Improvements and perception following a physical-exercise intervention specific for chronic/palliative older adults

Mejoras y valoración tras un programa de ejercicio específico para adultos mayores crónicos/paliativos

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Abstract

After analysing the impact of a cognitively oriented multicomponent home-based exercise training program on independence, perceived health status, and lower limb strength in a group of multimorbid and/or palliative older patients (MPO-P), we studied the associations between improvements following training and the participants and health personnel's opinion of the program. 13 MPO-P, (80.15+4.20 years) completed four months of training progressing in autonomy (from two supervised sessions and one autonomous weekly -60min session-, to two autonomous and one supervised). This was followed by four autonomous (detraining) weeks with a recommendation to continue the exercises. Volume and intensity were increased by introducing more global exercises, with a greater neuromuscular load and double tasks, and a shorter resting interval. No exercise was repeated during the session (EFAM-UV©). Independence (Barthel) and perceived health (physical SF-36, with no changes in the mental domain), were improved after supervised training, with a tendency to improve in strength (sitting and standing for 30-s) and perceived health (total SF-36). This effect was maintained after the autonomous detraining phase, with a very favourable final perception by both patients and health personnel, as indicated in questionnaires. The gain in independence correlated negatively with the users' perception, but this requirement ensured the improvement. There was no association between perceived health and the evaluation of the program.

Keywords: Autonomy, detraining, health perception, multi-component training, strength.

Resumen

Tras analizar el impacto de un programa de entrenamiento domiciliario multicomponente, con orientación cognitiva, sobre independencia, percepción subjetiva de salud, y fuerza del miembro inferior en un grupo de adultos mayores crónicos multimórbidos y/o paliativos (MCM-Ps), se estudiaron las asociaciones entre las mejoras obtenidas y la valoración del programa de participantes y personal sanitario. 13 MCM-Ps (80.15+4.20 años) completaron cuatro meses de entrenamiento progresando en autonomía (de dos sesiones supervisadas y una autónoma semanalmente -60 min/sesión-, a dos autónomas y una supervisada). Le siguieron cuatro semanas autónomas (desentrenamiento) con recomendación de ejercicio. El volumen y la intensidad se aumentaron introduciendo más ejercicios integrales, con mayor carga neuromuscular y doble tarea, y menor tiempo de descanso entre ellos, sin repetirlos en la sesión (EFAM-UV©). Independencia (Barthel) y salud percibida (SF-36 físico, sin cambios en dominio mental) mejoraron tras el entrenamiento supervisado, con tendencia a la mejora de fuerza (sentarse y levantarse 30-s) y la salud percibida (SF-36total). El efecto permaneció tras la fase autónoma/desentrenamiento, con una percepción final muy favorable de pacientes y personal sanitario-determinada mediante cuestionarios-. La ganancia en independencia correlacionó negativamente con la valoración del usuario, pero esta exigencia aseguró su mejora. No hubo asociación entre salud percibida y valoración del programa.

Palabras clave: Entrenamiento multicomponente, desentrenamiento, percepción de salud, autonomía, fuerza.

Introduction

Scientific evidence has revealed that isolation and lack of exercise lead to weakness and dependence (Roppolo et al., 2015). After an adverse event, a prolonged period of involuntary isolation or certain chronic illnesses the risk of becoming completely fragile rises steeply (Ong et al., 2016; Pilotto et al., 2020). Although we do not generally expect to find extreme fragility in those under 85 (Clark, 2019), the presence of one or more of these factors (including lack of exercise, a sedentary lifestyle, hyper-medication or frequent hospital admissions) can aggravate declining health and explain the ever increasing number of people who reach this state. These premature symptoms are associated with those of advanced age, with a high degree of fragility and dependence, comorbidity and the risk of death. We also find in this group an increased number of the so-called palliative patients.

In the last 20 years, physical exercise has been shown to improve people of all ages, regardless of their mobility levels and illnesses suffered (Bull et al., 2020), and the evidence has also mounted of its benefits for pre-fragile and fragile persons (Kidd et al., 2019; Rebelo-Marques et al., 2018). Demanding, high-volume and high-intensity exercises also seem to be most effective for increasing strength and muscle mass in fragile persons (Beckwée et al., 2019). Sessions combining flexibility, aerobics and physical effort have been shown to improve the physical condition, cognitive performance, quality of life (QoL) and functionality in those who are both elderly and fragile (Langlois et al., 2013; Rezaei-Shahsavarloo et al., 2020). In fact, interventions based on multi-component training (e.g., Mobility, strength and balance combined with cardiovascular and breathing exercises) are becoming increasingly recognized, thanks to their capacity for improving both physical and mental/cognitive abilities (Beckwée et al., 2019; Bray et al., 2020; Matos Duarte & Berlanga, 2020; Pardo et al., 2021; Poyatos & Orenes, 2018).

