

The effect of dietary standardisation on exercise performance and physiological responses in male athletes

Alaaddine El-Chab (2016)

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PhD, Oxford Brookes University

The effect of dietary standardisation on exercise performance and physiological responses in male athletes

Alaaddine El-Chab

Qzhqtf "Dtqqngu" Wpkxgtuk{ "

C"y guku'ku'uwdo kwgf "kp"r ctvkn'hwtko gpv'qh'y g'tgs wktgo gpw'qh'y g'cy ctf "qh"
F qevqt "qh'Rj kquqr j { "

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'Lcpwct { "4238

Contributions / Authors work

Vj ku'y guku'ku'tguwn/qh'y g'cwj qt *Cmc f f kpg'Gn/Ej cd+au'y qtnlkp"vto u"qh'f guki p."f cvc"
eqmgev kq."f cvc"cpn(ugu."kpvgr tgvckqp"qh'y g'kpf kpi u."cpf "y tkkpi "qh'y g'o cpwetr 0"

Acknowledgement

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Ky qwf "htuv" cpf "hqtgo quv" rknq "vq" vj cpni' o {" uwr gtxkuqtu" J grgp" Nki j vqy rgt." Ej ctrkg" Uko r uqp." cpf "Cppg" F grgz vcv' hqt" vj gk" uwr r qtv' cpf "gpeqwtci go gpwu" f wtkpi " o {" Rj F O' K vj qtqwi j n{ "gplq{ gf "rgctplki "htqo " {qw0'

Ky qwf "rknq" vq" vj cpni' Ej ctrkg" hqt" dgkpi "c" hcpvcuak" o gpvqt." gur gekcm{ "hqt" vj g" j qwtu" qh" kpvgtgukpi "f gdcvgu' cpf "f kuwukqu0' KJ qr g" vj cv' vj gug' y km' eqpvkpwg' vj tqwi j qw' o {" ectggt0'

Vj cpni' {qw' J grgp" hqt" {qwt" eqpvkpwqu' uwr r qtv' cpf "i wkf cpeg" kp" vj g' pwtkkqp" cur gev' qh' o {" Rj F O' Cnuq' vj cpni' {qw' hqt" uwr r qtv' kpi " o {" kf' gcu' cpf "cevkkkgu" cv' vj g' HHE0'

Ky qwf "vq" vj cpni' Cppg" F grgz vcv' cpf "O ktko " Ergi i " hqt" {qwt" xcnwcdng" eqpvtkdwwkp" vq" o {" uwf lgu0'

C" ur gekni' vj cpni' " vq" o {" hco kn{." gur gekcm{ " o {" o qo " cpf " f cf." hqt" vj gk" nqxg." gpeqwtci go gpwu." cpf "hkpceken' uwr r qtv0"

Hkpcn{ . "Ky qwf "rknq" vq" vj cpni' cm' o {" r ctvlekr cpwu" hqt" vj gk" vko g" cpf "ghqtv' kp" eqo r ngvki " vj qug' hqpi " cpf "gzj cwukxg" gz gtekug' r tqvqeqnu0'

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Publications and conference abstracts

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Gn/Ej cd."C."Uko r uqp"E."Nki j vqy rgt "J 0'42380'Vj g"tgr tqf weklrk{\ "qh" c" f lgv" wulpi "vj tgg" f khhgtgpv" f lgvct { " ucpf ctf luvkqp" vgej pls wgu" kp" cyj rgygu0' *European Journal of Clinical Nutrition* "kp" r tguu+0'

"

Gn/Ej cd."C0"Uko r uqp."E0"F grgz vcv"C0"Nki j vqy rgt."J 0'42370'F qgu" c"37' "f khhgtgpeg"kp" ectdqj { f tcvg" kpvcng" chgeve { enki " r gthqto cpeg" cpf " r j { ukqmi kcn' t gur qpug" kp" vckpgf " cyj rgyguA']Cdutcev_0'Dqqm'qh' Cdutcevu"qh' vj g"42vj "Cpwwcn'Eqpi tguu"qh' vj g" Gwtqr gcp" Eqmgi g"qh'Ur qt v'Uekgpeg0'

"

Gn/Ej cd."C0"Uko r uqp."E0"Nki j vqy rgt."J 0'42360'Vj g"xctkcdkx{\ "qh"gpgti { "cpf "pwtkpv" kpvcngu" wulpi "vj tgg" f khhgtgpv" f lgvct { " ucpf ctf luvkqp" vgej pls wgu" kp" cyj rgygu"]Cdutcev_0' Dqqm'qh' Cdutcevu"qh' vj g"3; vj "Cpwwcn'Eqpi tguu"qh' vj g" Gwtqr gcp'Eqmgi g"qh'Ur qt v'Uekgpeg0'

Abstract

"

Ur qtv' uekpvkuu" j cxg" dggp" wukpi " f khtgtpv' vej pls wgu" vq" eqpvtqn' f lgvct { " kpveng" kp" cp" cwgo r v'vq" o kpklo kug" vj g" ko r cev' qh' ugxgtcn' f lgvct { " eqo r qpwpv" qp" vj g" qweqo gu" qh' vj g" uwf { 0'Vj ku" ku" cej kxgf " d { " gko kpvkpi " uqo g" eqo r qpwpv" eqo r rvgv { " hqo " vj g" f lgv" *uwej " cu" echhkgpg" cpf " creqj qn" hqt" hgy " f c { u" qt" eqpvtqmki " vj g" kpveng" d { " tgr ncevki " y j cv" y cu" eqpuwo gf " dghqtg" vj g" hktuv' vlcni" r tkqt" vq" gxgt { " uwdugs wgpv' vlcni' Tgugctej gtu" j gr " r ctvkr cpw" tgr ncev" vj gk" f lgv" d { " wukpi " f lgvct { " ucpf ctf kucvqp" vqnu" uvej " cu" f lgvct { " tgecm' cpf " hqf " tgeqtf " qt" d { " r tqxkf kpi " r tg/ r cenci gf " o gnu" *ucpf ctf kugf " f lgv" 0'Vj g" clo u" qh' vj ku" Rj F " y gtg" 3+ " vq" cuuguu" vj g" tgr tqf weklkv { " qh" c" f lgv" wukpi " f khtgtpv' ucpf ctf kucvqp" vej pls wgu. " 4+ " gzcokpg" y j cv" ghgev' f qgu" 46/ j qwtu" ectdqj { f tcvg" o cplr wcvqp" y kj kp" c" 37' " xctkcvqp" j cxg" qp" gpf wtcepeg" ecr cekv { " cpf " r j { ulqmi kcn' t gur qpugu. " 5+ " cuuguu" vj g" pgy " r tqr qugf " o gj qf " vq" ucpf ctf kugf " f lgvct { " kpveng. " cpf " 6+ " o gcuwg" vj g" ghkece { " qh" gpeqwtci kpi " kpf kxf wcu" vq" uvc { " y gm/ j { f tcvg" qp" pgzv' f c { " j { f tcvqp" ucvwu' 0'Vj ku" Rj F " eqpenw gf " vj cv" ucpf ctf kugf " f lgv" ku" vj g" dguv" cr r tqcej " vq" eqpvtqn' f lgvct { " kpveng' 0'F lgvct { " tgecm' cpf " hqf " tgeqtf " vej pls wgu" uj qwf " qpn { " dg" wugf " y j gp" rti g" ghgev' ku" gzr gev' gf " cpf " vj g" f lgv" j cu" ny " ko r cev' qp" vj g" kpvtxgpvqp' 0'Vj g" rds wkf " dcugf " ucpf ctf kugf " f lgv" vj cv" y g" r tqr qugf " y cu" hqwpf " vq" dg" cp" ghgev' xg" vej pls wgu" y kj " uko kct " tgr tqf weklkv { " vq" uqrf " dcugf " ucpf ctf kugf " f lgv" *4/5' " cpf " 7' " xctkcvqp. " tgr gev' xgn { . " kp" gpgti { " cpf " o cetqpwtkgpv' kpvngu' 0' Hwt vj gto qtg. " k' y cu" uwi i guvf " vj cv" c" 37' " f khtgtpv' g" 46/ j qwtu" ectdqj { f tcvg" kpveng" f kf " pqv' uki pklcevni { " chgev' gpf wtcepeg" ecr cekv { . " pwtkpv' qz kf cvkqp" cpf " drqf " i nvequg lreewg" r xgn' kp" vclpgf " e { erkuu' 0' Hpcm { . " k' y cu" eqphko gf " vj cv" gpeqwtci kpi " r ctvkr cpw" vq" f tkpm' y cvt " kp" vj g" r tg/ vlcni' r tgr ctcvqp" r gkqf " ku" pqv' gpqwi j " vq" cej kxgf " gwj { f tcvqp" dghqtg" gztetekug" vguu' 0' Vj ku" Rj F " cf f u" gugpvcni' kphqto cvkqp" vq" vj g" ctgc" qh" f lgvct { " ucpf ctf kucvqp" cpf " j gr u' ko r tqxg" vj g" s wcrkv { " qh' hwwt g" t gugctej " r tqj gewu' "

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List of Abbreviations

| | | | |
|-------------------------|---|---|--|
| DO " | " | " | dqf { "o cuu" |
| DO K " | " | " | dqf { "o cuu"kp f gz " |
| ET " | " | " | tgr gcvdkrkv { "eqghlekgpv" |
| EQ ₄ " | " | " | ectdqp "f kqzk f g" |
| EX " | " | " | eqghlekgpv"qh"xctk vqp" |
| F _{tgecm'} " | " | " | f kgvt { "tgecm' |
| GKDO T " | " | " | gpgti { "kpcng" f kxkf gf "d { "dcuen'o gcvdqre"tcvg" |
| H _{geqtf} " | " | " | Hqpf "tgeqtf " |
| I K " | " | " | i n { ecgo ke"kp f gz " |
| J ki j gtEctd'" " | " | " | c" f kgv'eqpvkplpi '70' i 0ni "DO ^{/3} "qh'ectdqj { f tcvg" |
| KUP GO " | " | " | kpvtpvkqpcn'lqwtpcn'qh'ur qt v'pwtkkqp"cpf "gz gtekug"o gcvdqruo " |
| KUQ " | " | " | kpvtpvkqpcn'qti cplucvqp"ht "ucpf ctf kucvqp" |
| LKUP "" " | " | " | kpvtpvkqpcn'uqelgv { "qh'ur qt v'pwtkkqp" |
| NK kgv' " | " | " | rks wkf "r tg/r cenēi gf "f kgv" |
| Nqy gtEctd'" " | " | " | c" f kgv'eqpvkplpi '60' i 0ni "DO ^{/3} "qh'ectdqj { f tcvg" |
| Q ₄ " | " | " | qz { i gp" |
| RCN " | " | " | r j { ukecn'cevxxkv { "hgxgn" |
| Rev' " | " | " | Rgtegpvkqg" |
| UF " | " | " | ucpf ctf "f gxkcvqp" |
| U _{fkgv'} " | " | " | Ucpcf ctf kugf "f kgv' " |
| UQf kgv'" " | " | " | uqrf "r tg/r cenēi gf "f kgv" |
| WQuo "" " | " | " | wtkpg"quo qmrv { " |
| XQ ₄ " | " | " | qz { i gp"wr veng" |
| XQ ₄₀ cz'" " | " | " | o czko wo "qz { i gp"wr veng" |
| Xqkf 3'" " | " | " | htuv'o qtplpi "wtkpg"xqkf " |

Xqkf 4" " ugeqpf "wtkpg"xqkf "

Y " " " y cwu. "

Y r gcm" " j ki j guv'y cwci g"qdvkpgf "f wtkpi "vj g"XQ4o cz "gvu'

"

" "

List of Figures

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Hki wtg"5030Uwo o ct {"qh'yj g"gzr gtlk gpcnlf guki p"

Hki wtg"5040Eqo r ctkuqp"qh'yj g"co qwpv'qh'gpgti {"*necn'tgr qtvgf "qp'yj g'htuv'cpf "ugeqpf "
xkuk/hqt "F_{tgecm}"

Hki wtg"5050Eqo r ctkuqp"qh'yj g"co qwpv'qh'gpgti {"*necn'tgr qtvgf "qp'yj g'htuv'cpf "ugeqpf "
xkuk/hqt "H_{geqtf}"

Hki wtg"5060Eqo r ctkuqp"qh'yj g"co qwpv'qh'gpgti {"*necn'tgr qtvgf "qp'yj g'htuv'cpf "ugeqpf "
xkuk/hqt "U_{f_lgv}"

Hki wtg"5070Eqo r ctkuqp"qh'yj g"co qwpv'qh'ectdqj {f tcvg"*i +tgr qtvgf "qp'yj g'htuv'cpf "
ugeqpf "xkuk/hqt "F_{tgecm}"

Hki wtg"5080Eqo r ctkuqp"qh'yj g"co qwpv'qh'ectdqj {f tcvg"*i +tgr qtvgf "qp'yj g'htuv'cpf "
ugeqpf "xkuk/hqt "H_{geqtf}"

Hki wtg"5090Eqo r ctkuqp"qh'yj g"co qwpv'qh'ectdqj {f tcvg"*i +tgr qtvgf "qp'yj g'htuv'cpf "
ugeqpf "xkuk/hqt "U_{f_lgv}"

Hki wtg"50 0Eqo r ctkuqp"qh'yj g"co qwpv'qh'r tqvlp"*i +tgr qtvgf "qp'yj g'htuv'cpf "ugeqpf "xkuk"
hqt "F_{tgecm}"

Hki wtg"50 0Eqo r ctkuqp"qh'yj g"co qwpv'qh'r tqvlp"*i +tgr qtvgf "qp'yj g'htuv'cpf "ugeqpf "xkuk"
hqt "H_{geqtf}"

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xkuk/hqt "U_{f_lgv}"

Hki wtg"5030Eqo r ctkuqp"qh'yj g"co qwpv'qh'hcv"*i +tgr qtvgf "qp'yj g'htuv'cpf "ugeqpf "xkuk/hqt "
F_{tgecm}"

Hki wtg"5040Eqo r ctkuqp"qh'yj g"co qwpv'qh'hcv"*i +tgr qtvgf "qp'yj g'htuv'cpf "ugeqpf "xkuk/hqt "
H_{geqtf}"

Hki wtg'5050Eqo rctkuqp'qh'vj g'co qwpv'qh'hcv'xi +tgr qtvgf "qp'vj g'htuv'cpf "ugeqpf "xkuk'hqt"
Ufkgv"

Hki wtg'600Eqo rctkuqp'qh'vj g'co qwpv'qh'gpgti { 'equwo gf "qp'fc{ "3'cpf "fc{ "4'hqt"vj g"
UQfkgv'gej plswg"

Hki wtg'6040Eqo rctkuqp'qh'vj g'co qwpv'qh'gpgti { 'equwo gf "qp'fc{ "3'cpf "fc{ "4'hqt"vj g"
Nfkgv'gej plswg"

Hki wtg'6050Eqo rctkuqp'qh'vj g'co qwpv'qh'ectdqj { ftcvg'equwo gf "qp'fc{ "3'cpf "fc{ "4'hqt"
vj g"UQfkgv'gej plswg"

Hki wtg'6060Eqo rctkuqp'qh'vj g'co qwpv'qh'ectdqj { ftcvg'equwo gf "qp'fc{ "3'cpf "fc{ "4'hqt"
vj g"Nfkgv'gej plswg"

Hki wtg'7000Qxgtxkgy "qh'vj g"gzr gtko gpcn'cpf "hco kktkucvqp'tkcn'r tqveqn'

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Hki wtg'7060Rctgf "fcv'qh'vj g'vko g'vq"eqo r ngvqp'hqt'gej "cvj ngv"dgw ggp"Nqy gtEctd"cpf "
J ki j gtEctd"eqpf kkpqu"

Hki wtg'7070O gf kcp"cpf "kpf kxf wcn'f khtgpegu"kp"vko g'vq"eqo r ngvqp"dgw ggp"vj g"y q"
ectdqj { ftcvg'eqpf kkpqu"

Hki wtg'800'Htgs wgpe{ "f kvtkdvqp"qh'j { ftcvqp"ucwugu"dcugf "qp"htuv"o qtplpi "wtkg"
uco r ngu"

Hki wtg'8040Vj g'f khtgpeg'kp'htuv'cpf "ugeqpf "o qtplpi "wtkg"quo qrcv{ "xcnugu"

Hki wtg'9000Qxgtxkgy "qh'vj g"vj tgg'f khtg'gpv'r tqveqni'c.'d.'cpf "e"

Hki wtg'9040Vko g'eqwtug'qh'dmqf "i n(equg'eqpegpvtc'vqp'f wtkpi "vj g'i n(equg'vguv'wpf gt'tguv."
y cmkpi ."cpf "e{etkpi "eqpf kkpqu0'

Hki wtg'9050Vko g'eqwtug'qh'r nuoc'lpuwlk'eqpegpvtc'vqp'f wtkpi "vj g'i n(equg'vguv'wpf gt"
tguv.'y cmkpi ."cpf "e{etkpi "eqpf kkpqu0'

Hk wtg'9060Rck gf "f cvc"qh'vj g"lpetgo gpvci'dmqf "i mequg"ctgc"wpf gt"vj g"ewtxg"dgy ggp"cm'
eqpf kkpuc+Tguy'vs."e{enpi 0*d+E {enpi "vs."y cmki 0*e+Y cmki "vs."tguv'

List of Tables

- Vcdrg'300Co qwpv'qh'creqj qn'equpuwo gf 'kp'f khhgtgpv'uwwf kgu'qp'gpf wtcepeg'r gthqto cpeg"
- Vcdrg' 3040' O czko wo " tgeqo o gpf gf " creqj qn' kpcng" r gt" f c { " hqt" f khhgtgpv' v{r gu" qh' dgxgtci gu"
- Vcdrg'400F guetkr vkqp'qh'r gthqto cpeg'r tqveqnu"
- Vcdrg'4040F guetkr vkqp'qh'f kgvct { "ucpf ctf kucvkqp'cr r tqcej gu"
- Vcdrg'4050F kgvct { "ucpf ctf kucvkqp'cr r tqcej gu'wugf 'kp'lqwtpcnu'dgy ggp'422: /4236"
- Vcdrg'4060Dtgcnf qy p'qh'H_{geqtf} 'wug'd { "v{r g"cpf 'f wtckqp"
- Vcdrg'4070C "dtgcnf qy p'qh':pki'qt "o kpkc cni'cr r tqcej ø'wug'd { "v{r g"
- Vcdrg'500F kgv'hgf "vq'r ctvckr cpwu'qp'vj g'f c { 'r tgegf kpi "xkuku"7"cpf "8"
- Vcdrg'5040O gcp'cuuki pgf "cpf 'equpuwo gf "gpgti { "cpf "o cetqpwtkgpv'kpcngu'hqt'F_{tgecm}"
H_{geqtf}."cpf "U_{fkgv}"
- Vcdrg'5050O gf kcp'f khhgtgpeg'dgy ggp'cuuki pgf "cpf 'equpuwo gf 'pwtkpv'kpcng'hqt'F_{tgecm}"
H_{geqtf}."cpf "U_{fkgv}"
- Vcdrg'5060Mgpf cm'vcw'B"eqttgrcvkqp'dgy ggp'cuuki pgf "cpf 'equpuwo gf 'pwtkpv'kpcng'hqt"
F_{tgecm} H_{geqtf}."cpf "U_{fkgv}"
- Vcdrg'5070T grkcdkvw' { "qh'gpgti { "cpf "o cetqpwtkgpv'kpcngu'hqt'F_{tgecm} H_{geqtf}."cpf "U_{fkgv}"
- Vcdrg'600O gcp'gpgti { "cpf "o cetqpwtkgpv'kpcngu'qh'vtckpgf "cyj ngvu'qp'f c { "3"cpf "f c { "4"
qh'UQf kgv'cpf "NK kgv'equpuwo r vkqp"
- Vcdrg'6040Nko ku'qh'ci tggg gpv'hqt'vj g'o gcp'f khhgtgpegu'kp'r tqvklp'cpf 'hcv'kpcngu'qh'
vtckpgf "cyj ngvu'dgy ggp'f c { "3"cpf "f c { "4"qh'UQf kgv'cpf "NK kgv'equpuwo r vkqp"
- Vcdrg'700F kgv'eqo r qukkqp'qh'vj g'gzr gtko gpvni'eqpf kkpqu'P " ? "32+"

Vcdrg'7040Uco r rg"J ki j gtEctd"flgv'ht"e": 6'mi 'lwdlgev'tcklpi '8'f c {u'r gt'y ggm'

Vcdrg'7050O gcp"ŒUF +r rno c'ncvcg"cpf "i nœqug"eqpegpvcvqpu"cpf "tcv"qh'r gtegxgf "
gzgtvqp"fwlpi "gzgtekg'y j gp'r tgegfg "d { "gkj gt"Nqy gtEctd"qt"J ki j gtEctd"flgv""

Vcdrg'7060O gcp"ŒUF +tgr kcvqt { "gzej cpi g'tcvq"cpf "j gctv'tcv"fwlpi "gzgtekg'y j gp"
r tgegfg "d { "gkj gt"Nqy gtEctd"qt"J ki j gtEctd"flgv""

Vcdrg'8080Vj g'r j { ulecn'ej ctcevgtkvku'qh'y g'r ctvlekr cpw"

Vcdrg'8040Vj g"ew/qh'xcnwgu'ht"vj g'f khgtgpvj { f tcvqp"ucwugu"

Vcdrg'8050O gcp"htuv"cpf "ugeqpf "o qtplpi "wtkpg"quo qrnk { "qh'cvj rvgu."ppp/cvj rvgu."cpf "
qvcnr' ctvlekr cpw"

Vcdrg'9080Ej ctcevgtkvku'qh'y g'r ctvlekr cpw'cv'dcugrpg"

Vcdrg'9040Rrno c'i nœqug"cpf "kpuwkp"ctgcu'wpgt"vj g'ewtxg'fwlpi '82'o kp"cpf "342'o kp"
qh'y g'4/j qwt"i nœqug'vgu'hqmny kpi "gkj gt'tguv."y cmkpi "qt'twppkpi "

" "

Chapter 1

Introduction to dietary standardisation and assessment methods

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1.1 Introduction

Vj gtg"ctg"o cp{"gz vcpqgw"xctkcdngu"npqy p"v"chge"vj g"kvgtxgpkqp"*uki pcn"cpf "vj g" tgrkcdkx{"qh"vj g"vuv"*pqkug"vj cv"cngtu"vj g"f gvgevkqp"qh"vj g"uki pcn"lgceqeng"}("Dwtng." 4232-0)Gzco r ngu"qh"gz vcpqgw"xctkcdngu"kp"ur qt v"cpf "pwtkkqp"uwf lgu"kpemf g"mdqtcvt {" vgo r gtcwtg"cpf "j wo kf kx"."co qwpv"qh"xgtdcn"gpewtci go gpv"fwtkpi "r gthqto cpeg"vuvu." r j {ukcn"cevxkx{"cpf "fkgvt {"kpcng"vj g"fc {"u"dgqgt"cpf "fwtkpi "vj g"gzr gtko gpv"fwtkpi "v" eqvtqn"qt"grko kpcvg"vj gug"lcevtu"o c {"ngcf "v"hcng"eqtgrcvkpu"cpf "kpeqtgev"tguvnu0 Vj gtgqgt."tgugtej gtu"uj qwf"vcmg"gz vtc"o gcuvtgu"v"kuqrv"vj g"qweqo gu"qh"vj g"uwf {" htqo "vj g"gz vcpqgw"xctkcdngu0

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" 1.2 Dietary components that require standardisation

1.2.1 Energy

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"

1.2.2 Carbohydrate

Vj gtg'ku'c'rci g'xqmw g'qh'r wdkuj gf "uwf lgu'f guetkdkpi 'vj g'ko r cev'qh'f kgvct { "ectdqj { f tcvg" o cplr wv'kqp" qp"o wuerg"i n{eqi gp" *O cf ugp" gv'crl'3; ; 2="Dquej "gv'crl'3; ; 5="Tcwej "gv'crl'3; ; 7+" gpf wtcepg" r gthqto cpeg" *J cy rg{ " gv' crl' 3; ; 9=" Eqttgk/Qrkxgkc" gv' crl' 4235=" Gtrngpdwuej "gv'crl'4227="Lqj puqp"gv'crl'4228+."pwtkqpv'qz kf cvkqp" f wtkpi "gzgtekug" *Mrcxu" O cf ugp" gv'crl'3; ; 2="Rkukrcf ku"gv'crl'3; ; 8+."drqf "i nvequg"rgxgru" *Dkuj qr "gv'crl'4223d+." kpuwkp"cev'kqp" *Drcen'gv'crl'4227+."cpf "rk kf "r tqhkg" *O wqkq"gv'crl'3; ; 6+0'Qxgtcm"uwf lgu" j cxg'tgr qtvgf "ko r tqxgf "gpf wtcepg"r gthqto cpeg"kp"hxqwt"qh'vj g"ectdqj { f tcvg"tlej "f lgv" *QdMgghg"gv'crl'3; ; : ; ="Eqttgk/Qrkxgkc"gv'crl'4235+0'Vj g"equwo r v'kqp"qh'ectdqj { f tcvg" tlej " f lgv" kpetgcugu" i n{eqi gp" rgxgru" kp" ungrgvn' o wuergu." vj g" r tko ct { " ecwug" hqt" vj g" ko r tqxgo gpv'kp" gpf wtcepg"r gthqto cpeg" *Tcwej "gv'crl'4227+0'Hqt"gzco r rg."Tcwej "gv'crl' *3; ; 7+"lpxguki cvgf "vj g"ghgev'qh'j ki j "ectdqj { f tcvg" f lgv" *320"i 0ni ³"DO "r gt" f c { "+"versus" pqto cn' ectdqj { f tcvg" f lgv" *80" i 0ni ³" DO " r gt" f c { "+" qp" o wuerg" i n{eqi gp" rgxgru" cpf " gpf wtcepg"r gthqto cpeg' Qp" vy q" ugr ctvg" qeecukpu." vy g'xg" y gm'v'ckp'gf "o cng" e { erkuu" equwo gf "kp" c' t'cpf qo "qtf gt" qpg"qh'vj g" y q" f lgv" hqt" vj tgg" f c { "u'dghqtg" eqo r ngkpi "c" r t g/ r'cf gf "vko g" v'kcn'rcukpi "vj tgg" j qwtu'0'Rctv'ekr cpw" e { emgf "hqt" vy q" j qwtu'cv'097" "XQ4r gcm' k'vgtur gtugf "y kj "h'xg"82"ugeqpf u'ur t'kpw'cv'XQ4r gcm'cv'o k'pwgu"42."62."82." : 2."cpf "322" hqmyy gf "d { "c'qpg'j" qwt "vko g" v'kcn'0'k'petgculpi "ectdqj { f tcvg" k'pvcng" t'guwngf "kp"69" "kpetgcug" kp" o wuerg" i n{eqi gp'0'O gcp"r qy gt" qwr w'y cu" j ki j gt" f wtkpi "vj g" vko g" v'kcn' chgt" c" j ki j " ectdqj { f tcvg" f lgv" *455" Y +eqo r ctgf "vq"pqto cn'ectdqj { f tcvg" f lgv" *437" Y +0'O cf ugp" gv'crl' *3; ; 2+" hqwpf "vj cv" vj g" equwo r v'kqp" qh'c" ectdqj { f tcvg" gptlej gf " f lgv" kpetgcugf "o wuerg" i n{eqi gp" uxtgu" d { "47' 0'Vj g" t'gur k'cvqt { "gzej cpi g" t'cvkq" y cu" uki p'k'k'cpw" { "j ki j gt" cv' t'guv" cpf " f wtkpi "gzgtekug" chgt" c" j ki j "eqo r ctgf "vq"pqto cn'ectdqj { f tcvg" f lgv'0

O quv' r ctv'ekr cpw" kp" rcdqtcvt { "cpf "h'gnf "uwf lgu" kp" ur qt v' cpf "j wo cp" pwt'kkqp" ctg" h'gg" r'kxkpi " *lgceqeng" ("Dwtng"4232+0'F kgvct { "k'pvcng"qh'h'gg"r'kxkpi "r ctv'ekr cpw" ecp" xct { "htqo " f c { "vq" f c { "f wg"vq"ej cpi gu"kp"vj gk" f ckn' "rk'guy"rg" *g0 0'f ckn' "r j { u'kcn'cev'kxk { ="Rgrerux" a "gv" crl'4232+"cpf "pcwtcn'r j { ukqmi k'cnldkqmi k'cn' xctk'v'kpu'0' Hqt" gzco r rg." vj g" f c { /vq/ f c { " xctk'cdk'k'v' "qh'r'ncuo c"i j t'gk'p"eqepgp'v'kqp."cnuq"npqy p"cu"vj g"j wpi gt"j qto qpg."ku"0"; ' " *J cpugp"gv'crl'4224+0'Dkpi j co " *3; ; 9+"tgxgcngf "vj cv"vj g" f c { /vq/ f c { "xctk'cdk'k'v' "kp"gpgti { " cpf "ectdqj { f tcvg" k'pvcng"ku"45' 0'Vj gtghqtg." vj g" cdugpeg"qh'f kgvct { "ucpf ctf k'v'kqp" ecp" rgcf "vq" y kf g" xctk'v'kpu"kp" f kgvct { "k'pvcng"dgw ggp" v'kcn'0'Uqo g" r ctv'ekr cpw."hqt"gzco r rg." o ki j v'equwo g"622"i "qh'ectdqj { f tcvg" vj g" f c { "dghqtg"vj g" h'ku'v'v'kcn'cpf "722"i "dghqtg"vj g"

ugeqpf 0Vj gug'r ctvlekr cpw'o c { "gZR gtlgpeg"ko r tqxgo gpw'kp'r gthqto cpeg"cpf "cp"lpetgcug"
 kp"i n{eqi gp"ngxgn"kp"vj g'ugeqpf "tkn'eqo r ctgf "vq"vj g'htu0Dwuucw'cpf "eqmeci wgu"*4224+
 uj qy gf "vj cv"lpetgcukpi "ectdqj { ftcvg"kpvcng"vq"32"i 0ni ^{/3}"DO "hqt"46/j qwtu"ku"gpqwi j "vq"
 ucwvcvg"i n{eqi gp"ngxgn"kp"ungrvcn'o wuergu0Vj g'eqpvtct { "ku"cnq"vtwg0Dgti utqo "gv'crl"
 *3; 89+" f go qpuctcvgf "vj cv"uvctvki "vj g"tkn'y kj "82/: 2' "rguu"i n{eqi gp"rgf "vq"ϕ"72' "
 ko r cko gpv'kp"gpf wtcepeg"r gthqto cpeg0K'ku"vj gthqg"guugpvkn'vq"eqpvtqn'ectdqj { ftcvg"
 kpvcng'hqt"cv'rgcuv'46/j qwtu'dghqtg"gzr gtlo gpvcn'tkcn0

Uwf lgu"vj cv"wg"c"r tg/gzgtekug"o gcn"uj qwf "o cng"uwtg"vj cv"vj g"o gcn'ctg"ucpf ctf kugf "
 dgw ggp"tkcn0Hqt"gzco r rg."O eNckp"gv'crl"*4237+"gpeqwtci gf "r ctvlekr cpw"vq"equwo g"c"
 ugrh/ugrvegf "r tg/gzgtekug"o gcn"uko krcr "kp"gpgti { "cpf "o cetqpwtlgpv'eqpvgpv."r tkqt "vq"gej "
 tkcn0Vj g'eqpegtp"ku"y kj "ngcxkpi "r ctvlekr cpw"vq"ej qqug"vj g"v{r g"cpf "s wcpkv{"qh'hqqf "cv"
 gcej "o gcn'y j lej "o c { "pqv'dg"kf gpvlecr0Cunkpi "uwdlgeu"vq"gcv'o gcn'y kj "uko krcr "gpgti { "
 cpf " o cetqpwtlgpv' eqpvgpv" o c { " pqv" dg" uwhlelgpv" gur gekm{ " kh" vj g{ " xeni' pwtkkqp"
 npqy rgi g0J qy gxgt."vj g'tgugctej gtu'qh'vj ku'uwf { "f kf "eqmgev'hqqf "f kctku'y j lej "cmqy gf "
 vj go "vq"r ctvlekr "ej gen'hqt"eqo r rkepeg0Tgugctej gtu'uj qwf "cnq"dg"cy ctg"qh'vj g"ghgev'qh"
 f khgtgpv'o gcn'eqo r qukkqp"qp"r j { ukqni kecn'cpf "dkqni kecn'o ctngtu'cpf "ej qqug"vj g"qpg"
 vj cv'o quv'uwku"vj gk"kpvtxgpv'kp0Hqt"gzco r rg."ectdqj { ftcvg"tkej "o gcn'equwo gf "j qwtu"
 dghqtg"cp"gzr gtlo gpvcn'tkcn'ecp"cnqt "uwdutcvg"wg"cpf "ko r tqxg"gpf wtcepeg"r gthqto cpeg"
 y j gp"i n{eqi gp"uvtgu"kp"vj g"dqf { "ctg"uwdqr vko cn'eqo r ctgf "vq"qr vko cn'Uj gto cp"gv'crl"
 3; ; ; =P gwhgt"gv'crl03; ; 9+0'

Vj g"cr r tqcej "vq"ucpf ctf kug"ectdqj { ftcvg"kpvcng"ku"uko krcr "vq"gpgti { "*ugg"ugev'kp"30+03+0'
 Vj g"dguv"cr r tqcej "ku"vq"r tqxkf g"r tg/r ceni gf "o gcn" *Lgeceqeng" ("Dwtng"4232+0' Rt g/
 gzgtekug"o gcn"uj qwf "r tghgtcdn{ "dg"r tqxkf gf "d { "tgugctej gtu"kp"qtf gt "vq"grko kpcvg"vj g"
 rkngrkj qqf "qh'equwo kpi "urki j v{ "f khgtgpv'o gcn'dghqtg"gej "tkn'd { "r ctvlekr cpw0Kp"uqo g"
 uwf lgu."tgugctej gtu"o ki j v'o cplk wrcvg"ectdqj { ftcvg"kpvcng"ugxgtcn'f c { u'dghqtg"gej "tkn"
 *Ectg{ "gv'crl'4223="Y cmgt"gv'crl'4222="J qtxcvj "gv'crl'4222+0'Ectdqj { ftcvg"tgs wktgo gpw"
 eqwf "dg"ecrewrcvgf "gkj gt" wulpi "c"r gtegpvc i g"qh'vj g"vqcn' gpgti { "kpvcng"qt "dcugf "qp"
 r ctvlekr cpw'dqf { "o cuu"*i 0ni ^{/3}"DO +*Rtkej ctf /Rguej gni'gv'crl'4232="O vqlq"gv'crl'03; ; 6+0"

"
 "
 "

1.2.3 Fluid

C" eqpukf gtcdrng" co qwpv' qh' rkgtcwtg" j cu" dggp" r wdrkuj gf " kpxgurki cvkpi " vj g" ghge'v' qh' f gj { ftcvkap" qp" gpf wtcpeg" r gthqto cpeg' Vj gug" uwf lgu" tngxgrgf " vj cv" j { r qj { ftcvkap" qh' o qtg" vj cp" 4' "dqf { "o cuu" j cu" c" f gtko gpvcn' ghge'v' qp" gpf wtcpeg" r gthqto cpeg" kp" vgo r gtcvg" cpf" j qv' gpxkqpo gpw" *Ej gwxtqpv' gv' cr0' 4225= Cto utqpi " gv' cr0' 3; ; 7= Mepghkem" gv' cr0' 4232= Ej gwxtqpv' gv' cr0' 4227= Ej gwxtqpv. " Mepghkem" gv' cr0' 4232+0' J qy gxgt. " vj g" ko r ckto gpv' kp" cgtqdle" r gthqto cpeg" ku" o vej " o qtg" r tqpqwpegf " kp" j qv' gpxkqpo gpw" eqo r ctgf " vq" eqrf' 0' Hqt" gzco r ng. " j { r qj { ftcvkap" qh' 6' " DO " ko r ckto vko g" vlcni' e { enkpi " r gthqto cpeg" d { " 5' " cv" 32" AE. " 7' " cv" 42" AE " cpf" d { " 45' " cv" 62" AE " *Mepghkem" gv' cr0' 4232+0' J { r qj { ftcvkap" d { " 5' " DO " y cu' cnuq" uj qy p" vq" pgi cvkxgn { " ko r ckto r tg/ r qcf gf " vko g" vlcni' r gthqto cpeg" *uvgef { " uvvg" r j cug" hqmqy gf " d { " c" vko g" vlcni' vcum" d { " c" : ' " cv" 42" AE " *Ej gwxtqpv' gv' cr0' 4227+0' J { r qj { ftcvkap" qh' 4' " cpf" 6' " eqpugs wgpv { " tgf weg" y cmkpi " vko g" vq" eqo r ngvqp" vcu' ni' kp" j qv' eqpf kkpqu" d { " 44' " cpf" 6: ' " *Etcki " (" Ewo o kpi u" 3; 88+0' Hwt vj gto qtg. " Cto utqpi " et al." *3; ; 7+ " uj qy gf " vj cv' vj ngvu" r gthqto gf " uki plkecpv { " y qtug" kp" 7222/ " cpf" 32222/ o " twppkpi " gxgpw" *8' " unqy gt+ " y j gp" vj g { " y gtg" j { r qj { ftcvgf " r tg/ gz gtekug" d { " f kvt gvkeu" d { " 4' " qh' vj gk" DO 0'

J { r qj { ftcvkap" j cu' cnuq" dggp" uj qy p" vq" tgf weg" o czko cni' qz { i gp" qwr w" *XQ4o cz+ " *Ucy n" 3; ; 4= P { dq" gv' cr0' 4223+0' P { dq" et al. " vguv" vj g" ghge'v' qh' j { r qj { ftcvkap" qp" XQ4o cz" kp" dqvj " y cto " cpf" vgo r gtcvg" eqpf kkpqu' 0' Ukz " gpf wtcpeg" vlcpgf " e { enkpi " eqo r ngv" c" o czko cni' gz gtekug" vguv" *K0' kpetgo gpvcn' vguv' wvki' gzj cwukap+ " gwj { ftcvgf " cpf" cpqj gt" j { r qj { ftcvgf " *6' " DO + " kp" gcej " co dlkpv' eqpf kkpqu' 0' Vj g" tguvnu" uj qy gf " vj cv" XQ4o cz" y cu' tgf weg" d { " 8' " cpf" 38' " y j gp" j { r qj { ftcvgf " uwdlgeu" r gthqto gf " kp" vgo r gtcvg" cpf" y cto " eqpf kkpqu. " tgur gev kxgn { . " eqo r ctgf " vq" gwj { ftcvgf " kp" vgo r gtcvg" eqpf kkpqu' 0' Vj gtghqtg. " uj qy kpi " wr " j { r qj { ftcvgf " vq" vj g" r tgrko kpc { " vguvki " qh' c" uwf { " *XQ4o cz. " vguv+ " ecp" cff " pqkug" vq" vj g" xcnvgu" qdvkpgf " chge'vki " vj g" kpvgpukv { " qh' vj g" gZR gtlo gpvcn' vlcni' *K0' uwdlgeu" y kni' dg" r gthqto kpi " cv' c" hqy gt" y qtmitevg+0'

Hwt vj gto qtg. " j { r qj { ftcvkap" ecp" tgf weg" r ncuo c" xqno g" y j lej " ko r ckto " dqf { au' cdkkv { " vq" vtcpuhgt" vj g" j gcv" i gpgtcvgf " d { " vj g" y qtnkpi " o wuergu" vq" vj g" unkp " *P cf gni' 3; ; 2+0' J { r qj { ftcvkap" d { " 4/6' " tgf wegu" r ncuo c" xqno g" d { " wr " vq" 32' " *Ej gwxtqpv. " Mepghkem" gv' cr0' 4232+0' Vj ku' rcfu" vq" c" tgf wevkap" kp" j gcv' nquu" cpf " vj gtghqtg" c" tlug" kp" eqtg" dqf { " vgo r gtcwtg" *O cwi j cp" 4225+0' K' j cu" dggp" f go qpwtcvgf " vj cv' eqtg" dqf { " vgo r gtcwtg" kpetgcugu" d { " 2087" vq" 204AE" hqt" gxgt { " 3' " nquu" qh' DO " *O qpvcv { (" Eq { ng" 3; ; 4+0'

422: +!kp" c"y kf g"tcpi g"qh"gz gtekug"v{r gu"cpf "f wt cvkpu" *I tcj co "4223="Dwtng"422: +0Hqt" gzco r ng."c"qpg/j qwt"e{enkpi "ko g"vkcni'r gthqto cpeg"y cu"uki pkkhecpv{ "ko r tqxgf "d{ "60# " chgt" vj g"equpuwo r vkp" qh"5" o i 0ni /³" qh"echhgkpg" eqo r ctgf "vq" r rnegdq" *F gudtqy "gv" cr0' 4234+0K'y cu"gxgp"tgxgcrgf "vj cv'vj g"gti qi gple"ghgev'qh'echhgkpg"eqwrf "dg"qdugt xgf "wr "vq"8" j qwtu"chgt "ku"equpuwo r vkp"d{"pqpwugtu"*Dgm{ "O eNgrcp"4224+0Vj ku'y km'uki pkkhecpv{ " chgev' vkcni" cpf " r tgrko kpct {" vguu" eqpf wevgf " r vgt" f wtkpi " vj g" f c {" kp" ecugu" y j gtg" r ctvkr cpw{j cxg"equpuwo gf "eqhhgg"qt"cp {"qvj gt"echhgkpcvgf "r tqf wev'kp"vj g"o qtpkpi 0"

Vj g"o gej cpkuo " dgj kpf " j qy "echhgkpg" gpj cpegu"gz gtekug" ecr cekv{ "ku" ukm'pqv{ {gv' hwm{ " wpf gtuvqf 0'Vy q"qh"vj g"o ckp"o gej cpkuo u"r tqr qugf "ctg<3+"vj g"dmqenci g"qh'cf gpqukpg" tgegr vqtu" cpf " 4+" vj g" ukv wrcvkp" qh' vj g" egpvcni' pgtxqwu" u{vgo " *I tcj co " 4223=" Vctpqr qnm{ "422: +0Cf gpqukpg"tgegr vqtu"ctg"hwpf "kp" c"pwo dgt"qh'egm'o go dtcpgu"kp"vj g" j wo cp" dqf {" kpenw kpi " vj g" dtckp." cf kr qug" wuuwu." cpf " umgrvcni' o wuergu' F wg" vq" vj g" uko kctk{ " qh'echhgkpg" vq" vj g" utwewtg" qh' cf gpqukpg."kv' dkpf u" vq" cf gpqukpgau" tgegr vqtu" tguwv kpi " kp" vj g" dmqenci g"qh'ku" cekv{ *I tcj co "4223+0' Vj ku" tguwv kpi " cp" kpetgcug" kp" r ruo c" hgg" hcv{ " cekf u" cpf " hcv" qz kf cvkpp" f wtkpi " gz gtekug" r gcf kpi " vq" i n{ eqi gp" ur ctkpi " y j lej "eqwrf "gzr rckp"vj g" f gr {" kp" hcvki wg" *K { "gv" cr0'3; 9; =Gtlemuq"gv" cr0'3; : 9=Equvkm'gv" cr0'3; 9: +0C"pqvq"qh'ecwvkp"ku'f wg"j gtg"ulpeg"vj g" tguwv"ctg"ukm'eqphkcvkpi 0'O qtg"tgegpv' uwf lgu" hqwpf " eqpvcf kcvkpi " hkp kpi u" y kj " pq" ghgev' qh'echhgkpg" qp" hcv' qz kf cvkpp" cpf " vj gtghqtg" f q"pqv'uw r qtv'vj g"cdqxgo gpvkppgf "j {r qvj guku" *I tcj co "gv" cr0'4222="Ncwtpv'gv" cr0'4222="I tcj co "gv" cr0'422: +0K"j ku"tgxky ."I tcj co "4223+"o gpvkpu"vj cv'kp"34"uwf lgu" eqpf wevgf "kp"j ku" rcdqtcvqt {" qpn{ "uk" "qdugt xgf "cp" kpetgcug"kp" ektewrcv kpi " hgg" hcv{ " cekf " r g xgu"cpf "y cu'o ckpn{ "cv'tguv'dghqtg"vj g"uvcv'qh'vj g"gz gtekug0J g'cf f gf "vj cv'vj g'tgur ktcvqt {" gzej cpi g'tcvkq" *TGT +!kp"cm'34"uwf lgu"y cu"pqv'tgf wegf ."y j lej "tghgevu"vj cv'hcv'qz kf cvkpp" y cu"pqv'kpetgcugf 0'I tcj co "cpf "eqmgi wgu"4222+"cti wgf "vj cv'r tgxkqu"uwf lgu"o gcuwtgf " hcv"o gxcdqrkuo "o ckpn{ "wukpi "c"eqo dkpcvkp"qh"vy q"o gvj qf u"r wv qpct {" cpf "o gxcdqrk" o gcuwtgo gpw"lpwvcf "qh"gzco kpkpi "vj g"cevkg"o wuerg0Vj gtghqtg."vj g"cwj qtu"uwf lgf "hcv" o gxcdqrkuo " kp" vj g"cevkg"o wuerg" qh' vgp" o crg" uwdlgevu" e{enkpi " hqt" qpg" j qwt" cv'92' " XQ4o cz0' Dmqf " uco r rnf "y gtg" eqmgevgf " hqo " hgo qtcn' ctvgt {" cpf " xgk" qh' qpg" rgi " vq" o gcuwtg"vj g"wr vcnr"cpf "tgrgcug"qh'ugxgtcn'dkqo ctngtu"d {" vj g"cevkg"rgi 0'O wuerg"dkqr ukgu" y gtg"vcnrg"dghtg."vgp"o kpwgu"chgt"vj g"uvcv."cpf "gpf "qh"vj g"gz gtekug0Cmj qwi j ."echhgkpg" tguwv kpi " kp" cp" kpetgcug"kp" r ruo c" hcv{ " cekf u"cpf " i n{ egtqn'cv'tguv'eqo r ctgf "vq" r rnegdq."pq" cngtcvkp"y cu"qdugt xgf "kp"rgi " i n{ egtqn'tgrgcug"qt" hcv{ " cekf "wr vcnr" f wtkpi "gz gtekug"chgt" echhgkpg" kpi guvkp0'

Vj g'ugeqpf "j { r qvj guku'tgxgcu"vj cv'vj g'gti qi gple "ghgev"qh'echhgkpg"ku'f wg"vq"ku'cdkxv "vq" uko wcvg"vj g'egpvcn'pgtxqwu"u{ uvgo "d{ "kpetgculpi "r ckp"cpf "r gtegkxgf "gzgtvqp"vj tguj qif u" *Vctpqr qnum{ " 422: +0' Hqt" gzco r ng." I tej co " et al." *4222+" tgr qtvgf " cp" kpetgcug" kp" u{ o r cvj gvle"pgtxqwu"u{ uvgo "cevkxk{ "hqmjy kpi "echhgkpg"lpi gukqp0'K'j cu"tgr gcvgf n{ "dggp" uj qy p"vj cv'echhgkpg"tgf wegu"vj g'tcvg"qh'r gtegkxgf "gzgtvqp"f wtkpi "gzgtekug" *Fqj gtv{ "(" Uo kj "4227+"y j lej "r m{ u"u"uki pkhkecpv'tqng"lp"vj g'gpj cpego gpv'qh'gpf wtcepeg'r gthqto cpeg" *Dwtng"422: +0'Fqj gtv{ "cpf "Uo kj "hqwfp "vj cv'echhgkpg"ecp"uki pkhkecpv{ "tgf weg"TRG"d{ " 708' "f wtkpi "gzgtekug"eqo r ctgf "vq'r megdq0"

Vj g'eqo o qp"cr r tqcej "vq"o kpk kug"vj g'ghgev"qh'echhgkpg"ku"vq"cxqkf "ku'eqpuwo r vqp"46/ j qwtu"dghqtg"vj g'gZR gtko gpv" *Tcverkh"gv"cr04233+0'Nqpi gt "cdvkgppeg" *6: "j qwtu"wr "vq" c" y ggm"o c{ "dg"tgs vktgf "kp"ecugu"y j gtg"echhgkpg"ku"r ctv'qh"vj g"kpvtxgpvqp" *O qv{ gv"cr0 4228="Cuvtkpg"gv"cr04233+0'Tgugcej gtu'ecp"r tqxkf g" c"kuv"qh'hqf "cpf "f tkpmu"vj cv'eqpvckp" echhgkpg"vq"j gr "uwdlgeu"cxqkf "echhgkpg0'Eqo r rkepeg"eqwf "dg"vgugf "d{ "o gcuwtkpi "r ruo c" qt"vtkpg"echhgkpg"eqpegvckvpu" *Xcp"Vj w{ pg"gv"cr04227+0"

"

1.2.5 Alcohol

Uwtxg{ u"uwej "cu"vj cv'eqpf wevgf "d{ "Rqr qxc"et al." *4229+"uj qy gf "vj cv'cr r tqzko cvgn{ "34"N" qh'r vtg"creqj qn'y cu'eqpuwo gf "r gt"ecr kc"kp"vj g'WMl"kp"4224. "y j krg vj g'Qhleg"ht" P cvkqpcn' Ucvkukcu" *422: +" tgr qtvgf " vj cv"o qtg" vj cp"42' "qh"o gp"ctg"eqpukf gtgf "j gcx{ "f tkpngtu" *eqpuwo r vqp"qh"@: "wpku"qh'creqj qn'cv'ngcu"qpg"fc{ "r gt"y ggm0'Qp"vj g"qvj gt"j cpf. "vj g" cxgtci g"co qwpv'qh'creqj qn'eqpuwo gf "r gt"y ggm'd{ "cvj ngvu"ku"36"Ö7"wpku0'K'ku"r qukdrng" vj cv' vj gug" cvj ngv" cpf "pqp/cvj ngv" f tkpngtu" o c{ " gpf " wr " r ctvlekr cvkpi " kp" c" uwf {0' Tgugcej gtu'uj qwf "vj gtghqtg"r c{ "enugt"cvgpvqp"vq"creqj qn'eqpuwo r vqp"d{ "r ctvlekr cpwu" f wtkpi " vj g" uwf {0' Rtgxkqwu" uwf lgu" j cxg" tgr qtvgf " c" f gvtko gpvcn' ghgev" qh' creqj qn' qp" gpf wtcepeg" r gthqto cpeg" *O eP cwi j vqp" (" Rtggeg" 3; : 8=" Ngeqwm" g" (" Uej w{ " 422; =" Mgpftleni"gv"cr03; ; 5="Qdtkp"3; ; 5+0'Vj g"co qwpv'qh'gij cpqn'lpi guvgf "kp"gej "qh"vj gug" uwf lgu"ku"r tgugpvf "kp"Vcdng"3080'Ngeqwm" g"cpf "Uej w{ " *422; +"o gcuwtgf "r qy gt"qwr w" f wtkpi "c"82/o kpwg"e{erlpi "vko g"vken' chgt" lpi gukpi "i tcr ghtvkv"lwleg"y kj "qt"y kj qw" gjv cpqn'd{ "35"y gm/vtkpgf "o crg"e{erkuu0'Rqy gt"qwr w'y cu"uki pkhkecpv{ "tgf wegf "kp"vj g" creqj qn'vken'd{ "50 ' 0'K'uj qwf "dg"pqvgf "vj cv'i mequg"qz kf cvkqp"tcvg"y cu"cuq"tgf wegf "d{ "

35' O'Hwtvj gto qtg."Mgpf tlem'et al."*3; ; 5+"f go qputcvgf "cp"lpetgcug"kp"j gctv"tcvg"cpf " qz {i gp"wr vcnq"lqmjy kpi "gyj cpqnlkpi gukqp0"

Vj g"o quv"utknkpi "hkf kpi "eco g"ltqo "c"uwf {"r wdrukj gf "d{"QdDtlgp"*3; ; 5+"y j gtg"j g" f go qputcvgf "vj cv"vj g"f gtko gpvcn'ghgeV'qh'creqj qn'qp"gpf wtcepeg"r gthqto cpeg"eqwf "dg" qdugt xgf "gxgp"46/j qwtu'chgt"ku"equpuwo r vkqp."mpqy p"cu"vj g"j cpi qxgt"ghgeV'qh'creqj qn' Hhggp"ugpkqt"twi d{"r r{gtu'y gtg"i kxgp"o qpg{"cpf "lphqto gf "vq"f tlpn'vj gk"uwcn'co qwpv' qh'creqj qn'qp"c"pki j v'qww'y kj "vj gk"r ggtu0'Vj gtg"y cu"pq"tgutlvkqp"qp"vj g"co qwpv'qh' creqj qn' vj cv"eqwf "dg" equpuwo gf O'P gzv'f c{"."uwdlgeu" tgr qtvgf "creqj qn' kpcng" xct {kpi " dgvy ggp" 3" cpf " 5: " wpku0' T guwuu" uj qy gf " c" i tqwr " o gcp" tgf wevkqp" kp" gpf wtcepeg" r gthqto cpeg"qh'3306' O'Vj gug"t guwuu"ko r n' "vj cv'uwdlgeu"uj qwf "dg"tgo kpf gf "vq"cxqkf " equpuwo kpi "creqj qn'vj g'gxgpkpi "dghqtg"vj g'gzr gtko gpvcn'vkn0'Enqut "cwgpvkqp"uj qwf "dg" i kxgp"y j gp"fgcnkpi "y kj "cyj rvgu"cu"uqekcn'f tlpnkpi "y kj kp"vj ku"i tqwr "qh'uwdlgeu"ku"j ki j n' eqo o qp"ctqwpf "gxgpkpi "vko g."vj g"tcvg"tcpi kpi "dgvy ggp"3: "cpf": 6' "f gr gpf kpi "qp"vj g" v'r g"qh'ur qt v'*QdDtlgp"("N{qpu"4222-0'Hqt"gzco r ng."vj g"j ki j guv'r gtegpvc i g"qh'f tlpngtu" y j q"equpuwo g"creqj qn'cpf "vtckp leqo r gvq"pgzv'f c{"j cxg"dgpp"uggp"kp"etkengv"twi d{."cpf " i cgrke"lqqvdcn'": 6' ."97' ."cpf "97' ."tgr gevkggn{ +0'Vgco "ur qt u"uwej "cu"lqqvdcn'cpf " dcungvdcn'j cxg'urki j w' "lmy gt"r gtegpvc i g"qh'f tlpngtu"*87' "cpf "8: ' ."tgr gevkggn{ +0'Vj gug" hki wtgu'r tqxkf g"ci qqf "kfc"cdqw'y j qo "vq"r c{"cwgpvkqp"vq"y j gp"eqpf wekpi "c"uwf {0'Hqt" gzco r ng."tgugctej "uwf kgu"qp"twi d{"r r{gtu"o c{"pggf "vq"ko r ngo gpv'gzv'c"o gcuwg"gu"*gd O' o gcuwg"creqj qn'kp"wtkpg+"vq"o cng"uwg"vj gk"uwdlgeu"j cxg"cxqkf gf "creqj qn'vj g"pki j v' dghqtg"vj g'gzr gtko gpvcn'vkn0'

"

Vcdng"300Co qwpv'qh'creqj qn'equpuwo gf "kp"f khgt gpv'uwf kgu"qp"gpf wtcepeg"r gthqto cpeg"

| Uwf {" | Co qwpv'qh'gyj cpqn' |
|-----------------------------------|---|
| O eP cwi j vqp"("Rtggge"*3; ; 8+" | Wpkn'dmqf "creqj qn'ngxn'tgej gf "203." 207."cpf "20"o i 0 n ³ |
| QdDtlgp"*3; ; 5+" | 204."cpf "20"o rmi / ³ "DO " |
| Mgpf tlem'et al."*3; ; 5+" | 47"o n" |
| Ngeqwm'tg"("Uej wj "422; +" | ¢"52"o n" |

"

Vcdrg" 3040' O czko wo " tgeqo o gpf gf " creqj qn' kpcng" r gt" f c{" hqt" f hgtgpv" v{r gu" qh' dgxgtci gu0'

| Creqj qn' dgxgtci gu" | O czko wo "tgeqo o gpf gf "kpcng"r gt" f c{" " | |
|---|--|---------------------------|
| | O gp" | Y qo gp" |
| Tgf."Y j kg."cpf "tqug'y kpg" *34' +" | 4"ucpf ctf "i rcuugu'qh'397o n' | 3"rci g'i rcuu'qh'472o n' |
| Nqy gt/utgpi vj "rci gt."dgg." cpf "ekf gt" *58' +" | 4'r kpu" | 30'r kpu" |
| J ki j gt/utgpi vj "rci gt."dgg." cpf "ekf gt" *704' +" | 30'r kpu" | 3'r kpv" |
| Dqwg"qh'rci gt."dgg."cpf " ekf gt" *7' +" | 4"dqwg'qh'552o n' | 30"dqwg'qh'552o n' |
| Ecp'qh'rci gt."dgg."cpf "ekf gt" *607' +" | 4"ecpu'qh'662o n' | 30"ecpu'qh'662o n' |
| Ukpi rg'uj qv'qh'ur kku" *62' +" | 6"uo cm'uj qu'qh'47o n' | 5"uo cm'uj qu'qh'47o n' |

Uqwtg<Uelgpeg"cpf "Vgej pqm { "Eqo o kwgg."4233"

"

1.2.6 Vitamins and minerals

I gpgtcm{."tugctej gtu" f q"pqv"ucpf ctf kug"xkco kp"cpf "o kpgtci"kpvcngu"qt"uetggp"uwdlgevu" vq"kf gpvkh{ "f ghelkpeku"vj cv'o ki j v'chgevj g"tguwu"qh'vj g"uwf {0'Vj ku"ku"eqpukf gtgf "vq"dg" vko g"equwo kpi "cpf "cf f "gz vtc"equv'hqt"pq"uki p hkecpv"cf f kkpvcn'dgpghk"vq"vj g"uwf {0'Nqpi " vgo "uwf kgu"kp"r ct kwrct"uj qwf "r c{"enugt"cwgpvqp"vq"egt vcp" f ghelkpeku"uwej "cu"ktqp0' Kqp" f ghelkpe { "ku"j ki j n{ "r tgcrgpv"kp" hgo crg"cvj rgvu"cpf "j gcmj { "y qo gp" *F k"Ucpvqm"gv' cr0'4229="Quvllk"("Cj o gvxlk"422: "O gwrgt"(" \ ko o gto cpp"4232-0'Vj g"tcvg"qh'kqp" f ghelkpe { "co qpi uv'hgo crg"cvj rgvu"ku"ctqwpf "4: ' " *F k"Ucpvqm"gv' cr0'4229="O gwrgt"(" \ ko o gto cpp"4232+."y j kg"vj g"tcvg"qh'kqp" f ghelkpe { "cpcgo kc"ku": 08' " *j cgo qi mqdkp"> 342"i (N³"=hgttkkp">"34"Ui (N³"=F k"Ucpvqm"gv' cr0'4229-0'Vj g"r tgcrgpeg"ku"gxgp"j ki j gt"kp" cf qnuegpv'hgo crg"cvj rgvu"tgej kpi '74' " *Ucpf ut 3/4 "gv' cr0'4234-0'Kqp" f ghelkpe { "cpcgo kc" y cu"uj qy p"vq"tgf weg"qz {i gp"tcur qt v"kp"vj g"dqf {"vq"y qtnkpi "o wuengu"y j lej "f getgcugu" XQ_{40 cz} " cpf " gpf wtcepeg" r gthqto cpeg" *F gmcXcmg" 4235-0' Vj g" r tqdrgo " qeewtu" y j gp" r ct vkr cpw"uactv"vj g"uwf {"y kj "uwdqr vko cn'rgxgn"cpf "vj gp"tgwtp"vq"pqto cn'f vtkpi "vj g"

uwf { "kp" ecug" vj g{ "uactv' ktqp" uwr r ngo gpvcvkp0' Vj g" uwr r ngo gpvcvkp" y km' rfcf "vq" cp" ko r tqxgf "XQ_{40_cz}"cpf "gpf wtcepg"r gthqto cpeg"*Hkgo cpp"gv'crl'4223="O ci c| cpkm'gv'crl'3; ; 3="O eEnmpi "gv'crl'422; +0'K r tqxgo gpv"kp"XQ_{40_cz}"ecp"tgcej "90' "kp"qpn("5"y ggmu" *O ci c| cpkm'gv'crl'3; ; 3+0'Rctvkr cpv'u'y j q"ctg"npqy p"vq"dg"f ghekp'cpf "ctg"wpf gtvcnpi "c" vtgcvo gpv'uj qwf "dg"gzewf gf "htqo "uwf lgu"*Lgceqeng"("Dwtng"4232+0

1.2.7 Antioxidants

Cpvkzlf cpw'uwej "cu'nwglp."n{eqr gpg."ugrgpkwo ."xkco kpu"C."E."cpf "G"ctg"uwduwcegu"vj cv' r n{ "cp"ko r qtvcv'tqrg"kp"pgwtcrkupi "htgg"tcf kcnu"kp"vj g"dqf {0'Htgg"tcf kcnu."uwej "cu" tgcevkxg"qz {i gp"ur gekgu."ctg"wpucdng"o qrgewgu"npqy p"vq"ecwug"qz kf cvkqp"rgcf kpi "vq"egm' f co ci g" *Ukpf j k' gv' crl' 4235+0' Vj gtg" ku" pqto cm{ " c" dcrpeg" dgw ggp" vj g" rxxgn' qh' cpvkzlf cpw' cpf "htgg"tcf kcnu"kp"vj g"dqf {0'Cp"ko dcrpeg"y qwf "ecwug"qz kf cvkxg"ut guu' eqpvtkdwkpi " vq" vj g" f gxxgr o gpv' qh' cewg" cpf " ej tqple" f kugcugu" uwej " cu" ecepgt" cpf " cvj gtquergtquku" *F cmg/F qppg" gv' crl' 4228+0' K' j cu" dggp" uj qy p" vj cv' utgpwqwu" gz gtekug" kpetgcugu"vj g'tgrgcug"qh'htgg"tcf kcnu'ecwukpi "f co ci g"cpf "kphco o cvkqp"vq"o wuerg"kuuwgu" *F gmgtu"gv'crl'3; ; 8+0'kp"eqpvteuv."c"o qf gtcvg"gzr quwtg"qh'ungrvci'no wuergu"vq"htgg"tcf kcnu" cu" c" eqpugs wpepg" qh" nqy " vq" o qf gtcvg" kpvpuks{ " gz gtekug" ecp" kpf weg" r j {ukqmi kcn' cf cr cvkqp"d { "kpetgcukpi "vj gk"qz kf cvkxg"r qvvpkcn"*Rr {gt"("Ngy ku"4234+0'Vj ku"lpenw' gu" i tgcvt"cpvkzlf cpv' gp| {o g"cevkxk{ "cpf "gpj cpegf "r tqvevkxg"ko o wpg"tgur qpugu"*Uknt w' Nco kpc"4235+0'Xkco kp"E"uwr r ngo gpvcvkp"kp"j ki j "f qugu"ecp"r tgxgpv'vj gug'cf cr cvkqpu"vq" vcklpi " j gpeg" f getgcukpi " vcklpi " ghhekgpe { " *I qo gl /Ecdtgtc" gv' crl' 422; +0' I qo gl / Ecdtgtc"et al."f go qpwtcvgf "vj cv'vj g"kp' gukqp"qh'3"i "qh'xkco kp"E"r gt"fc { "qxgt"cvcklpi " r gtlkf "qh": "y ggmu" f getgcugf "vj g"gzr tguukqp"qh"o ckp"tcpuetr vkp"hcvtu"vj cv'r n{ "u"cp" ko r qtvcv'tqrg"kp"o kqej qpf tkcn'dkqi gpguku'Vj gtghqtg. "vj g"equwo r vkp"qh'cpvkzlf cpw' f wtapi "npi "vgo "uwf lgu"kp"ctgcu"uwej "cu"tgeqxt { "cpf "vcklpi "cf cr cvkqp"ecp"kvgtgtg" y kj "vj g"pcwtcn'r tqeguu"qh" vj g"kvgtxgpvkp0' Vj wu"kv' ku" guugpvkn'vq" cxqkf "cpvkzlf cpv' uwr r ngo gpvcvkp" f wtapi "uwej "kvgtxgpvkpu0"

Cpvkzlf cpw'ctg"pqv'wuwcm{ "ucpf ctf kugf "f wtapi "tgugcte"j "uwf lgu'Vj g"ucpf ctf kucvkp"qh' cpvkzlf cpv'kvcng"uj qwf "dg"vcngp"kvq"eqpukf gtcvkp"kp"ukwcvkpu"y j gtg"kv"j cu" c" f kt gev' ko r cev' qp" vj g" kvgtxgpvkp0' Hqt" gzc o r ng. " c" uwf { " gzc o kplpi " vj g" ghhev' qh' vcklpi " r tqi tco o gu" qp" r j {ukqmi kcn' ej cpi g" qxgt" c" npi " r gtlkf 0' kvwtwvkpu" vq" cxqkf "

uwr r ngo gpvcvkqp"uj qwf "dg"i kxgp"v"r ctvlekr cpwu"r tkqt "v"j gk"r ctvlekr cvkqp"kp"j g"uwf { " *lgceqeng"("Dwtng"4232+0'

"

1.2.8 Supplements

K'vcngu"j qwtu"v"fc{u"ht"flgvct{"uwr r ngo gpwu"v"gpj cpeg"rj {ulecn"r gthqto cpeg"cpf " rj {ukqmi le"tgur qpug"*Mlgkft"gv'cr0'4232+0'Hqt"gzco r ng."v"gequwo r vkqp"qh'dlectdqpcvg" j qwtu"dghqtg"gztekug"ecp"ko r tqxg"cpctgdle"r gthqto cpeg"*Nkfj "gv'cr0'422: + "y j gtgcu." etgcvkpg"cpf "dgv/cncpkpg"uwr r ngo gpvcvkpu"vcng"fc{u'dghqtg"uki pkkecpv"ko r tqxgo gpwu"ctg" qdugtvgf " *Fwengt"gv' cr0' 4235=" J qy g" gv' cr0' 4235=" Nkf r ng" ("Eqppqt" 4235+0'Etgcvkpg" uwr r ngo gpvcvkqp"j cu'dggp"uj qy p"v"lpetgcug"o wueng"etgcvkpg"ngxgnu"*J cttku"gv'cr0'3; ; 4+" rfcf kpi "v"gpj cpegf "ur tkvki "r gthqto cpeg" *Rtggp"gv' cr0'4223=" Ks vktf q" gv' cr0'4224+." lpetgcugf "utgpi vj *Fgo r ug{ "gv'cr0'4224+."cpf "j ki j "lpvgpukf{ "r qy gt"qwr w"*Mlgkft"4225+0' K'ku"gcukgt"v"eqpvtqn"uwr r ngo gpwu"wej "cu'dlectdqpcvg"fwtkpi "v"gtkn'r tgr ctvlekr"r gtkf " cu"vj g{"pqto cm{"j cxg"cu"j qtvgto "ghgev"rcvki "ngui"vj cp"46"j qwtu"eqo r ctgf "v"qvj gt " v"r g"qh"uwr r ngo gpwu0'Hqt"gzco r ng."k'vcngu"6/8"y ggmi"ht"o wueng"etgcvkpg"v"tgwtp"v" tgvkpi "ngxgnu"qpeg"ucwtcvkqp"ku"tgej gf " *Rtggp"gv' cr0'4225+0'Vj gtghqtg."gxgp"kh"uwdlgeu" uqr "etgcvkpg"uwr r ngo gpvcvkqp"dghqtg"vj g"uactv"qh"vj g"uwf { ."k'o ki j v'ukm'cngt"vj g"tguwu"qh" cpcgtqde"r gthqto cpeg" dgvy ggp" vy q" v'knu"eqo r rvgf " ngui" vj cp" hqt" y ggmi" cr ctv' C " y cuj qw"r gtkf "dgvy ggp"v'knu"ku"guugpv'kcn'ht"o clpn{ "vy q"tgcuqpu<qhht"uwdlgeu"vko g"v" tgeqxt"htqo " vj g" r tgxkqu"gztekug"vuv"cpf " i kxg" vko g"ht" vj g" kvgtxgpvkqp" ghgev" v" fko lkuj "*J qr nku"gv'cr0'3; ; ; +0'

"

Cm' uwr r ngo gpwu"vcngp" d{ " r ctvlekr cpwu"uj qwf " cry c{u" dg" tgeqtf gf 0' Vj qug" npqy p" v" kvgtcev"y kj "v"j g"uwduwpeg"dgkpi "uwf kgf "qt"v"j g"kvgtxgpvkqp"uj qwf "dg"cxqkf gf "cpf "kp" uqo g"ecugu"vko g"ht"y kj f tcy cn'uj qwf "dg"r tqxkf gf " *Tcverkh"gv'cr0'4233+0'K'k'ku"critgcf {" npqy p" vj cv' vj g" uwr r ngo gpvcvkqp" f qgu" pqv" j cxg" cp{ " ghgev" qp" vj g" kvgtxgpvkqp." vj gp" r ctvlekr cpwu"y km'dg"cmqy gf "v"eqpvkpwg"vj g"equwo r vkqp"qh"vj g"j cdkwcn'kpcng="j qy gxgt." k'ku'tgeqo o gpf gf "vj cv'vj g{ "nggr"c'tgeqtf "qh"vj gk"equwo r vkqp" *lgceqeng"("Dwtng"4232+0'

"

"

1.3 Approaches to dietary standardisation

1.3.1 Dietary assessment

O cp{ "f kgvct { "cuuguuo gpv'vej pls wgu"j cxg"dggp" f gxgnr gf "qxgt"vj g" { gctu"vq"ko r tqxg"vj g" ceewtce { "qh" f kgvct { "kpcng" o gcuwtgo gpv' Vj gtg" ctg" ewtgpvnl " y q" v{r gu" qh" f kgvct { "cuuguuo gpv' cr r tqcej gu' Vj g" hktuv' wugu" c" t gvtqur gevxxg" o gvj qf "y j kej " o gcuwtgu" f kgvct { "kpcng"vj cv'j cu'dggp'tgegpvnl "eqpuwo gf 0Vj ku'v{r g" kpenmf gu'vej pls wgu'uwej "cu" F_{tgecm} "hqf " hts wpe { " s wgu'kppckg." cpf " f kgv" j kxqt { 0' Vj g" ugeqpf " v{r g" qh" cuuguuo gpv' wugu" c" r tqur gevxxg" o gvj qf "y j kej " o gcuwtgu" qpi qkpi " f kgvct { "kpcng 0Vj ku' kpenmf gu" y gki j gf "cpf " guko cvgf "H_{geqtf} "cpf "vj g" f wr rkecvg" r qt vqp" o gvj qf " *O ci nqu" (" [cppenqwk "4225+0F kgvct { " tgecm/cpf "H_{geqtf} " *guko cvgf "cpf "y gki j gf "ctg" ewtgpvnl "vj g" o ckp" vy q" f kgvct { "cuuguuo gpv' vej pls wgu" wugf "kp" t gugctej "uwf lgu" cu'ckf "vqnu" vq" j gr "uwlgeu" tgr rkecvg" vj gk "f kgv" "kq0" vq" ucpcf ctf kug" f kgvct { "kpcng=Lgceqeng" ("Dwtng"4232+0Hqt" gzco r ng. "uwlgeu" ctg" kput wevgf " vq" tgeqtf "cm" hqf "cpf " f tkpmi" eqpuwo gf "vj g" f c { "dghqtg" Vtkn'30Vj gp" vj g { "ctg" i kxgp" c" eqr { "qh" vj g" H_{geqtf} "cpf " kput wevgf "vq" tgr rkecvg" k' r tkqt "vq" Vtkn'40C" pqvg" qh" ecwkp" ku" f wg" j gtg" ukpeg" vj g" xcrlf k{ "qh" vj g" o gvj qf "ecp" j cxg" cp" ko r cev' qp" vj g" f kgv' tgeqtf gf "qp" vj g" hktuv' qeekqp 0' Cp" wpf gt guko cvkp" qh" hqf "kpcng" qp" vj g" hktuv' qeekqp" o gcpu" vj cv' gxgp" kh" r ct vkr cpw" tgr rkecvg" gzcevn { "vj g" tgeqtf gf "f kgv" vj gtg" y kn'dg" c" f kuetgr cpe { "kp" vj g" co qwpv" qh" hqf "eqpuwo gf "dgy ggp" dqj " qeekqp 0' Vj gtghqtg. "k" ku" guugpvkn" vq" ej qqug" c" o gvj qf " vj cv' j cu" c" nqy " rxxgn" qh" o kutgr qt vki "y j gp" t { kpi "vq" ucpcf ctf kug" f kgvct { "kpcng" kp" t gugctej " uwf lgu 0' "

