

HEALTH, SPORTS & REHABILITATION MEDICINE

Published since 2000 as *Palestrica of the Third Millennium - Civilization and Sport*

A quarterly of multidisciplinary study and research

© Published by "Iuliu Haieganu" University of Medicine and Pharmacy of Cluj-Napoca
and
The Romanian Medical Society of Physical Education and Sports
in collaboration with
The Cluj County School Inspectorate

A journal rated B+ by CNCS (Romanian National Research Council) since 2007,
certified by CMR (Romanian College of Physicians) since 2003,
CFR (Romanian College of Pharmacists) since 2015 and CMDR since 2018

A journal with a multidisciplinary approach in the fields of biomedical science,
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EBSCO, Academic Search Complete, USA
Index Copernicus, Journals Master List, Poland
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Vol. 24, No. 2, April-June 2023

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pISSN 2668-2303

eISSN 2668-5132

ISSN-L 2668-2303

www.jhsrm.org

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ORIGINAL STUDIES

Modifications in plantar pressure in overground assisted gait training

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Abstract

Background. In recent years, gait rehabilitation research has focused on developing systems for central neurological diseases affecting the gait patterns of patients. However, most systems lack pelvic mechanisms that can control the rotational movements of the pelvis. RELIVE overground gait rehabilitation is a system designed to control obliquity.

Aims. This study investigates how the alternator - the RELIVE's subsystem that controls translational and rotational movement of the pelvis - influences gait in healthy subjects and is part of a more complex research.

Methods. The study took place in 2021 in the Elias Emergency University Hospital and 15 healthy subjects participated. We used in-shoe sensors from Tekscan, for gathering data regarding plantar pressure distribution, during various gait sessions with the RELIVE system. The gait sessions included walking with hands alongside the body, with the alternator turned on or off and with different degrees of body weight support. The gathered data was statistically analyzed with IBM SPSS Statistics v28 tool.

Results. When the alternator was turned on, the values of average plantar pressure decreased during the sessions characterized by walking hands free with the same percentage of body weight support. Statistically significant differences (p -value <0.05) were recorded comparing the gait sessions at 0 and 20% body weight of load. At 10% body weight of load, the differences were not statistically significant.

Conclusions. The results showed that the alternator subsystem might be able to offload the participant's weight to some extent. More investigations should be considered in the following studies, including more comparisons between other gait sessions.

Keywords: plantar pressure, gait rehabilitation, overground system, pelvic mechanism.

Introduction

Despite the significant progress in the prevention and treatment, stroke is still the second-leading cause of death and the third-leading cause of combined death and disability worldwide (Feigin et al., 2022). Conventional physiotherapy has limited success in recovering the loss of physical mobility for neurological patients. This is why, in recent years, a subject of interest is represented by novel therapy methods in gait rehabilitation, which imply using new technological solutions (Ye et al., 2014). Trunk and pelvis movements play an important role in achieving natural gait patterns. However, gait rehabilitation systems

lack an efficient pelvis mechanism, which can provide multiple degrees-of-freedom to control all six movements of the pelvis (Badea et al., 2021a).

In this context, the use of kinetic measurement systems has increased in the past years (Mann et al., 2016). Plantar pressure distribution is an important measure in the diagnosis of lower limb and gait conditions (Hessert et al., 2005) and it is also used for research purposes. Systems that record plantar pressure are platforms, plantar mats and in-shoe insoles. Platforms are limited to indoor measurement and although plantar mats have a large number of sensors for high accuracy measurements, they

Received: 2023, April 3; Accepted for publication: 2023, April 15

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<https://doi.org/10.26659/pm3.2023.24.2.54>

cannot be used for recording in various conditions, such as when using stairs (Ostaszewski et al., 2020). Another disadvantage of platform systems and mats concerns the sensors that get activated during walking, because they change with every step (Wafai et al., 2015).

By comparison, in-shoe insoles are more flexible, their main drawback being their fragility because they need to be very thin (Ostaszewski et al., 2020). These systems use the same sensors to measure the forces and pressures between the foot and the inside of the shoe. The main advantage of these systems is the possibility to record, average and analyze multi-steps within the same object or mask (Rosenbaum & Becker, 1997).

One of the most used in-shoe systems is F-Scan (by Tekscan, USA), which offers data acquisition straightaway with high resolution (Palaya et al., 2022; Woodburn & Helliwell, 1996).

RELIVE is an overground gait training system, which provides active movements for the pelvis. It was designed for rehabilitation in case of central neurological diseases, which affect the gait patterns of patients. The system has been studied intensively in the past years (Badea et al., 2021b; Seiciu et al., 2016; Ciobanu, 2016).

Hypothesis

RELIVE system has a subsystem for body weight support (BWS) and for vertical alternative oscillation of the pelvic girdle (or “alternator”). The alternator provides translational movement, as well as rotational (obliquity) of the pelvis during gait.

In this study we investigated how walking with hands alongside the body, with the alternator turned on, influences the average plantar pressure values.

Material and methods

Research protocol

a) Period and place of the research

The present study is part of a more complex research which investigates RELIVE system, some other experiments being previously published (Badea et al., 2022; Badea et al., 2021b). The research has the approval of the Ethics Committee of Elias Emergency University Hospital (6364/13.09.2021) and took place in the Physical Medicine and Rehabilitation Department, in 2021. The participants were enrolled after signing a consent form.

b) Subjects and groups

The study included 15 healthy, able-bodied subjects, both male and female, with no history of foot pain.

c) Applied tests

From the 16 possible gait sessions described in Table I, we have investigated only 6 sessions (C, E, G, I, K and M) having all the same characteristic: walking with hands free, alongside the body. Each participant had to walk three times during each gait session, summing a total of 18 walks.

Table I.
Gait sessions.

Gait sessions	Characteristics
A	Self-selected speed, without RELIVE
B	RELIVE speed, without RELIVE
C	Hands free, with RELIVE
D	Hands on handrail, with RELIVE
E	With alternator, hands free, with RELIVE
F	With alternator, hands on handrail, with RELIVE
G	With 10 % BWS, hands free, with RELIVE
H	With 10 % BWS, hands on handrail, with RELIVE
I	With 10 % BWS, with alternator, hands free, with RELIVE
J	With 10 % BWS, with alternator, hands on handrail, with RELIVE
K	With 20 % BWS, hands free, with RELIVE
L	With 20 % BWS, hands on handrail, with RELIVE
M	With 20% BWS, with alternator, hands free, with RELIVE
N	With 20% BWS, with alternator, hands on handrail, with RELIVE
O	RELIVE speed, out of RELIVE
P	Self-selected speed, out of RELIVE

Legend: BWS=body weight support

Plantar pressure data was collected during each walk, with F-scan from Tekscan (research software version).

In order to acquire the data needed for this study, we applied the peak/stance average function and obtained the average distribution of pressure values for each foot, during each walk. In order to analyze only complete stance phases, we deleted the first and the last recorded step. This way we eliminated the inaccuracies mentioned in previous studies, which occur during initiation and termination of gait (Patrick & Donovan, 2018).

In the end, we obtained the average distribution of pressure values for each foot, during each selected gait session C, E, G, I, K and M, by averaging the pressure values for the three walks within the same gait session.

d) Statistical processing

IBM SPSS Statistics v28 tool was used for statistical analysis. To verify that a variable is normally distributed, the Shapiro-Wilk test was used (given that we have less than 2000 records), with a p-value significance threshold of 0.05 (interpretation: if the p-value is above 0.05, then the data are considered as normally distributed). When one of the two variables compared was non-normally distributed, the corresponding non-parametric test was used.

Results

Table II shows the average plantar pressure obtained following the procedure described above, during sessions C and E.

We present below the results of the comparison of average plantar pressures between the two sessions, for each participant and the corresponding statistical significance.

Table II.
Session C vs. Session E.

Participant	Session C	Session E	p-value
Participant #1	98.7292	98.7917	0.971
Participant #2	102.0625	100.625	0.526
Participant #3	98.5625	96.375	0.623
Participant #4	101.375	99.7708	0.525
Participant #5	104.1667	95.8333	0.249
Participant #6	114.4375	93.5625	<0.001
Participant #7	107.6042	98.8958	0.057
Participant #8	112.5833	96.75	0.011
Participant #9	102.9583	97.7083	0.114
Participant #10	115.0208	93.7708	<0.001
Participant #11	106.2292	96.7917	0.047
Participant #12	114.5833	93.2083	<0.001
Participant #13	123.7708	102.9583	<0.001
Participant #14	114.6875	93.0208	<0.001
Participant #15	104.0208	85.2917	<0.001

Participant #1: From an average value of 98.7292 for Session C to an average value of 98.7917 for session E, the difference is not considered statistically significant: p-value = 0.971. Participant #2: From an average value of 102.0625 for Session C to an average value of 100.625 for session E, the difference is not considered statistically significant: p-value = 0.526. Participant #3: From an average value of 98.5625 for Session C to an average value of 96.375 for session E, the difference is not considered statistically significant: p-value = 0.623. Participant #4: From an average value of 101.375 for Session C to an average value of 99.7708 for session E, the difference is not considered statistically significant: p-value = 0.525. Participant #5: From an average value of 104.1667 for Session C to an average value of 95.8333 for session E, the difference is not considered statistically significant: p-value = 0.249. Participant #6: From an average value of 114.4375 for Session C to an average value of 93.5625 for session E, the difference is considered statistically significant: p-value <0.001. Participant #7: From an average value of 107.6042 for Session C to an average value of 98.8958 for session E, the difference is not considered statistically significant: p-value = 0.057. Participant #8: From an average value of 112.5833 for Session C to an average value of 96.75 for session E, the difference is considered statistically significant: p-value = 0.011. Participant #9: From an average value of 102.9583 for Session C to an average value of 97.7083 for session E, the difference is not considered statistically significant: p-value = 0.114. Participant #10: From an average value of 115.0208 for Session C to an average value of 93.7708 for session E, the difference is considered statistically significant: p-value <0.001. Participant #11: From an average value of 106.2292 for Session C to an average value of 96.7917 for session E, the difference is considered statistically significant: p-value = 0.047. Participant #12: From an average value of 114.5833 for Session C to an average value of 93.2083 for session E, the difference is considered statistically significant: p-value <0.001. Participant #13: From an average value of 123.7708 for Session C to an average value of 102.9583 for session E, the difference is considered statistically significant: p-value <0.001. Participant #14: From an

average value of 114.6875 for Session C to an average value of 93.0208 for session E, the difference is considered statistically significant: p-value <0.001. Participant #15: From an average value of 104.0208 for Session C to an average value of 85.2917 for session E, the difference is considered statistically significant: p-value <0.001.

In Table III are presented the average plantar pressures obtained following the procedure described above, during sessions G and I.

Table III.
Session G vs. Session I.

Participant	Session G	Session I	p-value
Participant #1	85.7083	80.6042	0.112
Participant #2	80.2708	75.6042	0.369
Participant #3	80.4792	77.8333	0.528
Participant #4	85.1875	73.6667	0.012
Participant #5	73.0625	71.1875	0.841
Participant #6	90.3125	71.0625	<0.001
Participant #7	87.1875	74.125	0.005
Participant #8	86.1875	74.6667	0.014
Participant #9	71.0417	72.6458	0.46
Participant #10	75.1875	71.4792	0.666
Participant #11	86.4375	75.3958	0.03
Participant #12	77.375	72.7292	0.57
Participant #13	84.7083	73.1042	0.041
Participant #14	90.5	76.2292	0.001
Participant #15	67.1458	74.8958	0.074

Below are the results of the comparison of average plantar pressures between the two sessions, for each participant and its statistical significance:

Participant #1: From an average value of 85.7083 for Session G to an average value of 80.6042 for session I, the difference is not considered statistically significant: p-value = 0.112. Participant #2: From an average value of 80.2708 for Session G to an average value of 75.6042 for session I, the difference is not considered statistically significant: p-value = 0.369. Participant #3: From an average value of 80.4792 for Session G to an average value of 77.8333 for session I, the difference is not considered statistically significant: p-value = 0.528. Participant #4: From an average value of 85.1875 for Session G to an average value of 73.6667 for session I, the difference is considered statistically significant: p-value = 0.012. Participant #5: From an average value of 73.0625 for Session G to an average value of 71.1875 for session I, the difference is not considered statistically significant: p-value = 0.841. Participant #6: From an average value of 90.3125 for Session G to an average value of 71.0625 for session I, the difference is considered statistically significant: p-value <0.001. Participant #7: From an average value of 87.1875 for Session G to an average value of 74.125 for session I, the difference is considered statistically significant: p-value = 0.005. Participant #8: From an average value of 86.1875 for Session G to an average value of 74.6667 for session I, the difference is considered statistically significant: p-value = 0.014. Participant #9: From an average value of 71.0417 for Session G to an average value of 72.6458 for session I, the difference is not considered statistically significant: p-value = 0.46. Participant #10: From an average value of 75.1875 for Session G to an average value of 71.4792

for session I, the difference is not considered statistically significant: p-value = 0.666. Participant #11: From an average value of 86.4375 for Session G to an average value of 75.3958 for session I, the difference is not considered statistically significant: p-value = 0.03. Participant #12: From an average value of 77.3750 for Session G to an average value of 72.7292 for session I, the difference is not considered statistically significant: p-value = 0.570. Participant #13: From an average value of 84.7083 for Session G to an average value of 73.1042 for session I, the difference is considered statistically significant: p-value = 0.041. Participant #14: From an average value of 90.5000 for Session G to an average value of 76.2292 for session I, the difference is considered statistically significant: p-value = 0.001. Participant #15: From an average value of 67.1458 for Session G to an average value of 74.8958 for session I, the difference is not considered statistically significant: p-value = 0.074.

Table IV shows the average plantar pressures obtained following the same procedure, during sessions K and M.

Table IV.
Session K vs. Session M.

Participant	Session K	Session M	p-value
Participant #1	66.6042	51.5625	<0.001
Participant #2	67.625	53.1458	<0.001
Participant #3	53.18421	50.0208	0.015
Participant #4	68.6042	53.5	0.002
Participant #5	60.4375	53.0417	0.126
Participant #6	65.1667	56.125	0.062
Participant #7	62.8333	55.5	0.24
Participant #8	64.8958	56.9792	0.035
Participant #9	61.375	52.625	0.359
Participant #10	70.75	53.3333	0.001
Participant #11	68.6458	54.6875	0.003
Participant #12	72.25	56.0417	0.002
Participant #13	61	51.25	0.003
Participant #14	70.5208	53.4792	<0.001
Participant #15	61.2083	52.9583	0.607

Below are the results of the comparison of average plantar pressures the two sessions, for each participant and its statistical significance:

Participant #1: From an average value of 66.6042 for Session K to an average value of 51.5625 for session M, the difference is considered statistically significant: p-value <0.001. Participant #2: From an average value of 67.625 for Session K to an average value of 53.1458 for session M, the difference is considered statistically significant: p-value <0.001. Participant #3: From an average value of 53.18421 for Session K to an average value of 50.0208 for session M, the difference is considered statistically significant: p-value = 0.015. Participant #4: From an average value of 68.6042 for Session K to an average value of 53.5 for session M, the difference is considered statistically significant: p-value = 0.002. Participant #5: From an average value of 60.4375 for Session K to an average value of 53.0417 for session M, the difference is not considered statistically significant: p-value = 0.126. Participant #6: From an average value of 65.1667 for Session K to an average value of 56.125 for session M, the difference is not considered statistically significant: p-value = 0.062. Participant #7: From an average value of 62.8333 for Session K to an average value of 55.5 for session M, the difference is not considered statistically significant: p-value = 0.24. Participant #8: From an average value of 64.8958 for Session K to an average value of 56.9792 for session M, the difference is considered statistically significant: p-value = 0.035. Participant #9: From an average value of 61.375 for Session K to an average value of 52.625 for session M, the difference is not considered statistically significant: p-value = 0.359. Participant #10: From an average value of 70.7500 for Session K to an average value of 53.3333 for session M, the difference is considered statistically significant: p-value = 0.001. Participant #11: From an average value of 68.6458 for Session K to an average value of 54.6875 for session M, the difference is considered statistically significant: p-value = 0.003. Participant #12: From an average value of 72.2500 for Session K to an average value of 56.0417 for session M, the difference is considered statistically significant: p-value = 0.002. Participant #13: From an average value of 61.0000 for Session K to an average value of 51.2500 for session M, the difference is considered statistically significant: p-value = 0.003. Participant #14: From an average value of 70.5208

Table V.
Session E vs. Session I vs. Session M.

Participant	Session E	Session I	Session M	p-value for E vs. I	p-value for E vs. M	p-value for I vs. M
Participant #1	98.7917	80.6042	51.5625	<0.001	<0.001	<0.001
Participant #2	100.625	75.6042	53.1458	<0.001	<0.001	<0.001
Participant #3	96.375	77.8333	50.0208	<0.001	<0.001	<0.001
Participant #4	99.7708	73.6667	53.5	<0.001	<0.001	<0.001
Participant #5	95.8333	71.1875	53.0417	<0.001	<0.001	<0.001
Participant #6	93.5625	71.0625	56.125	<0.001	<0.001	<0.001
Participant #7	98.8958	74.125	55.5	<0.001	<0.001	<0.001
Participant #8	96.75	74.6667	56.9792	<0.001	<0.001	<0.001
Participant #9	97.7083	72.6458	52.625	<0.001	<0.001	<0.001
Participant #10	93.7708	71.4792	53.3333	<0.001	<0.001	<0.001
Participant #11	96.7917	75.3958	54.6875	<0.001	<0.001	<0.001
Participant #12	93.2083	72.7292	56.0417	<0.002	<0.001	<0.001
Participant #13	102.9583	73.1042	51.25	<0.001	<0.001	<0.001
Participant #14	93.0208	76.2292	53.4792	0.024	<0.001	<0.001
Participant #15	85.2917	74.8958	52.9583	0.133	<0.001	<0.001

for Session K to an average value of 53.4792 for session M, the difference is considered statistically significant: p-value <0.001. Participant #15: From an average value of 61.2083 for Session K to an average value of 52.9583 for session M, the difference is not considered statistically significant: p-value = 0.607.

Lastly, the average plantar pressure of the participants during Sessions E, I and M have been compared (Table V).

Firstly, the result of the comparison between the values for Session E and I is presented:

Participant #1: From an average value of 98.7917 for Session E to an average value of 80.6042 for session I, the difference is considered statistically significant: p-value <0.001. Participant #2: From an average value of 100.625 for Session E to an average value of 75.6042 for session I, the difference is considered statistically significant: p-value <0.001. Participant #3: From an average value of 96.375 for Session E to an average value of 77.8333 for session I, the difference is considered statistically significant: p-value <0.001. Involving free hands and no BWS Participant #4: From an average value of 99.7708 for Session E to an average value of 73.6667 for session I, the difference is considered statistically significant: p-value <0.001. Participant #5: From an average value of 95.8333 for Session E to an average value of 71.1875 for session I, the difference is considered statistically significant: p-value <0.001. Participant #6: From an average value of 93.5625 for Session E to an average value of 71.0625 for session I, the difference is considered statistically significant: p-value <0.001. Participant #7: From an average value of 98.8958 for Session E to an average value of 74.125 for session I, the difference is considered statistically significant: p-value <0.001. Participant #8: From an average value of 96.75 for Session E to an average value of 74.6667 for session I, the difference is considered statistically significant: p-value <0.001. Participant #9: From an average value of 97.7083 for Session E to an average value of 72.6458 for session I, the difference is considered statistically significant: p-value <0.001. Participant #10: From an average value of 93.7708 for Session E to an average value of 71.4792 for session I, the difference is considered statistically significant: p-value <0.001. Participant #10: From an average value of 96.7917 for Session E to an average value of 73.3958 for session I, the difference is considered statistically significant: p-value <0.001. Participant #11: From an average value of 96.7917 for Session E to an average value of 73.3958 for session I, the difference is considered statistically significant: p-value <0.001. Participant #12: From an average value of 93.2083 for Session E to an average value of 72.7292 for session I, the difference is considered statistically significant: p-value = 0.002. Participant #13: From an average value of 102.9583 for Session E to an average value of 73.1042 for session I, the difference is considered statistically significant: p-value <0.001. Participant #14: From an average value of 93.0208 for Session E to an average value of 76.2292 for session I, the difference is considered statistically significant: p-value = 0.024. Participant #15: From an average value of 85.2917 for Session E to an average value of 74.8958 for session I, the difference is not considered statistically significant: p-value = 0.133.

Next, the values for session I and M are compared and

the results are as follows:

Participant #1: From an average value of 80.6042 for Session I to an average value of 51.5625 for session M, the difference is considered statistically significant: p-value <0.001. Participant #2: From an average value of 75.6042 for Session I to an average value of 53.1458 for session M, the difference is considered statistically significant: p-value <0.001. Participant #3: From an average value of 77.8333 for Session I to an average value of 50.0208 for session M, the difference is considered statistically significant: p-value <0.001. Participant #4: From an average value of 73.6667 for Session I to an average value of 53.5 for session M, the difference is considered statistically significant: p-value <0.001. Participant #5: From an average value of 71.1875 for Session I to an average value of 53.0417 for session M, the difference is considered statistically significant: p-value <0.001. Participant #6: From an average value of 71.0625 for Session I to an average value of 56.125 for session M, the difference is considered statistically significant: p-value <0.001. Participant #7: From an average value of 74.125 for Session I to an average value of 55.5 for session M, the difference is considered statistically significant: p-value <0.001. Participant #8: From an average value of 74.6667 for Session I to an average value of 56.9792 for session M, the difference is considered statistically significant: p-value <0.001. Participant #9: From an average value of 72.6458 for Session I to an average value of 52.625 for session M, the difference is considered statistically significant: p-value <0.001. Participant #10: From an average value of 71.4792 for Session I to an average value of 53.333 for session M, the difference is considered statistically significant: p-value <0.001. Participant #11: From an average value of 75.3958 for Session I to an average value of 54.6875 for session M, the difference is considered statistically significant: p-value <0.001. Participant #12: From an average value of 72.7292 for Session I to an average value of 56.0417 for session M, the difference is considered statistically significant: p-value <0.001. Participant #13: From an average value of 73.1042 for Session I to an average value of 51.2500 for session M, the difference is considered statistically significant: p-value <0.001. Participant #14: From an average value of 76.2292 for Session I to an average value of 53.4792 for session M, the difference is considered statistically significant: p-value <0.001. Participant #15: From an average value of 74.8958 for Session I to an average value of 52.9583 for session M, the difference is considered statistically significant: p-value <0.001.

