



The Impact of the Financial Crisis on Lifestyle Health Determinants Among Older Adults Living in the Mediterranean Region: The Multinational MEDIS Study (2005-2015)

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Objectives: By the end of the 2000s, the economic situation in many European countries started to deteriorate, generating financial uncertainty, social insecurity and worse health status. The aim of the present study was to investigate how the recent financial crisis has affected the lifestyle health determinants and behaviours of older adults living in the Mediterranean islands.

Methods: From 2005 to 2015, a population-based, multi-stage convenience sampling method was used to voluntarily enrol 2749 older adults (50% men) from 20 Mediterranean islands and the rural area of the Mani peninsula. Lifestyle status was evaluated as the cumulative score of four components (range, 0 to 6), that is, smoking habits, diet quality (MedDietScore), depression status (Geriatric Depression Scale) and physical activity.

Results: Older Mediterranean people enrolled in the study from 2009 onwards showed social isolation and increased smoking, were more prone to depressive symptoms, and adopted less healthy dietary habits, as compared to their counterparts participating earlier in the study ($p < 0.05$), irrespective of age, gender, several clinical characteristics, or socioeconomic status of the participants (an almost 50% adjusted increase in the lifestyle score from before 2009 to after 2009, $p < 0.001$).

Conclusions: A shift towards less healthy behaviours was noticeable after the economic crisis had commenced. Public health interventions should focus on older adults, particularly of lower socioeconomic levels, in order to effectively reduce the burden of cardio-metabolic disease at the population level.

Key words: Financial crisis, Lifestyle health determinant index, Socioeconomic status, Health status, Older adults, Mediterranean islands

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INTRODUCTION

According to the World Health Organization (WHO), the determinants of good health can be divided into three major categories: the socioeconomic environment, the physical environment, and lifestyle and behaviours [1]. One kind of influence on behaviours is financial security. But since the end of

2000, the economic situation in many European countries has begun to deteriorate, generating financial uncertainty, social insecurity, and a significant increase in death rates related to chronic health conditions, as well as suicides [2-4]. Financial austerity measures in several European countries and modified health policies have led to the exclusion of numerous citizens from health care services. Thus, socioeconomic disparities and the violation of people's right to an equitable and accessible health care system are emerging as a new reality [5,6].

There is evidence that many behaviours have changed during the past few years, leading people to worse health and mental conditions. For example, a Dutch study on socioeconomic inequalities revealed that, during an economic crisis, unemployed people smoked more than those who were employed. At the same time, people with lower income showed higher rates of smoking as a habit [7]. With respect to nutrition, it has been demonstrated that in a period of economic crisis, this is affected not only by social status and the area of residence, but also by financial circumstances [8]. An economic crisis has a negative effect on dietary habits, since it brings with it a decrease in fruit, vegetable, and meat consumption and an increase in legume and snack consumption [8]. Moreover, the strict measures that have been adopted by many countries, including Greece and other countries in the Mediterranean region, put a great deal of pressure on their respective populations that has led to an increase in the depression rates. In Greece alone, in 2011, the prevalence of depression was about three times higher than in 2008, and it was found that the difficult economic situation was associated with major depression [9].

Among the age groups most affected by the economic crisis are older adults as a consequence of pension and social welfare cut-backs, while concomitantly, unemployment rates are continuously increasing. Both situations are crucial because people in this life stage have higher demands—not only in financial terms, but mainly concerning care for their health [10].

It is notable that this region has long been considered “privileged” in terms of the available agricultural products and environmental conditions, helping its residents to maintain better health, age successfully, and, in the end, live longer [11]. Given the lack of current data regarding the difficult socioeconomic times that many Mediterranean islanders are facing, the aim of this work was to evaluate how the financial crisis has affected lifestyle health behaviours of older adults living in the Mediterranean islands.

METHODS

The Mediterranean Islands (MEDIS) study is an ongoing, large-scale, multinational observational project in the Mediterranean region, supported by Harokopio University of Athens, Rutgers University of New Jersey and the Hellenic Heart Foundation, which aims to explore the association of lifestyle habits, psycho-social characteristics, and living environment on cardiometabolic factors, among older people (>65 years) who are permanent residents of the Mediterranean area.