Gctn { "uwf lgu" j cxg" vtkgf "vq" gzco kpg" vj g" xcrlf k{ "qh" F_{tgecm} "cpf "H_{geqtf} 0Vj g" o ckp" hko kc vqp" qh" vj gug" o gvj qf u'y cu" vj g" o kutgr qt vki " *o ckpn { "wpgt/ tgr qt vki " +qh" f kgvct { "kpcng" gur gekm { "kp" qxgty gki j v' cpf " qdgug" r gqr ng" *J kn' (" F cxkgu" 4223+0' O kutgr qt vki " ku" o gcuwtgf " d { " eqo r ctkpi "vj g" tgr qt vgf "gpgti { "kpcng" y kj "vj g" gpgti { "gzi gpf kwtg" o gcuwtgf "vukpi " f qwdn { " rcdgmf "y cvgt" vej pls wg" *f g" Lapi g" gv' cr' 4229=" Vtcdwnk' (" Uej qgmgt "4223+0' Dt lghn { "k" eqpuku" qh" vj g" eqpuwo r vqp" qh" f qwdn { " rcdgmf "y cvgt" vj cv' eqpvkpu" vy q" ucdrng" kuqvr gu" f gwgtkwo " *4J + "cpf " qz { i gp/3: " *3: Q+0' Vj g" gnko kpcvqp" tvg" qh" vj gug" kuqvr gu" ku" vj gp" o gcuwtgf " d { " eqmgevki " wtkpg" uco r ngu" *cngt pcvkxgn { "ucrlxc" qt "dmqf "ecp" dg" wugf " +qxgt" vko g' 0' Vj g" eqmgevki r gkqf "xctlgu" dgy ggp" 9" cpf "43" f c { u" *f g" Lapi g" gv' cr' 4229=" Vtcdwnk' (" Uej qgmgt "4223+0' Vj g" vej pls wg" r tqxf gu" cp" cxgtci g" qh" gpgti { "gzi gpf kwtg" qh" ugxgcrn' f c { u" cpf "ecppqv" dg" wugf "vq" o gcuwtg" o kutgr qt vki "qh" c" ukpi ng" f c { 0' Vj g" ceewtce { "qh" vj ku

o gjv qf " ku" j ki j n{ " f gr gpf gpv" qp" vj g" cuuwo r vqp" vj cv" kpf kxkf wenu" ctg" y gli j vucdng" vj tqwi j qw'vj g'uwf { "Uej qgmt"3; ; 2+0"

Vj g"I qrf dgti "ew/qhh"ku"cpqvj gt"o gjv qf "wugf"y j gp"vq"o gcuwtg"o kutgr qt vpi "kp" c"rti g" r qr wv vqp" cpf " vq" j gnr " kf gpvh{ " o ku/tgr qt vtu0 Vj ku" o gjv qf " eqpuku" qh" f kxkf kpi " vj g" o gcuwtgf "gpgti { "kpvng"vukpi "c" f lgvct { "cuuguuo gpv'vej pls wg"d{ "vj g"dcuci'no gvcdrke"tcvg" gkj gt"o gcuwtgf "vukpi "kpf kgev'ecrqtlo gt { "qt" guko cvgf "vukpi "cp"gs wv vqp"*GKDO T+0Vj g" xcnwg" qdvclpgf "ku"eqo r ctgf "vq"cp" guko cvgf "r j { ulecn'ce vxxk{ "rgxgn"*RCN=" Drcem'4222=" I qrf dgti . "Drcem'gv'ci0'3; ; 3+0Vj g'cuuwo r vqp"o cf g"ku'vj cv'vj g"GKDO T"ku"gs wcn'vq"RCN0' Kk' vj g" xcnwg" qdvclpgf " ku" dgrqy " vj g" ew/qhh" *kq0' RCN+" o gcpu" vj cv' vj g" kpf kxkf wcn' ku" o kutgr qt vpi " vj gk" gpgti { " kpvng0' I qrf dgti " ew/qhh" ku" c" i qqf " vqpn' hqt" f gvev vqp" qh" o kutgr qt vpi " cv' c" i tqwr " rgxgn' dw' pqv' cv' vj g" kpf kxkf wcn' rgxgn0' Vj g" o gjv qf " j cu" r qqt" ugpukxkxk{ "cpf" qpn{ "f kxkpi vkuj gu'rti g" f gi tggu"qh"o kutgr qt vpi " *Drcem'4222+0'C"o clqt" rko kcv vqp"qh" I qrf dgti "ew/qhh"ku"vj cv'vj g"RCN"ej qugp"o c { "pqv'tgr tgugpv'vj g'tgcn'RCN"qh" vj g'r qr wv vqp"dgkpi "uwf kgf 0' I qrf dgti "et al."*3; ; 3+"htuv"uwi i gvgf "vj g"wug"qh"RCN"gs wcn' vq"30/7="j qy gxgt. "pqv'cm'uwdi tqwr u"qh"vj g"r qr wv vqp"j cxg"vj g" uco g" rgxgn'qh"ce vxxk{ 0' Vj gtghgtg. "k' j cu" dggp" tgeqo o gpf gf " vj cv' RCN" uj qwr " dg" o gcuwtgf " gur gekcm{ " kh" vj g" uco r rg'uk' g"ku"dgrqy "322"*Drcem'4222+0'Kk' uco r rg'uk' g"ku'cdqyg"322. "vj gp" uwdlgevu"uj qwr " dg"kpuxwvvgf "vq" hkn'c"r j { ulecn'ce vxxk{ "s wguvqppckg"kp"qtf gt"vq"dg"em'uukhkf "kp"vq" f khgt gpv" i tqwr u"qh"RCN0'

C"eqpukf gtedng"co qwpv'qh"rkgtcwtg"j cu"dggp"r wdrkuj gf "qp"vj g"xckf kx{ "qh'dqvj "H_{geqtf}"cpf" F_{tgecm}"vej pls wgu"kp" vj g"i gpgtcn'r qr wv vqp0' Tgugctej gtu"tgr qt vgf " c" f khgt gpeg" dgwy ggp" gpgti { " kpvng" cpf" gpgti { " gnr gpf kwtg" kp" vj g" i gpgtcn' r qr wv vqp" *pqto cni" y gli j v." qxgty gli j v."cpf "qdgug" kpf kxkf wenu+"tapi kpi "dgwy ggp"/6' "cpf "/5; ' " *Rtgpveg"gv'ci0'3; ; 8=" Nlxkpi uvpgg"gv'ci0'3; ; 2="I qrf dgti "gv'ci0'3; ; 5="I qrf dgti . "Rtgpveg."gv'ci0'3; ; 3="P gnuqp"gv' ci0'3; ; ; =Drcem'gv'ci0'3; ; 7+0Vj g'cxgtci g'rgxgn'qh'wpf gt guko cv vqp"ku'dgrkxgf "vq"dg"ctqwpf" 42' " *O gt vj "gv'ci0'3; ; 3="Nlxkpi uvpgg"gv'ci0'3; ; 2+0Vj g"gpgti { "kpvng"o gcuwtgf "kp"vj gug" uwf lgu"y cu"o clpn{ "eqo r ctgf "vq"gpgti { "gnr gpf kwtg" f gtxgf "vukpi "f qwdn{ "ncdgmf "y cvgt" cpcn{uku" f vtlpi "9"vq"57" f c { u0'J qy gxgt. "qpg" rko kcv vqp"ku"vj cv'cu"vj g" f vte vqp"qh" f cvc" eqmgv vqp" kpetgcugu." vj g" ceewtce { " qh" f lgvct { " cuuguuo gpvu" f getgcugu" *I gtuqxkx{ " gv' ci0' 3; 9: +0Hqt"gzco r rg."grkg"e { erkuv"eqo r gv kpi "qp"vj g"Vqwt" f g"Hicpeg"wpf gt/tgeqtf gf "vj gk" gpgti { " kpvng" d { "38' " vj g"htuv" y ggm' cpf " d { "57' " cv" y ggm' vj tgg"qh" vj g" eqo r gv kxqp"

*Y gungtvgr "gv'cr0'3; : 8+0'Rqqt"eqo r rkcpeg"vqy ctf u"vj g"gpf "qh" c"mipi "vgo "uwf { "o ki j v" j cxg"cp'ko r cev'qp"vj g'cxgtci g'gpgti { "kpcng."j gpeg'tgf weg'ceewtce{0"

O kpg"et al."*3; ; 3+"cnuq"tgxgcnf "vj cv'uwdlgeu"uki pkkecpw{ "wpgt/tgr qtvgf "gpgti { "kpcng" qp"vj g"ugeqpf "y ggm'qh"cuuguu gpv'eqo r ctgf "v"vj g"htuv"chgt "qdugt xkpi "c"tgf wekqp"kp" gpgti { "kpcng"y j kg"gpgti { "gxr gpf kwtg"cpf "dqf { "o cuu"uc {gf "vj g"uco g'O O kpg" et al." uwi i gungf "vj cv'uwdlgeu"o ki j v'dgeqo g"vktgf "qh"nggr kpi "c"y gli j gf "H_{geqtf} "hqt"y q"y ggm" y j lej "ecwugu"wpf gt/tgr qt vpi O'Qp"vj g"qvj gt"j cpf."y j gp"fkvkkcpu"cuukvgf "cyj rvgu"kp" y gli j kpi "cm'hqf "eqpuwo gf "qxgt"7"fc{u."Ul^{3/4} k" et al."*3; ; 6+"tgr qtvgf "c" f kuetgr cpe{ " dgw ggp"gpgti { "kpcng"cpf "gxr gpf kwtg"qh'2' O'cm'vj gug'kpf kpi u'awi i guv'vj cv'vj g'pwo dgt" qh'fc{u'tgeqtf kpi "qxgtguwo cv"vj g"wpf gt/tgr qt vpi "d{ "tgugtej "uwdlgeu'Vj gtghgt."vj g" o ku/tgr qtvgf "rgxgm"qdugt xgf "kp"uwf kgu"wkpi "o wnr rg/fc{u'fkgvct {"cuuguu gpw"o c{ "pqv" dg'tgr tguvkvxg"qh'vj g"xcrk kv{ "qh"qpg"fc{ "cuuguu gpw'O'Qp"vj g"qvj gt"j cpf."y j gp"uwf kgu" wug"cv'uj qtvgf "eqmgevkv"r gkqf "v"cxqkf "vj g'f getgcug"kp"kvgt guv'qh'r ct vkr cpw'kp'tgeqtf kpi " hqf "kpcng."tgugtej gtu" hceg" c" pgy "r tqdrgo O'Ucy c{c" et al."*3; ; 8+"kpxguki cvgf "vj g" ci tggg gpv'dgw ggp"gpgti { "gxr gpf kwtg"wkpi "f qwdn{ "rdgmgf "y cvgt"cpf "gpgti { "kpcng"qp" y q"qecukqpu"wkpi "46/j qwt"F_{tgecm}O'I qqf "ci tggg gpv'y cu"qdugt xgf "dgw ggp"qvcr'gpgti { " gxr gpf kwtg"*; 0 4"O l'r gt"fc{ "+cpf "fkgvct {"kpcng"qdvkpgf "htqo "vj g"htuv"F_{tgecm}"*; 0/8"O l" r gt" fc{ +0' k" eqpvcuv." qp" vj g" ugeqpf " qecukq." fkgvct {" kpcng" *9069" O l" r gt" fc{ + uki pkkecpw{ "f khtgf "htqo "vj g"htuv"qecukq"cpf "qvcr'gpgti { "gxr gpf kwtg'O'Vj ku"ku"fwg"vq" vj g"fc{/vq/fc{ "xctkcvkp"qh"gpgti { "kpcng"y j lej "ku"45' " *P gnuqp"gv'cr0'3; ; ; =Dkpi j co " 3; : 9+0'

Vj g'nti g'xctkcvkp"kp"wpf gt guko cvkp"qh'hqf "kpcng"eqwf "dg"cwtkdwgf "v" f khtg pgegu"kp" r j { ukcr'cpf "r u{ej qm i kcr'ej ctcevt kveu"qh'r ct vkr cpw'uwej "cu"dqf { "o cuu'kpf gz " *DO K." cf kr qukv{ "fkgvct {"tgutckpv" *Drcem'gv'cr0'3; ; 7=Nchc {"gv'cr0'3; ; 9+"cpf "uqekq/geqpqo ke" ucwu" *Lqj puqp"gv'cr0'3; ; ; +0'Hqt"gzco r rg."DO Kj cu'dggp"uj qy p"v"dg"j ki j n{ "eqttgrv" y kj "wpf gt/tgr qt vpi " *Mtgvej "gv'cr0'3; ; ; =Vqo q{ cuw'gv'cr0'3; ; ; +0'Mtgvej "cpf "eqmgci wgu" tgr qtvgf "vj cv'wpf gt/tgr qt vpi "kp"qdug"y qo gp"y cu"fqwdrg"vj cv'qh"pqto cr'y gli j v'y qo gp" *42' "cpf "32' ".tgur gevkn{ +0'kpf kxf wcu'y kj "kpetgcugf "cf kr qukv{ "ctg"cnuq"o qtg'rkng{ "v" wpf gt/tgr qt v'vj cp"vj gk"rgcpgt "eqwpvgr ctw" *J gko cpp"3; ; 5=Nchc {"gv'cr0'3; ; 9=Lqj puqp"gv' cr0'3; ; ; +0'Vy q"o clp"hcvtu"eqpvdwv"v"vj g'wpf gt guko cvkp"qh'fkgvct {"kpcng"<3+"wpf gt/" tgeqtf kpi "qt" otgr qt vpi " *f grkdtcv"qt" uwdeqpuekwu" cpf "4+" wpf gt/gc vpi " *ugg"ugevkv" 304B+0' Vj g"htuv"hcvt" kpenf gu"o kutgr qt vpi "s wcpvkv"cpf "f guetkr vqp"qh'hqf "kgo u"

eqpuwo gf "Dwtng"4223d-0' O qtgqxtg."uqo g"uwdlgevu"kpceewtcvgn{ "tgr qtv"lqqf "kgo u"vj cv'
 ctg"uwuwm{ "r gteglxgf "cu"wpj gcmj { "O gt v "3; ; 4=Uej qngt "3; ; 2-0'C"ncm'qh'o qvxcvqp
 eqwf "cnuq"rgcf "v"o kutgr qtvpi "gur gekm{ "y j gp"uwdlgevu"ctg"cumgf "v"nggr "c"H_{geqtf} "qxgt"
 ugxgcnf c { u'qt'y ggm0'Wpf gt/gcvpi ."qp"vj g"qvj gt"j cpf ."o ki j v'qeewt "f wg"v"vj g"lpetgcugf "
 dwtf gp"qp"r ctvkr cpw"y j gp"vj g{ "ctg"cumgf "v"nggr "c"H_{geqtf} "O kpg"gv'cr0'3; ; 3-0'Vj gk"
 dgj cxkwt"o ki j v'dg"cngtgf "d{ "cxqf lpi "o qtg"eqo r rgz "lqqf "vj cv'ctg"fkhlwv"v"tgeqtf "
 *J km{ ("F cxkgu"4224=Uej w{ "gv'cr0'3; ; 4-0'Hq"kpucpeg."vj ku"o ki j v'rgcf "v"y gki j v'nuu"
 y j lej " y cu" qdugt xgf " kp" o cp{ " npi " vgo " uwf lgu" kpxguki cvpi " f lgvct { " cuuguu gpw"
 *Uqemg{ "3; ; 7=O kpg"gv'cr0'3; ; 3-0'Uqo g'r ctvkr cpw"o ki j v'gxgp"lqf "k'cp"qr r qtwpk{ "
 hqt "f lgvpi *J km{ ("F cxkgu"4223-0'

P qvlegcdn{ " dgwgt" ci tgggo gpw" dgwy ggp" gpgti { " kpcng" cpf " gZR gpf kwtg" *2" vq" 35' "
 f khtgpeg+y gtg"qdugt xgf "k'vtckpgf "cvj ngvu"eqo r ctgf "v"vj g'i gpgtci'r qr wcvkp "Lqpgu{ "
 Ngkej "3; ; 5=Y guvgtvtr "gv'cr0'3; ; 8=Uej w{ "gv'cr0'3; ; 4=U³/₄ k"gv'cr0'3; ; 6=F cxkgu"gv'cr0'
 3; ; 9-0'J qy gxgt."c"pwo dgt"qh'uwf lgu"y gtg"cdng"v"lqf "uki pklcpv'f kuetgr cpekgu"dgwy ggp"
 gpgti { " kpcng" tgr qtvf " cpf " gpgti { " gZR gpf kwtg" o gcuwgf " kp" uqo g"i tqw u" qh" cvj ngvu."
 o kpn{ "hgo cng" *Vtcr r g"gv'cr0'3; ; 9=Gf y ctf u"gv'cr0'3; ; 5=J km{ ("F cxkgu"4224-0'Ugxgcn'
 hcevqu"o ki j v'j cxg"eqptkdwgf "v"vj ku"r qqt"ci tgggo gp0'Hgo cng" cvj ngvu"uwuwm{ "tgr qtv"
 ny gt"gpgti { " kpcng" *Dglf rgo cp"gv'cr0'3; ; 7=Gf y ctf u"gv'cr0'3; ; 5=Uej w{ "gv'cr0'3; ; 4+
 gur gekm{ "vj qug"cnkpi "r ctv'lp"y gli j v'eqpuekwu"ur qt'u'uwej "cu"i { o pcvku" *Hqi grj qm "gv'
 cr0' 4229+" cpf " y j qo " j cxg" r tqdrgo u" y kj " vj gk" dqf { " ko ci g" *Dwtng" 4223d-0' F lgvct { "
 cuuguu gpw"eqpf wvfg "f wtkpi "r gtlqf u"qh"lpetgcugf "vtckkpi "xqno g"ecp"lpetgcug"wpf gt/
 tgr qtvpi "cu"y gm" *Xcp" Gwgp"gv'cr0'3; ; 9-0'k"cf f kkp."c"tgxky "r wdrkuj gf "k"4225"tgxgcnf "
 vj cv"cu"gpgti { " gZR gpf kwtg" lpetgcugu."wpf gt/tgr qtvpi "lpetgcugu"kp" cvj ngvu" *O ci nqu{ "
 [cpcnqwk"4225-0'K"o ki j v'dg"vj cv'cvj ngvu"y kj "j ki j "gpgti { " kpcng"lqf "k'f khlwv"v"
 tgo go dgt"qt"v"tgeqtf "cm"o gcu."upcemu."cpf "f tkpm"eqpuwo gf "qxgt" c"46/j qwt"r gtlqf "qt"
 npi gt "Dwtng"4223c-0'Qxgtem"O ci nqu"cpf "[cpcnqwk" *4225+"eqpenf gf "vj cv'vj gtg"y cu"
 c"utqpi "r qukkxg"eqttgrvkv" *t" ? "0 65."p">"023+"dgwy ggp"gpgti { " kpcng"cpf "gZR gpf kwtg"kp"
 cvj ngvu0' Vj g" gxf ppeg"htqo "cm" vj gug"uwf lgu" qp" cvj ngve" cpf " pqp/cvj ngve" r qr wcvkpu"
 uwi i guu"vj cv'vtckpgf "o cng"cvj ngvu"ecp"tgeqtf ltecm'f lgvct { " kpcng"y kj "c"eqpukf gtcdrng"
 r tgeklqp0""

"
 "

1.3.2 Replicating usual diet

ƁƁ" y gm/eqpvtqmgf " etquuxgt" f guki p" uwf lgu." r ctvkr cpvu" ctg" cunf " vq" eqpuwo g" vj gkt" j cdkwcn'f lgvct { "Ɓvcng"r tkqt"vq"vj g'htuv'vkn'cpf "vj gp"vq"tgr rdecv"vj g"uco g"flgv'r tkqt"vq" gxgt { "uwdugs wgpv' vkn'F lgv'tgr rdecvƁp"ku" wugf "vq"r tngxgpv' xctkdkk{ "Ɓ" f lgvct { "Ɓvcng" y j lej "ecp'cf f "pqkug"vq"vj g'tguwu'qh'c"uwf { "Lgceqeng"("Dwtng"4232-0Tgugctej gtu"o c{ "wug"F_{tgecm}"cpf "H_{geqtf}"*guvko cvgf "qt"y gki j gf "+"vej pls wgu"cu"cp"ckf "vqqr"vq"j gr "uwdlgevu" tgr rdecv"vj gkt" f lgv'Ɓ gcm{ . "tugctej gtu"uj qwf "wug"vj g"i qrf "ucpf ctf "ucpf ctf kugf "f lgvø" y j lej "eqpuku'qh'r tqxf Ɓpi "r tg/r cenæi gf "o gcu"vq"r ctvkr cpvu0"

"

1.3.2.1 Standardised diet

Tgugctej gtu" r tqxf g" uwdlgevu" y kj " cm' vj gkt" hqf " tgs vktgo gpw" ƁƁ" cf xcpeg" qh' vguvƁi " *uwcm{ "3"vq"5"fc {u'0Vj g"r tg/r cenæi gf "o gcu"i kxgp"r tkqt"vq"gej "vkn'ctg"kf gpvkn'ƁƁ" vj gkt" gpgti { "cpf "o cetqpwtlgpv'eqvgpw"cpf "ƁƁ kxf wcnkugf "vq"o ggv'r ctvkr cpvu" f ckn{ " tgs vktgo gpw" *Twj gthqtf " gv' cr0'4232-0Vj g"r tg/r cenæi gf "o gcu"r tqxf gf "uj qwf "cnuq" ceeqwpv'ht"hqf "r tghgtgpegu0J qy gxgt. "Ɓ"uqo g"ecugu."o gcu"ecp"dg" f hgtgpv'ƁƁ"eqvgpw" y j gp"vj g"ƁvtxgpvƁp"eqpuku'qh'f lgvct { "o cƁr wvƁp" *O qpecf c/Lko gpg| "gv'cr0'422; -0' Hqt"Ɓucpeg."uqo g"uwf lgu"r tqxf g"c"ucpf ctf kugf "o gcu"j qwu'dghqtf"vj g"gzr gtko gp'0'Ɓ"ku" r tqxf gf "gkj gt"cu'ucpf ctf "dtgcnhcuv'qt"upceni*Dgggp"gv'cr0'422; -0"

Qpg"qh"vj g"ng{ "cf xcpvi gu"qh"ucpf ctf kugf "f lgv"*U_{fgv}"vej pls wg"ku"ku"j ki j "eqo r rkepeg" tcvg."y j lej "tgf wegu"vj g'xctkdkk{ "Ɓ"gpgti { "cpf "o cetqpwtlgpv'Ɓvcngu" *Lgceqeng"("Dwtng" 4232-0Vj g'dgwt"vj g'tgr gcvdkk{ "qh"vj g"vej pls wg."vj g'uo cmgt"vj g"co qwpv'qh'pqkug"Ɓ"vj g" tguwu" *Lgceqeng" (" Dwtng" 4232-0Vj ku" vej pls wg" cnuq" o cngu" kv" ku" gcukgt" vq" ej gem' eqo r rkepeg" qp" vj g"uco g"fc {0'Tgugctej gtu"eqwf " gkj gt" wug" c" ej gemkuv" qt"y gki j " vj g" rghqxtu"vq"ecræwv"vj g"cewcn'co qwpv'qh'hqf "eqpuwo gf 0Vj g"r tg/r cenæi gf "o gcu"ecp" dg"r tgr ctgf "vq"uwk'ƁƁ kxf wcn'pggf u"cpf "tgs vktgu"pq"ghqtv'htqo "uwdlgevu0Vj g"htgg"r tg/ r cenæi gf "o gcu"r tqxf gf "f wƁi "vj g'uwf { "o ki j v'cwtevuqo g'r ctvkr cpvu"vq"vng"r ctv0"

Equv'cpf "vko g"qh'r tgr ctvƁp"ctg"vj g"vy q"o cƁ" f luv xcpvi gu"qh"U_{fgv}0Vj g"equ'ecp"xct { " uki phtecpv{ "f gr gpf Ɓpi "qp"vj g"v{r g"cpf "s wcpv{ "qh'hqf "r tqxf gf 0Vj ku"o gvj qf "ku"vko g" eqpuwo Ɓpi "cu"y gn0Tgugctej gtu'pggf "vq"ur gpf "vko g"v"dw{ "vj g'hqf "kgo u."ew'cpf "y gki j " cm'hqf u"Ɓ"ur gekke"r qt vƁp"uk gu."cpf "r cen'vj go "Ɓ"dqz gu"cpf "r rævke" dci u0Gzr gt vku"ku"

cnuq"tgs wktgf "lp"qtf gt"vq"o gcuwtg"vj g"fgvct {"tgs wktgo gpvu"qh"gej "uwdlgev"cpf "vj gp"r rcp"c" fkgv"vj cv"o ggvu"vj gk"pggf u0Vj g"vej pls wg"o ki j v"vqngtcvg"rkwg"hgzkdkk\ "lp"o gcn'r rcpkpi " gur gekm{"lp"ecug"uwdlgevu"uwhtg"htqo "cmgti {"qt"lpvqngtcpeg"vq"cp {"qh"vj g"hqf "kgo u" r txxkf gf 0' Vj gug" uwdlgevu" o ki j v' pggf " vq" dg" gzenmf gf " htqo " vj g" uwf {" j gpeg" mqukpi " r ctvkr cpw0Vj g"fgv"o ki j v'dg"uki pkklecpv\ "f khtgtpv"vj cp"vj g"j cdkwcn'f kgv"qh'uwdlgevu" y j lej "ecp"etgcvg'f kueqo hqt0Rctvkr cpw'y km'cnuq"pggf "vq"o cmg"gz ttc'xkuku"vq"eqmgev"vj g" r tg/r centi gf "o gcn'lpetgculpi "vj g"dwtf gp"qp"vj go 0'Kp"uqo g"ecugu."r ctvkr cpw"o ki j v' eqpuwo g"cf f kkkpcn'hqf ="vj gthqtg."r ctvkr cpw"uj qwf "dg"kpwtwevgf "vq"tgeqtf "qp"c"hqf " fkt {"uj ggv"cp {"f gxcvkqp"htqo "vj g"fgv0Vj ku"o gvj qf "o wuv'dg"wugf "y j gp"fgv"j cu"i tgcv' kphwpeg" qp"vj g"kpvtxgpvkp"qt"r gthqto cpeg0' O qtgxgt."y j gp"vj g"gzr gevfg" ghhev"ku" uo cm'cpf "cp"gpj cpegf "tgrkdkk\ "ku"tgs wktgf 0'K'ku"cnuq"wugf "y j gp"vj g"tgs wktgf "tguqtegu" ctg" cxckrdng" uwej " cu" hwpf kpi ." vko g." unkmf " tgugetej gtu." cpf "hqf " r tgr ctvkr" ctgc" *Igeqeng"('Dwtng"4232+0'

"

1.3.2.2 Food record

Rctvkr cpw'ctg'cungf "vq"tgeqtf "cm'hqf u'cpf "hmkf u'eqpuwo gf "qpg"vq"vj tgg'f c {"u'dghqtg"vj g" htu"gzr gtlo gpvcn'tkcn'lp"c"hqf "fkt {"0'Rctvkr cpw'ctg"kpwtwevgf "vq"dtkpi "vj g"hqf "fkt {" qp"fc {"3"y j gtg"kv"y km'dg"ej gengf "s wrkxcvkg\ "d {"tgugetej gtu"ht"o kuupi "qt"lpeqo r ngv" f cv0Vj gp"vj g {"y km'dg"kpwtwevgf "vq"tgr rncv"vj g"fgv'r tkqt "vq"gxgt {"uwdugs wgpv'tkcr0"

Kpwtwekpu" qp"j qy "vq"eqo r ngv" c"hqf "fkt {" ctg"pqto cm {"i kxgp"vq" r ctvkr cpw"vq" ko r txxg"cewtce {"0' C"uco r ng"hqf "fkt {"eqwf "dg"i kxgp"vq"i wkf g"r ctvkr cpw"qp"vj g" co qwp"qh"fgcku"vj g {"uj qwf "dg"kpemf kpi 0' Vj g"hqf "fkt {"ku"fkxf gf "lpv"ugxgtcn' ugevkpu0'Rctvkr cpw"j cxg"vq"tgeqtf "vj g"vko g"cpf "r meg"y j gtg"hqf u"cpf "f tkpmu"y gtg" eqpuwo gf 0'F gvcku"cdqw"vj g"dtcpf "pco g."eqqkpi "cpf "r tgr ctvkr"o gvj qf u'uj qwf "cnuq"dg" kpenmf gf 0' Hkpcm {"r qtvkp"uk g"qt "s wcpv\ "gcvgp"uj qwf "dg"tgeqtf gf "lp"fgcku" wulpi " j qwugj qrf "o gcuwtgu"*g0' ur qppu."ewr u."cpf "dqy nu+."kp"y gki j v"*g0' tgeqtf gf "qp"r cengf " hqf "kgo u+."cpf "lp"fk g"pukpu"*Drcem'4223+0' C"hqf "cvru"ecp"dg" wugf "vq"ko r txxg"vj g" cewtce {"qh"vj g" guko cvkq0' C"hqf "cvru"ku" c"uo cm'dqqmgv"vj cv'eqvckpu"r kwtgu"qh" f khtgtpv" r qtvkp" uk gu" qh' f khtgtpv" hqf "kgo u" *Cvnpuqp" gv' cr0' 4224+0' J qy gxgt." kptqf wekpi "c"hqf "cvru"y km'lpetgcug"vj g"equv"qh"vj g"uwf {"*equv"qh'dqqmgv+cpf "ku"rko kgf " lp"vj g'pwo dgt"qh'hqf "kgo u'kpenmf gf "*g0' 095'hqf "kgo u'lp" C vnpuqp"et al."4224+0"

Vj g"y gli j gf "H_{geqtf} "ku"cnuq" wugf "kp"tgugctej "cpf "ku" c"o qtg"ceewtcvg"vgej plks wg"vj cp"vj g" guko cvgf "H_{geqtf} "f guetldgf "gctrktg0'Rctvlekr cpw"ctg"cumgf "vq"y gli j "cpf "tgeqtf "cm"hqf "eqpuwo gf "wukpi "c"uecng."y j kng'hmkf "kpveng" wukpi "o gcuwtkpi "ewr u0'Rctvlekr cpw"ctg"cumgf "vq" y gli j v'cpf "tgeqtf "vj g"nghqxgtu"cu"y gm" *O ci nqu" ("[cppcnqwk"4225+0'Rj qvqi tcr j ke" H_{geqtf} "j cu" dggp" tgegpw{ "kpvqf weg" vq"ko r tqxg" vj g" ceewtce{ "qh" vj g" tcf kkpccn" H_{geqtf} " o gvj qf "dcugf "qp"r gp"cpf "r cr gt" *Uo cm'gv" cr0'422; +0'Rctvlekr cpw"ctg"r tqxkf gf "y kj "c" eco gtc"cpf "c"hqf "f kct {0'Vj g{ "ctg"cumgf "vq"tgeqtf "cpf "vcmg" c"r lewtg"qh"cm"hqf u"cpf " ftkpm"eqpuwo gf 0'Vj ku"o gvj qf "j gr u"ko r tqxg"fcw"cpcn{uku'd{ "r tqxkf kpi "tgugctej gtu"y kj " o qtg"kphto cvkp"cdqw"vj g"r qtvkp"uk g"eqpuwo gf 0'J qy gxgt. "vj ku"vgej plks wg"cf fu"gztc" dwtf gp"qp"uwdlgeu0'Rlewtgu"uj qwf "dg"ecr wtgf "htqo "c"egtckp"fkxpep"cpf "cpi ng"htqo " vj g"hqf "kgo "qt"r rvg0'k"cf f kkp. "c"uo cm'twrgf "vcdng"emj "qt"twrgt "pggf u"vq"dg" wugf "hqt" ueckpi "r wtr ugu0'Vj g" wug"qh"r j qvqi tcr j ke"tgeqtf "o ki j v'chgev"vj g"gcvkpi "dgj cxkwt"qh" uwdlgeu"cpf "tgf weg"eqo r rkepeg"y j gp"ugxgtcn'f c{u"qh" H_{geqtf} "ctg"tgs wkt gf " *Uo cm'gv" cr0' 422; +0'

kp"uqo g"ecugu."f kgv"j cu"pq"qt"ny "ko r cev"qp"vj g"qweqo gu"qh" c"uwf {0'Eqpugs wgpw{." r ctvlekr cpw"ctg"cumgf "vq"nggr "c" H_{geqtf} "46/j qwt"dghtg"gej "tkcn'y kj qw'tgr rckvkpi "k0'Vj g" f kctkgu"ctg"vj gp"cpn{ugf "cv"vj g"gpf "qh"vj g"uwf { "cpf "wugf "vq"gzr rckp"cp{ "wpgzr gev" tguwu" *Uej wo o "gv"cr0'422: +0'Vj ku"r tceveg"o c{ "ngcf "vq"rti g"xctk vkpu"kp" f kgvt { "kpveng." j gpeg"j ki j gt"tkm'qh'pqkug"kp"vj g"tguwu0"

Vj g"hqf "tgeqtf "vgej plks wg"ku"eqpukf gtgf "nguu"gzr gpukxg"vj cp"vj g"U_{fkgv}"cpf "cmjy u"uwdlgeu" vq"hmjy "vj gkt"j cdkwcn"kpvcng0'k"cf f kkp."wprkng"vj g"46/j qwt "F_{tgem}"vgej plks wg."k'tgrku" nguu"qp"o go qt{ "tgf welpi "vj g"pwo dgt"qh"htqti qwgp"hqf " *Vj qo r uqp" ("D{gtu"3; ; 6=Drcem' 4223=Igcqeng" ("Dwtng"4232=O ci nqu" ("[cppcnqwk"4225+0'J qy gxgt."hqf "tgeqtf u" o c{ "pqv'cny c{u'tghgev"vj g"r ctvlekr cpw"uwcn'f kgvt { "kpveng0'Vj g"cy ctgpguu"qh"tgeqtf kpi " hqf "kpveng"o ki j v'cngt"vj gkt"gcvkpi "dgj cxkwt0'k"cf f kkp."uwf lgu"j cxg" f guetldgf "ny " eqo r rkepeg" tcv" y j gp" vj g" fwtckp" qh" vj g" H_{geqtf} "gzeggf u" vj tgg" f c{u0' Rqukdng" wpf gtguko cvkp"eqwf "tguwu"y j gp"uwdlgeu"htqti gv"vq"tgeqtf "hqf "eqpuwo gf "qt"fwg"vq"vj g" f kkwem"kp"guko cvkpi "r qtvkp"uk gu0'Vj ku"o gvj qf "j gcxk"tgrku"qp"j qpgu"0'Hqf "uggp"cu" -wpj gcnj {0'o c{ "pqv'dg"tgeqtf gf 0'Rqukdng"xctkdkk"eqwf "cnuq"tguwu"y j gp"uwdlgeu"ctg" cumgf "vq"tgr rckcv"vj gkt"hqf "f kct {0'Hkpcn{."vj g"o gvj qf "ku"ko g"eqpuwo kpi "fwg"vq"vj g"pggf " qh"cpn{ ukpi "cm"vj g" f kctkgu" *Vj qo r uqp" ("D{gtu"3; ; 6=Drcem'4223=Igcqeng" ("Dwtng" 4232=O ci nqu" ("[cppcnqwk"4225+0'k"uwo o ct{."vj g"hqf "tgeqtf "vgej plks wg"uj qwf "dg"

wugf "y j gp"3+"nti g"ghgeV"ku"gzr gevff ."4+"vj g"f kgv"j cu"my "ko r cev"qp"vj g"kpvtxgpkqp."5+"
dqvj "ko g"cpf "hwpf kpi "ctg"tgutkevff ."cpf "6+"vj g"eqpuwo r vkqp"qh'r tg/r centi gf "f kgv"ku"pqv"
r quukdg"ff wg"vq"vj g"rceni"qh"uvtci g"hcckkkgu0

"

1.3.2.3 Dietary recall

C"46/j qwt"F_{tgecm}"kpvtxky "ku"eqo r rvgvf "qp"vj g"htuv"fc {"qh"vukpi 0Rctvlekr cpwu"ctg"cumgf "
vq"rkuv"cm"hqf "cpf "f tkpm"eqpuwo gf "qxtg"vj g"r cuv"46"j qwtu0'S wguvqpu"cumgf "f wtkpi "vj g"
kpvtxky "kpenmf g" ko g."co qwpv" cpf "f guetkr vkqp" qh"hqf "qt" f tkpm"eqpuwo gf ."cpf "vj g"
r tgugpeg"qh"cp {"ghqxtgu0Rctvlekr cpwu"ctg"vj gp"i kxgp"ceqr {"qh"vj g"fk gv"vq"tgr rkecvg"kv'r tkqt"
vq"gxgt {"uwdugs wgpv"tkrf0"

Vj g"o wnr rg/r cuu"o gj qf "hqt"46/j qwt"F_{tgecm}"j cu"dggp"ff gxgnr gf "d {"vj g"WU0F gr ctwo gpv"
qh"Ci tlewnwtg"*WUCF +"vq"ko r tqxg"vj g"cewtce {"qh"vj g"vtf kkpncn"F_{tgecm}"ff guetkdgf "gctrkt0"
Vj g"o wnr rg'r cuu"o gj qf "eqpukru"qh"7"uvr u<"

3+"Eqo r rvg"ce"skem"ku"qh"hqf "eqpuwo gf "wukpi "vj g"r ctvlekr cpwu"qy p"tgecm"utcvgi lgu0"

4+"Tgo kpf "vj g"r ctvlekr cpwu"qh"htq qwgp"hqf "dcugf "qp"pkpg"ecvgi qtkgu"qh"hqf 0"

5+"Ej tqpqmi kecm {"f kur m {"vj g"ko g"cpf "pco g"qh"vj g"qeecukqpu0"

6+"Cunlcdqvw"vj g"fkckl"qh"vj g"hqf "eqpuwo gf "kpenmf kpi "f guetkr vkqp"cpf "co qwpv0"

7+"Eqo r rvg"ce"hpncn"r tqdg"vq"tgecm"hqf "vj cv"vj g"uwlgev"o c {"dg"eqpukf gtgf "pqv"y qtvj "
o gpvkpkpi 0"

Vj g"clo "qh"vj ku"o gj qf "ku"vq"o kpk kug"vj g"co qwpv"qh"htq qwgp"hqf "cpf "vq"ucpf ctf kug"vj g"
s wguvqpu"cumgf "f wtkpi "vj g"kpvtxky "dgy ggp"cpf "y kj kp"uwlgevu"O quj hgi j "gv"cr0422: +0"
Ugxtcn"uwf lgu"j cxg"o gcuwtgf "o kutgr qt vki "wukpi "vj g"o wnr rg/r cuu"o gj qf "cpf "hqwpf "
vj cv"vj g"fkhtgpeg" dgy ggp" gpgti {"g zr gpf kwtg" cpf "kpveng" y cu" dgy ggp"3" cpf "36' "
*Eqpy c {"gv"cr04226=Two r ngt"gv"cr0422: =O quj hgi j "gv"cr0422: =Uwdct"4225=Vqq| g"gv"cr0'
4226+0' Vj gtg" y cu" qpg" eqo o qp" hcevqt" dgy ggp" uwf lgu" y j q" tgr qt vgf "j ki j "rgxgnu" qh"
fkhtgpeg" y j lej "ku" DO K' Cu" o gpvkpfgf "gctrkt." DO K'j cu" dggp" uj qy p" vq" dg" j ki j n"
eqttgrcvgf "y kj "wpf gt/tgr qt vki "Migwej "gv"cr03; ; ; =Vqo q {cuw"gv"cr03; ; ; +cpf "vj cv"y cu"
cnuq"ff go qpwtcvgf "kp"uwf lgu" wukpi "vj g"o wnr rg/r cuu"o gj qf "Uwdct"4225=Vqq| g"gv"cr0'

4226+0'Kp"eqpvtcuw."kpf kxkf wenu"y kj "pqto cr'dqf { "o cuu"wpf gtguko cvgf "f kgvct { "kpveng"d { " qpn{ "5' "3' "k'p'o gp'cpf '8' "k'p'y qo gp+0"

Uko kct "vq"H_{geqtf}"*ugg"ugevqp"30504+."y j gp"f kgv'j cu'pq'qt'my "ko r cev'qp'vj g'qweqo gu."c" 46/j qw"F_{tgecm}"o ki j v'dg"eqpf wevgf "v"cuuguu"hqf "kpveng"dghqtg"gej "tkn'y kj qw'cp { " tgr rdecvkqp"*Dqpf "gv'cr'0'4234+0'Vj g"tgecm"ctg"vj gp"cpn{ugf "cv'vj g'gpf "qh'vj g"uwwf { "vq" gZR rkp"cp { "wpgZR gevfg "tguwu'0'Vj ku'r tceveg"ngcf u"v"rti g"xctkcvkpu"kp"f kgvct { "kpveng" j gpeg"j ki j gt'tkum'qh'pqkug"kp'vj g'tguwu'0"

Vj g"f kgvct { "tgecm'vej pls wg"ku"kpZR gpukxg"cpf "cmjy u r ctvek cpw"v"hmjy "vj gk"uwcn' f kgv'y kj qw'chgevp "k'0'ci nqu"("[cpcnqwk"4225+0J qy gxgt."vj ku'vej pls wg'tgs wktgu" ur gekn'gZR gtvug"v"eqpf wev'vj g"kpvtxky u"cpf "vj gp"cpn{ug"cm'vj g"f cvc'0'hw'vj gto qtg."k' tgrku"qp"r ctvek cpw"o go qt { "v"tgo go dgt"y j cv'y cu'eqpuwo gf "qp'vj g'fc { "dghqtg"cpf " vj gk"j qpgw{ "cu'y gm'0'Rctvek cpw"o ki j v'kpf "k'f k'k'ewv"v"tgr rdecv"vj g"f kgv'dghqtg"gej " tkn'wupi "vj g"F_{tgecm}"uj gg'0'Vj ku"o ki j v'ngcf "v"xctkdkk{ "k'p"gpgti { "cpf "o cetqpwtkgpv" kpveng'0' k'p"cf f kxkp." r ctvek cpw"j cxg" c" vgpf gpe { "v"wpf gtguko cvg" F_{tgecm}"f wtkpi "vj g" kpvtxky "0'Vj qo r uqp"("D{gtu"3; ; 6="Drcem"4223="Igeceqeng"("Dwtng"4232="O ci nqu"("[cpcnqwk"4225+0Kp"uwo o ct { "vj ku"o gvj qf "ku"wugf "y j gp"3+'rti g'ghgev'ku"ZR gevfg."4+ vj g"f kgv'j cu'my "ko r cev'qp'vj g'kpvtxgpvkqp."5+'dqj "ko g'cpf 'hwpf kpi "ctg'tgutkevfg."cpf "6+ vj g'eqpuwo r vkp'qh'r tg/r cenai gf "f kgv'ku'pqvr quukdr'f wg"v'vj g'rcem'qh'uvtci g'hekkkkuo "

1.3.2.4 Dietary prescription

Vj g"f kgvct { "rtguetk vkp"vej pls wg"ku"uwcm{ "wugf "y j gp"tugctej gtu"ctg"vcti gvki "qpg"qt" o qtg"ur gekk"pwtkpv"vj g'fc { u'r tgegf kpi "vj g"tkn"0'lgceqeng"("Dwtng"4232+0'Vj gtg"ctg" f khtgpv'uegpctku'y j gtg'vj ku"o gvj qf "ecp'dg'cr r rkgf "v'0'ht"gzco r ng."c'ruk'qh'hqf "tlej "k" ectdqj { ftcv'ku"i kxgp"v"j gr "r ctvek cpw"tgej "c"ur gekk"vcti gv'qh'ectdqj { ftcv'kpveng'0' Vj g'ruk'eqpvkpu'r qtvkp"uk' gu'qh'hqf "kgo u"cpf "vj gk"ectdqj { ftcv'eqpvgp'0'Rctvek cpw" ctg"kpvtwevgf "v"nggr "c"hqf "f kct { "u"tugctej gtu"ecp"ej gen'ht"eqo r rkp'eg'0'Kp"eqpvtcuw." vj g"f kgvct { "rtguetk vkp"o gvj qf "ecp'dg"wugf "v"j gr "uwdlgeu"cxqk "qpg"qt"o qtg"pwtkpv" npqy p"v"kpvtgthg"y kj "vj g"kpvtxgpvkqp"*lgceqeng"("Dwtng"4232+0'Vj wu."r ctvek cpw"ctg" i kxgp"c'ruk'qh'hqf u"v"cxqk "0'c'ruk'qh'hqf "vj cv'eqpvkpu'echh'kpg+0"

Vj g"vej pls wg"j cu"my "equ"cpf "j gr u"tgugtej gtu"v"eqpvtqn"ur gekhe"lqqf lpwtlgpv"lp"vj g" f kgv"Rctvlekr cpw"ctg"cdrg"v"equpuwo g"lqqf u"vj g{"wuwcm{"gcv"cpf"y km"i kg"vj go "vj g" hgzkdkrk{"qh"ej qqulpi "ltqo "vj g"rkuv"qh"lqqf u"*Lgceqeng"("Dwtng"4232+0"Vtcklpi "qp"j qy " vq"r rcp"vj g"fkgv"cpf "wug"vj g"rkuv"ku"pggf gf "cpf "gZR gt vkg"y km'dg"pggf gf "vq"cpn{ug"vj g"lqqf " f kctkgu"ht"eqo r rkepeg"Vj g"vej pls wg"ecp"ngcf "vq"j ki j "xctkdkrk{"lp"vj g"v{r g"cpf"co qwpv" qh"gej "lqqf "equpuwo gf "r tkqt"v"gxgt {"v kcn"fg"vq"fkhtgpegu"lp"lqqf "ej qlagu"cpf "ecp"cf f " cf f kqpcn"equ"vq"r ctvlekr cpw"vq"dw{"egtckp"lqqf "kgo u"rkvgf "qp"vj g"rkuv" *Lgceqeng"(" Dwtng"4232+0"Kp"uwo o ct{. "vj ku"vej pls wg"ku"wugf "y j gp"3+"rti g"ghgev"ku"gzr gevdf ."4+" Rctvlekr cpw"ctg"y kmkpi "vq"r w"gzvtc"ghqtv"vq"r rcp"vj gkt"fkv."5+"vj g"equpuwo r vkp"qh"ur gekhe" i tqw "qh"lqqf "qt"ur gekhe"co qwpv"ku'tgs vktgf ."cpf "6+"vj g"equpuwo r vkp"qh"r tg/r cenci gf "fkv" ku"pqvr quikdrf"fg"vq"vj g"rcem"qh"uvqtc i g"hekkkku0

1.4 Summary

Vj ku" ej cr vgt" dgi cp" d{" j ki j rki j vpi " vj g" tqrg" qh" f kgvct {" eqo r qpwpv" cu" gzvtcpqwu" xctkdrgu"K"tgxky gf "vj g"lhwpeg"qh"ugrgevdf "r ctco gvtu"*tgrxcpv"lp"o cp {"ur qt v"cpf " gzgtkug"tgugtej +"qp"ng{"qweqo gu"*gf 0"gzgtkug"r gthqto cpeg."XQ4o cz."TRG+."vj gug" eqo r qpwpv"ecp"j cxg"uki pkkcpv"ko r cev"qp"r j {ulecn"r gthqto cpeg."r j {ukmqi kecn"cpf " dkmqi kecn" r ctco gvtu" Vj g" qpn{" y c {" vq" eqpvtqn" vj go " ku" gkj gt" d {" grko kpcvpi " qt" eqpvtqnkpi "vj gkt"lpcng"fwtkpi "vj g"r tg/vkcn"r tgr ctcvkp"r gtkqf 0"fkvct {"ucpf ctf kucvkp" o gvj qf u" y gtg" tgxky gf 0" Vj gkt" cf xcpvc i gu" cpf " f kucf xcpvc i gu" y gtg" f kuewugf 0" Hwtvj gto qtg."vj g"ukwcvkpu"y j gtg"vj g {"uj qwf "dg"wugf "y gtg"r tqr qugf 0"F gur kg"gz vgpukxg" tgugtej "qp"vj g"xcrkf k{"qh"vj gug"o gvj qf u."vj gkt"tgr tqf wekdkrk{"tgo ckpu"wpegtckp0

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1.5. Aims of this PhD

Vj ku" vj guku" ku" eqpegtpgf " y kj " vj g" tgr tqf wekdkrk\ " qh" c" f kgv" wulpi " f khgtgpv" f kgvct { " ucpf ctf kucvqp" cr r tqcej gu" cpf " r ctvlekr cpvuø" cdkrk\ " vq" hqmjy " kputwekqpu0' Vj g" eqpugs wpegu"qh"r qqt"eqo r rkepeg"vq"vj g" f kgv" f wtkpi "vj g" r tg/vtkn"r tgr ctcvqp"r gtlqf "qp" gzgtekg'r gthqto cpeg."pwtkgpv"qz kf cvkqp."cpf "dmqf "dkqo ctngtu"y gtg"cuq"lpxguki cvgf 0'

Ej cr vgt "4" clo gf "vq" kf gpvkh\ " vj g" f kgvct { " ucpf ctf kucvqp" cr r tqcej gu" ewtgpv\ " wugf " d { " tgugetej gtu" vq" eqpvtqn" f kgvct { " kpvng" r tg/gzr gtko gpvni" vtknu0' K' gzco kpgf " cm" tngxcpv" uwf lgu"r wdrkj gf "k" vj g" Lqwtpci"qh"vj g" kvgtpcvkqpci"Uqelgv\ "qh"Ur qtvu" P wtkkqp" cpf "vj g" kvgtpcvkqpci" Lqwtpci"qh"Ur qt v" P wtkkqp" cpf "Gzgtekg" O gvcdqkuo 'Itqo "422: "vpxn"42360"

Ej cr vgt "5" clo gf "vq" cuugu" vj g" tgr tqf wekdkrk\ " qh" c" f kgv" y j gp" f kgvct { " tgecm" hqqf " tgeqtf " cpf "ucpf ctf kugf " f kgv" y gtg" wugf " cu" f kgvct { " ucpf ctf kucvqp" vgej pls wgu0"

Vj g" clo "qh" vj ku" hqwtvj "ej cr vgt" y cu" vq" cuugu" vj g" cdkrk\ " qh" cvj ngvu" vq" tgr rkevg" c" f kgv" y j gp" rks wkf " cpf "uqrf " r tg/r cenci gf " f kgv" y gtg" wugf " cu" f kgvct { " ucpf ctf kucvqp" vgej pls wgu0' Vj g" rks wkf " r tg/r cenci gf " f kgv" y cu" r tgujpvf " cu" cp" cngtpcvkxg" cr r tqcej "vq" vj g" vcf kqkqpci" uqrf " r tg/r cenci gf " f kgv0'

Ej cr vgt "7" clo gf "vq" lpxguki cvg" vq" y j cv'gz vpvf gr gpf gpv' xctkcdngu" *10' gpf wtcepg" ecr cek\ " cpf " r j { ukqmi kecn' tgur qpugu" ctg" chgevgf " d { " o cplr wrcvpi "46/j qwt" ectdqj { f tcvg" kpvng" y kj k" vj g" v\ r kecn' tpci g" qh' xctkcvqp" *37' + " qdugt xgf " k" qwt" gctrlgt" hpf kpi u0'

Ej cr vgt "8" clo gf "vq" o gcuwtg" vj g" lpekf gpeg" qh" r ctvlekr cpvu" y j q" y gtg" } r qj { f tcvgf " qp" vj gkt" cttkxci" vq" vj g" rdqtcvqt { " chgt" tgegkxkpi " gpeqwtci go gpv" vq" uvc { " y gmj { f tcvgf 0'

Hkpcmf . "Ej cr vgt "9" clo gf "vq" lpxguki cvg" vj g" ghgev" qh" cewg" gzgtekg" *y cmlpi " cpf " e { erkpi + r tkqt" vq" I K' vguvpi " qp" vj g" y kj k" p/ uwdlgev" xctkcdkrk\ " qh" dmqf " i nweqg" cpf " kpuwkp" tgur qpugu0"

Vj g" qxgtcm" clo " qh" vj ku" Rj F " y cu" vq" gZR cpf " qwt" npqy ngf i g" qh" vj g" ewtgpv" f kgvct { " ucpf ctf kucvqp" vgej pls wgu" wugf " y kj " go r j cuku" qp" vj g" lo r qtvcepg" qh" lo r ngo gpvpi " j ki j gt" s wcnk\ " f kgvct { " ucpf ctf kucvqp" cr r tqcej gu0' Cp" gpj cpegf " o gvj qf " vq" eqpvtqn" f kgvct { " kpvng" f wtkpi " vj g" r tg/vtkn" r tgr ctcvqp" r gtlqf " ku" cuq" r tqr qugf 0' "

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Chapter 2

A profile of dietary standardisation techniques used in sport science research

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2.1 Summary

Vj gtg" ku" ewttgpm{ " c" mem' qh' r wdrkuj gf " rkgtewtg" qp" vj g" ko r qtcpeg" qh' f kgvct { " ucpf ctf kucvqp"cpf "vj g's wcrk{ "qh'f kgvct { "ucpf ctf kucvqp"cr r tqcej gu'ewttgpm{ "dgpki "wugf 0' Vj gtghqtg."vj g"clo "qh'vj ku'tgxky "y cu"vq"kf gpvh{ "vj g" f kgvct { "ucpf ctf kucvqp"cr r tqcej gu' ewttgpm{ "wugf "d{ "tgugctej gtu"vq"eqpvtqn'f kgvct { "kpcng" dghqtg" gzr gtlo gpvcn'vkcnu0' Vj ku' tgxky "gzco kpgf "cm'gzr gtlo gpvcn'uwf lgu"r wdrkuj gf "kp"kp"vj g" kpgtpevqpcn' Lqwtpcn' qh' Ur qtV' P wtkkqp" cpf "Gzgtekg" O gwcdqruo " *KUP GO +" cpf " vj g" kpgtpevqpcn' Uqekgv{ "qh' Ur qtva'P wtkkqp" *LKUP +"cpf "KUP GO ."qxgt"vj g"ruv'9" { gctu"*422: /4236+0' Vj g" kpenwukqp" etkgtk'y gtg'f gvto kpgf "d{ "vj tgg'tgugctej gtu'cpf "y gtg'3+"vj g"gzr gtlo gpvcn'r tqveqn'o wuv' dg"cewg"ruvki "rguu"vj cp"46/j qwtu."4+"vj g"uwf { "j cu"vq"dg"qp"j wo cp"uwlgeu."cpf "5+"vj g" uwf { "uj qwf "eqpvcpu'cv'ngcu"y q"gzr gtlo gpvcn'vkcnu0T guwmu'uj qy gf "vj cv'89' "qh'uwf lgu" r wdrkuj gf "kp"KUP GO "cpf "65' "kp"LKUP "ucpf ctf kugf "f kgvct { "kpcng" dghqtg"vkcnu0' Hqqf " tgeqtf "y gli j gf "cpf "guko cvgf +"y cu'tgugctej gtu'r tghgtg" "o gvj qf "hqt"eqpvtqnkpi "f kgvct { " kpcng"cpf "y cu" wugf "kp"6: ' "cpf "kp"3: ' "qh'vj g"uwf lgu"r wdrkuj gf "kp"KUP GO "cpf "LKUP ." tgur gevxn{ 0'Rtg/r cenai gf "o gcm"*ucpf ctf kugf "f kgv"y gtg"r tqxkf gf "d{ "qpn{ "hgy "uwf lgu" *8' "kp"KUP GO "cpf ": ' "kp"LKUP +0'Cr r tqzko cvgn{ "67' "qh'uwf lgu"hcngf "vq"ucpf ctf kug" f kgvct { "kpcng"r tkqt "vq"gzr gtlo gpvcn'vkcnu"qt" f kf "pq'vo gpvqp" k0T gugctej gtu'o c{ "gpj cpeg" vj g'cewtce{ "qh'vj gkt"uwf lgu"kh'vj g{ "r c{ "emugt"cvgpvqp"vq" f kgvct { "ucpf ctf kucvqp"cpf "wug" j ki j gt"s wcrk{ "cr r tqcej gu"uwej "cu"ucpf ctf kugf "f kgv"cpf "y gli j gf "H_{geqtf} "vej pls wgu"vq" tgf weg"vj g"xctkcdk{ "kp" f kgvct { "kpcng"dgvy ggp"vkcnu0'

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2.2 Introduction

F kgvct { " ucpf ctf kucvqp" kp" tgugctej " uwf lgu" clo " vq" o kpo kug" vj g" ghgev' qh' f kgvct { " eqo r qpgpv"uwej "cu"echgkpg"qp"uwf { "qweqo gu0Uqo g"uwf lgu"wug"o kpo cn'cr r tqcej gu" y j lej "kpxqkxg"cumkpi "uwlgeu"vq" hqmqy "vj gk"uwcn'f kgv'cpf "vj gp"o qpkqt"vj gk" hqqf "kpcng" vj g" f c{ "dghqtg" gcej "vkcni" *Qwrcy "gv' crf' 4235= Tqdgta" gv' crf' 4234+0' Ukeg" vj gtg" ku" pq" eqpvtqn'qxgt" hqqf "cpf "hmkf" eqpuwo gf ."gpgti { "cpf "o cetqpwtkpv'kpcngu"y km'o qtg" rkngn{ " xct{ " dgvy ggp" vkcni" *Dkpi j co " 3; : 9= P gnuqp" gv' crf' 3; : ; +0' O qtg" eqpvtqmgf " tgugctej " r tqveqn'tgeqtf "f kgvct { "kpcng"vj g" f c{ "dghqtg"vj g" hku'vkcni'cpf "vj gp" kphqto "r ctvek' cpv"vq" tgr rkecv"vj g" tgeqtf gf "f kgv'r tkqt "vq" gxgt { "uwdugs wgpv'vkcni" *Dnqo gt "gv' crf' 4232= Uki ng" gv' crf' 4235+00 gvj qf u'uwej "cu" F_{tgecm} "y gli j gf "H_{geqtf} . "cpf "guko cvgf "H_{geqtf} "ctg"uwcm{ "wugf "vq"

ecr wtg"vj g"co qwpv"cpf "v{r g"qh"lqpf "equwo gf "qp"vj g"ktuv"qeecukqp0Vj gug"o gj qf u"ctg" f ghkpgf " kp" ugev"kp" 3004" cmpti " y kj " f gvckgf " f guetkr v"kp" qh" vj gk" cf xcpwi gu" cpf " f kucf xcpwi gu0"

Vj gtg" ku" ewttgpw{ " c" rcmi' qh" r wdrkuj gf " rkgtcwtg" qp" vj g" ko r qtwcpeg" qh" f kgvct { " ucpf ctf kucv"kp"cpf "ku"ghge"v"qp"r j { ulecn'r gthqto cpeg"cpf "r j { ukqmi lecn'tgur qpugu0Vq" qwt"npqy rgi g'hgy "tgxky u"cpf "gzr gtko gpvcn'uwf lgu"j cxg"eqxgtgf "vj ku"vqr le"J qr mpu"gv" cr03; ; ; =Igcceqeng"("Dwtng"4232="Y cnj "gv'cr04228="Ngpl "gv'cr04225+0Vj gtghqtg."vj gtg"ku" c" pggf "v" eqpf wev" c" uwtxg{ " kp" qtf gt "v" r tqxkf g" cp" kf gc" cdqw" vj g" s wcrkv{ " qh" f kgvct { " ucpf ctf kucv"kp"cr r tqcej gu"ewttgpw{ "wugf "kp"tgugctej "uwf lgu0"

C"uo cm'uwtxg{ "y cu"eqpf wevgf "cpf "o gpv"kp"gf "kp" c"tgxky "r wdrkuj gf "d{ "Igcceqeng"cpf " Dwtng"*4232+0Vj g"uwtxg{ "gzco kpgf "cm'uwf lgu"r wdrkuj gf "kp"vj g"Kvgtpcv"kp"cn'lqwtpcn'qh" Ur qt v"P wtkkqp"cpf "Gzgtekg"O gwcdqkuo "KUP GO +"tqo "4226"v"422; 0Vj g{ "tgr qtvgf " vj cv" vj g" o qu" cf cr vgf " f kgvct { " ucpf ctf kucv"kp" vgej pls wg" y cu" H_{geqtf}." hqmy gf " d{ " vj g" r tqxkukqp" qh" ucpf ctf kugf "r tg/r cenci g"o gcn0Vj g"uwtxg{ "cnu"uj qy gf "vj cv" qp"kp" ulz" uwf lgu'hckgf "v"ko r ngo gpv'cp{ "f kgvct { "ucpf ctf kucv"kp"cr r tqcej "vj g"fc{ u'dghqtg'r j { ulecn' r gthqto cpeg'v'lcnu0J qy gxgt. "k'y cu'rko kgf "d{ "vj g"pwo dgt"qh'lqwtpcn'lpenmf gf "qpn{ "qpg+" y j lej "o c{ "pqv'tghge"v"vj g"cr r tqcej gu" wugf "kp" uwf lgu"r wdrkuj gf "kp"qy gt"lqwtpcn0' Kp" cf f kkp."vj g"uwtxg{ "qpn{ "eqxgtgf "uwf lgu"r wdrkuj gf "wpv'kr'422; 0Vj gtghqtg."c"o qtg"tgegpv" uwtxg{ "ku" pgeguact { "v" r tqxkf g" c" y kf gt" r gtur gev"kg" d{ "lpenmf lpi " qy gt" lqwtpcn" cpf " eqxgtlpi "vj g"rcuv'hkxg{ gctu"kp"qtf gt"v"i kxg" c"o qtg"ewttgpv'xky "qh"vj g"vgej pls wgu'wugf 0'

Vj g"r tgugpv" uwtxg{ "gzco kpgf "cm'uwf lgu"r wdrkuj gf "kp"vj g"lqwtpcn'qh" vj g"Kvgtpcv"kp"cn'lqwtpcn' Uqekv{ "qh"Ur qt w"P wtkkqp"*KUP +"cpf "KUP GO ."qxgt"vj g"rcuv"9" { gctu"*422: /4236+0Vj gug"y gtg"vj g"qpn{ "y q" f gf lecvgf "lqwtpcn"vj cv"eqxgt"vj g"ctgc"qh"ur qt w"pwtk"kp"0Vj g" qy gt"lqwtpcn"kp"ur qt v'uekpeg"o clpn{ "hewu"qp"ur qt w"r j { ukqmi { "cpf "o gf lekpg"y kj "c" rko kgf "pwo dgt"qh'uwf lgu"kp"ur qt w"pwtk"kp"0Vj g"clo "qh"vj ku'tgxky "y cu"v"kf gpv'h{ "vj g" f kgvct { "ucpf ctf kucv"kp"cr r tqcej gu"ewttgpw{ "wugf "d{ "tgugctej gtu"v"q"eqpv"qif kgvct { "kpcng" r tg/gzr gtko gpvcn'v'lcnu0"

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2.3 Materials and methods

Vj ku'uwwf { "gzco kpgf "cm'gzr gtko gpvni'uwwf lgu'r wdnkuj gf "kp"KUP GO "cpf "LKUP "htqo "422: " vq"42360Cp"qpnkpg"ugctej "wukpi "vj g"lqwtpcnu"qy p"y gdukg'y cu"eqpf wevgf 0C"vqvn'qh"57: " ctvengu"y gtg"kf gpvnhgf "kp"KUP GO "cpf "49; "kp"KUP "y kj kp"vj g"ur gekhgf "vko g"r gtlkf 0' Hktuv"vj g"vkg"cpf "cdutcev'y gtg"uetggpgf "kf gpvnh{ lpi "vj g"lpenwukqp"etkgtk0'Vj g"lpenwukqp" etkgtk"vugf "y gtg<"

3+"Vj g"gzr gtko gpvni'r tqveqni'o wv'dg"cewg'ruvki 'rguu'vj cp"46/j qwtu"

4+"Vj g'uwwf { "j cu'vq"dg"qp"j wo cp"uwwlgeu"

5+"Vj g'uwwf { "uj qwf "eqpvkpu"cv'rgcu'vy q"gzr gtko gpvni'tknu"

Cm'r knv'uwwf lgu"y gtg"gzemf gf "htqo "vj g"cpn{uku"gxgp"kh'vj g{"o gg'vj g"cdqgo gpvkkpgf " etkgtk" f vq" vj gk" o gj qf qmi kcn' nko kvkqpu" *g0 0' uco r ng" uk g" qh" qpg+0' Hwtvj gt" uetggpki "qh'vj g'o gj qf qmi { "ugevqp"y cu'r gthqto gf "kp"ecug'vj g"lphqto cvkqp"tgs wkt gf "y cu" pqv'hqwpf "kp"vj g"cdutcev'0Co qpi uv'vj qug"kf gpvnhgf "r cr gtu."qpn{ "342"y gtg"grki kdr"htqo " KUP GO "cpf "95"htqo " KUUP 0' P gzv." vj g"hwmi'vgz'v' qh' vj g" grki kdr" ctvengu" y cu" hwtvj gt" uetggpgf 0' F cv" gzvcevqp" hqewugf " qp" vy q" o ckp" vqr keu< vj g" cr r tqcej " vq" f kvct { " ucpf ctf kvkqp"cpf "wug'qh'c'r j { ukecn'r gthqto cpeg'r tqveqni'0Rgthqto cpeg'r tqveqni"y gtg" f kxf gf "kvq"hxg"i tqwr u0'Vj g"f guetkr kvkqp"qh'gcej "i tqwr "ecp"dg"hwqpf "kp"Vcdrg"400'Vj g" cr r tqcej "vq" f kvct { "ucpf ctf kvkqp"y cu'utcvkhgf "cu'hqmjy <"

*****3+"P ki'qt'o kpo cni'cr r tqcej 0"

4+"O qpkqtki "qh'f kvct { "kpvng'y kj qw'cp { "tgr nckvqp0"

5+"Ucpf ctf kvkqp"d { "tgr nckvki "vj g'f kv'r tkqt "vq" gcej "tkri0"

"

"

"

"

"

Vcdng'400F guetkr vkqp'qh'r gthqto cpeg'r tqvqeqni"

| Rgthqto cpeg'r tqvqeqni' | F guetkr vkqp" |
|--------------------------|---|
| Cgtqdle" | Vcumi'rcukpi 'mqpi gt'vj cp'52'o kpwgu'*eqp vkpwqwu+ |
| Cpcgtqdle" | Vcumi'rcukpi "uj qt vgt'vj cp'52"o kpwgu"*gfi 0'ur tkpvkpi +'qt'ut gpi vj " dcugf "cevkxkkgu"*gfi 0'ngi "gz vgpukqp+" |
| Eqo dlkpgf " | Vj g'o gcuwtgo gpv'qh'dqvj "cgtqdle"cpf "cpcgtqdle"ecr cekkgu" |
| Unkmu" | Ur qt v'ur gekkle'unkmu'vguu" |
| P q'vguv' | P q'r gthqto cpeg'vguv'y cu'r gthqto gf " |

"

Vj g":P ki'qt"o kpklo cni'cr r tqcej ø'kpenmf gu'uwf lgu"vj cv'f q"pqv"ko r ngo gpv'cp {"utcvgi {"vq" eqpvtqni'f lgvct {"kpveng"*P kn:"dw"qpn {"cumu'r ctvlekr cpw"vq"cxqkf "echhgkpg"cpf "creqj qni'cv" ngcu'46"j qwtu'dghqtg"tknu"*O kpklo cni:"cpf "wug"rkuvu"vq"j gr "uwdlgevu"cxqkf "egtckp"hqf " *Nkuv'0' K' ku' ko r qt v'p' vq" erctkh {" vj cv' uwf lgu" y j lej " ko r ngo gpv'gf " dgwgt" eqpvtqmgf " cr r tqcej gu'cniq"cumgf "vj gk"r ctvlekr cpw"vq"cxqkf "echhgkpg"cpf "creqj qni'J qy gxgt."vj g {" y gtg"pqv'eqwpvgf "cu":o kpklo cni'Uqo g'uwf lgu"rko k'vj gk"cr r tqcej "vq"o qpkqt kpi "uwdlgevu" f lgvct {"kpveng"tcvj gt"vj cp"ucpf ctf kuki "k0'Vj ku"ku'cej kxgf "gkj gt"d {"cunuki "uwdlgevu"vq" ngr "c'hqf "f ket {"vj g'f c {"dghqtg"geej "tkni'qt"d {"eqpf wevki "c'46/j qwt'F_{tgecm}"qp'vj g'f c {"qh" gcej "tkni'0'Vj g"lphqto cvkqp"ku"vj gp"cpn {ugf "cv'vj g"gpf "qh'vj g"uwf {"cpf "wugf "vq"gzr rckp" cp {"wpzr gev'f "tguwu'0'k"eqpvtcu."f lgvct {"ucpf ctf kucvki "ku'cej kxgf "d {"tgr rckvki "vj g" f lgv."ckf gf "d {"qpg'qh'vj gug'vgej pls wgu<"

$$3+V_y \text{ gpv' / hqt' j qwt' } F_{tgecm}$$

$$4+Y_{gki} \text{ j gf' } H_{geqtf}$$

$$5+G_{urko} \text{ cvgf' } H_{geqtf}$$

$$6+U_{cpcf} \text{ ctf kugf' f lgv'}$$

$$7+U_{cpcf} \text{ ctf kugf' r tg/ tkni'o gni'}$$

$$8+F_{lgvct} \text{ { 'r tguetkr vkqp'}}$$

"

K'ku'ko r qt wcpv'v'p'p'q'v'j' c'v'u'qo g'u'w'f'k'g'u'o ki j v'j' c'x'g'u'w'c'p'f'c't'f'k'g'f' f'k'g'v'c't' { 'k'p'w'c'g' 'd'w'f'k'f' 'p'q'v' o g'p'v'k'q'p' 'k'v'k'p' 'y' g' 'o' g'j' q'f' q'm'i { "u'g'e'v'k'q'p' '0' 'V'j' g' 'f' g'u'e't'k'r' v'k'q'p' 'q'h' 'g'c'e'j' "u't'c'v'g'i { "e'c'p' 'd'g' 'h'q'w'p'f' "k'p' V'c'd'r'g' "4'0'4'0' 'V'j' g' 'f' w't'c'v'k'q'p' " * > "4'6' "j' q'w't'u' "q't' " @ '4'6' "j' q'w't'u' + "q'h' 'y' g' 'f' k'g'v'c't' { "u'w'c'p'f'c't'f'k'c'v'k'q'p' "y' c'u' g'z'c'o' k'p'g'f' "h'q't' 'y' g' 'h'q'm'y' k'p'i "v'g'e'j' p'l's' w'g'u' < 'U'f'k'g'v' "y' g'k'i' j' g'f' "H'g'e'q't'f' "c'p'f' "g'u'v'k'o' c'v'g'f' "H'g'e'q't'f' '0'

V'c'd'r'g' "4'0'4'0' 'F' g'u'e't'k'r' v'k'q'p' "q'h' 'f' k'g'v'c't' { "u'w'c'p'f'c't'f'k'c'v'k'q'p' "c'r' r' t'q'c'e'j' g'u'

F'k'g'v'c't' { "u'w'c'p'f'c't'f'k'c'v'k'q'p' "c'r' r' t'q'c'e'j' "

F'g'u'e't'k'r' v'k'q'p' "

46/j' q'w' 'F' t'g'e'c'm' "

R'c't' v'k'k'r' c'p'u' "c't'g' "c'u'ng'f' "v'q' "r'k'u'v' 'c'm' 'h'q'q'f' "c'p'f' "f' t'k'p'm' 'e'q'u'w'o' g'f' "q'x'g't' "v'j' g' 'r' c'u'v' '4'6' "j' q'w't'u' "

Y'g'k'i' j' g'f' "H'g'e'q't'f' "

U'w'd'l'g'e'u' "c't'g' "c'u'ng'f' "v'q' "t'g'e'q't'f' "c'm' 'h'q'q'f' "c'p'f' "h'w'k'f' "e'q'u'w'o' g'f' '0' 'H'q'q'f' "y' k'n'i'd'g' 'y' g'k'i' j' g'f' "c'p'f' "h'w'k'f' "y' k'n'i'd'g' "o' g'c'u'w't' g'f' "d'g'h'q't'g' "e'q'u'w'o' r' v'k'q'p' "

G'u'v'k'o' c'v'g'f' "H'g'e'q't'f' "

U'w'd'l'g'e'u' "c't'g' "c'u'ng'f' "v'q' "t'g'e'q't'f' "c'm' 'h'q'q'f' "c'p'f' "h'w'k'f' "e'q'u'w'o' g'f' '0' 'R'q't'v'k'q'p' "u'k'g' "k'u' "s'w'c'p'v'k'k'g'f' "w'u'k'p'i' "j' q'w'u'g'j' q'f' "o' g'c'u'w't'g'u' "c'p'f' "f'k'o' g'p'u'k'q'p'u' "

U'w'c'p'f'c't'f'k'g'f' "f'k'g'v' "

T'g'u'g'c't'e'j' g't'u' "r' t'q'x'k'f' g' "g'c'e'j' "u'w'd'l'g'e'v' "y' k'j' "c'm' 'y' g'k't' "h'q'q'f' "t'g's'v'k't'g'o' g'p'u' "h'q't' "c'v' 'r'g'c'u'v' '4'6' /j' q'w't'u' "k'p' "c'f' x'c'p'e'g' "q'h' 'v'g'u'v'k'p'i' "c'u' 'r' t'g' /r' c'e'n'e'i' g'f' "o' g'c'm' "

U'w'c'p'f'c't'f'k'g'f' "r' t'g' /v'k'n' "o' g'c'n' "

T'g'u'g'c't'e'j' g't'u' "r' t'q'x'k'f' g' "g'c'e'j' "u'w'd'l'g'e'v' "y' k'j' "c' "u'w'c'p'f'c't'f' "o' g'c'n' 'g'k'j' g't' "e'q'u'w'o' g'f' "y' g' "g'x'g'p'k'p'i' "q't' "j' q'w't'u' "d'g'h'q't'g' "y' g' 'v'k'n' "

F'k'g'v'c't' { "r' t'g'u'e't'k'r' v'k'q'p' "

T'g'u'g'c't'e'j' g't'u' "v'c't'i' g'v' "q'p'g' "q't' "o' q't'g' "p'w't'k'g'p'v' "u' "y' g' "f' c' { "u' "r' t'g'e'g'f' k'p'i' "y' g' 'v'k'n' "