Finally, the result of the comparison between the values for sessions E and M is presented:

Participant #1: From an average value of 98.7917 for Session E to an average value of 51.5625 for session M, the difference is considered statistically significant: p-value <0.001. Participant #2: From an average value of 100.625 for Session E to an average value of 53.1458 for session M, the difference is considered statistically significant: p-value <0.001. Participant #3: From an average value of 96.375 for Session E to an average value of 50.0208 for session M, the difference is considered statistically significant: p-value <0.001. Participant #4: From an average value of 99.7708 for Session E to an average value of 53.5 for session M, the difference is considered statistically significant: p-value

<0.001. Participant #5: From an average value of 95.8333 for Session E to an average value of 53.0417 for session M, the difference is considered statistically significant: p-value <0.001. Participant #6: From an average value of 93.5625 for Session E to an average value of 56.125 for session M, the difference is considered statistically significant: p-value <0.001. Participant #7: From an average value of 98.8958 for Session E to an average value of 55.5 for session M, the difference is considered statistically significant: p-value <0.001. Participant #8: From an average value of 96.75 for Session E to an average value of 56.9792 for session M, the difference is considered statistically significant: p-value <0.001. Participant #9: From an average value of 97.7083 for Session E to an average value of 52.625 for session M, the difference is considered statistically significant: p-value <0.001. Participant #10: From an average value of 93.7708 for Session E to an average value of 53.333 for session M, the difference is considered statistically significant: p-value <0.001. Participant #11: From an average value of 96.7917 for Session E to an average value of 54.6875 for session M, the difference is considered statistically significant: p-value <0.001. Participant #12: From an average value of 93.2083 for Session E to an average value of 56.0417 for session M, the difference is considered statistically significant: p-value <0.001. Participant #13: From an average value of 102.9583 for Session E to an average value of 51.2500 for session M, the difference is considered statistically significant: p-value <0.001. Participant #14: From an average value of 93.0208 for Session E to an average value of 53.4792 for session M, the difference is considered statistically significant: p-value <0.001. Participant #15: From an average value of 85.2917 for Session E to an average value of 52.9583 for session M, the difference is considered statistically significant: p-value <0.001.

Discussion

We compared all the gait sessions with RELIVE system that implied walking with hands free, alongside the body, with and without the alternator turned on, at 0%, 10% and 20% body weight of load, corresponding to Sessions C, G, K, E, I, M in Table I.

When comparing Session C to Session E, for 9 out of 15 participants, statistically significant differences (p-value<0.05) were recorded regarding plantar pressure. When walking hands free, without any BWS and without the alternator turned on, the average pressure was higher than when walking hands free, without any BWS and with the alternator turned on. This result suggests that the alternator has an influence on the participant's body weight, being able to load it to some degree.

When comparing Session G to Session I, for 7 out of 15 participants, statistically significant differences (p-value<0.05) were recorded regarding plantar pressure. For one participant the recorded difference was close to 0.05, but slightly higher (p=0.074) and it is not considered statistically significant. In this case, we cannot say that there are statistically significant differences in plantar pressure when walking hands free, with 10% BWS and without the alternator turned on versus walking hands free, with 10% BWS and with the alternator turned on. More

participants are required in order to clearly determine if a 10% BWS influences the differences between sessions.

When comparing Session K to Session M, statistically significant differences (p-value<0.05) were recorded regarding plantar pressure for 10 out of 15 participants. When walking hands free, with 20% BWS and without the alternator turned on, the average pressure was higher than when walking hands free, with 20% BWS and with the alternator turned on. The result of the comparison between Session K and Session M seconds the result of the first comparison, between Session C and Session E, emphasizing the fact that the alternator has influence on the participant's body weight.

When comparing Session E to Session I and Session M, the recorded difference was not statistically significant between Session E and I for only one participant. For the rest of the participants the difference between all sessions was statistically significant. This result implies that the BWS subsystem of loads efficiently the body weight of the participants, resulting in lower plantar pressure with each percentage of load. Also, the alternator doesn't interfere, by reducing the loading.

This study revealed that the alternator subsystem may play an important role in controlling the load of the participant's weight. Thus, it has been emphasized that, when the alternator is turned on, the plantar pressure values have decreased during the sessions carried out with the RELIVE system in hands free condition, with the same percentage of BWS. This finding might be due to the fact that the alternator is part of the BWS subsystem. Another possible explanation is that the double support period is shortened, as many participants complained that they didn't have enough time to shift their center of gravity from one side to the other. Also, walking with hands alongside the body with the alternator turned on produces instability, the center of gravity often falling outside the base of support, which might reduce the average plantar pressure values.

Conclusions

1. The alternator subsystem might be able to load the participant's weight to some extent. Plantar pressure values decrease during the sessions with the same percentage of BWS, when the alternator is turned on.

2. Other comparisons should be considered before stating a clear conclusion. It should be studied if and how walking with hands on the handrail differs from walking with hands alongside the body, with and without the alternator turned on, with different percentages of load.

Conflicts of interest

Nothing to declare.

Acknowledgement

This work was supported by a grant of the Romanian National Authority for Scientific Research, CNDS-UEFISCDI PN-II-PT-PCCA-2011-3.2-0053, project number 190/2012 and is part of the first author's PhD (doctoral) thesis, research which is in progress at Carol Davila University of Medicine and Pharmacy in Bucharest.

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Neuromotor rehabilitation of the child with infantile cerebral palsy - spastic paraparesis

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Abstract

Background. The development of the nervous system is a long-term and very complex process; at birth, the cerebral hemispheres are well outlined, and the maturation process continues at an accelerated rate. In cerebral palsy, there is damage or lack of development in one or more brain areas. The term “cerebral palsy” has been around for over a century.

Aims. Through this research, we wanted to highlight the importance and effectiveness of physical therapy in recovering children with cerebral palsy. An effective recovery program is adapted, specific and individualised to the needs of each child.

Methods. The research was conducted within the *Maria Beatrice Socio-Medical Complex* in Alba Iulia. It is a daycare center for recovering disabled children, especially those diagnosed with infantile cerebral palsy. This was comparative, prospective and interventional and took place over six months between 10.01.2022-10.06.2022. In the implemented study, 20 subjects participated; they were selected based on some inclusion criteria, namely: to be aged between 5 and 12 years, to be classified in GMFCS stage I or II, and not to present comorbidities such as hydrocephalus, epilepsy, hip dysplasia, or surgery that involved joint replacements in the lower limbs and spine surgery. The subjects in the experimental group benefited in addition to the control group from 16 minutes of exercises using the Galileo Board at each physical therapy session. The subjects were divided into two equal groups/groups, namely: group 1, the experimental group consisting of 5 girls and 5 boys aged between 6 and 11 years, classified as GMFCS stages I and II, and group 2, the control group, which also consists of 5 girls and 5 boys between the ages of 5 and 13 and placed in GMFCS stages I and II.

Results. The highlighted percentage results of this study confirm the importance and effectiveness of physical therapy in the recovery of a child with infantile cerebral palsy spastic paraparesis. After the final assessment, it was observed that each child evidenced an increase in gross motor function.

Conclusions. This study again confirms the importance of physical therapy in recovering a child with a cerebral motor disability and spastic paraparesis. In collaboration with other supportive therapies, physical therapy contributes to independence and allows the child to enjoy a high quality of life.

Keywords: cerebral palsy, physical therapy, recovery programs, motor disability, quality of life.

Introduction

Pediatric neurorehabilitation aims to restore patients with the highest level of independence possible (Moll & Cott, 2013). Depending on the type and degree of their disability, therapies designed to increase children's independence require them to actively work on their restrictions and push their physical limits for weeks, months, or even years. Active participation, persistence, and attention to the treatment program are essential for the success of these therapies, which include many motor learning concepts (Maier et al., 2019). Unfortunately, it

is tough for youngsters to preserve these characteristics throughout a long rehabilitation stay (Ammann-Reif et al., 2022).

The development of the nervous system is a long-term and very complex process; at birth, the cerebral hemispheres are well outlined, and the maturation process continues at an accelerated rate. Thus, specific to human ontogenesis, the maturation of neurological functions ends around the age of 10, and for mental functions around the age of 14-16. Stimuli from the external environment influence the entire maturation process. The brain controls everything

Received: 2023, March 5; Accepted for publication: 2023, March 16

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<https://doi.org/10.26659/pm3.2023.24.2.61>

we do and feel physically and emotionally (Rakic, 2002).

Cerebral palsy (CP) is a cluster of lifelong abnormalities of movement and posture development caused by non-progressive disruptions in the growing fetus or newborn brain (Rosenbaum et al., 2007). Current magnetic resonance imaging (MRI) research shows frequent abnormalities, including periventricular white matter lesions, localized ischemic/hemorrhagic lesions, widespread encephalopathy, basal ganglia damage, and brain deformities (Robinson et al., 2009). The prevalence of CP is between 2 and 3 per 1000 live births. Depending on the risk variables, these numbers change for specific patient groups (Van Naarden Braun et al., 2016; Europe SoCPi, 2000; Chen, 2022).

Cerebral Palsy (CP)/Cerebral Motor Palsy (CMP) has been defined as “a group of persistent developmental disorders of movement and posture, causing limitation of activity that is attributable to non-progressive disorders arising in the fetal brain or the brain in development course. The motor disorder of cerebral palsy is often accompanied by disturbances in sensation, perception, cognition, communication, and behavior, through epilepsy and secondary musculoskeletal problems” (Fowler, 2011). Before recent studies, it was believed that the lack of oxygen at birth is the cause of cerebral palsy; however, it is now clear that several additional reasons and risk factors contribute to the development of cerebral palsy. It is currently thought that cerebral palsy is caused by a sequence of developmental events that result in brain damage (Sadowska et al., 2020; Ruiz Brunner & Cuestas, 2019; Novak et al., 2017; Parikh et al., 2019; Paul et al., 2022).

In cerebral palsy, there is damage or lack of development in one or more brain areas. The term “cerebral palsy” has been around for over a century. Similar movement disorders continued to be referred to as “Little’s disease” until 1889, when William Osler, a Canadian physician, suggested using the term “cerebral palsy”. In his monograph, *Cerebral Palsies in Children*, Osler noted the link between difficult labour and brain damage in children (Kozyavkin et al., 2009). Clinical manifestations of cerebral palsy can vary from negligible impairment to apparent impairment. The severity of the disease is related to the nature, level and location of the lesions in the brain. Early manifestations are often visible soon after the child is born, while unmistakable signs of cerebral palsy appear in childhood.

In special literature, we also find that cerebral palsy is a term that describes a group of permanent motor function disorders (of movement and posture) often accompanied by proprioceptive disorders, speech, and hearing, determined by non-progressive abnormalities of a developing or immature brain. Starting from the definition of cerebral palsy, we can realize that this disorder is very complex, and the impact it has on them varies widely. There may be cases with patients who cannot mobilize independently, cannot communicate verbally and emotionally, and may have so-called “co-occurring conditions”, for example, epilepsy, autism spectrum disorders, and sialorrhea. There may be cases with patients who have only slight impairment of motor control (a neuro-motor delay) and a delay in cognitive development, which denotes the fact that each patient needs an individual Rehabilitation plan precisely

because each individual is different and has different needs (Christine et al., 2007).

Cerebral palsy is classified topographically and neurologically as follows:

- from a topographical point of view: hemiplegia (spasticity of one part of the body), diplegia (the whole body is affected, but the lower limbs are more affected than the upper ones), tetraplegia (the whole body is involved, and the impairment is at the level of all four limbs) (Ciulan & Stanca, 2011).

- from a neurological point of view: cerebral palsy - spastic form, ataxic form, hypotonic (atonic) form, mixed form, dyskinetic/athetotic form.

Disability is a delicate situation globally and is increasingly common; for example, over 15% of the population in Europe is disabled, of which 150 million are children aged between 0 and 18 (Spinei, 2016).

Cerebral palsy is a neuromotor disorder that affects thousands of children each year; precisely 1 in 323 children are diagnosed with this condition, and it is known as the most common neuromotor disability of childhood (Fowler, 2011).

Infantile cerebral palsy is much higher in newborns with low birth weight, <1500g, especially those born prematurely, with gestational ages below 28 weeks (Oskoui et al., 2013).

In children with spastic paraparesis (some authors describe it as being synonymous with the mild form of spastic diplegia), there are signs of classic spasticity in the lower limbs by adduction of the thighs (with shear), leg in “varus-equine” with internal rotation, hyperreflexivity osteo-tendinosus, genu-flexed/genurecurvatum, lumbar kyphosis (caused by the shortening of the hamstrings), consecutive tilting of the pelvis, Babinski sign present, and the primitive reflexes disappear more difficult (3–5 years), clonus (Ciulan & Stanca, 2011).

The degree of independence of the child with cerebral palsy is classified using the Gross Motor Function Classification System—GMFCS (Gross Motor Function Classification System). This system assesses and observes active movements, maintaining specific postures (e.g., trunk and head control) and walking. It was developed in Canada, by the Children’s Disability Research Centre, more precisely at the Institute of Applied Health Sciences, McMaster University, in 1997. It comprises 5 levels according to differences, and the degree of independence is aimed at the child’s motor skills in daily activities (Ciulan & Stanca, 2011).

The diagnosis of cerebral palsy is similar to that of other neurological diseases; based on the clinical data, the diagnosis is established, what kind of neurological syndrome it is, then the topographical diagnosis follows, where the lesion is, and finally, the etiological diagnosis, the reason for the lesion (Oskoui et al., 2013).

The importance of the interdisciplinary team

The interdisciplinary team is prompted by the need to increase the quality of life, increase independence, and help affected children and their families. This multidisciplinary team is a group of people who work together with a common goal and, through collective effort, can achieve the proposed objectives. This interdisciplinary team includes a

pediatrician, family doctor, neuro-psychiatrist, neurologist, physiotherapist, occupational therapist, psychologist, and speech therapist. Each has a role in the child's rehabilitation, and there must always be good collaboration and communication between all team members. This team must be as flexible as possible to adapt to the child's needs and be able to cope with the situation. Both therapists and parents contribute to the care program of the child with cerebral palsy; in other words, teamwork is the only way to achieve the most effective, complex, and correct rehabilitation of the child with neuro-motor disabilities (Bower, 2009; Ciulan & Stanca, 2011).

Through this research, we wanted to *highlight the importance and effectiveness of physical therapy in recovering children with cerebral palsy*. An effective rehabilitation program is adapted, specific, and individualized to the needs of each child. In this way, *it is possible to increase independence and improve the quality of his life. The family and an interdisciplinary team are essential factors that influence the motor and cognitive rehabilitation of the child*.

Hypothesis

In this research, we started from the premise that an individualized Rehabilitation program, consisting of kinetic exercises applied to children with infantile cerebral palsy, can significantly contribute to them obtaining new coordinative acquisitions and development, especially from a motor point of view. Therefore, the hypothesis that we propose for the study is the following: *the individual kinetic program will generate new acquisitions and improvements of motor skills, the correction of independent movement in orthostatic position, the increase of the degree of ADL type independence, against the background of personal evolution, generally optimized*.

Material and methods

Research protocol

This investigation was overseen according to the Declaration of Helsinki (2013) and approved by the Ethics Committee before the beginning of the study. It also met the ethical standards for Sport and Exercise Science Research. Because the General data protection regulation was enforced starting 25 May 2018 (Regulation (EU) 2016/679), which imposes a single set of rules on the protection of personal data, the tutors of the subjects investigated signed an agreement for recording and using personal data. This agreement was signed in two copies by all tutors. It made possible the use of records of some motor parameters, then using it with a confidentiality character without using the child's identity.

a) Period and place of the research

The research was conducted within the Maria Beatrice Socio-Medical Complex in Alba Iulia. It is a daycare center for recovering disabled children, especially those diagnosed with infantile cerebral palsy. This was a comparative, prospective and interventional study and took place over six months between 10 January 2022 - 10 June 2022.

b) Subjects and groups

The study was carried out in 20 subjects, selected based

on some inclusion criteria, namely to be aged between 5 and 12 years, to be classified in GMFCS stage I or II, and not to present comorbidities such as hydrocephalus, epilepsy, hip dysplasia, or surgery that involved joint replacements in the lower limbs and spine surgery. A physical therapist evaluated and monitored all subjects under the guidance of the coordinating teacher.

The subjects were divided into two equal groups/groups, namely: group 1, the experimental group consisting of 5 girls and five boys aged between 6 and 11 years, classified as GMFCS stages I and II, and group 2, the control group, which it also consists of 5 girls and 5 boys between the ages of 5 and 13 and placed in GMFCS stages I and II.

The subjects in the experimental group benefited in addition to the control group from 16 minutes of exercises using the Galileo Board at each physical therapy session.

c) Applied tests

In the present study, we used the methods of observation and clinical investigation. With their help, we tried to demonstrate the indispensability of physical therapy in recovering a child with infantile cerebral palsy - spastic paraparesis.

We used the gross motor function measurement sheets (GMFM) as a basis, thus using the results obtained at the initial assessment, respectively, at the final evaluation, or we could observe the changes following the recuperative program.

The Gross Motor Function Measure (GMFM) is a standardised observational tool validated and designed to measure changes in the gross motor function of children with cerebral palsy. It includes 88 items divided from A to E (A: supine and prone exercises and rolling; B: sitting exercises; C: crawling and kneeling exercises; D: sitting practices - orthostatic; E: exercises walking, running or jumping).

GMFM is scored from 0 to 3 where 0 = does not initiate, 1 = initiates, 2 = partially performs, and 3 = complete.

Rehabilitation program

The objectives of the recuperative program were: reducing spasticity (muscle relaxation) of the lower limbs on hip flexors, thigh adductors and triceps sural (gastrocnemius); maintaining/increasing joint mobility (all three joints of the lower limbs are targeted, especially the talocrural joint); correction of postural alignment in orthostatic; improving balance in standing and walking, reducing the base of support in the bipedal position, improving balance, coordination and control while walking by strengthening muscle tone; gait correction.

The procedural methodology of the recuperative program: the exercises were explained calmly and patiently, using common words, easily understood by the child so that he understood the requirement and executed the condition as correctly as possible; the exercises were adapted according to the child's age, understanding and motor skills; the activities were periodically changed to avoid monotony and to stimulate the child to carry out the rehabilitation program; the exercises were performed from simple to complex; the Rehabilitation program was executed under the permanent supervision of the physical therapist; the standard Rehabilitation program had a particular order; the proposed exercises were performed in

a series of 7–10 repetitions depending on the complexity of the training and the physical capacity of the child; each Rehabilitation session lasted 30 min.

The kinetic Rehabilitation program included the following exercises:

- Muscle relaxation/decontraction exercises (according to Metayer) – performed on: a table, ball, roll or mattress.

- Balance, coordination and control exercises: – performed on the balance board, bench, trellis, roll, bike and various applicative routes.

- The Bobath method was used to inhibit abnormal movements, sensory stimulation and muscle relaxation.

- Exercises for correcting gait and postural alignment in orthostatic: – performed between the parallel bars, on the walking lane and on the trellis.

- Applicative trials of varying complexity to improve balance, coordination and control.

- Elements of Feldenkrais therapy were used for proprioception, perceiving the child's body parts, and laterality.

- Elements of Masgutova therapy are helpful for spatial orientation (various objects of different colors are strategically placed, each time on the same side, and the child must go to them).

- Isometric exercises in various positions.

- Passive and global active stretching.

- Isometric and active exercises on the Galileo board for muscle toning and reducing spasticity.

Galileo board

In body components, muscles are integrated into a complex communication system consisting of the brain, spinal cord and peripheral nervous system; muscles, ligaments and tendons; bones and joints.

This internal communication system generates and manages all movements, postures, and reflexes. It is known that with adequate mechanical stimulation, a muscle can contract and relax several times per second. The so-called stretch reflex is a natural protective mechanism of the body. The rapid stretching of the muscles triggers the stretch reflex. If the muscle is stretched for a short time, it retracts; that is, it contracts on its own as an immediate reaction to the stretch. The contraction occurs automatically through the spinal cord and cannot be influenced.

The Galileo training platform works as a rocker. It is device-dependent, with an amplitude of +/- 6 mm, an adjustable frequency through which human movement is simulated, and muscle contraction information is activated up to the trunk level. At the same time, improved performance is achieved through intra- and intermuscular coordination. The rocking motion of the Galileo training platform generates the rapid muscle stretch required to trigger the stretch reflex. Galileo uses the natural process of the stretch reflex at a set frequency between 12 and 30 times per second, corresponding to frequencies from 5 to 30 Hz. This means, for example, that when you are standing, all the muscles that keep the body and righten the stretch reflex; therefore, they are trained. Repetitive frequencies between 5 and 30 Hz are most effective in exploiting the stretch reflex.

Example of training at the intensity of 5 Hz.: 2-minute

training; 2-minute break; 2-minute exercise; 2-minute break; 2-minute workout.

After only a few minutes of training with Galileo, the affected muscles or the entire muscle chain receive hundreds of stimulating impulses to perform.

d) Statistical processing

Descriptive and inferential statistics (median, mean, and standard deviation) are included in statistical analysis. Anderson-Darling Normality Test was used to see how well our data follow a particular distribution. To compare means, the T-student test for unpaired data was applied. The Mann-Whitney test was used to correlate the medians for unpaired data. Minitab (Minitab 20.3, LLC, 2021 (available at: <https://www.minitab.com>) was used for statistical analysis.

Results

The first subject is six years old, male and classified as GMFCS stage I. There is a 12% increase in the proposed goal, an improvement in walking and an increase in balance in standing; he climbs and descends the stairs independently and performs the standing jump. The total score is 6% higher (total achievement) (Table I).

The second subject is 11 years old, female, and classified as GMFCS stage II. This subject presents the best evolution of the second batch of issues. The increase in percentages is higher by 11% at the proposed goal; there is a decrease in the base of support during walking; it stands up independently by knight-servant, climbs stairs alone, and sometimes uses unilateral support when going down. The percentage of what she can do per general is 9% higher (Table I).

The third subject is ten years old, female, and classified as GMFCS stage I. This subject had the most diminutive evolution of batch 2. At the proposed objective, it shows an increase of 6%. Balance in orthostatic has improved, and walking is safer. The percentage of what she can do per general is 4% higher.

Subject four is eight years old, male, and classified as GMFCS stage I. There is an 8% increase in the proposed goal, an improvement in gait, a reduction in the base of support and an increase in standing balance, and the total score is 4% higher (Table I).

The fifth subject is seven years old, male and classified as GMFCS stage II. In this subject, there is a 5% increase in the total score and a 10% increase in the score per the proposed objective. Features a narrowing of the base of support during walking, correcting posture while walking, and increasing control, coordination, and balance (Table I).

The sixth subject is an eight-year-old female, GMFCS stage I, with a 5% change in total score and a 9% change in the proposed goal score. This subject maintains unipodal support for longer, climbs and descends stairs independently, and has acquired better balance in standing (Table I).

The seventh subject is ten years old, male, and classified as GMFCS stage I. It shows a 9% increase in the proposed goal, an improvement in walking and an increase in balance in standing is observed, and the total score is 4% higher (Table I).

Subject eight is a 7-year-old female and is classified as

Table I

The results from the experimental group with the GMFM scale.