The Mediterranean Islands Study Sample

During 2005 to 2015, a population-based, multi-stage convenience sampling method was used to voluntarily enrol older people from the 20 Mediterranean islands: the Republic of Malta (n=250), Sardinia (n=60) and Sicily (n=50) in Italy, the Republic of Cyprus (n=300), Gökçeada (n=55) in Turkey and the Greek islands of Lesbos (n=142), Samothraki (n=100), Cephalonia (n=115), Crete (n=131), Corfu (n=149), Limnos (n=150), Icaria (n=76), Syros (n=151), Naxos (n=145), Zakynthos (n=103), Salamina (n=147), Kassos (n=52), Rhodes and Karpathos (n=149), Tinos (n=129), as well as the rural region of east Mani (n=295). Individuals who resided in assisted-living centres, had a clinical history of cardiovascular disease (CVD) or cancer, or had left the island for a considerable period of time during their life (i.e., >5 years) were not included in the study. These exclusion criteria were applied because the study aimed to assess lifestyle patterns that were not subject to modifications due to existing chronic health care conditions or by environmental factors other than the immediate living milieu. A group of health scientists (physicians, dietitians, public health nutritionists, and nurses) with experience in field investigation collected all the required information using a quantitative questionnaire and standard procedures. For the present analysis, data from 2749 men and women were used; these participants were stratified into two main groups, namely, those 1220 people from Samothraki, Lesbos, Limnos, Crete, Kefalonia, Corfu, Cyprus, Zakynthos and Icaria who were enrolled before 2009 and those 1529 people from Syros, Naxos, Icaria, Malta, Salamina, Kassos, Rhodes, Karpathos, Tinos, Mani, Sicily, Sardinia and Gökçeada recruited during and after 2009. The selection of 2009 as the starting year of the financial crisis was made on the basis of the experience of many Mediterranean countries, and in particular Greece, Spain, and Italy, which began to show the influence of this macro-economic

and micro-economic situation from that year onwards in economic reports and trends (i.e., negative gross domestic product growth, rapid drop in the value of financial institutions and assets, as well as salaries and pensions) [11].

Bioethics

The study followed the ethical recommendations of the World Medical Association (52nd WMA General Assembly, Edinburgh, Scotland, October 2000). The Institutional Ethics Board of Harokopio University approved the study design (16/19-12-2006). Participants were informed about the aims and procedures of the study and gave their written informed consent prior to the interview.

Evaluation of Clinical Characteristics

All of the measurements captured in the different study centres were standardised and the questionnaires were translated into all of the cohorts' languages following the WHO translation guidelines for assessment tools [12]. Weight and height were measured using standard procedures to attain body mass index (BMI) scores (kg/m^2). Overweight was defined as BMI between 25 and $29.9 \text{ kg}/\text{m}^2$, while obesity was defined as $\text{BMI} > 29.9 \text{ kg}/\text{m}^2$. Type 2 diabetes mellitus was determined by measuring fasting plasma glucose and values were used in accordance with the American Diabetes Association diagnostic criteria (fasting blood glucose levels greater than $126 \text{ mg}/\text{dL}$ or use of special antidiabetic medication). Participants who had blood pressure levels $> 140/90 \text{ mmHg}$ or who used antihypertensive medications were classified as hypertensive. Fasting blood lipids levels (high density lipoprotein-cholesterol, low density lipoprotein-cholesterol and triglycerides) were also recorded and hypercholesterolemia was defined as total serum cholesterol levels $> 200 \text{ mg}/\text{dL}$ or the use of lipid-lowering agents according to the National Cholesterol Education Program Adult Treatment Panel III guidelines [13]. The coefficient of variation for the blood measurements was less than 5%.

Evaluation of Lifestyle and Socio-demographic Characteristics

Basic socio-demographic characteristics such as age, gender, living alone or co-habitation, employment status (retired or still working), financial and socioeconomic status (SES), as well as lifestyle characteristics, such as smoking habits and physical activity status, were also recorded. SES score was de-

