Journal of Public Health Research 2022; volume 11:2768

Article

Previous functional social and behavioral rhythms affect resilience to COVID-19-related stress among old adults

Mauro Giovanni Carta,[1] Michele Fornaro,[2] Luigi Minerba,[1] Massimiliano Pau,[3] Fernanda Velluzzi,[1] Laura Atzori,[1] Cesar Ivan Aviles Gonzalez,[4] Ferdinando Romano,[5] Roberto Littera,[6] Luchino Chessa,[1] Davide Firinu,[1] Stefano Del Giacco,[1] Angelo Restivo,[7] Simona Deidda,[7] Germano Orrù,[7] Alessandra Scano,[7] Simona Onali,[1] Ferdinando Coghe,[8] Goce Kalcev,[9] Giulia Cossu[1]

[1]Department of Medical Science and Public Health, University of Cagliari, Italy; [2]Department of Psychiatry, Federico II University of Naples, Italy; [3]Department of Mechanical, Chemical and Materials Engineering, University of Cagliari, Italy; [4]Universidad Popular del Cesar, Valledupar, Colombia; [5]University La Sapienza, Rome, Italy; [6]Unit of Medical Genetics, R. Binaghi Hospital, Local Public Health and Social Care Unit (ASSL) of Cagliari, Sardinian Regional Company for the Protection of Health (ATS Sardegna), Cagliari, Italy; [7]Department of Surgical Sciences, University of Cagliari, Italy; [8]Clinical Chemical and Microbiology Laboratory, University Hospital of Cagliari, Italy; [9]International Ph.D in Innovation Sciences and Technologies, University of Cagliari, Italy

Abstract

Background: Functioning of Social Behavioral Rhythms (SBRs) may affect resilience toward stressful events across different age groups. However, the impact of SBRs on the coronavirus disease of 2019 (COVID-19) in elder people is yet to ascertain, representing the aim of the present report.

Design and methods: Follow-up of a peer-reviewed randomized controlled trial on exercise on old adults (³65 years), concurrent to the onset of the pandemic-related lockdown. Post-RCT evaluations occurred after further 12 and 36 weeks since the beginning of the lockdown phase. People with Major Depressive Episode (MDE) at week-48 (follow-up endpoint) were deemed as cases, people without such condition were considered controls. MDE was ascertained using the Patient Health Questionnaire-9 (PHQ-9); SBRs functioning at week 12 onward, through the Brief Symptom Rating Scale (BSRS).

Results: Seventy-nine individuals (53.2%, females) entered the RCT-follow-up phase. The frequency of MDE did not significantly change before versus during lockdown (OR 2.60, CI95%=0.87-9.13). People with BSRS>1 standard deviation of the whole sample score at week-12 had an inflated risk of DE during lockdown (OR=5.6, 95%CI:1.5-21.4) compared to those with lower BSRS scores. Such odd hold after excluding individuals with MDD at week-12. The *post-hoc* analysis could be potentially affected by selection bias.

Conclusions: Overall, older adults were resilient during the first phase of the pandemic when functioning of pre-lockdown was still preserved, in contrast to the subsequent evaluations when the impairment of daily rhythms was associated with impaired reliance.

Introduction

During the coronavirus disease of 2019 (COVID-19) pandemic, the elder population showed more severe complications and a higher mortality rate in comparison with other age groups.[1] Also, old-age people suffered significant psycho-social disruption due to limited social contacts with friends, relatives, and healthcare workers, interruption of daily routine activities, limited access to care (including telemedicine).[2] Surprisingly, several surveys proved a low rate of stress and depressive disorders in several high-income countries,[3,4] possibly suggesting different coping skills and resilience across different regions, populations, or circumstances.

According to the American Psychological Association, resilience refers to "the process of adapting well in the face of adversity, trauma, tragedy, threats, or even significant sources of stress".[5] While this definition is useful, it does not reflect the complex nature of resilience[6] nor its potential variability across different samples.[7]

Among other populations, older adults and their putative psychobiological mechanisms underlying resilience represent a major research target, which has been recently investigated over the follow-up period of a randomized controlled trial (RCT) on exercise, started in the year 2019. The follow-up period post-RCT conclusion happened to occur when the Italian COVID-19 lockdown started, in April 2020.[8,9] The RCT evaluated the role played in the quality of life by social and behavioral rhythms (SBRs), such as habits of eating, sleeping, and having regular and constant social contacts; physical exercise may regulate and could also be a mediator of well-being in the elderly.[9,10] The impairment of the SBRs was found to be associated with Major Depressive Disorder

Significance for public health

The study confirms the resilience of older adults against depression during the pandemic. The lockdown during the COVID-19 pandemic did not lower the perception of health-related quality of life in older adults living at home. The functionality of social behavioral rhythms seems to be an early determinant of the resilience of older adults against depression during lockdown and pandemic.