No. Crt.	Subjects	Initial test				Final test			
		Total individual score (max. score 264)		Score-objective proposal for individual (max score: 111)		Total individual score (max. score 264)		Score-objective recommendation for individual (max score: 111)	
		Points	%	Points	%	Points	%	Points	%
1	Subject 1	243	92%	91	82%	258	98%	104	94%
2	Subject 2	220	83%	54	49%	243	92%	67	60%
3	Subject 3	244	92%	92	83%	253	96%	99	89%
4	Subject 4	242	92%	92	83%	253	96%	101	91%
5	Subject 5	229	87%	87	78%	244	92%	98	88%
6	Subject 6	243	92%	91	82%	255	97%	101	91%
7	Subject 7	240	91%	90	81%	252	95%	100	90%
8	Subject 8	243	92%	91	82%	255	97%	101	91%
9	Subject 9	230	87%	87	78%	246	93%	100	90%
10	Subject 10	228	86%	85	77%	239	91%	94	85%

Table II

The results from the control group with the GMFM scale.

No. Crt.	Subjects	Initial test				Final test			
		Total individual score (max. score 264)		Score-objective proposal for individual (max score: 111)		Total individual score (max. score 264)		Score-objective recommendation for individual (max score: 111)	
		Points	%	Points	%	Points	%	Points	%
1	Subject 1	238	90%	90	81%	251	95%	97	87%
2	Subject 2	230	87%	83	75%	241	91%	92	83%
3	Subject 3	234	89%	85	77%	247	94%	94	85%
4	Subject 4	240	91%	91	82%	253	96%	99	89%
5	Subject 5	240	91%	90	81%	252	95%	97	87%
6	Subject 6	243	92%	93	84%	254	96%	102	92%
7	Subject 7	242	92%	92	83%	253	96%	101	91%
8	Subject 8	228	86%	86	77%	235	89%	91	82%
9	Subject 9	236	89%	87	78%	246	93%	93	84%
10	Subject 10	245	93%	96	86%	251	95%	100	90%

GMFCS stage I. An increase of 9% of the proposed objective is observed. This subject maintains unipodal support for longer, uprights more easily through knight-servant, jumps from a ladder, and shows an increase in balance in standing, and the total score is 4% higher (Table I).

The ninth subject is nine years old, male and classified as GMFCS stage II. This subject is noted to improve posture while walking, shrink the support base, and maintain unipodal support with greater ease. The proposed objective shows an increase of 12%, and the total score is 6% higher (Table I).

The last subject is ten years old, female, and is classified as GMFCS stage II. The proposed objective shows an increase of 8%, and the total score is 5% higher. There is an improvement in control, coordination and balance on the knees and standing. It makes walking more accessible and with fewer imbalances (Table I).

The first subject is seven years old, male and classified as GMFCS stage II. There is a 6% increase in the proposed goal, an improvement in walking and standing balance, and the total score is 5% higher (total achievement) (Table II).

The second subject is seven years old, female, and classified as GMFCS stage II. In this subject, the increase in percentages is higher, i.e., by 8% to the proposed objective, the reduction of the base of support during walking and jumping from the place is observed, and the percentage of what she can do in general is 4% higher (Table II).

The third subject is nine years old, female, and classified as GMFCS stage II. This subject had the best evolution of batch 1. At the proposed objective, it shows an increase of 8%. Balance in orthostatic has improved; jumping from a place and a ladder and walking is safer. The percentage of what she can do per general is 5% (Table II).

Subject four is a 13-year-old male with GMFCS stage I. There is a 7% increase in the proposed goal, an improvement in walking and standing balance, and the total score is 5% higher (Table II).

The fifth subject is 11 years old, female, and is classified as GMFCS stage II. In this subject, there is a 4% increase in the total score and a 6% increase in the score on the proposed objective. There is a decrease in the base of support during walking, an increase in balance on the knees and standing, and a correction of the posture during movement (Table II).

The sixth subject is a 6-year-old female, GMFCS stage I have a 4% change in total score and an 8% change in the proposed goal score. This subject has acquired better balance in orthostatic, maintains unipodal support for longer, climbs stairs independently and descends them rarely using unilateral support.

Subject seven is eight years old, male, and classified as GMFCS stage I. There is an 8% increase in the proposed goal, an improvement in walking and standing balance, and the total score is 4% higher.

Subject eight is five years old, male, and classified as GMFCS stage II. An increase of 5% of the proposed objective is observed. It is easier to stand upright through the knight servant, the gait improvement and an increase in balance in orthostatic are highlighted, and the total score is higher by 3%.

The ninth subject is nine years old, male, and classified as GMFCS stage II. This subject maintains unipodal support more efficiently and improves posture during walking. The proposed objective shows an increase of 6%, and the total score is 4% higher.

The last subject is eight years old female classified as GMFCS stage I. He scored the lowest in this batch due to needing to be present for all therapies. In this subject, an improvement in standing balance and walking is evident. The proposed objective shows an increase of 4%, and the total score is 2% higher.

Statistical results

Table III

Analysis from the point of view of gender and age.

	The experiment group - EG	The control group - CG
Female gender	5 (50%)	5 (50%)
Male gender	5 (50%)	5 (50%)
Mann-Whitney	$p = 0.619$ (Adjusted for ties)	

Mann-Whitney Test, $p > 0.05$, there is no statistically significant difference between the median age values in the two groups (Table III).

Table IV

Analysis of initial (IT) and final Test (FT) - Total individual score

	IT		FT	
	EG	CG	EG	CG
Mean	236.20	237.60	249.80	248.30
Std. Deviation	8.61	5.58	6.30	6.17
Unpaired t test	0,672		0,598	

T-Student test, $p > 0.05$, there was no statistically considerable variation among the means of the initial and final total individual score relevance in the two groups (Table IV).

Table V

Analysis of initial (IT) and final Test (FT) - Score-objective recommendation for individual.

	IT		FT	
	EG	CG	EG	CG
Mean	86.0	89.30	96.5	96.60
Std. Deviation	11.5	4.00	10.7	3.92
Unpaired t test	0,410		0,978	

T-Student test, $p > 0.05$, there was no statistically considerable variation among the means of the initial and final score-objective recommendation for individual score relevance in the two groups (Table V).

Discussion

The most common cause of physical disability in young children is cerebral palsy. The child with

cerebral palsy encounters more significant obstacles and challenges in performing ADLs and everyday actions such as speaking, swallowing, and moving; therefore, it is a child with special needs. The specialized literature highlights that cerebral palsy is more common in less developed countries and is more common among boys. Most children diagnosed with this disease suffer from one or more conditions, known as “co-occurring conditions”, for example, epilepsy; autism spectrum disorders; pathological sleep disorders; hearing, vision, and speech. Another, not to be neglected positive aspect is that more than 50% of children diagnosed with cerebral palsy can move in independent standing (Fowler, 2011).

The causes of infantile cerebral palsy are varied and result from problems during pregnancy (prenatal such as genetic ones, vascular accidents, intercerebral hemorrhages, incorrect brain development, infections in the first months of pregnancy, placenta previa or placental haemorrhages RH incompatibility between mother and fetus, intoxication of the mother with the consumption of alcohol, nicotine, drugs or medicines), during birth (perinatal such as prematurity, difficult labor, prolonged labor through the pelvic presentation, cardio-respiratory arrest, use of forceps, hyperflexion of the head) or in the period following birth (postnatal such as severe infections such as meningitis and encephalitis, head trauma, anoxia or hypoxia, hemorrhages), starting from days, weeks and extending up to the age of 5 years. It is considered that until age 5, the human brain has accelerated development.

The highlighted percentage results of this study confirm the importance and effectiveness of physical therapy in rehabilitating a child with infantile cerebral palsy spastic paraparesis. After the final assessment, it was observed that each child had a change in gross motor function. There is no equality in their evolution; in some, the shifts are minor and slower, while in others, they are more evident in a shorter period. This confirms that everyone is different in development, even with the same diagnosis.

Both the child’s approach in therapy and the therapeutic Rehabilitation plan need to be individualized. Each child needs a particular system, and we as therapists have to find the most effective way to stimulate them to carry out the Rehabilitation program; for example, some children do exercises through play very well, while for others, play is a distraction by which they lose attention and concentration, some react well if they work with someone firmly in control. In contrast, others can no longer do anything if they are alerted (they get scared and tense up); some are stimulated if they see drawings, listen to music, or are verbally stimulated by the family, while others are distracted by these stimuli and lose focus.

The gross motor function classification system (GMFCS) indicates the child’s level of independence. Thus, children classified in stage I and II GMFCS predominantly encounter problems with balance, control and coordination, and these children need the safety of the home environment, respectively, from school. Impairment of both upper and lower limbs caused by spasticity, hypotonia, or sensory perception disorders interferes with ADLs, which prevents these children

from enjoying a good quality of life. The study shows that a lower degree of independence in a child does not mean that he can no longer progress or that he can no longer obtain acquisitions; on the contrary, any child can improve his motor skills, which is why the importance of the continuity of the program is understood rehabilitation regardless of the child's level of functioning.

In special literature, it is highlighted that the best results and the most remarkable evolution are more easily found in cases where the correct and early diagnosis together with the start of therapy as soon as possible and which is based on an interdisciplinary team (doctors, speech therapists, physiotherapists, family), and they collaborate very well.

We would also like to specify the importance of physical activity (Szabo, 2021a) through coordination (Szabo et al., 2021), balance (Szabo, 2021b) and general rehabilitation (Szabo, 2022; Szabo & Neagu, 2022) in the whole process of rehabilitation in the child with infantile cerebral palsy-spastic paraparesis.

The continuity of the kinetic program and the family plays a significant role in the child's neuromotor rehabilitation. Suppose the family, for various reasons, does not have the opportunity to work with therapists. In that case, it is essential to follow the therapists' recommendations and, under their guidance, implement a daily Rehabilitation program not to lose the acquisitions acquired during the therapies.

This study is helpful to all those who want to help these children achieve a better quality of life or those who encounter obstacles in their daily Rehabilitation program, both for the family of such a child and physical therapists.

From our point of view, it is necessary to carry out as many studies as possible aimed at the causes of cerebral palsy, the early diagnosis of this condition, the correct information of the family concerning the steps to follow in the rehabilitation of a child diagnosed with this condition, but also for the implementation of an individualized daily Rehabilitation program as quickly, correctly and efficiently as possible and at the level where access is allowed to all children with disabilities regardless of what kind of disability it is.

Conclusions

1. In conclusion, children with infantile cerebral palsy-spastic paraparesis who followed an individualized therapeutic program and benefited from a multidisciplinary team had noticeable improvements in acquiring and maintaining acquisitions, their overall evolution and quality of life.

2. This study confirms again the importance of physical therapy in rehabilitating a child with a cerebral motor disability, spastic paraparesis. In collaboration with other supportive therapies, physical therapy contributes to independence and allows the child to enjoy a high quality of life.

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Reduced energy intake in professional female tennis players promotes underfueling and inadequate recovery process

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Abstract

Background. International scientific papers have often analyzed the nutrition imbalances in tennis players. The study of sports nutrition has advanced significantly in recent years thanks to numerous innovations. Despite the fact that research on sports nutrition has evolved, the majority of new studies are still conducted on team sports.

Aims. The aim of this study was to analyze the eating patterns on a group of athletes and compare their dietary consumption to data from specialized literature.

Methods. An observational study was conducted over 4 months. Food ingestion was calculated using the USDA Nutritional values and all the tennis players had to go through anthropometric measurements and had to provide a food journal for 3 consecutive days.

Results. The reported ingestion of the tennis players was extremely low compared to the nutritional needs of professional tennis players.

Conclusions. Athletes are facing a very high risk of injuries and are minimizing their competitive level because of inappropriate fuelling.

Keywords: women athlete, nutrition, tennis, sports.

Introduction

As one of the foundations of athletic performance, nutrition counseling is crucial for the effectiveness of the recovery and adaptation processes. To increase effective muscle function, raise exercise tolerance, and improve adaptive responses to different sources of tiredness, a recovery plan is recommended. To improve an athlete's physical condition, it is thought necessary to monitor their nutrition and exercise routine, seek immediate medical attention, and consume food that satisfies the required quality and quantity standards (Kerksick et al., 2017).

Tennis nutrition research is challenging because there are so many factors that need to be taken in consideration, and there are few trustworthy performance protocols sensitive enough to spot performance changes that matter before and after an intervention (Rodriguez et al., 2009).

Tennis players must master the complex techniques and motions unique to their sport, such as the serve motion and the on-court movement patterns that call for acceleration, deceleration, and a change in direction (Kovacs, 2006; Kovacs & Ellenbecker, 2011; Hoppe et al., 2014).

Tennis has also developed into a true physical challenge that calls for a range of physical abilities, including strength, speed, power, agility, mobility, aerobic fitness, and anaerobic power output (Baiget et al., 2020). High-level tennis players are said to have a maximum oxygen uptake (VO₂max) that ranges from 44 to 69 ml · kg⁻¹ · min⁻¹, with the majority of cases being above 50 ml · kg⁻¹ · min⁻¹ (Kovacs, 2006). The duration spent with VO₂max values above 80% is between 50 and 60 percent of the typical fractional use of VO₂max during intense rallies (Fernandez et al., 2006).

The usual anthropometric and physiological traits of contemporary tennis players are shown in Table I. Tennis players, interestingly, are well-adapted in all areas and do not particularly excel in any one trait. This is probably due to the variety of tennis matches and training requirements.

Tennis players' anthropometric and physiological measurements found in another study, show that the medium stature height is 1.67m, the body mass is 59 kg and the VO₂max is 48ml (Fernandez-Fernandez et al., 2008; Kovacs & Baker et al., 2014).

Received: 2023, April 8; Accepted for publication: 2023, April 15

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<https://doi.org/10.26659/pm3.2023.24.2.69>

Material and method

Research protocol

a) Period and place of the research

An observational study was conducted over 4 months, between 20 October 2022 and 22 February 2023.

The study was carried out firstly at a tennis club, during a tennis competition in Heraklion, Province of Crete, Greece. The food journals were transmitted by the tennis players online and the data were analyzed in Targu Mures, Romania.

b) Subjects and groups

The study group consisted of a wide range of 50 women playing in professional tennis competitions with a minimum age of 18 years and maximum age of 25 years.

The inclusion criteria were: age between 18 and 25 years old, correct completion of the journals, and measurements done 3 times correctly. The exclusion criteria were: incomplete food journals, incorrect measurements, and age differences (>25 and <18 years old).

All the participants agreed to have their data analyzed and to participate in the study.

c) Applied tests

The analysis used information from the food journals provided by the tennis players, and the journals included the amount of food, liquids, and supplements consumed each day before the competition for 3 consecutive days. All the tennis players had to go through anthropometric measurements such as measuring height, weight and using a skin fold calliper to determine the fat percentage.

Food and liquid ingestion were calculated in Excel using the United States Department of Agriculture Data Base. The obtained results were compared with international recommendations for athletes and adapted to the preparation period, weight, and age.

d) Statistical processing

The data were analyzed statistically using the GraphPad Prism 5.0 software. The minimum and maximum values, means or medians, and standard deviations were utilized as descriptive statistical measures. A 95% (95% CI) confidence interval was used to determine whether a P-value of 0.05 was statistically significant.

Results

After analyzing the statistics, the study group's diet was insufficient in calories and macronutrients (significant differences between required and reported intake). The maximum value for all the macronutrients was recorded only in 2 subjects who ingested the maximum values for each macronutrient, the rest of 48 participants reported an ingestion closer to the minimum values.

The medium quantity of carbohydrate intake in a day was 225.9 grams. The average necessary amount calculated for the study group was 564 grams.

The maximum quantity of protein intake in a day was 166 gr grams compared to the minimum which was 52.75. The average necessary intake is 100 grams.

The age of athletes was statistically significantly correlated with magnesium intake (the older the age, the higher the intake; $p=0.0279$).

Age was statistically significantly correlated with

potassium consumption in female athletes. The statistics shows that there is a positive ($r=0.3723$; $CI95\%:0.09633$ to 0.5951) and substantial connection ($p=0.0078$) between age and magnesium intake.

Table I

Necessary vs intake of macronutrients.

Indicator	Calories	Carbohydrates	Proteins	Fat
Minimum	1393	128.7	52.75	48.51
Medium	2120	225.9	91.01	95.52
Maximum	4032	465.44	166.09	173.3
Necessary	3534	564	100	169

An increase in the triceps skinfold was linked to increased consumption of saturated fat. The statistics shows that there is a positive ($r=0.3379$; $CI95\%:0.05722$ to 0.5690) and substantial connection ($p=0.0164$) between the saturated fat intake and triceps skinfold.

The reported water intake is strongly and negatively correlated with body fat percentage (the higher the water intake, the lower the skin fold sum). The statistics shows that there is a negative ($r=-0.3082$; $CI95\%:-0.5462$ to -0.02414) and substantial connection ($p=0.0294$).

The reported protein intake is strongly correlated with the number of training hours per day. The statistics shows that there is a negative ($r=-0.3098$; $CI95\%:-0.5474$ to -0.02588) and substantial connection ($p=0.0286$).

The number of training hours per day is correlated with vitamin C intake. The statistics show that there is a positive ($r=0.3209$; $CI95\%:0.03823$ to 0.5560) and substantial connection ($p=0.0231$). The same correlation was observed between the training hours and intake of selenium. The statistics show that there is a positive ($r=0.2994$; $CI95\%:0.01441$ to 0.5393) and substantial connection ($p=0.0347$).

Discussion

After analyzing the data provided by the tennis players and comparing it with the international standards, it results that the athletes are exposed to a very inefficient recovery process including under fuelling and decreased muscle protein synthesis due to a very low energy intake. A balanced diet is essential for sustaining health and preventing disease. To sustain energy needs without causing excessive weight gain, a healthy diet must have a mix of calories, micronutrients, and macronutrients (fats, proteins, and carbohydrates) (Alfadhli, 2016; Alaunyte et al., 2015).

One tactic used to help athletes consume a proper diet is nutrition education (Birkenhead et al., 2015).

Athletes who have a better grasp of nutrition are more likely to consume more fruits, vegetables, and foods high in carbohydrates than athletes who have a poorer understanding, which shows that sports nutrition knowledge may be linked to healthy dietary intake. Women are reportedly more knowledgeable about nutrition than males (Condo et al., 2019).

International scientific papers have often analyzed the nutrition imbalances in tennis players. Tennis is described as an intermittent sport, with short bursts of activity (4-10 s) interspersed with shorter active recovery intervals (10-

20 s) and lengthier passive recovery intervals (60-90 s) (Fernandez et al., 2006).

Matches might run for three hours or longer. The intricate interconnections between technical, tactical, physical, and environmental restrictions that are present during a tennis match have a significant impact on the physiological demands of the game (Fernandez-Fernandez et al., 2016; Tippet et al., 2011).

The type of court surface, play style (serve and volley, baseline player), length of a rally, play phase (service or return game), ambient temperature and humidity are typical factors that affect the energy demands and make it difficult to design dietary plans for specific matches. Moreover, the playing surface impacts bounce and ball speed, which in turn affects the length of rallies and subsequently the amount of energy expended (Davis et al., 2009). Regardless of court surface, women players have been found to burn 30.9 ± 5.5 kJ/min of energy, as shown in (Table II).

Table II
Energy expenditure for women athletes.

Energy expenditure	
Kj*min	30.9
Kcal*min	7.4
Kcal*kg*hr	7.5
60 min match kcal	443
150 min match kcal	664
300 min match kcal	1107

High-carbohydrate diets are advised during periods of intense training to support immunological function and prevent overreaching and overtraining (Burke et al., 2011).

A study conducted on 7 female tennis players who trained for 4 hours per day, 6 days per week had the purpose of investigating protein intake (Gropper et al., 2003). The athletes were all 19 years old. Intakes of 0.8 g/kg were found to be very low in this investigation. By contrast, our results proved that the protein intake of our group of study was increased and the maximum quantity of protein intake in a day was 166 grams. An additional study recommended that the daily protein intake for a competitive athlete who trains hard and long is 1.6 g/kg (Pilis et al., 2019; Fleming et al., 2021)

Another study investigated the amount of fat consumed as a percentage of total energy intake, with 70% of athletes ingesting more than 30% of their daily total energy from fat (Fernandez-Fernandez et al., 2009). For endurance athletes who train for more than two hours per day, it is recommended that they consume 2 g/kg of fat daily to provide appropriate intramuscular triglyceride reserves (Stellingwerf et al., 2011). Athletes should concentrate on eating primarily monounsaturated and polyunsaturated fats because these have been shown to have several positive effects on both health and performance. Contrarily, saturated and trans fats are more challenging to be used as a fuel (Lowery, 2004)

Another study that was conducted over half marathon and full marathon runners, proved that the ingestion of macronutrients and vitamins was growing with the age of the subjects (Table III) (Wirnitzer et al., 2021).

According to the statistics, our study evidenced a correlation between the age of the subjects and the intake of micronutrients. It was found that the older subjects had a higher intake of micronutrients compared to the younger group, results visible also in the study conducted by (Wirnitzer et al., 2021).

Table III
Minerals and vitamins intake table.

Age	Minerals		Vitamins	
	CI	P-value	CI	P-value
20	[0.04-0.43]		[0.10-0.62]	
30	[0.11-0.41]	0.140	[0.19-0.55]	0.402
40	[0.22-0.41]		[0.31-0.51]	
50	[0.28-0.55]		[0.33-0.61]	

Limitations: despite having a small study group, we intend to expand this observational study for a bigger group of women and men. There was a total of 80 people that attended the tournament but only 50 of them had the age between 18 and 25.

Conclusions

1. The group of female athletes that were analyzed have little knowledge of sports nutrition and they fuel themselves incorrectly.
2. The study group had a very low caloric intake compared to the caloric needs of an elite tennis player.
3. The statistics show that the study group reported a very low macronutrients intake compared to the necessary. The intake of carbohydrates, protein, and fat is unbalanced.

Conflict of interests

The authors state that they have no conflicts of interest.

Acknowledgment

The first author's bachelor's thesis includes some of this study preliminary findings.

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Exploring the impact of urban food choices on malnutrition severity in teenage boys

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Abstract

Background. Malnutrition is based on poor nutrition and in adolescents can increase the risk of many pathologies. The education in dietary behaviour is necessary. Are food choices important for the weight status?

Aims. The purpose of this study was to analyze the correlation between food and the level of malnutrition in a group of teenagers from the urban environment.

Methods. The current study used a questionnaire administered for a period of 3 days among students where they had to mention the foods, quantities and times of ingestion. The subjects had to go through a series of anthropometric measurements.

Results. Only 8.33% of participants met their caloric needs. Weight and BMI were positively associated with systolic blood pressure.

Conclusions. The diet of the teenagers from the analyzed study group is unbalanced and does not meet the real dietary requirements, the percentage of malnutrition being high.

Keywords: malnutrition, eating habits, adolescents, carbohydrates.

