Psychological and functional impacts associated with restrictions in Long-Term Care Facilities (LTCF) due to the COVID-19 pandemic: A multicentre study

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Abstract

Objectives: To analyze the impacts of the restrictions implemented in LTCF during the COVID-19 pandemic on the psychological and functional status of older adults.

Design: A retrospective multicentre study. We hypothesize that the negative effects of the restrictions will lead to a higher rate of decline between the measures taken immediately before and after the lockdown than between the two measures taken before the lockdown.

Setting and participants: 365 participants recruited in four Spanish LTCFs in Galicia and Valencia.

Methods: Impacts of restrictions on cognitive (MMSE), affective (GDS) and functional status (Barthel index, Tinetti) were analyzed by Linear Mixed Models with random intercepts, random slopes, and personal and contextual factors as covariates.

Results: Social measures covaried significantly with the cognitive and functional status but did not predict longitudinal change. MMSE, Barthel index and Tinetti scores decreased significantly across pre- and post-lockdown measurement times, but only the Tinetti scores showed a specific impact of the restrictions.

Conclusions and Implications: Only performance-based functional measures showed the real impact of restrictions. The findings highlight the importance of having data from several pre-lockdown measurements to enable identification of changes that can be causally attributed to the restrictions. The findings also support the resilience of older adults in mitigating the effect of the restrictions.

Key words: Older adults, Long Term Care Facility, COVID-19 lockdown, cognition, affect, functionality.

Introduction

The spread of the COVID-19 pandemic and the consequent increase in mortality in the aging population was particularly intense in Long-Term Care Facilities (LTCF) (Onder et al., 2020), which led to the imposition of restrictions aimed mainly at maintaining strict social distancing measures to reduce infections and mortality (Yen et al., 2020; Brown et al., 2020; Mas Romero et al., 2020).

On 14 March 2020, the government of Spain imposed a severe lockdown for the whole Spanish population, including all non-essential workers, which lasted until 4 May 2020. According to the restrictions, the entire population had to remain confined to their homes except to stock up on food or attend to some specified emergencies. LTCFs were required to implement radical measures aimed at minimizing social contact with and between older adults. The impact of social isolation on the health of older adults is well known (Dahlberg et al., 2021; Donovan et al., 2020) and can have particularly damaging effects on people living in LTCFs (Dosil-Diaz et al., 2022; Simard & Volicer, 2020). Meta-analysis of the available data showed that deprivation of social contact was frequently associated with severe negative health outcomes (Kuiper et al., 2015; Valtorta el at., 2016; Holt-Lunstad et al., 2016).

There is some evidence for significant associations between pandemic-related social isolation and negative health outcomes (Lebrasseur et al., 2021; Sepúlveda-Loyola et al., 2020; Suárez-González et al., 2021). However, it remains unclear whether the restrictions associated with the COVID-19 pandemic lockdown have had a specific causal relationship in the deterioration of the health of older adults.

Several studies have been conducted to analyze the impact of the lockdown in participants recruited incidentally from the general population, mainly through questionnaires administered online or by telephone (Poli et al., 2019). Increased levels

of stress, anxiety and depression have been reported, particularly in young people and women, in both cross-sectional (Odriozola et al., 2020; Ozamiz-Etxebarria et al., 2020; Özdin & Bayrak Özdin, 2020) and longitudinal studies (Planchuelo-Gómez et al., 2020; Wang et al., 2020).

Studies aimed at measuring the psychological impact of lockdown specifically in older adults have focused on people living in the community (Lebrasseur et al., 2021; Rodriguez-González et al., 2020; Suárez-González et al., 2021). Such studies have generally reported a negative impact of confinement on mental health and wellbeing although compared to young groups, older adults consistently showed less psychological distress (Lebrasseur et al., 2021; Losada-Baltar et al., 2020), and both young-old adults and older-elderly adults were affected similarly (Facal et al., 2021; López et al., 2020).

Some longitudinal studies carried out in the community have highlighted the resilience of older adults to maintain similar or higher levels of wellbeing or subjective health (Kivi et al., 2021), similar subjective perception of isolation, loneliness (Peng et al., 2021) and quality of life (Esain et al., 2021) and similar cognitive status (Nogueira et al., 2021). Worse outcomes were observed in studies carried out in vulnerable populations of older adults. Thus, Amanzio et al. (2020) observed a longitudinal decrease in objective functional measures in the frailty spectrum in older adults with at least two chronic diseases. Likewise, Esain et al. (2021) reported that decline in quality of life associated with the COVID-19 lockdown only occurred in older adults with lower functionality.