(MDD)[11] and, to a bigger extent, with bipolar disorders (BD).[12] Recently, it has been shown that, in BD, adopting regular social rhythms can potentiate the efficacy of interventions to enhance favorable illness perceptions and may improve mood outcomes. Moreover, it was found that a more stringent lockdown increased the risk of a major depressive episode (MDE) among people with BD comparing areas with different degrees of lockdown during the COVID-19 pandemic.[13] Elderly adults showed greater functioning in biological and social rhythms compared to younger people.[14] This latter issue could be related to the greater resilience shown in this age group during COVID-19 pandemics and the subsequent lockdown, which represented a factor of induction of disruption of social rhythms. From this perspective, it is worth investigating the relationship between the risk of depression, social rhythms, and pandemics in elderly adults, considering that the rates of depression are high among elder people.[15]

The present study aimed to assess the prevalence of MDE and perception of the health quality of life in a sample of old adults living at home at the end of the RCT, and during the COVID-19-related lockdown. Based on the relevant impact of lockdown measures on daily life and biological rhythms,[16] the study focused on the functionality of SBRs before the implementation of the lockdown as a potential determinant of resilience against depression.

Design and methods

A cohort study and a case-control study on the cohort were performed at the end of the peer-reviewed, RCT;[8] people with MDE at the end of the cohort were deemed as cases, people without MDE represented the controls.

A total of 120 elderly individuals were randomly exposed to the experimental (12-weeks of aerobic/anaerobic exercises of moderate-intensity with three sessions/week) or the control protocol (cultural activities). The study, which was designed to assess the real-life role of physical exercise, was based on mild to moderate exercise to avoid the exclusion of the elderly with chronic medical conditions (10% had suffered from cancer in the past, 40% had hypertension, and 11% type II diabetes). A hundred and five (87.5%) participants completed the trial and were then evaluated at week-12, at the end of the RCT (mean ±SD] age 72.3±4.7 years, of whom 56% women). After further 36 weeks (week 48 of the present cohort follow-up), they were contacted during the first wave of the COVID-19 pandemic.

The outcome measure was the comparison of week-48 scores against week-12 ones: the Patient Health Questionnaire-9 (PHQ9)[17,18] is a self-administered tool. The score is the sum of the value of 9 items, one for each core symptom of Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria, and is coded from 0 to 4 as minimal symptoms; 5-9 mild; 10-14, moderate; 15–19 moderately severe and 20-27 severe depression.[17] The functionality of Functioning of Social Behavioral Rhythms SBRs at week-12 was measured through the Italian version of the Brief Social Rhythms Scale (BSRS),[19] where high scores indicate a worse functioning. Scores above one standard deviation (SD) of the mean were associated with rhythm dysfunction, stating the lack of a standardized cut-off.

The differences in depression according to previous exposure to dysfunctional SRB were measured through the McNemar test for nominal variables (considering differences by time and group of exposed/not exposed). As SBRs were found to be associated with the diagnosis of MDE in older adults, the prediction of MDE at week-48 was based on SBRS at week-12, with and without the exclusion of people with MDD at week-12. The latter approach was meant to exclude the potential confounding factor of the association between SBRs and MDE at week-12 as a determinant of the same association at week-48 (i.e., that the association between MDE and SBRs at week-18 could be the consequence of dysfunctionality of SBRs in depressed people, rather than depression. The Committee of the "Azienda Ospedaliero-Universitaria di Cagliari", Cagliari, Italy, approved the study on October 25th, 2018 (reference number PG/2018/15546).

Results

Seventy-nine (53.2%, females =42) individuals were evaluated during follow-up because 24% (n= 5) were lost-to-follow-up at week-12 (Table 1). The Huntington Quality of Life Instrument (H-QoL) improved during the lockdown period: the mean (SD) 12-Item Short Form Survey (SF-12) score raised from 34.0±6.5 at week-12 to 37.6±4.3 at week-48 (one-way ANOVA way for repeated measure 1,156 df, F=16.576, p<0.01).