Introduction

Global malnutrition is increasingly common. This has to do with both a deficit and an excess or an imbalance in a person's intake of calories and/or nutrients (Saunders & Smith, 2010). Thus, malnutrition can occur both in malnourished people and in those who feed excessively. Adolescence represents an important stage in the development of eating behaviors (Stabouli et al., 2021). Young people make choices for themselves, and these are influenced by factors such as the environment they live in, the place where they study, and the people they interact with.

According to the World Health Organization (WHO) and the latest UNICEF report - “The State of the World's Children 2019: Children, Food and Nutrition”, in the world:

a) 1.9 billion adults are overweight or obese and 462 million are underweight

b) among the children under the age of 5, 149 million are underdeveloped (too short for their age), 45 million are cachectic (too thin for their height) and 38.9 million are obese or overweight.

c) 340 million children (1 in 2) have vitamin deficiencies of vitamins and essential nutrients, such as

iron and vitamin A.

d) 45% of deaths among children < 5 years old are related to malnutrition. They appear especially in low- and middle-income countries. At the same time, in these countries, the cases of overweight or obese children began to increase.

Material and method

Research protocol

The research was an observational study and it included students from “Emil Racovita Theoretical High School” Baia Mare, Romania.

a) Period and place of the research

The study was carried out at an educational institution (high school) from Baia Mare, Romania, from September 2022 to February 2023.

b) Subjects and groups

The study included students aged between 14 and 17 (N = 65), of which 24 also completed a food diary for one, two, or three days. The high school was selected to be located in the city, not in the suburbs, and the participants were under 18 years old. We received parental consent for their children to participate in the study and the school's consent to conduct the research there.

Received: 2023, May 9; Accepted for publication: 2023, May 17

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<https://doi.org/10.26659/pm3.2023.24.2.73>

c) *Applied tests*

Students from the involved high school completed a questionnaire that took them approximately 10 minutes. The questionnaire was completed through a link, where the students had to put their age, height, weight, their meals and the time that they were taken, and also the quantities of the ingested food. Parental consent and student approval were obtained before data collection. They also had to write the level of physical activity they had that day, their level of hydration, and their stress level. Besides that, every student went through an anthropometric exam, analyzing several variables: weight, height, skin folds: biceps, triceps, subscapular, suprailiac; circumferences: neck, abdominal, gluteal, and arm. The devices used for the measurements were ADE taliometer and scale (Hamburg, Germany) for the weight and height, GMA plicometer (Italy) for skinfolds measurement, IMDK pulse oximeter (Shenzhen, China) and Minut Blood pressure monitor (Hamburg, Germany). The Basal Metabolic Rate (BMR) was determined according to the Mif in-St Jeor formula.

Every menu was analyzed and, the USDA database produced by the United States Department of Agriculture was used to calculate the calories, macronutrients, and micronutrients for every ingredient.

d) *Statistical processing*

The data were analyzed statistically using the GraphPad Prism 5.0 software. Descriptive statistical measures used were minimum and maximum values, means or medians, and standard deviations. For the inferential statistics, the Spearman test was used with a 95% (95% CI) confidence interval.

Results

The analysis of the 65 teenage boys included in the study evidenced that weight was not associated with

protein or fats intake but was negatively and significantly associated with carbohydrate intake (Table I). The medium quantity of protein intake in a day was 55.87 grams, while the average necessary amount calculated for the group was 136.94 grams. Also, the medium intake of carbohydrates in a day was 166.8. The average necessary intake is 294.59 grams. For fats, the medium intake is 72.2 grams, and the necessary quantity is 82.12 grams (Table I).

Table I
Descriptive data of food ingestion (grams).

Indicator	Protein	Fat	Carbohydrate
Minimum	16.38	14.06	25.79
25% Percentile	35	46.43	132.6
Median	55.87	72.47	166.8
75% Percentile	84.46	98.2	247.3
Maximum	159.8	156.9	489.9
Mean	62.23	75.04	185.9
Necessary	136.94	82.12	294.59

Weight and BMI were observed to be statistically and positively associated with systolic blood pressure. The statistics also shows that there is a positive ($r=0.4556$; CI95%: 0.2953 to 0.5909) and - substantial connection ($p=0.0049$) between body mass index and diastolic blood pressure (Table II).

SBP (systolic blood pressure) is positively and statistically significantly associated with weight, BMI, all folds, all circumferences, percentage of muscle mass and basal metabolic rate (Table III). The data indicates a positive and substantial correlation ($p<0.0001$) in most cases.

After analyzing the data provided by the students, the results showed that 30 from 65 boys have weight problems, whether we are talking about underweight, overweight or

Table II
The association between weight/body mass index (BMI) and blood pressure.

Indicator	Parameter	Spearman r	95% confidence interval	P value (two-tailed)
Association between weight and blood pressure	Systolic blood pressure	0.4556	0.2953 to 0.5909	< 0.0001
	Diastolic blood pressure	0.2562	0.07453 to 0.4215	0.0049
Association between body mass index BMI and blood pressure	Systolic blood pressure	0.5092	0.3577 to 0.6346	< 0.0001
	Diastolic blood pressure	0.2072	0.02285 to 0.3779	0.0237

Table III
Associations between systolic blood pressure and other parameter.

Parameter	Spearman r	95% confidence interval	P value (two-tailed)
Weight	0.5092	0.3577 to 0.6346	< 0.0001
BMI	0.4556	0.2953 to 0.5909	< 0.0001
Biceps skinfold	0.19	0.004960 to 0.3625	0.0385
Triceps skinfold	0.1802	-0.005177 to 0.3537	0.0498
Subscapular skinfold	0.2534	0.07148 to 0.4189	0.0054
Suprailiac skinfold	0.3311	0.1554 to 0.4865	0.0002
Neck	0.4059	0.2386 to 0.5498	< 0.0001
Abdominal circumference	0.4608	0.3012 to 0.5952	< 0.0001
Gluteal circumference	0.4153	0.2493 to 0.5577	< 0.0001
Arm circumference	0.509	0.3575 to 0.6344	< 0.0001
Fat percentage	0.01567	-0.1701 to 0.2003	0.8657
Lean body mass	0.4797	0.3232 to 0.6107	< 0.0001
Basal metabolic rate	0.4852	0.3296 to 0.6151	< 0.0001

obesity (Table IV). From the analyzed subjects, only a percentage of 8.33% ensured the caloric requirement, while 91.6% didn't. 4.1% ensured the protein requirement, while 95.8% did not. The fats requirement was ensured for 4.1%, while 62.5% didn't get the needed quantity. 91.6% of the subjects didn't reach the required amount of carbohydrates, and just 4.1% managed to provide the needed amount. Only 4.1% exceeded the required quantity. After analyzing the food journals, we came to the conclusion that the most frequently consumed foods were white bread, white wheat flour and potatoes.

Table IV
Weight status.

Weight status	Number of subjects
Underweight	4.61%
Normal weight	53.84%
Overweight	35.38%
Obesity grade I	1.53%
Morbid obesity	1.53%

Discussion

After analyzing the data provided by the teenage students, it results that they do not get the necessary quantity of macronutrients. 53.84% are normal weight, 4.61% of the boys are underweight, 35.38% are overweight, 1.53% are obese of degree 1 and another 1.53% are morbidly obese.

75 percent of them consume only 86.48 grams of protein, while the calculated average required amount is 136.94 grams.

A French study conducted on the prevalence of overweight, obesity and underweight showed, based on their data, that in the year 2018, 10,27% of the boys who participated in the study were represented by boys with underweight, 73,55% by boys with normal weight, 12,83% with overweight and 3,35% with obesity (Vanhelst et al., 2022). Compared to the year of 2018, when the prevalence of overweight in the French group was 12,83%, in 2022, in our study we had 35% of overweight boys.

Data from another research indicates that 16.5% of the students participating in the study were overweight and 4.5% were obese. Approximately half of the students who are overweight and obese reported staying in the dormitory. Average BMI value in males is 23.1 kg/m² and 22.3 kg/m² in females. Male gender and the presence of an obese person in the family increase the risk of being overweight or obese (Tokaç, et al., 2021).

Obesity is associated with an increased risk of several adverse health outcomes in adolescents, including cardiovascular disease. Overweight and obese teenagers are at higher risk of developing high blood pressure, high cholesterol levels, or other cardiovascular problems (Farpour et al., 2015). Besides that, overweight and obese teenagers are more likely to have respiratory problems, such as asthma or sleep apnea, and also are more exposed to the risk of type 2 diabetes (Reinehr, 2019; Ford, 2005). Underweight teenagers are also at significant health risk, and it can lead to immune system dysfunction, mental health problems like anxiety and depression, and nutritional deficiencies (Dagnelie & Staveren, 1994;

Golden et al., 2014; (1). According to some series of studies, insufficient consumption of macronutrients can harm the body. Insufficient carbohydrate consumption can have negative effects on an individual's health. As the primary source of energy, not reaching the needed quantity of carbohydrates can lead to decreased glycogen stores in the muscles and liver, resulting in fatigue and lower physical performance (Burke, 2015). More than that, not getting the needed quantity of carbohydrates can lead to inadequate nutrient intake, which can increase the risk of deficiencies and associated health problems. Low carbohydrate diets have been associated with an increase in cardiovascular disease, type 2 diabetes, and certain types of cancer (Hu et al., 2012; Nakamura et al., 2014). On the other hand, exaggerated carbohydrate consumption can lead to increased blood sugar glucose levels, insulin resistance, and weight gain (Samaha et al., 2003). For proteins, a higher intake than needed can increase the risk of kidney stones and the risk for cardiovascular disease (Taylor et al., 2010; Song et al., 2016), while an insufficient amount can lead to muscle loss and slower wound healing (Houston et al., 2008). A fat intake deficiency can reduce nutrients absorption and can also produce hormone imbalances, including problems in reproductive health (Henry & Clarke, 2008). A higher fat intake can lead to cardiovascular diseases such as coronary heart disease and can increase the levels of the inflammatory markers in the blood (Li et al., 2015; Calder et al., 2011).

A potential solution for an inadequate intake of nutrients is to engage in mindful eating practices. According to a study published in the American Journal of Clinical Nutrition, mindful eating practices, such as paying attention to hunger and fullness cues, can improve people's overall nutrient intake (Warren et al., 2017)

An Indian study showed that the global prevalence of childhood obesity has increased eightfold in the 5–19 y age group in the past four decades (Mittal & Jain, 2021). Also, a few studies found that, as the BMI distribution shifts upwards, the prevalence of underweight declines somewhat more slowly than the prevalence of obesity rises (NCD-RisCv, 2021).

It appears that the relationship between BMI and systolic pressure is significantly positively associated ($p < 0.0001$)

The minimum value for the systolic pressure observed was 100 mmHg and the highest 184 mmHg. The normal values for systolic pressure are between 100-130 mmHg (Javaudin et al., 2018). Our mean value was 132.6 mmHg. A study showed that the strength of association between the body mass index (BMI) and blood pressure (BP) varies with population and time. Mean systolic blood pressure (SBP) values decreased from 122.8 to 122.3 mmHg in the first year of the comparative study and gradually increased to 125.9 mmHg thereafter. The data showed that the BMI-BP association increased over time (coefficient of the interaction term > 0 , $P < 0.001$). Moreover, as the BMI increased, the annual increase in BP and BP per unit BMI also increased. The association analysis between BMI and SBP resulted in an annual increase in the correlation coefficient (SBP: 0.257-0.495).

The study emphasized a continuous shift towards obesity in BMI distribution and intensifying BMI-BP association over time (Koh et al., 2022).

The data from another study showed that the odds ratios (ORs) for high BP were 1.27 (95% confidence interval [CI], 1.14-1.41; $P < 0.001$) in the 25th-49th percentile subgroup, 1.55 (95% CI, 1.39-1.73; $P < 0.001$) in the 50th-74th percentile subgroup, and 2.17 (95% CI, 1.92-2.46; $P < 0.001$) in the 75th-84th percentile subgroup, respectively, after adjustment for sex, age, race/ethnicity, height, and country (Wang et al., 2020).

Based on the data that our study provided, we observed that weight was statistically significantly and positively associated with systolic and diastolic blood pressure.

A study showed that children with elevated blood pressure or hypertension had significantly higher weight, BMI, WC, HC, fat mass, and fat-free mass values compared to participants with normotension, supporting the direct association between obesity and hypertension in this population (Wühl, 2019). All obesity-related variables showed statistical differences between the normotensive, elevated blood pressure, and hypertension groups for systolic and diastolic blood pressure ($p < 0.05$) (Koh et al., 2022). Hypertension is a common finding in children and increases the risk for future cardiovascular events (Tran & Urbina, 2020; Srouf et al., 2019).

Our statistics showed that the maximum intake of carbohydrates in a day was 489.9 grams, while the mean value is 294.59. An etiological element that may contribute to the diverse condition and phenotypes of obesity is food addiction (Lennerz & Lennerz, 2018). Carbohydrates with a high glycemic index cause neurochemical and behavioral reactions that resemble addiction (Vella & Pai, 2016). The carbohydrate quantity and quality also have a vital function in the prevention and management of diabetes. Also, a study found a linear association between carbohydrate consumption and MetS risk with a corresponding OR of 1.026 (95% CI, 1.004-1.048) and with significant heterogeneity ($I^2 = 82.0\%$) at 5% energy intake from carbohydrates (Liu et al., 2019).

Conclusions

1. According to the analyzed study sample, a weight development problem was observed in 47.66% of the cases, while only 53.84% of the adolescent subjects included in the research were characterized by normal weight.

2. Poor anthropometric development was significantly influenced in our adolescent sample by carbohydrate intake, with no positive or significant association with protein or fat intake.

3. In our research, weight and body mass index were positively and significantly associated with systolic and diastolic blood pressure.

4. Only a percentage of 8.33% of the analyzed subjects managed to ensure the caloric requirement, while 91.6% did not.

Conflict of interests

The authors declare no conflict of interests.

Acknowledgment

Partial results from the paper are part of the first author's bachelor thesis.

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The Biering–Sorensen test as a screening tool to observe lower back muscle strength and sub-clinical back strain in computer users: a cross sectional study

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Abstract

Background. Work-related low back pain is very common in computer users due to prolonged sitting time at work. The lower back muscle strength weakness is associated with occurrence of back pain in computer users. It is very essential to find out effective back pain prevention methods at sub-clinical level.

Aims. This study aims to investigate the Biering-Sorensen test as a screening tool to measure lower back muscle strength and sub-clinical back strain in computer users.

Methods. This cross-sectional study recruited 520 IT employees (262 men and 258 women) from various companies in Q City Tech Park, Hyderabad. The subjects without any back pain from the last year were included in this study. The Biering-Sorensen test was used to assess back extensor muscle endurance strength. All the participants were assessed position hold time (PHT). The Biering-Sorensen test itself is a provocative of back pain. Any back strain during the test was also recorded for data analysis.

Results. Logistic regression analysis showed significant association between back extensor endurance strength and risk of back strain in both genders ($p < 0.01$ and $p = 0.04$). Position hold time for poor and medium performance categories were positively associated with a risk of back strain, whereas good performance category has no significant association.

Conclusions. The results of this study are helpful to understand the possibility of back pain occurrence at sub-clinical level. We believe that the Biering-Sorensen test could have a great value to design appropriate back pain prevention programs.

Keywords: Biering-Sorensen test, muscle strength, low back pain, computer users, WMSDs.

Introduction

Low back pain (LBP) is a commonly reported work-related disorder in now a day's society. LBP imposes financial burden on industries in terms of healthcare costs, compensation payments, loss of productivity and new staff trainings (Brady et al., 2016; Janwantanakul et al., 2011). A further financial strain on organizations is to spend more about accurate healthcare standards like specialist appointment or buying expensive equipment. LBP not only affects the person, but also greatly strains the families, organizations and governments (Conway et al., 2016). Therefore, finding out preventive measures for work-related back pain are essential to minimize all these burdens.

Most people experience LBP at least once in their life time. Many research studies have shown that weak back extensor muscles are associated with non-specific LBP (Davarian et al., 2012; Chiarotto et al., 2018). Sitting for long time at workstations is associated with endurance

of back extensor muscles. People with weak extensor endurance capacity are more prone to develop back pain in future. A reduced back extensor capacity could be a great predictor of LBP (Jung et al., 2020; Mofroid et al., 1997; Chok et al., 1999; Martínez-Romero et al., 2020; Moreno Catala et al., 2018; Smith et al., 2010).

The Biering-Sorensen test was used in men to predict whether Position Hold Time (PHT) of back extensor muscles is associated with first time occurrence of LBP (Biering-Sørensen et al., 1984). Whereas Luoto et al. found significant association between PHT and new LBP occurrence in both men and women (Alaranta et al., 1995). These authors reported the risk of new LBP was higher in people with low PHT scores. The PHT score of back extensors was a great tool to differentiate subjects with and without risk of LBP. The isometric back extensor endurance test itself was provocative of LBP (Chidozie & Olusola, 2010). While performing the test, some of subjects, who

Received: 2023, April 17; *Accepted for publication:* 2023, April 25

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<https://doi.org/10.26659/pm3.2023.24.2.78>

had not shown any clinical symptoms of LBP previously, terminated the test due to back pain (Latimer et al., 1999).

However, prolonged sitting time could be a possible risk factor to develop LBP (Gupta et al., 2015; Citko et al. 2018; Inoue et al., 2015; Ye et al., 2017; Delpozoz-Cruz et al., 2012). Computer users from IT industry tend to sit longer hours and were at high risk to develop LBP. The Biering-Sorensen test was found to be a good assessment tool to predict lower back muscle weakness. The purpose of the test is to measure isometric endurance strength of back extensor muscles (Biering-Sørensen et al., 1989; Latimer et al., 1999).

Hypothesis

Based on these studies, we hypothesized that applying the Biering-Sorensen test in computer users might be helpful to observe the people with low muscle strength who do not clinically present back pain at the time of test (sub-clinical back strain). The test findings could be useful in early interventions with rightful preventive actions and lower the back pain prevalence rate.

Therefore, the aim of the study was to investigate if the Biering-Sorensen test could be an effective screening tool to measure lower back muscle strength and sub-clinical back strain in computer professionals.

Material and Methods

Ethical considerations

The Institutional Review Board approved this study. All the study participants were explained about study procedure prior to start the study. An informed consent was obtained from all the participants.

a) Period and place of the research

This cross-sectional study was conducted at Preventa Curo-Workplace Healthcare Centre located in Q City Tech Park, Hyderabad. The study was conducted for three months from January 2023 to March 2023.

b) Subjects gender and groups

It was carried out with consecutive sample method, recruited 520 IT employees (262 men and 258 women) from various companies. This study group age range was 22-45 years. All the subjects were explained about study procedure and any questions or concerns were addressed. A no-objection consent form was read and signed by each subject prior to the study.

The subjects included in this study had no history of back pain from the time of study and were working hours of 7-8 per day with full time employment.

The participants were excluded if they had any history of recent back pain, any neurological issues, spinal deformities, cardiovascular diseases, pregnancy and any kind of limitations to participate in this study. Individuals who were involved in specific back muscle exercise programs, competitive sports and athletes also excluded from this study.

c) Applied test

The Biering-Sorensen test is a muscle performance test that measures the endurance of back extensor muscles. It measures the holding time of unsupported trunk horizontal while prone lying on treatment table (Lanning et al., 2006; Demoulin et al. 2006; Mbada et al., 2009). The test

procedure and importance were explained and demonstrated to subjects prior to test. During the test, the subject is in prone lying position with anterior superior iliac spine aligned with edge of the treatment table. Lower body was strapped to the treatment table by two straps around pelvis and ankles respectively. The subject was allowed to rest the upper body on a chair until measurement starts. Subject was then instructed to hold upper body isometrically in horizontal position with hands folded across the chest. The subjects were encouraged to hold the position as long as possible and measured the hold time with stop watch. An inclinometer was placed at the interscapular region to determine horizontal position of trunk. If there was a deviation of more than 10 degrees in sagittal plane, the subject was instructed to gain horizontal position. The test terminated if the position was not immediately corrected or the subject no longer held the position or any pain aggravating conditions. The position hold time (PHT) was measured with stop watch. The position hold time is also known as Biering-Sorensen test score (BST score). The test was conducted only once and subjects instructed to take rest for some time before they were discharged from the test procedure.

Data collection

Anthropometric measurements like Weight, Height and Body Mass Index (BMI) were measured. Body weight was measured to the nearest of 100 grams with a weighing scale (Omron HN 286). A stadiometer (Stadiometer - Prime surgical) calibrated from 20-210 cm was used to measure height of each subject to the nearest of 1 mm. BMI was estimated by dividing weight in Kilograms by height in square meters.

d) Statistical processing

All the data analysis was performed using JASP version 0.16.2.0. The significance level set at $p < 0.05$. Descriptive statistics of mean and standard deviation used to summarize continuous variables while percentages and frequencies used to describe categorical variables. Independent t-test used to analyze differences between male and female variables. The association between lower back endurance level and relative risk of back pain was estimated with logistic regression analysis. The odds ratio (OR) was estimated with 95% confidence interval.

Results

The total number of study participants was 520 (262 men and 258 women). The general characteristics and position-hold time (PTH) of subjects by gender are described in Table I.

Table I
Comparison between physical characteristics and position-hold time of male and female subjects.

Variable	Male (n=262) Mean ± SD	Female (n=258) Mean ± SD	P- value
Age	29.8 ± 4.9	27.2 ± 4.2	0.00*
Weight	82.3 ± 10.5	70.9 ± 11.5	0.00*
Height	1.73 ± 0.04	1.65 ± 0.05	0.01*
BMI	26.8 ± 3.8	26.1 ± 4.6	0.04*
PHT	71.1 ± 42.5	66.3 ± 38.6	0.17

* Indicates significance at $p < 0.05$; BMI – Body Mass Index; PHT – Position Hold Time

According to Luoto et al. research, based on PHT scores, the subjects were grouped as poor, medium and good performers. The subjects whose PHT scores was less than 58 were classed as poor performers, PHT scores between 58-104 (men) and 58-110 (women) as medium performers and PHT scores between 104-240 (men) and 110-240 (women) as good performers (Alaranta et al., 1995).

Table II

Different categories of PHT endurance performance among men and women with reported back strain during test.

Category	Number (n)	Percentage %	Back strain	Percentage %	P
Men					
Poor	133	51.9	96	61.1	<0.01*
Medium	73	27.8	38	24.2	0.01*
Good	56	20.3	23	14.6	0.07
Total	262	100	157	100	<0.01*
Women					
Poor	120	46.5	74	47.5	0.01*
Medium	93	36.0	37	23.7	0.03*
Good	45	17.5	13	28.8	0.09
Total	258	100	124	100	0.04*

*p < 0.05

While performing the test, the reported back strain within group of men was 61.1%, 24.2% and 14.6% for the poor, medium and good performer groups respectively. In women, the reported back strain had a distribution of 47.5%, 23.7% and 28.8% for the poor, medium and good category. Logistic regression analysis showed that back extensor muscle endurance performance was significantly associated with risk of back pain in both categories (Men P < 0.01, Women P = 0.04). In category-wise, poor and medium categories from both genders showed significant association (p < 0.05) between BST score and back strain. But good scores in both genders were not significant with back strain (Table II).