Physical exercise and a training program can thus be seen as a type of medicine for the fragile (Nagai et al., 2018), those in their eighties, even 100-year-olds (Miller et al., 2020) and people in bad health or with reduced mobility (Laddu et al., 2021). Physical training at home is therefore now recommended to promote or facilitate the practice of physical exercise by the aged and fragile unable to go outside their homes, those who are institutionalised (Thomas et al., 2019), or who live in environments without the proper conditions for the practice of physical activity (Annear et al., 2014). The advantages of this type of program include the ability to adapt the sessions to individual needs and they show promising results in those who have recently suffered falls (Hill et al., 2015; Liu-Ambrose et al., 2019). They have also been found to reduce anxiety and stress levels, improve mental health, reduce dyspnea and incapacity, with the associated benefit of a better quality of life (Loh et al., 2019). These home training sessions are usually based on working with single individuals with a single objective (e.g. to improve their strength, balance or aerobics) (Liu-Ambrose et al., 2019).

In this context, in spite of the evidence that supports the use of multi-component training programs, these programs have a more holistic vision of improving the elderly's QoL, although as far as we know home interventions for chronic or palliative patients have not been multi-component, nor have they included a cognitive and entertaining orientation to maintain physical condition by improving both neuromuscular and cardiovascular factors far removed from the aim of rehabilitation. The challenge of carrying out these programs and treatments while guaranteeing the participants' safety is also considered. The Home Hospitalisation Unit (HHU), responsible for chronic and/or palliative patients, is thus seen as the best medicalised unit to supervise these multi-component programs and help to get over two of the main barriers to their exercising: the difficulty they have to get around and a fear of a lack of control (Rodrigues et al., 2017).

Home-based training programs make up an alternative to the fragility-dependence binomial and give them a multi-component orientation that also focuses on the cognitive and game aspects to motivate chronic elderly patients with multiple pathologies to exercise. However, few studies have been published in this topic and neither have the subjects' opinions on this strategy been taken into account. Also, since informing the users on improvements to their physical and mental health has recently been shown to give them an incentive to exercise (Hager et al., 2019; Rodrigues et al., 2017), including participants' opinion and appraisals in these programs can help to strengthen their effects and imbue a perception of their necessity in both the medical staff and users.

In order to achieve results for the successful application of home training programs for the elderly chronic/palliative patients, the present study had several objectives: 1) to determine the effects of multi-component training with important effects on their cognitive faculties as regards their QoL, independence and lower limb strength; 2) evaluate their degree of satisfaction and perception of the need for such exercises in both clinical staff and patients; and 3) determine the relationship between this perception and the possible benefits of the intervention.

Our main initial hypothesis was that both staff and patients should positively value this strategy to achieve health improvements.

Material and Methods

Participants

The pilot study was on 13 elderly chronic multimorbid and/or palliative patients (MPO-P) either admitted to or discharged from the Home Hospitalisation Unit (HHU) of the Alicante General Hospital. After medical approval and derivation, the patients were gradually admitted to the training program. After informing them and their families on the characteristics of the study, those who decided to join the training program signed written consent forms.

All the patients who complied with the following criteria were included: medical approval to participate, included in the HHU program, over 65 and available for the entire training period. Those excluded were the ones who did not match these criteria, or who were taking part in another physical training or rehabilitation program, those suffering a cognitive impairment that disabled them from taking part, or who could not complete the entire program and/or the periodical tests.

Participation was entirely voluntary, and the subjects were free to abandon the intervention at any time with no negative repercussions. The study was given the previous approval of Valencia University's Ethical Committee (H14014428868708), in accordance with the Declaration of Helsinki.