The frequency of mild to severe depression (PHQ³4) did not significantly change [10 (12.7%) *vs* 18 (22.8%), McNemar test=2.77, p=0.10, OR=2.60 (C.I.95%=0.87-9.13]. The frequency of moderate to severe depression (PHQ ³10) did not increase compared to the pre-lockdown period [4 MDE at week-12 (5.1%) *vs* 5 at t48weeks (6.3%), McNemar test=0.125, p=1.1, OR=1.33 (C.I.95%=0.26-9.12)]. The prevalence of moderate/severe depression (PHQ³10) was lower when compared with that of an Italian non-elderly sample evaluated during the lockdown using the same tool and cut-off (6.3% *vs* 30.0%; p<0.01).[20]

The mean ±SD score at BSRS at week-12 was 19.1±7.9. A score above +1SD at week-12 was significantly associated with depression during the lockdown. Six people with MDE at week-48 (33.3%) had dysfunctional BSRs at wekk-12 *vs* 5 (8.1%) of people without MDD at week-48; c^2=7.327, 1 df, p<0.01 OR=5.6, 95%CI=1.5-21.4). The association did not change after the exclusion of 10 individuals with MDE at t12 weeks [individuals with BSRS dysfunctional score at week-12 with MDE at week-48 were 4 (33.3 %) *vs* 3 (5.3%) in people without MDE at week-48; (Fisher' exact test, p<0.04 OR=5.4, 95%CI=1.2-24.4)].

Table 1. Characteristics of the sample and factors associated with resilience/risk of depression during the lockdown.

	Depressed mild/severe at week-48 n= 18 (22.8%)	Not depressed at week-48 n=61 (% 77.2%)	p-value OR (CI 95%)
Mean (SD) age (ANOVA)	71.6 (4.6)	72.5 (4.7)	0.34
Female (McNemar test)	11 (61.1%)	31 (53.4)	0.44 1.5 (0.5-4.4)
BSRSs≥1 SD from the mean (week-12) (McNemar test)	6 (33.3)	5 (8.1%)	0.007 5.6 (1.5-21.4)

ANOVA, analysis of variance; OR, odd ratio; BSRS, Brief Social Rhythms Scale.

Discussion

The present study confirms a strong resilience of older adults during the first phase of the COVID-19 pandemic despite the "life-threatening climate" in Italy, exemplified by the local media repeatedly broadcasting rows of military trucks with coffins.[21] The frequency of MDE did not change during the lockdown period and the H-QoL was surprisingly better than that measured 48 weeks before. This result is coherent with several surveys that found low rates of stress and depressive disorders in old adults during the COVID-19 pandemic and lockdown.[3,4,22] However, this finding seems even more pronounced in our sample. It may be that the lockdown saw a belt of solidarity tighten around the elderly in Italy. This has sensitized families but also institutions and social solidarity. The family, which in Southern Italy includes an enlarged circle of cousins and grandchildren, has maintained very close contacts also through phone calls and social networks with their elders. An agreement between the municipality of Cagliari (where the study took place) and non-profit organizations made it possible to distribute home shopping and drugs to the elderly, to prevent exposing themselves to risk. These may have been the reasons for this surprising result, but at present, they are heuristic hypotheses that will have to be verified over time and with adequate comparisons.

In general, older adults appear to show better stress responsiveness and emotional regulation than younger adults,[23] thus proving the resilience of the elderly to the consequences of the pandemic.[2,24] However, sudden changes in time cues related to automatic biological answers might impair mental well-being.[25] It is well known that disruption of SBRs, such as habits of eating, sleeping, and having regular and constant social contacts, affect circadian rhythms and, consequently, mental health.[26,27] The study appears to confirm our hypothesis on the role played by dysfunctional rhythms before lockdown: they can increase individual vulnerability during the pandemic by altering biological rhythms after the implementation of lockdown restrictions. But having functional SBRs appears to be a factor of resilience to stress due to disruption of daily rhythms during the lockdown. The difference of SBRs between older adults and other age groups is unclear, but scientific findings show more regular circadian rhythms in elderly people.[10,28] If SRBs have more similar differences by age than circadian rhythms, the regularity of SBRs in the elderly could be recognized as a factor of age-dependent resilience. Although we were not able to further stratify the sample at this time, yet there are chances that people who developed an MDE had prominent atypical features of depression, which in turn are more related to circadian rhythm impairments, and are, indeed, part of the bipolar realm. According to the 'allostatic load model' based on the integrative perception of late-depressive symptoms that occur because of a combination of psychological and physiological determinants, older people with high allostatic load are those who are at increased risk for depression in the community.[29]

Our study, which was not designed ahead to study the impact of lockdown, has several limitations, such as selection bias due to its post-RCT-extension nature, and limited sample size; furthermore, a case-finding on MDE can be carried out with brief questionnaires such as the PHQ-9 but these tools cannot allow diagnosis of MDD, which is a lifetime diagnosis. It may be possible that a person with a current depressive episode has experienced mania or hypomania in the past. In this case, the lifetime diagnosis is not MDD, but BD.