The association between social isolation during the pandemic and mental health in older adults was reviewed by Sepúlveda-Loyola et al. (2020), focusing cross-sectional evidence on community dwelling older adults and reporting similar effects to those

observed in the general population. A more recent review that focused on the impact of the confinement on community dwelling older adults with objective cognitive impairment (Suárez-González et al., 2021) reported longitudinal evidence for worsening in cognitive, behavioural, and functional domains. The only two studies considering LTCF samples included in the review (Suárez-González et al., 2021) reported worsening in cognition, neuropsychiatric symptoms, and functionality in about half of the cognitively impaired participants. However, Pereiro et al. (2021) failed to find any significant post-confinement effects on psychological and functional measures in a longitudinal study conducted in a Spanish LTCF, regardless of the cognitive status of the participants.

The main aim of the study was to analyze the impact of the measures aimed at minimizing social contact implemented in the LTCF during the confinement due to the COVID-19 pandemic on the cognitive, affective, and functional status of the elderly residents. Changes across two pre-lockdown measurements and one post-lockdown measurement in two psychological (i.e. cognition and depressive symptomatology) and two functional (i.e. BADL and motor-balance skills) measures in a LTCF multicentre sample were studied. Some relevant variables that mediated possible longitudinal changes in the outcome measures were included in the model as covariates. Specific effects of restrictions on health status should lead to a more apparent changes in slopes between the measurements made immediately preceding pre-lockdown (Pre2) and post-(Post) lockdown than between the two pre-lockdown measurements (Pre1 and Pre2).

Method

Participants

A retrospective multicentre study was carried out including 365 participants (Age: *M*=83.86, *SD*=8.19; Gender: 59.9% women) from four LTCFs: 98, 82, 96 and 89

participants were recruited in Centres 1, 2, 3 and 4, respectively. All LTCFs included in the study are managed by private companies, with most of the beds (more than 60%) being subsidized by the public administration and considered extra-large capacity (150-200 residents) in accordance with Park-Lee et al. (2011). The educational level of the most participants was basic literacy (51.2%) or primary school (35.9%), and only 12.9% had high school or university education. Regarding their professions, most of the participants had engaged in housework (36.7%) or were unskilled workers (39.2%), and only 20.5% were skilled workers (i.e., specialized formal training is required).

The participants were recruited in the four LTCFs by considering the following inclusion criteria: 1) aged 60 years or older; 2) spending the entire period of strict lockdown of the population (from March 14 to May 4, 2020) in the LTCF; and 3) having 2 pre-lockdown measurements for all instruments considered (see Instruments subsection). The inclusion criteria were met by 59.01% of the people residing in the four LTCFs. Eleven participants were unable to complete the study due to death (2.46%) or hospitalization (.54%).

Participants with very poor cognitive status are expected to show a floor effect in cognitive measures or deterioration in consciousness that seriously compromises the validity of self-reported measures. Therefore, following Formiga et al. (2009), data from those participants with MMSE scores ≤ 12 points were excluded from the analysis of psychological outcomes. The subsample consisted of 212 participants (Centre 1=54; Centre 2=50; Centre 3=62; Centre 4=46) with similar sociodemographic characteristics (Age: *M*=83.41, *SD*=8.29; Gender: 67.1% women; basic literacy=49.1% and primary education=37.3%; Profession: housework=33% and unskilled=42%).

Instruments

Changes in psychological health were measured using a 35-point Spanish adaptation (Lobo et al., 1979) of the Mini-Mental State Examination (MMSE) (Folstein et al., 1975) and the 15-item Spanish adaptation (Martí et al., 2000) of the Geriatric Depression Scale (GDS) (Sheikh & Yesavage, 1975) Functionality was measured using the Spanish adaptation (Baztan et al., 1993) of the Barthel index (BI) (Mahoney & Barthel, 1965) and the Spanish adaptation (Roqueta et al., 2007) of the Tinetti scale (Tinetti, 1986). Sociodemographic data (i.e. age, gender, education, profession) and lockdown circumstances (i.e. restriction time, information about infections, emotional/behavioural observable reactions, place of isolation, accompaniment frequency, changes in therapeutic routines, frequency and modality of family contact) were collected by means of an *ad hoc* questionnaire.

The MMSE is a brief tool for screening cognitive impairment considering domains of orientation, memory codification, episodic recall, attention and calculation, language and visuospatial construction ability. The Spanish version shows good reliability and validity indices (sensitivity: .90; specificity: .84) for differentiating cognitively unimpaired and demented participants for the 23/24 cutoff points (Lobo et al. 1999).

The GDS is a screening test for depressive symptomatology in older adults. The 15-item version that includes dichotomous response alternatives to questions about mood in the last week was used. The Spanish adaptation shows good validity indices for depression in the geriatric population (Sensitivity: 0.81; specificity 0.77) and cut-off points of 4/5 (Martínez-de la Iglesia et al., 2002).

