰŰ Ű ɛűű¯əyůɛŰűű ŭůű3 g´ɛůűł¡œɛg3 Ű3 ɛ¡dfjűł¡ű¯ Ű3g. Ŧ¡ɛűŭ3ıgű qůűɑű¡Ŭůqűx3 əɛ93ı3´Ű¡Ŭɔfj3Ű¯x3 ůűł3 Ű3Ÿ´Ű93qűű3gɛdŰgɐűű3gŸəəqgɜfjůɛg ůəűű3 ŭ9ŰŰɛ¡ůűə9ɐ Ű fj fjŰ3ůűŰɛ3 əŰdɛ¡9ůɛfj Ű¯ɛg ɓŰdɛɛi Ű3gə¡ű¯xůqg. z 9Ű¥əəqŰ3ŰűŰɔ9Ű Ű3ł3 ¥əə¥ůŷxqůgůɑɣŰűůqgűůəűű3´x gɛ9¥əə¥9ɛq ɛqəəɛɑ´Ű¡¥ɔɛ3ŰűŰ´ɛg ůɛ´ə¥əɛ3ŰűŰ3 ůŷŰůəɛi3 9ůɑgɟɐ Ůɑű¡Ŭůqůx3´Ŭdɛɔ¥3ůŷŰ Ű3gɛdŰgɐ Ű3g Ÿəəqgɜfjůɑ9 ůŷŰůəɛi3 Ŭɛůə¥qŰ¥Ű ɐ əŰ3 əŰdfjə¥g Ůɑű¡Ŭůqůx3 ŭ9Ŭɛfj¡ű¥xůqŰ3gůɛ´ɛ3ŭgə¥9ɐgůűɐəqg.

Summary of background data

The curvature of the lumbar spine and the risk of developing either osteoporosis or osteoarthritis are inþuenced by many common factors. Since normal lordosis displays a wide spectrum of values, it is possible that patients with osteoarthritis have a different range than those with osteoporosis.

Purpose

The primary aim of this dissertation is to investigate the relationship between lumbar lordosis and the risk factors for developing osteoporosis and osteoarthritis. Besides that, an attempt is undertaken to clarify the correlation between lumbar spine curvature with the presence of either disease.

Material and methods

The design of the study was cross - sectional, randomized and observational. Subjects were selected from a group of 524 consecutive patients that were examined over a period of 6 months in the Outpatients Department of the Orthopaedics Clinic, University Hospital of Heraklion, Crete. All patients underwent DEXA scanning with the same equipment. Additionally, they were all referred for anteroposterior and lateral radiographic examination of the thoracic and lumbar spine in the standing position. From these, Cobbôs lumbar lordosis angle was calculated between L_1- L_5, L_1- S_1 and L_5-S_1. All lumbar radiographs were examined on two separate occasions, independently by two observers.

Results

The ýndings of this study are in agreement with previously established correlations between risk factors and the presence of osteoporosis or osteoarthritis. However, no signiýcant differences were found in the degree of lumbar lordosis and the lumbosacral angle between patients with osteoporosis, patients with lumbar spine osteoarthritis, patients with both diseases and healthy individuals.

Conclusions

Besides the hypotheses, correlations were examined that were already known, and were found to be in agreement with already established facts. Consequently, although the presumptions that generated the tested hypothesis are valid, the results do not support it. Evidently, the magnitude of effect of these risk factors on disease occurrence is different than that on spinal conýguration. Another reason for which the hypotheses was invalidated could be that the other, not common factors that are involved have a signiýcant inþuence on disease development and a negligible or no inþuence on lordosis.