termined by the combination of education and financial status of the participants over the past five years; specifically, years of school multiplied by financial level groups (1: low financial level [< 9000 euro annual income], 2: middle financial level [$10\,000$ - $18\,000$ euro income], and 3: high financial level for higher income). According to the tertiles of the combined score, values of 0-6 were considered as low SES whereas values of 7-12 were considered as middle SES and values > 13 as high SES. "Retired" was defined as those who had already retired from paid employment, while "still working" were those older adults who were still in paid employment at the time of the interview. The "number of friends" declared by respondents was based on their perception of how many friends they thought they had at the time of the interview. Current smokers were defined as those who smoked cigarettes or any type of tobacco at the time of the interview. Former smokers were defined as those who previously smoked, but had not done so for a year or more. Current and former smokers were defined as ever smokers. The remaining participants were defined as occasional or non-smokers. Physical activity was evaluated in metabolic equivalent of task (MET)-minutes per week, using the short and translated version, validated into Greek, of the self-reported International Physical Activity Questionnaire (IPAQ) [14]. Physically active was defined as those who reported at least three MET-minutes. Dietary habits were assessed through a semi-quantitative, validated, and reproducible food-frequency questionnaire [15]. To evaluate the level of adherence to the Mediterranean diet, the MedDietScore (range, 0 to 55) was used [16]. Higher values for this diet score indicate greater adherence to the Mediterranean diet and better quality in terms of health. This has been further categorised into tertiles to reflect low (0-29), medium (30-37), and high (38-55) adherence to the Mediterranean diet. Symptoms of depression during the previous month were assessed using the validated Greek version (also translated in all the cohorts' languages) of the short-form Geriatric Depression Scale (GDS) (range, 0 to 15) [17]. According to the established cutoff points, the scores were further categorised into three groups, that is, low (0-4), moderate (5-10), and severe depression score (11-15).

Lifestyle Determinants Score

In order to avoid the collinearity effect of highly correlated measurements, we combined into a single score a number of health behaviours and habits that are known for their effect

on human health. Thus, a composed lifestyle index was developed (with theoretical range of 0, good lifestyle, to 6, poor lifestyle) as the cumulative score of the presence or absence of four components, that is, smoking habits, physical activity, MedDietScore and GDS. These factors were selected as they are among the most common risk factors for chronic diseases [18]. Specifically, for the scoring of the index, and for the 3-scale components, that is, MedDietScore and GDS—with categories high/medium/low adherence to the Mediterranean diet and low/moderate/severe depressive symptomatology—a score of 0 was given if the individual had high adherence to Mediterranean diet, a score of 1 for medium adherence, and a score of 2 for low adherence; whereas, a score of 0 was given for low depression and 1 or 2 for moderate or severe depression, respectively. As for smoking habits, those who were current or ever smokers were assigned score 1, while non-smokers were assigned score 0. Finally, score 0 was used for physically active older adults (i.e., those achieving at least moderate daily physical activities) and score 1 for those with sedentary activity. Higher scores corresponded to a worse status of lifestyle health determinants.

Further details about the MEDIS study protocol have been extensively published elsewhere [19,20].

Statistical Analysis

Continuous variables are presented as mean \pm standard deviation (SD) or otherwise stated, and categorical variables as frequencies. Comparisons of continuous variables between groups based on year of enrolment were performed using the independent samples *t*-test, while associations between categorical variables and year of enrolment were tested using the Pearson chi-squared test. Linear regression models were used to evaluate the association between the participants' characteristics (i.e., age, gender, medical history, retirement status, and various socio-demographic characteristics) and the lifestyle health determinant index. Results are presented as unstandardised (*b*) (SD) and standardised beta coefficients (*B*), in order to allow comparisons between variables, due to scaling and metric differences. SPSS version 20 (IBM Corp., Armonk, NY, USA) was used for all calculations.

RESULTS

In Table 1 basic socio-demographic data, lifestyle, and clinical characteristics of the participants are presented. The SES

and particularly the income of older adults enrolled after 2009 was lower as compared to those enrolled before 2009. Likewise, post-2009 older adults showed greater social isolation compared to their pre-2009 peers. A greater percentage of older participants enrolled after 2009 were defined as smokers and reported depressive symptoms when compared to those recruited before 2009. However, older adults enrolled after 2009 were more physically active and less prone to retire or to live alone. Notably, the cumulative lifestyle health determinants score that was developed to capture participants' "unhealthy" lifestyle behaviours was 16% higher among those enrolled after 2009 as compared to the rest of the participants ($p < 0.001$).