V'j' k'u' 't'g'x'k'g'y' "g'z'c'o' k'p'g'f' "y' j' g'j' g't' "u'w'f'k'g'u' 't'g'r' q't'v'g'f' "s'w'c'p'v'k'c'v'k'g' "q'w'e'q'o' g'u' "q'h' 'f' k'g'v'c't' { "k'p'w'c'g' "q'p' "y' j' g' "f' c' { "d'g'h'q't'g' "g'c'e'j' "v'k'n' '0' 'C'f'f'k'k'q'p'c'm' { . "y' j' k'u' 't'g'x'k'g'y' "c'n'u'q' "g'z'c'o' k'p'g'f' "y' j' g'j' g't' "t'g'u'g'c't'e'j' g't'u' "g'x'c'n'w'c'v'g'f' "y' j' g' "e'q'o' r' 'r'k'c'p'e'g' "q'h' "r' c't'v'k'k'r' c'p'u' "v'q' "y' j' g' "f'k'g'v' '0' 'E'q'o' r' 'r'k'c'p'e'g' "y' c'u' "e'q'u'p'k'f' g't'g'f' "g'x'c'n'w'c'v'g'f' "k'h'k'y' c'u' "o' g'p'v'k'q'p'g'f' "k'p' "y' j' g' "v'g'z'v' "f'k'g'v'c't' { "q'w'e'q'o' g'u' "y' g't'g' 't'g'r' q't'v'g'f' "h'q't' "c'm' 'v'k'n' "c'p'f' "y' j' g' "u'w'c'p'f'c't'f'k'g'f' "r' t'g' /v'k'n' "o' g'c'n' "y' c'u' "e'q'u'w'o' g'f' "k'p' "y' j' g' "r'e'd'q't'c'v'q't' { "y' j' l'e'j' "c'u'w'o' g'u' "y' j' c'v' "r' c't'v'k'k'r' c'p'u' "y' g't'g' "w'p'f' g't' "u'w'r' g't'x'k'k'q'p' '0' 'U'w'f'k'g'u' 'y' c'v' "w'u'g'f' "y' j' g' "p'k'i' "q't' "o' k'p'k'o' c'n' 'c'r' r' t'q'c'e'j' "y' g't'g' "g'z'e'n'w'f' g'f' "h'q'o' "y' j' g' "c'p'e'n' { "u'k'u' "q'h' "t'g'r' q't'v'g'f' "q'w'e'q'o' g'u' "c'p'f' "e'q'o' r' 'r'k'c'p'e'g' '0' 'C'm' 'f' c'w' "y' g't'g' "t'g'r' q't'v'g'f' "c'u' "r' g't'e'g'p'v'c'i' g'u' "c'p'f' "h'g's'w'g'p'e'k'g'u' '0'

2.4 Results

T guwnu'uj qy gf 'vj cv'89' "qh'uwf lgu'r wdrkuj gf "kp"KUP GO "cpf '65' "kp"LKUP "ucpf ctf kugf " f kgvct { "kpcng"dghqtg"vtkcn'0'Vj g'cpcn{uku'qh'vj g'f kgvct { "ucpf ctf kucvkap"cr r tqcej gu'wugf "ku" uwo o ctkugf "kp"Vcdng"40'0'Kp"vj g"ecvgi qt { "qh"df kgvct { "ucpf ctf kucvkapö."F tgecm"y cu"qpn{ " wugf "d { "qpg'uwf { "kp"geej "lqwtpcn'y j gtgcu"H_{geqtf}"*y gki j gf "cpf "guko cvgf "eqo dlpgf +.y cu" vj g'r tghgttgf "o gjv qf "hqt"eqpvtqmkpi "f kgvct { "kpcng="vj ku'y cu'wugf "kp"6; ' "cpf "kp"3: ' "qh" vj g'uwf lgu'r wdrkuj gf "kp"KUP GO "cpf "LKUP ."tgur gevxgn{0'F gvckngf "cpcn{uku'qh'vj g'v{r g" cpf "f wcvkap"qh'H_{geqtf} "ku'r t gupvgf "kp"Vcdng"40'0"

"

Vcdng"40'0'F kgvct { "ucpf ctf kucvkap"cr r tqcej gu'wugf "kp"lqwtpcn'dgy ggp"422: /4236"

| | F _{tgecm} " | Y gki j gf "H _{geqtf} " | Guko cvgf "H _{geqtf} " | Ucpf ctf kugf "f kgv" | Ucpf ctf kugf " r tg/vtkcn' o gcn' | F kgvct { " r tguetr vkap" |
|-----------|----------------------|----------------------------------|---------------------------------|-----------------------|------------------------------------|----------------------------|
| KUP GO "" | 3'*3' +" | 34'*32' +" | 68'*5; ' +" | 9'*8' +" | 36'*34' +" | 9'*8' +" |
| LKUP " | 3'*3' +" | 2'*2' +" | 35'*3: ' +" | 8'*: ' +" | ; '*34' +" | 7'*9' +" |

Xcngv<p"* #="p"? "pwo dgt"qh'uwf lgu"

"

Vcdng"40'0'Dtgcnf qy p"qh'H_{geqtf}"wug'd { "v{r g"cpf "f wcvkap"kp"lqwtpcn'dgy ggp"422: /4236"

| | Y gki j gf "H _{geqtf} " | | Guko cvgf "H _{geqtf} " | |
|----------|----------------------------------|-------------|---------------------------------|-------------|
| | 46/j qwtu" | @46/j qwtu" | 46/j qwtu" | @46/j qwtu" |
| KUP GO " | 7'*6' +" | 9'*8' +" | 47'*43' +" | 43'*3: ' +" |
| LKUP " | 2'*2' +" | 2'*2' +" | : '*33' +" | 7'*9' +" |

Xcngv<p"* #="p"? "pwo dgt"qh'uwf lgu"

"

Y j gp"eqpukf gtkpi "vj g'i qrf /ucpf ctf "hqt" f kgvct { "ucpf ctf kucvkap."Uf kgy'y cu'wugf "d { "qpn{ " hgy "uwf lgu"*8' "kp"KUP GO "cpf ": ' "kp"LKUP +0'Vj g'ucpf ctf kugf "r tg/vtkcn' o gcn'y cu'o qtg" htgs wgpvn{ " wugf " cv' 0'34' " qh"uwf lgu'0'F kgvct { " r tguetr vkap" y cu" qpn{ " wugf " kp" 0'8' " qh" tgugetej " uwf lgu'0' Cr r tqzko cvgn{ " 7' " qh" uwf lgu" kp" dqj " lqwtpcn' o gpvkapgf " vj g" ko r ngo gpvkap"qh'c'f kgvct { "ucpf ctf kucvkap"gej pls wg'y kj qw'ur gekh{ kpi "y j lej "qpg0'

Vj g"nti guv"r tqr qt vqp" qh'uwf lgu" *63' + "kp" LKUP "wugf" c" pki' qt" o kpklo cni' cr r tqcej "vq" f lgvct { "ucpf ctf kucvqp" eqo r ctgf "vq" 48' "kp" KUP GO 0'F gvckngf "cpcn{uku" qh" vj g" -pki' qt" o kpklo cni' cr r tqcej ø'ku'hqwpf "lp" vcdng"40'0'Uwf lgu"vj cv'qpn{ "o qpkqtgf "f lgvct { "kpveng"tcvj g" vj cp"tgr rkecvpi "vj g"f lgv'eqpukwvgf "9' " *4' "wugf" 46/j qwt "F_{tgecm}"cpf "7' "wugf "H_{geqtf}+"qh" tgugctej "r tqlgew"lp"KUP GO "cpf "39' " *8' "wugf" 46/j qwt "F_{tgecm}"cpf "33' "wugf "H_{geqtf}+"kp" LKUP 0"

"

Vcdng"40'0C"dt gcnf qy p"qh'-pki'qt"o kpklo cni' cr r tqcej ø'wug'd { 'v{ r g"

| " " | P ki' | O kpklo cni' | Nkuv' |
|----------|-------------|--------------|----------|
| KUP GO " | 36'*34' +" | 35'*33' +" | 6'*5' +" |
| LKUP " | 36'*3; ' +" | 33'*37' +" | 7'*9' +" |

Xcnwgu<p" *p" pwo dgt "qh'uwf lgu"

"

Vj kt v{/gki j v'r gtegpv'qh'uwf lgu"r wdrukj gf "kp" KUP GO "p?: 5+"cpf "LKUP "p? 66+"tgr qt vgf " vj g"qweqo gu"qh"vj g"f lgvct { "kpveng"qp"cm'vkcni" *g0 0'gpgti { "cpf "o cetqpwtkgpv'kpveng"qp" gcej "vkcni: "y j gtgcu"qpn{ "qpg"vj kf "tgr qt vgf "vj g"eqo r rkepeg"vq"vj g"f lgvct { "ucpf ctf kucvqp0' Cm quv" j crh' *6: ' + "qh" vj g" uwf lgu" r wdrukj gf " kp" KUP GO " f kf " pqv" o gcuwtg" r j { ukcni' r gthqto cpeg."dw'kpugcf "vj g{ "o clpn{ "o gcuwtg" r j { ukqni keni'cpf "dkqni keni' r etco gvgtu." y j gtgcu."48' "wugf" cgtqdle."42' "wugf" cpcgtqdle."cpf "8' "wugf" unkm" vgu0' Vj g"o quv' htgs wgpw{ "wugf" r gthqto cpeg" r tqveqn' kp" LKUP "y cu" ðcpcgtqdleö" *58' + "hmqy gf "d { " ðcgtqdleö" *4; ' + "öunkm" * : ' + "cpf "ðeqo dlpgf ö" *6' + "y j gtgcu."qpg"s wctvgt "qh'uwf lgu" r wdrukj gf "kp"vj g'uco g'lqwtpcnlf kf "pqv'wug'cp { 'r gthqto cpeg" r tqveqn0'

"

2.5 Discussion

Vj g"o quv'kpvtgukpi "hpf lpi "qh"vj g"r tguvpv'uwtxg{ "y cu"vj cv'ø67' "qh"vj g"3; 5"r wdrukj gf " tgugctej " uwf lgu" hckngf " vq" ucpcpf ctf kug" *qt" f kf " pqv" o gpvqp+" f lgvct { " kpveng" r tlqt" vq" gzr gtko gpvcn'vkcni0'Vj gtg"ctg"vj tgg'lo r qtvcpv'r quukdrkkgu"y j { "tgugctej gtu'f gekf gf "pqv"vq" ucpcpf ctf kug" f lgvct { "kpveng0"

Hktum{."uqo g"tgugctej gtu"o c{"pqv"tgeqi plug"vj g"ko r qtvcepg"qh"fgvct {"ucpf ctf kucvkqp0
Vj ku"o ki j v'dg"vj g"ecug"ht"vj g"39' "qh'uwf kgu"r wdkuj gf "kp"LKUUP "vj cv'f kf "pqv"ko r ngo gpv"
cp{"cr r tqcej "f gur kg"o gcuwtkpi "r j {ukecn'r gthqto cpeg"cu"o ckp"qweqo g0'Ectdqj {f tcvg."
kp"r ctvkwct."ku"y gm'hpqy p"vq"cngt"gpf wtcepg"r gthqto cpeg"*J cy ng{"gv'cr03; ; 9=Eqtgk/
Qrxgkct"gv'cr04235="Gtrgpdwuej "gv'cr04227+"cpf "r j {ukqmi kecn'tgur qpugu"*O cf ugp"gv'cr0
3; ; 2="Rkukrf ku"gv'cr03; ; 8+0'K'j cu"dggp"uj qy p"vj cv'f ckn{"ectdqj {f tcvg"lpvcng"eqwf "xct {"
d{"45' "P gnuqp"gv'cr03; ; ; ="Dkpi j co "3; ; 9+"y j lej "kpetgcugu"vj g"r quukdkk{"qh'uwdlgeu"
equpuo kpi "y q"fgwu"y kj "uki pkhecpv{"f hgtgpv'ectdqj {f tcvg"eqv'gpv'f wtkpi "vj g"46/j qwt"
r tgr ctcvkp"r gkqf "dghqtg"tkcu0'ht"vj gto qtg."hckkpi "vq"eqvtqnl'creqj qnl'kpcng"vj g"pki j v"
dghqtg"gzr gtko gpvnl'tkcu"eqwf "cngt"pgzv'f c{"r j {ukecn'r gthqto cpeg0'Q@Dtkgp"*3; ; 5+"
tgr qtvgf "c" tgf wkvqp" kp" cgtqdle" r gthqto cpeg" d{" 3306' " 46/j qwtu" chgt" creqj qnl'
equpuo r vkp0'Vj g"qpn{"gzegr vkp"y j gtg"fgvct {"ucpf ctf kucvkqp"o c{"pqv"dg"tgs wkt gf "ku"
y j gp"vj g"qweqo gu"o gcuwtgf "ctg"pqv'f kgev{"qt"kp'f kgev{"chgevgf "d{"cewg"ej cpi gu"kp"
f kvct {"lpvcng0'Gzco r ngu"lpenmf g"uwf kgu"o gcuwtkpi "j gctv'tcvg"xctkcdkkl{"cv'tguv"*Uej o kw"
gv'cr0422: +"qt"dmqf "dkqo ctngtu"uwej "cu"lpvgtngwlp/8"cpf "E/tgcevkxg"r tqvgk"*Rggkpi "gv"
cr0422; +0"

Ugeqpf n{."tgugctej gtu"o c{"pqv"j cxg"vj g"gzr gtvkug."hwpf u"qt"vko g'tgs wkt gf "vq"ko r ngo gpv"vj g"
i qrf /ucpf ctf "f kvct {"ucpf ctf kucvkqp"vej pls wg0'Ucpcf ctf kugf "r tg/r cenai gf "o gcu"o ki j v"
dg"equm{"cpf "vko g"equpuo kpi "Igeqeng"("Dwtng"4232+0J qy gxgt."kh'c'rci g"ghgevu'uk'g"ku"
gzr gevfg "f wtkpi "vj g"uwf {"cpf lqt"vj g"fgv'j cu"ny "ko r cev"qp"vj g"kpvtxgpvkp"vj gp"
cngtpevkxg'o gj qf u'ecp'dg'wugf."uwej "cu"vj g'y gli j gf "H_{geqtf}0"

Vj kf n{."uqo g"tgugctej gtu" o c{"pqv" eqpukf gt" f kv" vq" j cxg" cp{" kphwpgpeg" qp" vj g"
gzr gtko gpvnl'r tqveqn'wugf 0'Cu"o t'guwn."r ctvlekr cpw'ctg'qpn{"cungf "vq"cxqkf "echgkpg"cpf "
creqj qnl'f wtkpi "vj g"tkcn'r tgr ctcvkp"r gkqf "qt"vj gkt"fgvct {"lpvcng"y kn'dg"o qpkqtf "tcvj gt"
vj cp"dgkpi "ucpf ctf kugf 0'Vj ku"cr r tqcej "o ki j v'dg"uwkcdng"ht"ukpi ng"dqw."j ki j "kpv'pukl"
r gthqto cpeg"vguu"*g0 0Y kpi cvg'vgu"vj cv'ruu"52"ugeqpf u+"dw'pqv'ht"mqpi gt"fv'cvkqp"*@7"
o kpwgu="J cy ng{"gv' cr0 3; ; 9+0' Vj g"tgxky "eqpenmf gf "vj cv"o wuerg"i n{eqi gp"ku"pqv"o"
rko kkpki "hcevt"qh'gpf wtcepg"ecr cekl{"gz gtekugu"rcu'kpi "ngu"vj cp"hxg"o kpwgu"y j gp"r tg/
gz gtekug'rxgnu'ctg'y kj kp"vj g'pqto cnl'cpi g0"

Qh"vj g"477' "uwf kgu"y j q"fk"eqvtqnl'fgvct {"lpvcng."vj g"o quv'htgs wgpv{"wugf "vej pls wg"
y cu"vj g"gu'ko cvgf "H_{geqtf}."y j kg"vj g"ngcu'wugf "y cu"F_{tecm}0'T gcuqpu"y j {"gu'ko cvgf "H_{geqtf}"
go gti gf "cu"vj g"o quv'r qr wct"r tqveqn"o c{"lpenmf g"ku"ny "equv'eqo r ctgf "vq"U_{fgv}"cpf "

tgf wegf "dwtf gp"qp"uwdlgeu0Kp"cf f kkp. "wprkng"vj g"46/j qwt "F_{tgecm}"vgej pls wg. "H_{geqtf}"f qgu"pqv"tgs wktg"cp{"gzt gt vug"kp"kpvtxky kpi "cpf "f qgu"pqv"tgn"qp"o go qt {"tgf wekpi "vj g"pwo dgt"qh"gttqtu"kp"tgecm"*Vj qo r uqp"("D{gtu"3; ; 6="Drcem"4223="Lgceqeng"("Dwtng"4232="O ci nqu"(" [cppcnqwk"4225+0"Qpg"wpvkvk cvgf "hpf kpi "y cu"vj cv"qpn{"9" "qh"uwf lgu"wgf "ucpf ctf kugf "f kv"fur kv"vj g"eqpukf gtdng"pwo dgt"qh"uwf lgu"y j q"tgs wktg"utkv"eqpvtqn"qh"fgvct {"kpcng0C"r quukng"gzr rcpvkv"ht"vj ku"o ki j v"dg"vj g"equ"cpf "vko g"tgs wktg"vq"r tgr ctg"vj g"o gcn0"O qtgxgt."k"tgs wktgu"gzr gt vug"vq"fguk p" c" f kv"r rcp"*Lgceqeng"("Dwtng"4232+0Kp"hev"o qtg"uwf lgu"wgf "c"ucpf ctf kugf "r tg/vkcn"o gcn"tcvj gt"vj cp"ucpf ctf kipi "vj g"fgv"ht" c"r gkqf "qh"cv"rcu"46/j qwt0'K'ku"eqpukf gtgf "ej gcr gt."tgs wktgu"rkng"vko g"ht"r tgr ctvkv. "cpf "pq"gzr gt vug"ku"tgs wktgf 0'cm"uwdlgeu"pqto cm{"tgegkxg"vj g"uco g"o gcn"uwcm{"cu"cupcm"*Dggngp"gv"cn0422; +0Cnj qwi j "c"r tg/vkcn"o gcn"ecp"j grr "vq"tgugt"ny "qt"uwd/qr vko cni n{eqi gp"uqtgu"dghtg"tknu"*P knuqp"("J wno cp"3; 95="Eq{ng"gv"cn03; : 7+."k"ecppqv"eqtgev" c" f khtgpeg"kp"vcn'dqf {"i n{eqi gp"uqtg"cu"kv"eqpvtkwgu"vq"vj g"uco g"co qwpv"qh"ectdqj {f tcvg"dghtg"gej "tkcn0"

F kvct {"ucpf ctf kvkv"vgej pls wgu"ctg"ughw"vqnu"vj cv"j grr "tgf weg"xctkdkk{"kp"fgvct {"kpcng"dgw ggp"tkcn0J qy gxgt."vj g"fgv"i kxgp"o c{"pqv"cnj c{"u"dg"utkv{"hmqy gf "d{"cm"tgugctej "uwdlgeu0Lgceqeng"cpf "Dwtng"*4232+uj qy gf "vj cv"vj g"y kj kp/uwdlgev"xctkdkk{"kp"ectdqj {f tcvg"kpvcng"y cu"dgw ggp"20"cpf "30"i 0ni³"dqf {"y gki j v'y j gp"guno cvgf "H_{geqtf}"y cu"wgf 0'Vq"r w'k'kpq"eqpvz v" c"r ctvkv cpv'y j q'y gki j u'97"mi "ecp"equwo g"342i "o qtg"ectdqj {f tcvg"vj g"fc{"dghtg"qpg"tkcn"eqo r ctgf "vq"vj g"qy gt0F gur kv"vj gug"hi vtgu."87' "qh"uwf lgu"r wdkuj gf "kp"KLUP GO "cpf "LKUP" gkj gt "f q"pqv"ej gem'uwdlgeu"eqo r rckpeg"vq"vj g"fgv"i kxgp"qt" f q"pqv"o gpvkv" k0' Vj ku" kpetgcugu"vj g"tkun'qh" uwdlgeu" y kj "r qqt"eqo r rckpeg"cf f kpi "pqkv"vq"vj g"tguwu"cpf "f getgcupi "gzr gto gpvnr qy gt0

Cr r tqzko cvgn {"87' "qh"uwf lgu"hekf "vq"tgr qtv"s wpvkvkxgn"vj g"qweqo gu"qh"fgvct {"kpcng"fwkpi "vj g"tkcn"r tgr ctvkv"r gkqf u0'Vj ku"r tqxkf gu"cp"kf gc"y j gvj gt"vj g"cxgtci g"kpvcngu"ctg"eqo r ctcdng"vq"qy gt"uko krt"i tqw u'lp"vj g'r qr wvkv0J qy gxgt."kp"vj g"o clqtk{"qh"tgugctej "uwf lgu."vj g"cxgtci g"xcngu"ctg"pqv"uki pkkcpv{"f khtgpv"dgw ggp"eqpf kkp"u"*Dqpf "gv"cn04234="O cef gto kf "gv"cn04234+0'Y kj kp/uwdlgev"xctkdkkku"ctg"qhngp"o cunf "d{"vj g"cxgtci g"xcngu0'K gcm{."c"vdrng"lpenf kpi "kpf kxf wcn'xcngu"cpf "c"eqnwo p"tgr qt vki "vj g"fgv"i kxgp"gpvti {"cpf "o cetqpwtkpv"kpvcngu"dgw ggp"tkcn"uj qwf "dg"uj qy p"kp"vj g"tgugctej "r cr gt0'Qpn" qpg"r wdkuj gf "uwf {"kpenf gf "vj ku"v{r g"qh"vdrng" *N{pej "4235+0'Tgugctej gtu"uj qwf "dg"gpqwtci gf "vq"lpenf g"vj g"vdrng"kp"vj gkt"r cr gt"gur gekm"y j gp"fgv"

ecp"j cxg"uki pklhcepv"lphwpeg"qp"vj g'uwf { "qweqo gu0J qy gxgt."ku"lpenwukqp"ku"lko kvgf "d{ " vj g'o czko wo "y qtf "eqwv"cpf lqt"pwo dgt"qh"cdrgu"cmqy gf "d{ "uelgp"lqwtpcn0"

C"pqvcdng"fhgtgpeg"y cu"qdugtxgf "lp"vj g's wcrkv{ "qh"vj g"cr r tqcej gu"wugf "lp"dqvj "lqwtpcn0"
 Vy gpv{/hxg"r gtegpv"o qtg"uwf lgu"ucpf ctf kugf "f kvct { "lpvcng"lp"KUP GO "eqo r ctgf "vq"
 LKUP " f gur kg" vj g" rwtg" o gcuwtkpi " r j {ulecni" r gthqto cpeg" cpf " tgrvxf" r j {ukqmi keni"
 tgr qpugu" lp" 97' " qh" tgugctej " r tqlgew" eqo r ctgf " vq" 72' " lp" vj g" hqto gt0 Rj {ulecni"
 r gthqto cpeg" ku" j ki j n{ "lphwpegf "d{ "ugxgtcn" f kvct { "hcevtu" *Dgm' (" O eNgrcp" 4224=" Q@Dtkp" 3; ; 5+" cpf " vj gkt "xctkckqp" dgw ggp" vlcni" *Eqttgk/Qrkxgk" gv" cni' 4235=" vj wu."
 dgwgt" ucpcf ctf kucvqp" ku" tgs wktgf 0' K' wpeqvtqmgf. " dqvj " y kvj kp/" cpf " dgw ggp/ugdgevu"
 xctkcdkkv{ " lp" r gthqto cpeg" y kn' kpetgcug. " rvcf kpi " vq" c" f getgcugf " ghgev" uk' g. " j gpeg"
 kpcf gs wcvg" gzi gtko gpvni" r qy gt " *Cvnpuqp" (" P gxkn' 4223=" J qr nku" gv" cni' 3; ; ; +0' Cu" c"
 tguw. "hcnug" eqpenwukpu" o ki j v" dg" f tcy p0' Ucpf ctf kugf "f kvj" uj qwf "dg" wugf "cu" c" f ghcnw"
 o gvj qf " lp" vj gvg" v{ r gu" qh" uwf lgu" vq" o kpk kug" xctkcdkkv{ 0' C" urki j v' f lhtgpeg" ecp" dg"
 qdugtxgf "lp" vj g" lo r cev" hcevtu" qh" dqvj "KUP GO "cpf "LKUP " *406" cpf "30. " tgr gevkn. "lp"
 42364237+0' K' cf f kkp. " o cp{ " qh" vj g" r wdkuj gf " ctvengu" lp" LKUP " kpenwf g" eqo o gtecni"
 r tqf wvu0' Vj ku" o ki j v' r ctvcm{ "gzi rclp" vj g" rcm' qh" f kvct { "ucpcf ctf kucvqp" lp" vj gvg" uwf lgu0'
 O qtgxgt. "34' " qh" uwf lgu" lp" LKUP " wugf " ucpcf ctf kugf " r tg/ vlcni" o gni" *gxgkpi " cpf " r tg/
 gztgekug+ " y j kej " o gcpu" f kvct { " lpvcng" o c{ " pqv" dg" hwm{ " eqvtqmgf " f vlcni " vj g" vlcni"
 r tgr ctkvqp" r gkqf 0' Eqpugs wgvn. " qpn{ " qpg" lp" vj tgg" tgugctej " r tqlgew" j cxg" eqvtqmgf "
 f kvct { "lpvcng" hqt" cv" rvcu' 46/ j qwt" eqo r ctgf "vq" qpg" lp" vj q" tgugctej " r tqlgew" lp" KUP GO 0'
 Vgp" r gtegpv" qh" uwf lgu" lp" KUP GO " wugf " y gli j gf " H_{geqtf} " eqo r ctgf " vq" 2' " lp" LKUP 0'
 Y gli j gf " H_{geqtf} " j cu" dggp" uj qy p" vq" dg" c" o qtg" ceewcvg" vgej plsvg" vj cp" vj g" guko cvgf "
 o gvj qf " *Y qn gt" gv' cni' 3; ; 7+0"

"

2.6 Conclusion

Dcugf "qp"vj ku"tgxky "gzco kpkpi "cm'gzr gtko gpvni"uwf lgu"r wdkuj gf "lp"KUP GO "cpf "LKUP "
 dgw ggp"422: "cpf "4236. "kv' cu"eqpenwf gf "vj cv' o cp{ "uwf lgu" *55' "lp"KUP GO "cpf "79' "lp"
 LKUP + " f kf " pqv" ko r ngo gpv' c" f kvct { "ucpcf ctf kucvqp" vgej plsvg" vq" eqvtqni' gpgti { " cpf "
 o cetqpwtkgpv"lpvcngu0' Co qpi uv" vj qug" vj cv' f kf. "c" uducpvcni" pwo dgt " *c " 67' + " gkj gt " f kf "
 pqv'ej genlht" eqo r rlcpeg" qt " f kf " pqv' o gpvqp" k0'

"

Chapter 3

The reproducibility of a diet using three different dietary standardisation techniques in athletes

3.1 Summary

Rctvlekr cpwu"ctg"qhngp"cumgf "vq"tgr nkecvg"vj gkt"f lgv" dghqtg" gcej "vlecn"kp" qtf gt "vq" eqpvtqn" f lgvct {" kpcng0" J qy gxgt." rkwg" ku" npqy p" cdqw" vj g" tgr tqf weklkrk{" qh" vj g" f lgv" wulpi " f khtgtpv"cr r tqcej gu0Vj g"clo "y cu"vq"cuugu"vj g"tgr tqf weklkrk{"qh" c" f lgv"y j gp"U_{f lgv}"H_{geqtf}" cpf "46/j qwt" F_{tgecm}" y gtg" wugf "cu" f lgvct {" ucpf ctf kucvkqp" vzej pls wgu0" Vj ktv{" cy rvgu" eqo r rvgvf "ukz" xkuku"vq"vj g"rdqtcvqt {"0"Qp"vj g"htuv"qeeckqp" c" F_{tgecm}"y cu"r gthqto gf "cpf" uwdlgeu"y gtg"cumgf "vq"tgr nkecvg"gzcevn{"vj g"uco g" f lgv"qp"vj g" f c {" dghqtg"Xkuku"4."y j gp" cpqyj gt" F_{tgecm}"y cu"r gthqto gf 0"Vj g" f c {" r tkqt "vq"vj g"vj kf "xkuku." uwdlgeu"eqo r rvgvf "c" H_{geqtf}." y j lej "y cu"r tguvpvgf "cv"Xkuku"5"cpf "cuuguugf "wulpi " F_{tgecm}"kp" qtf gt "vq" gpuwtg"eqo r ctdckrk {" dgwy ggp"o gjv qf u0"Uwdlgeu"y gtg"cumgf "vq"tgr nkecvg"vj ku" H_{geqtf}" dghqtg"Xkuku"6"y j lej "y cu" cuuguugf "wulpi " F_{tgecm}"0" Ncum {" . uwdlgeu"y gtg" r tqxkf gf "y kj "c" U_{f lgv}" qh" npqy p" eqo r qukvkqp" y j lej "vj g {" eqpuwo gf "hqt"46/j qwtu" dghqtg"Xkuku"7"cpf "80" Hqt "gcej "o gjv qf ."vj g" f khtg gpeg" kp" gpgti {" cpf "o cetqpwtlgpv" kpcngu" dgwy ggp" dqvj " qeeckqp" y cu" o gcuwtgf 0 F gur kg" hpf lpi "pq" f khtg gpegu"kp" o gcp" gpgti {" cpf "o cetqpwtlgpv" kpcngu" dgwy ggp" xkuku" hqt" cp {" vzej pls wg. "ko r qtvcpv"y kj kp/ uwdlgev" f khtg gpegu"y gtg" cr r ctgp0" Vj g" tpci g" qh" r gtegpvi g" eqghlelgpv" qh" xctkcvkqp" hqt" cm" xctkcdngu" y cu" dgwy ggp" 40/70 ' "hqt" U_{f lgv} "320/3: 08' "hqt" H_{geqtf} . "cpf "90/330' "hqt" F_{tgecm} 0" Vj ku" uwf {" j cu" uj qy p" vj cv" U_{f lgv} "ku" vj g" dguv" cr r tqcej "vq" ucpf ctf kug" f lgvct {" kpcng. "gur gekcm {" y j gp" vj g" gzr gevfgf "ghgev" qh" cp" kpvgtxgpvkqp" ku" uo cm" cpf "cp" gpj cpegf "tgrkcdckrk {" ku" tgs wktgf .

3.2 Introduction

Vj g"qweqo gu"qh" c" tgugetej "uwf {" y j gtg" j wo cp" uwdlgeu" ctg" cumgf "vq" r gthqto "c" r j {" ulecn" vumlecp" dg" kphwvpegf "d {" j qy "gcej " uwdlgev" r tgr ctgu0" Hqt "gzco r ng. "c" uwf {" vj cv" o gcuwtgu" vj g" ghgev" qh" echhkgp" qp" r j {" ulecn" r gthqto cpeg" o wuv" gpuwtg" vj cv" uwdlgeu" dgi kp" vguvki "kp" c" uko kct "ucvg" qh" r tgr ctgf pguu0" K gcm {" . uwdlgeu" uj qwf "dg" vguvgf "kp" cp" kf gpvlecn" ucvg" qh" pqwtkuj o gpv" cpf "j gcnj "kp" qtf gt "vq" r tguvtxg" kpvgtpci' xcrkf k {" 0" kpvgtpci' xcrkf k {" o gcpu" vj cv" vj g" qweqo gu" qdugt xgf " *g0 0" ko r tqxgo gpv" kp" vko g" vlecn" ctg" ecwugf "d {" vj g" kpvgtxgpvkqp" *g0 0" echhkgp = Lgceqeng" (" Dwtng" 4232+0" Vj gt ghqtg. " f lgv" pggf u" vq" dg" ucpf ctf kugf "kp" qtf gt " vq" o kpk kug" vj g" ghgev" qh" f khtgtpv" f lgvct {" eqo r qpwp" *g0 0" gpgti {" . ectdqj { f tcvg" cpf " echhkgp" npqy p" vq" j cxg" cp" ko r cev" qp" vj g" qweqo gu" qh" vj g" uwf {" *ugg" ugevkqp" 304+0" Hckkpi " vq" eqpvtqn" qt" grko kpcvg" vj gug" hcevqtu" ecp" ngcf "vq" hcnug" eqttgrvkvpu" cpf " kpeqttgev" tguwmu0

Ugxgten'uwf lgu"j cxg" f go qputcvgf "vj cv'hcrlpi "v"ucpf ctf kug"r ctvlek cpwu" f lgv"qp"vj g" f c" " dghqtg" wtkpg" uco r ng" eqmgevqp" kpetgcugu" xctkcdkx{"kp" vj g" wtkpct {" o gvcdqke" r tqhkg" *Y cnj "gv'cr04228="Ngp| "gv'cr04225+0Hwvj gto qtg."vj g"lpcdkx{"v"eqpvtqn'creqj qn'kpcvng" tgf wegu" cgtqde" r gthqto cpeg" d {"3306" "gxgp"46/j qwtu" chgt "ku" eqpuwo r vkp" *Qdtkgp" 3; ; 5+0Tgugctej gtu"uj qwf "vj gthqtg"vng"gzvct"o gcuwtgu"v"kuqrv"vj g"qweqo gu"qh"vj g" uwf {"htqo "vj g"gzvcpqqw"xctkcdgu0'

Kp" y gm'eqpvtqmgf " etquuxgt" f guki p" uwf lgu." r ctvlek cpwu" ctg" cungf " vq" eqpuwo g" vj gk" j cdkwcn'f lgvct {"kpcvng"r tkqt"v"vj g"htuv'vkn'cpf "vj gp"v"tgr rdecv"vj g"uco g" f lgv"r tkqt "v" gxgt {" uwdugs wgpv'vkn0Vj g"clo "ku"v"o kpo kug"vj g"xctkcdkx{"kp" f lgvct {"kpcvng"dgvy ggp"vj g" r tg/vkn'r tgr ctevkp"r gkqf u0Tgugctej gtu"o c {"wug" F_{tgecm}"cpf "H_{geqtf}"vgej pls wgu"cu"cp"ckf " vqqn"v"j gr "uwdlgeu"tgr rdecv"vj gk" f lgv0K gcm{. "vj g {"uj qwf "wug"vj g"U_{flgv}"cr r tqcej "y j kej " eqpuku"qh"r tqxf lpi " r tg/r cemi gf "o gcm"v"r ctvlek cpwu" hqt" eqpuwo r vkp" dghqtg" gcej " vkn0"

Tgugctej gtu"qhvgp"vng" hqt" i tcvpvgf " f lgvct {"ucpf ctf kucvkp0Vj ku"j cu"dgpp"j ki j rki j vgf "d {" vj g"pwo dgt "qh"uwf lgu"y j q" f q"pqv"ej gem"vj g"eqo r rncpeg"qh"vj gk" r ctvlek cpwu"v"vj g" f lgv" *ugg"ugevkp"406+0Ur qt v'uelgpeg"uwf lgu"kp"r ctvlewrt"qhvgp"j cxg" c"uo cni'uco r ng"uk" g" f wg"v" vj g"qhvgp"gzj cwukxg"pcwtg"qh"vj g"gz gtekug"r tqveqn'cpf " f khlwv {"v"tgetwk"r ctvlek cpwu." y j kej "o cngu"kv'o qtg" f khlwv"v" f ggev'uki plhlecpev'ej cpi gu"kp"vj g"r tgugpeg"qh"qwnktu"cpf " r ctvlek cpwu" y kj " r qqt" eqo r rncpeg" vq" vj g" f lgv" i kxgp0 F lgvct {" xctkcdkx {"kp" uwdlgev" r tgr ctevkp"ku" c"r qvvpkn'uwteg"qh" gttqt"vj cv'o c {"kphwpeg"r tko ct {"o gcuwtgo gpwu" d {" kpetgcukpi " uki pcn' pqkug" cpf " tgf wekpi " gzr gtko gpvkn" r qy gt" *Dtcwp" (" Dtqqm" 422: = Lgceqeng"("Dwtng"4232+0Y j cv'ku"pqv" {gv'engct "ku"vj g"o ci pkwf g"qh"vj g" f khtgpegu"kp" r ctvlek cpwu" gpgti {" cpf " o cetqpwtkgpv" kpcvngu" dgvy ggp" vkn" y j gp" vj g" vj tgg" cdqxgo gpvkpgf "cr r tqcej gu"ctg" wugf 0Vj gthqtg."vj g"o ckp"clo "qh"vj ku"lpxguki cvkpy" cu"v" cuugu" vj g" tgr tqf wekdkx {"qh" c" f lgv" y j gp" U_{flgv}" H_{geqtf}" cpf " F_{tgecm}" y gtg" wugf "cu" f lgvct {" ucpf ctf kucvkp"vgej pls wgu0'

3.3 Materials and methods

3.3.1 Participants

Vj ktv{ /hqt "o qf gtevgn{ /" cpf "y gm vtckpgf " o crg " cy rvgu " htqo " hkg " f khtg pv " f kxkr rkgu " *tqy kpi <43. "vtckv nqp <9. "e{enkpi <5. "twppkpi <4. "cpf "hqqvdcn <3 +r ctvckr cvgf "kp "vj ku'uwf { 0 Cj rvgu'y gtg'tgetwkgf "htqo "ur qt w'enwdu'kp "Qzhqtf uj ktg'y tqwi j "vj gkt'tgur gevkg'eqcej gu0 Vj ktv{ "cy rvgu"eqo r rvgf "vj g'uwf { "o gcp "Ö'UF <ci g"? "47'Ö'8" {t. "dqf { "o cuu"? "980'Ö'; 0" ni. "j gli j v"? "3: 2" Ö'9" eo + "cpf "hqt" y kj f tgy "htqo "vj g' uwf { "hqt" r gtuqpcn' tgcuppu0 Grki kdkrv{ "etkgtk'kpenw gf <"

- Cj rvgu'ci gf "dgy ggp"3: /62" {gctu"
- Kpxqrxgf "kp" c'vgo "qt" gpf wtcepg"v{ r g'cevkkv{ "
- Vtckkpi "x"7"j qwtu'r gt'y ggm'
- P qv'cmgti ke"qt'kpvrgt cpv'vq'hqf "r tqxf gf "
- Htgg" qh" o gxcdqrk" f kuqtf gtu" *gf 0' f kcdgvgu. " ectf kqxcuewrt" f kugcug. " qt" j {r gtvgpukqp+0"

C"o kpk wo "qh'42" r ctvckr cpw"y cu'tgs wkt gf "hqt" uco r r g'uk g" hqt" r tgekug" guvko cvg" qh" EX" cpf "ET" *C vnkpuqp" ("P gxkn'4223 += "j qy gxgt. "52" r ctvckr cpw"y gtg'tgetwkgf "vq" ko r tqxg" ucwvckn'r qy gt0Vj ku'uwf { "y cu'eqpf wevgf "ceeqt f kpi "vq" vj g'i wkf gkpgu' rckf "f qy p" kp" vj g" F gemtckqp" qh" J gnukpnk' cpf "cm'r tqegf wtgu" kpxqrxkpi "j wo cp" uwdlgeu"y gtg'er r tqxgf "d { " vj g" Wpkxtuk { "Tgugctej " cpf "Gj keu" Eqo o kvgg" *WTGE + "cv" Qzhqtf "Dtqqngu" Wpkxtuk { " *Crr gpf kz "C+0Y tkwgp" kphqto gf "eqpugpv'y cu'qdvckpgf "htqo "cm'r ctvckr cpw" r tkqt "vq" vj gkt" r ctvckr cvkp0

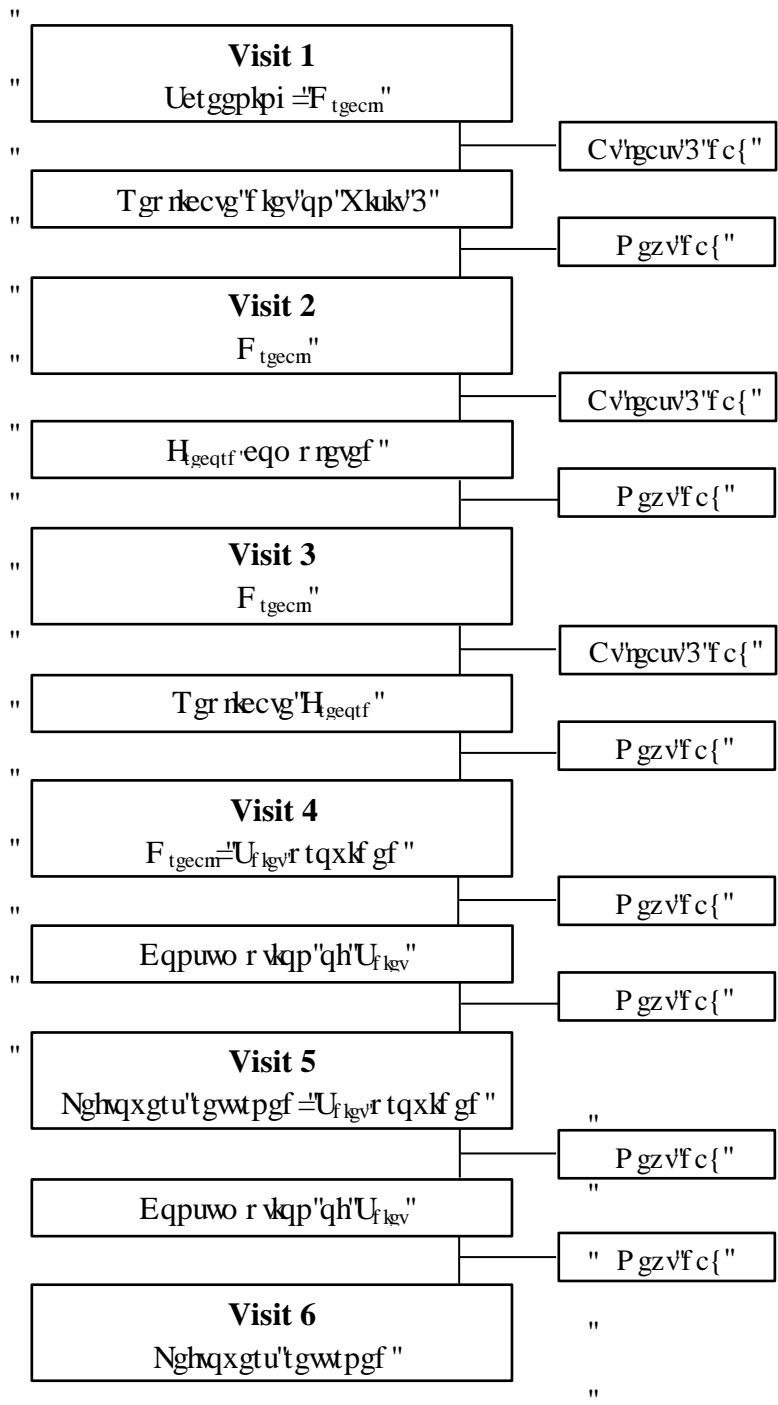
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3.3.2 Experimental design

Rctvckr cpw"eqo r rvgf "ukz "xkuku"vq"vj g" rcdqtcvqt { "vq" cuuguu"vj g" tgr tqf wekdkrv{ "qh" c" f kvv" y j gp" U_{figv}" H_{tgeqtf}" cpf " F_{tgecm}" y gtg" wugf " cu" f kvvct { " ucpf ctf kucvqp" vgej pls wgu0 Tgr tqf wekdkrv{ " kp" vj ku" eqpvzv" eqpukvgf " qh" vy q" o ckp" hcevqu" eqpvtkdwkpi " vq" vj g" xctkdkrv{ "qh" f kvvct { "kpvng0Vj g"htuv'y cu'vj g"cdkrv{ "qh" r ctvckr cpw"vq" tgr rkecvg"vj g" f kvv" cpf "vj g"ugeqpf "eqpukvgf "qh" vj g"ej cmgpi gu'vj cv'gcej "vgej pls wg'r rneg"qp" r ctvckr cpw0"

Vj g"gzr gtlk gpcn'f guki p"ku'uwo o ctlugf "dgrny "lp"Hki wtg"500'Rctvlekr cpw'y gtg"y gli j gf " qp" xkuk'3" vq"208" mi "pgct"r tgekukqp" kp" rki j v' enqj kpi "cpf" dctghqqv' wulpi "c" eckdtcvgf " grgetqple" uecrng" *Vcplkc" WM' Nvf 0" [lgy urg{." O kf f ngugz." WM+0' J gli j v' y cu" o gcuwtgf " y kj qw'uj qgu'y kj "cp"ceewtce{"qh'207"eo "wulpi "c"ucf kqo gvt "*Ugec"Nvf 0"Dkt o kpi j co ." WM+0'Tcpf qo kucvqp"y cu"pqv'r quukdng"cu"kv'y qwf "j cxg"eqo r rkecvgf "vj g"fguki p"qh'vj g" uwf {"d{"kpetgculpi "vj g"pwo dgt"qh'xkuku"*ugg"ugevqp"507+0Vj g"o gcp"f wtcvqp"qh'vj g"uwf {" hqt"r ctvlekr cpw'y cu"42"Õ'6"f c{u0"Vy gpv{/hqt"j qwt"o wnk r ng"r cuu"o gj qf "hqt" F_{tgecm}"y cu" wugf "cv'xkuku"3."4."5."cpf"6"vq"i gpgtcvg"r tko ct {"f cv"cpf "hqt"eqo r ctdckk{"dgvy ggp" o gj qf u0' Vj g" f hgtgpeg"kp" gpgti {"cpf" o cetqpwtkgpv' kpcngu"dgvy ggp"dqj "xkuku" hqt" F_{tgecm}" cpf " H_{tgeqtf}" o gj qf u" y cu" vj gp" o gcuwtgf 0' Hqt" c" eqo r ngv" cpf " ceewtcvg" f kvct {" cuuguu gpv."gcej "kpvgtxkgy "vqnm'dgy ggp"42"vq"52"o kpwgu'vq"eqo r ngv0'Rctvlekr cpw'y gtg" kphqto gf "vq"nggr "vj gk"vtcklpi "cu'uko kct"cu'r quukdng"vj g"f c{"dghqtg"gcej "xkuk'kp"qtf gt"vq" tgf weg'ku'kphwpeg"qp" f kvct {"kpcng0'

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Hki wtg'500Uwo o ct {"qh'y" g"gzr gtlk gpcn'f guki p0'

Vj g"o v_{nk}rg"r cuu"o gj qf "y cu" wugf "cu" cp" ckf "v" vj g" F_{tgecm} "kp" qtf gt "v" k_{pet}gcug" yj g"
 ceewtce {"qh'y" g" f cvc" eqm_{ge}v_{gf} " *O quj hgi j " gv' cr0'422: +0' Vj g"o v_{nk}rg"r cuu"o gj qf "j cu"
 crtgcf {"dggp'f guetkdgf "kp" uge_vqp"300400C"r j qvi tcr j le" hqqf "cv_{cu}'y cu" wugf "hqt"r qt_vqp"
 uk gu'kp" qtf gt "v" guko cvg' yj g" co qwpv'qh' hqqf "eqpuwo gf " *C_{nk}puqp" gv' cr0'4224+0'

J cdkwcn' fkgvct { " kpcng" y cu" cuuguugf " wukpi " vj g" F_{tgecm}" vgej pls wg" cv" Xkuk" 3" y j lej " r ctvlekr cpw" vj gp" wugf " dghqtg" Xkuk" 4" kp" cp" cwgo r v" vq" tgr rkecvg" vj g" uco g" f kgv' Cpqvj gt" F_{tgecm}" y cu" eqo r ngvgf " qp" Xkuk" 4" kp" qtf gt " vq" ecr wtg" vj g" cewcn' hqqf " kpcng" qp" vj g" r t g x k q w u" f c { " cpf " r ctvlekr cpw" tgegkxgf " kputwvkapu" qp" j qy " vq" eqo r ngvg" c" f g v c k g f " H_{geqtf} 0' P g z v." r ctvlekr cpw" eqo r ngvgf " c" H_{geqtf} " y j lej " y cu" r t g u g p v g f " cv" Xkuk" 5" cpf " y g t g " vj g p " i k x g p " vj g " q t k i k p c n " H_{geqtf} " k p " q t f g t " v q " t g r r k e c v g " 4 6 / j q w t u " d g h q t g " X k u k " 6 0 ' C f f k k q p c m { . " c " F_{tgecm}" y cu" eqpf wvgf " qp" Xkuk" 5" kp" qtf gt " vq" gpuwtg" vj g" eqo r ngvgp gu" qh" vj g" H_{geqtf} " cpf " ci ckp" qp" Xkuk" 6" kp" qtf gt " vq" ecr wtg" vj g" cewcn' hqqf " kpcng" qp" vj g" r t g x k q w u" f c { 0"

Ncuw{. " u w d l g e w u' y g t g' r t q x k f g f " y k j " c " U_{fkgv}" * r t g / r c e n c i g f " o g c n u " q h ' m p q y p " e q o r q u k k q p " k p " q t f g t " v q " d g " e q p u w o g f " k p " v j g " 4 6 / j q w t " r t k q t " v q " X k u k u " 7 " c p f " 8 0 ' V j g " r t g / r c e n c i g f " o g c n u " r t q x k f g f " q p " d q v j " q e e c u k q p u " y g t g " k f g p v k e c n " c p f " r c t v l e k r c p v u r g e k k e . " e q x g t k p i " v j g k t " f c k n { " g p g t i { " c p f " p w t l g p v " t g s w k t g o g p u " * T q f t k i w g l " g v " c n 0 ' 4 2 2 ; + 0 ' V j g " f k g v " r t q x k f g f " 4 8 2 " " q h " e c t d q j { f t c v g . " 4 3 7 " " q h ' r t q v g k p . " c p f " 4 4 7 " " q h ' h c v " q h ' v j g " v q v c n ' g p g t i { " k p v c n g 0 ' C " u c o r n g " f k g v " k u ' r t q x k f g f " k p " V c d n g " 5 0 8 0 G c e j " r c t v l e k r c p w u " v q v c n ' g p g t i { " t g s w k t g o g p v " y c u " e c r e w v c v g f " w u k p i " v j g " J c t t k u " c p f " D g p g f l e v " g s w e v k q p " c p f " v j g " u j q t v h q t o " q h ' v j g " k p v g t p c v k a p c n ' R j { u l e c n ' C e v k x k v { " S w g u k a p p c k t g " v q " f g y g t o k p g " v j g k t " g u v k o c v g f " d c u c n ' o g v c d q r k e " t c v g " c p f " r j { u l e c n ' c e v k x k v { " n g x g n " t g u r g e v k x g n { " * J c t t k u " (" D g p g f l e v " 3 ; 3 : = K c s " 4 2 2 4 + 0 ' k p " c " l q k p v " r q u k k q p " u c v g o g p v . " T q f t k i w g l " e t a l . " * 4 2 2 ; + " t g r q t v g f < " d g e c w u g " v j g " E w p p k p i j c o " g s w e v k q p " t g s w k t g u " v j c v " n g c p " d q f { " o c u u " d g " m p q y p . " u r q t w u " f k g v k k c p u " v { r k e c m { " w u g " v j g " J c t t k u / D g p g f l e v " g s w e v k q p 0 ' R c t v l e k r c p w u " t g w t p g f " c m ' n g h q x g t u " q p " X k u k u " 7 " c p f " 8 " c p f " t g e q t f g f " c p { " c f f k k a p c n ' h q q f " g c v g p " u q " v j g " c e w c n ' h q q f " e q p u w o g f " e q w r f " d g " f g y g t o k p g f " d { " u w d t c e v k p i " v j g " c o q w p v " q h ' h q q f " i k x g p " d { " v j g " c o q w p v " q h ' h q q f " n g h " c p f " v j g p " c f f k p i " v q " v j g " v q v c n ' c p { " c f f k k a p c n ' h q q f " q t " f t k p n i " t g e q t f g f 0"

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 "

Vcdng'500F kgv'hgf "vq'r ctvlekr cpvu'qp"vj g'f c { 'r tgegf kpi "xkuku'7"cpf '8"

| | Hqf " | Co qwpv" |
|----------|---|---|
| O gcn'3" | Eqtphengu" Ugo k'unko o gf "o km' | 332'i " 722'o n' |
| O gcn'4" | Y j kg'dt gcf " Ej ggug" Dgcpu" Dwwgt " Vqo cvq" Ewewo dgt " | 565'i " 322'i " 622'i " 62'i " 382'i " 362'i " |
| O gcn'5" | Rcuc" Vqo cvq"ucweg" | 357'i " 397'i " |
| Upcemi" | Cr r ng" Rgcej " Nqy "lqwrg"eqtf kn' | 423'i " 38: 'i " 422'o n' |

³Uco r ng'f kgv'ku'hqt "c'97"ni "uwdlgev'tclpki "8"fc { u'r gt 'y ggn0F kgvct { "eqo r qukkqp<gpgti { " ? "5482"necn=ectdjq { ftcvg"? "6: 3'i =r tqvlp"? "347'i =hcv"?"; 5'i 0 "

3.3.3 Nutrient analysis

Kpvtxky u'y gtg"eqpf wevgf "d { "c"vclpgf "f kvelekp"chgt "tgegkxkpi "cr r tqr tkvg"vclpki "hqt " f grkxgtkpi "uweeguulwi' cpf " r tqhguukqpcn' kpvtxky u0' P wtkleu" uqhy ctg" *P wtkleu" NVF. " F wdrhp."Kgrcpf +y cu'wugf "vq"cpn { ug'vj g'gpgti { "cpf "o cetqpwtkpv'kpvcngu'htqo "vj g'F tgecm" cpf "H tgeqtf 0C"xtg { "uo cni'pwo dgt'qh'hqf "kgo u'y gtg"cf f gf "o cpwcm { "vq"vj g'f cvcdug"vulpi " vj g'kphqto cvkqp"qp"vj g'pwtkkqp'hcew'rcdgr0 "

3.3.4 Statistical analyses

Ucvkuecni'cpn { ugu'y gtg"r gthqto gf "vulpi "URUU"x0; " *KDO "eqtr 0" Cto qpm" P [."WUC +0' Rqy gt'ecrewevkqp'y cu'pqv'r quukdng'cu'vj ku'y cu'vj g'htuv'uwf { "vq"cuugu'vj g'tgr tqf weklkx { " qh'c" f kgv0C vnkpuqp" cpf "P gxkn' *4223 +r tqxkf gf "i wkf cpeg" hqt "uwej "uwf kgu" cpf "uwi i guvgf " vj g" tgetwko gpv'qh'cv'rgcu'42" r ctvlekr cpvu' Vgp"o qtg" r ctvlekr cpvu' y gtg" tgetwkgf "kp" vj g" r tgu'gpv'uwf { "vq"ko r tqxg" r tgeklkqp 0' Rckt gf / uco r ng' t'vguu' y gtg' wugf "vq" eqo r ctg' vj g" o gcp" cuuki pgf "gpgti { "cpf "o cetqpwtkpv'kpvcngu' y kj " vj g" cewcn' co qwpv' eqpuwo gf "cu" vj g { "

y gtg"dqvj "pqto cm{ "f kmtkdwgf 0'Vj g"f khtgpegu"dgwy ggp"cuiki pgf "cpf "equpuwo gf "gpgti { " cpf " o cetqpwtkgpw" kpcngu" y gtg" pqv" pqto cm{ " f kmtkdwgf 0' Vj gthgtg." Y kraqzqpa" pqr ctco gtle" vgu" y cu" wugf " vq" eqo r ctg" vj g" o gf kcp" f khtgpegu." y j gtcu" Mgpf cmu" pqr ctco gtle"vcw"B"y cu"wugf "vq"o gcuwtg"vj g"eqttgrvq0'k"cf f kkp."vj g"eqgthekgpv"qh" xctkckp" *EX"?" 322"z"o gcp lUF +" y cu"ecrewcvf "hqt" gcej "o cetqpwtkgpv" k" cm" vj tgg" o gvj qf u"cpf "vj g"cxgtci g"EX' "tgr qtvgf 0'Vj g"eqgthekgpv"qh"tgr gcvdckk{ "*ET"?" 3Q 8"z" $\sqrt{\sum(d2 - d1)^2 / n - 1}$ "="U"?" uwo ="d3"?" o gcuwtgo gpv"3="d4"?" o gcuwtgo gpv"4="p"?" uco r ng"uk g+"y cu"cnq"ecrewcvf "vq"f gvgto kpg"vj g"o czko wo "f khtgpeg"rkng{ "vq"qewt" dgwy ggp" vy q" eqpugewkxg"o gcuwtgo gpv" qh" vj g" uco g" f kvct { "ucpf ctf kckvqp" o gvj qf 0' Qwktu"y gtg"pqv"gzemf gf "htqo "vj g"f cv"cpn{uku"cu"vj g{ "tgr tguvp"r ctvckr cpw"y j q" hckgf "vq"hmuy "vj g"f kv'tcvj gt"vj cp"gttqtu"kp"f cv0'Vj g"lpenwukqp"qh"qwkgtu"y km'tghgev"vj g" y j qrg"ur gevwo "qh"xctkckk{ "k" f kvct { "kpcng0'Ucvkuecn'uki pkkcepeg'y cu'ugv'cv'p >"070

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3.4 Results

Vj g"o gcp"gpgti { "cpf "o cetqpwtkgpv" kpcngu"dgwy ggp"vj g"cuiki pgf "cpf "cewcn'co qwpv"qh" hqf " equpuwo gf " k" cm" vj tgg" f kvct { "ucpf ctf kckvqp" vgej plk wgu" y gtg" pqv" ucwvkecm{ " uki pkkcepv"*Vcdrg"504+0J qy gxgt."vj g"o gf kcp" f khtgpeg"dgwy ggp"cuiki pgf "cpf "equpuwo gf " gpgti { ."ectdaj { ftcvg."r tqvklp." cpf "hv" kpcngu" hqt" F_{tgecm} cpf "H_{geqtf}" y gtg"uki pkkcepv{ " j ki j gt"vj cp"vj qug"kp"vj g"U_{fkgv}"y kj "p">"03"*Vcdrg"505+0'Vj g"qpn{ "ucwvkecm{ "uki pkkcepv" f khtgpeg"dgwy ggp" F_{tgecm} cpf "H_{geqtf}" y cu'hqt' hv'kpcng0'

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Vcdrg'50400 gcp'cuuki pgf "cpf "equpuwo gf "gpgti { "cpf "o cetqpwtkgpv'lpvcng'htq'F_{tgecm}"
 H_{geqtf} · "cpf "U_{fgv}"

| O gjy qf " | Cuuki pgf " | UF " | Equpuwo gf " | UF " | p'xcnwg " |
|-----------------------|-------------|--------|--------------|---------|-----------|
| F _{tgecm} " | " | " | " | " | " |
| Gpgti { "*necm" | 5"269" | 873" | 5"334" | 9: 6" | 07: " |
| Ectdqj { f tcvg"*i +" | 6220" | 3330 " | 6330" | 35306" | 07: " |
| Rtqvglp"*i +" | 36708" | 7808" | 3720 " | 7: 05" | 046" |
| Hcv"*i +" | 3260" | 5: 09" | 32706" | 6307" | 0 ; " |
| H _{geqtf} " | " | " | " | " | " |
| Gpgti { "*necm" | 5"348" | 884" | 5"249" | : 58" | 065" |
| Ectdqj { f tcvg"*i +" | 5: 707" | 35207" | 5: 604" | 3670 " | 0 5" |
| Rtqvglp"*i +" | 3740" | 6707" | 3740 " | 8208" | 0 : " |
| Hcv"*i +" | 33808" | 5805" | 32709" | 6208" | 083" |
| U _{fgv} " | " | " | " | " | " |
| Gpgti { "*necm" | 5"253" | 6; 2" | 5"2: 7" | 759" | 044" |
| Ectdqj { f tcvg"*i +" | 6750 " | 9; 02" | 67: 08" | : : 08" | 069" |
| Rtqvglp"*i +" | 3380 " | 370 " | 33: 08" | 3: 0 " | 05: " |
| Hcv"*i +" | : 504" | 3906" | : 808" | 380 " | 02: " |

Vcdrg'50500 gf kcp'f hhtgpeg'dgy ggp'cuuki pgf "cpf "equpuwo gf "pwtkpv'lpvcng'htq'F_{tgecm}"
 H_{geqtf} · "cpf "U_{fgv}"

| P wtkgpv' | F _{tgecm} " | H _{geqtf} " | U _{fgv} " |
|--|----------------------|----------------------|--------------------|
| Gpgti { "*necfthi "DO ^{/3} +" | 508, " | 50 ^Ä | 207" |
| Ectdqj { f tcvg"*i th "DO ^{/3} +" | 209, " | 206 ^Ä | 202" |
| Rtqvglp"*i th "DO ^{/3} +" | 208, " | 208 ^Ä | 202" |
| Hcv"*i th "DO ^{/3} +" | 208, ^Æ | 206 ^Ä | 202" |

* p' > '023 = F_{tgecm} "v.s. "U_{fgv}"

Ä p' > '023 = H_{geqtf} "v.s. "U_{fgv}"

Æ p' > '023 = F_{tgecm} "v.s. "H_{geqtf} "

"

Vj g"tguwmu"qh"vj g"eqttgrvkwpcn'cpcn{uku'dgwy ggp"cuuki pgf "cpf "eqpuwo gf "pwtlgrp'kpvncgu" hqt"gcj "qh"vj g"vj tgg"o gj qf u'ctg"uj qy p"lp"Vcdng"5060'Qxgtcm"vj gtg"y cu"cxgt {"utqpi ." r qukkxg"eqttgrvkwpcn'dgwy ggp"cuuki pgf "cpf "eqpuwo gf "ectdqj {f tcv'kpvncgu" hqt"U_{f_{lgv}}"cpf "c" utqpi "eqttgrvkwpcn" hqt" gpgti {." r tqvklp." cpf "hcv" kpvncgu" hqt" U_{f_{lgv}}" J qy gxgt." o qf gtcv' eqttgrvkwpcn'y gtg'hqwpf "dgwy ggp"cuuki pgf "cpf "eqpuwo gf "gpgti {"cpf "ectdqj {f tcv'kpvncgu" hqt"F_{tgecm}"cpf "dgwy ggp"cuuki pgf "cpf "eqpuwo gf "gpgti {." r tqvklp."cpf "hcv"kpvncgu" hqt"H_{geqtf}" Vj g"qpn' "utqpi "eqttgrvkwpcn'hqwpf "hqt"F_{tgecm}"y gtg" hqt"r tqvklp"cpf "hcv"kpvncgu."y j gtgcu" hqt" H_{geqtf}"y cu" hqt"ectdqj {f tcv'kpvncgu"0Cm'eqttgrvkwpcn'y gtg'ucvkwkccm{ "uki pkkccpv"p">"027+0"

Vcdng"5060Mgpf cm'vcw"B"eqttgrvkwpcn'dgwy ggp"cuuki pgf "cpf "eqpuwo gf "pwtlgrp'kpvncgu" hqt" F_{tgecm}"H_{geqtf}."cpf "U_{f_{lgv}}"

| P wtlgrp' | F _{tgecm} ' | H _{geqtf} " | U _{f_{lgv}} " |
|----------------|----------------------|----------------------|--------------------------------|
| Gpgti { " | 076" | 066" | 09: " |
| Ectdqj {f tcv" | 073" | 08: " | 0 5" |
| Rtqvklp" | 097" | 076" | 09: " |
| Hcv" | 088" | 067" | 095" |

Cm'xcnwgu'y gtg'ucvkwkccm{ "uki pkkccpv"p">"027"

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"
"
"
"

Vcdng'5070Tgkcdkx\ "qh'gpgti { "cpf "o cetqpwtkgpv'kpcvngu'hqt'F_{tgecm} H_{tgeqtf} . "cpf "U_{fkgv}"

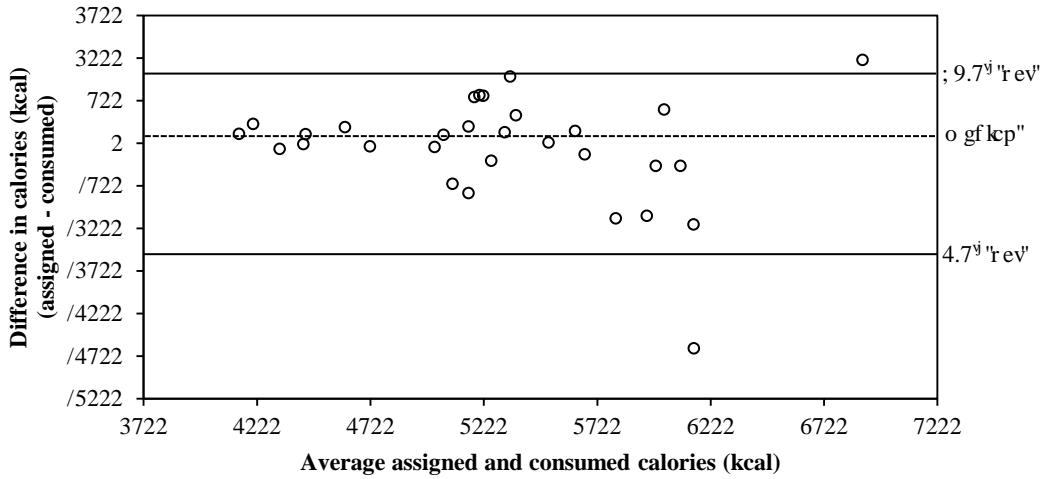
| O gyj qf " | Gpgti { "necm" | Ectdqj { f tcvg "i +" | Rtqvlgp "i +" | Hcv "i +" |
|---------------------------|----------------|-----------------------|---------------|-----------|
| D_{recall} | " | " | " | " |
| EX' " | ; ' " | 33' " | 9' " | 34' " |
| ET" | 3"47: " | 4250" | 6: " | 7906" |
| F_{record} | " | " | " | " |
| EX' " | 33' " | 32' " | 33' " | 3; ' " |
| ET | 3"578" | 37; Q " | 97Q " | 9205" |
| S_{diet} | " | " | " | " |
| EX' " | 5' " | 5' " | 5' " | 8' " |
| ET" | 6: 2" | 8605" | 4405" | 420 " |

"

"

Cuuki pgf " cpf " equpuwo gf " kpcvngu" cetquu" gpgti { ." ectdqj { f tcvg ." r tqvlgp ." cpf " hcv" y gtg" eqo r ctgf "wulpi "uecwtg'r mqu'y kj "; 7' "hko ku'qh'ci tggo gpv'cu'uj qy p"kp" Hki wtgu"504650350 Vj g'hko ku'qh'ci tggo gpv'y gtg" guko cvgf "wulpi "vj g"407vj "cpf"; 907vj "r gtegpv'ngu" *utcki j v' rkpgu'0' Vj g'f cuj gf "j qtk qpvcn' rkpgu'uj qy "vj g"o gf kcp" f khtgpeg0' Cu"ecp" dg"uggp"kp" vj g" hki wtgu." vj g" qdugtxcv'kpu"kp" vj g" F_{tgecm} "cpf " H_{tgeqtf} "o gyj qf u" y gtg" o qtg" uecwtg gf "hqt" cm' xctkcdngu" eqo r ctgf "vq" U_{fkgv} "0' Qp" vj g" qvj gt "j cpf . "vj g" qdugtxcv'kpu"kp" U_{fkgv} "y gtg" f kwtkdwgf " ctqwpf " vj g" o gf kcp'0' Vj g" hko ku'qh'ci tggo gpv'kp" vj g" F_{tgecm} "cpf " H_{tgeqtf} "o gyj qf u" hqt" cm' pwtkpvu" y gtg" y kf gt ." cm quv' vy keg" kp" o quv' xctkcdngu ." eqo r ctgf "vq" vj g" U_{fkgv} "o gyj qf 0' Qxgtcm "pq" erget "v'gpf u" y gtg" qdugt xgf "kp" vj g" uecwtg "r mqu" hqt" cm' o gyj qf u" gzege v' kp" Hki wtgu"504."509."503."cpf "50350' Hki wtg"504"cpf "5033" kpf kecvg" vj cv' vj g" xctkcdkx\ "qh' vj g" f khtgpegu" kpetgcugf "y kj "vj g" o ci pkwf g"qh'gpgti { "cpf "hcv" kpcvng"kp" F_{tgecm} "t gur gev'xgn(0' Hki wtg"509" kpf kecvg" vj cv' vj g" xctkcdkx\ "qh' vj g" f khtgpegu" f getgcugf "y kj "vj g" o ci pkwf g"qh' ectdqj { f tcvg" kpcvng"kp" U_{fkgv} "0' Hki wtg"5033" kpf kecvg" vj cv' pgi cv'xg" f khtgpegu" y gtg" o qtg" cr r ctgpv' vj cp" r qukxg" f khtgpeg0'

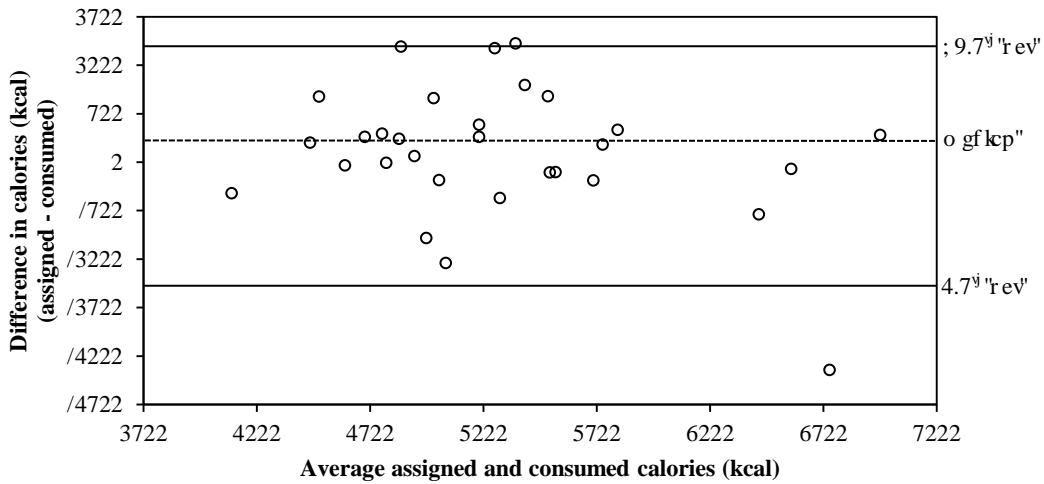
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"



Hi wtg 5050 E qo r ctkuq p'qh'j g'co qwpv'qh'gpgti { "necn'tgr qtvgf "qp'yj g'htuv'cpf 'ugeqpf " xkukv'ht'H_{geqtf}'

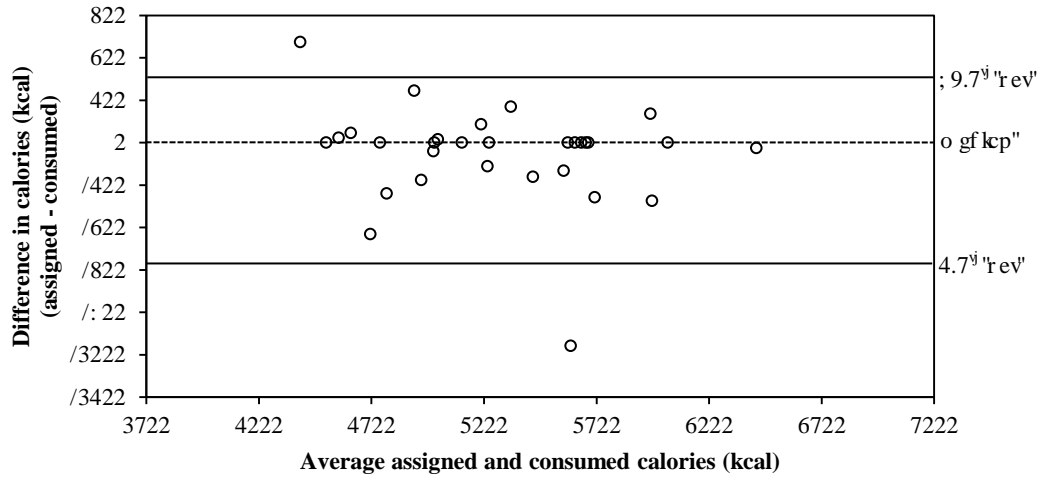


Figure 506: Scatter plot of difference in calories (assigned - consumed) versus average assigned and consumed calories (kcal). The plot shows a dashed line at 0 and two solid lines at 9.7 and 4.7 kcal, representing limits of reproducibility.