Discussion

Endurance capacity of back extensor muscles was important in the prevention and treatment of low back pain (Biering-Sørensen, 1984). The Biering-Sørensen test was a great tool to evaluate back extensor endurance strength and its helpful to predict back pain occurrence clinically. Many studies measured back muscle endurance capacity using Biering-Sørensen test to predict risk of LBP (Biering-Sørensen, 1984; Alaranta et al., 1995; Chidozie & Olusola, 2010; Latimer et al., 1999; Biering-Sørensen, 1989). Biering-Sørensen found that persons with PHT who scored less than 176 were prone to develop LBP within a year time. But the LBP was not developed in persons with a PHT score over 198 (Biering-Sørensen, 1984). The purpose of the current study is to measure lower back muscle strength at subclinical level using Biering-Sørensen test as a screening tool.

Statistical analysis revealed that PHT scores of poor and medium category from both genders has significantly correlated with risk of back strain during the test. However, good category from both genders has not shown significance between PHT score and risk of back strain.

Among men, poor category showed nearly three times higher risk of back strain compared to medium category and four times more risk than good category. Women with poor category had two times and almost six time more risk of back strain compared to medium and good categories respectively. When comparing between men and women, the reported back strain was higher in men among all the three categories. The reported back strain was higher in men than women in the poor category. The reason might be men had higher level of BMI than women.

Limitation of the study

The main limitation of study was that no analysis was used to detect motivation of subjects to complete the test. The motivation of subjects to complete test could impact medium and good category numbers. No such method like psychological outcome measures for motivation and perceived effort during the test was incorporated to this study (Moareu et al., 2001).

Conclusions

1. Low endurance levels may be considered as a predictor of occurrence of back pain in computer users.
2. Our study results show that poor PHT scores from both genders has positive association with the risk of back strain, whereas good scores are negatively associated.
3. The Biering-Sørensen test score is helpful to measure lower back muscle strength and helpful to estimate the possibility of back pain occurrence clinically.
4. In conclusion, we believe that the Biering-Sørensen test could have a great value to be a screening tool to observe the future risk of back pain at subclinical level.
5. This test might be helpful to design effective preventive programs for work-specific back pain.
6. It is also cost-effective, easy to administer the test.
7. We recommend the incorporation of the Biering-Sørensen test in non-clinical settings such as occupational health screenings and preventive health programs to prevent work-related back pain prevalence.

Conflict of interest

No conflict of interest

Acknowledgment

The author would like to thank all the employees at Q City tech park who volunteered for this study.

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CASE REPORTS

The effects of Health & Wellness Coaching intervention on the quality of life

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Abstract

Background. At present, the quality of life occupies a privileged place within society, representing an essential barometer both at the social and individual level. It comprises several dimensions, including interpersonal relationships, physical well-being and mental or emotional well-being, which are evidenced by a series of indicators, such as self-esteem, avoidance of excessive stress, health, the number of social contacts, the presence of clearly defined goals, etc.

Aims. The purpose of this research is to highlight the increasing presence of psycho-emotional disturbances, most often related to stress, which lead to the alteration of the quality of personal life, as well as to introduce new methods of intervention, in the hope of increasing the degree of awareness about them.

Methods. In this work we will present the favorable evolution of a 40-year-old woman suffering from a marked deterioration in the quality of her personal life, as well as a high level of stress, with pathological personal antecedents in the psycho-emotional sphere, and who followed a type of Health & Wellness Coaching (HWC) intervention between 2018-2019, with a view to assess the effects on the quality of life. The effect of the intervention was documented through the initial and final evaluations.

Results. The results showed a significant improvement in the subject's quality of life, brought about by a change in lifestyle, with a positive impact at the physical, psycho-emotional and social level, evidenced by the increase in self-esteem and the levels of communication and socialization.

Conclusion. The study demonstrates that HWC is an effective method in the process of lifestyle reorganization, in the case of people with stress-related conditions, resulting in the improvement of their quality of life, the positive impact of this technique extending to physical, psychoemotional and social levels.

Keywords: quality of life, self-esteem, healthy lifestyle, communication, health & wellness coaching, training.

Introduction

The concept of quality of life is widespread in highly developed societies, Romania being one of the few European countries which have massively taken up the complex issue of the quality of life in sociological research, ever since its emergence (Zamfir & Precupeanu, 2018). A Gallup poll conducted in 2022 showed that stress among the employees worldwide has reached a new record level, with them feeling even more stressed than in 2020 (the previous historical level), and with almost half

of employees worldwide feeling intensely the burden of stress (1). Even if the number of research papers related to stress and antistress therapies is constantly increasing, stress therapy is plagued by numerous controversies and uncertainties (Wagenaar & La Forge, 1994, quoted by Ellis et al., 2020). Part of the difficulty in treating stress effectively stems from the absence of a coherent definition of stress (Ellis et al., 2020). For example, the high level of stress contributes to the alteration of the quality of life, being associated with mental health issues and physical

Received: 2023, April 6; Accepted for publication: 2023, April 25

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<https://doi.org/10.26659/pm3.2023.24.2.82>

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diseases, something which is insufficiently captured by the existing definitions (Stofel et al., 2020). Consequently, there is an urgent need to approach the human being from a holistic point of view: physically, mentally, emotionally and socially, in order to reach a better understanding of the individual and to optimize the quality of life. The latter can be measured both by primary *objective indicators*, and by specific indicators *of a subjective nature*, which capture the reactions (perceptions, expectations) of the population, in relation to the given socioeconomic context (Zamfir & Precupeanu, 2018). The avoidance of excessive stress, an indicator of *emotional well-being*, together with *physical well-being* and *interpersonal relationships* (Lupu, 2006) are some of the dimensions of the quality of life. The assessment of the quality of life is considered to be subjective, as it is embedded in a sociocultural and environmental context (2). Being a subjective assessment that involves several facets of life, there are no general treatments which address this particular component.

Coaching is a consultative method of empowering the individual, wherein the main task of the coach is to help clients understand how they generate their problems (O'Connor & Lages, 2007), in order to solve them. Specifically, HWC is a technique at the intersection of medicine and wellness that provides improvement in wellness and health, fundamental indicators of the quality of life. HWC is an individual-centered process based on behavior change theory (Wolever et al., 2013). It has rapidly developed as an adjunctive treatment for lifestyle-related diseases, which are the most frequent causes of morbidity and mortality in developed countries (Sforzo et al., 2017). In addition, HWC helps individuals boost their motivation and integrate their own learning into how best to change their behavior in the context of their own life circumstances (Wolever et al., 2016).

Hypothesis

This study aims to emphasize the effectiveness of the HWC-type intervention in the case of people who present an alteration of the quality of life, due to a high level of stress, with a negative impact at a physical, mental, emotional and social level. The basis of this study is the growing demand for this type of interventions, with a concrete role in changing the lifestyle.

Objectives

By correlating the data collected from the case history and the questionnaires applied at the beginning of the HWC intervention, the following objectives were formulated: 1. increasing self-esteem and self-confidence; 2. improving the level of communication and socialization; 3. reaching a general state of well-being, by increasing the level of physical energy and muscle toning; 4. optimizing the psycho-emotional state of the subject so that she could develop a couple relationship, all with the ultimate goal of improving the quality of life.

Material and methods

The study was conducted according to the ethical procedures recommended by the World Medical Association (Helsinki) (3), after the subject provided written informed

consent. The parameters of the HWC intervention were as follows: 12 sessions during 12 different days, with individual sessions once every 3 weeks. The first session was a group training, followed by 11 individual sessions, of which 7 were combined coaching & training sessions, and 4 were only coaching sessions.

Research protocol

a) Period and place of the research

The study was conducted over a period of 9 months (May 2018 - February 2019).

b) Case Presentation

In May 2018 the subject presented at the office of the Age Sense private clinic in Bucharest, for a group training session on issues related to health, energy, and a healthy lifestyle. She was a 40-year-old woman with a higher education, from an urban environment, who came to the Age Sense clinic to participate in the training because she was suffering from high levels of stress, lack of energy and an altered quality of life. As stress is a highly personalized phenomenon, considered by WHO as the health epidemic of the 21st century (Fink, 2016), it requires a new understanding and approach. From the personal pathological antecedents, I noted the presence of psycho-emotional disorders, affecting the general state of well-being, for which she had undergone drug treatment for 9 years (2005-2014), a treatment discontinued by the subject in 2014, as she presented a condition of fatigue and anhedonia. Moreover, the subject reported having suffered multiple family-related emotional traumas during childhood.

c) Applied tests

The following psychometric instruments were applied, both at T0, the start of the program, and at T1, the completion of the program:

- *Self-esteem* (Rosenberg, 1965)
- *Personal communication styles* (Marcus, 1997, quoted by Radu, 2015).

At the end of the first training session (120 min), the subject enrolled in the personalized HWC program, attending a second meeting, 3 days later, this time 1-1 in a coaching session (120 min). After a brief case history, it became apparent that among the dimensions of the quality of life, the most affected were those related to emotional and mental well-being, closely followed by interpersonal relationships and physical well-being. I also evidenced the lack of clearly defined goals, the lack of need for affirmation, the preference for isolation, the difficulty in making decisions and the absence of time dedicated to hobbies. The only chapter where there were no obvious problems was the financial situation, which ensured a precarious biopsychosocial balance. After this first assessment, we estimated that approximately 9-12 individual training & coaching sessions would be required. It is important to note that before 2020, mental disorders were the main causes of the global health burden, and the emergence of the pandemic created an environment in which many determinants of poor mental health were exacerbated (Santomauro et al., 2021). Considering the data collected from the case history, we agreed that during the HWC intervention we will work on the most deeply affected aspects, with the following objectives:

- increasing self-esteem and self-confidence;
- improving the levels of communication and socialization;
- achieving a general state of well-being, by increasing the level of physical energy and muscle toning;
- optimizing the psycho-emotional state, so that she could develop a couple relationship.

Self-esteem is an important predictor of subjective well-being and refers to people's perceptions of their quality of life (Du et al., 2017). It gives the person an individual sense of value and is part of the four fundamental needs of the human personality (Leca, 2015).

In our case, the HWC program lasted nine months, during which there were 12 meetings, one every three weeks, lasting between 60-120 min, depending on the needs. The HWC-type interventions took place in an informal setting, with the first author acting as a guide (doctor & coach & trainer), empowering the subject throughout the intervention, in order to set out and achieve the objectives of the intervention, by focusing on specific tasks. During the training sessions, the coach provided general and specific information (info training) according to the subject's needs, while during the coaching sessions she empowered and guided the subject towards establishing and achieving the set goals.

During the *first training session - Education for a healthy lifestyle* - which took place in a small group, the information delivered was focused on stress, neuroscience, epigenetics and coaching. After this initial group session, eleven single or combined coaching & training individual sessions followed.

Session 2 of one coaching & training (120 min) – the subject expressed a desire to improve and develop communication skills and increase energy levels. A good rapport was successfully established starting with the first meeting, the subject receiving info training about how the brain works and the role of breathing. Objective: finding a social context to make a presentation in front of an audience, in a state of high energy levels. Selected actions: documenting for a presentation, taking walks in the park and socializing by asking questions. Current blockages: fear of socializing and communication, which had plagued her since adolescence, when the first episodes of panic attacks and nightmares occurred.

Session 3 online coaching & training (90 min) - Previous objective reached 90%. The subject gave 3 presentations within a small group. The states of fear and anxiety did not go away, but she began to be able to control them. Info training: deep abdominal breathing necessary for controlling dysfunctional mental states. The walks continued, energy levels increased, and socializing, both physical and online, was initiated. Objective: monitoring and controlling emotional states through the mental switch technique, combined with breathing. Selected actions: 1) awareness and monitoring of stressful situations, which cause unpleasant emotions (using a diary), followed by training on how to react 2) use of parasympathetic oil as an adjuvant in difficult situations, 3) continuation of socialization exercises 4) practicing taking pictures (a

new hobby). No apparent barriers.

Session 4 online coaching & training (60 min) - Previous objective achieved 100%. The subject became a facilitator during certain events, where she also took photos. Info training: communication styles. She continued her walks and began to enjoy being around people. She still does certain things in order to get attention, not necessarily because they give her pleasure. The subject also discloses the thought that if she is rejected, this means she is not loved. Objective: defining the perfect life and relationship. Chosen actions: writing down what she wants to do, where she wants to live, how she wants to feel and what will be different from the present. Barriers: fear of expressing feelings, associated with the idea that she might get hurt.

Session 5 online coaching (60 min) - Previous objective achieved 100%. She realized that her current relationship does not really exist, since for her the perfect relationship involves: communication, feeling connected, playfulness, closeness, trust, support, tenderness and intimacy, and none of these have been present. For her, the perfect life means traveling with your camera and your partner. At present, when attention is paid to her, she gets involved in relationships without being aware of her desires, and afterwards she regrets it. Objective: a more effective presence and communication. Chosen actions: being more aware of her feelings and the actions she wants to take toward a new relationship. Barriers: there is still the fear of abandonment, which makes her perceive any refusal as dramatic.

Session 6 online coaching & training (60 min) - Previous objective achieved 100%. She became aware of and monitored her feelings and actions. The sense of abandonment disappeared, but instead the sense of shame appeared ("what would people say?"). Info training: the formation and disappearance of neural connections. Objective: improving communication, with the elimination of the feeling of shame. Selected actions: writing phrases from memory about shame and noting how they have influenced her life, in order to realize that they are not necessarily valid and do not represent her. Should select the phrases and thoughts which represent her, and in the future identify with them. Barriers: insignificant, perceives environmental situations more rationally.

Session 7 online coaching & training (60 min) - Previous objective reached 60%. She did some training with the feeling of shame and realized that it had helped her by keeping her safe, basically it did not let her show how she was really feeling, so that she would not be rejected. Info training: ways of communication. Then she selected the phrases which represented her. Objective: organizing events in the native area. Chosen actions: resuming communication with the people in the area so that she could invite them to the event. Barriers: fewer, the sense of shame has abated, it occurs less often.

Session 8 online coaching & training (60 min) - Previous objective achieved 100%, the subject organized an event in her native area with about 20 people. The sense of shame disappeared and she felt safe. Info

training: soft skills. Objective: initiating steps towards a functional relationship and improving soft skills. Selected actions: a course in soft skills and gaining awareness of the thoughts that arise regarding a possible relationship. Barriers: apparently none.

Session 9 online coaching & training (60 min) - Previous objective achieved 100%, she took the course and became aware of the inherited mental pattern regarding relationships: it is the man who should make the first step and only feelings of frustration can become manifest in a family. Info training: assertive communication. Objective: dissociation from “inherited thoughts” regarding family relationships. Selected actions: taking the first step in any relationship with a male person, regardless of whether he is a colleague, friend, etc. and expressing positive feelings: joy, happiness, delight, love, etc. Barriers: none.

Session 10 online coaching (60 min) - Previous objective achieved 100%. She experienced what it means to approach men, she signed up for a dance class, went to a workshop where she met someone and they started communicating online, expressing positive feelings. Objective: choosing conscious, family-related thoughts which should be representative for her. Selected actions: writing what a fulfilled couple or family relationship means to her. No apparent barriers.

Session 11 online coaching (60 min) - Previous objective achieved 100%. She chose her thoughts regarding the relationship she is currently in. She began to put these thoughts into action and experimented one more night out with her current partner to see if the feeling of shame would return, but it did not. Objective: conscious continuation of the initiated relationship. Actions chosen: setting up dates and following the natural course of a relationship after new realizations.

Session 12 online coaching (30 min) - in which she described her new relationship in wonderful terms, recounted what personal development courses she has followed and described her physical, mental, emotional and social states in superlative terms.

d) *Statistical processing*

The data have been processed using the statistical software SPSS Statistics (Statistical Package for the Social Sciences).

Results

Following the application of the tools, the results obtained were entered and processed with the aid of the SPSS statistical program package, in order to obtain descriptive statistical data. Thus, the results obtained from the application of the two tools are presented in Table I, and the data obtained after the statistical processing of the results are presented in Table II. Taking into account that there is just one subject, non-parametric statistical methods were used. These methods use scores converted into ranks, and differences between means are not tested. Therefore we will check if the ranks in a group are higher or lower than the ranks in the other group. We have applied the non-parametric tests Friedman Two - Way Analysis of Variance by Ranks and Cochran’s Q Test (Table II).

Table I

The results obtained from the application of the two tools.

Test	Score	
	T0	T1
Self-esteem	26	33
Communication style	Non assertive	6
	Aggressive	1
	Manipulative	8
	Assertive	4

Table II

The data obtained after the statistical processing of the results.

Quality of life Parameter	Non-Parametric Test	P value
Self-esteem	Friedman’s Two-Way Analysis of Variance by Ranks	0.501
Communication style (Non assertive, Aggressive, Manipulative, Assertive)	Cochran’s Q Test	0.024

The scores obtained by the subject on the “Self-Esteem” indicator at the beginning and at the end of the program demonstrate an improvement in the level of self-esteem. The minimum score that might be obtained is 10, which means very low self-esteem, while the maximum score is 40, which means very high self-esteem. Scores between 10-20 points represent low self-esteem, between 20-30 points - average self-esteem, and between 30-40 points - high self-esteem. An increase in the level of self-esteem is observed, from a score of 26 to a score of 33. The results obtained following the HWC intervention are shown in Fig. 1.

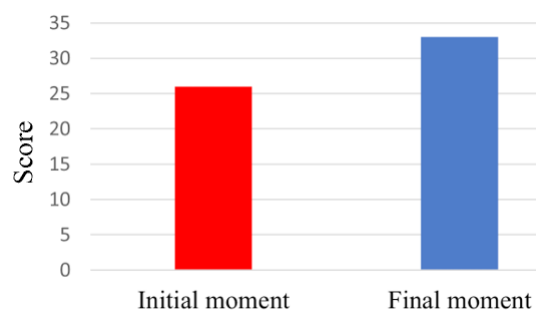


Fig. 1 – Self-esteem.

We also measured the type of communication present at the beginning and at the end of the program, of which we have four categories: non-assertive, aggressive, manipulative and assertive. The style with the highest number of points indicates the dominant attitude in communication. If for two styles identical or similar scores are obtained, the manifest style of communication is still undefined, and one or the other can become dominant at any time depending on the situation. If the scores correspond closely to three or four styles, then we can speak about the lack of a defined style of communication, which indicates an immature communicative behavior, associated with a behavior which is difficult to anticipate. The changes obtained between the two measurements are shown in Fig. 2 and reveal a positive evolution of the communication style.

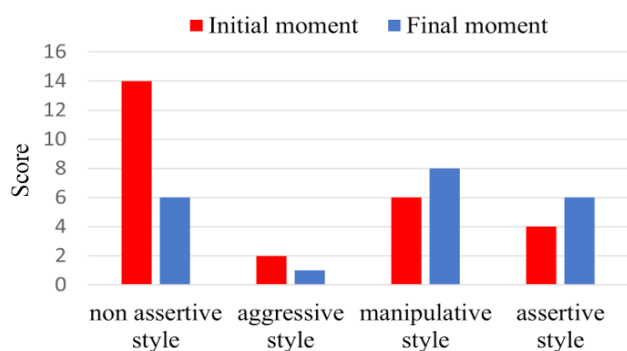


Fig. 2 – Communication style.

Discussion

The rehabilitation was all the more important as the subject is a young adult woman who has suffered a lot, with great potential for personal development and evolution, blocked due to her current condition. To the general objectives, specific objectives, established by the subject with the support of the first author, were added during the sessions.

At the end of the HWC program the set objectives were achieved 100%. Both the first monitored parameter, self-esteem (Fig. 1) and the second, communication style (Fig. 2) had a positive evolution. We consider that the practical results we obtained are relevant. This study certified the positive evolution of the intervention in terms of improving self-esteem, attitude and the feeling of self-satisfaction, which is related to the self-concept (Sánchez et al., 2021). Practically, a considerable improvement in the level of self-esteem was observed, from an average to a high level.

We will take into account the statistical result, which is > 0.05 , at the limit (Table II), but we consider that this is due to the small number of participants (one), as well as the small number of items (ten). In our case, in order to extrapolate we need a larger number of subjects. At the clinical level, what matters is the difference between the mean values and it corroborated the positive evolution of the parameter “Self-Esteem”, which was obtained following the HWC intervention.

The obtained scores, for the second parameter, demonstrate that the intervention had an effect on all styles, by decreasing the score of the non-assertive and aggressive styles, together with increasing the score obtained for the manipulative and assertive styles. Assertive communication means expressing your point of view in a clear and direct way, while respecting others (4) and is usually seen as a healthier communication style offering multiple benefits such as winning self-confidence and self-esteem, gaining a sense of empowerment, gaining respect from others, improving communication, increasing the ability to make decisions, creating honest relationships etc. (5). Aggressive communication is an ineffective communication style as the content of the message may get lost, because people are too busy reacting to the way it is delivered. Instead, manipulative communicators are skilled at influencing or controlling others to their own advantage (Newton, 2023). Non-assertive communication is the opposite of aggressive communication, and non-assertive communicators often want to be accepted, need to be liked, and always allow others to choose for them (Robboy, 2023).

Starting from an almost total lack of communication, lack of friends, lack of communication with family, lack of social contacts, the presence of only punctual professional contacts, lack of intimacy, a relevant reduction of the non-assertive attribute was obtained in the end. The subject became sociable, with frequent social contacts, new friendships, established functional family relationships, there was even a desire for affirmation at the level of the new communities she had accessed.

In addition, a decrease in aggressive style and an increase in empathy were the outcomes. The higher score on the manipulative attribute, apparently a negative result, could be interpreted positively, in the sense that she began to set clear goals and made the right decisions in order to achieve them, including making demands that she previously did not dare to do because of her sense of shame. The improved assertive attribute denotes that the subject has become more open, has managed to improve her interpersonal relationships, express her feelings, emotions and thoughts without fear, yet also without hurting the feelings of others, she has acquired the power to turn down certain unpleasant requests, which she could not refuse before. The initiation of conversations also helped her in her efforts to develop a couple relationship, which culminated in the acquisition of the feeling of joy and happiness. Therefore, we noted a favorable evolution, which involved moving from a dominantly non-assertive style, in which everything she communicated and did was just for the purpose of being liked and accepted, to a more balanced communication style, yet still insufficiently mature. However, the overall communication style has improved significantly.