When considering the history of the common cardiometabolic factors (i.e., hypertension, diabetes and dyslipidemia), with respect to hypertension status no significant differences were observed between the two cohorts ($p = 0.46$). In contrast, there was an increase in diabetes mellitus rates ($p \leq 0.001$) and a decrease in dyslipidemia rates ($p \leq 0.001$) in those enrolled after 2009.

In Table 2 the results from linear regression models that evaluated the association between period of enrolment of the older adult participants and the lifestyle health determinant index are presented. The rationale of the model's selection was: (a) at first, to evaluate the association of enrolment period with the participants' lifestyles, accounting only for age, gender and region (model 1), (b) to evaluate the aforementioned association accounting for potential confounding and/or mediating factors (model 2), (c) to evaluate the above-mentioned association, accounting also for some social factors (model 3), and then, (d) to further evaluate the association of enrolment period with older adults' lifestyles (model 4). Adjusting only for age, gender, and region, older adults enrolled after 2009 were associated with a worse lifestyle health determinant index ($\beta = 0.23$, $p < 0.001$; $R^2 = 0.06$), as compared with older adults enrolled before 2009 (model 1). Further adjustments (model 2) for SES, history of diabetes, hypertension, and hypercholesterolemia showed that those who had been enrolled after 2009 still showed an association with worse lifestyle health status ($\beta = 0.30$, $p < 0.001$; $R^2 = 0.12$). Supplementary adjustments (model 3) for work status and living alone or with others exhibited the same worse lifestyle health status as in the previous model. As can be calculated from the developed model, the participants enrolled post-2009 had a 50% increase in unhealthier behaviours according to the developed

Table 1. Lifestyle, psychosocial, and clinical characteristics of the Mediterranean Islands study participants, by year of enrolment

	Overall (n=2749)	Enrolled before 2009 (n=1220)	Enrolled after 2009 (n=1529)	p-value
Age	74.0±7.3	74.0±7.0	74.0±7.5	0.07
Men	1375 (50)	574 (47)	795 (52)	0.01
Retired	2337 (85)	1072 (88)	1183 (82)	<0.001
Still working	412 (15)	148 (12)	255 (18)	<0.001
Education (≤6 y)	2034 (74)	1025 (84)	994 (65)	<0.001
No. of friends	5±6	10±13	5±5	<0.001
High socioeconomic status	440 (16)	229 (19)	214 (14)	<0.001
Low/middle income (<9000 €/y)	2117 (77)	915 (75)	1193 (78)	0.06
Living alone	605 (22)	329 (27)	259 (17)	<0.001
Physical activity	1182 (43)	450 (38)	709 (47)	<0.001
Smoking habit	440 (16)	168 (14)	259 (17)	0.02
MedDietScore (range, 0-55)	33±5	34±4	32±5	<0.001
Low adherence (0-29)	698 (27)	174 (14)	524 (36)	<0.001
Medium adherence (30-37)	1589 (59)	868 (72)	721 (50)	
High adherence (38-55)	386 (14)	173 (14)	213 (14)	
Body mass index (kg/m ²)	28.0±4.7	29.0±4.8	28.0±4.5	0.01
History of diabetes	687 (25)	266 (22)	391 (27)	0.001
History of hypertension	1814 (66)	859 (71)	943 (63)	0.46
History of dyslipidemia	1375 (50)	646 (54)	657 (47)	<0.001
Geriatric Depression Scale (range, 0-15)	2.2±3.2	0.5±1.8	3.5±3.5	<0.001
Low depression score (0-4)	2191 (78)	1166 (96)	1025 (70)	<0.001
Moderate depression score (5-10)	515 (18)	35 (3)	360 (24)	
Severe depression score (11-15)	124 (4)	11 (1)	90 (6)	
Lifestyle health determinants score (0-6)	2.7±1.0	2.5±0.8	2.9±1.1	<0.001

Values are presented as number (%) or mean±standard deviation.