The BI is a brief instrument for assessment of functional status in Basic Activities of Daily Living (BADL) such as feeding, bathing, dressing, tidiness, bowel control, bladder control, toileting, mobility transition, global mobility and stair mobility. Three (0, 5 or 10 points) or two (0 or 5 points) levels of independence are considered in

scoring each activity. The Spanish adaptation successfully predicts mortality, institutionalization, and hospitalization time (Baztán et al., 1993).

Tinetti's scale assesses observable aspects of balance (range 0-16 points) and walking (range 0-12 points) in static and mobility situations that are common in everyday life. Three (0, 1 or 2 points) or two (0 or 1 points) levels of independence are considered in scoring balance and walking. Although the validity of the scale in predicting fall risk is usually low to moderate (Roqueta et al., 2007), Tinetti's scale is considered a useful tool for evaluating global mobility, a key ability for the preservation of functionality (Canbek et al., 2013).

Procedure

The two retrospective pre-lockdown measurements assessing psychological (i.e. cognitive status and depressive symptomatology) and functional (i.e. IADL and motor-balance function) domains formed part of the regular care routine and were retrieved from the LTCF records.

The first pre-lockdown measurement was carried out between August 2019 and November 2019 and the second pre-lockdown measurement, between December 2019 and February 2020 (between-time frame: 4-6 months). An additional post-lockdown measurement (from June 2020 to August 2020) was carried out after the strict lockdown for the whole Spanish population had ended: time-frame of 6-8 months). The post-lockdown measurement should be sensitive to the effects of the following restrictions implemented in LFTCs: a) prohibition of visits from people outside of the institution; b) isolation of people or holding in bubble spaces; c) monitoring of infections among staff and the proper use of protective material; and d) referral of infections to specific care spaces for patients with COVID-19. All evaluations were conducted by the

psychologists and occupational therapists within the LTCF multidisciplinary teams. The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ethics Committee of the University of Santiago de Compostela (reference USC-11/2020). Written informed consent was obtained from all participants.

Data Analysis

Linear Mixed Models (LMMs) with random intercepts and random slopes were used to model longitudinal changes. Statistical models were specified including the Evaluation time (two pre-lockdown, Pre1 and Pre2, and one post-lockdown, Post, measurement) as an independent variable or predictor, thus estimating its contribution to explaining temporal changes in the responses as a fixed effect. Individual factors such as age, gender and education were used as covariates in all of the estimation models. Socio-emotional factors were also included as covariates in all the regression models: Emotional/behavioural reactiveness during the confinement (dichotomous categorical factor: *Yes* and *No*), social accompaniment (categorical factor with categories *Mostly alone*, *Accompanied sometimes* and *Mostly accompanied*), frequency of family contact (levels *No contact*, *Every 15 days or monthly*, *Weekly* and *Daily*). Information concerning the presence of COVID-19 cases in the centres was also considered in the predictive models. All models included random effects for intercepts and heteroskedasticity due to the centres by default. Separate models were constructed for each outcome variable using LMMs and assuming a Gaussian response. A general procedure was used to model the relationship between responses and predictors: first, a null model including only the intercept was constructed (model 1); Fixed factors and Evalution time predictors and their interaction were then gradually added in two subsequent models (2 and 3). Several goodness of fit indexes were used (e.g. Akaike's Information Criterion -AIC-; Bayesian information criterion -BIC-) for selection of the

best LMMs and of the best candidate subset of predictors. Models with lowest AIC/BIC values were considered best. The general criteria for model selection were established following Fox (2016).

All descriptive analyses and the LMMs estimation were carried out in the R environment (version 4.1.2) (R-Core Team, 2021) with the nlme (version 3.1-152) (Pinheiro et al., 2021) and emmeans packages (version 1.6.1) (Length, 2021).

Results

Descriptive analysis

Most of the participants suffered significant mobility restrictions and spent the lockdown period confined to their rooms and / or next-door but were accompanied most of the time (Table 1). Significant changes in group organization were observed in Centre 1, where the frequency of therapeutic activities was reduced, while in the other LTCFs it was maintained or even increased. Preventive measures to avoid social isolation (i.e. frequent videocalls or phone calls) and increased efforts to maintain or even increase therapeutic routines were implemented in LTCCs. Thus, most of the participants had the opportunity to maintain social contact with their family or friends outside the facility and to continue therapies with a frequency similar to that in the pre-pandemic period. Emotional or behavioural alterations were observed as a reaction to the pandemic situation in around 10-15% of the participants, except in Centre 2, where these reactions were reported in only approximately 4% of the participants even though the number of infections was highest in this centre.