The statistical results obtained for the parameters “Communication styles” (Tab II), show a $p < 0.05$, which represents a significant value for 95% of the results. This result, prove that the HWC intervention is also effective from a statistical point of view. We believe that the larger number of items (sixty) made a difference, since we took into consideration only one subject. Therefore, the null hypothesis is rejected (the HWC intervention does not have a positive impact on communication styles) and the formulated hypothesis is accepted, namely that the HWC intervention has a positive impact on communication styles, improving the levels of communication and socialization.

We appreciate that the coaching interventions empowered the subject to assume certain behaviors in order to achieve the objectives, and the training sessions provided her with the informational basis necessary to understand physical, mental and emotional states, which helped her to develop an increased resilience to stress and initiate new actions. Stress resilience may be defined as a positive adaptation to adversity, a concept according to which an individual can bend to threats in the environment but does not break, or as the ability to bounce back from disruption (Bhatnagar, 2021). All these have also led to a positive improvement in physical condition, with increased energy levels and muscle tone.

The subject was monitored monthly, by telephone and online for the following 9 months, without further interventions or recommendations, as throughout the program she proved to be highly motivated: she adopted a healthy lifestyle, which led to a significant improvement in the quality of life, with a positive impact on the physical,

mental, emotional and social states. This type of informal and non-invasive interventions are growing in number and are highly appreciated by clients, as they offer a professional setting for manifestation, where the client has complete freedom in choosing solutions and making decisions, being only guided and empowered by a guiding expert.

Conclusions

1. Following the HWC intervention, the subject achieved a very high degree of personal satisfaction by gaining self-confidence and self-esteem.

2. The evolution of the communication style was further proof that HWC had a positive impact on all communication styles, resulting in a healthier communication style, which brought multiple benefits to the subject.

3. HWC is a modern method of effective intervention in the process of lifestyle reorganization, resulting in the improvement of the quality of personal life, with a positive impact at the physical, mental, emotional and social levels.

4. Mental disorders, generally related to stress, represent the main causes of the global health burden, and recent years have created an urgent need to find effective solutions to optimize the quality of life of individuals.

5. The early detection of stress-related symptoms with a negative impact on the personal quality of life is important, and even if medication is not always the most effective solution, there are currently new effective tools, both for prevention and for intervention.

Conflict of interests

The authors declare no conflicts of interests.

Acknowledgments

The study presents partial results from the first author's doctoral thesis.

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REVIEWS

The main lines of intervention and treatment of obesity: the effectiveness of cognitive behavioral therapy (CBT) and hypnosis

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Abstract

Obesity represents a growing public health issue, a phenomenon with a pandemic character.

Obesity is a chronic condition with a complex etiopathogenesis and is associated with risk factors for medical complications and comorbidities.

Given the complexity of the phenomenon of obesity, its treatment requires psychological interventions along with the standard ones (nutritional, pharmacological and surgical).

In this regard, the role of cognitive behavioral therapy (CBT) in the treatment of obesity and eating disorders is increasing. CBT represents an indicated method in the treatment of bulimia and a first-line intervention for obesity.

In the fight against obesity CBT is increasingly associated with Hypnosis, a combination which improves the effectiveness of the two methods.

CBT and hypnosis support the long-term emotional, cognitive and behavioral changes needed for the adoption of a healthy lifestyle.

Physical activity is an important component of a healthy lifestyle. In this respect, awareness of the preferences of the population regarding physical exercise is useful for the development of health policies and in the global fight against obesity.

Keywords: overweight, obesity, obesity pandemic, fitness, cognitive-behavioral therapy for obesity, hypnosis.

Obesity, a chronic disease and a public health issue

At present, our unhealthy style of eating, the daily stress, as well as the sedentary lifestyle affect the entire population of the globe, contributing to a significant increase in obesity and the emergence of serious health problems.

In Europe, over 60% of the population is affected by overweight and obesity, and if no measures are taken to prevent and combat it, for the year 2025 WHO predicts that obesity - considered by some specialists a “chronic disease” - will affect 50% of the world’s population. These figures confirm the extent of the phenomenon of obesity. We can speak of a “pandemic obesity”, a problem for which, at the global level, we have not yet found solutions, nor any sustainable and long-lasting approaches.

In recent years, overweight and obesity have become a “public health problem” (Cojocaru, 2021; Tihon, 2019), affecting people of all ages, considered by WHO a “chronic disease” and a “global pandemic”. It is one of the greatest challenges of the 21st century, affecting both men and women of all races and ages.

When looking at the global obesity epidemic, data on the risk factors of obesity are not exactly known, due to the differences in behavior, social culture and lifestyle from country to country and region to region. That is why BMI (body mass index) has become the statistical measurement unit of obesity and overweight, unanimously accepted in all countries, facilitating research related to the epidemiology of obesity, which, in the period until 1990, when each country had its own specific criteria for evaluating obesity,

Received: 2023, May 5; Accepted for publication: 2023, May 12

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<https://doi.org/10.26659/pm3.2023.24.2.88>

had been rather challenging.

WHO defines overweight as the situation in which the BMI is greater than or equal to 25, and obesity as the situation when the BMI exceeds or is equal to 30.

Hippocrates, the father of medicine, said the following about obesity: it is not only a disease in itself, but also a precursor of other diseases (Cojocaru, 2021).

Obesity is a chronic condition, associated with risk factors for many medical complications and comorbidities, and therefore it should be treated as a complex and multifactorial disease (being influenced by genetic, biological, psychological, behavioral, familial, social, cultural and environmental factors). As such, it requires urgent global action, which should be taken by unifying all knowledge and integrating practical interventions and all known effective therapies to combat and treat obesity.

The etiopathogenesis of obesity

Although in certain situations the main causes of obesity are genetic in nature, or generated by the existence of endocrine and mental disorders, or specific medications, in most cases obesity is closely related to a lifestyle combining a high calorie intake, an unhealthy diet, stress, occupations involving a sedentary lifestyle and the lack of exercise.

The social environment creates a predisposition to overeating, through the generous offers of foods rich in sugars, fats and preservatives, which are affordable, pleasant to the taste, yet with a very high caloric density and a low nutritional density.

Access to such foods, in increasing quantities, as well as the sedentary and stressful lifestyle combine with individual risk factors (psychological, biological, etc.), or with family risk factors, thus contributing to the increase in obesity among the population and to the emergence of certain eating behavior disorders.

Obesity is the result of a complex interaction between genetic, epigenetic, and environmental factors which determine the energy imbalance responsible for obesity.

Overweight and obesity result from the disruption of the energy balance, in the sense that the amount of energy ingested is greater than the amount of energy consumed. This process has the effect of depositing adipose tissue in certain parts of the body, as well as altering the structure and the secretory function of adipose tissue (Tihon, 2019).

Being a "chronic disease", obesity generates not only the deposition of fat in certain parts of the body, but also a series of metabolic complications such as diabetes, as well as cardio-vascular, endocrinological, osteoarticular complications, etc.

Obesity as a pandemic phenomenon

Due to the extent that the phenomenon of obesity has reached during the last decades, it is rightly considered to be a growing pandemic phenomenon, being also referred to as a public health crisis, which overwhelmingly affects the quality of life and the health of the individual, burdening the national budgets allocated for health.

Obesity affects adults, men and women of all ages and from all the walks of life, as well as children.

According to the latest WHO report (2) on obesity, carried out in 54 countries, the figures for Europe are

worrying in the sense that approximately 60% of the population is overweight, and the obesity index in Europe is on the increase. The most affected countries are Turkey and Malta, with a figure of over 65% of overweight people. Recent estimates have shown that overweight and obesity cause more than 1.2 million deaths in the WHO European Region each year, being the fourth leading cause of death after high blood pressure, unhealthy diet and tobacco use (2).

The WHO report also confirms that the COVID-19 pandemic has increased the obesity rate and worsened the situation of the overweight, due to the lack of exercise and the fact that people stayed indoors for a long time during the quarantine period.

In Romania, in 2022, the percentage of adults affected by overweight and obesity was 58%, a percentage very slightly below the European average of 60% (2).

In addition, more and more children are affected by overweight and obesity. Childhood obesity is also a consequence of the aggressive marketing of unhealthy foods and drinks, and the lack of nutritional education on the part of the parents, but also of the lack of physical education and sports activities in schools.

The WHO warns that if urgent measures are not taken, by 2025 50% of the world's population will suffer from obesity. In the 2023 Atlas of the World Federation against Obesity, it is estimated that by 2035, 51% of the global population could be affected by obesity, and childhood obesity could reach 100%, if we do not intervene (1).

Obesity is spreading like a global epidemic and represents one of the biggest challenges of the health system nowadays.

Already in 2015, after an alarming increase in obesity and overweight was observed, the "International Obesity Day" was designated, which WHO marks every year on March 4, in order to increase the degree of responsibility on the part of society, at a global level, with regard to the phenomenon of obesity.

Together we can correct the misconceptions about obesity and everything that has not worked so far by taking collective action, changing outdated norms and tackling the phenomenon of obesity in a complex way, as the current situation calls for.

It is necessary to monitor the evolution of this phenomenon, and all the causes and consequences of obesity must be correctly evaluated and treated interdisciplinarily by teams of doctors and specialists from different fields.

Directions for action to prevent obesity: trends in fitness

The two main directions of action in the prevention of obesity still remain healthy eating and an active lifestyle. However, quality sleep, avoiding stress, and balance in everything are also necessary for a healthy lifestyle.

A healthy diet implies avoiding fats, highly concentrated sweets, carbonated juices rich in sugar, avoiding fast food and processed foods which contain a lot of sugar and preservatives, and at the same time increasing the consumption of fruit and vegetables, whole grains and quality protein.

An active and healthy lifestyle also requires a lot of movement, considered by some authors as the "basis of life",

with a significant role in maintaining health and balance in the human body, the movement of skeletal muscles involving energy consumption (Szabo, 2022), with beneficial effects on fat burning and keeping the body in shape.

Although lifestyles have been affected by the COVID-19 pandemic, many of those isolated at home, as shown in the latest 2023 Global Fitness Trends Survey by Thompson (2023), have turned to fitness at home - which played an essential role in the post-pandemic recovery.

If during the isolation at home, fitness professionals resorted a lot to online services, so that online training from the comfort of home was the number 1 trend in 2021, we notice that in 2022 it reached the 9th place among the options of amateurs of exercise, and is currently on the 21st place, which means that people now choose to exercise outdoors or go to the gym in person.

The online survey using www.surveymonkey.com was sent to 125.940 people, including more than 32.000 ACSM certified professionals, who registered to attend the International Health ACSM 2022 & Fitness Summit; 3.753 people responded to this survey, and responses were received from all continents.

The results of the survey showed that among the solutions for keeping fit, for adults, functional fitness training, outdoor activities are preferred (ranked 4th among the preferences of fitness activities in 2021 and 3rd in 2022), together with basic training, circuit training etc. (Thompson, 2023).

Knowing these trends can be very useful for the development of health and prevention policies, for finding solutions to encourage the adoption of a healthy lifestyle among the population, based on the practice of healthy eating habits, as well as outdoor movement, training and fitness programs for adults, as well as practicing traditional sports - for children.

The main scientifically validated approaches to treating obesity: the importance and effectiveness of CBT and hypnosis

Currently, the following three scientifically validated approaches are used for the treatment of obesity, including severe or morbid obesity, but also for weight regulation, accompanied by the reduction of symptoms and conditions associated with overweight and obesity:

- bariatric surgery;
- pharmacotherapy;
- psychological treatment.

When the classic obesity therapy does not yield the expected results or fails, there are treatments which can successfully intervene even in cases of Class III obesity, associated with symptomatic conditions such as Type 2 diabetes, hypertension, joint insufficiency etc. Among them, bariatric surgery is also indicated, the procedures of which are currently provided by laparoscopy (gastric banding, vertical gastropasty, gastric bypass, sleeve gastrectomy, biliopancreatic diversion, etc.) (Kasalický, 2020).

Psychological treatments of obesity propose the following four main directions:

1. Cognitive behavioral therapy for weight loss - CBT.
2. Hypnosis.
3. Food inhibition training - (Food inhibition training - FIT).

4. Mechanisms of change - identifying the psychological factors that can influence the results.

Cognitive Behavioral Therapy (CBT) and hypnosis

One of the definitions of CBT states that it can be seen as a “scientifically based theoretical-methodological combination of behavioral therapy with cognitive therapy, with applications in pathology and health” which “has, in addition to the clinical character (treatment of diseases), a deeply educational and preventive (optimization, health promotion) character” (David, 2006).

To understand the importance of this therapy (of a psychological nature) for the regulation of body weight and for the maintenance of long-term results, but also its potential for the prevention of obesity and the improvement of health policies, an analysis of the studies conducted in the field is necessary.

Specialists in the field have shown that, to a large extent, patients return to their pre-treatment weight approximately within 3 years, as there are psychological obstacles to the acquisition and long-term adherence to an effective weight control behavior, precisely if one does not take into account of the importance of cognitive behavioral treatment in maintaining an ideal weight in the long term (Cooper & Fairburn, 2001).

It was concluded that when we add cognitive-behavioral techniques to standard behavioral treatments (which emphasize changing eating behaviors, reducing calorie intake, and increasing physical activity), CBT recipients' weight loss and weight maintenance outcomes become sustainable (Shaw et al., 2005; Grave et al., 2020).

Personalized cognitive-behavioral therapy for obesity (CBT-OB) combines the traditional procedures of standard obesity therapy (monitoring, goal setting, stimulus control, etc.) with a set of cognitive strategies and procedures that help the patient to maintain a long-term healthy weight loss, adopt a healthy lifestyle, and at the same time develop a way to maintain an optimal weight, by addressing the main mechanisms that negatively influence weight loss and its maintenance (Grave et al., 2020).

The efficiency of CBT, however, also has its questionable aspects, there are studies which support its results in the treatment of obesity, along with more reserved opinions in this respect.

There are also recent analyses showing that CBT interventions, although representing one of the first-line treatments in the psychological approach to obesity, still do not lead to significant weight loss, statistically speaking (Castelnuovo et al., 2017). The same reserved opinion was expressed by Cooper in 2010, according to a study, carried out together with other specialists, through which he tested a new cognitive-behavioral treatment for obesity, over a period of three years (Cooper et al., 2010). The immediate and long-term effects of the cognitive-behavioral intervention, designed specifically to minimize or prevent the return to the initial weight, were tested in the case of a number of 155 female participants. Although the main treatments generated results and led to the loss of 10% of the weight, it was found that the majority of the participants returned to their previous weight, the effect of the cognitive-behavioral treatment being maintained more in the short term than in

the long term. This led Cooper to consider that obesity is resistant even to psychological treatments for obesity, and it is unethical to assert the absolute effectiveness of CBT in treating obesity as long as we do not have data on its long-term effectiveness (Cooper et al., 2010).

Another study, on the contrary, supports the effectiveness of CBT treatment in obesity, demonstrating, in a group of 88 patients suffering from morbid obesity, treated with CBT-OB, and who followed a period of residential treatment, an average weight loss of 15% after 12 months, with no tendency to gain weight again - in the next 6-12 months (Grave et al., 2020). The effectiveness of the treatment was also supported by the results of 77 morbidly obese patients who, after completing a TCC-OB treatment delivered in a clinical setting, achieved a weight loss of 9.9% after 18 months – which confirms the idea that CBT-OB would be more effective than traditional lifestyle modification programs for weight loss.

A randomized clinical trial (Moraes et al., 2021) supports the idea of including CBT among the first-line interventions for obesity and highlights the need for a complex, multi-level approach.

The study compares the effectiveness of the intervention in three situations, namely a group that received support through lectures on health topics and health information, a group that was involved in supporting physical training, and the third, the interdisciplinary therapy group (physical training, nutritional advice and physical therapy), plus cognitive-behavioral therapy. Although there were improvements in all three groups, the findings show that the most important changes were observed in the complex intervention group - interdisciplinary therapies plus CBT, in which case there was an increase in the quality of life in all domains (physical, psychological, social and environmental) as well as an improvement in eating behaviors (Moraes et al., 2021).

Cognitive behavioral therapy is therefore a method which, in combination with the standard treatment of obesity, which includes elements of diet, nutrition, physical training and other healthy behaviors, can actively contribute to reducing the phenomenon of obesity and overweight.

In addition, there is increased interest in including, alongside cognitive behavioral therapy, a therapy that could be listed among the oldest and at the same time controversial methods of psychological intervention, namely, hypnosis.

Hypnosis is a psychological approach which has seen a growing revival in the clinical field in recent years. It can be described as an intervention based on two stages: one of induction, in which the participant is guided to achieve a state of concentration and attention, and another of suggestion - on the basis of which a wide range of behaviors and experiences, compelling from a subjective point of view, are modified and improved (Oakley & Halligan, 2013).

There is a growing body of research on the beneficial effects of treatments which include hypnosis, either on its own or as an adjunct to other involved therapies. In the treatment of obesity, the most common combination is between CBT (or other forms of cognitive therapy, behavioral therapy, etc.) and hypnosis. We should mention here a study published in the *Journal of Clinical Psychology* as early as 1985, whose results strongly support the use

of hypnosis as an adjunct to the behavioral treatment of obesity (Bolocofsky et al., 1985). The conclusions of the study show that the addition of hypnosis not only led to a significant reduction in the weight of the participants during the program, but also weight loss continued after the end of the study, which was observed during the follow-up period.

A study (Er an & Er an, 2020) conducted on 32 participants with a BMI ≥ 30 to test the effects of hypnotherapy on weight control, by monitoring leptin, adiponectin (ADP) and irisin levels, demonstrated that after 10 weeks of hypnotherapy, biochemical analyses showed a decrease in BMI and serum leptin levels and an increase in ADP levels, which supported the conclusion that hypnotherapy works, being easy to apply and without potential side effects.

Moreover, hypnosis can prove effective not only for the actual weight loss of patients. In another study, as a result of the suggestions received, the subjects of hypnotherapy began to have increased physical activity, as well as eating behaviors appropriate to a healthy and balanced lifestyle (Roslim et al., 2021).

Some authors believe that the effectiveness of hypnosis should also be evaluated according to its possibility of replication. Methodological limitations sometimes reduce the possibility of replicating this treatment method, which is one of the recognized limitations of hypnotherapy interventions (Barabasz, 2012).

In a study related to the use of hypnosis in bulimia nervosa, it was concluded that its effectiveness, used together with other methods of cognitive-behavioral therapy, can be a conceptual and methodological basis suitable for an empirical investigation (Barabasz, 2007).

Other specialists, according to a recent study (Untas et al., 2023) carried out on 82 participants in order to observe the side effects of hypnosis and self-hypnosis, found that after eight sessions of hypnosis, in addition to weight loss, by combining hypnosis and self-hypnosis with nutritional education, as a secondary result the participants in the study improved their self-esteem and acquired better coping strategies. They also had more energy than those in the non-hypnosis group, even at eight months after the therapy sessions ended.

These results indicate that hypnosis and self-hypnosis, in combination with nutrition education, may be promising interventions to assist patients in weight management programs, particularly by improving their coping strategies and increasing self-esteem.

Balancing body weight and maintaining a BMI in the “normal weight” category requires a change in habits and in the way of thinking, a change that generates psychological “tensions” and requires constant effort.

At the individual level, the treatment of obesity requires not only the knowledge of appropriate behaviors and the necessary cognitions, but also the acquisition of psychological skills and capacities by the individual (because most of the barriers that appear in the fight against obesity are of a psychological nature), so that he/she would be able to apply that information, conducive to a sustainable change in his behaviors.

In this sense, CBT and Hypnosis have results in the fight against obesity in the long term, because they contribute to endowing the participants with a set of attitudes and

psychological resources, with better coping strategies and behavioral decisions, which ultimately lead to a balanced lifestyle and increase the quality of life.

That is why we believe it is necessary that prevention policies, especially at the social - global level, also contain programs which contribute to obtaining and maintaining a balanced psychological - emotional and cognitive climate, in turn supporting the natural and constant adoption by the individual of a healthy lifestyle.

Conclusions

1. In the absence of urgent measures, over 50% of the world's population could become obese by 2025, a situation which requires finding sustainable solutions as quickly as possible.

2. Obesity is a condition with a complex etiopathogenesis and therefore it is recommended to approach the treatment in a multidisciplinary context, involving a clinical team made up of endocrinologists, nutritionists, surgeons, psychiatrists and psychologists.

3. The treatment of obesity requires finding effective strategies, resulting from combining standard treatments with psychological interventions, such as cognitive-behavioral therapy and hypnosis.

4. Reducing obesity involves prevention strategies, which imply the adoption of a healthy lifestyle, including a balanced diet and physical activity, training and fitness programs, etc.

5. CBT and hypnosis have an important role in relieving the psycho-emotional tensions which arise in the process of regulating body weight.

6. CBT and hypnosis are effective tools for adopting and maintaining long-term healthy lifestyle behaviors.

Conflict of interests

The authors declare no conflict of interests.

Acknowledgments

The article presents a partial processing of the specialized literature (narrative review) on the topic of the effectiveness of cognitive-behavioral therapy (CBT) and hypnosis in the treatment of obesity, which is part of an ongoing study, used in the doctoral thesis of the first author, at the "Carol Davila" University of Medicine and Pharmacy, Bucharest.

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PORTRAITS – Personalities of Romanian science and culture

Two shining examples of excellence in both science and sport

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Abstract

Many outstanding personalities in Romanian sports were also well known scientists. Two of them are featured here, Nicolae Ghilezan, member of the Romanian Academy, and Uray Zoltan, member of the Hungarian Academy, both of them renowned specialists in oncology and biology, respectively. Both were high performance fencers, with participations in national and international competitions.

Keywords: academics, oncology, biology, fencing, sports performance.

NICOLAE GHILEZAN



Doctor of Cluj. He was born on July 1, 1938, in Cluj-Napoca. He graduated from “Emil Racovi ” High School in Cluj-Napoca (1950-1954). He studied at the Faculty of General Medicine at the University of

Medicine and Pharmacy in Cluj-Napoca (1954-1960). He pursued postgraduate studies in radiology (1964-1966) and oncology (1965) at the University of Medicine and Pharmacy in Bucharest. In 1967, he attended courses in oncologic radiotherapy at the “G. Roussy” Institute in Paris. Specializing in oncology and radiotherapy, he followed the academic path from assistant professor to doctoral supervisor, visiting professor in the United States, emeritus professor at the University of Medicine and Pharmacy in Cluj-Napoca, and became a full member of the Romanian Academy in 2016. His prodigious scientific activity is reflected in over 148 studies and articles published in the country, and over 64 articles published internationally. He authored three monographs in the country (as the sole author), co-authored 36 works in the country, and co-authored three works internationally. He has been recognized and awarded by the Romanian Academy.