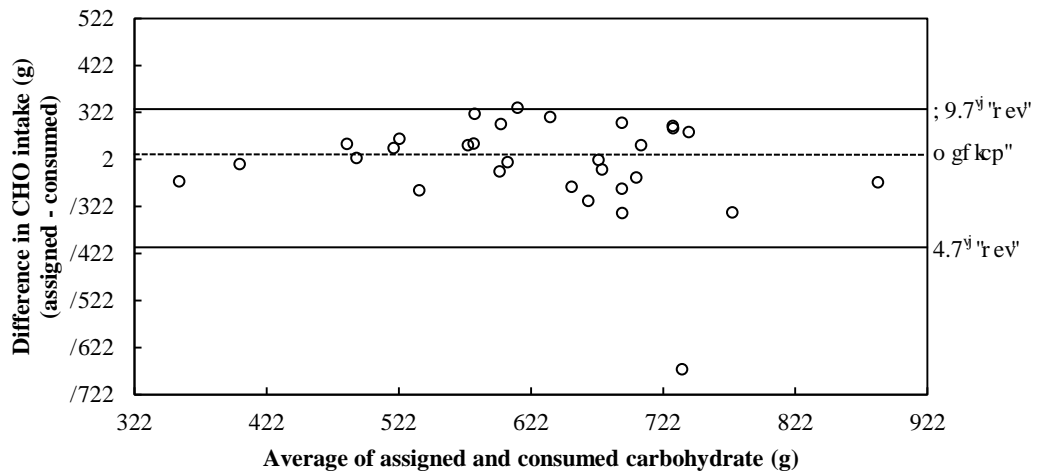
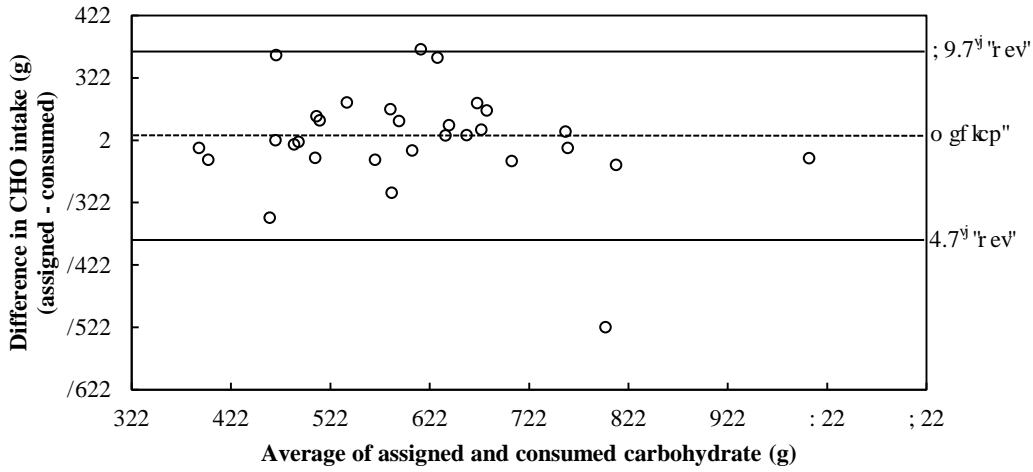
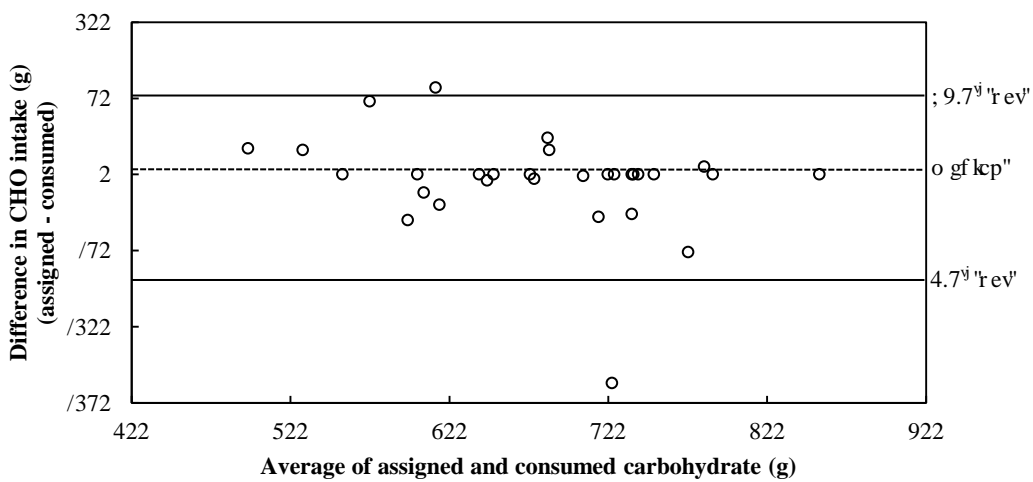


Figure 507: Scatter plot of difference in CHO intake (assigned - consumed) versus average of assigned and consumed carbohydrate (g). The plot shows a dashed line at 0 and two solid lines at 9.7 and 4.7 g, representing limits of reproducibility.

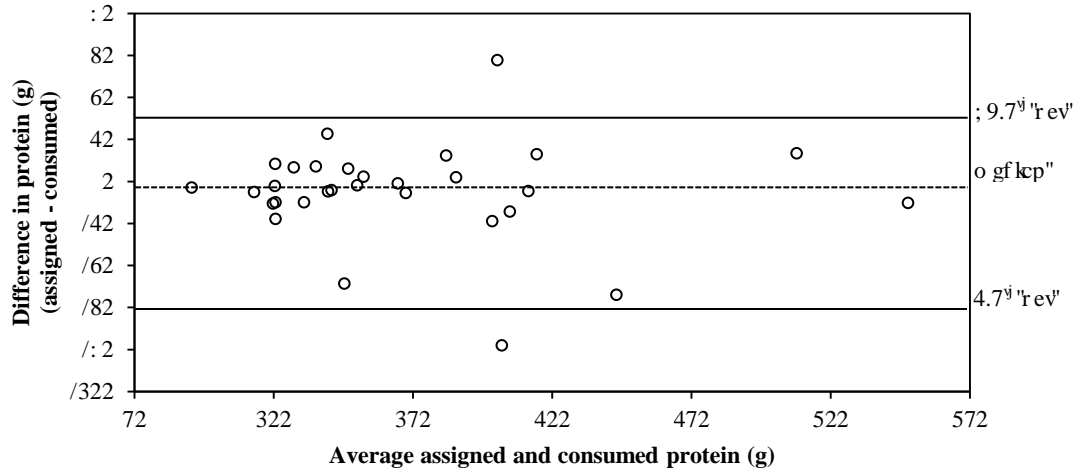


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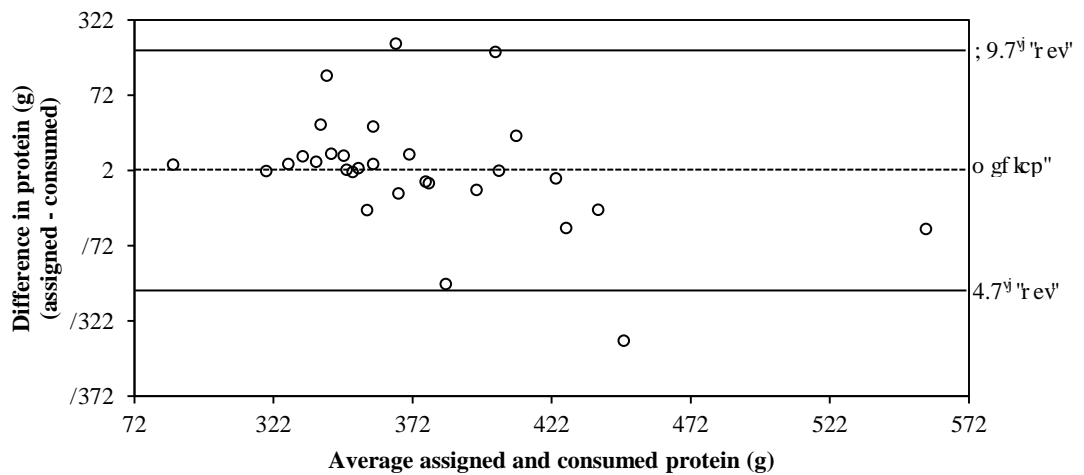


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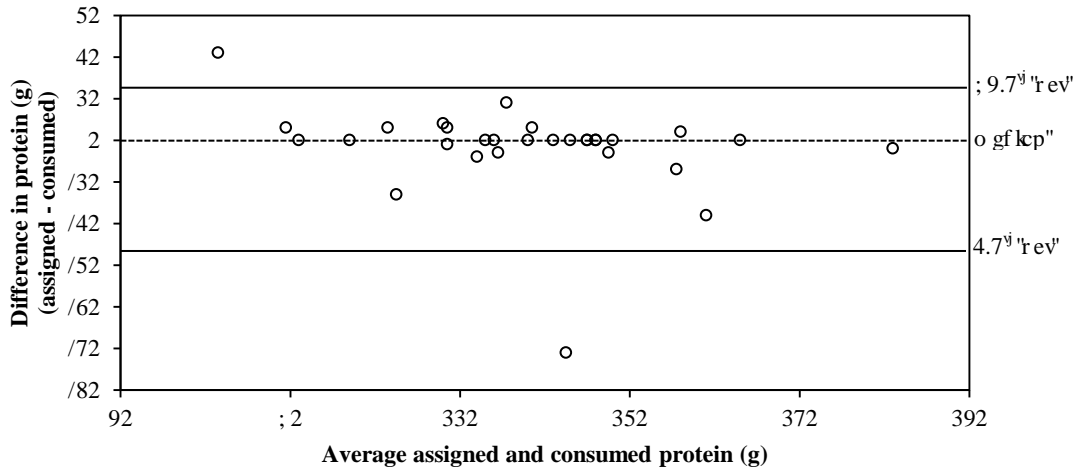
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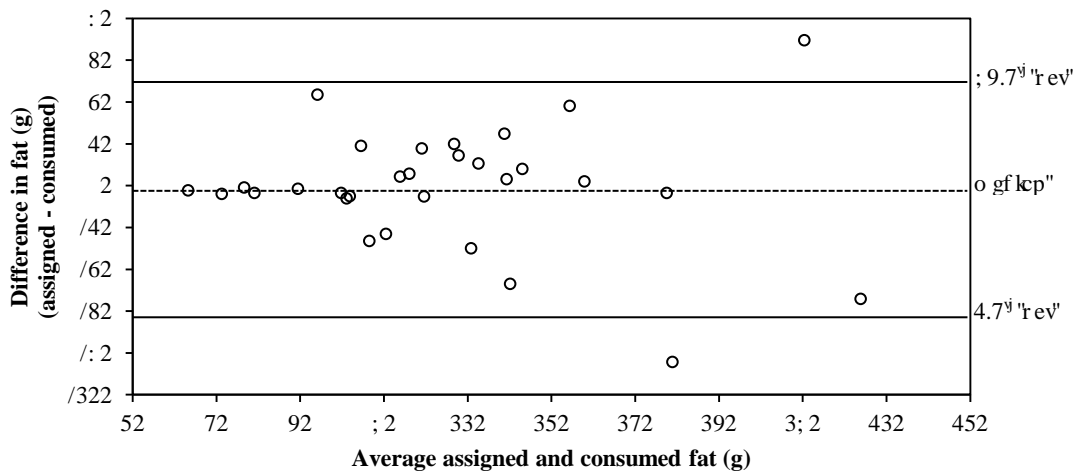
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Hi wtg'50 0Ego r ctkuqp'qh'yj g'co qwpv'qh'r tqvlp'i +tgr qtvgf "qp'yj g'ktuv'cpf "ugeqpf 'xlukv' hqt'H_{geqtf}0



Hi wtg"5020Eqo rctkuqp"qh'yj g"co qwpv'qh'r tqvlp"xi +tgr qtvgf "qp'yj g'htuv'cpf "ugeqpf " xkuk/hqt "Ufigv0



Hi wtg"5030Eqo rctkuqp"qh'yj g"co qwpv'qh'rcv"xi +tgr qtvgf "qp'yj g'htuv'cpf "ugeqpf "xkuk/hqt " F tgecm0

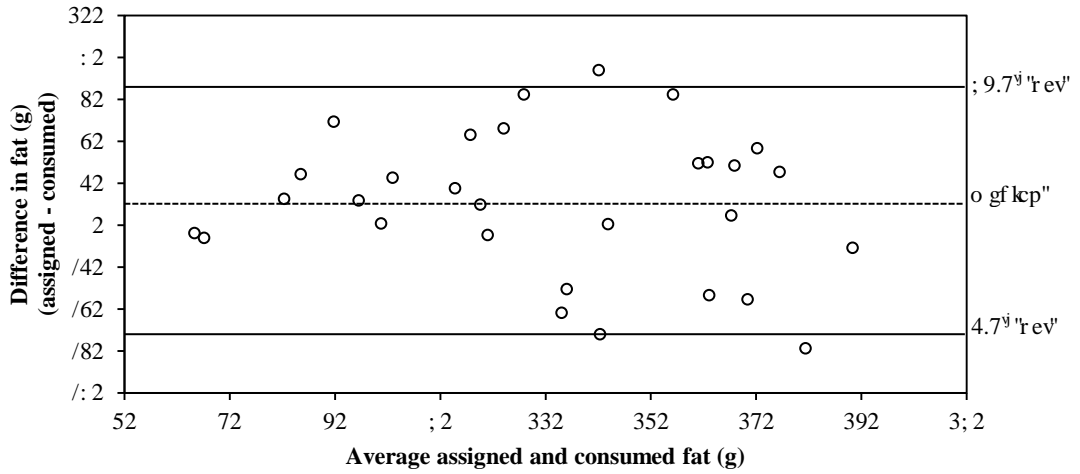


Figure 5.340: Scatter plot of assigned vs. consumed fat (g) for a group of subjects. The dashed line represents the identity line (y=x). The solid lines represent the 9.7% and 4.7% reproducibility limits.

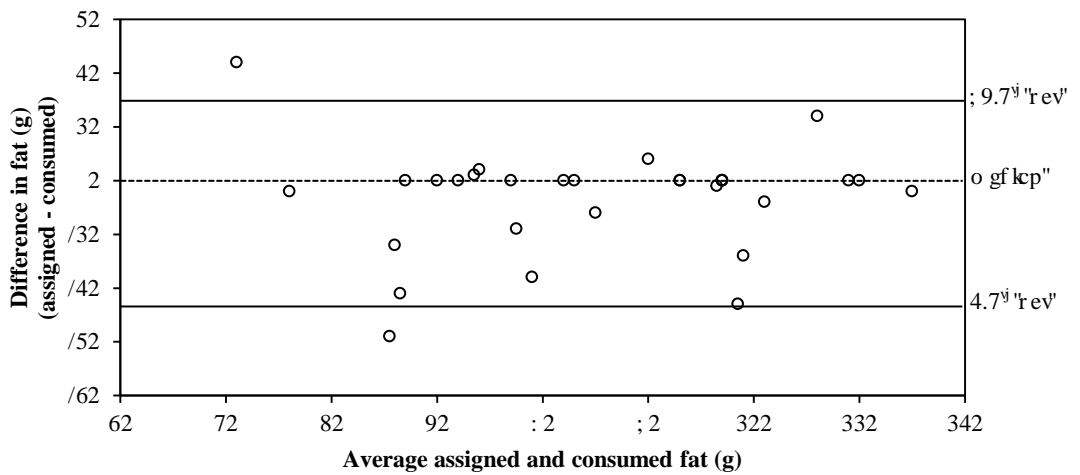


Figure 5.350: Scatter plot of assigned vs. consumed fat (g) for another group of subjects. The dashed line represents the identity line (y=x). The solid lines represent the 9.7% and 4.7% reproducibility limits.

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3.5 Discussion

Vj g"o gf kcp" f khtg ppeg" dgy ggp" cuuki pgf "cpf" eqpuwo gf "pwtkpv" kpcng" hqt" F_{tgecm} "cpf" H_{geqtf} "y gtg" uki p hkecpw { "j k j gt" "j cp" "kp" "vj g" "U_{flgv}" "Vq" "r w" "k" "kp" "vq" "eqpvz.v." "vj g" "f khtg ppeg" dgy ggp" xkuku" "3" "cpf" "4" "qh" F_{tgecm} "kp" "ectdqj { f tcvg" "kpcng" "qh" "c" "r ct vlek" "cpv" "y gli j kpi" "97" "mi" "y cu" "ctqwpf" "72" "i" "y j gtgcu" "vj g" "f khtg ppeg" "y cu" "52" "i" "hqt" H_{geqtf} "cpf" "2" "i" "hqt" U_{flgv} "0J" "qy gxgt." "pq" "y gm" "f guki" "pgf" "uwf { "j cu" "gxgt" "kpxguki" "cvgf" "c" "f khtg ppeg" "kp" "ectdqj { f tcvg" "kp" "uwej" "ngxgn" "qp" "r j { ulecn" "r gthqto" "cpeg" "uwej" "cu" "vko" "g" "vq" "gzj" "cwukqp" "0" Vj g" o gf kcp" f khtg ppeg" dgy ggp" cuuki pgf "cpf" eqpuwo gf "pwtkpv" kpcng" kp" F_{tgecm} "cpf" H_{geqtf} "y cu" "pqv" "ucv" "kulecm" { "uki p hkecpv" *gzevr "hqt" "hcv" "kpcng" + "cpf" "vj gtg" "ctg" "vy q" "r quukdn" "gzr" "ncpv" "kpu" "hqt" "vj ku" "0"

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gxr gto gpvt"cu"vj g"r tgr ctvqp"qh"vj g"r tg/r cenf gf"o gcu"ku"ko g"equwo kpi "cpf"equw{
eqo r ctgf "v"F tgecm"qt"Hgeqtf"lgceqeng("Dwtng"4232+0

Hkpcmf . "c"pwo dgt "qh'ko r qtvcpv'iko kcvkqpu"pggf "v"dg"eqpukf gtgf O'Rctvlekr cpvu'y gtg'cy ctg" qh'vj g"clo "qh'vj g"uwf { "y j lej "gpj cpegf "vj g"rkngrkj qqf "qh'dgwgt "cf j gtgpeg"v"vj g"f kgv'cpf " r qvvpkcmf "mqy gt "vj g"xctkcdkkrv{ "qh'pwtkpv'kpvncguO'Hqt "vj ku'tgcuqp. "vj g'tguwmu"qdvckpgf "kp" vj ku'uwf { "o c { "wpcf gtguko cvg"vj g"vbwg"xctkcdkkrv{ "vj cv'eqwrf "dg"qdugt xgf "kp"qvj gt "uwf kgu" y j gtg'fkgvct { "ucpf ctf kucvqp"ku"pqv'vj g'htuv'clo O'Vj g"qtf gt "qh'vj g'f kgvct { "vgej pls wgu'wugf " y cu"pqv'tcpf qo kugf "rgcf kpi "v" c "r qvvpkcn'ko r tqxgo gpv"kp" r ctvlekr cpvu'tgecmkpi "unkmu" fwtkpi " vj g" F_{tgecm} kpvgtxkgy uO' Vj g" tcpf qo kucvqp" y cu" pqv' r quukdrg" cu" kv' y qwrf " j cxg" eqo r rdecvgf "vj g'f guki p"qh'vj g"uwf { "d { "kpetgculpi "vj g'pwo dgt "qh'xluku"y j gp"H_{tgeqif} "ku'wugf " htuv" *ugxgp" xluku+"qt" U_{fkgv} htuv" *gki j v' xluku+"eqo r ctgf "v" ulz " xluku"cu" kp" vj g" ewtgpv" r tqvqeqrO'Y g"cmq'f kf "pqv'o gcuwtg"r ctvlekr cpvu'gpgti { "gZR gpf kwg"qp"vj g'f c { "r tgegf kpi " gcej "xluk'v"ugg"y j gvj gt "vj g"xctkcdkkrv"kp"pwtkpv'kpvncgu"y cu"eqttgrcvgf "y kj "vj gk"cevxkv{ " r xgrnOJ qy gxgt. "y g'f kf "cum'qwt"r ctvlekr cpvu"v"nggr "vj gk'r j { ukecn'cevxkv{ "hxgrn'cu'emqug"cu" r quukdrg'vj g'f c { "dghqtg"gej "xlukO"

3.6 Conclusion

Vj ku'uwf { "eqphko u"vj cv'o crg"cvj ngvu"xct { "vj gk" f kgvct { "kpvncg"y j gp"vj g { "ctg"cumgf "v" tgr tqf weg" vj gk" htgnf "ugrgvgf " f kgv' kp" eqo r ctkuqp" v" y j gp" o gcu" ctg" r tqxkf gf "cu" c " ucpcf ctf kugf " f kgvO' Vj gtghqtg. "ucpcf ctf kugf " f kgv"uj qwrf " dg" wugf " y j gp" f kgv" j cu" c " i tgcv' kphwpeg"qp"vj g"kvgtxgpvqp"qt"r gthqto cpeg"cpf "cp"gpj cpegf "tgrkcdkkrv{ "ku'tgs wkt gf "f wg" v"vj g"uo cm'gZR gevfg "ghgeO'Vj ku'tgugctej "j cu"j ki j rki j vgf "o cp { "s wguvqpu"kp"pggf "qh" hwtvj gt "kpxgunki cvkqpO'O qtg'tgugctej "ku"pggf gf "vcti gvki "qvj gt"r qr wrcvqp"i tqwr u."uwej "cu" wvckpgf . "qxgty gli j v."cpf "qdgug"r gqr ng. "cpf "hgo crg"cvj ngvuO'Hwtvj gt"y qtni'pggf u"v"dg" f qpg"v"guvdrkuj "v"y j cv'gz vgpv'f gr gpf gpv'xctkcdrgu" *kgo'r gthqto cpeg. "dmqf "dkqo ctngtu. " cpf "pwtkpv'qz kf cvkqp+"ctg"chgevgf "d { "o cpr wrcvqp"qh'f kgvct { "r ctco gvgtu" *gd O'vqcn'f cknf " ectdqj { f tcvg'kpvncg+y kj kp"vj g"v{ r kecn'cpi g"qh'xctkcdkkrv"qdugt xgf "kp"vj ku'uwf { O' "

Chapter 4

The consumption of liquid diet pre-experimental trials improves adherence compared to solid diet in athletes

4.1 Summary

F kuetgr cpekgu"kp"gpgti { "cpf "o cetqpwtkgpv"kpvcngu"ctg"cr r ctgpv"kp"tgugctej "uwwf kgu"gxgp" y j gp" c" uqrkf" r tg/r cenai gf " fkgv" *UQf kgv" ku" wugf " vq" uxcpf ctf kug" f kgvct { " kpvcng0' K' ku" wnpny p"y j gj gt" c" nks wkf "r tg/r cenai gf " fkgv" *NKf kgv" rgef u"vq" ko r tqxgf "cf j gtgpeg"cpf " vj gtghqtg" rny gt "xctkcdkrf { "kp"gpgti { "cpf "o cetqpwtkgpv"kpvcngu0'Vj g" cko "qh"vj ku"ugeqpf " uwwf { "y cu"vq"cuugu"vj g"cdkrf { "qh"cyj rvgu"vq" tgr rdecvg" c" fkgv"y j gp"NKf kgv"cpf "UQf kgv"y gtg" wugf " cu" f kgvct { " uxcpf ctf kucvkqp" vgej pls wgu0' Kp" c" etquuxgt" f guki p." r ctvlekr cpwu" y gtg" tcpf qo n { " cuuki pgf " vq" gkj gt" UQf kgv" qt" NKf kgv." gcej " eqpuwo gf " qp" vy q" ugr ctcvg" f c { u0' Rctvlekr cpwu"y gtg"kpwtwvfg "vq"eqpuwo g"cm"vj g"o gcu"r tqxkf gf "cpf "vq"tgwtp"vj g"rghqxtgu0' Vy gpv{/gki j v'o cng"cyj rvgu"eqo r rvgf "vj g"uwwf { 0'Vj g"cpn { ugu"qh"vj g"uecwtg"r rqu"uj qy gf " vj cv"vj g" qdugtxcvkqp"kp"UQf kgv" cpf "NKf kgv"y gtg" f kmkdwgf "ctqwpf " vj g"o gcp"y kj " vj g" gzeqr vkqp"qh"uqo g"qwrktgu0' Vj g"EX' "qh"gpgti { "cpf "o cetqpwtkgpw" hqt"UQf kgv"y gtg" j ki j gt"vj cp"NKf kgv"*7' "cpf "5' "hqt"gpgti { =7' "cpf "5' "hqt"ectdqj { f tcvg=7' "cpf "4' "hqt" r tqvklp=cpf "7' "cpf "5' "hqt"hc.v"tgur gevkgm { +0'Gpgti { "cpf "o cetqpwtkgpv"kpvcngu"qp" f c { "3" y gtg"xgt { "utqpi n . 'r qukkxgn { "eqttgrcvf "t"@0 2+"y kj "vj qug"qp" f c { "4'hqt"dqj "o gyj qf u"*p >"02+0'Vj ku"uwwf { "eqpht o u"vj cv"NKf kgv"ku"cp"ghgevkxg"vgej pls wg"vq" uxcpf ctf kug" f kgv"r tg/ gzr gtko gpvci"tkni"cpf "eqwf "dg"wugf "cu"cp"cngtpcvkxg"vq"UQf kgv0'

"

4.2 Introduction

Cu"eqpenmf gf "kp"vj g"r tgxkqu"uwwf { "r tgugpvgf "kp"Ej cr vgt"5. "Ufkgv"ku"vj g"dguv"cr r tqcej "vq" eqpvqrnf f kgvct { "kpvcng"cpf "o wuv'dg"eqpukf gtgf "y j gp" f kgv"j cu" c" i tgcv" kphwvgep"qp" vj g" kpvgtxgpvkqp" qt" r gthqto cpeg" cpf " cp" gpj cpegf " tgrkcdkrf { " ku" tgs wkt gf " f wg" vq" vj g" uo cm' gzr gevfg "ghge0'Vj ku"eqpenwukqp"ku"cnuq"uwr r qtvgf "d { "Lgceqeng"cpf "Dwtng"*4232+"y j q" uj qy gf " uko kct" qdugtxcvkqp0' J qy gxgt. " f gur kvg" ku" uwr gtkqtkv { " qxgt" vj g" qvj gt" f kgvct { " uxcpf ctf kucvkqp"o gyj qf u."k'j cu"qpn { "dggp" wugf "d { '9' "qh"uwwf kgu"r wdrkuj gf "kp"KLUP GO "cpf " LKUP "htqo "422: "vq"4236"*ugg"ugevkqp"406+0'Vj g"vpr qr wrctk { "qh"vj g"UQf kgv"ku"xgt { "rkngn { " f wg"vq"vj g"j ki j "equv"cpf "dwtf gp"qp"tgugctej gtu0'Ceeqtf kpi "vq" Lgceqeng"cpf "Dwtng"*4232+" vj g"cxgtci g"equv"r gt"r ctvlekr cpv"r gt"tkni"ku"dgwy ggp"9042"cpf "C; 020'Vj ku"lpetgcugu"vj g" dwf i gv"qh" c"uwwf { "uki phtecpwn { ."gur gekm { "y j gp" c" dki "uco r ng"uk g"cpf lqt"o wnr ng"tkni" ctg"tgs wkt gf 0'K"cf f kkkp."vj g"r tgr ctcvkqp"qh"vj g"UQf kgv"ku"vko g"eqpuwo kpi "y kj "cp"cxgtci g"

ko g'ur gpv'r gt'r ctvlekr cpv'dgy ggp"407/5047"j qwtu"lpenwf lpi "f gxgnr lpi "vj g'f lgv"i tqegt {"
uj qr r lpi ."hqqf "y gki j lpi "cpf "r cenxi lpi "lgeceqeng"("Dwtng"4232+0"

Vj gtghqtg."lp"cp"cwgo r v"vq"ko r tqxg"vj g"eqo r rlcpeg"vq"vj g'f lgv"i kxgp"gxgp"lwtvj gt"cpf "vq"
tgf weg"vj g"equv"cpf "ko g'qh'r tgr ctvlekrp."y g'r tqr qug"cpgy "o gjy qf "vq"ucpf ctf kug"fkvct {"
kpcvng"fwlpi "vj g'r gtlqf "dghqtg"gzr gtko gpvcl'tkcn0Vj ku"o gjy qf "ku"ej ctcevtkugf "d {"vj g"
rtqxlukqp" qh" c" NK lgv" kpuvgcf " qh" UQf lgv" Y g" dgrkxg" vj cv" NK lgv" y kni" tgs wktg" rguu"
r tgr ctvlekrp"ko g"cpf "ghqt0Tgugctej gtu"y kni"qpn" "pggf "vq"o kz "f khtg gpv'r tqf weu"vqi gjy gt"
*g0 0' o gcn' tgr mego gpv' r qy f gt" cpf " o km0 NK lgv" ecp" dg" ej gcr gt" cu" y gm' cpf " o quv"
ko r qtvcpw" "y kni"o cng" k' gculgt "hqt"r ctvlekr cpw"vq" equpuwo g0 Vj g" cko "qh"vj ku"uwf {"y cu"
vj gtghqtg"vq"cuugui"vj g"cdkxv" "qh"cvj rgyu"vq" tgr rdecvg" c" f lgv"y j gp" c" NK lgv" cpf " UQf lgv"y gtg"
wugf "cu" f kvct {"ucpf ctf kucvlekrp" vgej pls wgu0

4.3 Materials and methods

4.3.1 Participants

Vj kv{/vy q" o qf gtcvgn{/ " cpf " y gm'vckp"gf " o crg" cvj rgyu" r ctvlekr cvgf " lp" vj ku" uwf {0
Rctvlekr cpw"y gtg"tgetvkwgf "htqo "ur qtu'enxdu"lp"Qzhqtf uj ktg"d {"eqpvcevlpi "vj gkt"tgur gevkg"
eqcej gu0Gri kdkxv" "etkgtc"lpenwf gf <"

- Cvj rgyu"ci gf "dgy ggp"3: /67" {gctu"
- Kpxqrxgf "lp" c" vgo "qt" gpf wlcpeg"v{r g"cevkvxv" {"
- Vtclpki "x"7"j qwtu"r gt"y ggm'
- Pqv'cmgti ke"qt"lpvqngtcpv"vq" hqqf "r tqxkf gf "
- Htgg"qh'o gvcdqre" f kuqtf gtu" *g0 0f kcdgyu. "ectf kqxcuewret" f kugcug. "qt"j {r gtvgpukqp+"

Vj ku"uwf {"y cu" eqpf wevgf "ceeqtflpi "vq"vj g"i wlf grkpgu" rckf "f qy p"lp"vj g" F gerctvlekrp"qh"
J gnukpnk"cpf "cm"r tqegf vtgu" kpxqrxlpi "j wo cp" uwdlgeu"y gtg" cr r tqxgf "d {"vj g" Wpkxgtukv" {"
Tgugctej "cpf "Gjy keu"Eqo o kvgg" *WTGE+"cv" Qzhqtf "Dtqqngu" Wpkxgtukv" {"Cr r gpf kz "D+0'
Y tkwgp"lphqto gf "eqpugpv"y cu" qdvlekrp" htqo "cm"r ctvlekr cpw"r tkqt "vq"vj gkt"r ctvlekr cvlekrp"lp"
vj g"uwf {0

"

4.3.2 Experimental Design

Rctvlekr cpwu"eqo r ngvfg "hxxg"xkuku"vq"vj g"rdqtcvqt {"cv"Qzhqtf "Dtqqngu"Wpkkgtukv{"y kj "cv" ngcu"ppg"fc {"dgy ggp" gcej "xkuk0'Qp"xkuk"3."r ctvlekr cpwu"y gtg"y gki j gf "vq"20"ni "pgct" r tgeklqp"kp"rki j v'erqvj kpi "cpf" dctghqv" wukpi "c"ecrkdtevgf "grgevtqple"uecrg"*Vcpkce"WM" Nf 0"l kgy urg{."O kf f nguzg."WM#0J gki j v'y cu'o gcuwtgf "y kj qw'uj qgu'y kj "cp"ceewtce {"qh" 20"eo "wukpi "c"ucf kqo gvgt"*Ugec"Nf 0'Dkto kpi j co ."WM#0Chgt "vcmkpi "vj g"cpvj tqr qo gtle" o gcuwtgo gpw."r ctvlekr cpwu"y gtg"tcpf qo n {"cuuki pgf "vq"qpg"qh"vj g"hmny kpi "eqpf kkpq"3+" uqkf "r tg/r cenci gf "f kgv" cpf "4+" rks wkf "r tg/r cenci gf "f kgv' Vj gtghqtg."r ctvlekr cpwu"y gtg" gkj gt"i kxgp"UQf kgv" qp" Xkuku" 3" cpf "4" cpf "Nk kgv" qp" Xkuku" 5" cpf "6" qt" vice versa0' Rctvlekr cpwu" y gtg" cmqecvgf " wukpi " c" eqo r wgt/i gpgtcvgf " rku" qh' tcpf qo " pwo dgtu" *O letquqhv"Gzegn" Tgf o qpf ."Y cuj kpi vqp."WUC-0'Rctvlekr cpwu"y gtg"kpwtwvgf "vq"eqpuwo g" cm'vj g'o gcu"r tqxkf gf "cpf" lphqto gf "vq"tgwtp"cm'rhv/qxgtu"vj g"pgzv'xkuk0'Vj g {"y gtg"cnq" cunfg "vq"tgeqtf "qp" c" hqqf "f kct {"uj ggv" cp {"f gxkcvkp" htqo "vj g" f kgv' Vj g" f khgtgpeg" kp" gpgti {" cpf " o cetqpwtkpv" kpcngu" dgy ggp" dqvj " xkuku" hqt" gcej " eqpf kkpq" y cu" vj gp" o gcuwtgf 0'Vj g"cewcn'hqqf "eqpuwo gf "y cu" f gvto kpgf "d {"uwdtcevkpi "vj g"co qwpv'qh'hqqf " i kxgp"d {"vj g"co qwpv'qh'hqqf "rhv"cpf "vj gp"cf f kpi "vq"vj g"vqcn'cp {"wpcuuki pgf "cf f kkpqcn' hqqf "qt" f tkmteqtf gf 0"

Vj g" gpgti {" cpf "o cetqpwtkpv"eqpv'qh"UQf kgv'cpf "Nk kgv"y gtg"kf gpvlecn'ceeqt f kpi "vq" r ctvlekr cpwu" f ckh {"pwtkpv'tgs wkt go gpw"*T qf tki wgl "gv'cr0'422; +cpf "ceeqwvki "hqt" hqqf " r tghgtgpegu0'Vj g" f kgv'r tqxkf gf "qp"cxgtci g"082" "qh'ectdqj {"f tcvg."039' "qh'r tqvklp."cpf " 045' "qh'hv'qh"vj g"vqcn'gpgti {"kpcng0'Vj g"UQf kgv'eqpukvgf "qh'eqtphcngu."y j qrg"o km" y j kg"dtgcf ."ej ggug."dgcpu."dwwgt."vqo cvq."r cuc."vqo cvq"ucweg."cr r rg."cpf "dcpcep0'Vj g" Nk kgv'eqpukwvgf "qh" F {"o cvk g"Uwr gt"O cuui clpgt"Rqy f gt"*F {"o cvk g."Dgf hqtf ."Vgzcu." WUC+"o kzgf "y kj "y j qrg"o km'cpf "y gtg"qhgtgf "kp"vj tgg"hrxqwtu<ej qeqrvg."xcpkrc."cpf " utcy dgtt {"ceeqt f kpi "vq" gcej "kpf kxf wcn'cvug"r tghgtgpeg0'Gcej "ugtxkpi "*556"i "+eqpvkpu" 34: 2"mecn"474"i "qh'ectdqj {"f tcvg."74"i "qh'r tqvklp."cpf "32"i "qh'hv'0' kpf kxf wcn'gpgti {" tgs wkt go gpv'y cu"ecrewcvgf "wukpi "vj g"O khkp/UV'lgqt"gs wcvkp"cpf "vj g"uj qtv'hqto "qh"vj g" kpgtpevkpcn'Rj {"ulecn'cevkxk {"S wgunqppckt g"vq" f gvto kpg'vj gk "guko cvgf "dcucn'o gvedqrke" tcvg"cpf "r j {"ulecn'cevkxk {"ngxgn'tgur gevkggn {"K cs "4224=O khkp"gv'cr0'3; ; 2+0Cnj qwi j "vj g" J cttku" cpf "Dgpgf lev" gs wcvkp" *J cttku" ("Dgpgf lev" 3; 3: + "ku" v{r kcm {"wugf "d {"ur qt wu" pwtkklpku."O khkp/UV'lgqt"gs wcvkp"y cu"uj qy p"vq" guko cvg"dcucn'o gvedqrke" tcvg"y kj kp" 32' "qh"vj cv'o gcuwtgf "*Hcpngphgrf "gv'cr0'4227="vj gtghqtg."k'y cu" wugf "kp"vj g"r tgu'gpv"

uwf {0'P wtkleu'uqhy ctg"*P wtkleu"NVF."F wdrp."Kgrcpf +'y cu'wugf "v"eqputwev"vj g"46/
 j qwt'o gpw'htq"vj g"UQf kv'cpf "v"cpn{ug"vj g"cf f kkpncn'hqf "equwo gf "d{"r ctvkr cpw"qp"
 vguvpi "f c{u0"

"

4.3.3 Statistical analyses

Ucwkvecn'cpcn{ugu'y gtg"r gthqto gf "wukpi "URUU"x044"*KDO "eqtr 0"Cto qpm"P [."WUC+0'
 Cm'f cv"y gtg"pqto cm{ "f kwtkdwgf " cpf " vj gthqtg" r cktgf /uco r ng" t" vguv"y gtg" wugf " vq"
 eqo r ctg"vj g"o gcp"gpsti {"cpf "o cetqpwtkpv"kpvcngu"dgy ggp"f c{"3"cpf "f c{"4"ht"gej "
 o gj qf 0'Vj g"f cv"y gtg"cpn{ugf "wukpi "vj g"Drcpf "("Cno cp"*O ctvkr"Drcpf "("Cno cp"
 3; : 8+"vej pls wg"ht"cuugukpi "ci tggg gpv'dgy ggp"vj g"v q" f c{u'qh'o gcuwtgo gpw'ht"gej "
 eqpf kkp0'Rgctuqp"vuv'y cu'wugf "v"o gcuwtg"vj g"eqtgrvkr"dgw ggp"f c{"3"cpf "f c{"4"kp"
 pwtkpv"kpvcng"ht"gej "o gj qf 0'kp"cf f kkp." vj g"eqghkpv"qh"xctkvr"*EX"? "322"z"
 o gcp IUF +'y cu"ecrwrvgf "ht"gej "pwtkpv"ht" vj g"v q"o gj qf u"cpf "tgr qtvgf "cu" vj g"
 cxgtci g"EX' 0'Vj g"uco r ng"uk" g"y cu"ecrwrvgf "wukpi "vj g"gs wvkr"r wdrkj gf "d{"J qr nku"
 *4222+" cpf " dcugf " qp" vj g" tguwu" qdvkpgf " kp" qwt" r tgxkqu" uwf {" *Ej cr vgt" 5+0' Vj g"
 ecrwrkr" uj qy gf " vj cv" 4: " r ctvkr cpw" y gtg" pggf gf " vq" i kxg" cf gs wvg" r tgekkp" ht"
 pwtkpv"kpvcng0J qy gxgt."c"vcr'qh"54"r ctvkr cpw"y gtg"tgetvkr0'Ucwkvecn'uki phkcepeg"
 y cu'ugv'cv'p >"070"

"

4.4 Results

Vj kv{"cvj ngvu"htqo "hwt" f hgtgpv'f kkr kpgu"*tqy kpi ."vkvj nqp."e{erkpi ."cpf "hqvdcn"
 r ctvkr cvgf "kp"vj ku"uwf {0'Vy q"r ctvkr cpw"y kv f tgy "htqo "vj g"uwf {"qpg"ht"r gtuqcn"
 tguqpu" cpf " vj g" ugeqpf " ht" hgnkpi " pcwugqu" f vkrpi " vj g" NK kv0' Vj g" tgo ckpki " 4: "
 r ctvkr cpw"y gtg"*o gcp"0'UF +4: "09"{gctu'qrf ."960"0'; 0'mi "kp"dqf {"o cuu."cpf "39; "0": "
 eo "kp"j gki j 0'

Vj g"tguwu."cu"uj qy p"kp"Vcdrg"60."kpf kcvg"vj cv"vj g"o gcp"gpsti {"cpf "o cetqpwtkpv"
 kpvcngu"dgy ggp"f c{"3"cpf "f c{"4"ht"dqj "f kvct{"ucpf ctf kcvkr"vej pls wgu"y gtg"pqv"
 uki phkcpv{"f hgtgp0'kpvcngu"qp"f c{"3"cpf "f c{"4"cetqu"gpsti {"cpf "ectdqj {"f cvg"y gtg"
 eqo r ctg" wukpi "uecwt"r nqu"y kv "; 7' "rko ku'qh'ci tggg gpv'cu'uj qy p"kp"Hi vtgu"606060."

y j gtgcu'r tqvlp"cpf "hcv'y gtg"eqo r ctgf "wulpi "rko ku"qh'ci tggg gpv'hqwpf "lp"Vcdrg"40'Cu" ecp"dg"uggp"lp"vj g"hi wtgu."vj g"qdugtxcvkpu"lp"UQf kv'cpf "NK kv'y gtg'f kvtkdwgf "ctqwpf " vj g'o gcp"y kj "vj g"gzegr vkp"qh'uqo g"qwdgtu0'Vj g'rko ku"qh'ci tggg gpv"lp"vj g"UQf kv'hqt" cm'pwtkgpu"y gtg"y kf gt."cm quv'vy kv"lp"uqo g"xctkcdrgu."vj cp"qh'vj g"NK kv'0' Vj tgg" r ctvkr cpw"lp"UQf kv'f kvhgtf "lp"vj gkt"ectdqj {f tcv"lpvcng"dgwy ggp"fc{"3"cpf "fc{"4"d{" o qtg"vj cp"322'i "eqo r ctgf "v'qpn{ "qpg'r ctvkr cpv"lp"NK kv'0'

"

Vcdrg"6000 gcp"gpgti {"cpf "o cetqpwtkgpw"lpvcngu"qh'vckpfg "cvj ngvu"qp"fc{"3"cpf "fc{"4" qh"UQf kv'cpf "NK kv'eqpuwo r vkp"

| O gjv qf " | F c{"3" | UF " | F c{"4" | UF " | p"xcmg" |
|---------------------|---------|-------|----------|-------|---------|
| S Odiet | " | " | " | " | " |
| Gpgti {"*necnt" | 4"; 92" | 835" | 4"; ; 9" | 867" | 089" |
| Ectdqj {f tcv"*i +" | 685" | 32: " | 677" | 33: " | 06; " |
| Rtqvlp"*i +" | 349" | 54" | 349" | 49" | 02" |
| Hcv"*i +" | 94" | 44" | 96" | 48" | 052" |
| L Idiet | " | " | " | " | " |
| Gpgti {"*necnt" | 5"35; " | 843" | 5"362" | 845" | 0: " |
| Ectdqj {f tcv"*i +" | 697" | 344" | 697" | 345" | 0; " |
| Rtqvlp"*i +" | 353" | 48" | 354" | 48" | 073" |
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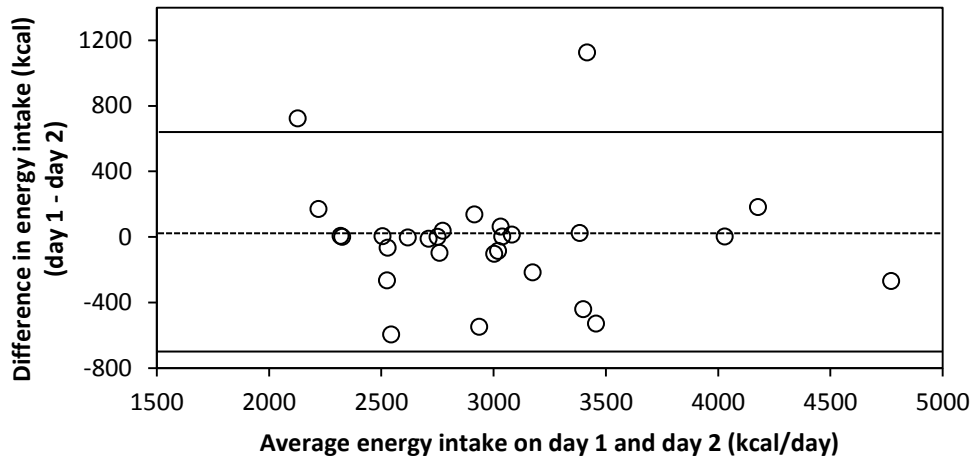
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| | Nko ku'qh'ci tggg gpv' | | |
|-----------------|------------------------|---------|----------|
| O gyj qf " | O gcp'f'k'ht'gpeg" | Nqy gt" | Wf r gt" |
| SODiet | " | " | " |
| Rtqv'k'p'k'i +" | 207" | /590" | 5: 0" |
| Hcv'k'i +" | /307" | /4207" | 3906" |
| LI diet | " | " | " |
| Rtqv'k'p'k'i +" | /20 " | /370" | 3505" |
| Hcv'k'i +" | 206" | /350 " | 3608" |

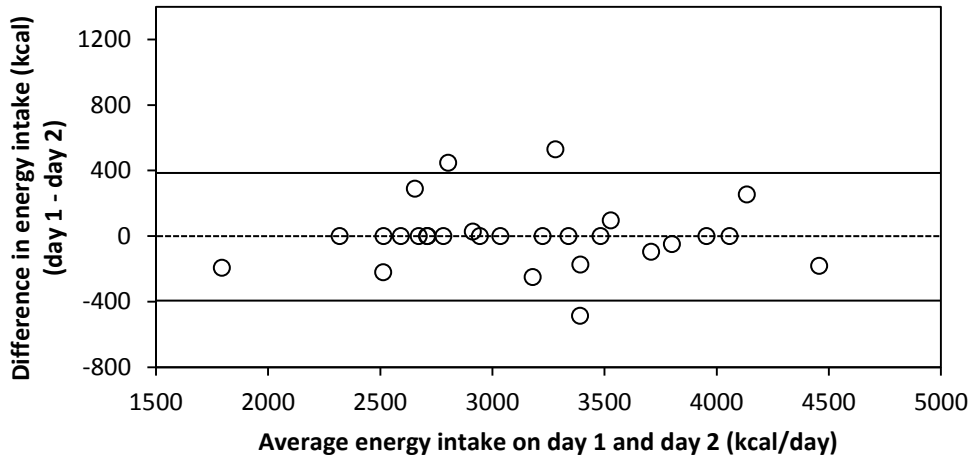
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"

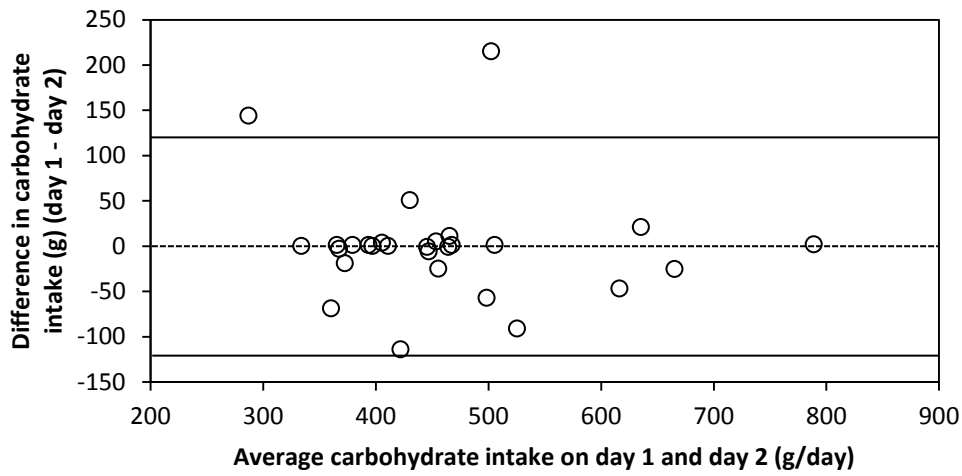


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 NK kgv'gej plk wg0'

"

"

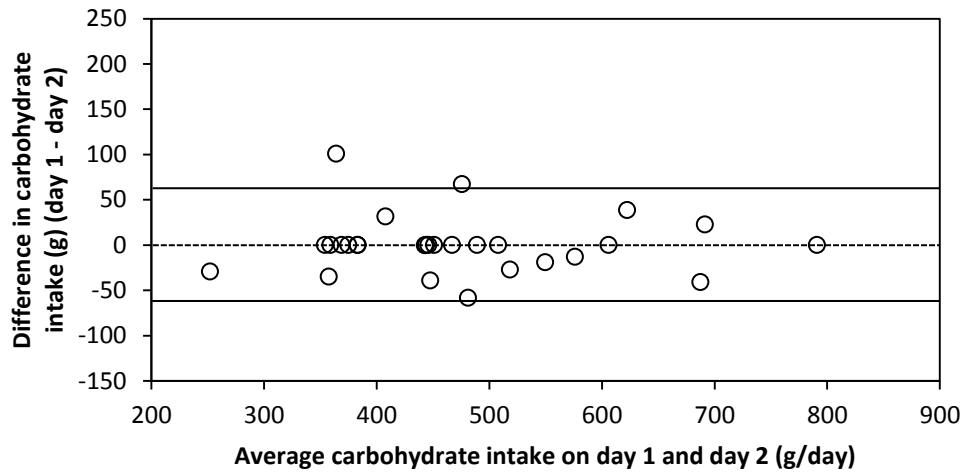


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 yj g"UQf kgv'gej plk wg0'

"

"



Hi wtg'60Ego rctkqp'qh'vj g'co qwpv'qh'ectdqj {f tcvg'eqpuwo gf "qp'fc{"3'cpf'fc{"4'hqt" vj g'NK kgv'gej pls wg0

"

Vj g'EX' "qh'gpgti {"cpf "o cetqpwtkgpv" hqt "UQf kgv'y gtg"j ki j gt "vj cp "NK kgv"*7' "cpf "5' " hqt "gpgti {"=7' "cpf "5' "hqt"ectdqj {f tcvg="7' "cpf "4' "hqt"r tqvklp="cpf "7' "cpf "5' "hqt"hcw." tgr gevkgn{+0'Rgctuaq"vuv'uj qy gf "vj cv'hqt"UQf kgv."gpgti {"cpf "o cetqpwtkgpv"kvncgu"qp" fc{"3'y gtg"xgt {"utqpi n{ "eqttgrcvf "y kj "vj qug"qp'fc{"4"*t"? "0 7"hqt"gpgti {"t"? "0 7"hqt" ectdqj {f tcvg."t"? "0 2"hqt"r tqvklp"cpf "t"? "0 5"hqt"hcw0Vj g'tgrvklpuj kr "qh'vj g"gpgti {"cpf " o cetqpwtkgpv"kvncgu" dgvy ggp"fc{"3'cpf "fc{"4'hqt"NK kgv'y cu"xgt {"utqpi "cu"y gm" j qy gxgt. "vj g'xcnwguy gtg"j ki j gt "vj cp "UQf kgv'gzegr v'hqt'hcw*t"? "0 6'hqt"gpgti {"=t"? "0 8'hqt" ectdqj {f tcvg="t"? "0 8'hqt"r tqvklp"cpf "t"? "0 4'hqt"hcw0Cm'eqttgrcvklpu"y gtg"ucvklkcm{" uki pklkcpv'kp"dqj "o gj qf u"*p">'03+0

"

4.5 Discussion

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ku'ko g'equwo kpi "cpf "equw{ "eqo r ctgf "v"vj g"qvj gt "f kgvt { "ucpf ctf kucvqp "vej pls wgu0k{
 cf f kkp. "f gur kg"vj g"i qqf "rgxgn'qh"eqo r rkcpeg"d { "vj g"o clqtk{ "qh'r ctvkr cpwu. "vj g"uwf { "
 r t gupvgf "k{ "Ej cr vgt "5"j cu'uj qy p"vj cv'vj g"r t g/r cemei gf "f kgv"vej pls wg"ukm'j cu" c" hgy "
 uwdlgeu" y kj " r qqt" eqo r rkcpeg0' Vj ku" xctkdkk{ " k{ " f kgvt { " kpcng" ecp" eqphqwpf "
 gzr gtko gpvri' tguwu" cpf " o cng" k' o qtg" f khlw" vq" f gvge' ej cpi gu" cuuqekvgf " y kj " vj g"
 kpgtxgpvqp. "gur gekm{ "k{ "uwf kgu'y kj "c"uo cm'uco r ng'uk g0'

Vj g"htuv's wguvqp" k{ "vj ku"uwf { "uqwi j v'vq" f gvto kpg"vj g" tgr tqf vekdkk{ "qh" UQf kgv" cpf "
 NK kgv" k{ "vj ngvu0Cu" gzr gevfg. "vj g" o gcp" gpgti { "cpf " o cetqpwtkgpv" kpcngu" qp" f c { "3" cpf "
 f c { "4" hqt" dqj " vej pls wgu" y gtg" pqv' uki pkkecpv{ " f khtgtpv0' J qy gxgt. " y kj k{ "uwf lgeu"
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 dqj " qp" qp" qh" vj g" y q" qeecukpu0' Cp" ko r rkc'vqp" qh" vj ku" ku" vj g" r quukdkk{ "vj cv' vj g" "
 f khtgtpv0' k{ "ectdqj { f tcvg" kpcng" ecp" kpetgcug" uki pcn' pqkug" cpf " tgf weg" vj g" cdkk{ "vq"
 f gvge' uo cm' y qtj y j kg" ej cpi gu0' P gxgt vj gnuu. "tugctej gtu" ctg" gzr gevfg "vq" ej gem' vj g"
 eqo r rkcpeg" qh" vj g" k{ "uwf lgeu" gxgp" y j gp" vj g" i qrf "ucpf ctf " o gvj qf " *Q0' U_{fkgv+} " j cu" dggp"
 wugf 0' Vj g { "eqwf " gkj gt "wug" c" ej gem' ku' qt" uko r n{ "cun' vj g" k{ "uwf lgeu" vq" t gwt p" vj g" rghxqgtu0'
 Vj ku" y c { " vj g" f kuetgr cpeku" k{ "gpgti { "cpf " o cetqpwtkgpv" kpcngu" eqwf " dg" cxqk' gf 0'
 J qy gxgt. "k{ "ecug" qh" c" rti g" uco r ng' uk' g. "ej gem' kpi " vj g" eqo r rkcpeg" qh" r ctvkr cpwu" o ki j v'
 dgeqo g' ko r tce'vkn' cpf " vj g" tghq' g" NK kgv' dgeqo g' vj g" dguv' ej qleg0'

Vj g" tguwu" qh" vj g" EX' "cnuq" eqphkto "vj cv" UQf kgv" cpf " NK kgvctg" dqj " ghge' v' xg" vej pls wgu"
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 r cemei gf " o gnu" vej pls wg" ku" cp" kf gcn' vej pls wg" hqt "uwf kgu" y kj "uo cm' uco r ng' uk' g" cpf lqt"
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 ectdqj { f tcvg" kpcngu" tgr qtvgf " k{ " vj ku" uwf { " y cu" y kf g0' K' uggo u" r quukdn" vj cv' vj ku"
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 pwtkpv" tgs vkt go gpw" cpf " vj g" k{ "dqf { " y gli j 0' Hqt" gzc o r ng. "vj g" ectdqj { f tcvg" kpcng" qh" c"

e{erku'y gli j kpi "850"mi "y cu"588"i "cpf"qh"cpqvj gt"e{erku'y gli j kpi "; ; 04"mi "y cu"874"i 0
 Vj ku" xctkckqp" eqwf " kpetgcug" vj g" y kf vj " qh" vj g" eqphkf gpeg" kvgtxcn" vj gtghqtg." k" ku"
 uwi i guvgf "v"tgetwk"uwdlgeu"y kj "uko krt"ej ctcevtkueu"v"t gf weg"vj g"dgwy ggp/uwdlgeu"
 xctkcdkx{"*J qr nku"gv'cn03; ; ; +0

Equv'cpf "vko g"qh'r tgr ctckqp"y gtg"vy q"qh"vj g"o clk"rko kckvapu"qh"UQf kv'tckugf "gctrkt0
 Eqo r ctkpi "vj g"vy q"vej pls wgu."vj g"cxgtci g"equv"qh"UQf kv'r gt"r ctvkr cpv'r gt"vken'y cu"
 C802"eqo r ctgf "v"Q60 2"ht "NK kv'0Vj ku"fggu"pqv'eqxgt"vj g"equv"qh"rdqwt."r nku"dcu u"
 cpf "dqwgu."uqhy ctg'r cenai g."cpf "qvj gt"equwo cdngu0Vq"r w'vj ku"lp"eqpvzv."vj g"cxgtci g"
 equv"qh"UQf kv'ht"52"r ctvkr cpw"wpf gti qkpi "vy q"vken'ku"C5; 802"eqo r ctgf "v"Q4; 602"
 ht "NK kv'0k"cf f kkp."vj g"cxgtci g"vko g"ur gpv'r gt"xkuk"r tgr ctkpi "vj g"uqkf "r tg/r cenai gf "
 f kv'y cu"mipi gt"vj cp"r tgr ctkpi "vj g"rks wk"r tg/r cenai gf "f kv"*42"o kvwgu"cpf": "o kvwgu."
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 uk g0

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 r tkq"v"gcej "vken0

"

4.6 Conclusion

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 y j gp"NK kv"cpf "UQf kv"y gtg" wugf "cu"fkvct {" ucpf ctf kvkqp" vej pls wgu0 Vj ku" uuf {"
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 Hwt vj gto qtg."NK kv'o c {"ngcf "v"cf f kkp"cn'ko r tqxgo gpw'kv"vj g"eqo r rkepeg"qh'uwdlgeu"v"
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"

"

"

"

Chapter 5

Does a 15% difference in carbohydrate intake influence cycling performance and physiological responses in endurance-trained athletes?

5.1 Summary

Cmj qwi j "tgugtej gtu"qhvgp"lphqto "j wo cp"r ctvlekr cpwu"vq"cfj gtg"vq"vj g"uco g"fgv'dghqtg" o wnkfc{"gzr gtko gpwu."vj g"v{r kecn'uwdlgev"ku"rkngn{"v"xct{"vj gkt"ectdqj {f tcvg"kpvcng"d{" 37' "qt"o qtg0Y g"gzco kpgf"vj g"ghgev"qh"37' "f khtgpeg"lp"vj g"ectdqj {f tcvg"kpvcng"qh" vckpgf "e{erkuu"qp"gpf wtcepg"r gthqto cpeg"cpf "r j {ukqmi kecn'tgur qpug0Vgp"o cng"e{erkuu" eqo r ngvgf "hco kktkucvqp"cpf "cgtqde"r qy gt"vguu0Vj gp."qp"vy q"ugr ctcvg"qeeckqpu." uwdlgeu"eqo r ngvgf "c"i n{eqi gp"fg r ngvqp"vcun"fc{"3+"hqmjy gf"d{"cp"gpf wtcepg"ecr cek{" vgu"cv"92' "qh"XQ4o cz"qp"ce{eng"gti qo gvg"wpvki"hcvi wg"kg0vko g"vq"gzj cwukqp=fc{"4+0' Rctvlekr cpwu" tgr nkecvgf "vj gug" r tqegf wtgu" wukpi "c" tcpf qo kugf "etquu/qxgt" f guki p" cpf " eqpuwo gf "gkj gt"cf kgv"eqvcklpi "60"i 0mi "DO^{/3}"qh"ectdqj {f tcvg"*Nqy gtEctd+"qt"cp" gpgti {/o cvej gf "fgv"eqvcklpi "76"i 0mi "DO^{/3}"qh"ectdqj {f tcvg"*J ki j gtEctd+"dgy ggp"vj g" i n{eqi gp"fg r ngvqp"vcun"cpf "vko g"vq"gzj cwukqp"vgu0Vj g"vy q"qeeckqpu"y gtg"ugr ctcvg" d{" cv'rgcu"9/fc{u0'Dmqf "i nmequg"cpf "necv"ngxgnu"y gtg"o gcuwgf "cv'dcugrkg"cpf "gxgt {"52" o kpwgu"fwlpi "e{erki ".y j kg"vj g"tgur ktcvqt {"gzej cpi g"tcvq"*TGT+"y cu"o gcuwgf "gxgt {" 37"o kpwgu"wpvki"vj g"gpf "qh"vj g"vko g"vq"gzj cwukqp0Vko g"vq"eqo r ngvqp"y cu"pqv'chgevgf " d{"J ki j gtEctd"* : 6"0390"o kp+eqo r ctgf "vq"Nqy gtEctd"* : 8"0370"o kp+y kj "p"? "0 80' J ki j gtEctd"cnu"fkf "pqv"j cxg"cp{"uki pklkecpv"ghgev"qp"dmqf "necv"cpf "i nmequg"ngxgnu." cpf "TGT"cv"cp{"vko g"r qkp"eqo r ctgf "vq"Nqy gtEctd"*p @027+0Vj ku"uwf {"uwi i guu"vj cv"cf f khtgpeg"lp"ectdqj {f tcvg"kpvcng"d{"w"vq"37' "f qgu"pqv'ghgev"qp"e{erki "r gthqto cpeg." pwtlqv"qz kf cvkqp."dmqf "i nmequg"cpf "necv"ngxgnu0

"

5.2 Introduction

Ceeqtf lpi "vq"vj g"tgxky "rtgugvgf"lp"Ej cr vt"4."crr tqzko cvgn"87' "qh"uwf lgu"r wdrukj gf " kp"KLUP GO "cpf "LKUP "gkj gt"fq"pqv"ej gem'uwdlgevu"eqo r rkepeg"vq"vj g"fgv"i kxgp"qt"fq" pqv"o gpvqp"ko0Vj ku"ko r nku"vj cv'tgugtej gtu"o c{"dg"cnkpi "f kvct {"ucpf ctf kucvqp"ht" i tcvgf0' Vj ku" eqwf " dg" f wg" vq" vj g" ncm' qh" uwf lgu" j ki j rki j vpi " ku" ko r qtcepg0' P gxgtvj gnuu."r qqt"fkvct {"eqvtqn'o ki j v'j cxg"ugtqwu"eqpugs wpegu"d {"etgcvpi "rcti g" y kj kp/"cpf "dgy ggp/uwdlgev"xctkcdkv {"kp"fg r gpf gpv"xctkcdngu"ngcf lpi "vq"cf getgcugf " ghgevuk g."j ppeg"lpcf gs wcv"gzr gtko gpvnr qy gt"*Cvkuqp ("P gxkni4223=J qr nku"gv'cfo 3; ; ; +0Vj gug"lpcf lpi u"ngf "wu"vq"eqpf wev"cuw" {"gzco kplpi "vj g"tgr taf wekdkv {"qh"cf kgv" wukpi "f khtgvp" f kvct {" ucpcftf kucvqp" vzej plsvgu "Ej cr vt" 5+0' Vj g" tguwu" qh" vj ku"

kpxgunki cvkqp"uj qy gf "v cv"v j g"cxgtci g"o qf gtcvgn{/vclpvgf "cvj ngvg"ku"rkngn{ "vq"xct{ "v j gkt" f cln{ "ectdqj {f tcvg"lpcvng"d{ "37" "qt"o qtg."gxgp"y j gp"v j g{ "y gtg"cumgf "vq"tgr tqf weg"v j gkt" 46/j "f kv0"

Uekgpvku"j cxg"gzvgpukxgn{ "kpxgunki cvgf "v j g"ghge"qh"ectdqj {f tcvg"f kvu"qp" gpf wtcepeg" r gthqto cpeg" cpf "o gvcdqkuo 0' [gv."uwf kvu"o clpn{ "hgewgf "gkj gt" qp" eqo r ctkpi "v y q" gzvtgo g"f kvu"*9"o"; "i 0ni ^{/3}"DO "f khgtgpeg"kp"ectdqj {f tcvg="Dkuj qr "gv"cr0"4223c."4223d=" Lqj puqp"gv"cr0"4228+"qt"v y q"f kvu"y kj "o qf gtcvg"f khgtgpegu"*5"i 0ni ^{/3}+"lp"ectdqj {f tcvg" eqpvgpw"*Dwtng"gv"cr0"4222="J cy ng{ "gv"cr0"3; ; 9="Rkukrf ku"gv"cr0"3; ; 8="Y kkrco u"gv"cr0" 3; ; 4+0"Vj g"f khgtgpeg"kp"v j g"co qwpv"qh"ectdqj {f tcvg"dgvy ggp"v j g"v y q"f kvu"lpi guvgf "kp" v j gug"uwf kvu"f khgtgf "d{ "cv"ngcu"44' "*Y kkrco u"gv"cr0"3; ; 4+"cpf "tgcej gf "; ; ' "*Lqj puqp"gv" cr0"4228+0"Vj g"o clp"hpf lpi "qh"v j gug"uwf kvu"y cu"v j cv"gpf wtcepeg"r gthqto cpeg"y cu"i tgcvtg" y j gp" r ctvkr cpw" lpi guvgf "c" j k j " ectdqj {f tcvg" f kvv "Eqttgk/Qrxgk" gv" cr0" 4235=" QdMgghg"gv"cr0"3; ; ; +0"

Vj g"equwo r vkp"qh"ectdqj {f tcvg"tlej "f kvv"lpetgcugu"i n{eqi gp"ngxgn"lp"ungrvgn"o wuengu." v j g"r tko ct{ "ecwug"ht"v j g"ko r tqxgo gpv"lp" gpf wtcepeg"r gthqto cpeg"*Tcwej "gv"cr0"4227+0" Gzgtekg"kvvgpukv{ "r rc{u"cp"ko r qtvcv"tqng"lp" v j g"tgrvkppuj kr "dgvy ggp"i n{eqi gp"ngxgn" *f gr ngvkp+"cpf "gpf wtcepeg"r gthqto cpeg"*hvi wg-0I qmplem"et al."*3; 96+"tgr qtvgf "v cv"cu" gzgtekg"kvvgpukv{ "lpetgcugu"vko g"vq"tgcej "hvi wg"f getgcugu"r ctvkm{ "f wg"vq" v j g"tr kf" f getgcug" kp"i n{eqi gp"ngxgn" f wtkpi "gzgtekg0" Hqt"gzco r ng."cv"o gf kwo "kvvgpukv{ "86" " XQ4o cz+"i n{eqi gp"ngxgn"tgcej gf "etklecm{ "ny "ngxgn"chgt"v y q"j qwtu."y j gtgcu"cv"j ki j " kvvgpukv{ "6" " XQ4o cz+"ny "ngxgn" y gtg"tgcej gf "chgt"82" o kpwgu"qh" gzgtekg0" kp" cf f klkp." j ki j " kvvgpukv{ "gzgtekg" uki phkecpv{ "lpetgcugu" drqf "ncvvg" eqpegpvcvkp" eqo r ctgf "vq"o gf kwo "kvvgpukv{ "gzgtekg0"Uko krct"v tgpv"u"j cxg"cnuq"dggp"qdugtvgf "dgvy ggp" j ki j "cpf "ny "kvvgpukv{ "gzgtekg"ht" TGT"cpf "qz {i gp"wr vng0"

Vj gug" r tqveqni" y gtg" o clpn{ "cf cr vgf" d{ "uekpvku" y j q" y gtg"gzco klpki "f khgtgpv" utcvgi kvu" vq" gpj cpeg" gpf wtcepeg" r gthqto cpeg" cpf "cngt" uwdutcvg" qz kf cvkqp" f wtkpi " gzgtekg0J qy gxgt."vq"qwt"npqy ngf i g"pq"qpg"j cu" {gv'cf f tguvgf "v ku"y kj "tgi ctf u"vq" f kvvct { " ucpf ctf kvkqp"qh"tugctej "uwf kvu"0Y j cv"ku"npqy p"cdqw"v j g"ko r cev"qh"c"uo cm" f khgtgpeg" kp"ectdqj {f tcvg"lpcvng"qp" gpf wtcepeg"r gthqto cpeg"ku"rcti gn{ "dcugf "wr qp"v j g"eqpvqni" tqwr u" kp" uqo g" uwf kvu" *Dtgy gt" gv" cr0" 3; ; : : " O vqlq" gv" cr0" 3; ; 6=" Tqruvej " gv" cr0" 4224=" Xgpnevco cp" gv" cr0" 4223+0" Hqt"gzco r ng."kp" Dtgy gt" et al."*3; ; : : +" v j g" eqpvqni" i tqwr " kpenf gf "gZR gtlgpegf "twppgtu"y j q"y gtg"lphqto gf "vq"o clpvkpv"v j gkt"ectdqj {f tcvg"lpcvng"

dgwy ggp" vlcnu0' Vj g" cxgtci g" f khtgpeg" kp" ectdqj { f tcvg" kpcng" *ppq/ucpf ctf kugf +" qpn{ " f khtg" d{ "5; "i "35' +0J qy gxgt."gpgti { "kpcng"y cu" kpetgcugf "d{ "932"necni"q"v"j g"ugeqpf " qeecukq"kp"qtf gt"v"ucpf ctf kug"kv"y kj "v"j g"qvj gt"gzr gtko gpvni" tqwr u0'Vj gtghqg."v"j gtg"ku" c" pggf "v"q" eqpf wev" c" y gm/eqpvtqngf "uwf { " f guki pgf " ur gekhccm{ "v"q" gzco kpg" c" uo cm" f khtgpeg" *kq0' c" tgr tguqpvkxg" f khtgpeg" dcugf " qp" v{r lecn" cvj ngv" dgj cxkqwtu+" kp" ectdqj { f tcvg"qp"gpf wtcepeg"r gthqto cpeg"cpf "r j { ukqmi lecn"tgur qpug0'Vj g"r wtr qug"qh"v"j ku" kpxguki cvkq"y cu"v"q"eqo r ctg"v"j g" ghgev"qh" c"37' " f khtgpeg"kp"46/j qw" ectdqj { f tcvg" kpcng"qp"gpf wtcepeg"ecr cekv{ . "pwtkpv"qz kf cvkq"cpf "dqj" dkqo ctngtu" f wkpi "e{erki "kp" cvj ngvu0'

5.3 Materials and methods

5.3.1 Subjects

Hqwtvgp" j gcnj { "y gm/vtckpgf " o crg" e{erkuu" cpf " vlcvj ngvu" r ctvlekr cvgf " kp" v"j ku" uwf { 0' C vj ngvu"y gtg"tgetwkxg" htqo "ur qt w'enwdu"kp"Qzhqtf uj ktg"v"j tqwi j "v"j gk"tgur gevkg"eqcej gu0' Grik kdkrk{ "etkgtk" kpenmf gf <"

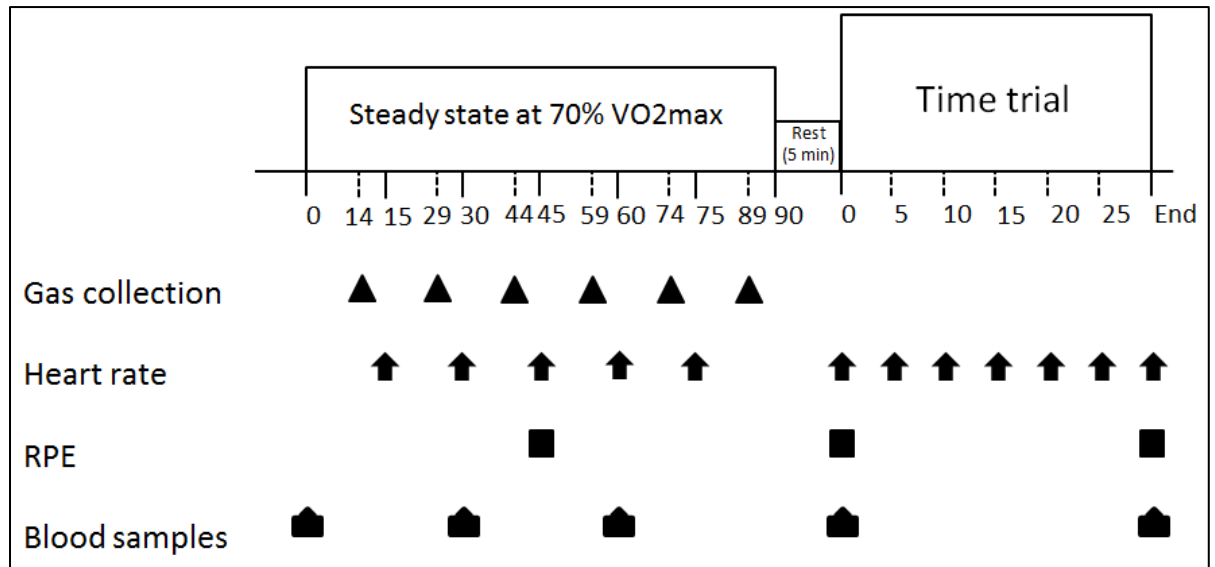
- C vj ngvu"ci gf "dgwy ggp"3: /64" {gctu"
- Y kj "cp" cgtqdk" ecr cekv{ "cdqxg"v"j g"; 2v"j "r gtegpvkxg" hqt "v"j gk"ci g"3: /4; " {gct<x"77" o rmi ³ω k³ =52/64" {gct<x"74" o rmi ³ω k³ =Y j crg{ .4228+"
- P qv'cmgti ke"qt" kpvqrgtcpv"v"q" hqj" r tqxkf gf "
- Htgg"htqo "kplwkgu"
- Htgg"qh'o gvcdqk" f kuqtf gtu" *g0 Of kcdgvyu. "ectf kqxcuewret" f kugcug. "qt" j { r gtvgpukq"p+"

Vy grxg"r ctvlekr cpw"eqo r ngvf "v"j g"uwf { "y j kxg"y q"r ctvlekr cpw" f tqr r gf "qw" hqt" r gtuqpcn" tgcuppu0' C "hmt vj gt"y q" uwdlgeu"y gtg" gzenmf gf "r tkqt "v"q" uvcvkwecni" cpcn{ uku" dgecwug" v"j g{ " eqo r ngvf " v"j g" gpf wtcepeg" ecr cekv{ " vguv" kp" nguu" v"j cp" 82" o kpwgu0' Vj g" r j { ulecn" ej ctcevgtkvleu"qh"v"j g" hpcn"v"p" r ctvlekr cpw"y gtg"cu" hqmjy u" *o gcp" Ō"UF +<ci g"? "52" Ō": " {gctu=dqf { "o cuu"? "95Ō" Ō": 07"mi =j gki j v"? "3: 2" Ō"8"eo =XQ₄₀ cz<790 " Ō"50" o rmi ³ω k³ / 30'Vj ku"uwf { "y cu"eqpf wevgf "ceeqtf kpi "v"q"v"j g"i wkf grkpgu"rckf "f qy p"kp"v"j g" F gemt cvkq"qh" J gnuknk" cpf "cm" r tqegf wtgu" kpxqmkpi "j wo cp" uwdlgeu"y gtg" cr r tqxgf "d{ "v"j g" Wpkxgtukv{ " Tgugctej " cpf " Gv" leu" Eqo o kvgg" *WTGE+" cv" Qzhqtf "Dtqqngu" Wpkxgtukv{ " *Cr r gpf kz "E+0'

Rtkqt"vq"uuctvki "vj g"uwf { .r ctvkr cpv"i cxg"vj gk"y tkvwp"lphqto gf "eqpugpv"cpf "eqo r rvgf " c"i gpgtcn"j gcnj "s wgvkppckg"chgt"dgkpi "hwm" lphqto gf "qh"vj g'r wtr qug"qh"vj g"gzr gtko gpv0 "

