BENEFICIAL EFFECTS OF A COMBINED LIFESTYLE INTERVENTION FOR OLDER PEOPLE IN A LONG-TERM-CARE FACILITY ON REDOX BALANCE AND ENDOTHELIAL FUNCTION

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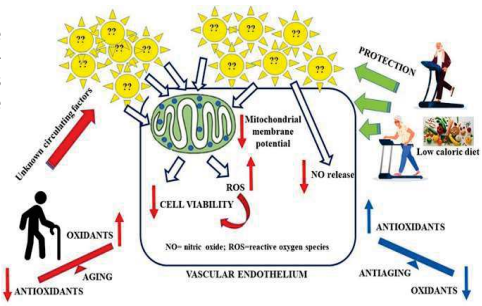
INTRODUCTION

A short healthy life-style program (LSP) can improve the functional outcomes of older people admitted to a Long-Term Care (LTC) facility. Although it is known that life-style medicine-based interventions can exert anti-aging effects through the modulation of oxidative stress and mitochondrial function, the mechanisms underlying the aforementioned effects have not been clarified, yet.



AIM

In this study, we wanted to investigate the possible mechanisms underlying the benefits of a short LSP in older people admitted to LTC facility, by focusing on the evaluation of plasma markers of redox state before (T0) and after a three-months-period of LSP (T1). In addition, we evaluated the effects of plasma of those subjects on HUVEC, in terms of cell viability, oxidants release and mitochondrial function.

METHODS

Fifty-four older people were divided into two groups (n = 27 each): subjects undergoing LSP and subjects not undergoing LSP (control). The LSP consisted of a combination of caloric restriction, physical activity, and psychological intervention and lasted 3 months. Plasma samples were taken before (T0) and after LSP (T1) and were used to measure thiobarbituric acid reactive substances (TBARS), 8-hydroxy-2-deoxyguanosine (8OHdG), 8-Isoprostanes (IsoP), glutathione (GSH), superoxide dismutase (SOD) activity and Thymosin β4 (Tβ4). In addition, plasma was used to stimulate HUVEC, which were examined for cell viability, mitochondrial membrane potential, reactive oxygen species (ROS) and mitochondrial ROS (MitoROS) release.

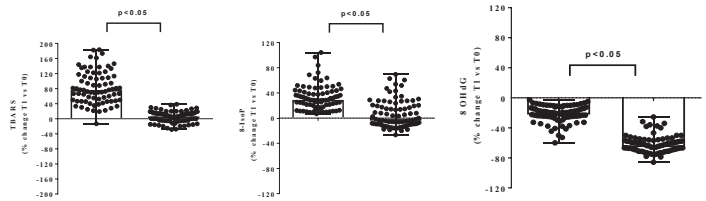
RESULTS

In table 1 baseline characteristics of LSP group and control group are shown

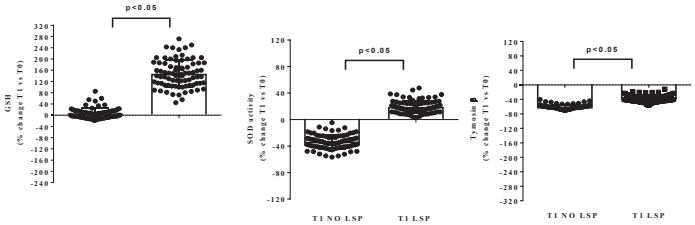
Table 1
Baseline characteristics of participants allocated to LSP group vs control group.

	Control group (n = 27)	LSP group (n = 27)	Test	p-value
Demographic				
Age at enrollment (years; mean, SD)	85.26 (9.16)	84.85 (7.07)	MWU	0.75
Gender (female, n, %)	17 (62.96)	22 (81.48)	F	0.22
Weight (kg, SD)	59.63 (16.17)	63.36 (13.26)	MWU	0.26
Body mass index (kg/m^2, SD)	22.27 (4.33)	23.90 (5.01)	MWU	0.24
Tobacco use				
Never (n, %)	19 (70.4)	16 (59.3)	MWU	0.10
Ex-smoker (n, %)	4 (14.8)	2 (7.4)		
Current smoker (n, %)	4 (14.8)	3 (11.1)		
Unknown (n, %)	0 (0)	6 (22.2)		
Health				
Comorbidities (n, SD)	5.85 (2.68)	7.11 (3.27)	MWU	0.16
Number of drugs (n, SD)	7.40 (2.25)	8.30 (3.27)	MWU	0.45
Use of restraints (daily use, n, %)	12 (44.44)	10 (37.03)	F	0.75
Care Intensity Level (SD)	8.30 (2.03)	7.55 (2.16)	MWU	0.39
Scales				
Barthel index (SD)	30.05 (20.44)	36.09 (27.73)	MWU	0.25
Tinetti Score - walk (SD)	4.93 (4.39)	7.04 (3.63)	MWU	0.09
Tinetti score - balance (SD)	4.96 (4.75)	7.44 (4.23)	MWU	0.06
Tinetti score (SD)	9.89 (9.02)	14.48 (7.67)	MWU	0.05
Katz ADL (SD)	1.93 (2.20)	2.67 (2.35)	MWU	0.20
Energy intake (Kcal, SD)	1615 (152)	1486 (217)	MWU	0.51
Calcium intake (mg, SD)	820 (211)	707 (282)	MWU	0.10

MWU: Mann-Whitney-U test; F: Fisher's exact test. Adapted from: Conti et al., [20].