Academician Nicolae Ghilezan is well-known among Romanian athletes. He passionately and wholeheartedly practiced fencing. He excelled in sabre, earning numerous titles in national and regional competitions as a member of the “tiin a” Cluj University Sports Club. Let us mention just a few of his most notable individual achievements. In 1952, he won first place in men’s sabre; in 1953, he took third place in men’s foil; in 1954 and 1955, he secured second place in men’s sabre; in 1956, he won first place in men’s sabre; and in 1958, he claimed first place in men’s sabre (all in the national junior championships). As a

Received: 2022, October 17; *Accepted for publication:* 2023, April 3rd

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<https://doi.org/10.26659/pm3.2023.24.2.93>

senior in this noble sport, he is one of the founders of the Association of Fencing Friends in Cluj (APSC). He has always found time to meet with young and senior fencers in Cluj, being one of the honorary guests at memorial tournaments. He is an exemplary figure of excellence both in science and sport.

Lastly, it is worth mentioning that the father of today's academic, Professor Dr. Nicolae Ghilezan, Ioan Ghilezan, held the position of center half for the U Cluj football team from 1926 to 1934, for a period of eight years.

URAY ZOLTAN



A biologist from Cluj, born on September 23, 1931, attended secondary school at the Reformed College in Cluj (1942-1950), graduated from the Faculty of Biology at Babe -Bolyai University in Cluj (1950-1955), obtained a Ph.D. in Biology (1970) from Babe -Bolyai University in Cluj, pursued postgraduate studies at the Institute of Atomic Physics in Bucharest (1960), the Institute of Radiobiology in Budapest (1964, 1966, 1970), and

the Karolinska Institute in Stockholm (1971-1972). Specialized in experimental radiobiology and nuclear medicine, worked as a biologist at the Nuclear Medicine Laboratory in Cluj, senior researcher at the "Constantin Chiricu "Oncology Institute in Cluj, invited researcher at the Karolinska Institute in Stockholm (1974), University of Freiburg (1979), Oncology Institute in Budapest (1990-1991), University of Szeged Medical School (1992-1993), full member of the Hungarian Academy (1998), with a distinguished scientific career reflected in over 150 specialized articles both in Romania and abroad, co-author of 5 monographs, co-author and editor of 6 Oncology Encyclopedias, author of studies and essays on fencing, awarded by the Hungarian Academy.

In terms of sports, in 1947, he made his debut at the National Junior Championships, securing the second place in foil. In 1948, he became the national champion in foil and took the third place in sabre at the National Senior Championships. In 1948, he achieved the second place in foil and in 1952, he attained the second place in both foil and sabre at the National Senior Championships. He represented the Romanian team in men's foil and individual men's sabre at the 1952 Olympic Games in Helsinki. Additionally, at the World University Championships in Budapest in 1954, he won the bronze medal in individual foil and in team sabre. He was awarded the title of Master of Sport in 1954, received the Order of Labor medal in the same year, and was honored with the Knight's Cross of the Order of Merit of Hungary in 1992.

Between 1954 and 1956, he had the opportunity to compete against five world and Olympic champions. In chronological order, his opponents were Gyuricza József, Fülöp Mihály, Christian d'Oriola, Allan Jay, and Eduardo Mangiarotti, all legendary figures in the world of fencing. In 1956, in Budapest, he reached the final eight out of 39 participants, which included four world champions. This achievement catapulted him to international recognition.

As a coach, he mentored a generation of cadets who achieved remarkable results both nationally and internationally. He is also one of the founders of the Association of Fencing Friends in Cluj (APSC). In his old age, he remains extremely active in journalism and in organizing fencing memorial competitions in Cluj. He stands as a shining example of excellence in both science and sport.

Mircea Rusu - Professor and international rugby player

Dan Dr ghiciu

Member of the Cluj-Napoca Local Civic Council

Abstract

A remarkable personality, Mircea Rusu was Professor - Engineer, instructor, coach, writer and international rugby player.

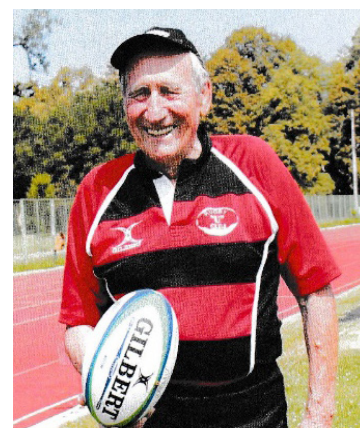
Keywords: professor, teacher, school master, international rugby player



In 1964, winner of the European Rugby Cup with the team Grivi a Ro ie Bucharest.



Romanian Rugby legends (from left to right) Mircea Rusu, Petrica Motrescu, Mircea Ortelecan, Ioan Bucan.



At the 80th birthday anniversary, always active.

Mircea Rusu is a living sports legend, for more than 50 years a citizen of Cluj-Napoca, celebrating this year – 2023 – his 90th birthday. Behind this venerable age there is an exceptional career in sports and engineering, doubled by an outstanding moral integrity. Born in Blaj, he was educated in the spirit of justice, Christian morality and the values of Transylvanian school. He was born on 29 July 1933 in Blaj, went to the highschool “Sfântul Vasile cel Mare [St. Vasile the Great]” of the same town. In Alba Iulia, the county capital, he continued high school studies at the “Horea, Clo ca and Cri an” lyceum, being deeply attached to the spiritual and moral values of the Transylvanian forerunners who fought for the making of a United Romania. His family, unfortunately, was persecuted during the communist regime, which strengthened young

Mircea Rusu’s character in his pursue of fairness and justice.

At the age of 18 years he is admitted to the Faculty of Mechanics of the Polytechnic Institute in Bucharest. A quiet and friendly nature, with a well built, athletic figure, he impressed his colleagues of the Grivi a Ro ie rugby club, the best in the country at that time, who persuaded him to join. Shortly, due to his athletic qualities, strength, agility, speed, he became an essential member of the team, contributing to the victories at the national and international level – winning the European Rugby Cup. He was selected in the national rugby team and head tournaments in France, Italy, Germany, winning matches against strong and reputed teams. He was part of the gold rugby generation of Romania, along with Viorel Moraru, Radu Demian,

Received: 2023, May 8; *Accepted for publication:* 2023, May 12

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<https://doi.org/10.26659/pm3.2023.24.2.95>

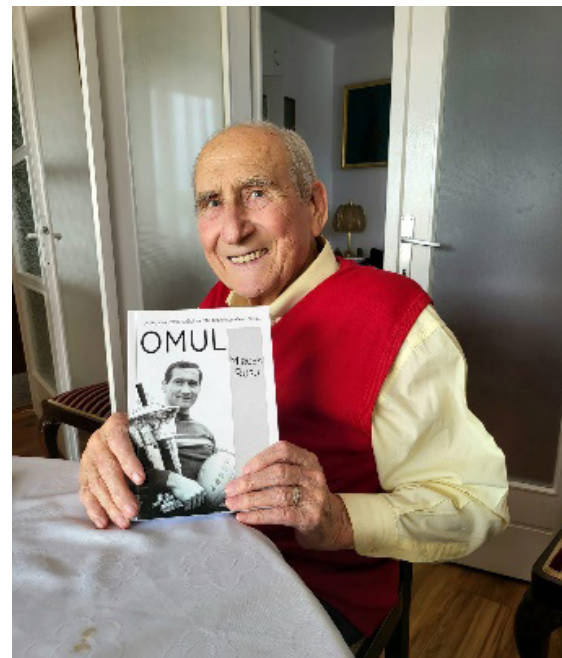
Viorel Irimescu, Alexandru Penciu, nicknamed Alexander the Great, Costel St nescu and others, who managed to beat the strong team of France in 1960 for the first time. He was selected in the Romanian team 23 times, the National of Oaks, with a strong international reputation; he was awarded the title of Master Emeritus in Sports. He graduated the Faculty of Mechanics successfully and started to work as an engineer at the Grivi a Ro ie factory. His longing to come back to his beloved Transylvania is speedily fulfilled by the tragedy of his wife's death, which left him a widower with three children to raise. He came back to Cluj, where he is appointed Director and Professor Engineer at the Railway School. He did not abandon sport, playing another 2 years for the University rugby team. Rugby gave him the strength to overcome the hardships of life. His professionalism and earnestness is appreciated by all his colleagues and students."MENS SANA IN CORPORE SANO", the motto embraced by Professor Iuliu Ha ieganu, who lent his name to the sports park and "temple" of Cluj rugby, prompted him to found the rugby team "Railway Engine 16 February", whose coach and player he was until the age of 46, assisted by the young Chihaiia N, Stef P. i Deleanu T. Dedicated to his profession, a true teacher, kind and understanding with his students, he was an example and at the same time an inspiration. The Ministry of Transportation asked him to help establish rugby teams in all the Transylvanian schools subordinated. Due to his dedication and efforts, rugby teams were founded in Baia Mare, Satu Mare, Oradea, Arad, Simeria, and especially Cluj, the junior team, which provided the senior team with valuable athletes. His passion and dedication for sports won him wide appreciation; he formed characters and true athletes. Many of his students were also rugby players for the Cluj team or other national and international teams. After 24 years of uninterrupted work, he retired from the Railway School; an active nature, he continued as a maintenance engineer at the URSUS factory. He became founding member of the Rotary Club of Cluj. Here Mircea Rusu is colleague with Prof. Dr. Ionel Haiduc, former President of the Romanian Academy and also with the current President, Prof. Ioan Aurel Pop. The Rotary committee also includes personalities like Prof. Dr.

Petre Mircea, Prof. Dr. Radu Badea, Prof. Dr. Cornel C toi, Rector of USAMV, Prof. Dr. Ioan Sbârciu, former Rector of the University of Art and Design, the renowned painter Radu Ciorbea etc. Over the years, his contributions and advice are still viable and appreciated and applied by the young disciples.

As a teacher and school master of Cluj-Napoca, with an exceptional sports and professional career, Mircea Rusu educated hundreds of students, who appreciated, respected and followed his example, considering him a living legend.

On 11 May this year (2023) he launched his autobiographical book with a suggestive title THE MAN, proving he is also a talented writer.

For his outstanding sporting and professional achievements, Professor Engineer Mircea Rusu was nominated for being awarded the status of *Honorary Citizen of Cluj-Napoca*.



Mircea Rusu (90 yrs. old) – launching his book OMUL (THE MAN)

Tribute to Dr. Flora Orosz Katalin

Baloga Istvan

Physical Education and Sport Faculty, “Babes-Bolyai” University, Cluj-Napoca, Romania

Abstract

This article brings a tribute to Dr. Flora Orosz Katalin at one year from her death.

Keywords: swimming, sports medicine, sports history, Dr. Flora Orosz Katalin, FINA, Olympic Games, Cluj University



Fig. 1 – Orosz Katalin, member of the “U” Cluj University. Club and Romanian National Team in Bucharest 1949 (Photo-personal archive).

Dr. Flora Orosz Katalin, born in Cluj, Romania, on 22 December 1934, was well known for her remarkable career in swimming and in sports medicine. She started to swim with her sister Judith Orosz coached by their father Gabor Orosz, then continued her trainings with coaches Bogdan Koloman and Bela Jordaky (*MTS Personalitati*). At the age of 13 she already achieved a Master in Sports title from the Romanian Swimming Federation. At the age of 14 she became a National Champion and established her first national record in 50 m breaststroke. In her

career as a swimmer Flora Orosz Katalin was 30 times Romanian National Champion with 27 National Records. Starting 2011 she participated in senior masters swimming competitions where she broke 17 world records and won 12 gold medals at FINA Masters World Championships. Flora Orosz Katalin was multiple National Champion also in Hungary, as she was of Hungarian nationality. In her athletic career she competed for the Romanian National Team, and for the following sports clubs: Stiinta Cluj, Progresul Cluj, Universitatea Cluj, Orca Cluj, Debreceni Szenior Úszó Klub.

Orosz Flora Katalin graduated from Cluj University of Medicine class of 1958 having been mentored and influenced in her career by the prestigious Prof. Dr. Iuliu Hatieganu. As a consultant physician, Dr. Flora Orosz Katalin worked in Romania and Germany in sports medicine and research. She participated in two Summer Olympic Games, Moscow 1980 and Los Angeles 1984 as a doctor for the Romanian Gymnastics and Rowing Team. In 1980 she obtained her Ph.D. in Medicine focusing with her thesis and many research articles on the influence of performance sports on the genital sphere and physical development in women. After almost 30 years of dedication to the Romanian sports medicine, being a founding member of the Romanian Institute of Sports Medicine and consultant physician for the swimming, diving, rowing, gymnastics, and volleyball national teams, Flora Orosz Katalin continued her career from 1987 until retirement in Germany, where she became the head of department at the Sports Medicine Institute in Frankfurt.

Received: 2023, March 21; *Accepted for publication:* 2023, April 10

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<https://doi.org/10.26659/pm3.2023.24.2.97>

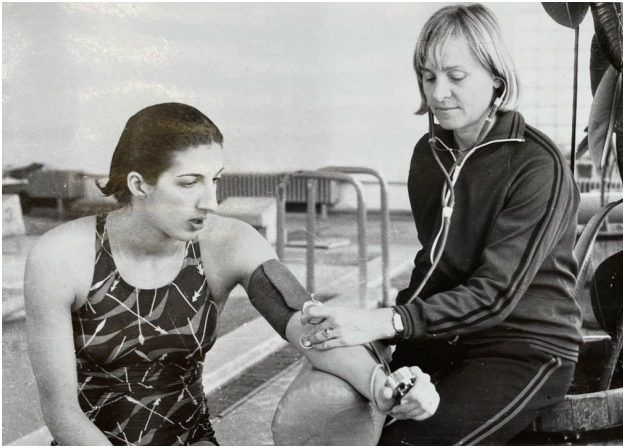


Fig. 2 – With Carmen Bunaciu, first medal in history for Romania at the World Championship, bronze medal in 200 m backstroke in Guayaquil, Ecuador, 1982 (Photo-Ion Mihalic).
 “Dr. Ecaterina Flora devotes herself to the health of swimmers. She also does it actively. Do you remember the champion, Ecaterina Orosz?” (Translation: Callimachi D, 1980).

Her career in Masters swimming starts in 2011 after she became National Champion in Romania and in Hungary she decided to compete at the European and World Championships as well. The major events she obtained her best results in chronological order were: in 2012 in Riccione, Italy, FINA Masters World Championships, in 2014 in Montreal, Canada, FINA Masters World Championships, in 2015 in Nice, Italy European Masters Championships, in 2017 in Budapest, Hungary, FINA Masters World Championships, in 2019 in Gwangju, South Korea, FINA Masters World Championships.

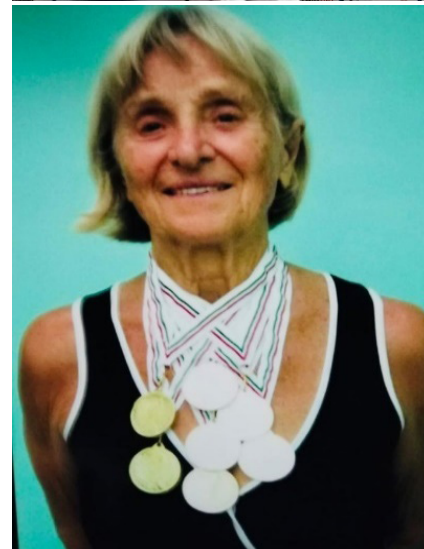


Fig. 3 – Dr. Flora Orosz Katalin at FINA Masters World Championship Montreal 2014 and after National Championships (Photo-personal archive).

Table I
 Dr. Flora Orosz Katalin, Results: Gold medals won in major individual events
 FINA World Championships and European Masters Games.

Championship/ Location	Year	Age group (years)	Event (distance/stroke) in 50m pool	Time (min: sec. Hundredth of second)	World Record (WR) Championship Record (CR)
FINA World Championship, Riccione, Italy (1)	2012	75-79	50m Backstroke	46.20	–
FINA World Championship, Montreal, Canada (2)	2014	80-84	50m Backstroke 100m Backstroke	49.26 1:48.15	–
European Master Games, Nice, France (3)	2015	80-84	50m Backstroke 100m Backstroke 200m Backstroke	49.12 1:47.28 3:46.61	– – –
FINA World Championship, Budapest, Hungary (4)	2017	80-84	50m Backstroke 100m Backstroke 200m Individual Medley	47.65 1:43.57 3:53.63	– CR WR-CR
FINA World Championship, Gwangju, South Korea (5)	2019	85-89	50m Backstroke 100m Backstroke 200m Backstroke 50m Butterfly 200m Individual Medley	49.92 1:46.51 3:43.27 48.90 3:54.86	WR-CR WR-CR WR-CR WR-CR WR-CR



Fig. 4 – Statue of Dr. Flora Orosz Katalin at “Iuliu Haieganu” Sports Parc in Cluj-Napoca, Romania (Photo-personal archive).

The Babes-Bolyai University of Cluj-Napoca honored Dr. Flora Orosz Katalin for her athletic and professional career with a statue in the “Iuliu Haieganu” Sports Park (Fig. 4). The statue is not far from the swimming pool (today a covered indoor pool named “Complexul de Natatie Universitas”) where she trained and competed as a young swimmer. We need this statue to remember who Dr. Flora

Orosz Katalin was, and especially for the new generations of children and students who practice sports and study in this park to have it as a model for her outstanding achievements. We hope that this memorial article will also raise interest in remarkable student athletes to follow with gratitude and honor the path of Dr. Flora Orosz Katalin.

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- (2) FINA Masters Results Montreal, Canada 2014 https://resources.fina.org/fina/document/2021/03/05/f91c0b76-dadf-466e-9b9c-f1f212cc9c6a/ma_2014_sw_W_3_0.pdf
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EVENTS



INSPECTORATUL ȘCOLAR
JUDEȚEAN CLUJ



The annual cross-country skiing competitions with students from underprivileged backgrounds in Cluj County

Crina Laura Ionescu, Cristian Potora
Cluj County School Inspectorate, Romania

We would like to remind you that these cross-country skiing competitions, which take place every winter, are part of the educational and health prevention project in rural areas called “Sport - an alternative for a healthy life.” This project also includes spring and autumn cross-country runs.

In February and March 2023, the Cluj County School Inspectorate organized the traditional cross-country skiing competitions as part of the scheduled school sports competition calendar for this season. The following competitions took place:

10th edition of the “VI deasa” Cup in Rogojel on February 4th

27th edition of the “Scoru et” Cup in Beli on February 22nd

24th edition of the “S I nducu” Cup in Râ ca on February 23rd

16th edition of the “Tomordok” Cup in Sâncraiu on March 2nd

36th edition of the “Pelaghia Ro u” Cup in M ri el on March 5th

6th edition of the “Avram Iancu” Cup in M guri Bogd ne ti on March 11th, 2023.

Over 70 students participated in each competition from all seven cross-country skiing centers in Cluj County: R chi ele Gymnasium School - M rg u commune, “Pelaghia Ro u” Gymnasium School - M ri el commune,

M guri Bogd ne ti Gymnasium School - M guri R c t u commune, “Avram Iancu” Gymnasium School - Beli commune, “Ady Endre” Vocational School - Sâncraiu commune, Râ ca Gymnasium School - Râ ca commune, and Rogojel Gymnasium School - S cuieu commune.

The Cluj County School Inspectorate, represented by General School Inspector Marinela Marc, Deputy General School Inspectors Adelhaida Kerekes and Cristian Simion Potora, School Inspectors Laura Ionescu and Mihaly Bela, in collaboration with the City Halls and Local Councils of S cuieu, Beli, Râ ca, Sâncraiu, M ri el, and M guri R c t u, represented by mayors and deputy mayors, as well as the organizing teachers, parents of students, and local communities, contributed to the optimal organization of these unique nationwide competitions exclusively dedicated to students from underprivileged backgrounds in Cluj County.

This school year’s (2022-2023) calendar included the usual cycle of three stages, each consisting of two coupled competitions, as follows:

“VI deasa” Cup - Rogojel, February 4th, 2023

“Scoru et” Cup - Beli, February 22nd, 2023

“S I nducu” Cup - Râ ca, February 23rd, 2023

“Tomordok” Cup - Sâncraiu, March 2nd, 2023

“Avram Iancu” Cup - M guri-R c t u, March 11th, 2023

“Pelaghia Ro u” Cup - M ri el, March 5th, 2023

Received: 2023, March 15; *Accepted for publication:* 2023, March 20

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<https://doi.org/10.26659/pm3.2023.24.2.100>

Rankings

1. Rogojel Center - The *Vl deasa* Cup, 10th ed. 2023, February 4th

Place	Girls 11-12 years	Boys 11-12 years	Girls 13-14 years	Boys 13-14 years	Relay	Team ranking
1	Stan Daria-M ri el	Toader Sebastian- R c t u	Tomo Estera-Râ ca	Ple Claudiu- Rogojel	Rogojel	Râ ca
2	Potra Andreea-Rogojel	Potra Mihai-Rogojel	Bethelendi Emma-Sâncraiu	Potra Radu-R chi ele	Râ ca	Rogojel
3	M rcu Carina-Râ ca	Roba Nicu or- M guri R c t u	Abrudan Alexandra-R chi ele	Mihu Daniel-R chi ele	R chi ele	M ri el

Physical education teacher: Szapora Norbert Zsolt, Aurel Dan Cri an; Director: Prof. Alina One ; Mayor: Gheorghe Cuc; Cluj-Napoca mountain rescue - organization and assistance



2. Beli Center - The *Scoru et* Cup, 27th ed. 2023, February 22

Place	Girls 11-12 years	Boys 11-12 years	Girls 13-14 years	Boys 13-14 years	Relay	Team ranking
1	Stan Daria-M ri el	Toader Sebastian-M guri R c t u	Tomo Estera-Râ ca	Ple Claudiu-Rogojel	Rogojel	M ri el
2	Cri an Selena-M ri el	Roba Nicu or- M guri R c t u	Dobra Flavia-Beli	Mihu Daniel-R chi ele	Râ ca	Râ ca
3	Rus Andreea-Râ ca	Potra Mihai-Rogojel	Abrudan Alexandra- R chi ele	Torok Zalan-S ncrail	M ri el	R chi ele

Physical education teacher: R zvan Ovidiu F uric ; Director: Mihaela Mocean; Mayor: Viorel Mati ; Cluj-Napoca mountain rescue - organization and assistance.



3. Râ ca Center - The *S l nducu* Cup, 24nd ed. 2023, February 23

Place	Girls 11-12 years	Boys 11-12 years	Girls 13-14 years	Boys 13-14 years	Relay	Team ranking
1	Stan Daria-M ri el	Toader Sebastian- M guri R c t u	Bethelendi Emma-Sâncraiu	Ple Claudiu-Rogojel	Rogojel	Sâncraiu
2	Rus Andreea-Râ ca	Potra Mihai-Rogojel	Tomo Estera-Râ ca	Mihu Daniel-R chi ele	M ri el	M ri el
3	Cri an Selena-M ri el	Roba Nicu or- M guri R c t u	Benk Lilla-Sâncraiu	Potra Radu-R chi ele	Râ ca	Râ ca

Physical education teacher: Ardelean Ilea; Director: Trif Florina; Mayor: Alin Abrudan; Cluj-Napoca mountain rescue - organization and assistance.