5.3.2 Pilot study

K'y cu"guugvkn" gctn" f wtkpi "vj g"uwf { "f guki p"r gkqf "vq"ugrgev" c"uwkcdng"r gthqto cpeg" r tqvqeqn"vq"cf f tguu"vj g"tgugctej "s wgvkqp0Vj ku"y cu"gur gekm" lko r qtvcpv"cu"vj g"gzr gev" ghhev"y cu"uo cm0Vj gtghqtg."ugxgtcn"r tg/vgukpi "uguukqpu"y gtg"eqpf wvvgf "kpenw" kpi "vj g" cuuguo gpv"qh"vj g"gs wkr o gpv0Vj g"htuv"r gthqto cpeg"r tqvqeqn"vq"y cu" c" r tg/rqcf gf " e{enkpi "vko g"vkn"y j lej "ku"r tgugpv" kpi"Hki wtg"700K"eqpukngf "qh" c"uvvgf { "ucv"gzgtekug" r j cug" rnkpi "; 2"o kpwgu"cv" cp" kpvpu" gs wcn" vq"92' "XQ4o cz" hmqy gf "d" c"hzgf " f kvcpvg" vko g" vkn" cu" hcv" cu" r quukng" *f wcvkqp" vcti gv" 52" o kpwgu+0' J qy gxgt. " vj g" r ctvkr cpv"eqo r rvgf "vj g"uvvgf { "ucv"r j cug"y kj "c"j ki j "tcv"qh"r gtegk"gf "gzgkqp"*39"?" xgt { "j ctf +0' Vj g" r ctvkr cpv" o quv" rkn" "tgcej gf " o kpk cn"i n"eqi gp" rvgu" kpi" vj g"dqf { " f wtkpi "vj g"uvvgf { "ucv"r j cug"y j lej "eqw" "gzr kpi"vj g"j ki j "tcv"qh"r gtegk"gf "gzgkqp0K' j cu"dggp"uj qy p"vj cv"e{enkpi "hqt"; 2"o kpwgu"cv"o qf gtcv"vq"j ki j "kpvpu" rvgf "vq"i n"eqi gp" f gr rvgkqp"*Dwtng"4224+0'Vj gtghqtg."vj g"ghhev"qh"37' "f hgtgpeg" kpi"ectdqj { ftcv"kvcn" y qwf "pqv"dg"ecr wvvgf "f wtkpi "vj g"vko g"vkn"cu"i n"eqi gp"y qwf "j cxg"dggp" f gr rvgf "qp"vj g" r tgxkwu"uci g0Vj g"r tqvqeqn"y cu"rcvgt"tgr megf "d" { "c"vko g"vq"gzj cvkqp"vuv"y j lej "r tqxkf" g" eqpvqn"qxgt" vj g"gzgtekug" kpvpu" { "cpf "gpj cpegf "vj g"cdk"v" { "vq" o gcuwtg"r j { ukqmi kcn" tgur qpugu"wpk"i hvi wv0 "



Hki wtg'7(30Qxgtxkgy "qh'vj g'gizr gtlo gpvni'cpf 'hco kktkucvkap'tlkn'r tqvqerf'

"

"

Ugxgtcn' kgo u" qh' gs wkr o gpv' y gtg" cuuguuf " f wtkpi " r tg/vgukpi " kp" qtf gt" vq" gpj cpeg" tgrkcdkrk{" cpf " r tgekukap" qh' yj g" tguwnu' J go qewg" I nwequg" 423- " *J go qewg" CD." £ pi grj qm . "Uy gf gp+" cpf "Nceevg"Rtq" *Ctntc{ "MFM"Eqtr qtcvkap." Uj ki c. "Lcr cp+" y gtg" tgr ncegf "d{ "yj g"Cpcmqz" I O 9"cpn{ ugt "Cpcmqz"Kputwo gpw." J co o gtuo kj . "WM"y j lej "ku" eqpukf gtgf "o qtg" tgrkcdrg" yj cp" yj g" hqto gt" y q" o cej kpgu" vq" o gcuwtg" dmqf "nceevg" cpf " i nwequg"eqpegpvcvkapu" *xcp"Uqo gtgp" gv'crf'4227=Gf y ctf u'gv'crf'4225+0Vj g"EX' "qh'vj g" Cpcmqz" I O 9"qdvkpgf "chgt"kvpgukxg'r tceveg"y cu'20' "hqt"dmqf "i nwequg"cpf "20' "hqt" dmqf "nceevg'Eqmgevkap" dci u" y gtg" wugf "vq" o gcuwtg" Q4" cpf "EQ4" eqpegpvcvkapu" kp" yj g" gizr ktgf "ct" qh' r ctvek cpw" kp" qtf gt" vq" f gvto kpg" yj g" tgur kcvqt { "gzej cpi g" tcvkq" *TGT+ " y j lej "ku" c"ugpukxg'r ctco gvt "yj cv'tgs wktgu" j ki j gt" r tgekukap'0Vj gtghgtg." yj g"EX' "qh'i cu" eqmgevkap" hqt "yj g" gizr ktgf "ct" eqmgevkap" r tqegf wtg" y cu'f gvto kpgf "d{ "hmkpi "vgp"eqmgevkap" dci u" y kj " npqy p" xqno g" cpf "EQ4" eqpegpvcvkap" wukpi " c" tgur kcvqt { " i cu" uko wrcvt " *Xcewo gtkeu"Kpe." Ecrkhtpkc." WUC+0Vj ku" i gpgtcvgf "c"EX' "qh'30' 0Qp" yj g" qyj gt" j cpf . " dtgcj /d{ /dtgcj "vej pls wg" hqt "i cu" cpcn{ uku" y cu' wugf "kpungcf "qh'eqmgevkap" dci u" o gj qf "vq" f gvto kpg" XQ4o cz" y kj " i qqf "r tgekukap" cpf "o qtg" r tcevecrk{ 0"

"

"

5.3.3 Experimental overview

Rctvkr cpw'xkukgf "j g'rdqtcvqt { "qp'ukz "f hgtgpv'qecukapu"cpf "eqo r rvgf "j g'hmqy kpi " vgu'ugs wgep<"

3+"Rtgrko kpc { "vgu'

4+"Hco kktkucvqp'tkcn'

5+"Htuvi n{eqi gp'f gr rvgqp'r tqveqn'

6+"Htu'gZR gtko gpvni'tkcn'

7+"Ugeqpf "i n{eqi gp'f gr rvgqp'r tqveqn'

8+"Ugeqpf "gZR gtko gpvni'tkcn'

Vj g'vko g'ugr ctcvki "j g'r tgrko kpc { "vgu'htqo "j g'hco kktkucvqp'tkcn'y cu'c"o kpo wo "qh" 6: "j qwtu'cpf "j g'hco kktkucvqp'vgu'htqo "j g'htuvi n{eqi gp'f gr rvgqp'r tqveqn'd { "cv'rgcu' 94"j qwtu'Vj g'i n{eqi gp'f gr rvgqp'r tqveqn'cpf "j g'gZR gtko gpvni'tkcn'y gtg"eqo r rvgf "qp" eqpugewkg"fc {u'cpf "c"o kpo wo "qh"ugxgp"fc {u'ugr ctcvqf "j g'vq" gZR gtko gpvni'tkcn' *y kuj qw'r gkqf +0'kpc"etquuxgt"fguki p."r ctvkr cpw'y gtg"tcpf qo n{ "cuiki pgf "v"qpq"qh" vq" gpgti { "o cvej gf "fkgu"y kj "c" 37' "f hgtgpeg"kp" ectdqj { ftcvq" wukpi "c" eqo r wgt/ i gpgtcvqf "rkuv'qh'tcpf qo "pwo dgtu"*O letquqhv'Gzegn'Tgfo qpf ."Y kuj kpi vqp."WUC+0'Chgt "j g'eqo r rvgqp"qh"j g'i n{eqi gp'f gr rvgqp'r tqveqn"r ctvkr cpw"tgegkxgf "r tg/r cenci gf " o gcu"y j lej "j g{"y gtg" cunqf "v"eqpuwo g"dghqtg"tgwtpkpi "v"j g'rd"pgzv'o qtpkpi "v" eqo r rvgf"j g'gZR gtko gpvni'tkcn'0'

"

5.3.4 Preliminary test

Rctvkr cpw'cttkxgf "cv'j g'rdqtcvqt { "hqt"j g'r tgrko kpc { "vgu'chgt'hcu'kpi "hqt"j g'r tgrkqwu" j tgg"j qwtu'cpf "j cxkpi "cxqkf gf "echgkpg"lpvcng"ht"cv'rgcu'32"j qwtu'0'Cf fklqpcmf."j g{" y gtg" cunqf "v"cxqkf "creqj qn'cpf "v"tgh'ckp"htqo "cp{ "utgpwqwu"r j { ukecn'cev&kv{ "hqt"j g' r tgegk kpi "46"j qwtu'0' Rctvkr cpw"y gtg"j gp"y gki j gf "v"20"ni "pgct"r tgekukqp"kp" nki j v' emqj kpi "cpf "detghqqv" wukpi "c" ecrkdtcvqf "grgestqple" uecng" *Vcpkc" WM'Nf 0' [lgy unq{." O kf fnguzg."WM#0J gki j v'y cu'o gcuwtgf "y kj qw'uj qgu'y kj "cp"ceewtce { "qh"20"eo "wukpi "c"

Uwclqo gvgt "Ugec" Nf 0 "Dko kpi j co . "WM40P gzv" r ctvlekr cpw" eqo r ngvgf "cp" kpetgo gpvcn' uvr " vguv' vq" xqikqpcn' gzej cwukqp" qp" c" e{enkpi " gti qo gvgt" *Gzecnkdw." Nqf g." Vj g" P gj gtrcpf u+"vq" f gvgto kpg"vj gk "XQ4o cz "cpf "hcewvg"vj tguj qrf 0Vj g"y qtmqcf "uactvgf "cv"; 2" Y cw*Y "+cpf "r tqi tguukgn{ "kpetgcugf "d{ "52"Y "gxgt {"6"o kpwgu"wpkngzj cwukqp0Gzr ktgf " ckt" y cu" cpcn{ugf " wukpi " cp" cwqo cvgf " i cu" cpcn{uku" u{uvgo " *O gvcn{| gt " 5D." Eqtvgz." I gto cp{-0Vj ku"vguv"y cu" wugf "vq" gpuwtg" uwdlgevu" o gv"vj g" uwf {" gpt {"etkgtk" hqt "cgtqdle" r qy gt "cpf "vq" f gvgto kpg"vj g" kpf kxkf wcn'y qtm'tcvg" hqt "wug" f wtkpi "vj g" i n{eqi gp" f gr ngvqp" r tqvqeqn'cpf "vj g" gzer gtko gpvcn'tkcr0

5.3.5 Familiarisation session

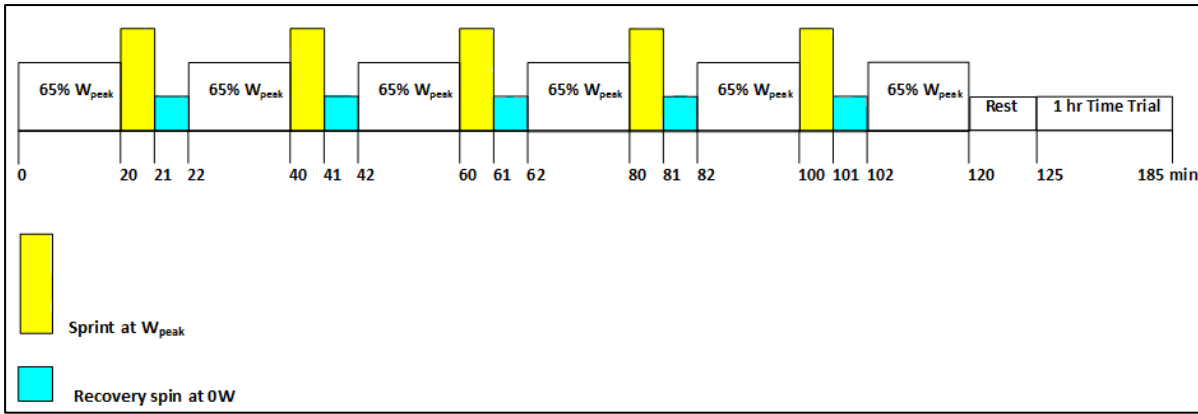
Rctvlekr cpw" r gthqto gf "c" vko g"vq" gzej cwukqp" vguv"vq" hco kkrctkug"vj go ugrkgu"y kj "vj g" vcu" f guetkdgf "kp" ugevqp" 7500' Vj ku" uguukqp" y cu" cnuq" wugf "vq" xgtkh{ "vj g" e{enkpi "kpvgpukv{ " r tguetk vqp"qh'92' "qh"XQ4o cz0

"

5.3.6 Glycogen depletion protocol

Uwdlgevu" tgr qtvgf "vq" vj g" mdqtcvqt {"cv": <22" c0 0*0'3" j qwt "+chgt" qxgtpi j v' hcuukpi "cpf " j cxkpi "tghtckpgf "htqo "utgpwqu" r j {ulecn'cevkvk{. "creqj qn'cpf "echhgkpg"kp" vj g" r tgxkqu"46" j qwtu0C m'r ctvlekr cpw" tgr qtvgf "vcnkpi "c" tguvf c {"dghqtg"vj ku" r tqvqeqn'0Vj ku" r tqvqeqn'cko gf " vq" ucpf ctf kug" i n{eqi gp" uvtgu"kp" vj g" dqf {" r tkqt "vq" vj g" eqpuwo r vqp"qh"vj g" r tg/r cenai gf " o gcu"dcugf "qp" vj g" cr r tqcej "f guetkdgf "kp" Tcwej "et al0*4227 "+cpf "r tguvgvf "kp" Hki wtg"7040' Dtkghn{. "r ctvlekr cpw" e{engf "hqt"vy q" j qwtu"cv"87' "qh"vj g" j ki j guv"y cwci g" qdvckpgf "f wtkpi " vj g" XQ4o cz "vguv" *Y r gcm" kpvgtur gtugf "y kj "hxg"82" ugeqpf u" ur tkpw"cv" Y r gcm'cv" o kpwgu" 42."62."82." : 2."cpf "322" hqmjy gf "d{ "3" o kpwg" tgeqxt {"ur kp"cv"2" Y 0Vj gug" ur tkpw"cko gf "vq" f gr ngvgf "i n{eqi gp" kp" v{r g"4" o wuerg' hkdgu0Vj gtgchgt. "e{erkwu" eqo r ngvgf "c" qpg" j qwt" vko g" vtkr0 Uwdlgevu" kpi guvgf "822" o n'qh'c"32' "i nwequg" r qn{ o gt" uqrvkqp" r gt" j qwt" kp" vj g" htu"vy q" j qwtu" kp" qtf gt "vq" r tggp"vj { r qi n{ecgo kc0Vj gtgchgt. "ad libitum" y cvgt "kpveng" y cu" cmjy gf " f wtkpi "vj g" qpg" j qwt" vko g" vtkr0

"



Hi wtg'7040Qxgtxkgy "qh'vj g'i n(eqi gp'f gr ngvkap'r tqvqeqn'

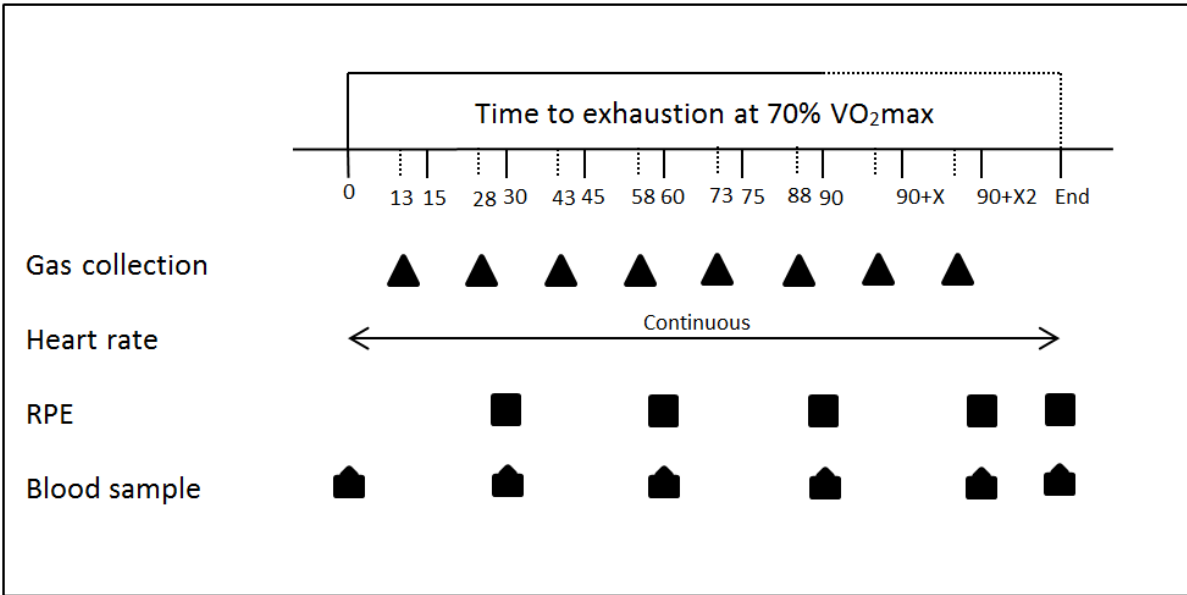
"

5.3.7 Experimental trial

Vy gpv/hqw"j qwtu"chgt"vj g"i n(eqi gp'f gr ngvkap'r tqvqeqn' "10'9-22" c0 0'vq"; 22" c0 0:" r ctvlek cpw"tgr qtvgf "vq"vj g"rdqtcvqt {"j cxkpi "hcuvgf "ukpeg"vj g"eqpuwo r vkap"qh'vj gk"rcuv" o gcn'vj g"f c{" dghqtg"cv": 22" r 0 0' 3"j qwt"cpf "cxqkf gf" cp{" rj {"ulecn'cevkkk'0' Vj g" gZR gtko gpvcr'vkcne'eqpukvgf "qh'uvgef {"ucvg"e{enkpi "cv'92' "qh"XQ4o cz"wpvki'gzj cwvkap0' Vj g"xqgtxkgy "qh'vj g"gzr gtko gpv'ku"hwpf "kp"Hi wtg'7050'F wtkpi "vj g"vguv"pq"gzvtpcn' kphqto cvkqp"y cu"cxckrdng"vq"r ctvlek cpw" *g0 0'f kucpeg."vko g"qt"j gctv'tcvg+"gzegr v'hqt" r gf cn'tcvg0'Rctvlek cpw'y gtg"vqf "vj cv'cm'rj {"ukqmi kcn'o gcuwtgu'y kn'dg"vcnng"tcpf qo n(" f wtkpi "vj g"vkcrl'0'Qpg"qt"vy q"hcng"o gcuwtgu'y gtg"vcnng"tcpf qo n("f wtkpi "vj g"gzr gtko gpv'kp" qtf gt"pqv"vq"i kxg"cp{" enwgu"cdqw"vko g"grcr ugf"vq"r ctvlek cpw0' Hqt"gzco r ng."uqo g" r ctvlek cpw"o ki j v'eqo r ctg"vj g"pwo dgt"qh"o gcuwtgo gpw"vcnng" f wtkpi "vj g"vguv"cpf" eqo r ctg"kv"vj g"r tgxkqwu'vkcrl'0'Rctvlek cpw'y gtg"pqv'cmqy gf "vq"nkvgp"vq"o wuke"qt"y cvej" xkf gqu'f wtkpi "vj g"vgu0'Vj g{"y gtg'y ctpgf "y j gp"vj g'r gf cnkpi "tcvg"ftqr r gf "dgmjy "82"tr o " cpf "vj g"vguv"y cu"vgo kpcvgf "y j gp"vj g{"eqwrf "pqv'kpetgcug"kv'cdqyg"82"tr o "y kj kp"32" ugeqpf u"qh"cy ctpkpi 0' Vj g"vko g"htqo "vj g"uactv'qh"vj g"gzr gtko gpv'wpvki'vj g"r qkp'qh" gzj cwvkap."gzr tguugf "kp"o kpwgu"cpf "ugeqpf u."y cu"vj g"o gcuwtg"qh"gpf wtcepg"ecr cekv'0' Rctvlek cpw'y gtg"pqv'i kxgp"cp{" hggf dcen'chgt"vj g"gpf "qh'vj g"vkcrl'kp"qtf gt"pqv'vq"chge'vj g" r gthqto cpeg"qh"vj g" hqmjy kpi " vkcrl'0' Rctvlek cpw" tgegkxgf "vj gk" XQ4o cz" cpf "vko g"vq" gzj cwvkap"xcnwguy j gp"cm'vj g"vkcrl'y gtg"eqo r ngvf 0'

Vy q'o kpwg"gzr ktgf "ck"eqmgevkapu'wukpi "eqmgevkap'dci u'y gtg"qdvckpgf "gxgt {"37"o kpwgu" uctv'kpi "cv'o kpwg"35"wpvki'vj g"gpf "qh'vj g"vgu0'Vj ku'gpcdrf "wu"vq"eqo r ngv"i cu"eqmgevkap" dghqtg"vj g"dmqf "uco r ng"o gcuwtgo gpv0'Vj g"uk'g"qh'eqmgevkap'dci 'y cu'ej qugp"ectghwm'("hqt"

gcej "r ctvlek cpvlp" qtf gt "vq" tgf weg "vj" g"gttqt "cuuqekcvgf "y kj "vj" g"tgukf wcn'xqno g"qh'dci u0
 Kp"cf fklqp. "r ctvlek cpw'õhnwuj gf õ'vj" g'dci "y kj "vj" gkt "gzk gf "ck" dghqtg"vj" g'uctv'qh'vj" g'tkcn'
 d {"dtgcj kpi "kpkf g"vj" g'dci "hqt" 5/6 "o kpwgu"lp" qtf gt "vq" tgf weg "vj" g"eqpvo kpcvkqp"qh'vj" g"
 dci u'y kj "vj" g"co dlkpv'ck" *J qr ngt "gv" cr0 "4234-0'Qz { i gp" cpf "EQ4" eqpegpvcvkqpu"y gtg"
 f gyto kpgf "wukpi "c" i cu" cpcn{ugt" *Ugtxqhgz" O kpkOR "Ugtxqo gz. "J qwuwq. "WUC+" cpf "
 ecrkdtcvgf "wukpi "ecrkdtcvkqp" i cugu0 Gzr ktf "xgpvkrcvqt {" xqno g" y cu" o gcwtf "wukpi "c"
 J ctxctf "ft {" i cu" o gygt" *J ctxctf "Cr rctcwu. "O cucej wugwu. "WUC+0'Dmqf "i nweug" cpf "
 nwevg" eqpegpvcvkqpu"y gtg" o gcwtf "cv'dcugrkpg" cpf "vj" gp" gxgt {" 52" o kpwgu"wpvkn'vj" g"gpf "
 qh'vj" g'vgu0Dmqf "uco r ngu"y gtg" eqmgev "htqo "vj" g" hpi gtvr "cpf "o kzgf "hqt" qpg" o kpwg"lp"
 ecr kmct {" wdgu0Vj" g"co qpwu'tgs vktgf "hqt" cpcn{uku"y gtg" 32" Ûn'qh'y j qrg"dmqf "hqt" i nweug"
 cpf " 9" Ûn' hqt" nwevg" cpf " y gtg" cpcn{ugf " wukpi " cp" Cpcmqz" I O 9" cpcn{ugt" *Cpcmqz"
 Kputwo gpw. "Nqpf qp. "WM+0J gctv'tcv"y cu" o gcwtf "eqpvkpwqun{ "vj" tqwi j qw"vj" g'vgu'xlc"
 vrgo gt {" *Rqrt "Grgvtq" Q[. "Mgo r grg. "Hkrcpf +0' Rctvlek cpw"y gtg" cunf "vq" tcv"vj" gkt"
 r gtegxgf "gzgtvkqp" wukpi "vj" g"8/"vq" 42/r qkp" Dqti "uecr" gxgt {" 52" o kpwgu"wpvkn'vj" g"gpf "qh"
 vj" g'vgu" *Dqti '3; : 4+0'
 "



Hki wtg'700Qxgtxky "qh'vj" g"gzr gtko gpwn'cpf "hco kktkucvkqp" tkcn' r tqveqr0

"

"

"

5.3.8 Dietary intervention

ƒ" c" etquuxgt" f guki p." r ctvkr cpw" y gtg" tcpf qo n{ " cmqecvgt" "v" eqpuwo g" gkj gt" c" f kv" eqpcklpi " 60" i 0mi " DO^{/3}" qh" ectdqj { f tvgt" *Nqy gtEctd+" qt" cp" gpgti { /o cvej gf" f kv" eqpcklpi " 706" i 0mi " DO^{/3}" qh" ectdqj { f tvgt" *J ki j gtEctd+0' Vj g" o gcp" gpgti { " cpf " o cetqpwtkgpv" kvngv" qh" dqvj " f kvgt { " kvgtxgpvkpu" ctg" r tgugpvgt" kv" Vcdng" 700' Vj g" cxgtci g" f kvgt gpeg" kv" ectdqj { f tvgt" kvng" dgy ggp" eqpf kvkpu" y cu"72" i " *37' -0' Vj g" f kvu" y gtg" r tgr ctgf" ceeqtf kvpi " v" r ctvkr cpw" f ckn{ " gpgti { " tgs vkt go gpw" *Tqf tki wgl " gv" c10' 422; + "cpf" ceeqwpvgf" hqt" kvf kvk wcn" hqqf" r tghgt gpegu0C " uco r ng" f kv' ku' r tqxkf gf" kv" Vcdng" 7040' Vj g" kvuv" o gcn' y cu' eqpuwo gf" y kvj " cv' kvcu' 472" o n' qh' y cvgt" 37" v" 52" o kvwgu" chgt" vj g" gpf" qh" vj g" i n{ eqi gp" f gr kvkpv" vguv" *c" 33-22" c0 0: y j gtgcu. " vj g" qvj gt" wy q" o gcu" y gtg" eqpuwo gf" cv' 7-22" r 0 0' 3" j + "cpf": 22" r 0 0' 3" j + "f vktpi " vj g" uco g" f c{ 0' Rctvkr cpw" y gtg" kvutwvgt" v" tgvwtp" cp{ " wpequwo gf" hqqf" v" o gcuwtg" eqo r kvpeg" dghgtg" vj g{ " y gtg" ergtgf" v" vctv0' Vj g" cxgtci g" EX' " hqt" gpgti { " kvng" dgy ggp" vktcu" y cu" 20' 0

"
"

Vcdng'700F kvveqo r qukkpv" qh' vj g" gzr gtko gpvneqpf kvkpu" *P " ? " 32+ "

| " | Nqy gtEctd"" | J ki j gtEctd"" |
|-------------------------|----------------|------------------|
| Gpgti { " kvng" } | 5283' 0' 5: 6" | 526: ' 0' 5; : " |
| Ectdqj { f tvgt" *i + " | 548' 0' 57" | 59; ' 0' 62" |
| Rtqvkv" *i + " | 336' 0' 34" | 336' 0' 37" |
| Hcv" *i + " | 35; ' 0' 53" | 337' 0' 56" |

O gcp" 0' UF; J ki j gtEctd<706" i 0mi " DO^{/3}" qh" ectdqj { f tvgt=" Nqy gtEctd<60" i 0mi " DO^{/3}" qh" ectdqj { f tvgt"

"
"
"
"
"
"

Vcdrg'7040Uco r ng'J ki j gtEctd'f kgv'ht'c': 6'mi 'uwdlgev'tcklpi '8'f c {u'r gt'y ggm'

| | Hqqf " | Co qwpv' | |
|----------------------|-----------------------|----------------|-------------|
| | | J ki j gtEctd" | Nqy gtEctd" |
| O gcn'3" | Ej lengp'r cuw'ucrf " | 5: 2'i " | 5: 2'i " |
| " | " | " | " |
| O gcn'4" | Eqtphtngu" | 92'i " | 92'i " |
| | Y j qng'o km' | 78: 'o n' | 78: 'o n' |
| | Y j kg'dt gcf " | ; ; 'i " | ; ; 'i " |
| | Ej ggug" | 322'i " | 322'i " |
| | Dwwgt" | 62'i " | 65'i " |
| | | " | |
| O gcn'5" | Rcuw" | 388'i " | 342'i " |
| | Vqo cvq'ucweg" | 392'i " | 392'i " |
| Upcemu" | Cr r ng" | 3: 2'i " | 2'i " |
| | Dcpopc" | 437'i " | 382'i " |
| | O kz gf 'pwu" | 92'i " | 332'i " |
| Gpgti { 'necn" | " | 5'6: 7" | 5'6: 8" |
| Ectdqj { f tcv'xi +" | " | 5; 4" | 554" |
| Rtqvklp'xi +" | " | 347" | 348" |
| Hcv'xi +" | " | 376" | 39; " |

"
"

5.3.9 Statistical analyses

Ucvkuecn'cpcn(ugu'y gtg'r gthqto gf "wukpi "URUU"x04"*DO "eqtr 0"Cto qpm"P [."WUC+0' Cm' f cv' y gtg' cpcn(ugf " hqt" pqto crk(0' Cm' uco r ngu' y gtg' pqto cm(" f kutkdwgf " cpf " uwdugs wgpw("c'r ckt gf /uco r ng'r"vuv'y cu'wugf "vq"eqo r ctg'y g'o gcp"vko g'vq"eqo r ngvqp"lp" vj g" y q' gzi gtlo gpven' vguu0' C" y q/y c{ " CP QXC" hqt" tgr gcvgf "o gcuwgu" hqmqy gf " d{ " Dqphgttqpk'r quv'j qe"vguu'y gtg'wugf "vq"cuugu'lpvgtcevkp"dgwy ggp"vj g'y q"eqpf kkpqu"cpf " vko g'ht"dmqf "necvg."dmqf "i nœqug."TRG."cpf "TGT0'Cm'f cv'ctg"tgr qtvgf "cu'o gcpu'Õ'

UF 0Uc vkecn'uki p hkepeg'y cu'ugv'cv'p >'0270Vj g'uco r ng'uk g'y cu'ej qugp'qp'yj g'dcuku'qh'
 r tglkqu'uwf lgu'qh'c'uko kct'pcwtg"*Dtgy gt"gv'cr0"3; : : =O wlkq"gv'cr0"3; ; 6="Tqnuej "gv'
 cr0"4224="Xgpmetco cp"gv'cr0"4223+0'

"

5.4 Results

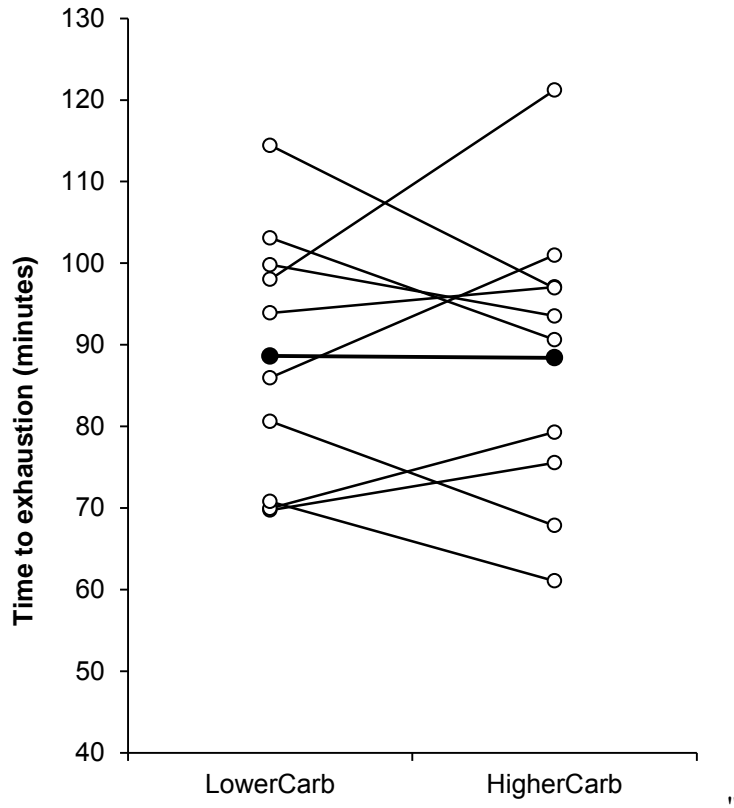
Vko g"vq"gzj cwukqp"cv'92' "XQ4o cz'y cu'pqv'uki p hkecpv'f hgtgpeg"lp"
 ectdqj {f tcvg"lpvcng"*Nqy gtEctd<: : 8"Ö'370"vs."J ki j gtEctd<: : 6"Ö'390"o kpwgu."p"?"
 Q 8="Hki wtg"706+0'Kf kxf wcn'f cv"tgxgcrgf "vj cv'hkg"r ctvkr cpw"ko r tqxgf "vj gk"vko g"vq"
 eqo r ngvqp"y j kg"vj g"qj gt"hkg"j cf "vj gk"r gthqto cpeg"ko r cktgf "*Hki wtg"707+0'Vcdrg"705"
 eqo r ctgu'dmqf "rxcv"cpf "i mequg"eqpegpvcvapu"dgwy ggp"Nqy gtEctd"cpf "J ki j gtEctd"
 cv'dcugrpg."f wtkpi ."cpf "gzj cwukqp0Vj gtg'y gtg'pq'uki p hkecpv'f hgtgpegu"dgwy ggp"vj g'y q"
 eqpf kkpqu" cv' cp{" vko g" r qk0' Vj g" tcvpi "qh"r gtegkxgf "gzgtvqp" *Vcdrg" 705+" y cu" pqv'
 uki p hkecpv'f hgtgpv'cv'cp{" r qk0' *p"@027+0'Vcdrg"706"uj qy u"vj g" TGT"cpf "J T"xcwgu"
 f wtkpi "vj g"ecr cekv{" vguv"dgwy ggp"Nqy gtEctd"cpf "J ki j gtEctd0'P q"uki p hkecpv'ej cpi gu"
 y gtg'qdugtxgf "dgwy ggp"vj g'y q'eqpf kkpqu"*p"@027+0'

"

"

"

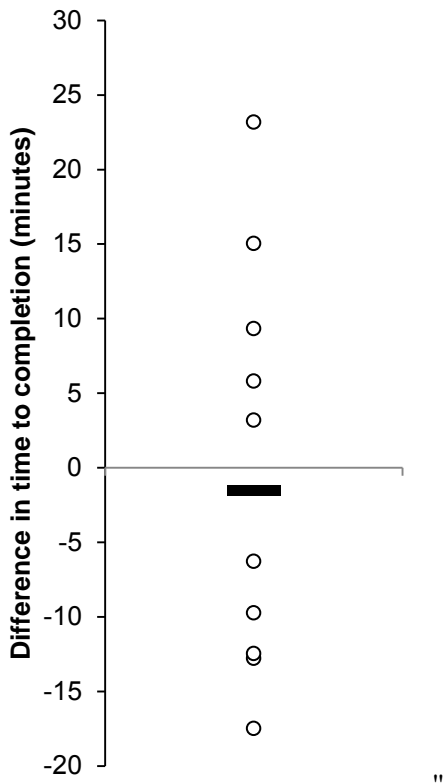
"



Hi wtg"7060Rcktgf "f cvc"qh'yj g'vko g"vq"gzj cwvkap"ht"gej "cyj ngv"dgwy ggp"Nqy gtEctd"cpf "

J ki j gtEctd"eqpf kkpup0'Qr gp"ektergu"tgr tgugpv"vj g"vko g"vq"eqo r ngvkap"qh'r ctvkr cpw0'

Enugf "ektergu"tgr tgugpv"vj g'b gcp"vko g"vq"eqo r ngvkap"qh'yj g'i tqwr 0"



Hi wtg"70'O gf kcp"cpf "kpf kxf wcn'f khtgpegu"kp"ko g"vq"eqo r ngvqp"dgw ggp"yj g"wy q"
ectdqj {f tcvg"eqpf kkpup0'

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Vcdmg'7000 gcp "0UF +r ruo c'rexcg'cpf"i mveqg'eqpegrcwkpu'cpf"tcvg'qhr' gtekgf'gzgtvkqp"r wtkpi 'gzgtkug'y j gp" r tgegf gf"d{"gkxj gt"Nqy gtEctd"qt"J ki j gtEctd"rkgv""

| | Nqy gtEctd" | | | J ki j gtEctd" | | |
|--------------------------------------|-------------|------------|-----------------------|----------------|------------|-----------------------|
| T guv' | 52"o kp" | 82"o kp" | Gpf" | 52"o kp" | 82"o kp" | Gpf" |
| Ncexcg" *o o qirN ³ + | 307'Ö304" | 408'Ö308," | 406'Ö302," | 304'Ö207" | 404'Ö20," | 407'Ö20," |
| I mveqg" *o o qirN ³ + | 50 'Ö206" | 504'Ö207," | 502'Ö208," | 50 'Ö206" | 505'Ö208," | 504'Ö208CE |
| TRG" | " | 38'Ö3" | 3: 'Ö3 ^Å " | " | 38'Ö3" | 3: 'Ö3 ^Å " |

, "p">'0223"vs.'tguv=CEp">'027"vs.'tguv=Äp">'023"vs.'52"o kp=J ki j gtEctd<706"i 0ni "DO³"qflectdqj {f tcvg=Nqy gtEctd<609" i 0ni "DO³"qflectdqj {f tcvg"

Vcdng'7600 gcp"ÖUF +tgur kcvqt {"gzej cpi g'tcvkq "cpf"j gctv'tcvg"fwkpi "gzgtelkg"y j gp'r tgeg gf "d{"gkij gt"Nqy gtEctd"qt"
 J ki j gtEctd"fkgyu""

| | Nqy gtEctd" | | | J ki j gtEctd" | | | | |
|-----------------|-------------|------------|------------|----------------|------------|------------|------------|------------|
| | 37"o kp" | 52"o kp" | 67"o kp" | 82"o kp" | 37"o kp" | 52"o kp" | 67"o kp" | 82"o kp" |
| J T" *do kp+ | 362'Ö35" | 363'Ö34" | 365'Ö34, " | 366'Ö35, " | 359'Ö35" | 35; 'Ö35" | 363'Ö35" | 365'Ö38" |
| TGT" | 20 4'Ö206" | 20 3'Ö205" | 20 3'Ö205" | 20 2'Ö205" | 20 3'Ö205" | 20 3'Ö206" | 20 2'Ö206" | 20 3'Ö206" |

, "p">'07"vs. "37"o kp=J ki j gtEctd<706"i Öni "DO^{/3},qhl'ectdaj {f tcvg=Nqy gtEctd<600"i Öni "DO^{/3}"qhl'ectdaj {f tcvg"

5.5 Discussion

K'ku'i qqf 'r tcevek'v'kphqto 'r ctvek cpw'v'q'tgr necv'v'j gk 'f lgv'ht'cv'ngcu'46/j qwtu'dghqtg' uctv'pi "cp"gzr gkto gpvcn'r tqegf wtg'kp"qtf gt "v"eqpvtqn'f kvct { "kpcng'0'J qy gxgt."uwdlgevu' ecp'xct { "v'j gk"gpgti { "cpf "o cetqpwtkgpv'kpcngu'gxgp'y j gp'v'j g { "ctg'kphqto gf "v'q'tgr necv'v' v'j gk '46/j qwt 'f lgv'*ugg"ugev'kqp"506+0'K'ku'v'j gt ghqtg'ko r qt vcpv'v'w'pf gt ucpf "v'j g'ko r cev'qh' v'j ku'xctk'v'kqp"qp"v'j g'qweqo gu'qh'c"tgugctej "uwwf { 0'Vj ku'uwwf { "gzco kpgf "v'j g'ghgev'qh'c" 37' " f khtg'p'eg" kp" ectdqj { f tcv'g' kpcng" qp" gpf wtcepg" ecr cekv{" cpf " r j { ukqmi kecn' tgr qpugu'0

Vj g'o clp'ej cmgpi g'qh'v'j ku'uwwf { "y cu"v'q'tgf weg"v'j g'co qwpv'qh'p'kug'htqo "cm'o gcuwgf " r ctco gvgtu'v'c"o kpo wo "kp"qtf gt "v'kpetgcug'v'j g'kngrk'j qqf "qh'qdugt'x'kpi "c'r quukdr'g'ghgev' qh'v'j g'f lgv'o cpkr w'v'kqp'0'ht'v'j ku'tgcuq'p."o cp { "o gcuwgf y gt g'v'cngp'dghqtg'v'j g'u'ctv'qh'v'j g' uwwf { 0'ht'gzco r ng."qwt'tgugctej "i tqwr "eqpf wev'gf "v'y q'r kv'v'uwf kgu'v'j cv'eqpvt'kdwgf "v'v'j g' f guki p"qh'v'j g'gzr gkto gpv'*ugg"ugev'kqp"7050+0'E'qmg'v'kqp"dcu u'kp"v'j g'gzr gkto gpvcn'v'kcu' y gt g'wugf "kpuvcf "qh'dtgc'v'j /d{/dtgc'v'j "vej pls wg"cu"kv'j cu"dggp"uj qy p"v'q"dg"cu"o qtg' tgr'kdng'vej pls wg"*J qr ngt"gv'cn'0'4234+0'Y g"ur gpv'o cp { "j qwtu'r tcevek'kpi "qp"eqmg'v'kqp" dci u'kp"qtf gt "v'f gv'gev'uki pcnu'y kj "ceewtce { 0'Y g'wugf "v'j g'tgeqo o gpf v'kqp"d { "J qr ngt" cpf "eqm'ci wgu"*4234+ "v'q'tgf weg"v'j g'p'kug'kp"qwt"cp'cn'uku"v'q"cu"ngy "cu'r quukdr'0'Vj g' Cpcn'z "I O 9"cp'cn'ugt"y cu"wugf "v'q"o gcuwgf"dm'qf "i n'wequg"cpf "n'ce'v'g"eqpegp'v'k'v'ku' kpuvcf "qh'v'j g'j cpf j grf "o cej k'gu'y j kej "j cxg"dggp"uj qy p"v'q"j cxg"nguu'r tgekuk'qp"*xcp" Uqo gt gp'gv'cn'0'4227+0'cp'q'v'j gt "ej cmgpi g'y cu"v'q"o cng'uwg"v'j cv'cm'r ctvek cpw'tgcej gf " v'j g'72'i "37' +f khtg'p'eg"kp"ectdqj { f tcv'g'kpcng'0'Vj ku'y cu'y j { "r ctvek cpw'y gt g'i kxgp" r tg/r cen'i gf "o gcu'cpf "kphqto gf "v'q'tgwtp'cm'ng'hxgtu'v'q"v'j g { "eqwf "dg'y gki j gf "dghqtg" v'j g'tgugctej gt "f gekf gf "y j gv'j gt "v'q"r wtuwg"y kj "v'j g'v'kcn'qt "v'q'tgr gc'v'v'j g'f lgv'0'K'gcm'."c" r gtewcp'g'qwu"o wueng"dkqr u { "uj qwf "j cxg"dggp"r gthqto gf "v'q"o gcuwgf"o wueng"i n'eqi gp" ngxnu'cv'v'j g'gpf "qh'v'j g'i n'eqi gp'f gr ng'v'kqp'r tqveqnu'0'J qy gxgt."v'j g'tg'ctg"o cp { "r tcevekn' f k'he'v'k'gu'cu'q'ek'v'gf "y kj "v'j ku'o gv'j qf 0'Vj g'vej pls wg'tgs v'k'gu'ur gek'v'kugf "gs v'k' o gpv'cpf " g'zr gt v'kug'0'k'p"cf f k'kqp."f v'g"v'q"ku"l'p'xcuk'xg'pcw'wg."k'ecp"ecwug'f k'ueqo hqtv'k'p"r ctvek cpw' cpf " ch'gev' v'j g'pwo dgt"qh'v'j g'ng'v'gu"y kn'kpi "v'q"r ctvek cv'g" *F gpi ngt" gv' cn'0'4236+0' Vj g' i n'eqi gp'f gr ng'v'kqp'r tqveqnu'wugf "kp"v'j g'ewtgpv'uwf { "ku'c'tg'kdng'r tqegf wtg'v'j cv'tgu'wngf " kp"uko k'ct"gpf "gzg'tekug"o wueng"i n'eqi gp'ngxnu."k'p'gr gpf gpv'qh'r tg/gzgt'ekug'ngxnu"*Tcwej " gv'cn'0'4227+0

Cuuwo kpi "qwt"kpvtgxpvkqp"y cu"uweeguhwn"vj gtg"y cu"pq"tgcuaqp"vq"vj kpm'vj cv'uwdlgeu"
 y qwf"fq"y qtug"qp"J ki j gtEctd"eqo r ctgf "vq"Nqy gtEctd0'Gz gtekulpi "wpvki'gzj cwunkqp"cv'
 92/97' "XQ4o cz"j cu'dggp"uj qy p"vq"dg"rko kvgf "d{"i n{eqi gp"cxckrcdkrkv{"*J gto cpugp"gv'
 crf0"3; 89="Mctnuuqp" ("Ucnkp."3; 93+." kpf gr gpf gpvaf "qh' dmqf " i nweug" eqpegpvcvkpu"
 *O â j nwo "("J gto cpugp"3; 9: +0'Vj gtghqtg."c"72"i "kpetgcug"kp"ectdqj { f tcvg"kpvcng"uj qwf "
 gzvgpf "vko g"vq"eqo r ngvkqp0'Vj gtg"ku"cy gm/guvcdrkuj gf "rkpgct"tgrvdkp"dgvy ggp"i n{eqi gp"
 uqtci g"cpf "vko g"vq"gzj cwunkqp"cv'cp'kpvgpukv{"ç87' "XQ4o cz"*I qmplem'gv'crf0"3; 96+0'Uq"kh"
 y g" y gtg" vq" eqpukf gt" c" j { r qvj g'vlecn' uegpctkq" y j gtg" r ctvlekr cpw" ctg" vguvfg " kp" kf gcn'
 eqpf kkpqu."r ctvlekr cpw'uj qwf "j cxg"gzvgpf gf "vj gk"vko g"vq"gzj cwunkqp"htqo ": : "o kpwgu"kp"
 Nqy gtEctd"vq"323"o kpwgu"kp"J ki j gtEctd0J qy gxgt."qpg"qh'vj g'tgcuaqp"y j {"kp'tgcn'y qtrf "
 gZR gtko gpv'r ctvlekr cpw"y km'pqv'i gv'35"o kpwgu"ko r tqxgo gpw"ku"fwg"vq"vj g"fc{/vq/fc{"
 xctkdkrkv{"kp"gpf wtcepeg"ecr cekv{0'Vj g'hkxg'uwdlgeu."kp"vj g'ewttgpv'uwwf {. 'y j qug"gpf wtcepeg"
 ecr cekv{"y cu'tgf wegf "kp"J ki j gtEctd"o c{"dg"gzr rckpgf "d{"vj g'tgr tqf wekdkrkv{"qh'vj g'vko g"
 vq"gzj cwunkqp"vgu0"

Lgwnpgf twr "cpf "eqmci wgu"*3; ; 8+"o gcuwtgf "vj g'tgr tqf wekdkrkv{"qh'eqpvkpwqwu"e{erki "cv'
 97' "XQ4o cz"wpvki'gzj cwunkqp"kp"vgp"y gm'vckpgf "qt'tgetgcvkqpcn'cvj ngvu"y j q"eqo r ngvf "
 vj g'vgu'ukz"vko gu'cpf "tgr qtvgf "c"EX' "qh'4808' 0'Cnj qwi j "vko g"vq"gzj cwunkqp"j cu"e"r qqt"
 tgr tqf wekdkrkv{."k"ku"rkngn{"vq"ngcf "vq"o wueng"i n{eqi gp"fg r ngvkqp"cv"o qf gtcvg"vq"j ki j "
 kpvgpukv{"kp"cdqmw"; 2"o kpwgu"*Dwtng."4224+"y j kej "y g'dgrkxg"y cu"vj g"o quv'cr r tqr tkcvg"
 r tqvqeqn'htq"fgvgevkpi "f khhgtgpegu"fwg"vq"cu"uo cni'f khhgtgpeg"kp"ectdqj { f tcvg"kpvcng0'Y g"
 cnuq"eqo r tqo kugf "qp"vko g"vq"gzj cwunkqp"kp"qtf gt"vq"o gcuwtg'r j { ukqni lecn'o ctngtu"y j kej "
 ctg" wugf "d{"o cp{"tgugctej gtu0'Hwtvj gto qtg."vj g"kpcdkrkv{"vq"tgcej "eqo r ngvg"i n{eqi gp"
 f gr ngvkqp"ku"cp"cf f kkpqpcn'tgcuaqp"y j {"kp'tgcn'y qtrf "gzr gtko gpv'r ctvlekr cpw"y km'pqv'i gv'35"
 o kpwgu" ko r tqxgo gpw0'Kp"cp"kf gcn'uegpctkq."r ctvlekr cpw"y km'e{eng"wpvki'vj g{"tgcej "
 eqo r ngvg"i n{eqi gp"fg r ngvkqp0'Vj ku'y km'gpcdrng"wu"vq"o gcuwtg"ceewtcvgn{"vj g"ghgev'qh'72"i "
 f khhgtgpeg"kp"ectdqj { f tcvg"kpvcng"vj cv'y cu"uqtgf "cu"i n{eqi gp"kp"vj g"dqf {0'Kp"tgcrkv{."
 hvki wg"qeewtu"y j gp"o wueng"i n{eqi gp"tgcej gu'xgt {"hgy "ngxgn."ç47"o o qrfni^{/3}"y gv'y gli j v'
 *Tcej " gv' crf0'4227=" Y kf tkem' gv' crf0'3; ; 5+0'Eqpugs wgpvaf ."r ctvlekr cpw" uvr "gzgtekulpi "
 dghqtg" vj g{"tgcej " etkkekcm{"mgy " ngxgn0' Hqt" gzco r ng." o wueng" i n{eqi gp" ngxgn" qh"
 r ctvlekr cpw"kp"tcej au'uwf {"y gtg"ç44"o o qrfni^{/3}"y gv'y gli j v'cv'vj g"gpf "qh"cy"vj tgg"j qwt"
 gzgtekug"r tqvqeqn0'Hkpcmf."qvj gt"r quukdrng"tgcuaqp"lpenwf g" f khhgtgpegu"kp" f ckn{"r j { ukecn'
 cevkvkv{"ngxgn" *g0' ur gpf " vj g" fc{" cv" j qo g" chgt" vj g" i n{eqi gp" f gr ngvkqp" vgu" vs."
 qwf qqt ly qtnkpi +." uj km' kp" r ctvlekr cpw" o qvxcvdkp" f wtkpi " gzgtekug" dgvy ggp" vlcnu"

*J qr nkp" gv' cr0" 4223+ vj g" s wcrk{ " qh" unggr " vj g" plj v' dghqtg" gcej " vten" cpf " qvj gt" wpeqpvqmcdrg"gpvktqpo gpcvnhcevqtu0"

"

Kp" vj g" ewttgpv" uwf { ." vj g" cxgtci g" f khtgpeg" kp" vko g" vq" eqo r ngvqp" dgvy ggp" vj g" vy q" eqpf kkp" y cu" c" pqp/uki pkkcpv" xcnwg" qh"/205' 0' Vq" qwt" npqy ngf i g. "pq" qpg" j cu" gxgt" eqpf wevgf "c" uwf { "kpxguki cvkpi "vj g" ghgev"qh" c" uo cmf khtgpeg" kp" ectdqj { ftcvg" kpcng" qp" gpf wtcpvg" r gthqto cpeg0[gv' uqo g" uwf kgu" y gtg" hqwpf "vq" eqpvkp" c" eqpvqn' i tqwr " *g0' tgegkxkpi " c" ectdqj { ftcvg" o cvej gf " fkgv" uq" kv" ecp" dg" eqo r ctgf " vq" qvj gt" gZR gtko gpcvni i tqwr u" *Dtgy gt" gv' cr0" 3; ; : =O vqlq" gv' cr0" 3; ; 6= Tqmuej " gv' cr0" 4224= Xgpnvco cp" gv' cr0" 4223+0' Vj g" f khtgpegu" kp" vj g" ectdqj { ftcvg" eqpvgpv" dgvy ggp" vj g" eqpvqn' cpf " kpvtxgpvqp" i tqwr u" kp" vj gug" uwf kgu" y gtg" 4" vq" 38' 0' Uqo g" qh" vj gug" uwf kgu" r quugu" o gvj qf qmki kcn' y gcnpguugu" kp" f kgvct { "ucpf ctf kvkqp0Hqt" gzco r ng. "vqcn' gpgti { "kpcng" y cu" pqv' eqpvqmgf " dgvy ggp" vj g" vy q" f kgvct { "kpvtxgpvqp" cpf " xctkgf " d { " cr r tqzko cvgn { "922" ncn' kp" vy q" qh" vj gug" uwf kgu" *Dtgy gt" gv' cr0" 3; ; : =O vqlq" gv' cr0" 3; ; 6+0' Vj ku" o cngu" kv' f kkwv" vq" f kvkpi vkuj " y j gvj gt" vj g" ghgev" qdugt xgf " y cu" f wg" vq" vj g" f khtgpeg" kp" ectdqj { ftcvg" qt" vqcn' ecmtke" kpcng0"

Vj g" enqugv" uwf { "vq" qwt" r tqveqn' y cu" eqpf wevgf " d { "Dtgy gt" *et al.* " *3; ; : +0' Vj g" uwf { " eqo r ctgf " vj g" ghgev" qh" vy q" ectdqj { ftcvg" tkej " f kgv" cpf " cp" gpgti { "o cvej " f kgv" y kj " 35" " f khtgpeg" kp" ectdqj { ftcvg" kpcng" qp" vgcfo km' twp" vq" gzj cwvqp" cv' 92' " XQ4o cz" kp" j ki j n { "vckp" gf " twppgtu0' Vj g" tgugetej gtu' tgr qtvgf " uko kct " hpf kpi u" vq" qwtu" f go qpvtkvpi " c" pqp/ucvkvkcm { "uki pkkcpv" f khtgpeg" qh" 40' " cu" c" tguv" qh" c" 35' " *5; ; "i +f khtgpeg" kp" ectdqj { ftcvg" kpcng" dgvy ggp" vten0'

Vj g" ewttgpv" uwf { "f kf " pqv" hpf " cp { "uki pkkcpv" f khtgpegu" kp" dmqf " ncev" cpf " i ncev" eqpegpvkqp" dgvy ggp" vj g" vy q" f kgvct { "kpvtxgpvqp" 0' Vj g" gZR gevgf " f khtgpeg" ku' pgt " vj g" r tgekukp" qh" vj g" gs vkr o gpv' v' r kcn' kp" ur qt u' uelkpeg" cpf " vj ku' eqwf " dg" vj g" tgcup" hqt " qwt" hckwtg" vq" hpf " uki pkkcpv" f khtgpegu0' Dmqf " ncev" xcnwu" xctkgf " dgvy ggp" 40' cpf " 40' " o o qrn³0' Vj gug" xcnwu" y gtg" gZR gevgf " cu" vj g" o gcp" y qtn' tcv" hqt " vj g" vko g" vq" gzj cwvqp" *428" 0' 52" Y +y cu" lwv' cdqxg" vj g" ncev" vj tguj qf " qh" 40' " o o qrn³ *3; ; 3" 0' 63" Y +0' Vj gug" hpf kpi u" ctg" kp" nkg" y kj " vj qug" qh" r tgxkqu" uwf kgu" *Y kkrco u" gv' cr0" 3; ; 4= Tqmuej " gv' cr0" 4224= O vqlq" gv' cr0" 3; ; 6+0' Vj g" cxgtci g" ncev" eqpegpvkqp" qdugt xgf " f vt kpi " gz gtekug" kp" vj g" ewttgpv" uwf { " y gtg" nqy gt" eqo r ctgf " vq" Dtgy gt" *et al.* " *3; ; : +y j q" wugf " c" uko kct " gz gtekug" kpvkp { 0' Kp" vj g" ewttgpv" uwf { ." ectdqj { ftcvg" y cu" vj g" r tko ct { "gpgti { "uqteg" wugf "

f wtkpi "vj g"uvpcf {/ucvg"uwo czko cni'gzgtekug"wpkn'gzj cwukqp"kp"dqj "J ki j gtEctd"cpf "Nqy gtEctd"eqpf kkpupu"*TGT"×"20 2-0J qy gxgt."pq"uki pkkcepv'f khtgpegu'y gtg"hwpf "kp" TGT"dgw ggp"vj g"eqpf kkpupu'Uko kct"kp f kpi u'y gtg"qdvckpgf "d {"Tqmuej "cpf "eqmci wgu" *4224+"y j q"kp xguki cvgf "vj g"ghgev"qh"38' "f khtgpeg"kp"ectdqj {f tcvg"kpvcng"qp" TGT" f wtkpi "c"62"o kpwg'uwo czko cni'vuv'cv'95' "XQ4o cz0Vj gug'tguwnu'uggo "v"dg"eqpukuvp' y kj "qj gt'tgugctej "*Y knko u'gv'cr03; ; 4=O wlkq'gv'cr03; ; 6-0"

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5.6 Conclusion

Vj g"o ckp"qweqo g"qh'vj ku'uwf {"y cu'vj cv'cv'c"i tqwr "ngxgn"c"37' "cxgtci g'f khtgpeg"kp" ectdqj {f tcvg" kpvcng" f kf " pqv' cngt" gpf wtcepg" r gthqto cpeg" qt" ugrgevgf " r j {ukqmi kecn' tgur qpug0J qy gxgt."cv'vj g'ngxgn'qh'vj g"kp f kxf wcn'uwdlgev."vj gtg"o c {"ukm'dg"c"r qvcpkcn' ghgev'qh'ectdqj {f tcvg"kpvcng."dw'uwej "cp"ghgev'o c {"dg{qpf "vj g'vej pkecn'r tgekukqp"qh'vj g" o gcuwtgo gpv0'Hwtvj gto qtg."72' "qh'r ctvekrcpvu'y j q" wugf "F_{tgem}"v"ucpf ctf kug" f kgvct {" kpvcng"kp"vj g"uwf {"r tgugpvgf "kp"Ej cr vgt"5."j cf "c"rti gt"xctkcdkvw{"vj cp"37' 0Vj g"ko r cev' qh'c'f khtgpeg"kp"ectdqj {f tcvg"j ki j gt'vj cp"37' "cpf "ny gt'vj cp'y j cv'j cxg'dggp"vugvf "j cu" {gv'v"dg'uwf kgf 0'

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Chapter 6

The effect of encouraging individuals to stay well-hydrated in the pre-trial preparation period on their hydration level"

6.1 Summary

O cp{" tgugetej gtu" rko kv" vj gk" r tgv/vkcn" j {f tcvkqp" utcvgi kgu" vq" uko r nq" gpeqwtci kpi " r ctvlekr cpw"vq"uc{ "y gmj" {f tcvgf "y kj qw'r tqxkf kpi "cp{ "kputwekqpu"qp"} qy "vq"fq"uq0K'ku" ukm'pqv'npqy p"y j gvj gt"vj ku"gpeqwtci go gpv"ecp"dg"uweeguulwn'lp"o kpk kpkpi "vj g'tkum'qh" uctv kpi "cp"gz gtekug'vgu'lp"c"} {r qj {f tcvgf "ucvg0Vj gtghqtg."vj g'o clk'cko "qh'vj ku'uwf {"y cu" vq"o gcuwtg"vj g"lpekf ppeg"qh'r ctvlekr cpw"y j q"y gtg"j {r qj {f tcvgf "qp"vj gk"cttkxcn'vq"vj g" rcdqtcvqt {" chgt"tgegkxkpi " gpeqwtci go gpv" vq" uc{ "y gmj" {f tcvgf 0' Hqwtv{/hxxg" pqto cm{ " cevxg"qt"o qf gtcvgn{ "vclpfg" "o gp"r tqxkf gf "c"htuv'o qtpkpi "wtkpg"uco r ng"cv"j qo g"uqqp" chgt"y cnkpi "wr 0'Crr tqzko gvcn{ "qpg"j qwt"chgt."vj g{ "r tqxkf gf "c"ugeqpf "wtkpg"uco r ng"cv" vj g"rcdqtcvqt {0'Rctvlekr cpw"y gtg"kputwevgf "vq"hcuv'qxgtpki j v'hqt"32"j qwtu'htqo "cm'hqf " cpf "ftkpm"gzegr v'htqo "y cvgt."y j lej "vj g{ "y gtg'xgtdcm{ "gpeqwtci gf "vq"ftkpm'vq"uc{ "y gmj" j {f tcvgf 0'Vj g"tguwu'lpf kecvgf "vj cv'57' "qh'r ctvlekr cpw"y gtg'uki pkkpvcn{ "j {r qj {f tcvgf." 52' "y gtg"knkn{ "j {r qj {f tcvgf."cpf "57' "gvj {f tcvgf "qp"vj gk"cttkxcn'vq"vj g"rcdqtcvqt {0' Hktuv'o qtpkpi "wtkpg"quo qrcrv{ "xcnvgu"y gtg"*o gcp"0'UF +<3265"0'32: .": 23"0'66."cpf "75: " 0'329"o Quo qrfni /3."tgur gevkn{ 0'Wtkpg"quo qrcrv{ "qh'vj g"htuv'xqkf "y cu"pqv'uki pkkpvcn{ " f khtgpv" dgw ggp" cvj ngvu" cpf " pqp/cvj ngvu" *9: 2" 0'444" cpf ": 2: " 0'473"o Quo qrfni /3." tgur gevkn{ =p"? "08; + "pqt"vj g"ugeqpf "xqkf" *: 47" 0'3: 4" cpf ": 6; " 0'457"o Quo qrfni /3." tgur gevkn{ =p"? "03+0'Vj gug'tguwu'lpf kecvgf "vj cv'gpeqwtci kpi "r ctvlekr cpw"vq"ftkpm'y cvgt" kp"vj g'r tgv/vkcn'r tgr ctvlekr r gtkqf "ku"pqv'gpqwi j "vq"cej kxg"gvj {f tcvkqp"kp"cm'uwdlgewu'

"

6.2 Introduction

Vj g"ghge'v'qh"j {r qj {f tcvkqp"*vto u"fhkpgf "kp"Vcdng"80+"qp"gpf wtcepg"r gthqto cpeg"ku" y kf gn{ "npqy p"cpf "gz vgpukgn{ "uwf kfg "*"Ucy n"gv'cn04229+0'K'j cu"dggp" f go qpucvfg "vj cv" y cvgt"nqu"qh'o qtg"vj cp"4' "qh'DO "ecp" f ko kpkuj "cgtqdle"r gthqto cpeg"kp"vgo r gtcvg."y cto " cpf "j qv'gpxkqpo gpw"*Ej gwxtqp'v'gv'cn04225=Cto utqpi "gv'cn03; : 7=Mepghkn'gv'cn04232=Ej gwxtqp'v'gv'cn04227=Ej gwxtqp'v'Mepghkn"gv'cn04232+0'Hqt"gzco r ng."Ej gwxtqp'et al." *4227+"gzco kpgf "vj g"ghge'v'qh"j {r qj {f tcvkqp"qp"gpf wtcepg"r gthqto cpeg"kp"c"vgo r gtcvg" gpv'kqpo gpv'0'Rctvlekr cpw"y gtg"r cuvkn{ "j {r qj {f tcvgf "d{ "ukv kpi "kp"c"j qv'tqgo "*"67Å+" hqt"5"j qwtu'lp"vj g'o qtpkpi "y kj "qt"y kj qw'hwkf "tgr nrego gpv'0'Vj g'hqto gt"eqpf kkp"rgf "vq" y gli j v'o clk'vpcpeg."y j gtgcu"vj g"rwtg"eqpf kkp"rgf "vq"c"5' "nqu"qh'DO 0'Vj gp."kp"vj g" chgtppqp."uwdlgewu"gz gtekugf "hqt"52"o kpwgu"cv'72' "XQ4r gcm'qp"c"e{enkpi "gti qo gvgt"

hqmry gf "d{ "c"52"o kpwg"vko g"v'kcn0Vj g'tgugctej gtu'hqwpf "vj cv'vko g'v'kcn'r gthqto cpeg'y cu" uki p'k'ecpwn{ " fgetgcugf " d{ " c " : ' " y j kg" j {r qj {f tcvkqp" eqo r ctgf " vq" gwj {f tcvkqp0 Vj gthqto." j {r qj {f tcvkqp"uj qwf " dg" eqpvtqmgf "hqt" kp"uwf { " r tqveqnu"cpf "tgugctej gtu" uj qwf "o cng"uwg"vj cv'r ctv'ekr cpw"ctg"uctv'kpi "gcej "gZR gtko gpvcn'v'kcn'kp" c"gwj {f tcv'gf " ucv'g"vq"cxqkf "pqkug'kp"vj gkt "tguwmu0"

Tgugctej gtu"ecppqv'tgn{ "qp"r ctv'ekr cpw"vq"wtp"wr "vq"gzr gtko gpvcn'v'kcn'y gm/j {f tcv'gf "kh" vj g{ " f q" pqv' r tqxkf g" erget " kputwv'kqpu" vj cv' uj qwf " dg" hqmry gf " f v'kpi " vj g" r tg/v'kcn' r tgr ctv'kqp"r g'kqf 0Uj ktghu"cpf "O cwi j cp"*3; ; : +"pcn{ugf "vj g"fc{/vq/fc{ "xctkcdk'k'v{ "kp" j {f tcv'kqp"rgxgnu"hqt"hxg"eqpugewkxg"fc{u'kp"33"ugf gpvct { ""kp'kxkf wcn'y kj qw'tgutv'kpi " vj gkt " f l'gvt{ " k'pvcng" qt" f ckn{ " r j {ulecn' ce'v'kxk{0' Vj g" tgugctej gtu" uj qy gf " vj cv' v'kpg" quo qnc'k'v{ "WQuo +"qh"vj g"htuv'o qtpkpi "xqkf "xctk'gf "dgwy ggp"64; "cpf "3236"o Quo q'f'ni /3" y kj kp/uwdlgeu=" y j gtgcu." dgwy ggp/uwdlgeu" xctkcdk'k'v{ " y cu" dgwy ggp" 453" cpf " 3379" o Quo q'f'ni /30' Uj ktghu" cpf " O cwi j cp" cnuq" tgxgc'rgf " vj cv' 72' " qh" uwdlgeu" y gtg" uki p'k'ecpwn{ "j {r qj {f tcv'gf "*"@; 22"o Quo q'f'ni /3+"qp"cv'ngcu"qpg"qh"vj g"hxg"v'gukpi "f c{u0 Vj ku'f go qp'utcv'gu"vj cv'kh"uwdlgeu"ctg"ng'h'y kj "pq"j {f tcv'kqp"uctv'gi { ."vj g{ "o ki j v'dgi kp" v'gukpi "j {r qj {f tcv'gf 0"

K'j cu" dggp" f go qp'utcv'gf " vj cv'j {r qj {f tcv'kqp"ku"o qtg" eqo o qp" co qpi uv' cvj ngv'u" vj cp" r t'gxlq'wun{ "vj qwi j 0'Hqt"gzco r ng."Rj knkr u"et al."*4236+"o gcuwtgf "v'kpg"ur gek'he"i t'cxk'v{ " *ew/qh'h'xcnwg" wugf "hqt"j {r qj {f tcv'kqp" @30242"y j k'ej "gs wcv'g"vq" @922"o Quo q'f'ni /3-"qh" vj k'v'ggp"gr'k'g"Gwtqr gcp" {qwj "uqeegt"r n{gtu"d{ "eqmge'v'kpi "vj gkt "htuv'o qtpkpi "v'kpg"xqkf " hqt"vj tgg"eqpugewkxg"v'ctk'p'kpi "f c{u0Vj g"tgugctej gtu"tgr qt'v'gf "vj cv'99' "qh"cvj ngv'u"y gtg" r'kn'gn{ "j {r qj {f tcv'gf "qp"fc{ "3"cpf "5."y j gtgcu"84' "y gtg'r'kn'gn{ "j {r qj {f tcv'gf "qp"fc{ "40"

Xqrr g"et al."*422; +"eqpf wv'gf "c"uwf { "uko k'ct"vq"Rj knkr u"cpf "eqm'gci wgu'dw"qp" c"r'ti gt" uec'rg"kp'ew'f kpi "485"o c'rg"cpf "hgo c'rg"uwf gpv'cvj ngv'u0Xqrr g"cpf "eqm'gci wgu"eqm'ge'v'gf "qpg" ur qp'vcp'gq'wun{ 'xqkf gf "v'kpg"uco r ng"dghqtg"v'ctk'p'kpi "cpf "cu'gu'ugf "v'kpg"ur gek'he"i t'cxk'v{ "cpf " tgr qt'v'gf "vj cv'88' "qh"cvj ngv'u"y gtg'r'kn'gn{ "j {r qj {f tcv'gf "dghqtg"v'ctk'p'kpi "*"ew/qh'h"@30242-0' K'uj qwf " dg"pq'v'gf " vj cv'k'j cu" dggp" uwi i gu'v'gf " vj cv' v'kpg" uco r ngu" v'cngp" ur qp'vcp'gq'wun{ " uj qwf "pqv'dg" wugf "vq"cu'gu"j {f tcv'kqp"rgxgnu"cu'k'eqwf "dg"ch'ge'v'gf "d{ "h'w'k'f "k'pvcng."f l'gv." cpf "gzg'tekug" f v'kpi "vj g"fc{ "*"Ej gwxtqp'v'g'v'c'f'04237-0'Hktuv'o qtpkpi "v'kpg"xqkf "j cu" dggp" uj qy p"vq" dg" c"dgwgt "kp'f l'ecv't"qh" WQuo "gur gek'm{ "cu"ku"vj t'g'uj q'f'u"j cxg" c'it'gcf { "dggp" x'c'k'f cv'gf "*"Cto utqpi "g'v'c'f'03; ; : ="Rqr qy un'k" g'v'c'f'04223=" Uj ktghu" ("O cwi j cp"3; ; : -0' J qy gxgt."vq" qwt" npqy r'g'f i g." vj gtg" ctg" u'k'n'pq" erget "i w'k'f gr'k'p'gu" qp"y j g'v'j gt " vj gtg"ku" c"

uki pkklecpv'f khtgpeg"dgvy ggp"vj g"htuv'cpf "ugeqpf "wtkpg"xqkf 0'Vj g"ugeqpf "o qtpkpi "xqkf " ecp"dg"r tcevekn'gur gekm{"k'h'vj g"gzr gtko gpv'ku"pqv'qp"gtcn{"o qtpkpi "*Cto utqpi "gv'cif' 3; ; 6-0'

C"eqpukf gtcdrng"pwo dgt"qh'tgugctej "uwf kgu"fq"pqv'ko r ngo gpv'cp{"j {f tcvkqp"utcvgi {"pqt" ej gem'vj g"j {f tcvkqp"ucwuu"qh'r ctvekr cpwu'r tkqt"vq"vj g"gzr gtko gpv'*Eco r dgm'gv'cif'422: =" Tqmq"gv'cif'422: ="O qpecf c/lko gpgj "gv'cif'422; ="Dggngp"gv'cif'422; ="Ur gpeg"gv'cif'4235=" Rgugtkeq" ("O cej cf q"4236+0' Uqo g"qh" vj gug"uwf kgu"rko k' vj gk" kputwekqpu"vq" uko r n{" gpeqwtci kpi "r ctvekr cpwu"vq"uc{"y gm'j {f tcvgf "46/j qwtu'dghqtg"gxgt {"tkcn'y kj qw'i kxkpi " engct'kputwekqpu"qp"j qy "vq"cej kxg"kv"*Eco r dgm'gv'cif'422: ="Rgugtkeq" ("O cej cf q"4236+0' Vj g"gpeqwtci go gpv'o c {"tguwn'kp'r ctvekr cpwu"vq"uctv'kp"xct {kpi "ucvqu"qh'j {f tcvkqp"cetquu" o wmkrg"vguv'qeecukqpu'0'Vj g{"o ki j v'dg"y gm'j {f tcvgf "qp"qpg"qeecukqp"cpf "j {r qj {f tcvgf " qp"cpqyj gt0'Cu"ceqpugs wpeg. "tgugctej gtu"o c {"hcn'vq"kp"uki pkklecpv'ghgevu"cuuqekvgf " y kj "vj g"kpvtxgpv'kqp"fwg"vq"vj g"pqkug'kvtqf wegf "d {"j {r qj {f tcvgf "r ctvekr cpwu'0'J qy gxgt." k'ku'ukm'pqv'npqy p"vq"y j cv'gz vgp'gpeqwtci go gpw'ecp"chgevj {f tcvkqp"ucwuu'0'Vj g"ghqtg." vj g"o clk" cko "qh" vj ku"uwf {"y cu"vq"o gcuwg"vj g"kekf gpeg"qh'r ctvekr cpwu"y j q"y gtg" j {r qj {f tcvgf "qp"vj gk"cttkcn'vq"vj g"ndqtcvqt {"chgt"tgegkxkpi "gpeqwtci go gpv'vq"uc {" y gm'j {f tcvgf 0' Vj g"ugeqpf ct {"cko u"y gtg"vq" eqo r ctg" WQuo "qh' cvj ngvu" versus" pqp/ cvj ngvu'cpf "htuv'versus"ugeqpf "o qtpkpi "xqkf 0'

"