Conclusions

Therefore, the study does not clarify whether the association between ED and SBRs occurs in people with a vulnerability to MDD, BD, or both. The assessment of functional biorhythms as a possible predictor of resilience in the elderly requires further analyses with increased statistical power and the use of adequate diagnostic tools. Moreover, a detailed comparison of age groups in the elderly considering key confounding variables (*e.g.*, socioeconomic status, educational level) may help to better understand the psycho-social dynamics associated with the COVID-19 pandemic. Studies should be conducted in the future phases of the pandemic, for which lockdowns do not seem to be excluded, with the outcome to proactively identify the most vulnerable individuals among the elder population and to implement optimal public health and socio-economic interventions across different recipients and cultures.

Correspondence: Mauro Giovanni Carta, Department of Social Science and Public Health, University of Cagliari, Italy, Strada SS554 09042 Monserrato (CA) Italy. Tel. +39.392.4944509.
E-mail mgcarta@tiscali.it

Key words: Social and behavioral rhythms; major depressive disorder; health-related quality of life; COVID-19; resilience.

Contributions: The study was initially designed by MGC, GC, and GS and then discussed with MP, FV, LA, GK, SC, and CIAG. The methodology was decided by MGC, GS, and GC. MGC conducted the data analysis. The results were discussed collectively. MGC, GC, and GS drafted the paper, or its revisions (MF). All authors read and approved the final manuscript.

Funding: The "Active Aging Study" Identifier: NCT03858114. clinicaltrial.gov was funded by a grant of "Fondazione di Sardegna". This article has been developed within the framework of the Research Project financed with the resources of the P.O.R. SARDEGNA F.S.E. 2014-2020 - Axis III "Education and Training, Thematic Objective: 10, Specific Objective: 10.5, Action of the fi Partnership Agreement: 10.5.12 "Call for proposals for the funding of research projects - Year 2017".

Conflict of interest: The authors declare no conflict of interest.

Availability of data and materials: The datasets are not available with open access: the agreement shared with the participants and partners as stated in the presentation for authorization to the Ethics Committees was that the project leader will be guarantors and they will review all access requests. Requests for access to the datasets (with anonymous records) are to be directed to the corresponding author.

Ethics approval and consent to participate: The Ethical Committee of the "Azienda Ospedaliero-Universitaria di Cagliari" approved the study on 25 October 2018 (reference number PG/2018/15546). During evaluations, the researchers provided information about the aims of the study and informed participants about the possibility of discontinuing the interview if they wished. The researchers explained that data would be collected in an anonymous database. Each participant signed informed consent. The study procedure was in accordance with the ethical standards of research and with the 1964 Helsinki declaration and its later amendments.

Received for publication: 6 December 2021.
Accepted for publication: 10 January 2022.