INSERT TABLE 1 ABOUT HERE

Descriptive values for psychological and functional measures across the two pre- and the post-lockdown measurements are shown in Table 2.

INSERT TABLE 2 ABOUT HERE

Longitudinal change in psychological and functional measures was tested using LMMs in order to analyze covariates (i.e. Age, Gender, Education, Infection, observable emotional/behavioral reactiveness, Social accompaniment, Frequency of family contact) association with the slope across the two pre-lockdown (Pre1, Pre2) and post-lockdown (Post) measurements.

Longitudinal changes in measures of cognition and depressive symptomatology

Estimated LMMs for MMSE showed that the best-fit model included Evaluation time and the random effects for the intercepts (see Table 3).

The significant effect of the Evaluation time factor [$\chi^2(2) = 52.35$; $p < .001$] indicated a significant change over time (Pre1, Pre2 and Post). The MMSE score was significantly higher in the first and second pre-lockdown measurements than in the post-lockdown measurement (slightly higher than 2 points and 1 point respectively) (see Figure 1). However, estimated marginal means indicated that the change in MMSE scores was higher for the Pre1 and Pre2 comparison (mean difference = -1.18; $SE = .27$; $p < .001$) than for the Pre2 and Post comparison (mean difference = -0.90; $SE = .27$; $p < .001$). MMSE scores were also successfully predicted by the covariates Age [$\chi^2(1) = 9.01$; $p = .003$], Gender [$\chi^2(1) = 4.90$; $p = .03$], Frequency of family contact [$\chi^2(3) = 8.73$; $p = .033$] and Education [$\chi^2(2) = 24.94$; $p < .001$] (see Table 3). Thus, for each year of increase in age, the MMSE score decreased by .16; men scored almost 2 points higher than women, and primary or higher educational levels predicted respectively almost 4 and 6 points higher than the elementary level. Frequency of social contact outside the facility also was associated with MMSE scores, and daily and weekly frequency predicted scores almost 3 and 4 points higher respectively than in participants without social contact. No significant interaction was observed between the covariates and the Evalution time factor.

INSERT TABLE 3 ABOUT HERE

LMMs for GDS scores, assuming Gaussian response, yielded a final model that did not include the Evaluation time factor (see Table 3) as a predictor, and therefore, the total GDS score remained stable throughout the longitudinal measurements.

GDS scores were positively associated with Infections [$\chi^2(1) = 4.23$; $p = .039$], and observable emotional/behavioural reactiveness [$\chi^2(2) = 35.13$; $p < .001$]. Therefore, the surviving participants infected with the Sars-Cov-2 virus showed a slightly significant increase (more than ½ point) in the GDS scale relative to those who were not infected (see Table 3). Similarly, those who did not show observable emotional / behavioural reactivity scored almost three points lower in the total GDS score than those who externalized some type of emotional / behavioural response.

INSERT FIGURE 1 ABOUT HERE

Longitudinal changes in measures of functionality

Longitudinal changes in BI and Tinetti's scale were also tested using LMMs to analyze the slope changes across the first and second pre- and the post-lockdown evaluations and the involvement of the covariates. All participants were considered in the analysis of functionality outcomes.

Regarding the BI, LMMs showed that the best-fit model was that including the Evaluation time as well as random effects for the intercepts; the latter indicates the importance of taking into account initial individual differences as an important source of variability (see Table 3).

The significant effect of the Evaluation time factor [$\chi^2(2) = 34.71$; $p < .001$] indicated a change in the BI throughout the three measurement times, being significantly higher in the first and second pre-lockdown than in the post-lockdown evaluation (more than 5 and 1 points, respectively) (see Table 3). However, estimated marginal means showed

that the change in BI was higher for the comparison of Pre1 and Pre2 measurements (mean difference = -3.80; *SE* = .60; $p < .001$) than for the comparison of Post and Pre2 measurements (mean difference = -1.30; *SE* = .60; $p = .008$) (Chart A in Figure 2).

The BI was also successfully predicted by the covariates Age [$\chi^2(1) = 11.90$; $p < .001$], Gender [$\chi^2(1) = 12.45$; $p < .001$] and social accompaniment [$\chi^2(2) = 9.11$; $p = .011$]. Thus, for each additional year of age, the BI decreased by slightly more than ½ point; men scored almost 12 points higher than women, people who were mostly accompanied scored on average more than 8 points higher than those who were mostly alone (see Table 3). No significant interaction was observed between the covariates and the measurement time factor.

INSERT FIGURE 2 ABOUT HERE

Finally, the best fitting LMMs for the Tinetti scale included the Evaluation time as well as random effects for the intercepts (see Table 3).