Training Program

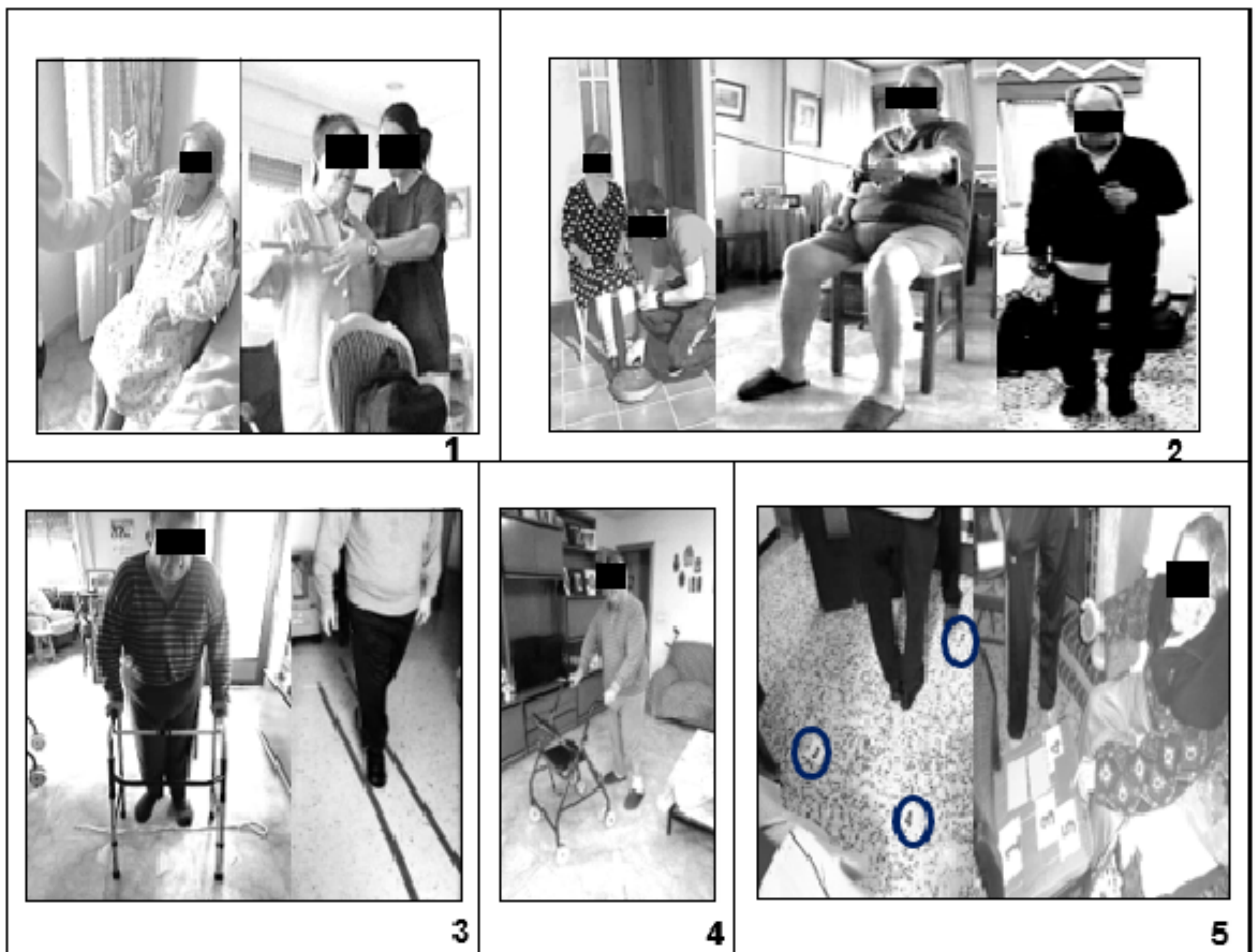
The training program was divided into phases according to the EFAM-UV© recommendations (Blasco-Lafarga et al., 2020; Blasco-Lafarga et al., 2016), adapted to the hospital context and the participants' characteristics (Blasco-Lafarga et al., 2019; Blasco-Lafarga et al., 2021; Sanchis-Soler et al., 2021). It was opted to include indirect training of participants and carers to foment autonomy and the practice of physical exercise, so that training autonomy was introduced gradually by combining supervised and autonomous sessions. Three evaluations were carried out during the 4-month intervention (Ev.: preliminary; Ev.: after 36 sessions, 24 supervised and 12 autonomous; Ev.: after 12 sessions, 4 supervised and 8 autonomous), followed by an evaluation after one month of complete autonomy or detraining (Ev.).

In accordance with the EFAM-UV© Method (Blasco-Lafarga et al., 2020; Monteagudo et al., 2020), the 4 months' training were divided into three mesocycles (M): M1-Introductory o Familiarisation, M2-Neuromuscular & Cognitive Development, and M3-Neuromuscular Stabilisation & Improvement of Motor Plasticity. Two transition microcyles were introduced in each mesocycle for patients that required reinforcement of the goals set for the mesocycle.