Journal of Public Health Research 2022;11:2768
doi:10.4081/jphr.2022.2768

References

1. D'Silva KM, Serling-Boyd N, Wallwork R, et al. Clinical characteristics and outcomes of patients with coronavirus disease 2019 (COVID-19) and rheumatic disease: a comparative cohort study from a US 'hot spot'. Ann Rheum Dis 2020;79:1156-62.
2. Vahia IV, Jeste DV, Reynolds CF 3rd. Older adults and the mental health effects of COVID-19. JAMA 2020;324:2253-4.
3. Pearman A, Hughes ML, Smith EL, et al. Age differences in risk and resilience factors in COVID-19-related stress. J Gerontol B Psychol Sci Soc Sci 2021;76:e38-e44.
4. Klaiber P, Wen JH, DeLongis A, et al. The ups and downs of daily life during COVID-19: Age differences in affect, stress, and positive events. J Gerontol B Psychol Sci Soc Sci 2021;76:e30-7.
5. American Psychological Association. The road to resilience. Washington: American Psychological Association; 2014. Available from: http://www.apa.org/helpcenter/road-resilience.aspx
6. Southwick SM, Bonanno GA, Masten AS, et al. Resilience definitions, theory, and challenges: interdisciplinary perspectives. Eur J Psychotraumatol 2014;5:25338.
7. Southwick SM, Douglas-Palumberi H, Pietrzak RH. Resilience. In: M.J. Friedman, P.A. Resick, T.M. Keane, Editors. Handbook of PTSD: Science and practice. New York: Guilford Press; 2014.
8. Carta MG, Cossu G, Pintus E, et al. Moderate exercise improves cognitive function in healthy elderly people: Results of a randomized controlled trial. Clin Pract Epidemiol Ment Health 2021;17:75-80.
9. Carta MG, Cossu G, Pintus E, et al. Active elderly and health-can moderate exercise improve health and wellbeing in older adults? Protocol for a randomized controlled trial. Trials 2021;22:331.
10. Cossu G, Agus M, Atzori L, et al. Principal component analysis of the social and behavioral rhythms scale in elderly. J Public Health Res 2022;11.2546.
11. Lieverse R, de Vries R, Hoogendoorn AW, et al. Social support and social rhythm regularity in elderly patients with major depressive disorder. Am J Geriatr Psychiatry 2013;21:1144-53.
12. Lin EC, Weintraub MJ, Miklowitz DJ, et al. The associations between illness perceptions and social rhythm stability on mood symptoms among patients with bipolar disorder. J Affect Disord 2020;273:517-23.
13. Carta MG, Ouali U, Perra A, et al. Living with bipolar disorder in the time of Covid-19: Biorhythms during the severe lockdown in Cagliari, Italy, and the moderate lockdown in Tunis, Tunisia. Front Psychiatry 2021;12:634765.
14. Hood S, Amir S. The aging clock: circadian rhythms and later life. J Clin Invest 2017;127:437-46.
15. Fornaro M, Solmi M, Stubbs B, et al. Prevalence and correlates of major depressive disorder, bipolar disorder and schizophrenia among nursing home residents without dementia: systematic review and meta-analysis. Br J Psychiatry 2020;216:6-15.
16. Leone MJ, Sigman M, Golombek DA. Effects of lockdown on human sleep and chronotype during the COVID-19 pandemic. Curr Biol 2020;30:R930-1.
17. Spitzer RL, Kroenke K, Williams JB. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary care evaluation of mental disorders. Patient health questionnaire. JAMA 1999;282:1737-44.
18. Cossu G, Abbile Gonzalez CI, Minerba L, et al. Exercise improves long-term social and behavioral rhythms in older adults: Did it play a role during the COVID-19 lockdown? J Public Health Res 2022;11:2432.
19. Moro MF, Carta MG, Pintus M, et al. Validation of the Italian version of the Biological Rhythms Interview of Assessment in Neuropsychiatry (BRIAN): Some considerations on its screening usefulness. Clin Pract Epidemiol Ment Health 2014;10:48-52.
20. Mollaioli D, Sansone A, Ciocca G, et al. Benefits of sexual activity on psychological, relational, and sexual health during the COVID-19 breakout. J Sex Med 2021;18:35-49.
21. Kurotschka PK, Serafini A, Demontis M, et al. General practitioners' experiences during the first phase of the COVID-19 pandemic in Italy: A critical incident technique study. Front Public Health 2021;9:623904.
22. Sotomayor-Beltran C, Matta-Solis H, Perez-Siguas R, et al. Fear of COVID-19 among Peruvian people living in disadvantaged communities: A cross-sectional study. Clin Pract Epidemiol Ment Health 2021;17:19-25.
23. Lee EE, Depp C, Palmer BW, et al. High prevalence and adverse health effects of loneliness in community-dwelling adults across the lifespan: role of wisdom as a protective factor. Int Psychogeriatr 2019;31:1447-62.
24. Czeisler MÉ, Lane RI, Petrosky E, et al. Mental health, substance use, and suicidal ideation during the COVID-19 pandemic-United States. MMWR Morb Mortal Wkly Rep 2020;69:1049-57.
25. Grandin LD, Alloy LB, Abramson LY. The social zeitgeber theory, circadian rhythms, and mood disorders: review and evaluation. Clin Psychol Rev 2006;26:679-694.
26. Margraf J, Lavallee K, Zhang X, et al. Social rhythm and mental health: A cross-cultural comparison. PLoS One 2016;11:e0150312.
27. Stafford M, Ben-Shlomo Y, Cooper C, et al. Diurnal cortisol and mental well-being in middle and older age: evidence from four cohort studies. BMJ Open 2017;7:e016085.
28. Carta MG, Atzeni M, Perra A, et al. Cost-effectiveness of US National Institute of Health and European Union FP7 projects on active ageing and elderly quality of life-Author's reply. Clin Pract Epidemiol Ment Health 2019;15:10-4.
29. Kobrosly RW, van Wijngaarden E, Seplaki CL, et al. Depressive symptoms are associated with allostatic load among community-dwelling older adults. Physiol Behav 2014;123:223-30.