The significant effect of the Evaluation time factor [$\chi^2(2) = 60.83$; $p < .001$] indicated a change in the Tinetti total score throughout the evaluation times, which was significantly higher in the first and second pre-confinement measurements than in the post-confinement measurement (by more than 2 and 1 points, respectively).

Estimated marginal means indicated that change in the Tinetti's scale scores was higher for the comparison of Post and Pre2 measurements (mean difference = -1.36; *SE* = 0.24; $p < .001$) than for the comparison of Pre1 and Pre2 measurements (mean difference = -0.71; *SE* = 0.24; $p = .01$) (see Chart B in Figure 2).

The Tinetti total score was also successfully predicted by the covariates Age [$\chi^2(1) = 8.57$; $p = .003$], Gender [$\chi^2(1) = 9.68$; $p = .002$] and Social accompaniment [$\chi^2(2) = 23.28$; $p < .001$]. Thus, for each additional year of age, the Tinetti score decreased by slightly more than 1/10 point; men scored 3 points higher than women, and participants

who spent the lockdown period mostly accompanied scored almost 6 points higher on the Tinetti scale (see Table 3). No significant interaction was observed between the covariates and the Evaluation time factor and therefore longitudinal slope change were constant despite the covariates.

Discussion

Longitudinal changes in psychological (cognition and depressive symptomatology) and functional measures were tested in four LTCFs where similar restrictions were implemented in accordance with the recommendations of health authorities (Yen et al., 2020; Brown et al., 2020). Contrary to expectations (Simard & Volicer, 2020), a low prevalence of emotional or behavioural reactions was observed, even in the centre with the highest infection rate. It should be noted that the unsystematic observations of psychological and behavioural symptoms recorded in this study are consistent with the lower level of quality evidence in the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) system (Jaeschke et al., 2008).

Contrary to expectations, we found no evidence for worsening of the pre-pandemic decline in cognitive (MMSE), affective (GDS) or self-reported functional (BI) measures associated with lockdown restrictions in the COVID-19 pandemic. Our findings are consistent with those suggesting higher resilience and less psychological distress associated with these restrictions in community dwelling older adults (Lebrasseur et al., 2021; Rodriguez-González et al., 2020; Odriozola-González et al., 2020; Ozamiz-Etxebarria et al., 2020; Özdin & Bayrak Özdin, 2020; Planchuelo-Gómez et al., 2020; Wang et al., 2020). The exclusion of older adults with moderate and severe cognitive impairment from the analyzes of change in cognitive and affective status, as well as the low rates of infection or the measures to reinforce activity and communication

implemented in the LTCF considered, could also be partly responsible for these results (Lob et al., 2022; Sepúlveda-Loyola et al., 2020; Suárez-González et al., 2021). However, the model that includes the post-lockdown measurement for the Tinetti scale scores explaining the level of performance in motor skills and balance showed a worsening in decline of these measures. Therefore, it appears that the resilience of older adults cannot mask the negative effect of restrictions on functionality when actual performance on global mobility skills is assessed, in line with evidence available on the possible discrepancies between self-reported and performance-based measures of functionality (Coman & Richardson, 2006). This finding is consistent with those reported in several studies carried out in older adults living in the community which indicate loss of functionality as the aspect of health most affected by the restrictions associated with lockdown due to the COVID-19 pandemic (Amanzio et al., 2020; Suárez-González et al., 2021). The exclusion of participants with severe cognitive impairment does not allow us to corroborate the previously observed impact of lockdown in this group (Suárez-González et al., 2021).

Regarding the role of sociodemographic characteristics and particularities of the restrictions in the predictive models, none of these influenced longitudinal change, although some of them established significant associations with the measures of cognition (i.e. age, gender, education and frequency of family contact), depression (i.e. infection, emotional and behavioural reactiveness), and self-reported (i.e. age, gender and social accompaniment) and performance-based (i.e. age, gender and social accompaniment) functionality. Thus, as has been consistently observed, increasing age was negatively associated with cognitive (Verhaeghen & Salthouse, 1997) and functional status (Millán-Calenti et al., 2010). We did not find any significant

association between age and affective status, probably due to the decrease in measurement fluctuations associated with the low age range of the sample.

Similarly, we found that female gender was associated with poorer cognition consistent with an increased risk of dementia and cognitive decline (Gao et al., 1998) and both self-reported and performance-based functional measures according to a higher prevalence of physical limitations (Zunzunegui et al., 2015).

Consistent with meta-analytical data showing the association between social isolation and negative health outcomes (Kuiper et al., 2015; Valtorta el at., 2016; Holt-Lunstad et al., 2016), we found significant associations between cognitive and both self-reported and performance-based functional measures and social contact variables.