Table 2. Results from linear regression models (presented as unstandardised (SD) and standardised beta coefficients) that evaluated the association between year of enrolment (after vs. before 2009) (independent variable) and lifestyle index (outcome), among Mediterranean Islands study participants

	Model 1	Model 2	Model 3	Model 4
Older adults enrolled after vs. before 2009	0.47 (0.04); 0.23***	0.63 (0.05); 0.30***	0.60 (0.05); 0.30***	0.88 (0.40); 0.10*
Age (per 1 y)	0.02 (0.003); 0.12***	0.01 (0.003); 0.65**	0.05 (0.01); 0.04	0.01 (0.01); 0.02
Men vs. women	0.01 (0.04); 0.005	0.01 (0.05); 0.003	0.08 (0.05); 0.04	0.02 (0.1); 0.01
Region of study ¹	0.001 (0.01); 0.003	-0.005 (0.01); -0.01	-0.02 (0.01); -0.04 [†]	0.02 (0.02); 0.04
Socioeconomic status (high vs. low)	-	-0.39 (0.05); -0.18***	-0.41 (0.06); -0.19***	-0.57 (0.10); -0.25***
Diabetes mellitus (yes vs. no)	-	0.09 (0.06); 0.04 [†]	0.09 (0.06); 0.04	0.14 (0.11); 0.05
Hypertension (yes vs. no)	-	-0.04 (0.05); -0.02	-0.07 (0.05); -0.32	-0.13 (0.10); -0.06
Hypercholesterolemia (yes vs. no)	-	-0.16 (0.05); -0.08**	-0.17 (0.05); -0.08**	-0.22 (0.10); -0.10*
Living alone (yes vs. no)	-	-	0.14 (0.06); 0.06*	0.18 (0.12); 0.06
Retired (yes vs. no)	-	-	-0.07 (0.07); -0.03	0.11 (0.17); 0.03
No. of friends (n)	-	-	-	-0.001 (0.01); -0.01

Values are presented as unstandardised (SD) and standardized beta coefficients.
SD, standard deviation.

¹Region of study divided into: Aegean islands (Lesbos, Samothraki, Limnos, Ikaria, Syros, Naxos, Kassos, Rhodes, Karpathos, Tinos, Gökçeada), Island of Crete, Ionian islands (Cephalonia, Corfu, Zakynthos), West Mediterranean islands (Malta, Sardinia, Sicily, Mallorca, Minorca), Saronikos islands (Salamina) and South Peloponnesus area (Mani).

[†]p<0.1, *p<0.05, **p<0.01, ***p<0.001.

health determinant index as compared to those enrolled before the year 2009 (it was observed 0.30 SD, that is $0.30 \times 1.0 = 3$ out of 6 units higher values; $R^2 = 0.12$) (models 2 and 3). Further adjustments for the number of friends per individual revealed that participant enrolment after 2009 had a mediation effect on lifestyle health status as compared to those surveyed before 2009 (model 4) (Table 2).

DISCUSSION

The present work revealed that the financial crisis has affected lifestyle behaviours of older adults in ways that may have also affected their health status. It is widely acknowledged that adoption of a healthy lifestyle is the cornerstone of achieving good health and living longer. According to the WHO, 60% of factors associated with human health and quality of life are correlated to lifestyle [1]. It has been estimated that millions of people follow an unhealthy lifestyle, and therefore they encounter illness, disability, and even death. Beyond malnutrition and unhealthy diet, smoking, drug abuse, chronic and acute stress and other related factors, citizens are now confronted with new challenges in the form of the global financial crisis. The presented findings are drawn from a wide range of countries across the Mediterranean region that, although sharing the same Mediterranean environment, also have a number of cultural, political and behavioural differences, and these findings are of major importance, especially since 2009, when the financial crisis commenced.

It is now evident that the financial and health status of many people has changed since the beginning of the financial crisis [21]. The prevalence of CVD risk factors—especially diabetes mellitus type 2 and obesity, and to a lesser extent hypertension or dyslipidemia—has changed because of the high stress levels that older adults are experiencing [22]. Hypertension and dyslipidemia are common conditions in the rapidly growing older population. The prevalence of hypertension among older adults has always been high and its incidence has risen over time [23]. Changes in the way of life that have been imposed due to the financial context are probably the reason why older adults in the Mediterranean basin have started quitting long established regional healthy eating patterns, that is, the Mediterranean diet. Since the outbreak of the financial crisis, the level of adherence to high quality nutrition standards as recommended by this diet has been greatly reduced. Therefore, the prevalence of lifestyle and food related