The training sessions had a general cognitive neuromotor functional objective (see Figure 1), for which gait and postural re-education tasks – the central core of the session – were combined with manipulative and cognitive skills. The demands of strength and motor control – balance and coordination – were gradually increased since the subjects were very weak and lacking in physical abilities. The cardiovascular demands were increased when they showed a certain amount of mastery of the task.

Following the EFAM-UV© method, based on dual-tasking and unilateral proposals, the sessions gradually became more demanding by increasing the Volume, Intensity and Complexity. For the first of these, the volume was increased by 2 or 3 reps before the introduction of harder loads / new proposals, aiming to do between 6 to 10 intense reps; new exercises were then introduced while the recovery times were slowly reduced as far as possible. For the second and third, respectively, the duration of joint contraction and/or amplitude was increased in work with dumbbells and elastic bands, together with stamina in assisted/resisted exercises and cognitive-coordinative complexity. Shortening the rest times made the sessions more dense and thus more intense.

As can be seen in Figure 1, the postural control requirement was used as the variable to modify and/or increase the neuromuscular demands. The strengthening tasks were begun in a sitting position and progressed from bilateral support to tandem and semi-tandem positions also while sitting. The exercise was then repeated in a dynamic position for the subjects who were able to do so. The exercises were not generally repeated in a single session but were modified to involve the muscle groups selected in different patterns. The work was progressively intensified in the three mesocycles, passing from neuromuscular exercises (large muscle groups; motor coordination, joint, amplitude and balance) to cognitively more demanding tasks in the final part of the program (taking decisions, associating or remembering while moving). In short, the EFAM method is based on the progressive involvement of different muscle groups in increasingly complex situations (see Blasco-Lafarga et al. (2021) for further details.



1. Mobility, joint flexion and coordination: daily selection of a muscle group following different patterns to vary joint and neuromuscular involvement

2. Strength: increased loads with dumbbells and elastic bands. Priority to asymmetric work to improve balance and Core work, including waist and shoulders as movement nuclei. Exercise speed and repetitions according to loads and cognitive complexity. Evolution of positions: supported sitting, unsupported sitting with feet parallel, sitting with feet together (no capacity for one-footed exercises).

3. Balanced steps and postural control: bands, marks and ropes combining step education and posture control involving maximum re-balance and cognitive work within subject's capacity with no loss of movement. Adaptation of available home space.

4. Cardiovascular: Increased exercise speeds and times to improve cardiovascular capacity according to individual capacity.

5. Double tasks: Greater task motor complexity combined with association, identification, memory or calculation activities, as appropriate.

Figure 1. Characteristics of tasks carried out

Sessions were controlled daily by monitoring blood pressure, oxygen saturation and subjective pain perception after each block of exercises (EVA scale) and fatigue (modified 1-10 Borg scale) with at least 3 registers of each variable per session. The exercises were intensified to stay within the subjects' individual capacities or safety ranges to allow the trainer to adapt the daily sessions to safely increase the effort required.

To conclude, the patients' needs, habits and hobbies were also considered (e.g. board games, cards and other pastimes) in the design of the session, which also included cognitive and fine psychomotor tasks to maintain stimulation throughout the 60 m.

Instruments

To determine the participants' characteristics, and health status, information was collected on their sociodemographic and general health conditions, including: oxygen saturation (SO.) by a WristOx. pulse oximeter (Model 3150, Nonin Medical, Inc., Amsterdam, The Netherlands), blood pressure by an automatic OMRON M3 (IM-HEM-7131-E) tensiometer (Omron Healthcare Co., Ltd. Binh Duong, Vietnam), blood sugar by an Accu-Chek Aviva monitor. Roche Diabetes Care Spain, S.L., Sant Cugat del Vallès, Barcelona), and body mass index by a Tanita model BC 545 N body impedance scale (TANITA Corporation, Amsterdam, The Netherlands), while cognitive capacity was measured by Mini-Mental State Examination (MMSE) in the initial evaluation.

The pre-post assessment included evaluating the degree of independence in everyday activities by means of the Spanish version of the Barthel Index (Cid-Ruzafa & Damián-Moreno, 1997). This scale analyses the degree of independence (help and time required) in 10 activities (maximum score 100 points), using the criteria proposed by Shah et al. (1989): from 0 to 20 points - complete dependence, 21 to 60 - severe dependence, 61 to 90 - moderate dependence, and 91 to 99 - little dependence.