6.3 Materials and methods

6.3.1 Participants

Hqtv{/hxxg" ugf gpvct {" qt" o qf gtcvgn {" vclp'gf " o gp" r ctvekr cvgf " kp" vj g" r tgugpv' uwf {0' Tgetwko gpv'qh'r ctvekr cpwu"y cu"o cf g"vj tqwi j "r quvgtu'r nregf "ctqwpf "eco r wu'cv'Qzhqtf " Dtqqngu'Wpkxgtukv{0'Vj g'r j {ulecn'ej ctcevgtkuk'eu"qh'vj g'r ctvekr cpwu'ctg'r tgugpv'gf "kp"Vcdng" 800'Grki kdkkv {"etkgtk" kpenw'gf "o gp"ci gf "dgvy ggp"3: /62" {gctu'cpf "htgg"qh"o gvcdrke" f kuqtf gtu"*g'f kcdgvgu."ectf kqxcuewrt "f kugcug."qt"j {r gtvgpukqp+0'Rctvekr cpwu"y gtg"pqv' vqf "cdqw"vj g'tgen'cko "qh'vj g'uwf {"cpf "vj cv'vj gk"eqo r kcepg"y cu'dgkpi "o qpkqtf "vq"r tg/ vgu'gpeqwtci go gpv'0'Vj g"cko "qh'vj g'f gegr vqpp"y cu"vq"r tgxgpv'uwldgevu"htqo "o qf kh{kpi " vj gk"dgj cxkqwt"*g'f t'kpn'ic'nti g's wcpvkv {"qh'hmw'f "qpn {"dgecwug"vj g'cko "qh'vj g'uwf {"y cu" cdqw" vj gk"cdk'kv {"vq" hqm'qy "kputwekqpu" qp"j {f tcvkqp+"y j lej "eqw'f "o cng" vj g"tguwuu" kpxcrkf 0'J qy gxgt."qpeg"vj g {"j cf "eqo r ngvf "vj g'uwf {"vj g {"y gtg'f gdt'kghf "cdqw"vj g'tgen'

clo "Cr r gpf kz "F +"cpf "y gtg"i kxgp "y g"qr r qtwpkx{ "vq"tghwug"y g"wug"qh"y gkt "kphqto cvkqp" d{ " y g" kpxguxki cvqtu0' P qpg" qh' y g" r ctvlekr cpwu" tghwugf 0' Vj ku" eqo r nku" y kj " y g" i qqf " r tceveleg" tgeqo o gpf cvkqpu" qh' y g" P J U" t gugctej " i qxgtpcpeg" i wkf g" *P cvkqpcn' Tgugctej " Gyj leu" Ugtxleg" 422; +"cpf " y g" Y qtrf " J gcmj " Qti cpkucvkap" *Y qtrf " J gcmj " Qti cpk cvkqp" 4235+0'Vj ku"uwf { "y cu"eqpf wevgf "ceeqtflpi "vq"y g" i wkf gkpgu"rcfk "f qy p"lp"y g" F gerctcvkqp" qh'J gnukpnk'cpf "cm'r tqegf wtgu"lpxqrxkpi "j wo cp"uwdlgeu"y gtg"cr r tqxgf "d{ "y g" Wpkxgtuk{ " Tgugctej "cpf "Gyj leu"Eqo o kwgg" *WTGE+"cv" Qzhqtf "Dtqqngu" Wpkxgtuk{ " *Cr r gpf kz "F +0' Y tkwgp "kphqto gf "eqpugpv"y cu"qdvkpgf "htqo "cm'r ctvlekr cpwu" r tkqt "vq"y g" go "eqo o gpekpi " y g'uwf { 0'

"

Vcdng'800'Vj g'r j { ulecn'ej ctcevtkukcu'qh'y g'r ctvlekr cpwu"

| " | Cm*P "? "65+" | Cy rvgu" *p"? "44+" | P qp/cy rvgu" *p"? "43+" | p'xcnwg, " |
|--------------------|---------------|---------------------|--------------------------|------------|
| Ci g."{tu" | 49"08" | 49"09" | 49"07" | 05" |
| J gki j v."eo " | 39; "08" | 3: 2"09" | 39: "08" | 04" |
| Dqf { "o cuu."mi " | 960 "0: 0" | 970"0: 0" | 960"0: 0" | 07" |

, p'xcnwg"dgvy ggp"cy rvgu"cpf "pqp/cy rvgu"

"

6.3.2 Experimental design

Rctvlekr cpwu"xlukgf "y g"rdqtcvqt { "y leg"f wtkpi "y g"uwf { 0'Qp"xluk'3." r ctvlekr cpwu"i cxg" yj gkt "y tkwgp"eqpugpv"hmjy gf "d{ "y gki j lpi "y g" go "vq"20'mi "pgct"r tgekukqp"lp"rki j v'erqy lpi " cpf "dctghqv" wulpi "c"ecrkdtevgf "grgestqple" uecng" *Vcpkoc" WM'Nf 0" [lgy urg{ ." O kf f rugz. " WM+0' J gki j v' y cu" cnuq" o gcuwtgf " y kj qw" uj qgu" y kj " cp" ceewtce{ " qh' 20' "eo " wulpi " c" ucf kqo gvgt *Ugec" Nf 0' Dkto lpi j co. " WM+0' Vj gp" y g{ "y gtg"lpustwevgf "vq"lcuv"htq"vgp"j qwtu" qxgtplj j v'htqo "cm'hqqf "cpf "f tlpnu" *gzegr v'htqo "y cvgt+"r tkqt "vq"y g" hktuv" wtkpg" eqmgevkqp" qp" xluk' 40' Uwdlgeu" y gtg" xgt dcm{ " gpeqw tci gf " vq" nnggr " y go ugrxgu" y gm/j { f tcvgf " yj tqwi j qw" y g" f c{ " dghqtg" xluk' 4." gur gekcm{ " f wtkpi " y g" gxgplki 0' Vj g" xgt dcn' gpeqw tci go gpv' i kxgp" vq" r ctvlekr cpwu" y cu" cu" hmjy < "nnggr " { qwtugr" y gm/j { f tcvgf " yj tqwi j qw" y g" f c{ ." gur gekcm{ " lp" y g" gxgplki ." dghqtg" y g" wtkpg" eqmgevkqp 0' [qw" ecp" cej kxg"y cv'd{ "f tlpnkpi "cf f kkpncn'co qwpv'qh'y cvgt "y cp" { qwt "wucn'lpvcng0' Vj g{ "y gtg"

cnuq"lphqto gf "v"cdvckp"htqo "cp{"wpceewuqo gf "utgpwqwu"rj {ulecn'cevkkv{."cnkpi "cp{"
 pwtkklqpcn"uwr r go gpw"*g0 0'xkco kpu"cpf"o kpgtcnu+."f tkpki "creqj qn'cpf"echhkg"46/
 j qwtu"dghqtg"xkuk"40'Qp"vj g"fc{"qh"xkuk"4."r ctvlek cpw"eqmgevfg"vj g"htuv'o qtpki "wtkpg"
 uco r ng"*Xqkf 3+"cv"j qo g"uqpp"chgt"y cnkpi "wr 0'Vj g{"eqmgevfg"42"o n'qh'wtkpg"o kf utgco "
 kp"o ctngf "uvtkkg"eqpvckp0'Vj g"ugeqpf"o qtpki "wtkpg"uco r ng"*Xqkf 4+"y cu"eqmgevfg "
 cr r tqzko cvgn{"cp"j qwt"chgt "Xqkf 3"cv"vj g"rdqtcvqt {0'P q"hqf "qt"ftkpmu"*kpenw lpi "y cvgt+"
 y gtg" r gto kwgf " dgwy ggp" Xqkf 3" cpf " Xqkf 40' Kp" ecug" vj g" eqmgevqap" qh" Xqkf 4" y cu"
 wpuweeguuhw"qp" vj g"htuv"cwgo r v."r ctvlek cpw"tgugf "hqt"52"o kpwgu"dghqtg"vj g{"y gtg"
 cunfg"v"t{"ci ckp0'Kp"ecug"vj g"ugeqpf"cwgo r v'y cu"wpuweeguuhw"cu"y gm"vj g"r ctvlek cpv"
 y cu" cunfg" v" tgr gcv" vj g" r tqveqn" qp" cpqj gt" fc{0' Cm' wtkpg" uco r ngu" y gtg" eqmgevfg "
 dgwy ggp": <22"o0 0'cpf "32<22"o0 0'

"

6.3.3 Urine Osmolality

C" uco r ng" xqnwo g" qh"72" n' y cu" wugf " v" cpcn{ug" ku" quo qnrkv{" wukpi " htgg| kpi " r qkpv"
 f gr tguukp" *Quo qo cv' 252." I qpqve." Dgtrk." I gto cp{+0' Uco r ngu" y gtg" cpcn{ugf " kp"
 vkr rkevgu"v"ko r tqxg"ceewtce{0'Vj g"tgr qtvgf "EX' "qh"vj g"vkr rkevgo" gcuwtgo gpw"y cu"
 20 ' 0' Vj g" f khgtgpv" j {f tcvkqp"ucwugu" cpf " vj gk" ew/qh' wugf " v" encuukh{" uwdlgew" ctg"
 f ghkpgf "kp"Vcdrg'8040'

Co qpi uv" vj g" exckrdrg"j {f tcvkqp"cuuguu gpv"o gj qf u."WQuo "y cu"ej qugp" hqt"ugxgcn'
 tgcuppu0'Wtkpg"quo qnrkv{"cpf"wtkpg"ur gekke"i tcvk{"ctg"eqpukf gtgf "xcrkf"cpf"tgkrkdrg"vqnu"
 vq"cuuguu"j {f tcvkqp"ucwuw"cpf"ej tqple"ej cpi gu'lp"vqcn'dqf {"y cvgt"*Cto utqpi "gv'cn03; ; : =
 Uj ktghu"("O cwj cp"3; ; : =Cto utqpi "gv'cn03; ; 6+0J qy gxgt."vj g{"ctg"rguu"ugpukxg"vj cp"
 r nuu c"quo qnrkv{"y j gp"wugf "v"o gcuwtg"ceewg"ej cpi gu'lp"vqcn'dqf {"y cvgt"*Rqr qy unk'gv"
 cn0'4223+0'Rnuu c"quo qnrkv{"j cu"dgpp"enko gf "v"dg"vj g"oi qrf "ucpf ctf o"ht"j {f tcvkqp"
 cuuguu gpv" *kpvkwwg"qh"O gf lekpg"4227+="j qy gxgt."vj ku"j cu"dgpp" f gdcvfg " *Cto utqpi "
 4229+0'Qpg"qh"vj g"o ckp"rko kcvkpu"ecp"dg"f go qpwtcvfg "kp"Cto utqpi "gv'cn0*4235+"y j q"
 tgr qtvgf "pq"uki phekcpv'f khgtgpeg"kp"o gcp"r nuu c"quo qnrkv{"dgwy ggp"ny "hmkf "f tkpngtu"
 *38"N'r gt"fc{="p"? "36+"cpf "j ki j "f tkpngtu"*504"N'r gt"fc{="p"? "36+"f gur kg"46/j qwt"WQuo "
 ergctn{"uj qy kpi "vj cv"ny "f tkpngtu"y gtg"rkngn{"f gj {f tcvfg "": 26"O~435"o Quo qrfni^{1/3}+"cpf "
 j ki j "f tkpngtu"y gtg"gwj {f tcvfg "": 5: 9"O~34; "o Quo qrfni^{1/3}+0'Y j gp"dqj "i tqwu"uy cr r gf "
 vj gk" hmkf "kpvng." r nuu c"quo qnrkv{"uc{gf "vj g"uco g0'Vj ku"ku"o ckpn{"dgecvug"r nuu c"

quo qrcrk\ "ku'emqgn\ "tgi wrcvf "d\ "v'j g"j qo gqucve"u{uvgo "y kj kp" c"xgt\ {"pcttqy "tcpi g"
 *4: 2"ó"4; 2"o Quo qrfni ^{/3}="kpvkwwg"qh'O gf lekpg"4227+0Qvj gt"rko kcvkqpu"qh'v'j ku'o gj qf "
 kpenmf g"v'j g"lpxcukxg"pcwtg"qh"v'j g"vej pls wg"cpf "ku"j ki j "equv'eqo r ctgf "v'j g"qv'j gt "
 cxckcdrg"vej pls wgu0'Vj gtghqtg."v'j g"dguv'y q"ej qlkgu"ht"v'j g"ewtgpv'uwf {"y gtg"WQuo "
 cpf "wtkpg"ur gekle"i tcxk\0'Vj gug"y q"o gj qf u"j cxg"dggp"uj qy p"v"dg"j ki j n\("eqttgrcvf "
 cpf "ctg"kpvtgj cpi gcdrg"t"? "Q 9=Cto utqpi "gv'cr0'3; ; 6+0[gv"WQuo "ku"eqpukf gtgf "v'j g"
 i qrf /ucpf ctf "hqt"guvko cvkpi "wtkpg"eqpegpvcvqpu"*Ej cf j c"gv'cr0'4223+0'Vj gtghqtg."WQuo "
 y cu'o gcuwtgf "kp"v'j ku'uwf {0'

"

Vcdrg'8040'Vj g'ew/qh'xcnwg'u'ht"v'j g'f khtgtpv'j {f tcvkqp'ucwugu"

| J {f tcvkqp'ucwuu" | Wtkpg"quo qrcrk\ "o Quo qrfni ^{/3} +" |
|----------------------------------|--|
| Gwj {f tcvgf " | >922"" |
| Nkngn\ "j {r qj {f tcvgf " | @922"cpf ">"; 22"" |
| Uki pkhcepv\ "j {r qj {f tcvgf " | @; 22"" |

Dcugf "qp"Ucy mc"et al."*4229+"cpf "Uj ktghu\ ("O cwi j cp"*3; ; : +"

"

6.3.4 Statistics

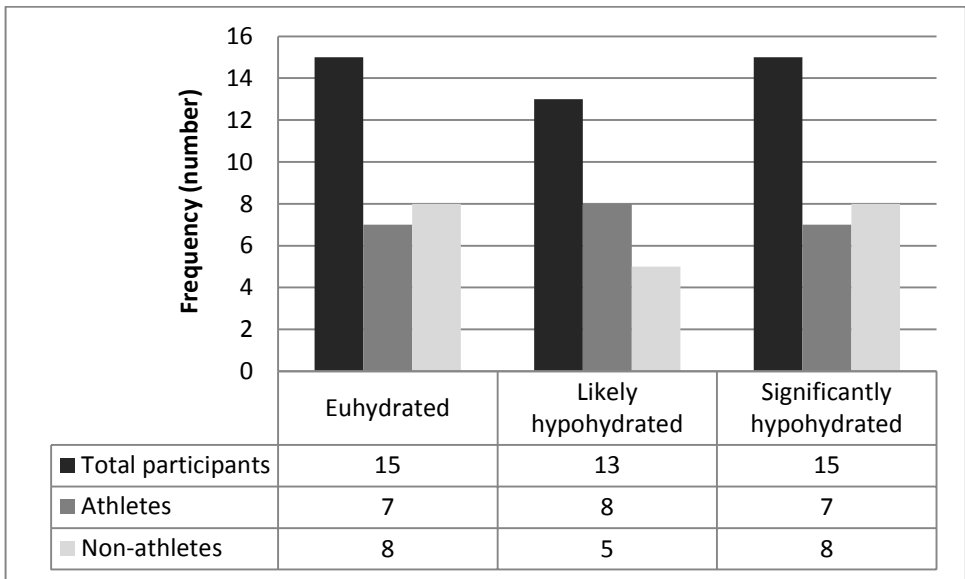
Ucvkuecn'cpcn\ ugu"y gtg"r gthqto gf "wukpi "URUU"x044"*kdo "eqtr 0"Cto qpm"P [."WUC+0'
 Wtkpg"quo qrcrk\ "cv'X3"cpf "X4"y gtg"pqto cm\ "f kntkdwgf 0'Vj gtghqtg."r cktgf /uco r ng"t'v'guv"
 y cu"wugf "v"eqo r ctgf"v'j g"o gcp"WQuo "xcnwg"qh"Xqkf 3"versus"Xqkf 4"cpf "cv'j ngvu"versus"
 pqp/cv'j ngvu0'Rgctup"t"eqttgrcvkqp"y cu"wugf "v"o gcuwtg"v'j g"eqttgrcvkqp"dgwy ggp"Xqkf 3"
 cpf "Xqkf 40Cmf cv"ctg'tgr qtvgf "cu'o gcpu'0SD0Ucvkuecn'uki pkhcepeg"y cu'ug'cv'p >'070'
 k\ cf f kkp." v'j g" EX' " *EX" ?" 322" z" o gcp IUF + " tgr qtvgf " hqt" WQuo " tgr tgugpvgf " v'j g"
 xctkcdk\ "dgwy ggp"v'j g"y q"wtkpg"xqkf u0'Vj g"uco r ng"uk' g"y cu'ecrewrvcgf "dcugf "qp"; 7' "
 r qy gt"cv'c"7' " ngxgn"qh'uki pkhcepeg"cpf "wukpi "tguwmu"htqo "Rj kkrk u"et al."*4236+0'Vj g"
 ecrewrvcqp"uwi i guvgf "v'j g"tgetwko gpv'qh'62"r ctvlekr cpw=j qy gxgt."hxg"o qtg"r ctvlekr cpw"
 y gtg'tgetwkgf "kp"ecug"qh'qwnktu0'

"

6.4 Results

Vj g"htuv"s wguvqp"gzco kpgf "vj g"ghgev"qh" gpeqwtci go gpv"vq"uc{ "y gm/j {f tcvgf "qp"vj g" j {f tcvqp"ucwuu"qh"r ctvlekr cpwu"Vj g"htgs wgepe{ "f kurtkdwkqp"qh"j {f tcvqp"ucwuu"dcugf "qp" htuv"o qtplpi "wtkpg"uco r ngu"ctg"uj qy p"kp"Hi wtg"800'Vj g"tguwuu"kp f lecvg"vj cv'57' "qh" r ctvlekr cpwu"y gtg"uki phtecpwn{"j {r qj {f tcvgf."52' "y gtg"rkngn{"j {r qj {f tcvgf."cpf"57' " gwj {f tcvgf"y kj "o gcp"ÖUF "xcwgu"qh"3265"Ö32: ".: 23"Ö66."cpf"75: "Ö329"o Quo qrfni ^{/3}." tgur gevkggn{0' Y j gp"ugeqpf "o qtplpi "xqkf"y cu" wugf "vq"ercuukh{ "r ctvlekr cpwu."64' "qh" r ctvlekr cpwu"y gtg"uki phtecpwn{"j {r qj {f tcvgf."55' "y gtg"rkngn{"j {r qj {f tcvgf."cpf"48' " gwj {f tcvgf"0'Wulpi "vj g"ugeqpf"o qtplpi "xqkf."vj g"o gcp"ÖUF "xcwgu"y gtg"325: "Ö324: ".: 22" Ö69."cpf"777"Ö84"o Quo qrfni ^{/3}."tgur gevkggn{0'

"



"

Hi wtg"800' Htgs wgepe{ "f kurtkdwkqp"qh"j {f tcvqp"ucwuu"dcugf "qp"htuv"o qtplpi "wtkpg" uco r ngu"

"

Vj g"tguwuu"qh"WQuo "qdvckpgf"htqo "vj g"cpnc{uku"qh"Xqkf 3"cpf "Xqkf 4"htq"cm"vj tgg"i tqw u" *qvcnr ctvlekr cpwu."cvj ngvu."cpf "pqp/cvj ngvu"ctg"uwo o ctugf "kp"Vcdrg"800Cu"ecp"dg"uggp" kp"vj g"vcdrg."vj g"o gcp"WQuo "qdvckpgf"htqo "dqj "htuv"cpf"ugeqpf "xqkf u"y gtg"cm"cdqxxg"vj g" 922"o Quo qrfni ^{/3}" ew/qh0'Wtkpg"quo qrcrk{"qh"Xqkf 3"cpf "Xqkf 4"y gtg"pqp"uki phtecpwn{" f khgtgpv" y kj kp" vj g" vj tgg" i tqw u" cpf " dgw ggp" cvj ngvu" cpf " pqp/cvj ngvu" *p" @ 027+0'

J qy gxgt." xctkcdkx\ " kp" WQuo " dgy ggp" Xqkf 3" cpf " Xqkf 4" y cu" cr r ctgpn\ kp" uqo g" r ct vlek cpw\y kj "cp"cxgtci g'y kj kp/uwdlgev'EX' "qh'36' 0Hki wtg'4'r tgugpu'yj g'kpf kxkf wcn' f khtgpegu"kp"WQuo "dgy ggp"Xqkf 3"cpf "Xqkf 40'Cu"Hki wtg'80'uj qy u."WQuo "f getgcugf " kp"59' "cpf "kpetgcugf "kp"85' "qh'r ct vlek cpw"kp"Xqkf 4"eqo r ctgf "vq"Xqkf 30'Vj g"o gf kcp" f khtgpeg"y cu"68"o Quo qfni ³0'Vj g"tguwnu"uj qy gf "utqpi "eqttgrv\kp"t"?"Ø3+"dgy ggp" Xqkf 3"cpf "Xqkf 4"y kj "c"p">Ø230'

"

Vcdrg"80'0'gcp"htuv"cpf "ugeqpf "o qtpkpi "wtkpg"quo qrcx\ "qh'cyj rvgu."pqp/cyj rvgu."cpf " vqcnr' ct vlek cpw"

| | Htu'v'o qtpkpi "wtkpg"uco r r g" | | | | Ugeqpf "o qtpkpi "wtkpg"uco r r g" | | | | P" xcnwg, " |
|---------------|----------------------------------|-------|-------|--------|------------------------------------|-------|-------|--------|----------------|
| | O gcp" | UF " | O kp" | O cz " | O gcp" | UF " | O kp" | O cz " | |
| Vqcn" | | | | | | | | | |
| *P"?"65+" | 9; 6" | 454" | 579" | 347: " | : 59" | 433" | 67; " | 3454" | Ø4" |
| Cyj rvgu" | | | | | | | | | |
| *p"?"44+" | 9: 2" | 444" | 579" | 3377" | : 47" | 3: 4" | 67; " | 332: " | Ø: " |
| Pqp/cyj rvgu" | | | | | | | | | |
| *p"?"43+" | : 2: " | 4773" | 59: " | 347: " | : 6; " | 457" | 683" | 3454" | Ø8" |

Xcnwgu"ctg"o gcp."ucpftf "f gxlcv\kp" *UF +."o kpk wo " *O kp+."cpf "o czk wo " *O cz+0', p" xcnwgu"qh'Xqkf 3'vs. "Xqkf 40'

"

"

"

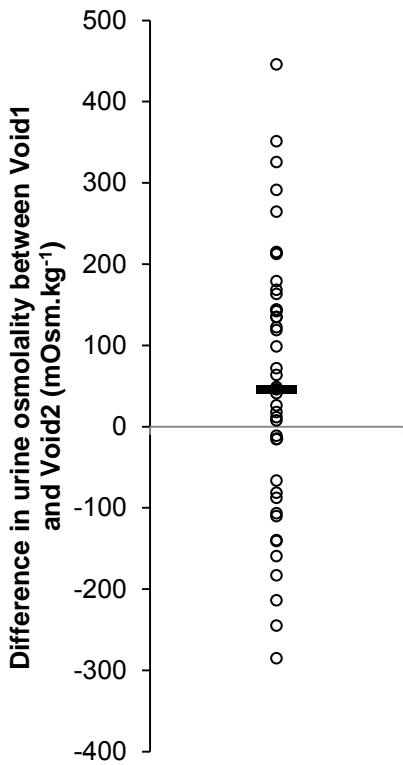
"

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"



"

Hki wtg'8040Vj g'f khtg ppeg'lp'htuv'cpf 'ugeqpf 'o qtpkpi 'wtkpg'quo qmrvk\ 'xcnwgU'

"

6.5 Discussion

C'ng{ 'utgpi vj 'qh'vj g'r tguv'uwf { 'y cu'vj g'f gegr vq'p'qh'r ct vkr cpw'cdqw'vj g'qweqo gu' dgkpi " gzco kpgf O' K' y cu' guv'vkn' pqv' vq' qhgt' wppgeguuct { " ewgu' kp' vj g' r ct vkr cpv' kphqto cvkq'uj gg'cu'vq'vj g'y c { 'vj cv'vj g'f cv'y gtg'i qkpi "vq'dg'wko cvgn' "wugf "ukpeg'vj ku' y qwf "kpxckf cvg'vj g'r tgo kug'qh'vj g'uwf { O'F gegr vq'p'ku'qh'v'wugf "kp'tgugctej "uwf kgu' o qpkqtkpi "vj g' eqo r kpeg' qh'uwldgew" y kj "vj g' r tqvqen'kp' qtf gt' pqv'vq' o qf kh { "vj gkt' dgj cxkqwt *P cvkqpcn'T gugctej "Gvj leu'Ugtxleg"422; +0'Vj gtghqg."y g'dgrkxg'vj cv'vj g'tguwru' qdvkpgf 'y gtg'vj g'tgcn'tgh'v'vq'p'qh'r ct vkr cpw'dgj cxkqwt "vqy ctf "gpeqwtci go gpv'vq'uc { " y gmj { ftcvgf 'r tkqt "v'g'zr gtko gpvcn'v'kcn0'

Vj g' ng { " kpf kpi " qh' vj ku' uwf { " y cu' vj cv' qpg' kp' vj tgg' r ct vkr cpw' y cu' uki p'k'ecpv { " j { r qj { ftcvgf " y kj " c" WQuo " cdqyg" ; 22" o Quo qrfni ³0' Vj gug' r ct vkr cpw' y gtg' j { r qj { ftcvgf "d { 'cv'ngcu'4' "qh'vj gkt'dqf { "o cuu'cv'vj g'vko g'vj g { 'cttkxgf "vq'vj g'rdqtcvqt { " *Uj ktghu' (" O cwi j cp' 3; ; : +0' Hwtvj gto qtg." c" WQuo " cdqyg" 3272" o Quo qrfni ³ y cu'

qdugtxgf "kp"38' "qh'r ctvlekr cpwu'y j kej "j cu'dggp'tgr qtvgf "vq"eqttgur qpf "vq"cy cvgt'mquu'qh'
6/7' "DO "Ecuc."Cto utqpi ."gv'cif04222="Cto utqpi "gv'cif03; ; : -0'Vj g"ewttgpv'CEUO "
i wkf grkpgu"*4229+"eqpegtpkpi "gz gtekug"cpf "hmkf "tgr rnego gpv'eqpenmf gf "vj cv'f gj {f tcvkqp"
qh'o qtg"vj cp"4' "DO "f ko kpkuj gu"cgtdkle"gz gtekug"r gthqto cpeg"kp"vgo r gtcvg."y cto ."cpf "
j qv'gpv'kqpo gpwu'Gz gtekug"r gthqto cpeg"ku"hmvtj gt" f getgcugf "y kj "kpetgcukpi "ngxgn'qh"
y cvgt'mquu"*Ecuc."O ctguj ."gv'cif04222+0'Rctvlekr cpwu'y kj "c"WQuo "cdqxg"; 22'o Quo qrfni ^{/3}"
j cxg" vj g" r qv'p'vkn' vq" cngt" vj g" tguwmu" qh' uwf lgu" y kj " xct {kpi "gz gtekug" r tqv'eqnu0'
Ej gwxtqpv' cpf " eqmgci wgu" *4225+" r wdrkuj gf " c" tgxkgy " gzco kpkpi " vj g" ghhev' qh"
j {r qj {f tcvkqp" qp" gpf wtcepeg" r gthqto cpeg0' Vj g" tgxkgy " eqpenmf gf " vj cv' gpf wtcepeg"
r gthqto cpeg"ku"ko r cktgf "y j gp"y cvgt'mquu'gzeggf u"4' "qh"DO ."gur gekm{ "y j gp"gz gtekug"
rcuu'ctqwpf "qt"mpi gt "vj cp"; 2"o kpwgu'Gzco r ngu'qh'vj ku'kpenmf g'mpi "f kucpeg"vko g"v'kcnu"
uwej "cu"322/ no "vko g"v'kcn"J wpygt "gv'cif04224+" r tg/mqcf gf "vko g"v'kcn"*Tcwej "gv'cif04227+"
cpf "vko g"vq"gzj cwv'kqp"v'guu'rcu'kpi "ctqwpf "qt"mpi gt "vj cp"; 2"o kpwgu"*I qmplem'gv'cif0'
3; 96+0'k"eqpvtcuv."uqo g"uwf lgu'uwu i guv'vj cv'o kf "j {r qj {f tcvkqp"*c"4' "DO "+ecp"tgf weg"
cgtqdle"r gthqto cpeg"kp"uj qtvgf "f wtcvkqp"gz gtekugu0'Cto utqpi "et al."*3; : 7+"uj qy gf "vj cv"
cvj ngvu'r gthqto gf "uki p'k'lecpv' {y qtug"kp"7222/"cpf "32222/o "twppkpi "gxgpw"*8' "umy gt+"
y j gp"vj g{ "y gtg"j {r qj {f tcvgf "d{ "4' "qh'vj gkt"dqf { "o cuu0'Vy q'r gtegpv'j {r qj {f tcvkqp"j cu"
cnuq"dgpp"uj qy p"vq"tgf weg"r tg/mqcf gf "vko g"v'kcn'r gthqto cpeg"rcu'kpi "62"o kpwgu'd{ "35"cpf "
9' "kp"wp'v'kpgf "cpf "v'kcpgf "uwdlgeu."tgur gev'kgn{ "*O gtt { "gv'cif0'4232+0' Hmvtj gto qtg."
Dctf ku"gv'cif0'4235+"f go qp'v'cv'gf "vj cv'7/no "j km'erko d'kpi "vko g"v'kcn'r gthqto cpeg"y cu"
tgf weg" d{ "70' "kp" y gm'v'kpgf "cvj ngvu" y j kg" j {r qj {f tcvgf "d{ "3' "eqo r ctgf" vq"
gwj {f tcvgf '0'

O cp{ "y gm'eqpvtqmgf "uwf lgu"ko r ngo gpv'j {f tcvkqp"utcvgi lgu"kp"vj g'r g'kqf "r tkqt"vq"vj g"
g'zr g'klo gpv'cn'v'kcn"dw'hqti gv'vq"ko r ngo gpv'vj g"uco g"utcvgi lgu'r tkqt"vq"vj g'r tgrko k'pct { "
v'guv'vj cv'wuwcm{ "kpenmf g"vj g"XQ4o cz "v'guv'cpf lqt "rcv'v'g"v'gu'kpi 0'Vj gug"vy q"v'guu'i gp'gtcvg"
ko r q'v'cpv'k'p'qto cv'kqp"uwej "cu"y q'nm'tcv'g"vj cv'ku"v'ugf "vq"ugv'vj g"kp'v'p'v'k'v'q'qh'vj g"gz gtekug0'
Enug"cv'w'v'kqp"uj q'wf "dg'r c'k"j gtg"gur gekm{ "ukpeg"j {r qj {f tcvkqp"@4' "qh"DO "j cu'dggp"
uj qy p"vq"tgf weg"XQ4o cz "Rlej cp"gv'cif03; ; : =P {dq"gv'cif04223+0'Rlej cp"et al."uj qy gf "vj cv"
XQ4o cz "ecp"dg"tgf weg" d{ "5' "hqm'v'kpi "5' "j {r qj {f tcvkqp"qh"DO ."y j gtgcu."cy cvgt"
mquu'qh'6' "DO "ecp"ngcf "vq"cy"8' "tgf wv'kqp"kp"XQ4o cz "P {dq"gv'cif04223+0'C"uko r ng"
gzco r ng'v'w'kpi "vj g'f'c'v'qh'q'p'g'qh'vj g'r ctvlekr cpwu'htqo "vj g'uwf { "kp"Ej cr vgt"7'uj qy u'vj cv'c"
8' "tgf wv'kqp"y km'ej cpi g"vj g"tgcn'XQ4o cz "xcn'v'g'qh'60B"vq"50 "no k'p^{/3}0'k"cy"j {r qj g'v'kcn'
uegpctkq"kp'x'q'k'kpi "e{er'kpi "wp'v'k'gzj cwv'kqp"cv'92' "XQ4o cz."r ctvlekr cpwu'p'gy "y q'nm'tcv'g"

y km'dg"3: 2"Y "kpugcf "qh'422"Y 0'Vj ku'ku'rkng{ "vq'dg"ecwugf "d{ "c"eqo dkpvcqp"qh'hcevqtu" kpenmf kpi "tgf wegf "o czko cn'ectf kee"qwr ww"*I qpl "a rg| /Cmpuq"gv'cr0'3; ; 7=O qpvcqp"gv'cr0' 4229+"cpf lqt"j gcv'utguu"*Ucy mc"gv'cr0'3; ; 7+0"

Cpqvj gt"tgcupq"y j {"tgugctej gtu"uj qwf "r c{"enug"cwgpvcqp"vq"j {r qj {f tcvkqp"dghqtg"c" XQ4o cz"vuv'ku'dgecwug"ku"ko r cev'qp"dmqf "rxcvq"eqpegpvtcvkpu0'O qs wkp"cpf "O c| | gq" *4222+"gzco kpgf "vj g'ghgev'qh'407' "j {r qj {f tcvkqp"qh'DO "qp'rxcvq"eqpegpvtcvkqp"fwtkpi " cp"ketgo gpvcn'vuv'wpvki'gzj cwvukqp"kp"ugxgp"o qf gtcvgn{/vckpfg "hgo crg"cyj rvgu0'T guwuu" uj qy gf "c'uj kv'kp"vj g'rxcvq"ewtxg'wry ctf 00 gcp"i tqwr "y qtnitcvq"cv'rxcvq"vj tguj qrf "y cu" tgf wegf "y j gp"uwdlgeu"y gtg"j {r qj {f tcvqf "34: "O8"Y "+eqo r ctgf "vq"gwj {f tcvqf "368"O7" Y +0'Qz {i gp"wr vcmg"y cu'cnuq"tgf wegf "d{"; ' "cv'rxcvq"vj tguj qrf "y j gp"uwdlgeu"y gtg" j {r qj {f tcvqf 0' O qs wkp" cpf " O c| | gq" eqpenmf gf " vj cv" vj g" ketgcug" kp" gr kpg r j tkpg" eqpegpvtcvkqp"kp"vj g"j {r qj {f tcvqf "ucvq"r r {gf "cp"ko r qtcvpv'tqrg"kp"vj g'uj kv'qh'vj g'rxcvq" ewtxg0'

Vj g't guwuu"qh'vj ku'uwf {"kpf kecq"vj cv'87' "qh'uwdlgeu"y gtg"cdqxg"vj g'gwj {f tcvkqp"ew/qhh" qp" xkukv' 4" cpf " kv' f kf" pqv'o cwgt"y j gyj gt" uwdlgeu"y gtg"cyj rvgu"qt" pqp/cyj rvgu0' Vj g" r gtegpvc i g" qh'cyj rvgu"cdqxg"vj g"ew/qhh"y cu"uko kret"vq" pqp/cyj rvgu" *93' "cpf "84' ." t gur gevkg n{ +0'Vj gug't guwuu"ctg"eqpukvpgv'y kj "vj g'f cv"qdvckpfg "d{ "Rj kkrk u"et al."*4236+" cpf "Xqr g"et al."*422; +y j q'hqwpf "vj cv'99' "cpf "88' ."t gur gevkg n{ . "qh'cyj rvgu"cttkxg"vq" vj g"vcklpi "uguukqp"rkngn{ "j {r qj {f tcvqf 0'Vj ku'tghgeu"vj cv'vj gug"cyj rvgu"j cxg"hcrgf "vq" ko r ngo gpvtgj {f tcvkqp"utcvgi kgu'chgt"vcklpi "uguukpu0'Vj ku'eqwf "dg"ecwugf "d{ "vj g'rxcvq" qh'ur qt w'pwtkkqpcn'hpqy rgi g'kp"eqmgi kvq"cyj rvgu"y j q'ueqtgf "; ' "qp"c"ur qt w'pwtkkqpcn' hpqy rgi g" s wugkppc ktg" eqo r ctgf " vq" : 5' " kp" Utgpi vj " cpf " eqpf kkpki " ur gekrkruu" *Vqttgu/O eI gj gg" gv" cr0' 4234+0' Uwej " rcti g" pwo dgt" qh" r ctvckr cpw" y j q" ctg" rkngn{ " j {r qj {f tcvqf "cv'vj g"dgi kppki "qh'cp"gz gtekug"vuv'ecp"j cxg"cpvkgcdrg"ko r cev'qp"uwf {" qweqo gu."gur gekcm{"cgtqdle"r gthqto cpeg0'Eqpugs wgpv{ ."tgugctej gtu"uj qwf "r c{"enugt" cwgpvcqp"y j gp"cyj rvgu'r wuwg'y kj "vj gkt"vcklpi "tqwkpg"y j kv'vckpi "r ctv'kp"vj g'uwf {0"

Uq"y j cv'ecp"gzr rckp"vj g"j ki j "pwo dgt"qh'cyj rvgu"cpf "pqp/cyj rvgu"y j q"wtpgf "wr "vq"vj g" rcdqtcvqt {"uki pkkcpv{ "f gj {f tcvqf "kp"vj g"ewttgpv"uwf {"A'Rgttktg"cpf "eqmgi wgu" *4235+" kf gpvkgf "vy q"i tqwr u"qh'kpf kxf wcu'dcuqf "qp"vj g'xqno g'qh'hwkf "equwo gf "r gt"fc{<ny " f tlpngtu" *O304" rktgu"cpf "j ki j "f tlpngtu" *4"o"6" rktgu0'Vj g"o gf kcp"O'UG"htuv"o qtpki " WQuo " qh" vj g" ny " cpf " j ki j " f tlpngtu" y gtg" 9; 6" O' 62" o Quo qrfni /3" cpf " 7; 2" O' 69" o Quo qrfni /3. "t gur gevkg n{ 0'Hwt vj gto qtg. "Cto utqpi "gv'cr0' *4235+"gzco kpgf "46/j t"WQuo "

qh'my "308"N'r gt'f c{+'versus'j ki j "504"N'r gt'f c{+'f tlpngtu'hqt"y q'f c{u0'Vj g'uwf {"
 tngxgrgf "v'cv'WQuo "y cu'uki pkkcpw{"j ki j gt"qp"f c{"3"qh"my "f tlpngtu": 26" Õ'435"
 o Quo qrfni ^{/3}+eqo rctgf "v'j ki j "f tlpngtu":5: 9"Õ'34; "o Quo qrfni ^{/3}+0'P gzv."my "f tlpngtu"
 y gtg'r tguetkdgf "507"N'qh'y cvgt"cpf "j ki j "f tlpngtu">"4"N'r gt'f c{"hqt'hqwt'f c{u0'Cu'c'tguwv."
 vj g'WQuo "qh"my "f tlpngtu"y cu'f getgcugf "v'ç"496"o Quo qrfni ^{/3} cpf "j ki j "f tlpngtu"
 kpetgcugf "v'ç"7; 4"o Quo qrfni ^{/3}0'Vj gtghqtg."j {r qj {f tcvkp"eqwf "dg'tgxgtugf "h'y cvgt"ku"
 r tguetkdgf 0'K'ku'rkgn{"v'cv'r ctvlekr cpw'qh'vj g'ewtgpv'uwf {"y j qo "WQuo "y cu'cdqyg"; 22"
 o Quo qrfni ^{/3}ctg'my "f tlpngtu":0'304"rktgu+qt'f kf "pqv'equpuwo g'gpqwi j "y cvgt'hqt'f khtg'gpv"
 tgcuppu0' Vj g' dguv' uqnvkqp"v"o kpkog"vj g'rkgnkj qqf "qh"vj gug"r ctvlekr cpw"v" dgi kp"
 gzer gklo gpvcr'v'kcnj {"r qj {f tcvgf "ku'v'ko r ngo gpv'c'r tgv'v'kcnj {"f tcvkp"utcvgi {"0"

Vy q'o ckp"utcvgi kgu"j cxg"dgpp"uj qy p"v"dg"uweeguhw0' Vj g'htuv'utcvgi {"eqpukuv"qh"
 kpvtvlekr "r ctvlekr cpw"v"v'f tlpni'c"ur gekhe"co qwpv'qh'hmkf "46/j qwtu'r tktq"v"v'kcnj"cpf "
 o gcuwg"eqo r nkepeg"pgzv'f c{0' Hqt"gzco r ng."Ej gwxtqpv' et al."*4232+"gzco kpgf "vj g"
 kor qtvpep'qh'ko r ngo gpv'pi "c"j {"f tcvkp"utcvgi {"vj g'f c{"dghqtg"cp"gzr gklo gpvcr'v'kcnj"qp"
 j {"f tcvkp"ucwu0'Rctvlekr cpw'y gtg"i kxgp"5"N'qh'hmkf "v"equpuwo g'qxgt"vj g'f c{"wpv'k'32"
 r 0'cpf "kpvtvlekr"v"equpuwo g'vj gk"j cdkwcn'f kv'cpf "v"v'f tlpni'cf f kkpvcn'hmkf "h'y vj g"
 y cpvgf "v'0'Vj gk"v'v'kcnj"kpvcng'tgcej gf "ç508"N0'Rctvlekr cpw'y gtg"cnq"lphqto gf "v'hcu'
 htqo "32"r 0'wpv'k'8"co 0'dghqtg"r tqxf kpi "c"v'kpg"uco r ng"v"o gcuwg"v'kpg"quo qrv'k{"
 *WQuo +0' Vj g'tguwv"kp'kcv'vj cv'o quv'r ctvlekr cpw'y gtg"gwj {"f tcvgf "y kj "cp"cxgtci g"
 WQuo "qh"836"o o qrfni ^{/3}*tcpi g< 427/32; 3+"wv'pi "vj g"922"o o qrfni ^{/3}ewqhh" hqt"
 j {"r qj {"f tcvkp0"

Uqo g'tgugctej gtu'r tghg"v"tgf weg'tkunkpi "j {"r qj {"f tcvkp"qp"vj g"o qtpkpi "qh"vj g'v'v'v'd {"
 r tqxf kpi "c"ur gekhe"co qwpv"*472/722"o n"qh'hmkf "uj qt vq" "*62/342"o kpwgu+"dghqtg"vj g"
 uctv'qh'vj g'gzr gklo gpv"*Uj ktghu"gv'crf04226="Rqr qy un'k'gv'crf04223="Qr r rki gt"gv'crf04227+0'
 Vj g'ghge'v'x'gp'guu"qh"vj gug"utcvgi kgu"j cxg"dgpp"tgr qtvgf "cuugukpi "r r'cuo c"quo qrv'k{"
 y j kej "ku"cdkqo ctngt"vugf "kp"vj g'cuuguo gpv'qh'j {"f tcvkp"ucwu0'c"uwdlgev'y kj "c"r'cuo c"
 quo qrv'k{"cdqyg"4; 2"o Quo ãni ^{/3}"ku'rkgn{"v"dg"j {"r qj {"f tcvgf "*Ucy nç"gv'crf04229+0'Vj g"
 equpuwo r v'kp'qh"v"ur gekhe"co qwpv'qh'y cvgt"vj g'f c{"dghqtg"v'kcnj"hnmy gf "d{"qxgtpi j v'
 hcu'kpi "tguwngf "kp"r'cuo c"quo qrv'k{"dgw ggp"4: 9"cpf "4; 5"o Quo ãni ^{/3}*Dctvqm'gv'crf0'
 4226="Mgpghem'gv'crf04232="Ht'gw'f "gv'crf0'3; ; 7="Qrv'x'gt"gv'crf0422: ="Y cnj "gv'crf04226+."
 y j gtgcu."uwf kgu'y j q'qpn' lphqto gf "r ctvlekr cpw"v"equpuwo g'y cvgt'hgy "j qwtu'dghqtg"v'kcnj"
 tgr qtvgf "r'cuo c"quo qrv'k{"r'x'gn'dgy ggp"4: 3"cpf "4: : "o Quo ãni ^{/3}*O cen'gv'crf0'3; ; 6="

Qr r rki gt "gv'crf'4227="Rqr qy unk'gv'crf'4223="Ucej gphgrf "gv'crf'3; ; 8="Ucej gphgrf "gv'crf'4222="Uj ktghu'gv'crf'4226+0"

Cnj qwi j "Huej dcej "*4226+"tgr qtvgf "vj cv'Xqkf 3"ku'vj g"o quv'eqpegpvcvgf "uco r ng"qh'vj g" f c{. "uqo gqpg"o ki j v'cti wg"vj cv'Xqkf 4"o ki j v'dg"o qtg"eqpegpvcvgf "f wg"vq"qpi qlpi "hmkf" rquugu'y kj "pq"cf f kkpqcn'uqwtg"qh'hmkf "kpr w0Vj g'hkpf kpi u'qh'vj g'ewttgpv'uwwf { "uj qy gf "c" rcti g"xctkcvkp"kp"vj g"fhgtgpeg"dgy ggp"htuv'cpf "ugeqpf "o qtpkpi "WQuo "xcnwguy kj "pq" ergct"tgpf "vqy ctf u'c'tgf wevkp"kp"eqpegpvcvkp"kp"Xqkf 4"cu'cti wgf "d{ "Huej dcej "*4226+0' k"heev"qwt"hkpf kpi u'uj qy gf "vj cv'85' "qh'r ctvlekr cpw"j cf "c"WQuo "j ki j gt"kp"Xqkf 4"vj cp" Xqkf 30'Vj ku"xctkcvkp"kp"WQuo "dgy ggp"Xqkf 3"cpf "Xqkf 4"j cf "c"uo cm'ko rcev"qp"vj g" ercuukhlecvkp"qh'r ctvlekr cpw"kp"vj g"fhgtgpv"j { ftcvkp"ecvgi qtkgu0Dcugf "qp"Xqkf 4."hgy gt" r ctvlekr cpw"y gtg"ercuukhkf "cu"gwj { ftcvgf "cpf "o qtg"cu'uki pkhlecprv"j { r qj { ftcvgf 0'Vj g" eqngvkvq" qh' Xqkf 4" eqwf " dg" r tcevecrn' kp" ukwcvkpu" y j gtg" cp" gzgtekg" vguv' y kn' dg" eqo r ngvgf "qp"vj g"htuv'xkuk"*g0 0'XQ4o cz "vguv'f wtkpi "vj g"r tgrko kpct { "vguv'0'k"vj ku"ecug." tgugctej gtu'y kn'pqv"j cxg"vj g"qr r qtwpkv{ "vq"i kxg'r ctvlekr cpw"vj g"wtkpg"eqpvkpgt"r tkqt "vq" vj g'vgu0

6.6 Conclusion

Vj g'tguwmu"qh'vj ku'uwwf { "kpf kecv"vj cv'gpeqwtci kpi "r ctvlekr cpw"vq"ftkpm'y cvgt"kp"vj g"r tg/ vlcnr'tgr ctcvkp"r gtlkf "ku'pqv'uw'hkelpv"vq"tgej "gwj { ftcvkp"kp"cm'uwdlgeu0Vj g'heev"vj cv" vj g{ "ctg"cvj ngvu"qt"pqp/cvj ngvu"fkf "pqv'o cnr"cf fhgtgpeg"vq"vj g"j { ftcvkp"ucwu"qp"vj g" o qtpkpi "qh'vj g'vgu0Dcugf "qp"vj g'tguwmu"qh'qj gt"uwwf lgu."k'o c{ "dg'tgcuqpcdr"vq"cf xleg" cvj ngvu"cpf "pqp/cvj ngvu"vq"ftkpm'vq"cf ur gekhkf "utcvgi { "dghqtg"vj g{"eqo g"kp"vq"vj g" rcdqtcvt { 0'Tgugctej gtu"vj cv'twp"vkcni"y j gtg"j { ftcvkp"ucwu"ku"ko r qtvcv"vq"qweqo gu" uj qwf "eqpukf gt"o gcuwtkpi "wtkpg"quo qnrkv{ "dghqtg"vj g"uctv"qh'vj g"vkcni"vq"o gcuwtg"vj g" eqo r rkepeg"qh'r ctvlekr cpw"vq"vj g"j { ftcvkp"utcvgi { 0'

Chapter 7

The effect of mode of transport on glycaemic index testing

7.1 Summary

Vj g"ghgeV"qh'o qf gtcvg"kpvgpukv{"gzgtekug."uwej "cu"y cv'wugf "cu"o qf g"qh"tCpur qtV."qp" i n{ecgo le"kp f gz *I K'vgukpi "ku'wpergct0Vj g'cko "qh'y ku'uwf {"y cu'vq"kpXgukv cv'v'j g"ghgeV" qh' cewg" gzgtekug" *y cmkpi " cpf " e{enkpi "+" rtkqt" vq" I K' vgukpi " qp" v'j g" y kj kp/uwdlgev" xctkcdkkrv{"qh'dmqf"i nwequg"cpf "kpuwkp"t gur qpugu0'Grgxgp"ugf gpvct {"qt"tgetgcvkqpcmf {" ceVxg"o gp'xkukgf "y g'rdqtcvqt {"hqt"vko gu0Vj g{"wpf gtvqpm'c"r tgrko kpcct {"vgu'cv'xkuk'3." vj gp"tguv"*47"o kp+."e{enkpi "*"36"o kp'cv'72' "XQ4o cz+"cpf "y cmkpi "*"3"j "cv'59' "XQ4o cz+" vguv'hqt"v'j g'v'j tgg"uwdugs wgpv'xkuku"i kxgp"kp'tcpf qo "qtf gt"hmjy gf "d{"c"hxg"o kpwg'tguv" cpf "c"y q'j qwt"i nwequg'vgu0F wtkpi "y g'i nwequg'vgu'v'dmqf "uco r ngu'y gtg'vcngp'cv'o kpwg"/ 7."2."37."52."67."82."; 2."cpf "342"hmjy kpi "y g'i nwequg'f tkpni'eqpvckkpi "72"i "qh'cxckrdng" ectdqj {f tcvg0'Dmqf "uco r ngu'y gtg"uwdugs wgpv{"cpcn{ ugf "hqt"i nwequg"cpf "kpuwkp0' Vj g" j ki j guv'o gcp"EX' "qh'i nwequg'ctgc"wpf gt"v'j g'ewtxg"*I CWE+"y cu'qdugtxgf "dgy ggp"tguv" cpf "Y cmkpi "*"52' "+"hmjy gf "d{"Y cmkpi "cpf "E{enkpi "*"48' "+"y j kg"v'j g"j ki j guv'o gcp" EX' "qh'v'j g"kpukp"CWE" *KCWE+"y cu'qdugtxgf "dgy ggp"Y cmkpi "cpf "E{enkpi "*"4: '+' hmjy gf "d{"Tguv"cpf "Y cmkpi "*"46' +0' Vj g"mjy guv'I CWE"cpf "KCWE"y gtg"qdugtxgf " dgy ggp"tguv'cpf "E{enkpi "*"47' "cpf "36' ".t gur gevXgn{ +0P q"ucvXkukecmf {"uki plh'ecpv'ghgeV" y cu'f gvev'f "dgy ggp"cm'eqpf kkpup0'Vj g"kp f kpi u"qh'v'j ku'uwf {"uwi i guv'v'j cv'r ctv'ekr cpw" uj qwf "cxqkf "ej cpi kpi "v'j g"o qf g"qh"tCpur qtV'dgy ggp" xkuku"gur gekmf {"y cmkpi "v'j g" rdqtcvqt {"qp"v'j g"o qtpkpi "qh'c"vgu'kh'cpqj gt"o qf g"qh"tCpur qtV'y cu'wugf "qp"v'j g"qj gt" vguv'pi "f c{u0'

7.2 Introduction

Kp" 4232." v'j g" kpgtpevkqpcn' Qti cplkucvqp" hqt" Ucpf ctf kucvqp" *KUQ+" r wdrkuj gf "ku" hkuV" gf kkp"qh'v'j g"i wlf grkpgu'hqt"ucpf ctf kulpi "v'j g'f gyto kpcvqp"qh'I Kqh'hqf u'hqt"r tceVeg" cpf "tuguctej "r wtr qugu" *kpgtpevkqpcn' Ucpf ctf u" Qhleg"4232+0' Ceeqtf kpi "v'j g"tgr qtV." uwdlgeu'uj qwf "cxqkf "xki qtqwu"gzgtekug"qp"v'j g"o qtpkpi "qh'v'j g'vgu'cu'k'j cu'dggp"uj qy p" v'j tckug"y j qrg"dqf {"i nwequg"wr veng"cpf "I CWE" *Tqug"gv'cr0'4223+0'Vj ku'y kn't guwv'kp"cp" kpetgcug'kp"EX' "dgy ggp"tknu'cpf "r quukdn {"gzeggf "v'j g'ceegr vcdng'rgxgn'qh'xctkcdkkrv{"hqt" tghgtpeg"hqf "qh'52' " *kpgtpevkqpcn' Ucpf ctf u" Qhleg"4232+0' Vj g"rti g"y kj kp/uwdlgev" xctkcdkkrv {"hqt"v'j g'tghgtpeg"hqf "ecp" f getgcug"v'j g'ceewtce {"r tgekukp."cpf "tgr tqf wekdkrv {" qh'I K" *Dtqwu'gv'cr0'4227+0'K"ku'r quukdn"v'j cv'r gqr ng"y kn'cxqkf "gzgtekug"kp"v'j g"o qtpkpi "

dghqtg"vj g"vgu"dw'y kn'pqv"eqpukf gt"vj gk"hqto "qh"tcur qt'v'cu"gzgtekug"cpf "o c{"wug" y cmkpi "cpf "e{erkpi "cu"o qf g"qh"tcur qt'v'kp"qtf gt"v"eqo o wg"v"vj gug"tgugctej "uwf kgu' Vj gtg"j cu"dggp"kwg"ci tgggo gpv'qp"vj g"ghgev"qh"ny "v"o qf gtcv"kpvgpukf "gzgtekug"qp"i K' vguvpi 'Uqo g"uwf kgu"j cxg"uj qy p"pq"ghgev"qp"i n'ecgo le"tgur qpug"chgt"ctgdle"gzgtekug" *Tqdgwu"gv'crl'4235=Dgp/Gl tc"gv'crl'3; ; 7-0'Y j gtgcu."qvj gtu"j cxg"qdugtxgf "c"fgtgcug" *Dqpgp"gv'crl'3; ; : +qt"cp"lpetgcug"kp"i CWE"*Tqug"gv'crl'4223=Mpwf ugp"gv'crl'4236-0' Gkj gt"y c{. "y j gvj gt"l'ku"cp"lpetgcug"qt"c"fgtgcug."vj g'EX' "qh"vj g"o gcuwtgo gpv'y kn'dg" chhev'gf "d{"vj ku'ej cpi g'0T gi ctf ngu"qh'y j gvj gt"vj ku'ej cpi g'rgf u"v"c'EX' "cdqyg"52' "qt" pqv."tgugctej gtu"uj qwf "cny c{u"clo "v"o kpk kug"l'kp"qtf gt"v"ko r tqxg'r tgekukqp'0'K'uj qwf " dg'pqvgf "vj cv'pqp"qh"vj g"cdqygo gpv'qpgf "uwf kgu'tgr qtvgf "vj g'EX' "dgy ggp"tkcn'0'

Wpf gtucpf kpi "vj g"ghgev"qh'y cmkpi "cpf "e{erkpi "cv'cp"cxgtci g'r ceg"qh"eqo o wkpi ."qp" dnqf "i nvequg"cpf "kpuwkp"ngxnu"ku'r ctvewrctn{ "ko r qt'v'p'0'Uwdlgeu"o c{"eqo g"d{"dnu" *tguv"v"qpg'xkuk"cpf "e{erg"qt"y cmv"v"cpqj gt'xkuk'0'c{ "cngtcv'kp"vj g"v'r g."f wtcv'kp"qt" kpvgpukf{ "qh" vj g" cev'xk{ "o c{" cff" pqkug" v" vj g" tguwmu" cpf " j ppeg" tgf weg" vj gk" tgr tqf wekdkk{ '0'Vj gtghqtg."vj g"clo "qh"vj ku"uwf {"y cu"v"l'pxguki cvg"vj g"ghgev"qh"cewng" gzgtekug"*y cmkpi "cpf "e{erkpi +"r tkqt"v"i K'vgu'vpi "qp"vj g"y kj kpu'wdlgev"xctkcdk{ "qh" dnqf "i nvequg"cpf "kpuwkp"tgr qpug'0"

"

7.3 Materials and methods

7.3.1 Participants

Grgxgp"o gp'r ctv'ekr cvgf "kp"vj g'r t'gugpv'uwf {"cv'Qzhqtf "Dtqqngu"Wpkxgtukf '0'Tgetwko gpv' qh'r ctv'ekr cpw"y cu"o cf g" vj tqwi j "r quvgtu" r m'egf "ctqwpf "eco r wu"cv' Qzhqtf "Dtqqngu" Wpkxgtukf '0'Rj {ulecrl'ej ctcev'gtk'v'ku"qh"vj gug'r ctv'ekr cpw"ct g'rkugf "kp"Vcdrg"9'0'0'Gri kdkk{ " etkgtk'kpenf gf <

- Ugf gpvct {"qt"t'getgc'v'qpcmf {"cev'xg"o crgu"
- Gz gtekukpi "nguu"vj cp"qt"gs wcn"v"vj tgg"l'ko gu'c'y ggm"
- Ci gf "dgy ggp"3: /62" {gctu"
- DO Kdgy ggp"3: 0' "cpf "47"
- H'gg"qh"o g'cdq'ke"l'kuqtf gtu" *g'0'0'f kcdgygu."ectf kqxcuewrct"l'kugcug."qt"j { r gtvgpukqp+"

- P qv' vnkpi " cp{ " o gf kcvkp" npqy p" vq" chgev" i nvequg" vqrctpeg" *g0 0' uvgtqkf u." cpvr u{ej qve+ "
- P qv'lpvqrctpvqt "cmgti le"vq"cp{ "qh'vj g'hqf 'r tqxf gf "

Vj ku"uwf { "y cu"eqpf wevgf "ceeqt f kpi "vq"vj g"i wkf grkpgu"nckf "f qy p"lp"vj g"F gerctcvkp"qh" J gnukpnk"cpf "cm'r tqegf wtgu"lpxqmkpi "j wo cp"uwdlgeu"y gtg"cr r tqxgf "d{ "vj g"Wpkxgtuk{ " Tgugctej "cpf "Gyj leu"Eqo o kwgg" *WTGE+ "cv"Qzhqtf "Dtqqngu" Wpkxgtuk{ " *Cr r gpf kz "G+0' Y tkwgp"lphqto gf "eqpugpv"y cu"qdvckpgf "htqo "cm'r ctvlekr cpw"r tkqt"vq"vj go "eqo o gpekpi " vj g"uwf {0'

"

Vcdng'9080Ej ctcevgtkvkeu"qh'vj g'r ctvlekr cpw"cv'dcugrkg"

| Ej ctcevgtkvke" | Xcng" | " |
|---|------------|---|
| Ci g"*{gct+ " | 48'06" | |
| Dqf { "o cuu"*ni + " | 968'0': 8" | |
| J gli j v"*eo + " | 399'09" | |
| XQ _{40 cz} *o rmi ^{/3} 0 kp ^{/3} + " | 628'088" | |
| Y qtmqcf "cv'72' "XQ _{40 cz} *Y + " | ; 8'053" | |
| Y cmkpi "lpvgpuk{ "*" XQ _{40 cz} + " | 59'0': " | |

"

7.3.2 Experimental overview

Rctvlekr cpw" xkukgf " vj g" rcdqtcvqt { " hqwt" v0 gu" f wtkpi " vj g" uwf {0' Vj g{ " wpf gtvqqm' c" r tgrko kpc { "vgu"cv'xkuk'3. "vj gp"tguv"e{ enkpi "cpf "y cmkpi "vgu"hqmy gf "d{ "c"hxg"o kpwg" tguv"cpf "c"y q"j qwt"i nvequg"vgu"ht"vj g"vj tgg"uwdugs wgpv'xkuku"i kxgp"lp"tcpf qo "qtf gt0' Rctvlekr cpw" y gtg" cmqecvgf " wukpi " c" eqo r wgt/i gpgtcvgf " rkuv' qh" tcpf qo " pwo dgtu" *0 letquqh/Gzegn'Tgf o qpf ."Y cuj kpi vqp. "WUC+0Vj g'I Ky cu'o gcuwgf "wukpi "vj g'r tqvqeqn' cf cr vgf "d{ "Dtqwpu" cpf "eqmgci wgu" *Dtqwpu" gv' cr0' 4227+ "cpf "d{ "hqmy kpi " vj g" KUQ" i wkf grkpgu" *lpvgtpcvqpcn'Ucpcf ctf u'Qhheg"4232+0"

7.3.3 Preliminary testing

Rctvlekr cpwu"cttkxgf "cv" vj g" rcdqtcvqt {" chvgt" hcukpi " hqt" vj g" ruv" vj tgg" j qwtu." cxqkf kpi " echhgkpg" eqpuwo r vkqp" hqt" vj g" ruv" 32" j qwtu." j cxkpi " cxqkf gf " vj g" eqpuwo r vkqp" qh" creqj qn' cpf " tghtckpgf " htqo " cp {" utgpwqwu" r j { ukecn' cevkxk {" hqt" vj g" ruv" 46" j qwtu 0Vj gk" j gki j v'y cu" vcnrp" wukpi " c" uvcf kqo gvg" *Ugec" Nf 0" Dkto kpi j co . " WMH: " vj gk" dqf {" o cuu" cpf " dqf {" eqo r qukkqp" y gtg" o gcuwtgf " wukpi " Vcplkc" DE/63: " O C " *Vcplkc" WM' Nf 0" [lgy urg {" O kf frugz. " WMH" dqf {" eqo r qukkqp" cpcn { uku 0

Vj gp" r ctvlekr cpwu" eqo r rvgf " y q" uwo czko cn' gz gtekug" vguu" hqmjy gf " d {" c" XQ4o cz " vgu 0 Vj g" htuv" uwo czko cn' vgu" eqpukvgf " qh" y cmkpi " cv" c" uvcf {" r ceg" qh" 7" n0 j³ " cpf " 3" " i tcf kpv" hqt" vgp" o kpwgu" y j krg" vcnkpi " i cu" o gcuwtgo gpw" vq" f gvgto kpg" XQ4" wukpi " cp" cwqo cvgf " i cu" cpcn { uku" u { ugo " *O gvcn { | gt" 5D. " Eqtvz. " I gto cp {" +0Vj ku" vgu" y cu" wugf " vq" f gvgto kpg" vj g" kpvpuk {" qh" y cmkpi " cu" c" r gtegpvc i g" qh" XQ4o cz 0Uwdlgeu" tguvgf " hqt" 32" o kpwgu" dghqtg" vj g {" eqo r rvgf " vj g" ugeqpf " uwo czko cn' vgu" y j kej " eqpukvgf " qh" hkg" uci gu" qh' e { erkpi " gz gtekug 0Vj g" y qtn' mcf " uctvgt " cv" 62" Y cw" *Y + " cpf " r tqi tguukgn { kpetgcugf " d {" 37" Y " gxgt {" 6" o kpwgu" kn' k' tgej gf " 322" Y " cv" uci g" 70Vj ku" vgu" y cu" wugf " vq" f gvgto kpg" vj g" y qtn' mcf " qh" vj g" e { erkpi " eqpf kkp 0Hqmjy kpi " vj g" uwo czko cn' vguu. " uwdlgeu" vqnm' c" 37" o kpwg" tguv" cpf " vj gp" r gthqto gf " cp" kpetgo gpvcn' tco r " gz gtekug" vgu" *100XQ4o cz " vguv" qp" cp" ggevtqo ci pvgkcm { " dtcnf " e { eng" gti qo gvg" *Eqtkcn Nqf g. " Vj g" P gy gtrcpf u0I cu" cpcn { uku" y cu" r gthqto gf " vj tqwi j qw" vj g" vgu" wukpi " vj g" cwqo cvgf " i cu" cpcn { ugt" o gpvkqp" gctrkgt 0Vj g" kpetgo gpvcvqp" tvgy cu" 7" Y " gxgt {" 37" ugeqpf u" eqttgur qpf kpi " vq" tco r " unqr g" qh' 42" Y " r gt" o kpwg" htqo " c" dcugrkpg" qh' 42" Y 0Vj g" vgu" y cu" vgt o kpcvgf " cpf " XQ4o cz " y cu" eqpukf gtgf " tgej gf " y j gp" y q" qh' vj g" hqmjy kpi " etkgtk" y gtg" o gv" 3+ " vj g" r ctvlekr cpv" eqwf " pq" mqi gt " uuvckp" c" r gf cmkpi " ecf gpeg" qh' cv' rguv" 82" tr o . " 4+ " c" tgur kcvqt {" gzej cpi g" tvckq " x" 30. " 5+ " cp" kpetgcug' kp" qz { i gp" vr vcnr " > " 204" r0 kp³ " *J qy rg {" gv' cn' 03; ; 7-0Hqt" vj ku" uwf {" . " vj g" o czko cn' vgu" y cu" r tgegf gf " d {" c" uwo czko cn' vgu" hqt" r tcevecn' tgcuppu 0K' j cu" dggp" uj qy p" vj cv" o czko cn' qz { i gp" vr vcnr " ku" pqv' chgevgf " d {" xct { kpi " uci gu" qh' gzj cwukqp" cv" vj g" dgi kppkpi " qh' vj g" vgu" *Uco hqtf " gv' cn' 03; 9: +0

"

7.3.4 Experimental protocol

Rctvlekr cpwu"cttkxgf "cv" vj g" rcdqtcvqt {" chvgt" 32/ j qwtu" qxgtplj j v' hcukpi . " j cxkpi " cxqkf gf " vj g" eqpuwo r vkqp" qh" creqj qn' cpf " echhgkpg" cpf " tghtckpgf " htqo " cp {" utgpwqwu" r j { ukecn' cevkxk {"

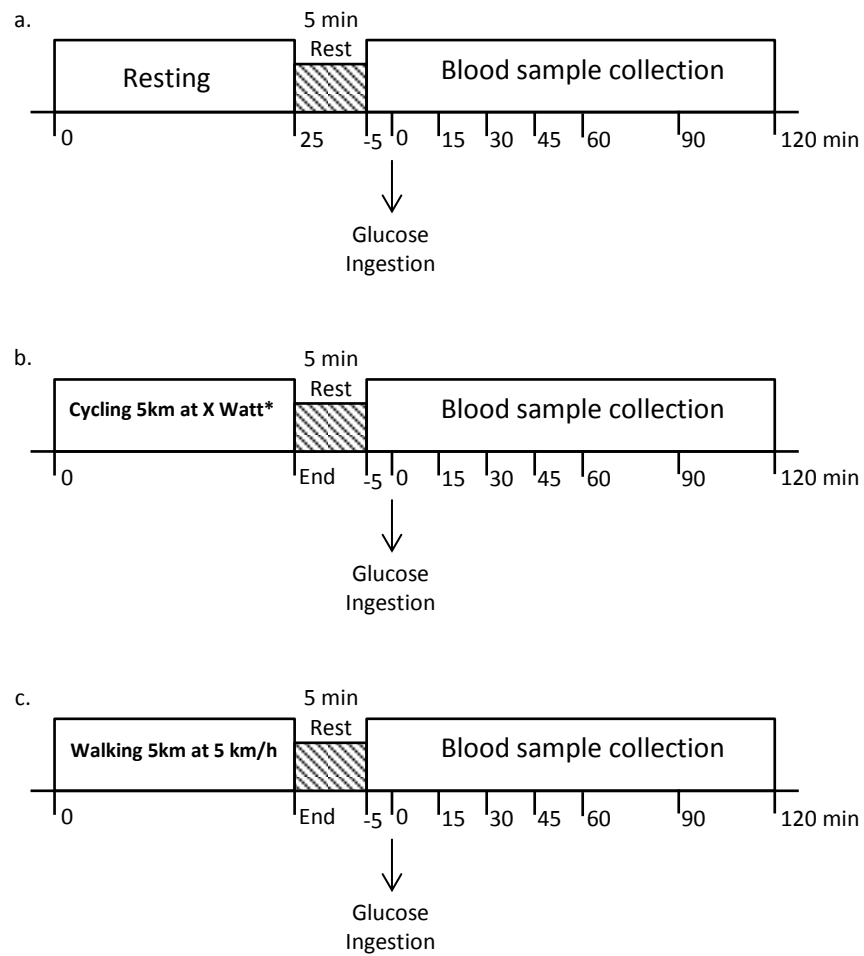
hqt"yj g"ncuv"46"j qwtu0Vj g{"y gtg"cong f"v"eqo g"v"yj g"ndqtcvqt {"d{"dwt"qt"ftkxkpi "v"
 cxqkf"cp{"v{r g"qh"gz gtekug"r tkqt"v"vgtkpi "k"qtf gt"v"ucpf ctf kug"r j {ulecn'cevxxk\0Vj g{"
 y gtg"cuq"cong f"v"veng"yj g"nk"kpugcf "qh"yj g"ucltu0Rctvlekr cpw'y gtg"tcpf qo kugf"v"qpg"
 qh'j g'y tgg'hqmy kpi "eqpf kkpup<"

3+"Tguv'qp"e"ej ckt'hqt"47"o kp"*Tguv+"

4+"E {eng'7"no "cv'72' "XQ4o cz "*E {enkpi +"

5+"Y cmi'7"no "cv'c"ur ggf "qh'7"no g^{/3}"y kj "3' "lperkpcvqp"gs wxcrppv'v"59"09" " "
 XQ4o cz "*Y cmi kpi +"

Cm'eqpf kkpup'y gtg'hqmy gf "d{"7"o kp"tguv'cpf "d{"c"y qj qwt"i nwequg"vgtu0Vj g"qxgtxkgy "
 qh'j g'y tgg'r tqvceqnu'ku'r tgugpvgf "k'Hki wtg'900'



Hki wtg'90Qxgtxkgy "qh'yj g'yj tgg'f hgtgp'r tqveqni'.c.'d.'cpf "e0, Z"Y cw<lpvgpuk{ "dcugf " qp'yj g"XQ4'hqwpf "f wtkpi "yj g'uwdo czko cn'vuv'qp'xkuk'30

Vj g'ej qugp'f kucpeg'hqt"Y cmkpi "cpf "E {enkpi "y cu'ugv'cv'7"no "y j lej "y cu'dcugf "qp"wy q" etkgtlc<3+"yj g'cxgtci g'f kucpeg'tcxgmf "vq'y qtmld{ "tkr'rgpi yj "cpf "o qf g'lp'I tgcv'Dtkckp" *F gr ctvo gpv'hqt"Vtcur qtv'4235+"cpf "4+"yj g'f kucpeg"tgs wktgf "vq"cr r n{ "hqt"c"r ctnkpi " r gto k'cv'Qzhqtf "Dtqqngu'Wpkxgtuk{ "Qzhqtf "Dtqqngu'Wpkxgtuk{ "4236+0Ceeqtf kpi "vq'yj g" pcvkpcn'tcxgn'uwtxg{ "eqpf wevgf "k"4234."yj g'j ki j guv'r gtegpvc i g"qh'r gqr rg"*46' +"y j q" wugf "y cmkpi ."e {enkpi ."qt"vcnkpi "yj g'dwu"cu"o qf g"qh"tcur qtv'eqo o wgf "cp"cxgtci g" f kucpeg'qh'70"no "*J qy "r gqr rg'tcxgn'4235+0J qy gxgt."cu'yj g'f kucpeg"tgs wktgf "vq"cr r n{ " hqt"c"r ctnkpi "r gto k'cv'Qzhqtf "Dtqqngu'Wpkxgtuk{ "ku"@/no "*Rctnkpi "r gto k'qtf gt'hqto ." 4236+."7"no "y cu'ugv'cu'yj g'cxgtci g'f kucpeg'y j gtg'o quv'r gqr rg'y kn'o quv'rkngn{ "wug'yj g" dwu."dle {erg."qt'y cmkpi "cu"o qf g"qh"tcur qtv'0Vj g'ur ggf "qh'7"no 0³"y cu'ugv'dcugf "qp'yj g" r tghgtgf "y cmkpi "ur ggf "qh'pqto cn'y gli j v'cf wuu"*Dtqy pki "gv'cn'04228+0"

7.3.5 Blood samples

Ecr knct { " hpi gt/r tkem' dmqf " uco r ngu" y gtg" vngp" wulpi " c" ukpi rg/wug" rpekp " u{ uvo " *Wpkukem'5."Qy gp'O wphqtf."Y qqf uqem"WM#0Dmqf "i nwequg'y cu'ko o gf kvgn' o gcuwtgf " wulpi "cp"cwqo c'le'dmqf "i nwequg"cpn{ ugt"*i nwequg"423- ."J go qewg"CD."Uy gf gp+0Vj g" ceewtce { "qh'yj g"cpn{ ugt"y cu"ej gengf "f ckn{ "wulpi "c"eqpvtqmgf "uqnwkp0Hqmqy kpi "yj g" o gcuwtgo gpv'qh'dmqf "i nwequg."522'Un'qh'dmqf "y cu'eqmgev'f "kp"o letqckpgt"cpf "j gf "qp" keg'v'v'kri'egpvtkwi gf "cv'6222'tr o "hqt"32'o kpwgu0Dmqf "r ruo c"y cu'r kr gwgf "cpf "uvtgf "cv' /62ÅE" y j gtg" r ruo c" kpuwkp" y cu" rvg" cpn{ ugf " wulpi " grgextqej go kno kpguepeg" ko o wpcuuc { "wulpi "cp"cwqo cvgf "cpn{| gt "Eqdcu"G"633."Tqej g"F kci pquku."WUC+0' Dmqf "uco r ngu"y gtg"vngp"cv' o kpwg"/7."2."37."52."67."82."; 2."cpf "342"hqmqy kpi "yj g" i nwequg"ftkpn0' Vj g"i nwequg"ftkpn' y cu" kpi guvgf "y kj kp" vgp" o kpwgu"cv' o kpwg"2" cpf " eqpukvgf "qh'472"o n'qh'y cvgt"o kzgf "y kj "72"i "qh'cxckrdng"ectdqj { ftcvg"qh'f gztqug" r qy f gt *O { r tqv'k'."Ej guj kg."WM#0'

"