Finally, in accordance with the higher mental health risk reported for those older people who suffered COVID-19 infection (Lob et al., 2022), we also observed a significant association between depressive symptomatology and greater emotional or behavioural reactivity and having been infected.

Our study has some weaknesses that indicate caution should be made in interpreting the results. Selection of the LTCF for this study was incidental and, although all the centres were legally obliged to implement the same restrictions aimed at preventing infections, our sample is not representative. Measures of depressive symptomatology and cognition were not suitable for older adults with moderate and severe cognitive impairment, and therefore these participants were excluded from analysis of these domains The effect of restrictions on the cognitive and affective status of older adults with moderate and severe cognitive impairment living in LTCF should be considered in future studies.

Conclusions and implications

No specific impact of restrictions on older adults living in LTCF was found in cognitive or affective measures. Although longitudinal decline in cognitive and functional

measures was observed, there was no significant worsening in the trend associated with the restrictive measures due to the COVID-19 pandemic. The effect of restrictions on functionality was only supported by the Tinetti scale, but not by the Barthel Index. Therefore, the functionality evaluated by performance-based measures seems to be more sensitive to the possible effects of the restrictions than the self-reported measures. Although the sociodemographic variables (i.e. age, gender, education) and specific conditions in which the restrictions were experienced (frequency of contacts, accompaniment) were associated with the cognitive and functional variables, none of these significantly affected the longitudinal change related to the restrictions. Being infected and observable emotional or behavioural reactions were associated with increased depressive symptomatology, but not with post-restraint mood.

Social restrictions do not appear to negatively affect older adults universally. Therefore, at least older adults with better cognitive status did not appear to experience a decline in their cognitive and affective status after implementing social restraint measures in their LTCF. Functionality would be negatively affected when older adults are considered regardless of their cognitive status, but only on performance-based measures. Consequently, a preferential use of performance-based functional tests, a reinforcement of physical activity and a special compensatory social intervention for older adults with cognitive impairment should be established in LTCF in future pandemic contexts.

Our results highlight the importance of having data from pre-lockdown evaluations in order to be able to interpret the longitudinal trends before the pandemic and compare them with those observed after the restrictions were implemented. Furthermore, our results highlight the importance of complementing self-reported functionality measures with performance-based measures.

Acknowledgements

This work was financially supported with FEDER founds (‘A way to make Europe’) by the Spanish AEI (Doi: 10.13039/501100011033; Refs. PID2020-114521RB-C21 and PSI2017-89389-C2-1-R) and by the Galician Government (Consellería de Cultura, Educación e Ordenación Universitaria; axudas para a consolidación e estruturación de unidades de investigación competitivas do Sistema Universitario de Galicia ED431C 2021/04; GI-1807-USC: Ref. 2021-PG011).

Disclosure/Conflict of interest

The Authors have nothing to declare.

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Tables and figures

Table 1. Description of sociodemographic and restriction characteristics in the four LTCFs

	Centre 1	Centre 2	Centre 3	Centre 4
Age (M, SD)	83.52 (9.66)	84.80 (7.37)	84.02 (7.07)	80.96 (8.29)
Gender (% Women)	59.03	66.00	69.4	41.3
Educational level (%)	Basic literacy: 46.3 Primary school: 37.0 High school/Univ: 16.7	Basic literacy: 96.0 High school/Univ: 4.0	Basic literacy: 12.9 Primary school: 74.2 High school/Univ: 12.9	Basic literacy: 50.0 Primary school: 28.3 High school/Univ: 21.7
Professional category (%)	Housework: 42.6 Unskilled: 22.2 Skilled: 20.9	Housework: 62.0 Unskilled: 36.0 Skilled: 2.0	Housework: 22.6 Unskilled: 66.1 Skilled: 8.1	Housework: 4.3 Unskilled: 39.1 Skilled: 56.5
Restrictions (days)	99	125	82	104
Infection rate (%)	0%	34.14%	2.08%	0%
Observed emotional/behavioural reaction *Yes*	11.22%	3.65%	10.41%	14.60%
Location (%): *Room* *Room and next-door instances* *Floor* *Whole building*	 15.30 80.61 3.06 1.02	 100 -- -- --	 100 -- -- --	 42.04 57.95 -- --
Social accompaniment (%): *Alone* *Occasionally accompanied* *Accompanied most of the time*	 13.26 7.14 79.59	 -- -- 100	 -- -- 100	 23.59 -- 76.40
Between-group mobility (%): *Isolated* *Yes* *No*	 6.12 87.75 6.12	 -- -- 100	 -- 7.29 92.70	 -- 10.11 89.88
Change in therapeutic routines (%): *Cancelled* *Lower frequency* *Same or higher frequency*	 9.18 85.71 5.10	 -- 31.70 68.29	 -- 23.95 76.04	 -- 37.07 62.92
Frequency family contact (%): *No contact* *Biweekly-monthly* *Weekly* *Daily*	 29.59 13.26 44.89 12.24	 8.53 91.46 -- --	 31.25 34.37 20.83 13.54	 32.58 25.84 11.23 30.33
Modality family contact (%): *No contact* *Telephone* *Videocall*	 29.59 42.85 27.55	 8.53 -- 91.46	 31.25 30.52 37.89	 32.58 25.84 41.57