diseases such as diabetes mellitus has increased in parallel among Mediterranean older adults [24-26]. The fact that the incidence of dyslipidemia did not parallel that of diabetes and hypertension is probably because products with saturated fat and cholesterol (meat products, fast food, etc.) are more expensive than other ones. Therefore, the price-increase of some food products can be beneficial [27]. The most significant change was observed in people with low or moderate SES, while people with high socioeconomic level did not change their habits [28]. It has been shown that populations with a low SES are more prone to having diabetes mellitus and generally poor health status [29,30]. Data from the ATTICA study showed that middle-aged or older adults of lower SES were more prone to 10-year CVD incidence [31]. This fact is in agreement with the results of the MEDIS study showing that older adults of lower SES had worse health status—a contributor to worse health prognosis—compared to those of higher SES, that is, older adults enrolled before 2009.

Another striking finding is that a large proportion of older adults are living together with other family members after 2009; this can be considered a positive finding, since it has already been demonstrated that older adults who do not live alone are protected against frailty [32] and depression [33] and preserve their cognitive function [34]. However, the context is of major importance, since this can be the outcome of the financial insecurity of their children who are unemployed and cannot support their own families. In the same direction as this, an increased number of older individuals are obliged to continue working instead of enjoying their pensions, in order to sustain their augmented household [35]. This phenomenon can also explain the lower percentage of people reporting higher SES among those recruited after 2009, though they seem to be better educated.

During this period, there was also a shifting in trends of some lifestyle habits such as smoking and physical activity. More old adults tend to smoke and to walk as part of their daily routine [36]. Both practises are very likely linked to the difficult period that they are facing. Smoking may be considered a mode of stress relief, whereas walking would be seen as a cheaper method of reaching their destination [29]. The social life of older adults has also been negatively impacted by the financial crisis, as the number of friends has shrunk [37]. Social isolation occurring after the establishment of the financial crisis seems to have led to a significant increase in symptoms of depression and suicide, indicating that mental health is affected as well

[38]; and this was indirectly revealed in the present study, too, when the number of friends entered in the analysis (model 4) (Table 2). In line with the previous considerations, depressive symptoms, as measured by the GDS, seem to be more pronounced in people recruited after 2009. This may be due to the considerable stress burden following deterioration of personal and household financial security and of family wellbeing (unemployment, inability to attain life goals or to start and maintain a family, etc.). This burden may be seen as unbearable, and although it was not directly measured in the study, it can be estimated by its expression in behaviours such as increased smoking rates and depressive symptoms, and so can also be regarded as a separate risk factor for adverse health outcomes.

Strengths and Limitations

To our knowledge, this is the first study concerning the financial crisis and its impact on lifestyle health determinants and behaviours of older adults from several Mediterranean islands. The fact that this is a cross-sectional survey limits the possibility for causal relationships and there is always a bias in self-reported questionnaires. Unfortunately, we have not recorded potential health education changes or mass media influence due to the financial crisis during the past years, and therefore potential confounds may still exist. However, the distinction of the period of enrolment is a valid way to evaluate the effect of time on longitudinally measured outcomes. Besides, our study has focused only on the health determinants with a negative impact on health, while the health assets were not on the focus of this study. Moreover, although the Mediterranean islands investigated before and after 2009 were different, the order in which the islands were surveyed was random; thus, the observed variance in participants' characteristics between the pre-2009 and post-2009 cohorts can be, at least partially, attributed to the classification factor, that is, the financial crisis.

It has long been acknowledged that Mediterranean traditional lifestyle characteristics can significantly contribute to healthy ageing and longevity [19,39,40]. However, this seems to have changed. Routines and behaviours have altered over the past few years of the economic crisis, leading to adverse health consequences in society. People of different SES have adjusted their habits and behaviours in order to face the financial difficulties that have emerged. The impact of the global financial crisis seems to be particularly acute for older adults of lower SES, not only in financial terms but also because chang-

es contribute to a worse health prognosis, following the adoption of unhealthy habits. For that reason, it is a crucial challenge to prevent the financial crisis from becoming a health and social crisis. Governments and public health stakeholders need to develop public health policies, adapted to the needs of older people, and address their particularities. This requires a mobilisation of all societal resources to support socially unprotected older adults, on the one hand, and create conditions for promoting healthy living and to decelerate the adoption of detrimental lifestyle patterns by older people on the other.

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CONFLICT OF INTEREST

The authors have no conflicts of interest associated with the material presented in this paper.

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