7.3.6 Dietary standardisation

Kp"qtf gt"vq"ucpfc tf kug"hqf "kpvng."r ctv'ekr cpw'tgegkxgf "r tg/r cenai gf "o gcu"yj cv'y gtg" eqpuwo gf "qp"yj g'fc { "dghqtg"gej "v'kcn'y kj "cp"wpiko kgf "ceegu"vq"y cvgt0Vj g'f kv'i kxgp" y cu'uwdlgev'ur gekk."eqxgtkpi "yj gkt"fc kn{ "gpgti { "cpf "pwtkpv'tgs wkt go gpw"*Vj g'P wtkkqp" Uqekgv{ "422; +0Vj g'r tg/r cenai gf "o gcu"eqpukvgf "qh'eqtphrcngu."y j qrg"o km"y j kv"dtgcf ." ej ggug." dwwgt." vqo cvq." r cuuc." vqo cvq" ucweg." cr r rg." cpf " dpcpc0' Vj g" vqcn' gpgti { " tgs wkt go gpv'hqt"gej "r ctv'ekr cpv'y cu'ecrewrvgf "wulpi "yj g"J cttku"cpf "Dgpgf lev'gs wcvkqp" *J cttku" (" Dgpgf lev'3; 3: + "cpf " yj g" uj qtv' hqto " qh' yj g" kvgtpcv'kpcn' Rj { ulecn' Cevkxk{ " S wgu'kppcktg" *Eqo o kvgg"4227+"vq" f gvgto kpg"yj gkt"guvko cvgf "dcucri'o gvcdqike"tcvg"cpf " r j { ulecn'cev'kxk{ "rgxgn"tgur gev'kxgn{ 0'Rctv'ekr cpw'y gtg"cuvgf "vq"dtkpi "cm'yj g'rg'hqxtu'yj g" hqmqy kpi "fc { "kp"qtf gt"vq"o gcuwtg"yj gkt"eqo r rkcpeg"vq"yj g'f kv'i kxgp"dghqtg"yj g{ "y gtg" ergctgf "vq"uvt0'

"

"

"

7.3.7 Statistics

Ucvkuecn'cpcn(ugu'y gtg'r gthqto gf "wukpi "URUU"x044"*KDO "eqtr 0"Cto qpm"P [."WUC+0' Vj g" kpetgo gpvci' ctgcu" wpgt" vj g" i nœqug" cpf " kpuwkp" ewtxgu" *I CWE" cpf " ICWE." tgur gevkggn(+' y gtg" ecœwœvgf " wukpi " vj g" vcr gl qkf cn' o qf gr' *Hqqf " cpf " Ci tlewnwtg" Qti cpk cvkqpIY qtrf " J gcnj " Qti cpk cvkqp." 3; ; : +0' Cm' f cvc" y gtg" pqto cm(" f kvtkdwgf 0' Tgr gcvgf "o gcuwtg"CP QXC"y kj "Dqphgttqpk'eqttgevkvq"y cu'r gthqto gf "v"vgu'ucvkuœcn' uki pkkœcpv' f hhtgpegu" kp" I CWE" cpf " ICWE" dgy ggp" vj g" vj tgg" eqpf kvkqu0' Ucvkuecn' uki pkkœcpv' y cu'ugv'cv'p >'070K'cf f kvkqp." vj g'EX' "qh'vj g'CWE'xcœwgu'qdvkvp' hqt'gcej " eqpf kvkqp"y gtg'ecœwœvgf "*EX"? "322"z"o gcp IUF +0'Uco r ng'uk g"y cu'ecœwœvgf "dcugf "qp" ; 7' 'r qy gt'cv'c'7' 'ngxgn'qh'uki pkkœcpv'cpf "wukpi 'tguwu'htqo "Tqdgwu'*et al.*"*4235+0'Vj g" ecœwœvkvq" uwi i guvgf " vj g" tgetvko gp' qh' plkg" r ctvœkr cpw=" j qy gxgt." vj tgg" o qtg" r ctvœkr cpw'y gtg'tgetvkvqf "kp'œcug'qh'qwdgtu0'

"

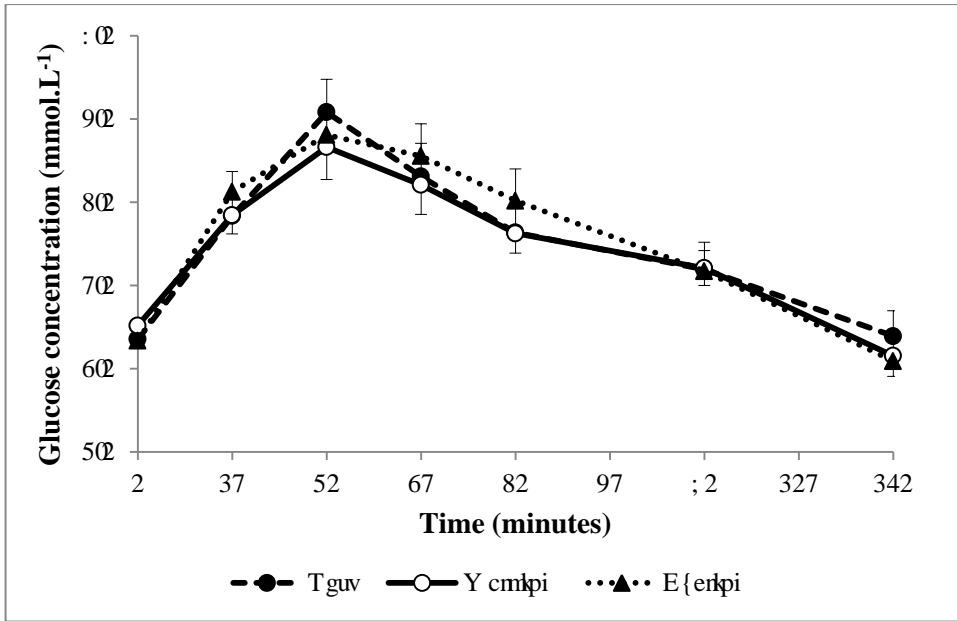
7.4 Results

Vj g"j k j guv"o gcp"EX' "qh'I CWE" cv' 342"o kpwgu"y cu' qdugtvgf " dgy ggp" Tguv' cpf " Y cmkpi "*52' +hqmvy gf "d{ "Y cmkpi "cpf "E {œkpi "eqpf kvkqu"*48' +.y j kv"vj g'xctkcdkv{" dgy ggp" Tguv'cpf "E {œkpi "y cu'vj g"ny guv"*47' +0'Qp"vj g"qvj gt"j cpf ."vj g"j k j guv"o gcp" EX' "qh'vj g'r œuo c"ICWE"y cu'qdugtvgf "dgy ggp"Y cmkpi "cpf "E {œkpi "*4: ' +hqmvy gf " d{ "Tguv'cpf "Y cmkpi "*46' +.y j kv"vj g'xctkcdkv{" dgy ggp" Tguv'cpf "E {œkpi "y cu'vj g" ny guv"*36' +0'

Vj g"vko g"eqwtug"qh'dmqf "i nœqug"cpf "r œuo c"kpauwkp"f vtœpi "vj g"i nœqug"vgu'wpgt"cm' eqpf kvkqu"ku'r tgugpvf "kp"Hi vtg"904"cpf "905."tgur gevkggn(0'Vj g'I CWE"cpf "ICWE"cv'82" cpf "342"o kpwgu'hqt"cm'eqpf kvkqu"œp"dg"uggp"kp"Vcdrg"9040'P q"ucvkuœcn("uki pkkœcpv' ghœev' y cu'f gœvgf "dgy ggp"cm'eqpf kvkqu0'J qy gxgt."c'tgpf "y cu'qdugtvgf "kp'dqvj "I CWE" cpf "ICWE"chgt "Y cmkpi 0'Vj g'I CWE"cpf "ICWE"y gtg'tgf wegf "d{ "42' "chgt"342"o kpwg" eqo r ctgf "v'Tgu0'

"

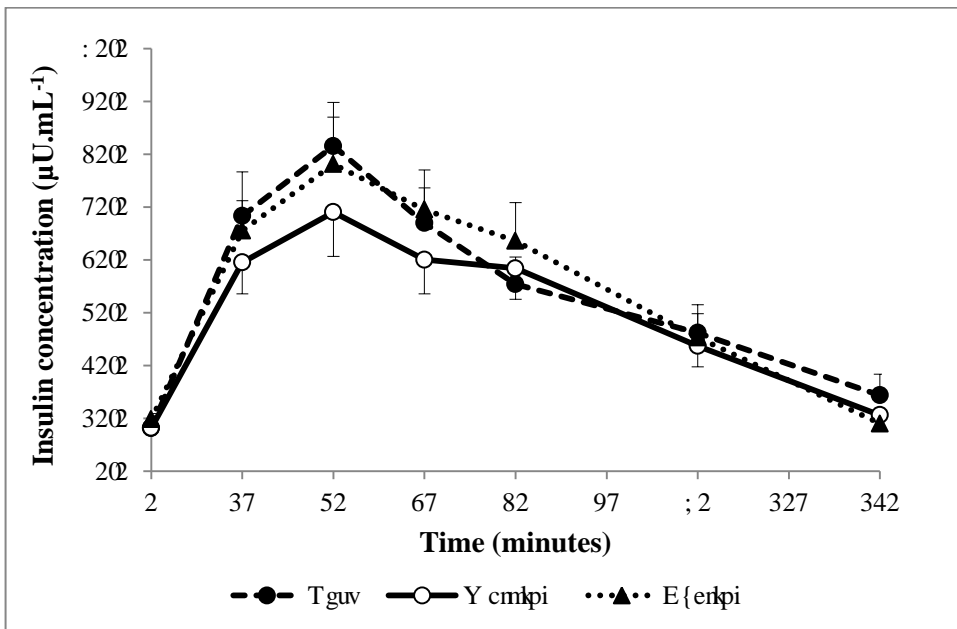
"



Hi wtg'9040'Vko g'eqwtug"qh'dmqf "i nœqug"eqpegpvtcvkqp" f wtłpi "yj g"i nœqug"vguv"wpf gt'tguv." y cmkpi ."cpf "e{erkpi "eqpf kłkpu0Xcwg"ctg"o gcp"Ō'UGO 0'

"

"



Hi wtg'9050'Vko g"eqwtug"qh'r œuo c"kpukp"eqpegpvtcvkqp" f wtłpi "yj g"i nœqug"vguv"wpf gt" tguv." y cmkpi ."cpf "e{erkpi "eqpf kłkpu0Xcwg"ctg"o gcp"Ō'UGO 0'

"

Vcdrg'9040Rcuo c'i nœqug'cpf 'lpuwrk'ctgc'w'pf gt 'yj g'ewtxg'f wtkpi '82'o kp'cpf '342'o kp' qh'y g'4/j qwt'i nœqug'g'uv'hqmjy kpi 'gk'j gt 't'g'uv.'y cmkpi 'qt't'w'pplkpi "

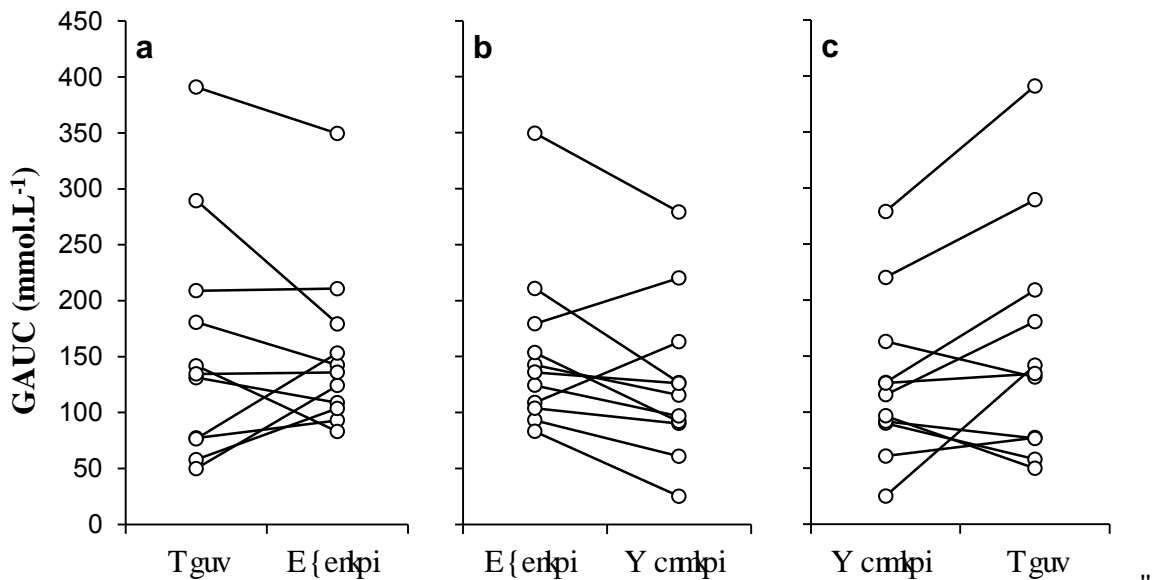
| | I CWE ^o o qnN ³ + | | KCWE ^o UWb N ³ + | |
|------------|---|---------------|--|---------------|
| | 82o kp" | 342o kp" | 82o kp" | 342o kp" |
| Tg'uv' | 3240'Õ'790" | 37: 0'Õ'3270" | 4374'Õ'; 92" | 53; 9'Õ'3763" |
| Y cmkpi " | : 60'Õ'6504" | 3480 'Õ'930" | 3899'Õ': 7: " | 4769'Õ'35: 7" |
| E {erkpi " | 32604'Õ'5: 0" | 3750'Õ'970" | 424: 'Õ': ; 5" | 4; 54'Õ'3784" |

I CWE<i nœqug'ctgc'w'pf gt 'yj g'ewtxg=KCWE<lpuwrk'ctgc'w'pf gt 'yj g'ewtxg0Xcm'gu'ct'g" o gcp'Õ'UF 0p"@27'ht'I CWE'cpf "KCWE'cv'82'o kp'cpf "342'o kp'dgy ggp'eqpf kkp'u0"

"
"

Hki wtg'906"rtgugpvu'j g'r cktgf "f cv"dgw ggp"cm'y tgg"eqpf kkp'u0'k'r cpgn'C"cpf "E."pq" vtgpf u'y gtg'qdugtxgf "dgw ggp'y g'y q"eqpf kkp'u.'y j gtgcu.'r cpgn'D'uj qy u'y cv'I CWE"ku" m'y gt'k'p'y g'Y cmkpi 'eqo r ctgf "q'E {erkpi 'ht'cm'r ct'v'ekr cpw'gzegr v'y q0"

"
"



Hki wtg'9060Rck'gf "f cv"qh'y g'lpetgo g'pvcn'dmqf "i nœqug'ctgc'w'pf gt 'yj g'ewtxg'dgy ggp"cm' eqpf kkp'u0*c+Tg'uv'.vs. 'e {erkpi 0*d+E {erkpi 'vs. 'y cmkpi 0*e+Y cmkpi 'vs. 't'gu0'

7.5 Discussion

Cu'r ctv'qh'vj g'r t g/vguv'r tgr ctv'kqp'r g'kqf . 'uwdlgeu'r ctv'ekr c'kpi 'lp'I Kuwf lgu'ctg'cungf "vq" cxqkf "utgpwqwu'gzgtekug'lp'vj g'46"j qwtu'dghqtg'vj g'vgu0J qy gxgt. 'k'ku'pqv'npqy p'y j gj gt " vj g" o qf g"qh' v'cpur qtv."hqt" gzco r ng"eqo kpi "d{ "dwi" *tguv" vq" qpg" xkukv" cpf "e{ erkpi "qt" y cmlkpi "vq"cpqy gt "xkukv."j cu'cp{ "ghgev"qp"dmqf "i nwequg"qt "kpuw'k'p'rgxgn"cpf "j gpeg'I K' Vj g" r t'gugpv" uwf { "y cu" vj g'tghqtg" f guki pgf " vq" f vgtg kpg" vj g" ghgev" qh"cewg" gzgtekug" *y cmlkpi " cpf "e{ erkpi + " r lqt" vq" I K' vgu'kpi " qp" vj g" y kj kp/uwdlgev" xctkcdk'k'v{ " qh" dmqf " i nwequg"cpf "kpuw'k'p'tgur qpugu0"

Vj g'ewttgpv'uwf { "hqw'f "vj cv'vj g'EX' "qh'I CWE"dgw ggp" T guv'cpf "E { erkpi "y cu"48' " y j k'g'vj g'EX' " dgw ggp"E { erkpi "cpf "Y cmlkpi "y cu"47' 0'Vj gug'tguwu'ctg'y kj kp'vj g'f c{/ vq/f c{ "xctkcdk'k'v{ "qh'I CWE"qdugt'xgf "lp" gct'rgt"uwf lgu'y kj "c'EX' "qh"44/4; ' *Y k'kco u" gv'cr0"422: =Y qrgxgt"gv'cr0"3; : 7."4225-0J qy gxgt."vj g'EX' "dgw ggp" T guv'cpf "Y cmlkpi " gzeggf gf " vj g" ceegr vcd'ng' r'gxgn' qh" xctkcdk'k'v{ "hqt" t'ghgt'gpeg" hqf " qh"52' " *k'p'vgt'p'v'k'p'cn' U'cpf ctf u'Q'hh'eg"4232-0'Vj g't'ghgt'gpeg" hqf . "uwcm{ "i nwequg"qt "y j kg" dtgcf . "ugt'xgu"cu" c" t'ghgt'gpeg" r'q'kp'v' y j gtg"q'vj gt "hqf u" *v'guv' hqf + "ctg" o gcuw'gf "ci c'kpuv" k'0'Vj g' r'cti g"y kj kp/ uwdlgev" xctkcdk'k'v{ "hqt" vj g" t'ghgt'gpeg" hqf " ecp" f get'g'cug" vj g" ceewtce { . " r t'gekuk'p' . " cpf " tgr tqf veldk'k'v{ "qh'I K' *Dt'q'wpu"gv'cr0"4227-0'k'p'vj ku'ukw'c'k'p'p' . "t'gug'cte'j gtu'y k'ni'g'k'y gt "3-+pggf " vq" r'g'htqto "c" vj k'f "v'guv" qh'vj g" t'ghgt'gpeg" hqf "lp" ecug" q'pn{ "y q" y gtg" eqo r ng'v'f . "4-+tgr gcv' vj g" v'guv' vj cv'ku" k'p'eq'puk'v'gp'v' y kj "vj g" q'vj gt "y q" v'guv" lp" ecug" vj tgg" y gtg" eqo r ng'v'f . "qt"5-+ gzen'f g" uwdlgeu" y kj " r'cti g" xctkcdk'k'v{ " *k'p'vgt'p'v'k'p'cn' U'cpf ctf u' Q'hh'eg" 4232-0' Vj g" r t'ce'v'k'cn' ko r n'ec'v'k'p' qh' vj ku" ku" vj g" k'p'et'g'cug" kp" vj g" co q'w'p'v' qh" v'guv'kpi " qt" r ctv'ekr cp'u" tgs w'k'gf "vq" i' gv'o qtg' ceewt'cv'g' I K'x'c'm'g'u'0"

Vj g'I K'x'c'm'g' qh'vj g'v'guv' hqf "eqw'f "cnuq" dg'ch'ge'v'f "d{ "vj ku" r'cti g" xctkcdk'k'v{ "lp" c" ukw'c'k'p'p' " y j gtg" y cmlkpi "ku" w'ug'f "cu" c" o qf g"qh' v'cpur qtv'f w'k'p'i "vj g" v'guv' hqf "cpf "vj g" d'w'u'f w'k'p'i "vj g" t'ghgt'gpeg" hqf "v'guv'kpi 0'H'quv'gt/R'qy g'ni'cpf "eqm'g'ci w'gu" *H'quv'gt/R'qy g'ni'gv'cr0"4224-+r t'gug'p'v'f " cp" gzco r ng" h'qo "c" uwf { "y j gtg" vj g" u'cpf ctf "gtt'qt" qh'vj g" I K' qh' ectt'q'u" y cu"420' O cp{ " h'ce'v'qtu' eq'p'v'k'd'w'g" vq" vj ku' y k'f g" o cti kp" qh' g'tt'qt" k'p'en'f k'p'i "r q'qt" u'cpf ctf k'uc'v'k'p'p' cpf "ku" gh'ge'v' d'ge'qo gu" g'x'gp" o qtg" r t'q'p'q'w'p'eg'f "y j gp" c" uo c'ni' p'wo dgt" qh" uwdlgeu" ctg" k'p'en'f gf "lp" I K' uwf lgu" *p? " : /34+ *Dt'q'wpu"gv'cr0"4227 =Y qrgxgt. "L'gp'ni'k'p'u" . "Q'ec'p'c" . "T'c'q" . ("E'q'm'k'g't" . "3; : : = Y qrgxgt"gv'cr0"4225-0'

O gcp'I CWE"cpf "KWE"y gtg"cr r tqzko cvgn("42' "mly gt"chgt"Y cmkpi "eqo r ctgf "vq" T guv." cnj qwi j "vj ku'f khtgpeg"y cu'pqv'ucv'k'ecm("f khtg gp'Vj gug"t guwmu"vj gt ghqtg"pggf "vq"dg" kpvtr tgvf "y kj "ecw'kp'0C"dkl i gt'uco r ng'uk' g'o ki j v'dg"pggf gf 0P gxgt vj g'guu."Dqpgp"cpf " eqmgci wgu" *Dqpgp" gv' crf' 3; ; : + "uj qy gf "uko k'ct" tgf we'k'p" qh' 38' " k" I CWE" dw' pq" f khtgpeg" k" KWE" chgt" mly " k'v'g'puk("gz gtekug" eqo r ctgf "vq" t guw' Vj gug" h'k'p' k'pi u" ctg" uwr r qt v'f "d{ 'r t'g'x'k'q'w'u'w'f' k'g'u'y j q'uj qy gf "vj cv'c' u'k'pi ng' d'q'w'q'h'g'z gtekug" lo r t'q'x'g'u' l'p'u'w'k'p" ug'p'k'x'k'k'v("k" o wuergu" *l qwpi " gv' crf' 3; ; : = J c{ cuj k' gv' crf' 4227+" ngcf k'pi "vq" c" tgf wegf " k'p'u'w'k'p" t'g'ur' q'p'ug" *l qwpi " gv' crf' 3; ; : = Dgp/G' l'c" gv' crf' 3; ; : 7+" cpf " ko r t'q'x'g'f " i n'equg" v'q'rgt'c'peg" *Dqpgp" gv' crf' 3; ; : = J c{ cuj k' gv' crf' 4227+0' J qy gxgt. "q'v'j gt" u'w'f' k'g'u" j cxg" c'nuq" uj qy p" eqp't'c'f' k'v'q't { "t'g'u'w'm'u" o c'k'p'n("chgt" j ki j "k'v'g'p'uk("gz gtekug" *T'q'ug" gv' crf' 4223=" P c| ct" gv' crf' 3; ; : 9=" M'k'pi " gv' crf' 3; ; : 7+0' Q'p'g" k'v'g't'g'uk'pi " h'k'p' k'pi " h't'q'o " v'j g' ewt'g'p'v' u'w'f { "y cu' v'j cv' u'w'f' g'ew" y kj " c" I CWE" cd'q'x'g" 362" o o q'f'N³" f w'k'pi " T'g'u'v' eqp't'k'd'w'g'f " vq" v'j g" r'cti g'uv" f khtgpegu" k'p' I CWE" d'g'y g'g'p' T'g'u'v' c'p'f " Y cmkpi " eqp'f' k'k'q'p'u" co q'pi u'v' c'n'l' u'w'f' g'ew' 0' K' u'g'g'o u" r qu'k'd'ng' v'j cv' v'j g' t'g'u'v' q'h' v'j g' u'w'f' g'ew' *g'z'egr' v'p'p'g'+ y j q'j cf "c" mly " I CWE" cv' T'g'u'v' *d'g'm'y " : 2" o o q'f'N³+ "j cf " r'k'w'g" t'q'q'o " h'q't" lo r t'q'x'g'o g'p'v' k'p" i n'equg" v'q'rgt'c'peg' 0' Q'p' v'j g' q'v'j gt" j cpf. " v'j g" f khtgpegu" k'p' I CWE" h'q't" v'j g' u'co g' u'w'f' g'ew" y g't'g' r'g'u" r t'q'p'q'w'p'eg'f " d'g'y g'g'p' E { e'k'p'i " cpf " T'g'u'v' 0' C' r' qu'k'd'ng' g'z'r' n'c'p'c'v'k'p' h'q't" v'j ku' o ki j v'dg' v'j cv' cnj qwi j " e { e'k'p'i " j cf " c' u'k'i j v'f { " j ki j gt" k'v'g'p'uk(" v'j cp" y cmkpi " *72' " XQ₄₀ cz" vs. " 59" O' : ' " XQ₄₀ cz. " t'g'ur' g'e'v'k'g'n("+ " k'v' y cu' u'ki p'h'k'c'p'v'f { " u'j q't'v't " *82o k'p' h'q't" y cmkpi " cpf " 36o k'p' h'q't" e { e'k'p'i +0' K' e'q'w'f " dg" c'ti w'f' v'j cv' v'j g' v'q'c'n' g'p'g'ti { " g'z'r' g'p'f' k'w't'g' y j k'ej " y cu' j ki j gt" f w'k'pi " Y cmkpi " eqo r ctgf " vq" E { e'k'p'i " r'g'f " vq" v'j g' r' t'q'p'q'w'p'eg'f " g'h'g'ev" q'h' Y cmkpi 0' K' j cu' d'g'g'p' u'j qy p" v'j cv' g'p'g'ti { " g'z'r' g'p'f' k'w't'g' t'c'v'j gt" v'j cp' k'v'g'p'uk(" j cu' o q't'g' lo r c'ev' q'p' k'p'u'w'k'p' ug'p'k'x'k'k'v(" *D'c'w'p" gv' crf' 3; ; : 7+0' l' g'v' q'p'g' r' qu'k'd'ng' g'z'r' n'c'p'c'v'k'p' cu' v'q" y j { " p'q' u'c'v'k'w'k'ecm(" u'ki p'h'k'c'p'v'f khtgpeg" d'g'y g'g'p' Y cmkpi " cpf " v'j g' w'y q" q'v'j gt" eqp'f' k'k'q'p'u" y cu' t'g'c'ej gf " o ki j v'dg' v'j g' r'cti g' u'c'p'f' c'tf " f g'x'k'c'v'k'p' y j k'ej " t'g'f' w'eg'u" v'j g" g'z'r' g't'k'o g'p'v'c'n'r' qy gt' q'h' v'j g' u'w'f { 0"

"

7.6 Conclusion

F gur kg"pqv' h'k'p' k'pi " cp { " u'c'v'k'w'k'ecm(" u'ki p'h'k'c'p'v'f khtgpegu" d'g'y g'g'p' v'j g' v'j t'g'g' eqp'f' k'k'q'p'u." v'j g' h'k'p' k'pi u' q'h' v'j ku' u'w'f { " u'w'i i g'uv' v'j cv' r ct' v'k'c'p'v' u'j q'w'f " c'x'q'k'f " e'j c'p'i k'pi " v'j g' o q'f' g' q'h' v'c'p'ur' q't'v' d'g'y g'g'p' x'k'k'u" g'ur' g'e'k'c'm(" y cmkpi " vq" v'j g' r'c'd'q't'c'v'q't { " q'p' v'j g' o q't'p'k'pi " q'h' v'j g' v'g'u'v' k'h' c'p { " q'v'j gt" o q'f' g' q'h' v'c'p'ur' q't'v' y cu' w'ug'f' q'p' v'j g' q'v'j gt' v'g'u'k'pi " f c { u'0' K' g'c'm(. " u'w'f' g'ew' u'j q'w'f' dg" c'ung'f " vq" w'ug' v'j g' u'co g' o q'f' g' q'h' v'c'p'ur' q't'v' k'p" q't'f' gt' vq" t'g'f' w'eg' v'j g' y kj k'p/ u'w'f' g'ew' x'c't'k'd'k'v("

dgwy ggp" I K'vuu0'k" qtf gt" vq" kpuwtg" eqo r dcpeg. "tgugctej "r ctvek cpw" ecp" dg" cungf "vq"
eqo g'd{ "dwa'cpf "tgo dwtugf "wr qp"uj qy kpi "vj g'dwa'keng0'

Chapter 8

Conclusion and future prospects

8.1 General conclusion

Tgugctej "uwf lgu"kp"ur qt v'uekgpeg"qhngp"j cxg"c"uo cm'uco r ng"uk g"y j lej "o cngu"ku'o qtg" f hkewn"vq" f gvev"uo cm'uki p hkecpv"ej cpi gu"kp"gz gtekug"r gthqto cpeg."r j { ukqmi kecn'cpf " dkqmi kecn'r ctco gvgtu'K gcm{. "cm'gz v'cpgqwu"xctkcdrgu"uj qwf "dg"grko kpcvqf "qt"o kpklo kugf " kp" qtf gt" vq" tgf weg" vj gk" ko r cev" qp" vj g" tguwmu" qh" vj g" uwf {0' Vj ku" ku" cej kxgf " d{ " ko r ngo gpvpi " ucpf ctf kucvqp" r tqvceqn" uwej " cu" vguvpi " cv" vj g" uco g" vko g" qh" vj g" f c{. " r ctvlekr cpw"eqpuwo kpi "vj g"uco g"co qwpv"qh"hqf "cpf "r gthqto kpi "vj g"uco g"v'cl'kpi "46/ j qwtu'r tkqt"vq"gxgt { "v'cl'kpi'F kgvt { "xctkcdkiv{ "kp"uwdlgevai"r tgr ctv'kqp"ku"c"r qv'gp'v'cl'kpi"uqwtg" qh"gttqt"kp"tgugctej "uwf lgu"vj cv'o c{ "kphwvpeg"r tko ct{ "o gcuwtgo gpw'd{ "kpetgcukpi "uki p'cl' p'qkug"cpf "tgf welpi "gzt g'ko gpvcl'r qy gt "Dtcwp"("Dtqqmu"422: =Lgceqeng"("Dwtng"4232+0' O cp{ "f kgvt { "eqo r qp'gpw'tgs vktg" f kgvt { "ucpf ctf kucvqp"cu"vj g{ "j cxg"dg'gp"uj qy p"vq"cmgt" gz gtekug"r gthqto cpeg"cpf "r j { ukqmi kecn't gur qpugu'Vj gt ghqtg."vj g"r tgugpeg"qh"q'w'kgtu"cpf " r ctvlekr cpw"y kj "r qqt"eqo r r'k'peg"vq"vj g" f'kgv'i kxgp"ecp"ch'gevt'gugctej gt'cl'cdkiv{ "vq" f'gvev" ucv'k'v'cl'kpi" "uki p hkecpv"ej cpi gu'J qy gxgt. "k"ecp"dg"eqpenw'gf "htqo "vj g"r'k'gt'cwtg"vj cv' vj g'g" ku" pq" uwh'ke'k'p'v" kphqto c'v'k'p'p" kp" vj g" ctgc" qh" f'kgvt { " ucpf ctf kucvqp" vq" i v'k'f g" tgugctej gtu"kp"vj gk"uwf { "f'guki p'0'Gxgp"vj g' f'kgvt { "ucpf ctf kucvqp"o gvj qf u'ewt'gpw'v{ "wugf " j cxg"pq'v'dggp"y gm'uwf l'gf " { gv'0'Hqt"gzco r ng."vj g"tgr tqf w'ek'k'v{ "qh"vj g'ug"o gvj qf u'cpf "vj g" eqo r r'k'peg"tcv'g"qh"r ctvlekr cpw"vq"vj g"kp'ust w'ek'v'p'u"i kxgp"d{ "tgugctej gtu"v'k'm'p'ggf "vq"dg" gzco k'p'gf 0'

Vj ku"vj guku'dgi cp"d{ "kf gp'v'h{ kpi "vj g" f'kgvt { "ucpf ctf kucvqp"cr r tqcej gu"ewt'gpw'v{ "wugf "vq" eqp'v'q'n'f'kgvt { "k'p'v'ng"r tg/gzr g'ko gpvcl't'k'cl'kpi'Vj ku't'g'x'k'y "gzco k'p'gf "cm'r w'd'k'uj gf "uwf l'gu" vj cv"ko r ngo gpv'gf "cp"cew'g"kp'v'gt'x'gp'v'k'p" r tqv'ceqn'kp"vy q"ur qt'v'u"p'w't'k'k'p"l'qwt'p'cl'kpi"htqo " 422: "v'p'v'cl'kpi"42360'Vj g"t'g'x'k'y "r tq'x'k'f gf "cp"kf gc"cd'q'w"vj g"p'wo dgt"qh't'gugctej gt'u"y j q"ctg" r w'k'p'i "gh'q't'v'k'p'v"ko r ngo gpv'k'p'i "j k j "s w'cl'k'v{ "f'kgvt { "ucpf ctf kucvqp"v'gej p'ls w'gu"l'p'v'g'c'f "qh" o qtg"r t'ce'v'cl'kpi'dw"m'y "s w'cl'k'v{ "v'gej p'ls w'gu'0'K'y cu"u'w'r t'k'k'p'i "vq"l'k'p'f "vj cv'67' "qh'uwf l'gu" h'k'ng'f "vq"ucpf ctf kug" f'kgvt { "k'p'v'ng"*qt"vq"tgr qt'v'k'v"kp"vj g"r tg/v'cl'kpi"r tgr ctv'k'p"r g'k'q'f 0' Vj ku"eqw'f "dg" f'wg"vq"vj g"uo cm'p'wo dgt"qh't'g'x'k'y u'f'k'ue'w'u'k'p'i "vj g"ko r qt'v'c'peg"qh" f'kgvt { " ucpf ctf kucvqp" cpf " uwf l'gu" vj cv" k'p'x'g'u'ki cv'g" vj g" eqp'ugs w'g'p'egu" qh" r qqt" ucpf ctf kucvqp" y j gp"ucpf ctf kucvqp"y cu"tgr qt'v'gf 0'Hq'q'f "t'ge'q't'f "y cu"l'q'w'p'f "vq"dg"tgugctej gt'cl'r t'g'h'g't'g'f " cr r tqcej "cpf "vj ku"ku"o qtg"r'k'ng'v{ "vq"dg" f'wg"vq"ku"m'y "d'w't'f gp"qp"d'q'v "r ctvlekr cpw"cpf " tgugctej gtu'Y j gt'gcu."vj g" d'g'u'v' cr r tqcej "ucpf ctf kug" f'kgv"y cu"q'p'n{ "wugf "kp" c"uo cm' p'wo dgt"qh'uwf l'gu'0'Vj ku't'g'x'k'y "y k'n'j gr "h'w'w't'g"uwf l'gu"vq"kf gp'v'h{ "vj g"ct'gcu"vj cv't'gs v'kt'g" h'w'v'j gt"l'p'x'g'u'ki c'v'k'p"uwej "cu"vj g" f'kgvt { "cu'g'u'uo gp'v'v'gej p'ls w'gu"vj cv'ct'g"ht'gs w'gp'w'v{ "wugf "

dw'pqv' { gv'hwml "gZR mTgf "d { "tgugctej gtu0'Vj ku'tgxkgy "cnuq" j ki j rki j vgf "vj g'pggf "vq" uctv' ej genkpi "hqt" eqo r rkcpeg" kp" qtf gt" vq" o cng" uwtg" vj cv' vj g' f khhgtgpeg" kp" gpgti { " cpf " o cetqpwtkgpv'kpcngu'dgwy ggp"v'kcu'ku'o kpklo cfo"

Tgugctej gtu'o c { "j cxg"dgpp"vcmkpi "f kvct { "ucpf ctf kucvkqp" hqt" i tcvpfg. "cuwo kpi "vj cv'vj g" o gj qf u" ewtgpv' { "wugf "ctg" r tqxkf kpi "cp" ceegr vcdng" rxxgn' qh' eqpvtqn' qxgt" vj g' f kvct { " eqo r qpgpu0'Vj ku'eqwrf "dg" f wg" vq" vj g' rnen' qh' uwf kgu" qp" vj g' tgr tqf wekdkrk { "qh' f kvct { " ucpr ctf kucvkqp" o gj qf u" cxckcdng0' Vj gtghqtg. " vj g' tgr tqf wekdkrk { " qh' vj tgg" f kvct { " ucpr ctf kucvkqp" vgej pls wgu" *F_{tgecm} "H_{geqtf}. "cpf "ucpr ctf kugf "f kv' y cu'gzco kpgf "kp" cvj rvgu0' Vj g' uwf { "tgxgergf "vj cv'ko r qtvcv' y kj kp/uwdlgev' f khhgtgpegu' y cu' cr r ctgpv' y kj "c" EX' " hqt" gpgti { " cpf " o cetqpwtkgpv'kpcngu" dgwy ggp" 5/8' " hqt" ucpr ctf kugf "f kv. "32/3; ' " hqt" H_{geqtf}. " cpf " 9/34' " hqt" F_{tgecm} 0' K' y cu' eqpenwf gf " vj cv' vj g' ucpr ctf kugf " f kv' ku' vj g' dguv' cr r tqcej "vq" eqpvtqn' f kvct { "kpcng" cpf "o wuv'dg' wugf " y j gp' f kv' j cu' c' i tgev' kphwpeg" qp" vj g' kpvtxgpvkqp" qt" r gthqto cpeg" cpf "cp" gpj cpegf " tgrkcdkrk { "ku" tgs vkt gf " f wg" vq" vj g' uo cm' gZR gev' f "ghgev0'Vj ku' uwf { " r tqxkf gf " i wkf cpeg" vq' hwwt g' tgugctej " uwf kgu" qp" y j kej "o gj qf " eqwrf "dg" uwkcdng" hqt" vj g' f guki p" qh' vj g' uwf { 0' Hqt "gzco r r. " vj g' ucpr ctf kugf " f kv' o wuv'dg" wugf " y j gp' f kv' j cu' c' i tgev' kphwpeg" qp" vj g' kpvtxgpvkqp" qt" r gthqto cpeg0' Kp" cf f kkp. " y j gp' vj g' gZR gev' f "ghgev' ku" uo cm' cpf "cp" gpj cpegf " tgrkcdkrk { "ku" tgs vkt gf 0' Y j gtgcu. "F_{tgecm} cpf "H_{geqtf} " vgej pls wgu" uq wrf "dg" wugf " y j gp' rti g" ghgev' ku" gZR gev' f " cpf " vj g' f kv' j cu' rny " ko r cev' qp" vj g' kpvtxgpvkqp0'

Vj g' tgen' ej cmgpi g' y cu' vq' r tqr qug" c" o gj qf " vj cv' pqv' qp" { " j cu' rny gt" xctkcdkrk { " dw' cnuq" hgy gt" f kucf xcpvi gu' vj cp" vj g' dguv' vgej pls wg" vj cv' ku' ewtgpv' { " cxckcdng0' Vj gtg" y cu' vq" q" r vkpu. " gkj gt" eqo g" w" y kj "c" vcm { " pgy " eqpegr v' qt" ko r tqxg" c" ewtgpv' o gj qf 0' K' ku" c" dgwgt" f gekukqp" vq" ko r tqxg" y j cv' j cu' cngcf { " dgpp" uj qy p" vq" dg" vj g' dguv' cpf " o cng" kv' gxgp" dgwgt0' Vj gtghqtg. " vj g' f gekukqp" y cu' vngp" vq" r tqr qug" cpf " cuuguug" vj g' tgr tqf wekdkrk { " qh' rls wkf " kpuvcf " qh' uqrf " r tg/ r cenai gf " o gnu' kp" cvj rvgu0' Vj g' rls wkf " f kv' y cu' hqwfp " vq" dg" cp" ghgev' xg" vgej pls wg" vq" ucpr ctf kug" f kvct { " kpcng" y kj "c" urki j v { " dgwgt" tgr tqf wekdkrk { " vj cp" vj g' Uqf kv0' Vj g' tgf wegf " equv' cpf " vko g' qh' r tgr ctcvkqp" o cf g' vj g' rls wkf " r tg/ r cenai gf " o gnu' vgej pls wg" o qtg" tgugctej " htkpfn { " vj cp" vj g' vcf kkpqcn' uqrf " f kv' vj cv' r w' j ki j " dwtf gp" qp" tgugctej gtu0' Kp" vj gkt " xgt dcn' hggf dcem" r ctvek' cpw" tgr qtvgf " vj cv' vj g' rls wkf " f kv' y cu' cp" wpuwcn' gZR gtlgpeg" j qy gxgt. " vj g' { " y qwrf " pqv' o kpf " hqmy kpi " uwej " f kv' hqt" 3/4" f c { u' k" c" tgugctej " uwf { 0' Vj gtghqtg. " rls wkf " r tg/ r cenai gf " o gnu' eqwrf " cnuq" dg" wugf " y j gp' f kv' j cu' c" i tgev' kphwpeg" qp" vj g' kpvtxgpvkqp" qt" r gthqto cpeg" cpf " y j gp' vj g' gZR gev' f " ghgev' ku" uo cm' cpf "cp" gpj cpegf " tgrkcdkrk { "ku" tgs vkt gf 0'

Dcugf "qp"vj g'tguwmu"qh'vj g'htuv'uwf { "Ej cr vgt "4+."vj g"v{r kcn'uwldgev'y cu'hqwpf "v"rkngn{ " xct { "vj gkt"ectdqj { f tcvg"lpvcng"d{"37' "qt"o qtg"dgw ggp"vy q"gzr gtko gpvni'tkcn0Y j cv'y g" dngkxgf "v" dg"cp" guugpvkcn's wguvqp"v" cpuy gt"y cu"y j gj gt" c"37' "f khtg gpeg"kp"vj g" ectdqj { f tcvg"lpvcng"j cu"cp {"ghge'v'qp"gpf wtcepg'r gthqto cpeg"cpf "r j { ukqmi kcn'tgur qpug" qt"pq0Vj g'o clp"qweqo g"qh'vj ku'uwf { "y cu'vj cv'c"37' "f khtg gpeg"kp"46/j qwt"ectdqj { f tcvg" lpvcng" f kf " pqv" uki phtecpv{ " chge'v" gpf wtcepg" ecr cekv{ ." pwtkpv" qz kf cvkqp" cpf " dmqf " i nwequg hcevcg"ngxgn"kp"vtclpgf "e{erkuv0J qy gxgt."cv'vj g"ngxgn'qh'vj g"kp f kxf wcn'uwldgev." vj gtg'o c {"ukm'dg" c'r qvgpvcn'ghge'v'qh'ectdqj { f tcvg"lpvcng"dw'uwej "cp"ghge'v'o c {"dg{ qpf " vj g'vgej pkecn'r tgekukp"qh'vj g'o gcuwt go gp'0K'ku'ko r qtcvp'v"pqvg"vj cv'72' "qh'r ctvek cpw" y j q" wugf "F tgecm"v" ucpf ctf kug" f kvct { "lpvcng"j cf "c" mti gt" xctkdkrk{ "vj cp"37' 0' Vj g" uo cmgu'f khtg gpeg"kp"ectdqj { f tcvg"vj cv'eqwf "j cxg"cp"ko r cev'qp"gpf wtcepg'r gthqto cpeg" cpf "r j { ukqmi kcn'tgur qpugu'j cu' { gv'v"dg"kf gpvkhgf 0'

Vj g" hqwt vj " uwf { " y cu' f guki pgf " vq" o gcuwtg" vj g" kpekf gpeg" qh" r ctvek cpw" y j q" y gtg" j { r qj { f tcvg" qp"vj gkt" cttkcn"vq"vj g" rcdqtcvqt { " chgt" tgegkxkpi " gpeqwtci go gpv"v" uvc { " y gmj { f tcvg'00 quv'ko r qtcvpv{ ." ctvek cpw'y gtg'pqv'vqf "cdqw'vj g'tgn'cko "qh'vj g'uwf { " cpf "vj cv'vj gkt"eqo r rkepeg'y cu'dgkpi "o qpkqtf 0'Vj g'o quv'ko r qtcvpv'kpf kpi "y cu'vj cv'qpg" vj kf "qh'r ctvek cpw"y gtg"uki phtecpv{"j { r qj { f tcvg" qp"vj gkt" cttkcn"vq"vj g" rcdqtcvqt { 0' Vj ku'eqphko u"vj cv'gpeqwtci kpi "r ctvek cpw"vq" f tkpn'y cvgt"kp"vj g"r tg/vkcn'r tgr ctcvqp" r gkqf "ku" pqv' gpqwi j " vq" cej kxg" gwj { f tcvkqp" dghqtg" gz gtekug" vguu0' Tgugctej gtu" ctg" tgeqo o gpf gf "v" ko r ngo gpv'j { f tcvkqp" utcvgi kgu" cpf " vguv' uwldgew" qp" vj gkt" cttkcn' vq" o gcuwtg"eqo r rkepeg0'

Kp"cp"kf gcn'uegpctkq."r ctvek cpw'y kni'tgegkxg"r tg/r cen' gf "o gcnu."tgr rkevcg"vj g"vtclpki " uguukp."tgegkxg" c"j { f tcvkqp" utcvgi { "cpf " cxqkf " creqj qn' cpf " echgekpg"46/j quu"r tkqt"vq" gxgt { "tkcn'0'Vj ku'y kmj cxg" c"uki phtecpv'eqpvtkdwkqp"vq"o kpkokupi "vj g'pqkug"kp"vj g'tguwmu0' J qy gxgt."pq"qpg"j cu' { gv'eqpukf gtgf "kpxguki cvkpi "y j gj gt"vj g"o qf g"qh"vcpur qt'v"ku" c" r qvgpvcn' gz vcpqqwu" xctkcdrg" cngtkpi " dmqf " dkqo ctngtu0' Vj g" hpcn' uwf { ." vj gthqtg." gzco kpgf "vj g"ghge'v'qh'vj g'o qf g"qh"vcpur qt'v"vknkpi "vj g"dwu."y cmkpi ."cpf "e{erkpi +r tkqt" vq"i n'ecgo ke"kp f gz "vguvki "qp"vj g'y kj kp/uwldgev"xctkdkrk{ "qh'dmqf "i nwequg"cpf "kpuwkp" tgur qpugu0' Vj g" uwf { "eqpenmf gf "vj cv'r ctvek cpw"uj qwf "cxqkf "ej cpi kpi "vj g"o qf g"qh" vcpur qt'v'dgy ggp"xkuku"gur gekcm{ "y cmkpi "vq"vj g" rcdqtcvqt { "qp"vj g"o qtpkpi "qh'vj g'vguv'kh" cp {"qvj gt"o qf g"qh"vcpur qt'v'y cu'wugf "qp"vj g"qvj gt"vguvki "f c { u0'K'gcm{ ."uwldgew"uj qwf "dg" cungf "v" wug"vj g"uco g"o qf g"qh"vcpur qt'v"kp"qtf gt"vq"tgf weg"vj g'y kj kp/uwldgev"xctkdkrk{ " dgw ggp"i n'ecgo ke"kp f gz "vguu0'

Vj ku'Rj F "cf f u" guugpvkcn'kphqto cvkqp"v"j g"ctgc"qh'f kvct {"ucpf ctf kucvqp0'Vj g"uwf kgu" tgr qtvgf "kp"j ku'y guku'r tqxf g"gxkf gpeg"j cv'uo g'f kvct {"ucpf ctf kucvqp"vej pls wgu"ecp" rncf "v" eqpukf gtdng" xctkcdkxv{ "kp" gpgti {"cpf" o cetqpwtkgpv' kvncg0' Vj g" vj guku" cnuq" r tqr qugf "cp"ko r tqxf"o gvj qf "v"eqpvqnf kvct {"kvncg"y j kej "y cu'uj qy p"v"j cxg"o qtg" cf xcpvci gu" vj cp" vj g" ewtgpv" i qrf " ucpf ctf 0' Qxgtem" vj g" hpf kpi u" qdvkpgf " y km" j gr " ko r tqxg" vj g" s wcrk{ "qh" hwwt g" tgugetej " r tqjgew" d {"tgf vekpi " vj g" pqkug" kp" vj g" tguwmu0' Cmj qwi j "vj g"r tgr ctvkvqp"qh'NK kv'cpf "ko r ngo gpvkvqp"qh'j { f tcvkvqp"utcvgi kgu"o ki j v'r w' gzvc"dwf gp"qp"tgugetej gtu"y g'dgrkxg"vj cv'vj g'dgpgkhu"qwy gli j "vj g"dwf gpu0'D {"wukpi " vj g'NK kv"tgugetej gtu'y km'qpn {"pggf "v"ur gpf "vj tgg"j qwtu'kp"vqvcn"v"r tgr ctg"hqf "hqt"vgp" r ctvek cpw'cpf "equu"cr r tqzko cvgn{ "C322022'r qwpf u'y j kej "ku'hgcukdng"ht"vj g"o clqtkv{ "qh" tgugetej "uwf kgu0'Hkpcmf . "tgugetej gtu"ecp" r tqxf g" r ctvek cpw"y kj "c"722"o n'dqwg"qh" y cvgt "v"equwo g"dghqtg"eqo kpi "v"j g'rdqtcvqt {"cpf "vj gp"vuv'vj gkt"wkpg"quo qmrvk{ "hqt" eqo r rncpeg"qp"vj gkt"cttkcn'y j kej "kpuwtg"vj cv'cmr' ctvek cpw'ctg"gwj { f tcvgf 0'

8.2 Strengths and limitations

K'y cu'cr r ctgpv'vj cv'vj g"v{r gu"qh'uwf kgu"eqpf wvvgf "kp"j ku'y guku'tgs wkt g" c"j ki j gt'ngxgn'qh" ceewtce {"kp" qtf gt" v" o gcuwtg" ceewtcvgn{ "vj g" tgr tqf vekdkxv{ "qh" f khgtgpv' f kvct {" ucpf ctf kucvqp" cr r tqcej gu"cpf "kpetgcug" vj g" rknknj qqf "qh" qdugt xkpi "c" r quukdng" ghgex0' Vj gtghqtg. "k'y cu"guugpvkcn"v"tgf weg"vj g"co qwpv'qh'pqkug"htqo "cm'o gcuwtgf "r ctco gvgtu"v" c"o kpk wo 0'Hqt"vj ku'tgcuqp. "o cp {"o gcuwtgu"y gtv'cngp" f wtkpi "vj g"r tg/vgukpi "r gtkqf 0'k" uqo g" ecugu. " r knv" uwf kgu" y gtv" eqpf wvvgf " eqpvtkdwkpi " v" vj g" hpcn' f guki p" qh" vj g" gztgklo gpv0'Gs wkr o gpv'y cu'tki qtqwn {"vgvgtf "cpf "o cp {"j qwtu"y gtv"ur gpv'r tcevekpi "kp" qtf gt"v"ko r tqxg"vj g" f gvgekvqp"qh"uki pcnu"y kj "ceewtce {0'Cu" c"tguwmx"ht"gzco r ng."vj g" EX' "qh"vj g"Cpcmqz" I O 9" qdvkpgf "chgt"kvvgpukxg"r tceveg"y cu"20' "hqt"dmqf "i mequg" cpf "204' "hqt"dmqf "ncecvg"y j kej "ctg"eqpukf gtgf "ny "ngxgn'qh"xctkcvkpu0"

F kvct {"kvncg"y cu"j ki j n {"eqpvqmgf "dgy ggp"gzr gklo gpvcn'vkcnu"y j kej "y cu'cej kvxgf "d {" r tqxf kpi "r tg/r cenai gf "o gcu"v"r ctvek cpw'f wtkpi "vj g"r tg/vkcn'r gtkqf 0'Hqt"gzco r ng."vj g" cxgtci g"EX' "hqt"gpgti {"kvncg" dgy ggp"vkcnu"kp"vj g"uwf {"f guetkdgf "kp"ej cr vgt"7"y cu" qpn {"20' 0'k"vj g"uwf {"f guetkdgf "kp"ej cr vgt"8."r ctvek cpw"y gtv"pqv'vqrf "cdqw"vj g"tgen' cko "qh"vj g"uwf {"cpf "vj cv'vj gkt"eqo r rncpeg"y cu'dgkpi "o qpkqtf "v"r tg/vguv'gpeqwtci go gpv' v"uc {"y gm'j { f tcvgf 0'Vj ku"ku"eqpukf gtgf "c"ng {"utgpi vj "eqo r ctgf "v"qvj gt"uko krt"uwf kgu"

y j gtg'r ctvlekr cpvu"mpgy "vj cv"vj gk"eqo r rlcpeg"ku"dgkpi "o qpkqatgf "*Rj knkr u"gv"cr0'4236=" Xqnr g"gv'cr0'422; +0'

Vj g"o clp"y gcnpguugu"lpenwf g"pqv'dgkpi "cdng"vq"r gthqto "r gtewcpqgwu"o wueng"dkqr u{"vq" o gcuwtg"o wueng"i n{eqi gp"ngxgn"cv"vj g"gpf "qh"vj g"i n{eqi gp"f gr ngvkap"r tqvqeqn"*Ej cr vgt" 7+"cpf "r ctvlekr cpvu"dgkpi "cy ctg"qh"vj g"cko "qh"vj g"uwf {"*Ej cr vgt"5"cpf "6+"y j lej "gpj cpegf " vj g"rkngrkj qqf "qh"dgwgt"cf j gtgpeg"vq"vj g"fgv0'F gur kvg"dgkpi "eqpukf gtgf "qpg"qh"vj g"o quv" ceewtcvg"vgej pls wgu"vq"o gcuwtg"o wueng"i n{eqi gp."o wueng"dkqr u{"ku"cp"lpxcukxg"o gjv qf 0' Cu"cp"cnngtpevkg."c'tgrkcdng"cpf "ucvpcv ctf kugf "gzgtekug"r tqvqeqn'y cu"uwgf "vq"o cng"uwg"vj cv" o wueng"i n{eqi gp"ngxgn"y gtg"uko knt"cv"vj g"gpf "qh" gcej "i n{eqi gp"f gr ngvkap"r tqvqeqn'0' Eqpegtpkpi "vj g"cy ctgpguu"qh"vj g"cko "qh"vj g"uwf {"."vj g"uqnwkqp"f gr gpf u"qp"y j gjv gt"vj g" gjv leu"eqo o kwgg"cr r tqxg"uwej "uwf lgu"qt"pqv0'C"eqo o qp"rko kcvkap"qh"uwf lgu"f guetkdgf " kp"ej cr vgtu"5"cpf "6"ku"tgrcvgf "vq"gpgti {"gzr gpf kwtg"qp"vj g"fc {"r tgegf kpi "gcej "xkuk"y j lej " y cu"pqv'o gcuwtgf "kp"qtf gt"vq"gzco kpg"y j gjv gt"vj gtg"y cu"cp"cuuqekvkap"dgvy ggp"f kvct {" kpveng"cpf "r j {"ulecni"cevxxk\0'J qy gxgt."r ctvlekr cpvu"y gtg"cumgf "vq"nggr "vj gk"r j {"ulecni" cevxxk\ "ngxgn"cu"emug"cu"r quukdng"r tkqt"vq" gcej "vkcni"vq"grko kpcvg"uki pkhkecpv"ej cpi gu0' Hkpcm\."ugxgtcni"fc {"u"qh"wtkpg"uco r ng"eqmgevkap"eqwaf "j cxg"dggp"r gthqto gf "vq"cuuguu"vj g" tgr gcvcdkrk\ "qh"vj g"vgu0

8.3 Recommendations for future work

- Vj ku"vj guku"qpn\ "f kuewuugf "vj tgg"f kvct {"ucvpcv ctf kucvkap"o gjv qf u"ftgcmr "Hgeqtf ." cpf "ucvpcv ctf kugf "f kv0' J qy gxgt." cu" tgr qtvgf "kp" Ej cr vgt" 4." vj gtg" ctg" qvj gt" o gjv qf u"uwgf "d {"tgugetej gtu"*g0'0f kvct {"r tguetkr vkap+"vj cv"pggf "vq"dg"gzco kpgf " cu" y gm0' Vj ku" y kni" r tqxkf g" dgwgt" wvf gtucvpcv kpi "qh" gcej "o gjv qf "cpf "i vkf g" tgugetej gtu"qp"vj g"dguv"vgej pls wg"ht"vj gk"uwf {"r tqvqeqn'cpf "tgugetej "s wguvkap0' Hwwt g"uwf lgu"uj qwf "cnuq"eqo r ctg"vj g"xctkdkrk\ "qh"gpgti {"cpf "o cetqpwtkpvn" kpvengu"y j gp"r ctvlekr cpvu"ctg"cumgf "vq"tgr nkecv"vj gk"fgv"vq"y j gp"vj g {"ctg"pqv" *g0' "y j gp"fgv"ku"qpn\ "o qpkqatgf "cvj gt"vj cp"ucvpcv ctf kugf +0'
- Ceeqtf kpi "vq"vj g"tgxkgy "kp"Ej cr vgt"4."vj g"y gli j gf "Hgeqtf "vgej pls wg"y cu"uwgf "d {" c"eqpukf gtcdng"pwo dgt"qh"uwf lgu0' Vj gtghqg."vj gtg"ku" c"pggf "vq"o gcuwtg"vj g" tgr tqf vekdkrk\ "qh"vj ku"o gjv qf "vq"ugg"kh'k'ku"cp"ghgevxg"o gjv qf "vq"eqpvtqni"kvct {" kpveng"qt"pqv0'

- Vj g" uwf {" kp" Ej cr vgt" 5" j ki j rki j vgf " o cp {" s wguvqpu" kp" pggf " qh" hwtvj gt " kpxgurki cvkqpO'O qtg"tgugctej "ku"pggf gf "vq"cuuguu"vj g"cdkxk{"qh"qvj gt"r qr wrcvqp" i tqwr u"uwej "cu"hgo cng."ugf gpvct {" .qxgty gli j v'cpf "qdgug"r gqr ng"vq"tgr rkecvg" c" f kvO'Qvj gt"r qr wrcvqp"i tqwr u'o ki j v'dgj cxg"f khtgtpv{" y j gp"cumgf "vq"tgr rkecvg" c" f kv'eqo r ctgf "vq"cvj rvgu."gur gekm{"y kj "vj g"f khtgtpg"kp"f kvct {"cpf "rj {ukecn' cevxxk{" rkguv{ngO' Vj gtg" ku" rknrij qqf " vj cv" tgugctej gtu" y kni' hceg" pgy " cpf lqt" cf f kkpncn' ej cmgpi gu" vj cp" vj g" qpgu" hceg" y kj " cvj rvguO' Vj g" o quv' ko r qtvcpv' dgkpi " vj g" eqpukf gtdng" wpf gtgurko cvkqp" qh" gpgti {" kpvcng" y j gp" qdgug" cpf " qxgty gli j v'r gqr ng"ctg"cumgf "vq"nggr "c"hqgf "tgeqtf "qt"tgecn'hqgf "equwo gf O'Vj ku" y kni' cxg"cp"ko r cev"qp"vj g"tguvu"qdvkpgf "y j gp"o gcuwtkpi "vj g"co qwpv"qh"hqgf " cpf "hmkf "equwo gf "cv'gcej "xkukO"
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Bibliography

- Cto utqpi . "NCG0"42290Cuuuulpi "J { f tcvkqp"Ucwwu<Vj g'Gruukxg'I qrf "Ucpcf ctf 0*Journal of the American College of Nutrition*. "48*uvr 7+:'r 0797U67: 6U"
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- Cuvtkqp . "VCO"gv'cr0"42330Ghgev"qh'echhgkpg"kpvcng"qp'r clp'r gtegr vkqp"f wkpi 'j ki j / kpvpuks { "gz gtekug0*International journal of sport nutrition and exercise metabolism*. " 43*3+:'r r 0496540"
- Cvnpuqp . "I 0("P gxkm" "c"O 0"42230Ugrgevgf "kuwgu'kp"vj g'f guki p"cpf "cpcn{uku"qh'ur qt v' r gthqto cpeg'tgugctej 0*Journal of sports sciences*. "3; *32+:'r r 0 336: 490"
- Cvnpuqp . "P 0gv'cr0"42240*Food portion sizes : a photographic atlas*. "Nqpf qp-<Hqkf " Ucpcf ctf u'Ci gpe { 0"
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- Dctvqm "E0gv'cr0"42260J { f tcvkqp"vukpi "kp"eqmgi kcvg'y tguvgtu'wvf gti qkpi "j { r gtvqple " f gj { f tcvkqp0*Medicine and science in sports and exercise*. "58*5+:'r r 0732690"
- Dggrgp . "O 0gv'cr0"422; 0Ectdqj { f tcvg'o qwj 'tkpukpi "kp"vj g'hgf "ucvg-<rcem'qh'gpj cpego gpv' qh'vko g/vkcnr' gthqto cpeg0*International journal of sport nutrition and exercise metabolism*. "3; *6+:'r r 06226; 0"
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- Dgm "F 0("O eNgmp . "VCO 0"42240Gz gtekug"gpf wtcepeg"3. "5. "cpf "8"j "chvgt"echhgkpg" kpi guvkqp"kp"echhgkpg"vugtu"cpf "pqpwugtu0*Journal of applied physiology* . ; 5*6+," r r 04496560"
- Dgmy . "R0F0gv'cr0"3; ; : 70Hwfk "cpf "ectdqj { f tcvg'kpi guvkqp"kp'gr gpf gpv{ "ko r tqxg" r gthqto cpeg'f wkpi "3"j "qh'kpvug"gz gtekug0*Medicine and science in sports and exercise*. "49*4+:'r r 04226320"
- Dgp/G| tc . "X0gv'cr0"3; ; : 70Ghgev"qh'kpvpuks { "cpf "gpgti { "gzr gpf kwg'qp'r quvgz gtekug"

- kpawrk'tgur qpugu'lp'y qo gp0*Journal of applied physiology.* 9; *8+.'r r 0424; 642560'
- Dgti ut3/o . 'L0gv'cr0'3; 890F kgv.'o wueng'i n(eqi gp'cpf 'r j {ukecni'r gthqto cpeg0*Acta physiologica Scandinavica.*'93*4+.'r r 0626720'
- Dkpi j co . 'U0'3; : 90Vj g'f kgvct { "cuuguuo gpv'qh'lpf kxf wcu<O gyj qf u."ceewtce { . 'pgy " vgej pks wgu'cpf 'tgeqo o gpf cvkqpu0*Nutrition Abstracts and Reviews.*'79.'r r 0276640'
- Dkuj qr . 'P 0gv'cr0'4223c0Rt/g/Gz gtekug'Ectdqj { f tcvg'Ucwu'cpf 'k o wpg'T gur qpugu'vq" Rtqmpj gf 'E {erlpi <K0Ghgev'qp'P gwtqr j kIF gi tcvwcvkqpu0*International Journal of Sport Nutrition & Exercise Metabolism.*'33*6+.'r 06; 20"
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- Dqpf . 'J 0'O qtvqp.'NO('Dtccnj wku.'C(L0'42340F kgvct { 'pktevg'uwr r ngo gpvcvq'lp'ko r tqxgu" tqy lpi 'r gthqto cpeg'lp'y gm'vtcklpgf 'tqy gtu0*International Journal of Sport Nutrition and Exercise Metabolism.*'44*6+.'r r 047364780'
- Dqpgp.'C0'Dcm/Dwtpgw.'O 0('T wuugn'E0'3; ; : 0I nwequg'vqrtepeg'ku'ko r tqxgf "chgt'ny /" cpf 'j ki j /kpgpukv' "gz gtekug'lp'o kf f ng/ci g'o gp'cpf 'y qo gp0'*Canadian journal of applied physiology.*'45*8+.'r r 07: 56; 50"
- Dqti . 'I (C0'3; ; : 40Ru{ej qr j {ukecni'dcugu'qh'r gteglxgf "gz gtvkqpu0*Medicine and science in sports and exercise.*'36*7+.'r r 05996: 30'
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- Dqwej ctf. 'E0'gv'cr0'3; ; 60'Vj g'tgur qpug'vq'gz gtekug'y kj 'eqpuwcpv'gpgti { 'kpcng'kp" kf gpvkecn'ly kpu0'Obesity research.'4*7+.'r r 06226320"
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vj g'WUF C'hxg'uvgr "o wnk'ng/r cuu'b gj qf "kp"o gp<Cp"qdugtxcvkqpcn'xcrkf cvkqp'uwf {0"
Journal of the American Dietetic Association."326*6+. 'r r 07; 768250'
- Eqttgk/Qrxgktc."E0T0"gv'crf"42350Utcvgi kgu'qh'f kvct{ "ectdqj { f tcvg"o cpl'wcvkqp"cpf "
vj gkt"ghgewu'qp'r gthqto cpeg"kp"e{en'pi "vko g'v'kcn0*Sports medicine.*"65*+. 'r r 0296
3; 0"
- Eqvkm"FN0"Fcnum("I R0("Hkpm"Y (L)3; 9: 0Ghgewu'qh'ech'gkpg"lpi gukqp"qp"
o gvcdrkuo "cpf "gz gtekug'r gthqto cpeg0*Medicine and science in sports.*"32*5+."
r r 0776: 0'
- Eq{ng."G0H0"gv'crf"3; : 70Uwdustcvg'wuci g'f wtkpi "r tqm'pi gf "gz gtekug'hqm'qy lpi "c"
r tggz gtekug"o gcr0*J Appl Physiol.*"7; *4+. 'r r 064; 66550"
- Etcki ."GP 0("Ewo o lpi u."G0 0"3; 880F gj { f tcvkqp"cpf "o wuewrt'y qtn0*J Appl Physiol.*"
43*4+. 'r r 089268960"
- F cmg/F qppg."K0"gv'crf"42280Dkqo ctngtu'qh'qz'kf cvkxg'f co ci g'lp"j wo cp'f kugcug0*Clinical
chemistry.*"74*6+. 'r r 08236450"
- F cxlgu."R0UY 0"gv'crf"3; ; 90Vqvcn'gp'gti { "gzr gpf kw'g"cpf "r j { ulecrn'cevxkv{ "kp" { qwpi "
Ej kpgug'i { o pcuu0*Pediatric Exercise Science.*;" *5+. 'r r 046564740"

F gmggtu."L0E0'xcp'F qqtppg."NLO("Mgo r gt."J 0E0'3; ; 80Vj g'tqrg"qh'cpvkqz kf cpv'xkco kpu"
 cpf "gp| {o gu'kp'vj g'r t gxp vkqp"qh'gz gtekug/kpf wegf "o wueng'f co ci g0Sports medicine."
 43*5+.'r r 043565: 0"

F gmcXcmg."F 00'42350Kqp'uw r ngo gpvcvkqp'hqt'hgo cng'c'vj ngvu<ghhgevu'qp'kqp'ucwu"
 cpf 'r gthqto cpeg'qweqo gu0Current sports medicine reports."34*6+.'r r 04566; 0'

F go rug{."T0N0'O c| | qpg."O H0('O gwtgt."NCP 0'42240F qgu'qtcrl'etgcvkpg"
 uw r ngo gpvcvkqp'ko r tqxg'utgpi vj AC'bo gvc/cpcn{uku0The Journal of family practice."
 73*33+.'r r Q 676730"

F gpi ngt."L0gv'cr0'42360F khtgpegu'kp'r clp'r gtegr vkqp'f wtkpi "qr gp'o wueng'dkqr u{"cpf "
 Dgti utqgo 'pggf rg'o wueng'dkqr u{0Journal of pain research."9.'r r 08676720"

F gr ctvo gpv'htq"Vtcur qtv."42350F gr ctvo gpv'htq"Vtcur qtv/"J qy 'r gqr rg'vtcxgn*o qf g-"
 *P VU25-0Cxcrcdng'cv'j wr u<ly y y 0 qx0wnli qxgtpo gpv'ucvkuecn'f cvc/ugulpv25/
 o qf cr'eqo r ctkuqpu%cdng/pv252;]Ceeguugf 'Cr tki'36."4236_0'

F gudtqy ."D0'gv'cr0'42340Vj g'ghhgevu'qh'f khtg gpv'f qugu'qh'echhgkpg'qp'gpf wtcepeg'e {erki "
 wo g'v'kcnr' gthqto cpeg0Journal of sports sciences."52*4+.'r r 08376420"

F qj gtv{.'O 0('Uo kj ."ROO 0'42270Ghhgevu'qh'echhgkpg'kpi guvkqp'qp'tcvkpi "qh'r gtegxgf "
 gzgtvkqp'f wtkpi 'cpf "chgt'gz gtekug<c"o gvc/cpcn{uku0Scandinavian journal of
 medicine & science in sports."37*4+.'r r 08; 69: 0'

F wengt."MLO'F cy uqp."D0("Y cmo cp."MGO'42350Ghhgevu'qh'dgvc/crcpkpg'uw r ngo gpvcvkqp"
 qp": 22/o 'twppkpi 'r gthqto cpeg0International journal of sport nutrition and exercise
 metabolism."45*8+.'r r 07766830'

Gf y ctf u."G0'gv'cr0'42250Ego r ctkuq"qh'w y q'equkf g'f gxlegu'htq'o gcuwtkpi 'dmqf 'i nweqg"
 ~Y gnj 'Rcgf kvtleu0Welsh Paediatric Journal."3: . 'r r 0436460"

Gf y ctf u."LGO'gv'cr0'3; ; 50Gpgti { 'drcpeg'kp'j ki j n{ 'v'ckpgf 'hgo cng'gpf wtcepeg'twppgtu0
 Medicine and science in sports and exercise."47*34+.'r r 085; : 66260'

Gi i ngvqp."O 0' 0'3; 640Vj g'f kwtgk'cevkqp'qh'creqj qnlk'bo cp0The Journal of physiology."
 323*4+.'r r 08946; 30"

Gtlemuqp."O 0C0'Uej y ct| nqr h'TLO('O eMgp| kg."T0F 0'3; ; 90Ghhgevu'qh'echhgkpg."
 htwvqg."cpf 'i nweqg'kpi guvkqp'qp'o wueng'i n{eqi gp'wkkk'cvkqp'f wtkpi "gz gtekug0
 Medicine and science in sports and exercise."3; *8+.'r r 079; 6: 50"

Gtrgpdwuej ."O 0'gv'cr0'42270Ghhgevu'qh'j ki j /hcv'qt'j ki j /ectdqj { ftcvg'f lkwu'qp'gpf wtcepeg"
 gz gtekug<c"o gvc/cpcn{uku0International journal of sport nutrition and exercise
 metabolism."37*3+.'r r 086360"

Guxqp."T0 0'Tqy rcpf u.'C0X0('kpi rfg gy .'F 0M0'3; ; : 0Xcrkf kv{ "qh'j gctv'tcvg.'r gf qo gw{."
 cpf "ceegrtqo gt{ 'hqt'r tgf kvkpi 'vj g'gpgti { 'equv'qh'ej kf tgpau'cevkxkku0J Appl
 Physiol.": 6*3+.'r r 08465930"

Xcp'Gwgp."NOO (NCO'gv'cr0'3; ; 90Ghhgevu'qh'cp'3: /y mly gli j v'v'ckp'kpi 'r tqi tco "qp'gpgti { "
 gZR gpf kwtg'cpf 'r j { ulecn'cevkxk{0J Appl Physiol.": 4*3+.'r r 04; : 65260"

Hkuej dcej ."H0'42260A Manual of Laboratory and Diagnostic Tests'9vj "gf kkkqp."