Table 2. Descriptive values for psychological (i.e. MMSE, GDS) and functional (Barthel, Tinetti) measures across the two pre- and the post-lockdown evaluation times

	First pre-lockdown (*M*, *SD*)	Second pre- lockdown (*M*, *SD*)	Post-lockdown (*M*, *SD*)
MMSE	23.57 (6.61)	22.32 (7.66)	21.14 (7.94)
GDS	2.80 (3.03)	2.69 (3.18)	3.18 (3.24)
Barthel	57.20 (30.81)	52.12 (30.63)	51.30 (31.23)
Tinetti	15.88 (9.54)	15.39 (9.56)	14.04 (9.63)

Table 3. Summary of predictive model for psychological (i.e. MMSE, GDS) and functional (BI, Tinetti) measures

	MMSE	GDS	Barthel	Tinetti
Intercept	31.34(4.80)***	5.16(0.45)***	93.89(16.58)***	21.96(5.00)***
Age	-0.16(0.053)**		-0.65(0.19)***	-0.17(0.057)**
Gender (reference: women)	1.95(0.88)*		11.61(3.29)***	3.09(0.99)**
Infection (reference: no-infection)	2.32(1.30)	-0.61(0.30)*	-2.09(3.54)	
Observed emotional/behavioural reaction (reference: Yes)		-2.79(0.47)***	-10.49(5.03)	-2.34(1.54)
Time factor (comparison reference: post-lockdown)				
Pre1-measurement time	2.43(0.36)***		5.58(0.97)***	2.04(0.29)***
Pre2-measurement time	1.22(0.39)**		1.17(0.55)*	1.36(0.21)***
Education (reference: literacy)				
Primary school education	3.82(1.05)***			
High school/University education	6.15(1.36)***			
Social accompaniment (reference: alone)				
Occasionally accompanied			-21.77 (12.29)	-5.22 (3.44)
Accompanied most of the time	-2.77(1.42)		8.38(5.39)	5.66(1.66)***
Frequency of family contact (reference: No contact)				
Biweekly/monthly	1.29(1.33)			
Weekly	2.91(1.36)*			
Daily	4.44(1.68)**			
Model fit				
Observations	629	629	1138	1140
Log Likelihood	-1878.92	-1330.68	-4820.34	-3620.90
Akaike Inf. Crit.	3797.84	2679.36	9674.78	7281.80
Bayesian Inf. Crit.	3886.34	2719.30	9760.17	7382.43

*p<0.05; **p<0.01; ***p<0.001

Note: All models include random effects for intercepts, heteroscedasticity due to centre-related and socio-emotional factors such as covariates (age, gender, education, COVID cases in the centre, observable emotional/behavioural reactiveness, and social accompaniment).

Figure 1. Estimated marginal means and error bars (±2SE) for the best fit model predicting MMSE total score across the three evaluation times.