❖ In plasma, we found an increase of TBARS and IsoP at T1 in control group, only. Instead, the levels of 8OHdG were reduced both in LSP group and control group, at T1, although at a lesser extent in control group.

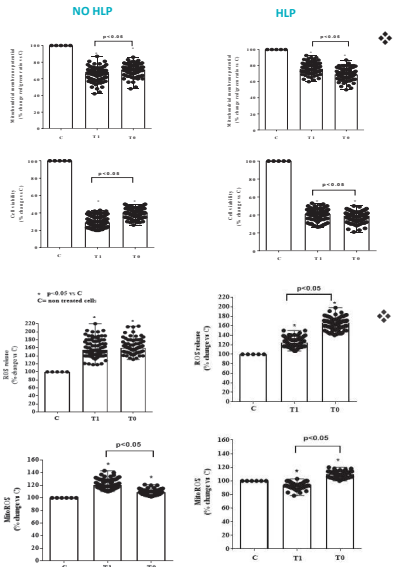


❖ As far as plasma antioxidants are concerned, only in LSP group we showed an increase in GSH levels at T1. Instead, it should be emphasized that the plasma SOD activity increased at T1 only in LSP group, while in control group it decreased compared to what was observed at T0.

❖ It is also to note that we observed a smaller reduction of the plasma levels of Tβ4 in LSP group at T1 vs T0, in comparison with control group.

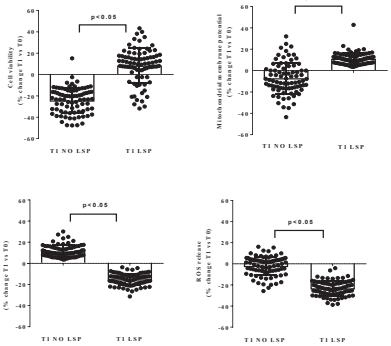
❖ It can also be observed that at T1, the percentage changes in plasma values of markers of oxidation, such as TBARS, IsoP and 8OHdG compared to T0, were significantly greater in control group versus LSP group .

❖ Instead, the percentage changes of plasma GSH levels, SOD activity and Tymosin β levels were significantly lower in the control group vs LSP group, at T1 vs T0.



❖ In HUVEC treated with plasma of control group cell viability was reduced at T1 vs T0, whereas it was increased in HUVEC treated with plasma of the LSP group. On the other hand, the mitochondrial membrane potential of plasma-treated HUVEC of the LSP group at T1 was increased in comparison with what was observed at T0, whereas it was reduced in the plasma-treated HUVEC of the control group.

❖ That the mitochondrial function was improved in HUVEC treated with plasma of the LSP group was confirmed by the analysis of ROS and mitoROS release, as well. Hence, both ROS and mitoROS release were reduced at T1 vs T0, in the LSP group only. Instead, an increase of mitoROS release was found at T1 in control group.



❖ In HUVEC treated with plasma of LSP group the percentage reduction of cell viability and mitochondrial membrane potential was lower at T1 vs T0 than that found in control group.

❖ Instead, in HUVEC treated with plasma of control group we found an increase of MitoROS and ROS release at T1 vs T0 only.

CONCLUSION

To conclude, our study has provided new information about the pathogenic mechanisms underlying the antiaging effects of a short LSP in a group of older people living in LTC facility. In particular, our data demonstrate that a short period of LSP can improve the redox state through the increase of antioxidants, like GSH and SOD activity and the reduction of oxidants, like TBARS, 8OHdG and IsoP. At a cellular level, the LSP can improve the endothelial function though the modulation of mitochondrial efficiency. These findings could represent the mechanism underlying the improvement in the observed functional outcome of the LSP group.

Grossini, E., Venkatesan, S., Pour, M. M. O., Conti, A., Concina, D., Opizzi, A., Sanguedolce, A., Rinaldi, C., Russotto, S., Gramaglia, C. M., Zeppegno, P., & Panella, M. (2024). Beneficial effects of a combined lifestyle intervention for older people in a long-term-care facility on redox balance and endothelial function. *Heliyon*, *10*(16), e35850. https://doi.org/10.1016/j.heliyon.2024.e35850