Events

4. Sâncraiu Center - The *Tomordok* Cup, 16th ed. 2022, March 2nd

Place	Girls 11-12 years	Boys 11-12 years	Girls 13-14 years	Boys 13-14 years	Relay	Team ranking
1	Stan Daria- M ri el	Toader Sebastian- M guri R c t u	Bethelendi Emma - Sâncraiu	Ple Claudiu - Rogojel	Rogojel	Sâncraiu
2	Rus Andreea- Râ ca	Potra Mihai- Rogojel	Tomo Estera - Râ ca	Mihu Daniel - R chi ele	M ri el	M ri el
3	Cri an Selena- M ri el	Roba Nicu or- M guri R c t u	Benk Lilla - Sâncraiu	Potra Radu - R chi ele	Râ ca	Râ ca

Physical education teacher: Csudom Norbert; Director: Prof. Okos-Rigó Dénes; Mayor: Póka Andrei- Gheorghe; Cluj-Napoca mountain rescue - organization and assistance



5. M ri el Center - The *Pelaghia Ro u* Cup, 37th ed. 2022, March 5

Place	Girls 11-12 years	Boys 11-12 years	Girls 13-14 years	Boys 13-14 years	Relay	Team ranking
1	Cri an Selena- M ri el	Toader Sebastian- M guri R c t u	Tomo Estera- Râ ca	Ple Claudiu- Rogojel	Rogojel	M ri el
2	Potra Andreea- Rogojel	Roba Nicu or- M guri R c t u	Dobra Flavia- Beli	Mihu Daniel- R chi ele	M ri el	Râ ca
3	Stan Daria- M ri el	Potra Mihai- Rogojel	Bethelendi Emma- Sâncraiu	Potra Radu- R chi ele	Râ ca	Rogojel

Physical education teacher: Darius Irímie Gladin, Director: Prof. Mariana Hetea; Mayor: Viorel Ghic; Cluj-Napoca mountain rescue - organization and assistance.



6. M guri Bogd ne ti Center - The *Avram Iancu* Cup, 6th ed. 2022, March 11

Place	Girls 11-12 years	Boys 11-12 years	Girls 13-14 years	Boys 13-14 years	Relay	Team ranking
1	Stan Daria- M ri el	Toader Sebastian- M guri R c t u	Tomo Estera- Râ ca	Ple Claudiu- Rogojel	Rogojel	M ri el
2	Cri an Selena- M ri el	Potra Mihai- Rogojel	Bethelendi Emma- Sâncraiu	Mihu Daniel- R chi ele	Râ ca	Râ ca
3	Potra Andreea- Rogojel	Roba Nicu or- M guri R c t u	Benk Lilla- Sâncraiu	Mari Darian- M guri Bogd ne ti	M ri el	Rogojel

Physical education teacher: Maria Toader; Director: Prof. Ioana Abrudan; Mayor: Alexandru Livescu; Cluj-Napoca mountain rescue - organization and assistance



During the last cross-country skiing sports competition, the “Avram Iancu” Cup, held according to this year’s calendar in M guri Bogd ne ti, students with special educational needs from the Huedin Special Gymnasium School were invited to participate. The Cluj County School Inspectorate awarded a Certificate of Excellence to student Tomo Eстера from Râ ca Gymnasium School for her 29 gold medals obtained between 2015 and 2023. A Certificate of Merit was also given to her teacher, Mr. Ilea Ardelean, for his outstanding results over the years.

Furthermore, the winners of the county competition were awarded based on their results in the six competitions held this year. The students and teachers of the winning teams were awarded medals, trophies, and certificates by the Deputy General School Inspector of the Cluj County School Inspectorate, Mr. Cristian Simion-Potor .

According to tradition, the competition cup is now hosted for one year by the fresh winner of the county competition, “Pelaghia Ro u” Gymnasium School in M ri el.

**General ranking of the Cluj Country cross country skiing
competition for the school year
2022-2023**

Rank	School
I	Gymnasium School “Pelaghia Ro u” M ri el
II	Gymnasium School Râ ca
III	Gymnasium School Rogojel
IV	Vocational School “Ady Endre” Sâncraiu
V	Gymnasium School R chi ele
VI	Gymnasium School M guri Bogd ne ti
VII	Gymnasium School “Avram Iancu” Beli

EVENTS

“Gheorghe Moceanu” Symposium (10)

Crina Laura Ionescu, Cristian Potora
Cluj County School Inspectorate, Romania



1838-1909

After a break of 4 years, largely due to the Covid-19 pandemic, this year, in 2023, on May 9th, the 10th edition of the Gheorghe Moceanu Symposium took place in Iclod, marking 185 years since the birth of Gheorghe Moceanu, considered the first Romanian physical educator. It is worth mentioning that the previous edition took place in 2019. The first commemorative edition of the Gheorghe Moceanu Symposium was held in Orman, on the occasion of his 170th birth anniversary (1838), and it has been held annually in Orman and Iclod until 2015.

The opening speeches of this year's symposium were delivered by the Deputy General Inspector of

Schools, Prof. Dr. Cristian Potora, the Mayor of the Iclod commune, Emil Pârdoc, the Principal of the Iclod Gymnasium School, Prof. Liana Dobocan, and the School Inspector, Prof. Mihaly Bela, who inaugurated the session of scientific communications.

Furthermore, the award ceremony took place, organized by the Mayor of Iclod, during which diplomas were presented to the representative teams of the Iclod Gymnasium School who achieved prizes in school sports competitions held during the 2022-2023 academic year.

During the Symposium, the following 4 specialized scientific papers on the topic of the game of “oină” (Romanian softball) were presented, directly delivered by the involved teachers during their pedagogical degree exams:

1. Duma Gabriel. “Oină,” from game to high-performance sport. “Liviu Rebreanu” Gymnasium School, Cluj-Napoca.

2. Hango Mihaela Elena. Rediscovering “oină” - a part of our Romanian identity. Căc u Gymnasium School.

3. Neag Simina-Aurelia. Developing motor skills in 8th-grade students through movement games. “Iuliu Haieganu” Gymnasium School, Cluj-Napoca.

4. Ristman-Cosma Anca. The role of selection in forming the representative team of female “oină” players at the gymnasium level. Căc u Gymnasium School.

The Symposium program also included a demonstration match of “oină” between the students of Căc u Gymnasium School and Constantin Brâncuși Technological High School in Dej, held on the occasion of the National Day of “oină,” celebrated every year on May 9th.

Received: 2023, May 11; Accepted for publication: 2023, May 15

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<https://doi.org/10.26659/pm3.2023.24.2.104>



School Inspector Mihaly Bela and Prof. Simina Neag.



A demonstrative game of "oina".



Awards ceremony of the Iclod Gymnasium School teams by the Mayor of the Iclod commune.



Group photo – some of the participants.

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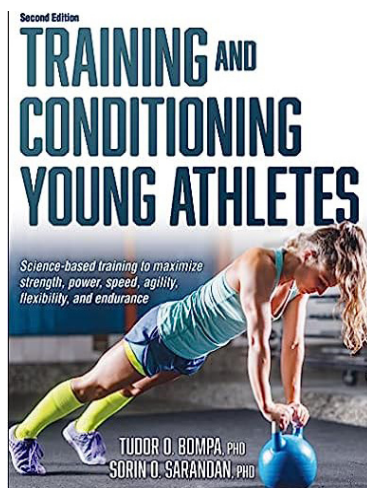
Book reviews

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Authors: Tudor O. Bompa and Sorin Sarandan

Publisher: Human Kinetics, December, 2022

320 pages; Price: \$34.95 (Paperback), \$33.20 (Kindle)



About thirteen years ago we presented in this journal another book by Professor Tudor Bompa. At that time a search by Google yielded 95,000 results. Well, at present, on a similar search the number of the results was more than three times greater, about 298,000. And this even if Professor Bompa is not a rock or sport star; he is just a sports scientist. It is true that he is not an ordinary sports scientist, but the world best expert in training periodization.

Periodization is a special science within the sports sciences, because it is considered the core one for launching champions. In other words it is the science of managing the complex potential of the athletes so that they reach their maximum at the right moment; the moment of the most important competition of a year, or sometimes even of an athlete's career. Professor Bompa is none other person than the author of the book titled as simply as possible "Periodization", which has already reached its 6-th edition at Human Kinetics in 2019.

In fact, even this work from 2022 that we will speak about now, represents a second attempt, a second approach of the subject it is dedicated to. The previous edition – entitled "Conditioning of Young Athletes" was published in 2015. But in relation with the year of the second publication of this book, it should also be mentioned that 2022 has a special, completely private significance for Tudor Bompa,

as it coincides with the 40th anniversary of his successful professional collaboration with Human Kinetics.

The key theory, the philosophy of Tudor Bompa on training and conditioning, is that only a strong physical foundation maximally improves the chances of the young athlete to benefit from an ideal development and finally become a top athlete. It means that the emphasis on acquiring technical and tactical skills, which defines the majority of the current training programs reserved to young athletes, represents a really unpardonable and dangerous mistake. And this because even if the respective skills are also essential for achieving athletic goals, without sufficiently improving the so called "athleticism", the young athletes will not become champions at their adult age.

That is why this book aims to propose and documents a long-term training methodology for young athletes. In other words, it collects and shares the best modern and scientifically proved methods and exercises, to be used for training athletes from under 12 [U12] to fully physical and technical maturation [U23].

The content of the book is distributed into four parts and 12 chapters, of which the first four constitute the initial part, entitled *Training considerations*. Such considerations should be permanently kept in mind by both the coaches and parents, being well known that early years of a young athlete's involvement in sports comes with not only positive effects but also with potential challenges. And this because exposing children to high intensity training can also result in sometimes even negative repercussions; especially when the coach and/or parents are too concentrated on winning at all costs.

If the above mentioned quasi-general training considerations are presented within the initial chapter, the second chapter addresses specifically *injuries and injury prevention*, while the next one – the greatest of the first part – contains "*guidelines for long-term training*". It is the sequence of the book within which the authors draw attention on the requirement to keep balance between the work (training load) and recovery, on starting specialization only after the athletes have developed a solid multilateral foundation, and on the importance of the individual characteristics and anatomical age in designing training programs of the young athletes. Warning also as clearly as possible on the danger to approach the children as simply little adults. A mistake much more frequent than acceptable, an error which originates in the superficial and/or inadequate coaches preparation.

One of the most important aspect clarified by the authors is that described by the title of the 4th chapter:

<https://doi.org/10.26659/pm3.2023.24.2.106>

“*Stages of Long-Term Athletic Development*”. In essence, between U12 and U 21 - 23, there are five specific phases (stages) of physical development, which all the coaches working with young athletes must take into consideration and which they should observe when designing the training programs. And this because to each stage of development corresponds a clear scope of training and type of training.

The title of the second part is *Nutrition and Energy System Training*, but only the first two (number 5 and 6) out of the three chapters in this part is addressed to the young athletes’ nutrition principles, and to the effects of training on the energy system. In the same context are also presented the methods to be used for periodically assessing the improvements the respective athletes display, as a consequence of the training program. Whereas the other chapter (“*Model Training for Team Sports*”) of this part is exclusively dedicated to some particularities the training program must present in the case of team sports. It is a chapter with an evident practical content and relevance, because in addition to other key information and knowledge it instructs the readers how to model different types of the so called “microcycles”, depending on what is planned

to happen during the respective week or weekend; be the case of a show game, of one or two league games, or of a weekend tournament.

The next part is exclusively dedicated to the best “*training methods*” recommended to scientifically develop and improve separate or combinations of physical abilities, as follows: *strength* (chapter 8), *strength and power* (9), *speed* (10), *agility and flexibility* (11), and *specific endurance* (12). The last part contains *selected concrete exercises* for all these physical abilities, i.e. for strength, power, agility, speed, and flexibility.

To be mentioned that apart from the printed book, Human Kinetics offers an Online Credit Education Course, at the price of \$54.50. It is a course which includes an online study guide, which reinforces the content from the book, and helps those interested to prepare for passing an online continuing education exam, and print the respective certificate for continuing education credits.

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FOR THE ATTENTION OF CONTRIBUTORS

The subject of the journal

The journal has a multidisciplinary nature oriented toward biomedical, health, exercise, social sciences fields, applicable in activities of physical training and sport, so that the dealt subjects and the authors belong to several disciplines in these fields. The main rubrics are: “Original studies” and “Reviews”.

The Journal is aimed at adapting the profile of the journal to scientific contemporaneity in the field of medical and pharmaceutical sciences and interdisciplinary integration with health, physical activity and biopsychosocial rehabilitation.

The journal will have the same contents: editorials, original articles, review articles, case reports, recent publications, events. The journal is open for publication to all members of the national and international scientific community and offers the possibility to promote young people involved in research, along with top researchers in the above mentioned fields.

Regarding “Reviews” the main subjects that are presented are: oxidative stress in physical effort; mental training; psycho-neuroendocrinology of sport effort; physical culture in the practice of the family doctor; extreme sports and risks; emotional determinatives of performance; the recovery of patients with spinal column disorders; stress syndromes and psychosomatics; olympic education, legal aspects of sport; physical fitness/exercise in the elderly; psychomotricity disorders; high altitude sportive training; fitness; biomechanics of movements; EUROFIT tests and other evaluation methods of physical fitness; adverse reactions of physical fitness; sport endocrinology; depression in sportsmen/women; classical and genetic drug usage; Olympic Games etc.

Among articles devoted to original studies and researches we are particularly interested in the following: the methodology in physical education and sport; influence of some ions on effort capacity; psychological profiles of students regarding physical education; methodology in sport gymnastics; the selection of performance sportsmen.

Other articles approach particular subjects regarding different sports: swimming, rhythmic and artistic gymnastics, handball, volleyball, basketball, athletics, ski, football, field and table tennis, wrestling, sumo.

The authors of the two rubrics are doctors, professors and educators, from universities and preuniversity education, trainers, scientific researchers etc.

Other rubrics of the journal are: the editorial, editorial news, reviews of the latest books in the field and others that are presented rarely (inventions and innovations, universitaria, preuniversitaria, forum, memories, competition calendar, portraits, scientific events).

We highlight the rubric “The memory of the photographic eye”, where photos, some very rare, of sportsmen in the past and present are presented.

Articles signed by authors from the Republic of Moldova regarding the organization of sport education, variability of the cardiac rhythm, the stages of effort adaptability and articles by some authors from France, Portugal, Canada must also be mentioned.

The main objective of the journal is highlighting the results of research activities as well as the permanent and actual dissemination of information for specialists in the field. The journal assumes an important role regarding the achievement of necessary scores of the teaching staff in the university and pre university education as well as of doctors in the medical network (by recognizing the journal by the Romanian College of Physicians), regarding didactic and professional promotion.

Another merit of the journal is the obligatory publication of the table of contents and an English summary for all articles. Frequently articles are published in extenso in a language with international circulation (English, French).

All the content of the journal is available immediately upon publication and is Open Access.

The Editorial Board of the Health, Sports & Rehabilitation Medicine journal informs its collaborators and readers that access to the journal is open and free. The journal does not have article processing or submission charges.

The journal is published quarterly and the works are accepted for publication in English language. The paper is sent by e-mail at the address of the editorial staff. The works of contributors that are resident abroad and of Romanian authors must be mailed to the Editorial staff at the following address:

Health, Sports & Rehabilitation Medicine

Chief Editor: Prof. dr. Traian Bocu

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Objectives

Our intention is that the journal continues to be a route to highlight the research results of its contributors, especially by stimulating their participation in project competitions. Articles that are published in this journal are considered as part of the process of promotion in one's university career (accreditation that is obtained after consultation with the National Council for Attestation of University Titles and Diplomas).

We also intend to encourage the publication of studies and research, that include original relevant elements especially from young people. All articles must bring a minimum of personal contribution (theoretical or practical), that will be highlighted in the article.

In the future we propose to accomplish criteria that would allow the promotion of the journal to superior levels according international recognition.

THE STRUCTURE AND SUBMISSION OF ARTICLES

The manuscript must be prepared according to the stipulations of the International Committee of Medical Journal Editors (<http://www.icmjee.org>).

The number of words for the electronic format:

- 4000 words for original articles;
- 2000 words for case studies;
- 5000-6000 words for review articles.

Format of the page: edited in WORD format, A4. Printed pages of the article will be numbered successively from 1 to the final page.

Font: Times New Roman, size 11 pt.; it should be edited on a full page, with diacritical marks, double spaced, respecting equal margins of 2 cm.

Illustrations:

The images (graphics, photos etc.) should be numbered consecutively in the text, with arabic numbers. They should be edited with SPSS or EXCEL programs, and sent as distinct files: „figure 1.tif”, „figure 2. jpg”, and at the editors demanding in original also. Every graphic should have a legend, written **under** the image.

The tables should be numbered consecutively in the text, with roman numbers, and sent as distinct files, accompanied by a legend that will be put above the table.

PREPARATION OF THE ARTICLES

1. Title page: includes the title of article (maximum 45 characters), the name of authors followed by surname, work place, mail address of the institute and mail address and e-mail address of the first author. It will follow the name of article in the English language.

2. Abstract: For original articles a summary structured like this is necessary: (Background, Aims, Methods, Results, Conclusions), of maximum 250 words, followed by 3-8 key words (if is possible from the list of established terms). All articles will have a summary in the English language. Within the summary (abstract) abbreviations, footnotes or bibliographic references should not be used.

Background, Aims. Description of the importance of the study and explanation of premises and research objectives.

Methods. Include the following aspects of the study: Description of the basic category of the study: of orientation and applicative. Localization and the period of study. Description and size of groups, sex (gender), age and other socio-demographic variables should be given. Methods and instruments of investigation that are used.

Results. The descriptive and inferential statistical data (with specification of the used statistical tests): the differences between the initial and the final measurement, for the investigated parameters, the significance of correlation coefficients are necessary. The specification of the level of significance (the value p or the dimension of effect d) and the type of the used statistical test etc are obligatory.

Conclusions. Conclusions that have a direct link with the presented study should be given.

Orientation articles and case studies should have an unstructured summary (without respecting the structure of experimental articles) to a limit of 150 words.

3. Text

Original articles should include the following chapters which will not be identical with the summary titles: *Introduction* (General considerations), *Hypothesis*, *Materials and methods* (including ethical and statistical informations), *Results*, *Discussions* results, *Conclusions* and suggestions. The conclusions should be formulated briefly, without comments extracted from the research, and numbered. Other type of articles, as orientation articles, case studies, Editorials, do not have an obligatory format. Excessive abbreviations are not recommended. The first abbreviation in the text is represented first in extenso, having its abbreviation in parenthesis, and thereafter the short form should be used.

Authors must undertake the responsibility for the correctness of published materials.

4. References

The references should include the following data:

For articles from journals or other periodical publications the international Vancouver Reference Style should be used: the name of all authors as initials and the surname, the year of publication, the title of the article in its original language, the title of the journal in its international abbreviation (italic characters), number of volume, pages.

Articles: Pop M, Albu VR, Vișan D et al. Probleme de pedagogie în sport. *Educație Fizică și Sport* 2000; 25(4):2-8.

Books: Drăgan I (coord.). *Medicina sportivă*, Editura Medicală, 2002, București, 2002, 272-275.

Chapters from books: Huliș I, Blatu O. Fiziologia senescenței. In: Huliș I. (sub red.) *Fiziologia umană*, Ed. Medicală, București, 1996, 931-947.

Starting with issue 4/2010, every article should include a minimum of 15 bibliographic references and a maximum of 100, mostly journals articles published in the last 10 years. Only a limited number of references (1-3) older than 10 years will be allowed. At least 20% of the cited resources should be from recent international literature (not older than 10 years).

Peer-review process

In the final stage all materials will be closely reviewed by at least two competent referees in the field (Professors, and Docent doctors) so as to correspond in content and form with the requirements of an international journal. After this stage, the materials will be sent to the journal's referees, according to their profiles. After receiving the observations from the referees, the editorial staff shall inform the authors of necessary corrections and the publishing requirements of the journal. This process (from receiving the article to transmitting the observations) should last about 4 weeks. The author will be informed if the article was accepted for publication or not. If it is accepted, the period of correction by the author will follow in order to correspond to the publishing requirements.

In order to check the quality of articles submitted for publication, the Health, Sports & Rehabilitation Medicine journal applies the method of single-blind peer review (the identity of reviewers, but not authors, is kept anonymous).

Conflict of interest

The authors must mention all possible conflicts of interest including financial and other types. If you are sure that there is no conflict of interest we ask you to mention this. The financing sources should be mentioned in your work too.

Specifications

The specifications must be made only linked to the people outside the study but which have had a substantial contribution, such as some statistical processing or review of the text in the English language. The authors have the responsibility to obtain the written permission from the mentioned persons with the name written within the respective chapter, in case the readers refer to the interpretation of results and conclusions of these persons. Also it should be specified if the article uses some partial results from certain projects or if these are based on master or doctoral theses sustained by the author.

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The Editors will notify authors in due time, whether their article is accepted or not or whether there is a need to modify texts. Also the Editors reserve the right to edit articles accordingly. Papers that have been printed or sent for publication to other journals will not be accepted. All authors should send a separate letter containing a written statement proposing the article for submission, pledging to observe the ethics of citation of sources used (bibliographic references, figures, tables, questionnaires).

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- the informed consent of the family, for studies in children and juniors;
- the informed consent of adult subjects, patients and athletes, for their participation;
- malpractice insurance certificate for doctors, for studies in human subjects;
- certificate from the Bioethical Committees, for human study protocols;
- certificate from the Bioethical Committees, for animal study protocols.

The data will be mentioned in the paper, in the section Materials and Methods. The documents will be obtained before the beginning of the study. Will be mentioned also the registration number of the certificate from the Bioethical Committees.

Editorial submissions will be not returned to authors, whether published or not.

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These subscription costs are valid only for the printed journal.

INDEXING

Title of the journal: Health, Sports & Rehabilitation Medicine

pISSN: 2668-2303; eISSN: 2668-5132; ISSN-L: 2668-2303

Profile: a Journal of Study and interdisciplinary research

Editor: “Iuliu Haieganu” University of Medicine and Pharmacy of Cluj-Napoca and The Romanian Medical Society of Physical Education and Sports in collaboration with the Cluj County School Inspectorate

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The level and attestation of the journal: a journal rated B+ by CNCSIS in the period 2007-2011 and certified by CMR since 2003

Journal indexed into International Data Bases (IDB): EBSCO, Academic Search Complete – USA; Index Copernicus, Journals Master List – Poland; DOAJ (Directory of Open Access Journals) – Sweden; CrossRef – Linnfeld, MA(US)/Oxford (UK).

Year of first publication: 2000

Issue: quarterly

The table of contents, the summaries and the instructions for authors can be found on the internet page: <http://www.jhsrm.org>. Access to the table of contents and summaries (in .pdf format) is free.