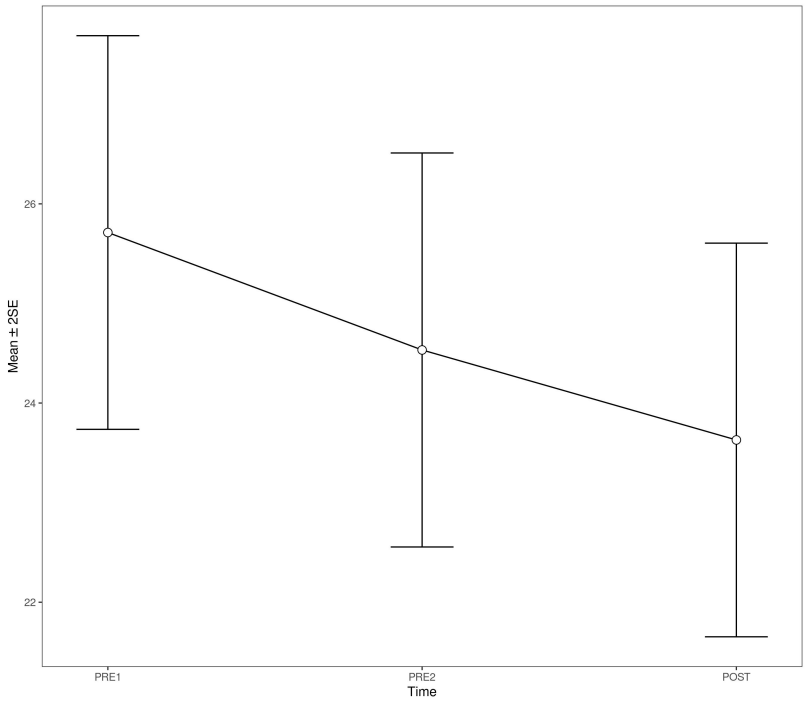


Figure 2. Estimated marginal means and errors bars (±2SE) for best fit model predicting Barthel Index (Chart A) and Tinetti (Chart B) total scores across the three evaluation times.

Chart A

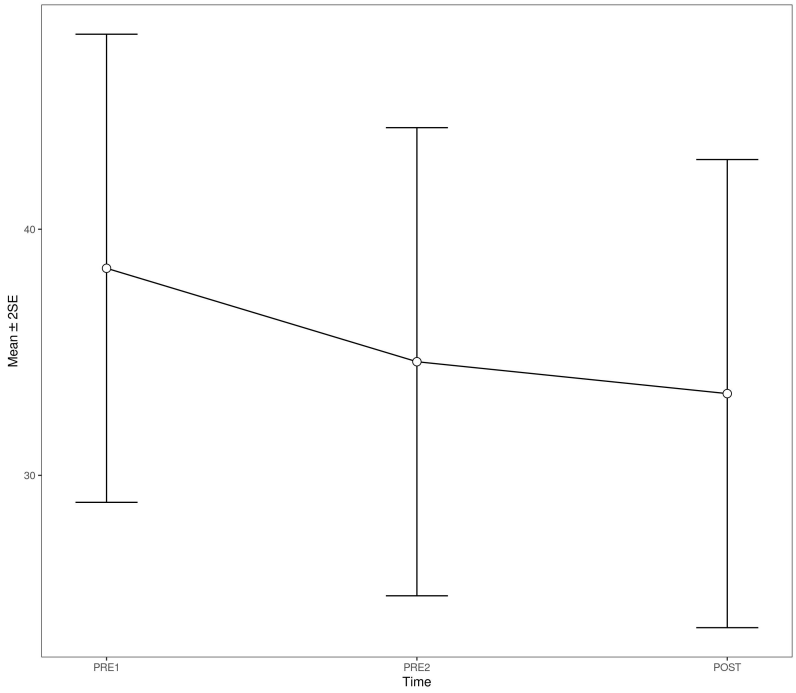
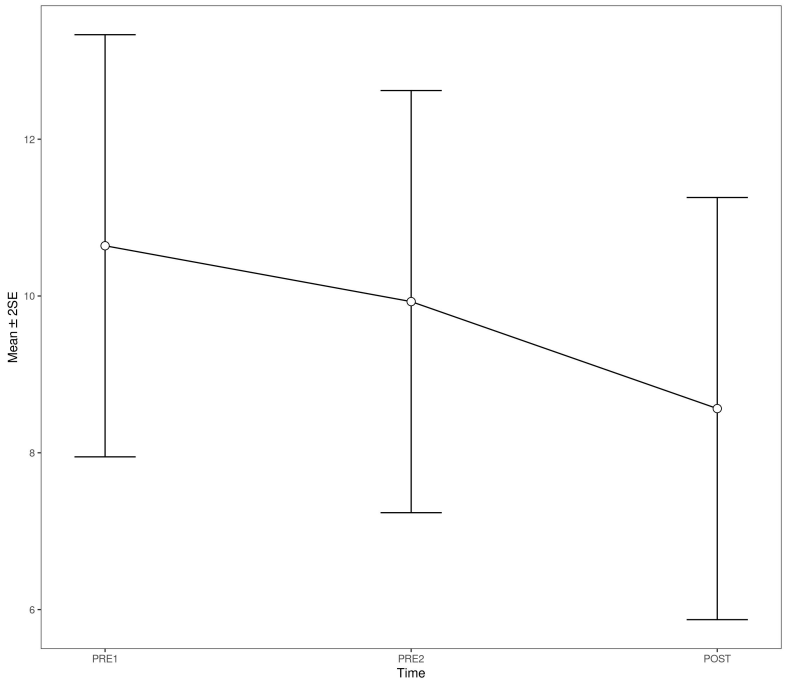


Chart B


12
10
8
6
Mean ± 2SE
PRE1
PRE2
POST
Time