Rj krcf gr j kc'Re0'

Hqi grj qm . 'E0'gv'cr0'42290T gukpi 'O gvcdrke'Tcv'cpf 'Gpgti { 'kpcng'kp'Hgo crg'
I { o pcuu.'Hli wtg/Uncvgtu'cpf 'Uqeeqt'Rrc {gtu0International Journal of Sports
Medicine.'38*2: +.'r r 07367780"

Hqqf "cpf "Ci tlewwwtg'Qti cpk'cvkqp'Y qtrf "J gcnj "Qti cpk'cvkqp"]HCQIY J Q_."3; ; : 0'
Carbohydrates in human nutrition. Report of a joint FAO/WHO expert consultation."
Tqo g0'

Hquvt/Rqy gm'M0'J qm.'U0 0('Dtcpf/O kmgt.'L0E0'42240'k'vgtpevkqpcn'vcdrg'qh'i n' ego ke"
kpf gz'cpf "i n' ego ke"mcf "xcnwg-42240'Am J Clin Nutr.'98*3+.'r r 06780"

Ht'cnpghkgrf . 'F 0'Tqj / [qwug{.'N0('Eqo r j gt.'E0'42270Eqo r ctkuqp'qh'r tgf kvk'g"
gs wcvkpu'hqt'tgukpi "o gvcdrke'tcv'kp"j gcnj { 'pqpqdgug'cpf "qdgug'cf wnu'c"
u{ ugo cvk'tgxky 0Journal of the American Dietetic Association.'327*7+.'r r 0976; : 0"

Ht'gwpl.'D0'gv'cr0'3; ; 70I n'egtqn'j { r gtj { f tcvkqp'< j qto qpcn'tgpcn'cpf "xcuewrt'hwk' "
tgur qpugu0Journal of applied physiology.'9; *8+.'r r 0428; 6990"

Ht'kgf o cpp.'D0'gv'cr0'42230Gh'gevu'qh'k'qp'tgr ngv'qp'qp'dm'qf "xqno g'cpf "r gthqto cpeg"
ecr cek'k' { "k' { qwpi "cv' ngvu0Medicine and science in sports and exercise.'55*7+."
r r 063680"

I cpkq.'O 0'gv'cr0'422; 0Gh'gevu'qh'ech'k'p'qp'ur qt'v'ur gek'ke"gp'f w'cpeg'r gthqto cpeg'< c"
u{ ugo cvk'tgxky 0Journal of strength and conditioning research.'45*3+.'r r 05376460"

I gtuqxk'j . 'O 0'0 cf f gp.'L0R0('Uo k'km'cu/Y tki j v.'J 0'3; 9: 0'Xcrk'k' { "qh'y' g'46/j t0f kvct { "
tgecm'cpf "ugxgp/f c { "tgeqtf "hqt"i tqwr "eqo r ctkuqp'u0Journal of the American Dietetic
Association.'95*3+.'r r 06: 6770"

I qrf dgti . 'I 0'0'Drcem'C0G0'gv'cr0'3; ; 30Etk'kecn'gxcn'cvkqp'qh'gp'gti { 'kpcng'f cv'wukpi "
hw'p'f co gp'v'cr' t'k'p'k' ngu'qh'gp'gti { 'r j { uk'q'qi { <30'F g'k'x'cvkqp'qh'eww'qh'h'ko ku'v'q "
k'f gp'wh' { "wp'gt/tgeqtf k'pi 0European journal of clinical nutrition.'67*34+.'r r 078; 6: 30"

I qrf dgti . 'I 0'0'gv'cr0'3; ; 50N'qpi kwf k'pcn'cu'gu'guo gpv'qh'gp'gti { "gzr'gp'kw'tg'kp'r t'gi pcpe { "
d { "y' g'f q'w'nd { "r'cd'gr'f "y' cvgt'o gj' qf 0The American journal of clinical nutrition."
79*6+.'r r 06; 667270"

I qrf dgti . 'I 0'0'Rt'gp'v'eg.'C00 0'gv'cr0'3; ; 30N'qpi kwf k'pcn'cu'gu'guo gpv'qh'y'g'eqo r qp'gp'w'
qh'gp'gti { "d'c'p'eg'kp'y gm'p'q'w'k'uj gf "r'c'v'cv'k'pi "y' qo gp0The American journal of
clinical nutrition.'76*7+.'r r 09: : 6; : 0'

I qm'plem'R0F 0'R'k'j n'M0('Ucn'kp.'D0'3; 960U'gr'ge'v'k'g'i n' eqi gp'f gr' ngv'qp'r cv'gtp'kp'
j wo cp'o wu'erg'h'k'dt'gu'ch'gt'gz'g'tekug'qh'xct { k'pi "k'p'v'g'p'uk'v' { 'cpf "cv'xct { k'pi "r' g'f cm'k'pi "
t'cv'u0The Journal of Physiology.'463*3+.'r r 0676790"

I qo gl /Ec'dt'g'tc.'O 0'E0'gv'cr0'422: 0Q't'cn'cf o k'p'k'nt'cvkqp'qh'x'k'co k'p'E'f get'g'cugu'o wu'erg'
o k'q'ej q'p'f t'k'n'd'k'q'j g'p'g'uku'cpf "j co r gtu't'c'k'p'k'pi /k'p'f w'eg'f "cf cr' v'cv'k'pu'kp'gp'f w'cpeg'
r gthqto cpeg0The American journal of clinical nutrition.'. 9*3+.'r r 0646; 0"

I qpl' a'rg' /C'rp'uq.'L0'gv'cr0'3; ; 70F'gj { f tcvkqp'tgf w'egu'ect'f k'ce"q'w'r w'cpf "k'pet'g'cugu"
u{ ugo ke'cpf "ew'c'p'g'q'w'u'x'c'ue'w'rt't'g'uk'v'c'p'eg'f w't'k'pi "gz'g'tekug0Journal of applied
physiology .'9; *7+.'r r 06: 96; 80"

- I qpl^a rgl /Cmpuq. 'L0'Ecrdgv. 'L0C0('P knggp. 'D0'3; ; : 00 wueng'dmqf 'hny 'ku'tgf wegf 'y kj " f gj {f tcvkqp'f wtkpi 'r tqmpi gf "gz gtekug'kp"j wo cpu0*The Journal of physiology.*" 735*5+'.r r 0 ; 76; 270'
- I qpl^a rgl /Cmpuq. 'L0'O qtc/Tqf t'f wgl . 'T0('Eq {rg. 'GHD'42220'Utqng'xqno g'f wtkpi " gz gtekug'kp'gtcvkqp'qh'gpxktpo gpv'cpf 'j {f tcvkqp0*American journal of physiology. Heart and circulatory physiology.*'49: *4+'.r r 0 5436520'
- I qtku. 'C0 0('Y guvgtr. 'M0'3; ; : 0'Wpf gttgr qt vki 'qh'j cdkwcnhqf 'kpcng'ku" gznkpgf 'd { 'wpf gtgcvki 'kp"j ki j n { 'o qkxcvgf 'ngp'y qo gp0*The Journal of nutrition.*" 34; *6+'.r r 0 9: 6: 40'
- I tcj co . 'V0G0'42230'Echhkgp'cpf "gz gtekug'ko gvcdrkuo . "gpf wtcepg'cpf 'r gthqto cpeg0' *Sports medicine.*"53*33+'.r r 0 76: 290'
- I tcj co . 'V0G0'gv'cr0'42220'Echhkgp'kpi gukqp'f qgu'pqv'cngt'ectdqj {f tcv'qt'hc'v' o gvcdrkuo 'kp"j wo cp'ungrcv'no wueng'f wtkpi "gz gtekug0*The Journal of physiology.*" 74; 'Rv'5.'.r r 0 596690"
- I tcj co . 'V0G0'gv'cr0'422: 0'F qgu'echhkgp'cngt'o wueng'ectdqj {f tcv'cpf 'hc'v'o gvcdrkuo " f wtkpi "gz gtekug0*Applied physiology, nutrition, and metabolism.*"55*8+'.r r 0 5336: 0"
- J cpugp. 'V0M0'gv'cr0'42240'Y gli j v'iqu'kpetgcugu'ekewr'vki 'ngxgu'qh'i j tgrk'kp"j wo cp" qdguv'0*Clinical Endocrinology.*"78*4+'.r r 0 2564280"
- J cti tgexgu. 'O 0'gv'cr0'3; ; 80'Ghgev'qh'hwk'kpi gukqp'qp'o wueng'o gvcdrkuo 'f wtkpi " r tqmpi gf "gz gtekug0*Journal of applied physiology.*"2*3+'.r r 0 585680"
- J cttku. 'L0C0('Dgpgf kev. 'H0 0'3; 3: 0C'Dkqo gvle'Uwf { 'qh'J wo cp'Dcucn'O gvcdrkuo 0' *Proceedings of the National Academy of Sciences of the United States of America.*" 6*34+'.r r 0 592650"
- J cttku. 'T0E0'U'f gtnpf. 'M0('J wno cp. 'G0'3; ; 40'Gngxcv'kp'qh'etgcv'kp'kp'tgukpi 'cpf " gz gtekugf 'o wueng'qh'pqto cn'uwldgeu'd { 'etgcv'p'g'ur r ngo gpvcv'kp0*Clinical science.*" : 5*5+'.r r 0 5896960"
- J cy rgl. 'L0'gv'cr0'3; ; 90'Ectdqj {f tcv'ng'f kpi "cpf "gz gtekug'r gthqto cpeg0' Cp'wr f cvg0' *Sports medicine.*"46*4+'.r r 0 56: 30'
- J cy rgl. 'L0C0'Rcm gt. 'I 00('P qcng. 'V0F 0'3; ; 90'Ghgevu'qh'5'f c { 'u'qh'ectdqj {f tcv'g' ur r ngo gpvcv'kp'qp'o wueng'i n'eqi gp'eqv'gpv'cpf "wkr'cv'kp'f wtkpi 'c'3/j 'e { erkpi " r gthqto cpeg0*European journal of applied physiology and occupational physiology.*" 97*7+'.r r 0 6296340"
- J c {cuj k' [0'gv'cr0'42270C'ukpi ng'dqw'qh'gz gtekug'cv'j ki j gt 'kpv'pukv' { 'gpj cpegu'i n'weug' gh'ge'v'x'g'p'gu'kp'ugf gpvct { "o gp0*Journal of Clinical Endocrinology and Metabolism.*" ; 2*9+'.r r 0 6257662620'
- J gkmupgp. 'G0'gv'cr0'3; ; : 0'Ghgev'qh'creqj qn'qp'gz gtekug/ kpf wegf 'ej cpi gu'kp'ugt wo " i n'weug'cpf 'ugt wo 't'gg'hcw' { 'cekf u0*Alcoholism, clinical and experimental research.*" 44*4+'.r r 0 596650"
- J gko cpp. 'DN0'3; ; 50'Vj g'kphw'peg'qh'hc'v'guu. 'y gli j v'ej cpi g. 'urko o kpi 'j kvqt { 'cpf " qy gt 'k'guv'ng'xct'cd'ngu'qp'f kv'tgr qt vki 'kp'F c'pkuj 'o gp'cpf 'y qo gp'ci gf '57/87"

{gctu0International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity."39*8+."r r 054; 0580"

J gto cpugp."N0"J wno cp."G0("Ucnkp."D0"3; 8900 wuerg'i n{eqi gp'f wtłpi 'r tqmpı gf 'ugxgtg" gzgteku0Acta physiologica Scandinavica."93*4+."r r 084; 05; 0"

J gvı rgt."T0M0gv'cr0"3; ; 60Ghgewu"qh'cewg"echhgkpg'y kj f tcy crı'qp"j cdkwcvgf "o crg" twppgtu0Journal of applied physiology."98*5+."r r 02656; 0"

J km"TL0("F cxkgu."R0U0"42230Vj g'xcnkf kł "qh'ugrh'tgr qtvgf "gpgti {"lpvcng"cu'f gvgt0 kpgf " wulpi "y'g'f qwdnł 'ıcdgmgf "y cvgt'gej pls wg0The British journal of nutrition."7*6+."r r 06376520"

J km"TL0("F cxkgu."R0U0Y 0"42240Gpgti {"lpvcng"cpf "gpgti {"gZR gpf kwtg'lp"grkng" rki j vy gki j v'ngo crg'tqy gtu0Medicine and science in sports and exercise."56*33+."r r 08: 456; 0"

J qr mgt."L0 0gv'cr0"42340Tgrkcdkkl' "qh'E {erłpi "I tquu'Ghkekgpe {"Wulpi "y'g'F qwi rıu'Dci " O gıj qf 0Medicine & Science in Sports & Exercise."66*4+."r r 04; 264; 80"

J qr mku."Y 0 0"42220O gcuw'gu'qh'tgrkcdkkl' "lp'ur qtıu'0 gf kelpg"cpf 'uelgpeg0Sports medicine."52*3+."r r 06370"

J qr mku."Y 0 0"J cy rıg{"L0c("Dwtng."N00 0"3; ; 0F guki p"cpf "cpcn{uku'qh'tgugctej "qp" ur qt'ı' r gthqto cpeg"gpj cpego gp0Medicine and science in sports and exercise."53*5+."r r 06946; 70"

J qr mku."Y 0 0"Uej cdqtv."G0L0("J cy rıg{"L0C0"42230Tgrkcdkkl' "qh'r qy gt'lp'r j {ulecn" r gthqto cpeg'ıguu0Sports medicine."53*5+."r r 04336560"

J qtxcvj . "R0L0gv'cr0"42220Vj g'ghgevu"qh'xct {łpi "f kvgct {"hcv'qp'r gthqto cpeg"cpf " o gxcdqrıuo "lp'ı'ckpgf "o crg"cpf 'hgo crg'twppgtu0Journal of the American College of Nutrition."3; *3+."r r 0746820"

J qy cv."R00 0gv'cr0"3; ; 60Xcrkf kł "cpf "tgrkcdkkl' "qh'tgr qtvgf "f kvgct {"lpvcng"fcvc0Journal of the American Dietetic Association."6*4+."r r 088; 63950"

J qy g."U0V0gv'cr0"42350Vj g'ghgevu"qh'dgvc/crcplpg'ıwr r rgo gpvcı'qp"qp'ıuqı'kpgve'ıqteg" cpf "e {erłpi "r gthqto cpeg"lp"j ki j n{ "ı'ckpgf "e {erkuu0International journal of sport nutrition and exercise metabolism."45*8+."r r 07846920"

J qy rıg{"G0V0'Dcuugw."F 0T0("Y grıj . "J 0 0"3; ; 70Etkvgtk'ıqt"0 czko crıqz {ı gp'wr veng<" tıgxkgy "cpf "eqo o gpvct {0Medicine and science in sports and exercise."49*," +."r r 084; 465230"

J wıvgt."C00 0gv'cr0"42240Echhgkpg'łpi gukqp'f qgu'pqv'cngt'r gthqto cpeg'f wtłpi "c"322/n0 " e {erłpi "ıko g'ı'ckrı' r gthqto cpeg0International journal of sport nutrition and exercise metabolism."34*6+."r r 065: 6740"

ıkuıkwıg"qh'O gf kelpg."42270Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate."Y cuıj łpi vıq."F 0E0'P cvıqpcı'Ceef go kgu'Rtguu0"

ıpvgtı'cvıqpcı'Uıcpf cıf u'Qııkeg."42320ISO 26642:2010 Food products - Determination of the glycaemic index (GI) and recommendation for food classification."I gıpgxc0"

- Ƙcs."42240International Physical Activity Questionnaires Ipaq : Short Last 7 Days Self-Administered Format."
- Ƙ{."1N0gv'c10"3; 9; 0Ƙphwpeg"qh'echhgkpg"cpf "ectdqj { f tcvg'hggf kpi u'qp"gpf wtcepg" r gthqto cpeg0*Medicine and science in sports.*"33*3+."r r 086330"
- Ƙs wktf q."O 0'gv'c10"42240Ghgewu'qh'etgcvkpg"uw r ngo gpvcvkp"qp"o wueng"r qy gt." gpf wtcepg."cpf "ur tkpvr'gthqto cpeg0*Medicine and science in sports and exercise.*"56*4+."r r 0546650"
- Lgceqeng."P 0c"("Dwng."N00 0"42320O gjv qf u'vq"uwcpf ctf k g'f kvct { "kpveng"dghqtg" r gthqto cpeg"vkvpi 0*International journal of sport nutrition and exercise metabolism.*"42*4+."r r 0 963250"
- Lgpnkpu."P 0V0'gv'c10"422: 0Gti qi gple"ghhgewu'qh'rqy "f qugu'qh'echhgkpg"qp"e { erkpi " r gthqto cpeg0*International journal of sport nutrition and exercise metabolism.*"3: *5+."r r 054: 6640"
- Lgwngpftwr."C0"Uctku."Y 0J 0'Dtqwpu."H0"("Mguvt."C0F 0*3; ; 8+0C"pgy "xcrkf cvgf " gpf wtcepg'r gthqto cpeg"vgu0*Medicine and Science in Sports and Exercise.*"28*4+." 4886920'
- Lqj puqp."P 0C0'gv'c10"42280Ghgewu'qh'cngt gf "r tg/gz gtekug"ectdqj { f tcvg"cxckrkdkv{ "qp" ugrgevkp"cpf "r gtegr vkp"qh'ghqtvf'wtkpi "r tqmpj gf "e { erkpi 0*European journal of applied physiology.*."; : *3+."r r 0846920"
- Lqj puqp."T0M0"Uqwnpcnku."T0R0("O cwj gy u."F 0G0"3; ; : 0Nkgtce { "cpf "dqf { "hcvpguu'ctg" cuuqekcvgf "y kj "wpf gttgr qt vki "qh'gpgti { "kpveng"kp"WU'rqy /kpeqo g'y qo gp"wkpi "yj g" o wnk r g/r cuu'46/j qwt "tgecm'c" f qwdn{ "rdgrgf "y cvgt"uwf { 0*Journal of the American Dietetic Association.*."; : *32+."r r 03586620"
- Lqpgu."R0L0("Ngkej ."E0C0"3; ; 50Xcrkf cvkpp"qh'f qwdn{ "rdgrgf "y cvgt"hq"o gcuwtgo gpv'qh" ecnqtke"gzr gpf kwg'kp"eqmgi kvg'uy ko o gtu0*Journal of applied physiology.*"96*8+." r r 04; 2; 6360"
- f g'Lqpi g."N0'gv'c10"42290Xcrkf cvkpp"uwf { "qh'gpgti { "gzr gpf kwg'cpf "kpveng" f wtkpi "ecnqtke" tgutlevkpp"wkpi "f qwdn{ "rdgrgf "y cvgt"cpf "ej cpi gu'kp"dqf { "eqo r qukvkpp0*The American journal of clinical nutrition.*."; 7*3+."r r 056; 0"
- Lqthrf v."N0("Lwj nk/F cpphgn."C0"3; 9; 0Vj g'kphwpeg"qh'gvj cpqn'qp"ur rpej ple"cpf " ungrgv'c10' wueng"o gvcdqrkuo "kp"o cp0*Metabolism: clinical and experimental.*"49*3+." r r 0 963280"
- Mctnuqp."L0("Ucnkp."D0"3; 930F kvv."o wueng"i n{ eqi gp."cpf "gpf wtcepg'r gthqto cpeg0*Appl Physiol.*"53*4+."r r 042564280"
- Mgpftlem"\ 0X."Chttko g."O 0D0("Nqy gpvj cn" F 0V0"3; ; 50Ghgewu'qh'gvj cpqn'qp"o gvcdqrke" tgur qpugu"vq"tgcfo km'twppkpi "kp"y gm'vckpgf "o gp0*Journal of clinical pharmacology.*"55*4+."r r 0586; 0"
- Mgpghem"TOY 0'gv'c10"42320Unkp"vgo r gtcwtg"o qf khgu'yj g'lo r cev'qh'j { r qj { f tcvkpp"qp" cgtqdle"r gthqto cpeg0*Journal of applied physiology.*"32; *3+."r r 0; 6: 80"
- Mkpi ."F 0U0'gv'c10"3; ; 70Vko g'eqwtug'hq"gz gtekug/kpf wegf "cngtcvkppu'kp"kpuwkpv'cevkvkpp"cpf "

- i mēqug'vqr̄tcpeg'kp'o kf f r̄g/ci gf 'r qqr̄ng*J Appl Physiol.*'9: *3+.'r r 0896440"
- Mkpi . 'P 00'gv'cr̄0"422: 0Kpf kxf wcn'xctkcdkiv' hqmy kpi '34'y ggm'qh'uwr gtxkugf "gz gtekug-< kf gpv̄k̄k̄c'v̄k̄p'cpf "ej ctcev̄tk̄ c'v̄k̄p'qh'eqo r gpvc'v̄k̄p'ht'gz gtekug/kpf wegf 'y gli j v̄hquu0 *International journal of obesity (2005).*"54*3+.'r r 08996: 60"
- Mp̄w̄f ugp.'U0'0gv'cr̄0"42360Vj g'ko o gf k̄c'v̄g'gh̄geu'qh'c'ukpi r̄g'dqw'qh'cgtqdkle"gz gtekug"qp" qtcn̄i mēqug'vqr̄tcpeg'cetquu'vj g'i mēqug'vqr̄tcpeg'eqv̄k̄p'w̄wo *OPhysiological Reports.*"4*: +.'r r 08343366g343360"
- M̄t̄gk̄f gt.'T00"42250Gh̄geu'qh'et̄g'v̄k̄p'g'uwr r̄go gpvc'v̄k̄p'qp'r̄ gthqto cpeg'cpf 'v̄t̄c'k̄p̄i " cf cr v̄c'v̄k̄p'pu0*Molecular and cellular biochemistry.*"466*3/4+.'r r 0; 6; 60"
- M̄t̄gk̄f gt.'T00'gv'cr̄0"42320KUP "gz gtekug"("ur̄ qt v̄p'w̄t'k̄k̄p't̄g'x̄k̄y <t̄gugctej "(" t̄geqo o gp̄f c'v̄k̄p'pu0*Journal of the International Society of Sports Nutrition.*"9*3+.'r r 00"
- M̄t̄ḡw̄ej . 'O 00'H̄q̄pi . 'C0M0('I t̄ggp.'O 0Y 0'3; ; ; 0Dḡj c̄x̄k̄q̄t̄c̄n̄'c̄p̄f "dqf { "uk̄ g'eq̄t̄t̄ḡr̄v̄ḡu'qh" gp̄gti { "k̄p̄v̄c̄n̄g'w̄p̄f ḡt̄t̄ḡr̄ q̄t̄v̄k̄p̄i "d{ "q̄d̄ḡug'c̄p̄f "p̄q̄to c̄n̄/y gli j v̄'y qo gp0*Journal of the American Dietetic Association.*."; ; *5+.'r r 052268=s w̄k̄ "5296: 0"
- N̄chc { . 'N0'gv'cr̄0"3; ; 90F ḡv̄ḡto k̄p̄c̄p̄u'c̄p̄f "p̄c̄w̄t̄g'q̄h'f̄ k̄ḡv̄c̄t { "w̄p̄f ḡt̄t̄ḡr̄ q̄t̄v̄k̄p̄i "k̄p'c'ht̄ḡg'rk̄k̄p̄i " r̄qr̄ w̄c'v̄k̄p'p'v̄j g'H̄ḡw̄t̄d̄c̄k̄ "N̄c̄x̄ḡp̄v̄k̄g'X̄k̄n̄g'Ūc̄p̄v̄ *HXU+Ūw̄f { *International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity.*"43*9+.'r r 07896950"
- N̄co d̄gt̄v.'G0X'gv'cr̄0"3; ; 60Ḡp̄j c̄p̄egf "gp̄f w̄t̄c̄p̄eg'k̄p'v̄t̄c'k̄p̄gf "e { er̄k̄u'f w̄t̄k̄p̄i "o qf ḡt̄c̄v̄g" k̄p̄v̄ḡp̄ūk̄{ "gz gtekug'hqmy kpi '4'y ggm'cf cr v̄c'v̄k̄p'v̄q'c'j ki j 'h̄c̄v̄f̄ k̄ḡ0*European journal of applied physiology and occupational physiology.*"8; *6+.'r r 04: 96; 50"
- N̄c̄w̄t̄ḡp̄v.'F 0'gv'cr̄0"42220Gh̄geu'qh'ech̄h̄k̄p̄g'qp'o w̄ūer̄g'i n̄f̄ eqi gp'w̄k̄k̄k̄ c'v̄k̄p'cpf "vj g" p̄ḡw̄t̄q̄gp̄f q̄et̄k̄p̄g'c̄z̄k̄u'f w̄t̄k̄p̄i "gz gtekug0*The Journal of clinical endocrinology and metabolism.*."; 7*8+.'r r 04392670"
- N̄geq̄w̄t̄g.'X0('Ūej w̄l . [0"422; 0Gh̄geu'qh'c'uo c̄n̄f̄ q̄ug'qh'c̄r̄eq̄j q̄n̄'q̄p'vj g'gp̄f w̄t̄c̄p̄eg" r̄ gthqto cpeg'qh'v̄t̄c'k̄p̄gf "e { er̄k̄u0*Alcohol and alcoholism.*"66*5+.'r r 049: 6; 50"
- N̄gp̄l . 'G00'0gv'cr̄0"42250C'3J 'P O T/dcugf "o ḡc̄w̄d̄q̄p̄qo k̄e'uw̄f { "qh'v̄t̄k̄p̄g'c̄p̄f "r̄ n̄c̄u c" ūc̄o r̄ n̄ḡu'q̄d̄v̄c'k̄p̄gf "ht̄qo "j ḡc̄n̄j { "j w̄o c̄p'uw̄d̄l̄ḡēu0*Journal of Pharmaceutical and Biomedical Analysis.*"55*7+.'r r 08325633370"
- N̄k̄f f̄r̄g.'F 0('Ēq̄p̄p̄q̄t.'F 00"42350P w̄t̄k̄k̄q̄p̄c̄n̄Ūw̄r r̄go gp̄v'c̄p̄f "Ḡti q̄i gp̄k̄e'C̄k̄f u0' *Primary Care: Clinics in Office Practice.*"62*4+.'r r 06: 967270"
- N̄k̄p̄f j . 'C00'0gv'cr̄0"422: 0Ūq̄f k̄wo "d̄l̄ēc̄t̄d̄q̄p̄c̄v̄g'k̄o r̄t̄q̄x̄ḡu'uy k̄o o k̄p̄i "r̄ gthqto cpeg0 *International journal of sports medicine.*"4; *8+.'r r 073; 6450"
- N̄k̄k̄p̄i ūv̄q̄p̄g.'O 00'gv'cr̄0"3; ; 20C̄ēēw̄t̄c̄e { "q̄h'y gli j gf "f̄ k̄ḡv̄c̄t { "t̄ḡēq̄t̄f u'k̄p'uw̄f k̄ḡu'q̄h'f̄ k̄ḡv'c̄p̄f " j ḡc̄n̄j *OBMJ (Clinical research ed.).*"522*8948+.'r r 02: 6340"
- N̄w̄p̄f s̄w̄k̄u.'H0'gv'cr̄0"3; 870I n̄f̄ ēḡt̄q̄n̄'0 ḡc̄w̄d̄q̄r̄k̄uo "k̄p'vj g'j w̄o c̄p'ik̄x̄ḡt'k̄p̄j k̄d̄k̄k̄p̄d' { "ḡy c̄p̄q̄r̄0' *Science.*"372*58; 8+.'r r 0838690"
- N̄{ p̄ej . 'U0"42350Vj g'f̄ h̄ḡt̄ḡp̄v̄c̄n̄'gh̄geu'qh'c'eqo r̄ n̄z "r̄ t̄q̄v̄k̄p'f̄ t̄k̄p̄n̄ix̄ḡt̄ūw̄u'k̄ūq̄ēc̄n̄t̄l̄e" ēc̄t̄d̄q̄j { f̄ t̄c̄v̄g'f̄ t̄k̄p̄n̄'q̄p' r̄ gthqto cpeg'k̄p' k̄ēḡu'hqmy kpi "j ki j /k̄p̄v̄ḡp̄ūk̄{ 't̄ḡūk̄ūc̄p̄eg"

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O cef gto kf .*ROY* 0'gv'cr0"42340C"eqo r ctcvkg'cpcn{ uku'dgvy ggp'yj g'ghgeu'qh'i crcevug" cpf "i nvequg'uw r ngo gpvcvqp"qp"gpf wtcepg'r gthqto cpeg0*International journal of sport nutrition and exercise metabolism.*"44*3+.'r 0466520"

O cem'I 0Y 0'gv'cr0"3; ; 60Dqf { 'hvkf "dcrpep'kp'f gj { f tcvgf 'j gcnj { "qrf gt'o gp<yj kuv'cpf " tgpcl'quo qtgi wcvvqp0*Journal of applied physiology,* '98*6+.'r r 08376450"

O cf ugp."M0'gv'cr0"3; ; 20Ectdqj { f tcvg'uw r gteqo r gpucvqp"cpf "o wuerg'i n{eqi gp" wklkcvvqp'f wtkpi "gzj cwvkg'twppkpi "kp"j ki j n{ 'vtckpgf "cyj rgyu0*European journal of applied physiology.*"83.'r r 068966940"

O cf ugp."M0'gv'cr0"3; ; 20Ectdqj { f tcvg'uw r gteqo r gpucvqp"cpf "o wuerg'i n{eqi gp" wklk cvvqp'f wtkpi "gzj cwvkg'twppkpi "kp"j ki j n{ 'vtckpgf "cyj rgyu0*European journal of applied physiology and occupational physiology.*"83*7/8+.'r r 06896940"

O â j nwo .*U0* ('J gto cpugp."N0"3; 9: 00 wuerg'i n{eqi gp"eqpepvtcvvqp'f wtkpi "tgeqxt { " chgt'r tqmpf gf "ugxgtg'gz gtekug'kp'hcuvkpi "uwlgeu0*Scandinavian Journal of Clinical and Laboratory Investigation.*"5: *8+.'r r 07967820"

O ci c| cpkm"C0'gv'cr0"3; ; 30Ghgev'qh'cp'kqp"uw r ngo gpv'qp"dqf { "kqp"ucwu"cpf "cgtqdle" ecrcek{ "qh"qwpf "vtcklpi "y qo gp0*European journal of applied physiology and occupational physiology.*"84*7+.'r r 05396450"

O ci nqu."H0('I cppenqwk."O 0"42250O gyj qf qmji { "qh'f kvct { "cuuguu gpv'kp"cyj rgyu<" eqpegr w'cpf "r klcnu0*Current opinion in clinical nutrition and metabolic care.*"8*7+.'r r 075; 66; 0"

O ctvkp"Drp'f."L0('Cno cp."F 0"3; : 80Ucvkvekn'no gyj qf u'hqt"cuuguulpi "ci tggo gpv" dgvy ggp'y q"o gyj qf u'qh'ekp'lekn'no gcuwtgo gp0*The Lancet.*"549*: 698+.'r r 052965320"

O cwi j cp."T0L0"42250K r cev'qh'o kf "f gj { f tcvvqp"qp'y gmpguu"cpf "qp"gz gtekug" r gthqto cpeg0*European journal of clinical nutrition.*"79"Uw r n'4.'r r 003; 6450"

O eEnwpi .*L0R0'gv'cr0"422; 0T*cpf qo k gf ."f qwdrg/drkpf ."r ncegdq/eqptqmgf "vkn'qh'kqp" uw r ngo gpvcvqp'kp'hgo crg'uqrf kgtu'f wtkpi "o kkkct { "vtcklpi <ghgeu'qp'kqp"ucwu." r j { ulecn'r gthqto cpeg."cpf "o qqf 0*American Journal of Clinical Nutrition.*"2*3+.'r r 04663530"

O eNckp."V0C0'gv'cr0"42370F gxgrq r o gpv'qh'cp"Cpcgtqdle"Ur tkpv'Twppkpi "Vguv'Wukpi "c" Pqpo qxtk gf "Vtgcf o kn0*Journal of strength and conditioning research / National Strength & Conditioning Association.*"4; *+. 'r r 043; 964260"

O eP cwi j vqp."N0('Rtggeg."F 0"3; : 80Craqj qn'cpf "ku'ghgeu'qp"ur tkpv'cpf "o kf f r'f kuvpep" twppkpi 0*British journal of sports medicine.*"42*4+.'r r 0786; 0"

O gtt { .*V0N0'C*kpukg."R0P 0('Eqwgt."L0F 0"42320Ghgeu'qh'cgtqdle"hsppguu"qp" j { r qj { f tcvvqp/kpf wegf "r j { ukqrqi lecn'utckp"cpf "gz gtekug'ko r ckt o gp0*Acta physiologica.*"3; : *4+.'r r 089; 6; 20"

O gtv .*Y 0"3; ; 40H*qqf "kpveng"o gcuwtgo gpv<ku'yj gtc"o'i qrf "ucv'ctf öA'*Journal of the American Dietetic Association.*"4*34+.'r r 0685670"

- O gtv . 'Y 0'gv'cr0'3; ; 30Y j cv'ctg'r gqr ng'tgcm{ 'gcvkpi A'Vj g'tgrv'kqp'dgy ggp'gpgti { 'kpcng' f gtxgf 'Itqo 'guko cvgf 'f kv'tgeqtf u'cpf 'kpcng'f gvto kpgf 'vq'o ckv'kqp'dqf { 'y gli j v0' *The American journal of clinical nutrition.* '76*4+.'r r 0; 3670"
- O gwgt. 'U0('\ ko o gto cpp. 'O 00'42320Kqp'gzegu'k'p'tgetgcvkqpcn'o ctcvj qp'twppgtu0' *European Journal of Clinical Nutrition.* '86*7+.'r r 0; 266; 60"
- O khkp. 'O 0'gv'cr0'3; ; 20C'pgy 'r tgf kv'xg'gs wcvkqp'hqt'tgukpi 'gpgti { 'gZR gpf kwg'k'p" j gcnj { 'kpf kxf wcn0*Am J Clin Nutr.* '73*4+.'r r 046364690"
- O kpg. 'C0E0'O eP gkm'I 0('\ cnct{.'C0'3; ; 30Y gli j vej cpi g'cu'cp'kpf kv'vqt'qh'gpgti { " ko dcrpeg'f wtkpi '9'f c{ 'y gli j gf 'hqqf 'kpcng'uwf kv0*Ecology of Food and Nutrition.* " 48*6+.'r r 0; 364; ; 0"
- O qpecf c/lko gpgl . '0'gv'cr0'422; 0F wvj npp'r gthqto cpeg'wpcngtgf "d{ 'uj qt v'vto 'ej cpi gu' k'f kv'ct { 'h'v'cpf 'ectdqj { f tcvu0*International journal of sport nutrition and exercise metabolism.* '3; *3+.'r r 0696820'
- O qp'v'k'p. 'U0'gv'cr0'42290Vj gto cn'cpf 'Ectf kv'xuewrt 'U'cl'p'Itqo 'J { r qj { f tcv'k'p< " kv'hwpeg'qh'Gz gtekug'kv'gpuk{ 0*International Journal of Sports Medicine.* '3; *24+." r r 0 96; 30"
- O qp'v'k'p. 'U0('Eq{rg. 'G0H'3; ; 40'kv'hwpeg'qh'i tcf gf 'f gj { f tcv'k'p'qp'j { r gtvj gto kv'cpf " ectf kv'xuewrt 'f tkh'f wtkpi 'gz gtekug0*Journal of applied physiology.* '95*6+.'r r 05626 720"
- O qs w'k'p. 'C0('O c | | gq. 'T00'42220Gh'gev'qh'o kv'f gf 'f gj { f tcv'k'p'qp'yj g'xev'v'j tguj qrf 'k'p" y qo gp0*Medicine and science in sports and exercise.* '54*4+.'r r 05; 866240"
- O quj hgi j . 'C00'gv'cr0'422: 0Vj g'WUF gr ctvo gp'v'qh'Ci tkeww'g'Cwqo cvgf 'O wnk'rg/Rcu' " O gj qf 't'gf wegu'dku'k'p'yj g'eqmge'k'p'qh'gpgti { 'kpcng0*AMERICAN JOURNAL OF CLINICAL NUTRITION.* " : *4+.'r r 054665540'
- O qv'TY . 'Q0eppqt 'RL 'Vw'c'p'f v'N. 'Rwgv 'V. 'G00 0'42280Gh'gev'qh'Ech'k'p'g'qp'Ngi " O weng'Rcl'p'f wtkpi 'E { en'k'p' 'Gz gtekug'co qpi 'Hgo crgu0*Medicine & Science in Sports & Exercise.* '5: *5+.'r r 07; : 68260"
- O w'k'p. 'F 00'gv'cr0'3; ; 60Gh'gev'qh'f kv'ct { 'h'v'qp'o gv'cd'q'k'c'f lwvo gp'u'v'q'o czko cn'XQ4" cpf 'gp'f w'c'peg'k'p'twppgtu0*Medicine and science in sports and exercise.* "48*3+." r r 0 36: : 0"
- P cf gn 'G0T'0'3; ; 20E'k'ew'v'qt { 'cpf 'y gto cn't'gi w'v'k'p'u'f wtkpi 'gz gtekug0*Federation proceedings.* '5; *7+.'r r 06; 3690"
- P cv'k'p'cn'T gugctej 'Gj keu'Ugt'x'leg. '422; 0*Issues, guidance & evidence - Deception in medical research.*"
- P c| ct. 'M0'gv'cr0'3; ; 90R'cuo c'k'p'w'k'p'cpf 'E/r gr v'k'f g't'gur qpugu'v'q'qt'cn'i kv'equg'iqcf 'ch'gt' " r j { u'k'cn'gz gtekug'k'p'o gp'y kj 'p'qto cn'cpf 'ko r cktgf 'i kv'equg'v'q'gt'c'peg0*Acta physiologica Polonica.* '5: *8+.'r r 067: 6880"
- P gnu'p. 'O 0'gv'cr0'3; ; ; 0D'gy ggp/'cpf 'y kj k'p/uw'dl'gev'xct'k'v'k'p'k'p'p'w'k'p'v'k'p'cng'Itqo " kv'k'p'e { 'v'q'q'rf 'ci g'G'uko cv'k'p' 'y j g'p'wo dgt'qh'f c { u't'gs w'k'f gf 'v'q't'cp'n'f kv'ct { 'kpcng' " y kj 'f g'ukt'gf 'r t'gek'k'p'0*American Journal of Clinical Nutrition.* '72*3+.'r r 07763890'

P gwhgt. 'R0f'0gv'cr0'3; : 90K r tpxgo gpw'lp'gz gtekug'r gthqto cpeg<ghgeu'qh'ectdqj { ftcvg' hggf lpi u'cpf 'f kgv'0*Journal of applied physiology.*'84*5+.'r r Q : 56: 0"

P knuqp. 'N0' 0('J wno cp.'G0'3; 950Nkxgt 'i n(eqi gp'lp'o cp//vj g'ghgeu'qh'vqcn'uctxcv'kqp" qt"e'ectdqj { ftcvg/r qqt'f kgv'hqmjy gf "d{ 'ectdqj { ftcvg'tghggf lpi 0*Scandinavian journal of clinical and laboratory investigation.*'54*6+.'r r 05476520"

P {dq. 'N0'gv'cr0'42230Ghgeu'qh'o ctngf 'j { r gtvj gto kc'y kj "cpf 'y kj qwf'gj { ftcv'kqp"qp" XQ*4+'nkpg'leu'f wtkpi 'lpvgpug'gz gtekug0*Journal of applied physiology.*.'2*5+." r r 082796860"

QdDtkgp. 'E'0R0'3; ; 50Craej qn'cpf 'ur qt'v0K r cev'qh'uqekcnf t'kpnkpi "qp'tgetgcv'kqpcn'cpf " eqo r g'kxk'g'ur qt'u'r' gthqto cpeg0*Sports medicine.*'37*4+.'r r 093690"

QdDtkgp. 'E'0R0('N{ qpu. 'H0'42220Craej qn'cpf 'vj g'c'vj r'vg0*Sports medicine.*'4; *7+." r r 04; 765220"

QdMgghg. 'M0C'0gv'cr0'3; ; : 0F kgvct { 'ectdqj { ftcvg'lpwcmg'cpf "gpf wt'cpeg'gz gtekug" r gthqto cpeg'qh'v'ckp'gf 'hgo crg'e{ enkuu0*Nutrition Research.*.'; *+.'r r 0 3; 6: 520"

Qhleg'hqt'P cv'kqpcn'Ucv'k'leu.'422: 0*General Lifestyle Survey-Smoking and Drinking Among Adults, 2008.*"Nqpf qp0"

Qr'xgt. 'U0'0gv'cr0'422: 0Uc'kxc'lpf legu'tcemj { r qj { ftcv'kqp'f wtkpi "6: j "qh'h'w'kf "t'gut'lev'kqp" qt'eqo d'kpgf 'h'w'kf "cpf "gp'gti { "t'gut'lev'kqp0*Archives of oral biology.*'75*32+.'r r Q 976 : 20"

Qr r'ki gt. 'T0C'0gv'cr0'42270Cee'w'ce { "qh'v'w'kpg'ur gek'le'i t'cx'k'v{ "cpf "quo q'm'k'v{ "cu" k'p'lec'v'qtu'q'h'j { ftcv'kqp'uc'w'u0*International journal of sport nutrition and exercise metabolism.*'37*5+.'r r 04586730"

Qu'q'le. 'U0' 0('Cj o g'q'x'k'e.\ 0'422: 0Y ggm{ 'v'ck'p'kpi "x'q'n'w'o g'cpf "j go cv'q'm'i kec'n'uc'w'u" k'p'hgo crg'v'qr /r'x'g'n'c'vj r'vgu'qh'f k'h'gt'gp'v'ur qt'u0*The Journal of sports medicine and physical fitness.*'6: *5+.'r r 05; : 66250"

Qw'w'ey. 'L0'gv'cr0'42350Ghgeu'qh'l'pi gu'k'qp'qh'c'eqo o gte'k'cm{ "cx'ck'rd'ng'vj gto qi g'p'le" f kgvct { "u'w' r'ngo gp'v'qp't'gu'k'pi "gp'gti { "gz'r'gp'f'kw't'g.'o q'q'f "uc'v'g'cpf "ect'f'k'x'c'ue'w'ct" o gcu'w't'gu0*Journal of the International Society of Sports Nutrition.*'32*3+.'r r 0470"

Qzh'q'tf 'Dt'q'q'ngu'W'p'k'x'g't'uk'v{.'42360Qzh'q'tf 'Dt'q'q'ngu'W'p'k'x'g't'uk'v{ "/"R'ct'n'k'pi 'r gto k'v'q't'f'gt" h'q'to 0C'x'ck'rd'ng'cv'<j' w'r'u'4ly y y 0lt'q'q'ngu'0e'0w'ic'd'q'w' dt'q'q'ngul'uw'v'ck'p'cd'k'k'v{ l't'c'x'g'n'l'w'p'k'x'g't'uk'v{/ect/r'ct'n'k'pi l'r'ct'n'k'pi /r gto k'v'q't'f'gt/h'q'to l']C'ee'gu'gf 'C'r't'ki'36.'4236_0"

Rgg'k'pi. 'R0'gv'cr0'422; 0Ghgeu'qh'Gz gtekug"qp'J gr ekf lp'T gur qpug'cpf "Kqp'O g'v'cd'q'r'kuo " F wtkpi "T ge'q'x'gt { 0*International Journal of Sport Nutrition and Exercise Metabolism.*" 3; *8+.'r r 07: 567; 90"

Rgr'eq'x'a. 'L0'Y crkf. 'G0C0('Xc-'f'eq'x'a. 'L0'42320Uwf { "qh'f'c{.'o qp'vj "cpf "ug'cu'qp" r gf qo g'v'gt/f g'v'gto k'p'gf "x'ct'k'd'k'k'v{ "qh'r'j { u'lec'n'c'ev'x'k'v{ "qh'j'k'j "u'ej'q'q'n'r'w'r'k'u'lp'v'j'g" e'l'gej "t'gr'w'd'ike0*Journal of sports science & medicine.*.'; *5+.'r r 06; 26: 0"

Rgt't'k'gt. 'G0'gv'cr0'42350J { ftcv'kqp'd'k'qo ctng'tu'lp'h'gg'rk'k'pi "cf'w'u'y'kj "f'k'h'gt'gp'v'rg'x'g'n'qh'" j'cd'k'w'cn'l'h'w'kf "eq'pu'wo r v'k'qp0*The British journal of nutrition.*'32; *; +.'r r 089: 6: 90"

- Rgutleq. 'E00('O cej cf q. 'HC0'42360E qo r ctc± q'gpvtg'f gugo r gpj qu'f g'eqttkf c'vko g' vlcrltgrk cf qu'go 'r kuc'g'gungktc0'Revista Brasileira de Cineantropometria e Desempenho Humano.'38*6+.'r 06780"
- Rj kkr u. 'U00'U{ngu. 'F0('I kduq. 'P0'42360J {f tcvkqp'Ucww'cpf 'Hwkw'Dcrrpeg'qh'Gkxg' Gwtqr gcp'f qwj 'Uqeeqt'Rrc {gtu'f vtlpi 'Eqpugewkxg'Vtcklpi 'Uguukqpu0'Journal of sports science and medicine.'*Cr tkn: 'r r 0 396: 440'
- Rlej cp. 'I 0gv'cr0'3; : : 0Ghgev'qh'r tlo ct { 'j { r qj { f tcvkqp'qp'rj { ulecn'y qtnlecr cek { 0' International Journal of Biometeorology.'54*5+.'r r 09863: 20'
- Rkukrf ku. 'f (R0'F wki pcp. 'E0('O cwi j cp. 'T00'3; ; 80Ghgevu'qh'cngtcvkapu'lp'f lgvct { " ectdqj { f tcvg'kpcng'qp'tvppkpi 'r gthqto cpeg'f vtlpi 'c'32'no 'v'gcf o kn'vko g'v'kcr0' British journal of sports medicine.'52*5+.'r r 04486530"
- Rrc {gt. 'F 00('Ngy ku. 'O (R0'42340O gej cpluo u'cevkcckpi 'RI E/3 'cpf 'eqpugs wgpv'kcn' v'cpuetr v'qpcn'o gej cpluo u'hqmqy kpi 'gz gtekug<C'o kpk'tgkgy 0'Cellular and Molecular Exercise Physiology.'3*3+.'r 040"
- Rqr qxc. 'U0gv'cr0'42290E qo r ctkpi 'creqj qre'qpuwo r v'kqp'lp'egpvtcr'cpf 'gcuwtp'Gwtqr g'v'q' qyj gt'Gwtqr gcp'eqwv'kgu0'Alcohol and Alcoholism.'64*7+.'r r 068766950"
- Rqr qy unk 'N00'0gv'cr0'42230Dmqf 'cpf 'v'kpcet { 'o gcuwtgu'qh'j { f tcvkqp'ucww'f vtlpi " r tqi tguukxg'cewg'f gj { f tcvkqp0'Medicine and science in sports and exercise.'55*7+.'r r 0696750"
- Rtggp. 'F 0gv'cr0'42250E tgc'v'kg'uw r ngo gpv'kqp<c'eqo r ctkuqp'qh'm'cf kpi 'cpf " o clp'v'gpcpeg'r tqv'eqn'qp'etgc'v'kg'w'v'cng'd { 'j wo cp'ung'v'cno' wueng0'International journal of sport nutrition and exercise metabolism.'35*3+.'r r 0 963330"
- Rtggp. 'F 0gv'cr0'42230Ghgev'qh'etgc'v'kg'm'cf kpi 'qp'm'pi /v'gto 'ur tlv'gz gtekug'r gthqto cpeg" cpf 'o g'v'cdqrkuo 0'Medicine and science in sports and exercise.'55*7+.'r r 0 366430"
- Rtgpv'eg. 'C00'0gv'cr0'3; : 80J ki j 'h'x'gm'qh'gp'gti { "gzr gpf kwt'g'lp'qdgug'y qo gp0'British medical journal (Clinical research ed.).'4; 4*8748+.'r r 0 : 5690"
- Rtkej ctf /Rgvej gm 'M00'0gv'cr0'42320Rugwf qgr j gf t'kpg'kpi gukqp'cpf 'e { er'kpi 'vko g'v'kcn' r gthqto cpeg0'International journal of sport nutrition and exercise metabolism.'" 42*4+.'r r 0546: 0"
- Tcdgp. 'C0'VCI NKDWG. 'C0('C'utw. 'C0'3; ; 70Vj g'tgr tqf w'ek'k'k'v' { 'qh'uwdl'ge'v'xg' cr r g'v'kg'ueqt'gu0'British Journal of Nutrition.'95*26+.'r r 073967520'
- Tcven'h. 'N00'0gv'cr0'42330Vj g'lp'h'w'gpeg'qh'j cdkw'cn'gz gtekug'v'kcklpi 'cpf 'o g'cn'hqto 'qp'f lgv' kpf w'egf 'v'j gto qi g'p'guku'lp'eqngi g'ci g'o gp0'International journal of sport nutrition and exercise metabolism.'43*3+.'r r 036: 0'
- Tcwej. 'J 0 (N00'0gv'cr0'42270C'uki p'cn'kpi 't'qng'hqt'o wueng'i n'eqi gp'lp'v'j g'tgi w'v'kqp'qh' r ceg'f vtlpi 'r tqm'pi gf 'gz gtekug0'British journal of sports medicine.'5; *3+.'r r 0665: 0'
- Tcwej. 'N00'0gv'cr0'3; ; 70Vj g'gh'gewu'qh'ectdqj { f tcvg'h'q'cf kpi 'qp'o wueng'i n'eqi gp'eqp'v'gpv' cpf 'e { er'kpi 'r gthqto cpeg0'International journal of sport nutrition.'7*3+.'r r 0476580"
- Tqdg'v. 'L00'0gv'cr0'42340Cp'lp'x'g'uki c'v'xg'u'w'f { 'lp'v'j g'lp'h'w'gpeg'qh'c'eqo o g'tek'cm { "

cxckrdng"ectdqj { ftcvg/r tqvklp/grgevtqn(vg'dgxgtci g"qp"uj qtv'vgtto 'tgr gcvgf "gz gtekug"
r gthqto cpeg0*Journal of the International Society of Sports Nutrition.*"; *3+.'r 0'

Tqdgwtu."U'gv'cr0"42350I n(ego k'e'tgur qpug'vq'ectdqj { ftcvg"cpf "vj g"ghgevu'qh'gz gtekug"cpf "
r tqvklp0*Nutrition.*"4; *8+.'r r 0 : 3ó: : 70'

Tqf tki wgl . 'P 0T0'F K'O cteq.'P 00 0('Ncpi rg{.'U0"422; 0Co gtlecp'Eqmgi g'qh'Ur qt w"
O gf kelpg'r quklqp"ucpf 0P wtklqp"cpf "cyj ngvle'r gthqto cpeg0*Medicine and science
in sports and exercise.*"63*5+.'r r 02; 6530"

Tqhg{.'F 00 0'D{tpg.'P 00 0('J km.'C'RO"42280F c{/vq/f c{'xctkpeg'lp"o gcuwtgo gpv'qh"
tgunpi "o gxcdqrle'tcvg'wulpi 'xgpvkrvgf /j qqf "cpf "o qwj r kgeg"('pqug/enr "lpf kgev"
ecmtko gvt { 'u{ugvo u0*JPEN. Journal of parenteral and enteral nutrition.*"52*7+."
r r 6486540"

Tqmq."U'gv'cr0"422: 0Vj g'kphwpeg'qh'ectdqj { ftcvg"o qwj 'tkpug'qp'ugr/ugrvgf "ur ggf u"
f wtkpi "c"52/o kp'tgcf o knltwp0*International journal of sport nutrition and exercise
metabolism.*"3: *8+.'r r 07: 768220"

Tqmiej.'O 0 0'Hqj t.'LO0('Dtgxctf.'R'D0"42240Vj g'ghgevu'qh'f kv'o cplr wv'kpu"qp"
cgtqdle'r gthqto cpeg0*International journal of sport nutrition and exercise
metabolism.*"34*6+.'r r 06: 2ó; 0'

Tqug.'C'LO'gv'cr0"42230Ghgevu'qh'r tkqt "gz gtekug"qp"i nvequg"o gxcdqrkuo "lp"v'ckpgf "o gp0"
American journal of physiology. Endocrinology and metabolism."4: 3*6+.'r r 0G9886
G9930'

Two r rgt."Y 0X'gv'cr0"422: 0K gpvkh'kpi "uqwtegu'qh'tgr qt v'kpi "gttqt"vulpi "o gcuwtgf "hqf "
kpvng0*European Journal of Clinical Nutrition.*"84*6+.'r r 076667740"

Twj gthqt f.'LO0'Ur tkgv.'NON0('U'gnkpi y gth."V0"42320Vj g'ghgevu'qh'cewg'v'wtkpg"
kpi guklqp"qp"gpf wtcepg'r gthqto cpeg"cpf "o gxcdqrkuo "lp"y gm'v'ckpgf "e{enkuu0"
International journal of sport nutrition and exercise metabolism."42*6+.'r r 05446; 0"

Ucpf ut'3o . 'I 0'D'41guuqp.'O 0('T'3'4 lgt."U0"42340Kqp'F ghkelp{ 'lp"Cf qnguegpv'Hgo crg"
C'j ngvuó K'Kqp'U'cwu'Chgevgf 'd{ 'Tgi wrt'Ur qt v'kpi "C'v'kxk{A'*Clinical Journal of
Sport Medicine.*"44*8+.'r r 06; 767220"

F'K'Ucpvqm.'O 0'gv'cr0"42290Cpgo kc"cpf "tkqp"ucwu'lp"{ qwpi "hgt v'kg'pqp/r tqhguukqpen"
hgo crg"cyj ngvu0*European Journal of Applied Physiology.*"324*8+.'r r 025692; 0"

Ucy c{c.'C0'gv'cr0"3; ; 80'Gxcnvc'kqp"qh'hqt"o gvj qf u'hqt'f gvgto k'kpi "gpgti { "kpvng'lp"
{ qwpi "cpf "qrf gt'y qo gp'<eqo r ctkuqp'y kj "f qwdn{ 'rdgrgf "y cvgt"o gcuwtgo gpw'qh"
v'v'cn'gpgti { "g'zr gpf kwtg0*Am J Clin Nutr.*"85*6+.'r r 06; 366; ; 0"

Ucy m.'O 0'0'gv'cr0"42290Co gtlecp'Eqmgi g'qh'Ur qt w'0 gf kelpg'r quklqp"ucpf 0Gz gtekug"
cpf "m'k'f "tgr n'ego gp0*Medicine and science in sports and exercise.*"5; *4+.'r r 05996
; 20"

Ucy m.'O 0'0'gv'cr0"3; ; 70'kphwpeg'qh'j gcv'utgu'ucpf "ceerko cv'kqp"qp"o czko c'c'gtqdle"
r qy gt0*European journal of applied physiology and occupational physiology.*"75*6+."
r r 04; 66: 0"

Ucy m.'O 0'0'3; ; 40'Rj { ukmqi k'cn'eqpugs w'pegu'qh'j { r qj { ftcv'kqp'<gz gtekug'r gthqto cpeg"

- cpf 'yj gto qtgi wrcvkp0*Medicine and science in sports and exercise.*"46*8+.'r r 08796 920"
- Uej o kw.'N0'gv'crl0"422: 0Qr wvkc'Hewu'kpf lec'kpet gcugu'j gctv'tcv'xctkcdkxv' 'kp'j ki j /ngxgn' cvj ngvu0*International Journal of Sport Nutrition and Exercise Metabolism.*"3: *4+." r r 08; 639: 0"
- Uej qgmt.'F 0C0"3; ; 20J qy 'Ceewtcvg'Ki'Ugrh/T gr qtvgf 'F kvct { 'Gpgti { 'KpvcngA'*Nutrition Reviews.*"6: *32+.'r r 095659; 0"
- Uej wj .'.N0Q0'gv'crl0"3; ; 40Gpgti { 'gxr gpf kwg'qh'gkxg'hgo crg'twppgtu'o gcuwtgf 'd { " tgr kcvqt { 'ej co dgt'cpf 'f qwdn' 'rdgrgf 'y cvgt0*Journal of applied physiology.*"94*3+." r r 0456: 0"
- Uej wo o .'.U0'0'gv'crl0"422: 0J qto qpcrl'tgur qpug'vq'ectdqj { f tcv'uw r ngo gpvcvkp'cv'tguv' cpf 'chgt'tgukvpep'gzgtekug0*International Journal of Sport Nutrition and Exercise Metabolism.*"3: . 'r r 048264: 20"
- Uekppeg'cpf 'vgej pqmji { 'Eqo o gwgg."42330*Alcohol guidelines.*"Nqpf qp0"
- Uj gto cp.'Y 00'gv'crl0"3; ; ; 0Ghgewu'qh'6'j 'r tggz gtekug'ectdqj { f tcv'ggf kpi u'qp'e { erkpi " r gthqto cpeg0*Medicine and science in sports and exercise.*"43*7+.'r r 07; ; 68260"
- Uj ktghu."U00'gv'crl0"42260'Vj g'ghgewu'qh'hvxf'tguktvkp'qp'j { f tcv'uw'ucwu'cpf " uwdlgev'xg'hgkpi u'kp'o cp0*The British journal of nutrition.*."3*8+.'r r 0736: 0"
- Uj ktghu."U00' 'O cwi j cp.'T00"3; ; ; 0Wkpg'quo qmrv' { 'cpf 'eqpf wv'xk' { 'cu'kpf keg'qh' j { f tcv'uw'ucwu'kp'cvj ngvu'kp'y g'j gc0*Medicine and science in sports and exercise.*"52*33+.'r r 07; ; 68240"
- Ukgrgt.'U0E0'gv'crl0"42350'Vj g'ghgev'qh'ectdqj { f tcv'cpf 'o ctkpg'r gr v'f g'j { f tqn'ucv'eq/ kpi guvkp'qp'gpf wtcpeg'gzgtekug'o gvcdrkuo "cpf 'r gthqto cpeg0*Journal of the International Society of Sports Nutrition.*"32*3+.'r r 04; 0"
- Ukntw'Nco kpc.'E00G0C0K0V0G0W0C0"42350Ghgewu'qh'htgg'tcf kcn'cpf "cp'kqz'kf cpw'qp" gzgtekug'r gthqto cpeg0*Oxidants and Antioxidants in Medical Science.*"4*4+.'r r 056 ; 30"
- Ukrgt.'U0S0'gv'crl0"3; ; ; 0Vj g'kpi kdkk'qp'qh'i nveppqi gpguku'hqmty kpi "creqj qrl'p'j wo cpu0 *The American journal of physiology.*"497*3+.'r r 0G; ; 96; 290"
- Ukpf j k'X0'gv'crl0"42350Rqvgp'kcn'r r nccvkpu'qh'cp'kqz'kf cpw'o'C'tgxky 0*Journal of Pharmacy Research.*"9*+.'r r 04: 6: 570"
- Uk34 kp.'C00'gv'crl0"3; ; ; 60Gpgti { 'drcpeg'kp'etquu'eqwvt { 'unkgtu'c'uwf { 'wukpi 'f qwdn' " rcdgrgf 'y cvgt0*Medicine and science in sports and exercise.*"48*8+.'r r 042660"
- Uo cm'N0'gv'crl0"422; 0Xcnf kv' 'cpf 'Tgrkcdkxv' 'qh'Rj qvqi tcr j le'F kv'F kctkgu'ht'Cuugukpi " F kvct { 'Kpvcng'Co qpi 'I qwpi 'Ej kf tgp0*ICAN: Infant, Child, & Adolescent Nutrition.*"3*3+.'r r 0496580"
- Xcp'Uqgtgp.'O 00' 'I tej co .'.V00"3; ; ; 0Ghgewu'qh'echgkpg'qp'o gvcdrkuo . 'gzgtekug' gpf wtcpeg.'cpf 'ecvgej qmco kpg'tgur qpugu'chgt'y kj f tcy crl0*Journal of applied physiology.*."7*6+.'r r 06; 567230"

Uqmcpm'MLO'g'v'c'f'0'42330Rq'v'p'k'c'f'0' r'cev'q'h'c'722/o'N'y'c'v'g't'd'q'n'u'c'p'f'd'q'f'{''o'c'u'u'q'p''
r'c'u'o'c'q'u'o'q'r'c'k'v'{'f'k'w'k'q'p'0'European journal of applied physiology.'333*,'+'
r'r'Ø'; ; 642260"

xcp'U'q'o'g't'g'p.'MOC'0'g'v'c'f'0'42270E'q'o'r'c't'k'u'q'p'q'h'v'j'g'N'c'e'v'c'v'g'R't'q'c'p'f'C'p'c'm'z'I' O'9'D'm'q'f''
N'c'e'v'c'v'g'C'p'c'n'f'g'u't'u'0'International Journal of Sports Medicine.'48*,'+'r'r'Ø7968830"

U'r'g'p'g'.'C'ON'0'g'v'c'f'0'42350C'eq'o'r'c't'k'u'q'p'q'h'e'c'h'g'k'p'g'x'g't'u'u'r'u'g'w'f'q'g'r'j'g'f't'k'p'g'q'p'e'{'e'n'k'p'i''
v'k'o'g'v't'k'n'r'g'h'q't'o'c'p'g'0'International journal of sport nutrition and exercise
metabolism.'45*7+,'r'r'Ø7296340"

U'c'ej'g'p'h'g'r'f.'P'U'0'g'v'c'f'0'3; ; 80'V'j'k't'u'v'c'p'f'f'k'w'k'f't'g'i'w'r'c'v'q't'{'t'g'u'r'q'p'u'g'u'v'q'j'{'r'g't'v'q'p'k'v'k'{'k'p''
q'r'f'g't'c'f'w'u'u'0'The American journal of physiology.'493*4+,'r'r'Ø9796870"

U'c'ej'g'p'h'g'r'f.'P'U'0'U'k'k'c.'E'0('M'g'g'h'g.'F'ON'0'42220G'u't'q'i'g'p'o'q'f'k'h'g'u'v'j'g'v'g'o'r'g't'c'w't'g''
g'h'g'ew'q'h'r't'q'i'g'u'v'g't'q'p'g'0'Journal of applied physiology.'; : *7+,'r'r'Ø8656; 0"

U'c'o'h'q't'f.'D'OC'0'T'q'y'm'p'f.'T'0('O'q'h'c'w.'T'OL'0'3; 9: 0'G'h'g'ew'q'h'u'g'x'g't'g'r't'k'q't'g'z'g't'ek'ug'q'p''
c'u'g'u'uo'g'p'v'q'h'o'c'z'k'o'c'n'q'z'{'i'g'p'w'r'c'v'ng'0'J Appl Physiol.'66*6+,'r'r'Ø7; 67850"

U'q'em'g'{'.'N'0'3; : 70'E'j'c'p'i'g'u'k'p'j'c'd'k'w'n'h'q'q'f'k'p'v'c'ng'f'w'l'k'p'i'y'g'k'i'j'g'f'k'p'x'g'p'v'q't'{'u'w'x'g'{'u''
c'p'f'f'w'r'k'c'v'k'p'f'k'g'v'e'q'm'g'e'v'k'p'u'OC'uj'q't'v't'g'x'k'g'y'0'Ecology of Food and Nutrition.'
39*5+,'r'r'Ø485648; 0"

U'w'd'c't.'C'OH'0'42250W'u'k'p'i'k'p'v'c'ng'D'k'q'o'c't'n'g't'u'v'q'G'x'c'w'c'v'g'v'j'g'G'z'v'g'p'v'q'h'F'k'g'v'c't'{'
O'k'u't'g'r'q't'v'k'p'i'k'p'c'N'c't'i'g'U'c'o'r'g'q'h'C'f'w'u'u'<V'j'g'Q'R'G'P'U'w'f'{'0'American Journal of
Epidemiology.'37: *3+,'r'r'Ø6350"

V'c't'p'q'r'q'n'u'f'.'O'OC'0'422: 0'G'h'g'ew'q'h'e'c'h'g'k'p'g'q'p'v'j'g'p'g'w't'q'o'w'ue'w'c't'u'{'u'g'o'ô' 'r'q'v'p'k'c'n'c'u''
c'p'g't'i'q'i'g'p'k'e'c'k'f'0'Applied Physiology, Nutrition, and Metabolism.'55*8+,'r'r'Ø4: 66
34; ; 0"

V'c't'p'q'r'q'n'u'f'.'O'OC'0'g'v'c'f'0'3; ; 80'G'h'g'ew'q'h't'c'r'k'f'y'g'k'i'j'v'h'q'u'u'c'p'f'y't'g'u'v'k'p'i'q'p'o'w'u'eng''
i'n'{'e'q'i'g'p'eq'p'eg'p't'c'v'k'p'0'Clinical journal of sport medicine.'8*4+,'r'r'Ø: 60"

V'c't'p'q'r'q'n'u'f'.'O'OC'0'g'v'c'f'0'42230I'g'p'f'g't'f'k'h'g't'g'p'eg'u'k'p'ect'd'q'j'{'f't'c'v'g'h'q'c'f'k'p'i'c't'g't'g'r'v'g'f'v'q''
g'p'g't'i'{'k'p'v'c'ng'0'Journal of applied physiology.'; 3*3+,'r'r'Ø476520"

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Sports Medicine.'48*,'+'r'r'Ø36693: 0"

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- Vqttgu/O eI gj gg."V00 0'gv'cr0"42340Ur qtw'pwtkkqp'npqy rgi g'co qpi 'eqmgi kv'cyj rgyu." eqcej gu.'cyj rgle'tckpqtu."cpf "utgpi vj "cpf "eqpf kkkpki "ur gekrkuu0*Journal of athletic training.*"69*4+.'r r 04276330"
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Appendix A

Gj k'eu'cr r tqxcn'qh'vj g'uwf { 'r' t g u g p v g f 'k p' E j c r v g t '50'

1 July 2013

Dear Dr Simpson

UREC Registration No: 130740

The variability of energy and nutrient intakes using three different dietary standardisation techniques in athletes

Thank you for the email of 20 June 2013 outlining the response to the points raised in my previous letter about the PhD study of your research student Alaaddine El-Chab, and attaching the revised documents. I am pleased to inform you that, on this basis, I have given Chair's Approval for the study to begin.

The UREC approval period for this study is two years from the date of this letter, so 1 July 2015. If you need the approval to be extended please do contact me nearer the time of expiry.

In order to monitor studies approved by the University Research Ethics Committee, we will ask you to provide a (very brief) report on the conduct and conclusions of the study in a year's time. If the study is completed in less than a year, could you please contact me and I will send you the appropriate guidelines for the report.

Yours sincerely

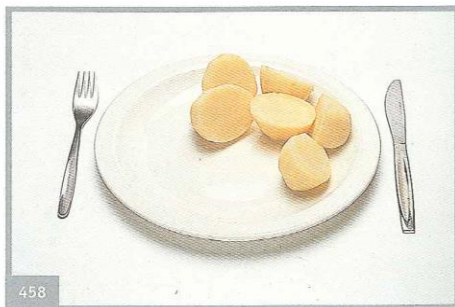
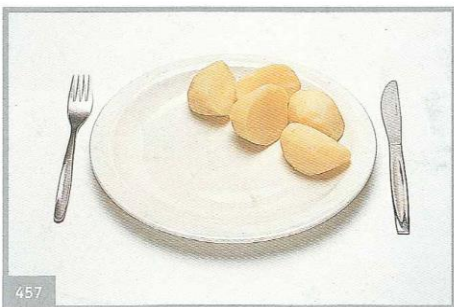
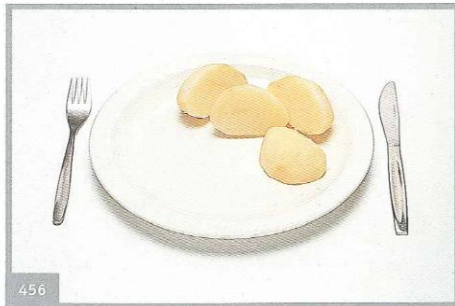
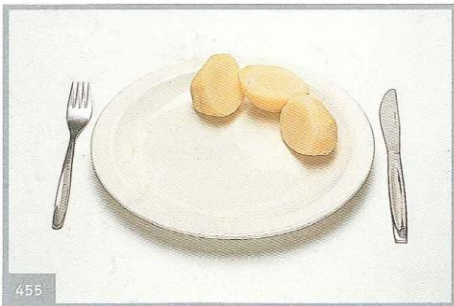
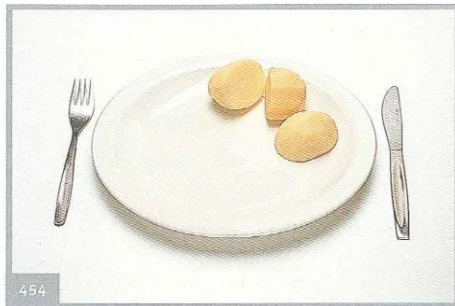
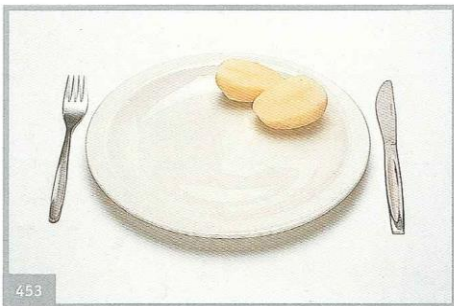
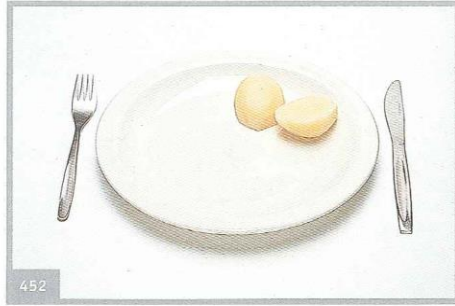
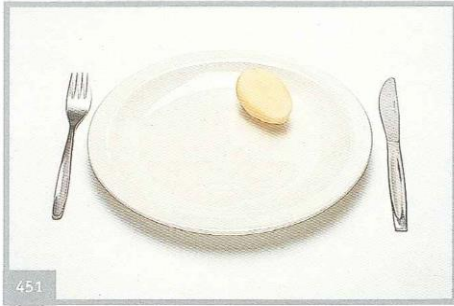
Hazel Abbott
Chair of the University Research Ethics Committee

| Day Thurs | | Date 31 March | | |
|-----------------------|---|--|---|--|
| Time | Where? With whom? TV on? Table? | Food/Drink description & preparation | Brand Name | Portion size or quantity eaten |
| 6am to 9am | | | | |
| 6.30 am | Kitchen Alone No TV Not at table (standing) | Filter coffee, decaffeinated milk (fresh, semi-skimmed) Sugar white | Douwe Egberts Silterspoon | Mug A little 1 level tsp |
| 7.30 am | Kitchen Partner TV on At table | Filter coffee with milk and sugar Cornflakes Milk (fresh, semi-skimmed) Toast, granary medium sliced Light spread Marmalade | As above Tesco's own Hovis Flora Hartleys | As above 1B drowned 1 slice med spread 1 heaped tsp |
| 9am to 12 noon | | | | |
| 10.15 am | Office desk Alone | Instant coffee, not decaffeinated Milk (fresh, whole) Sugar brown | Kenco | Mug A little 1 level tsp |
| 11 am | Office desk Alone | Digestive biscuit – chocolate coated on one site | McVities | 2 |

| Time | Where? With whom? TV on? Table? | Food/Drink description & preparation | Brand Name | Portion size or quantity eaten |
|----------|--|--|-------------------------------------|--|
| 12.30 pm | Work tea room With colleagues | 12 noon to 2pm | | |
| | | Ham salad sandwich from home Bread, wholemeal, thick sliced Light spread | Tesco's own Flora | 2 slices thin spread on 1 slice |
| | | Low fat Mayonnaise Smoked ham thinly sliced Lettuce, iceberg Cucumber with skin | Hellmans Tesco's own | 2 teaspoons 2 slices 1 leaf 4 thin slices |
| | | Unsweetened orange juice from canteen Apple with skin from home, Braeburn | Tropicana | 250ml carton medium size, core left |
| 3 pm | Meeting room With supervisor | 2pm to 5pm | | |
| | | Tea, decaffeinated Milk (fresh, whole) Jaffa cake – mini variety | Twinings Tesco's own McVities | Mug Some 6 |

| Time | Where? With whom? TV on? Table? | Food/Drink description & preparation | Brand Name | Portion size or quantity eaten |
|----------|--|---|--|---|
| 6.30 pm | Pub, partner | Gin Tonic water diet Lager Salted peanuts | Gordon's Schweppes Draught KP | Single measure 1/2 small glass 1 pint 1 handful |
| 8 pm | Dining room Family TV off At table | Spaghetti, wholemeal Bolognese sauce (see recipe) Courgettes (fried in butter) Tinned peaches in juice (juice drained) Single cream UHT Orange squash No Added Sugar | Tesco's own Prince's Sainsbury's own | 3b 6 tablespoons 4 tablespoons 3 halves 1 tablespoon 200ml glass, 1 part squash, 3 parts tap water |
| 9 pm | Sitting room Alone TV on Not at table | Grapes, green, seedless Chocolates, chocolate creams Potato crisps, Prawn Cocktail | Bendicks Walkers | 15 2 25g bag from multipack |
| 10.30 pm | Bed room Partner No TV Not at table | Camomile tea (no milk or sugar) | Twinnings | 1 mug |

C'uco r rg'qh'y g'hqf 'cvcu'wugf 'kp'y g'uwf { 'r t gugv'gf 'kp'Ej cr vgt '50'



Appendix B

Gj k'eu'cr r tqxcn'qh'vj g'uwf { 'r' t'gugp'vgf 'lp'Ej cr vgt'60'

5 March 2015

Dear Dr Lightowler

UREC Registration No: 150904

The variability of energy and nutrient intakes using two different dietary standardisation techniques in athletes

Thank you for the email of 3 March 2015 outlining your response to the points raised in my previous letter about the PhD study of your research student Alaaddine El-Chab and attaching the revised documents. I am pleased to inform you that, on this basis, I have given Chair's Approval for the study to begin.

The UREC approval period for this study is two years from the date of this letter, so 5 March 2017. If you need the approval to be extended please do contact me nearer the time of expiry.

Should the recruitment, methodology or data storage change from your original plans, or should any study participants experience adverse physical, psychological, social, legal or economic effects from the research, please inform me with full details as soon as possible.

Yours sincerely

Hazel Abbott
Chair of the University Research Ethics Committee

Appendix C

Gj leu'cr r tqxcn'qh'vj g'uwwf { 'r' t g u g p v g f 'l p 'Ej cr vgt '70'

7 August 2013

Dear Dr Simpson

UREC Registration No: 130759

The effect of two different diets on performance, nutrient oxidation and blood biomarkers

Thank you for the email of 6 August 2013 outlining the response to the points raised in my previous letter about the PhD study of your research student Alaaddine El-Chab, and attaching the revised documents. I am pleased to inform you that, on this basis, I have given Chair's Approval for the study to begin.

The UREC approval period for this study is two years from the date of this letter, so 7 August 2015. If you need the approval to be extended please do contact me nearer the time of expiry.

In order to monitor studies approved by the University Research Ethics Committee, we will ask you to provide a (very brief) report on the conduct and conclusions of the study in a year's time. If the study is completed in less than a year, could you please contact me and I will send you the appropriate guidelines for the report.

Yours sincerely

Hazel Abbott
Chair of the University Research Ethics Committee

Appendix D

Gj leu'cr r tqxcn'qh'vj g'uwf { 'r tgugpvf 'lp'Ej cr vgt'80'

10 April 2015

Dear Dr Lightowler

UREC Registration No: 150903

The hydration status of untrained subjects participating in an experimental trial

Thank you for the email of 11 March 2015 outlining the response to the points raised in my previous letter, and for the follow up email on 30 March requesting the addition of an extra urine sample on the second visit, this refers to the PhD study of your research student Alaaddine El-Chab. I am pleased to inform you that, on this basis, I have given Chair's Approval for the study to begin.

The UREC approval period for this study is two years from the date of this letter, so 10 April 2017. If you need the approval to be extended please do contact me nearer the time of expiry.

Should the recruitment, methodology or data storage change from your original plans, or should any study participants experience adverse physical, psychological, social, legal or economic effects from the research, please inform me with full details as soon as possible.

Yours sincerely

Hazel Abbott
Chair of the University Research Ethics Committee

Vj g'f gdtlghkpi 'hqto 'i kxgp'vq'r ctvlekr cpwu'cv'vj g'gpf 'qh'vj g'uwwf { 'r tguqpvvf 'kp'Ej cr vgt'80

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343288: : B dtqqngu@e0vni''''

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Please keep a copy of this form for your future reference. Once again, thank you for your participation in this study.

Appendix E

Ethics approval of the study presented in Chapter 7.

29 May 2014

Dear Dr Clegg

UREC Registration No: 140827

The effect of acute exercise prior to glycaemic index testing on blood glucose and insulin levels

Thank you for the email of 28 May 2014 outlining the response to the points raised in my previous letter about the PhD study of your research student Alaaddine El-Chab and attaching the revised documents. I am pleased to inform you that, on this basis, I have given Chair's Approval for the study to begin.

The UREC approval period for this study is two years from the date of this letter, so 29 May 2016. If you need the approval to be extended please do contact me nearer the time of expiry.

In order to monitor studies approved by the University Research Ethics Committee, we will ask you to provide a (very brief) report on the conduct and conclusions of the study in a year's time. If the study is completed in less than a year, could you please contact me and I will send you the appropriate guidelines for the report.

Yours sincerely

Hazel Abbott
Chair of the University Research Ethics Committee