The health-related QoL was evaluated by Questionnaire SF-36, which determines a person's level of physical, mental and overall welfare. We used the Spanish version adapted by Alonso (1995), with a 4-week recall period. The questionnaire contains 36 items and can evaluate health and perceived QoL on 8 scales (Physical Function, Physical role, Body pain, General Health, Vitality, Social Function, Emotional state and Mental health) grouped into 3 categories (perception of mental health (SF_36m), perception of physical health (SF-36f) (Zeggwagh et al., 2020) and total health perception (SF-36t). The possible scores range between 0 and 100 (Vilagut et al., 2005).

The 30-s Chair Stand Test (30s-CST) was used to check lower-limb strength, as proposed by Rikli and Jones 30-s (1999). This was selected since most of the participants could not stand up from the chair more than 3 times, and variants such as the time taken to stand up and sit down 5 times would hardly reflect any improvement following the intervention.

Finally, we compiled special questionnaires for patients and clinical staff to give their opinion and/or assessment of the physical exercise intervention. The one for the patients covered their degree of satisfaction and perceived need for training program. It was composed of 13 questions with 4 possible answers on a Likert scale (0 = never, 1 = seldom, 2 = sometimes, 3 = almost always and 4 = always). The clinical staff awarded points to the program in their questionnaire on a scale of 0-10, answering 12 closed questions, also on a scale Likert scale (0 = never, 1 = seldom, 2 =sometimes, 3 = almost always and 4 = always) plus 2 open questions. This questionnaire provided the clinical staff's opinions on the training program and also on the opinions expressed to them by the patients.

The sessions were monitored and guided by a WristOx2 Model 3150 pulse oximeter and an automatic OMROM M3 tensiometer (IM-HEM-7131-E), which were periodically used to monitor the patients' progress and safety levels during the intervention. This control was additionally supported by information from the perceived effort score (Borg 1-10) and the visual analogue pain scale (EVA) throughout the session.

Statistical analysis

The Statistical Package for the Social Sciences software (SPSS Version 26) was used for the statistical analysis. After checking the sample normality (Shapiro-Wilk n<30), to determine the changes brought about by the training a repeated measures analysis was performed followed by a Bonferroni test for (Ev_1-Ev_3), a Student's T-test for related samples (Ev_1-Ev_4) for QoL health-related perception, and a Friedman test followed by a Wilcoxon test for level of independence of the lower limb.

To collect the participants and clinical staff's perceptions, questionnaires were subjected to a descriptive or frequency analysis. In addition, to find the relationship between the participants rating and the changes generated by the intervention (Δ_{1-4}) on SF-36 and IB, a Pearson's bivariate correlation was carried out to determine the association with the SF-36 and a Spearman's correlation for IB.

Significance was set at $p < .05$, also considering the $p < .1$ tendencies due to the sample size (Rosner, 2015). The Cohen's D effect size was calculated for all the variables that underwent a significant change or a tendency to significance. The results were interpreted according to the ranges proposed by Fritz et al. (2012), considering 0.2 as small, 0.5 as medium and 0.8 as large.

Results

The final sample of the pilot study was composed of 13 patients with an average age of 80.15 years. As can be seen in Table 1, they were dependent elderly adults (84.62% needed a caregiver), with moderate desaturation and high levels of blood glucose. As regards body composition, the 8 participants that could be measured by bio-impedance had high IMC and a percentage of fat that indicated being overweight.

On assessing the effect of the training program on the level of independence (Table 2) significant improvements were found in all the outcomes in relation to the initial evaluation, with a medium effect size: v_{1-2} (p = .011; d = 0.47); Ev_{1-3} (p = .022; d = 0.45). Improved health related QoL was also found in the physical dimension (Table 2), with a trend to significance in the SF-36 total outcome (SF-36t). Specifically, the improvements in the SF-36f referred to Ev_{1-2} (p = .031; d = 0.84). In relation to the lower-limb strength, a significant tendency was only obtained in evaluations 2 and 3 with respect to the initial assessments: Ev_{1-2} (p = .058; d = 0.62); Ev_{1-3} (p = .085; d = 0.53).

Secondly, the 1-month post-training assessment (overall intervention assessment) showed that after the autonomous month, the significant improvements were maintained in spite of possible detraining. In fact, although not significantly, the results were better than those of the third evaluation in all variables except for IB. When compared to the start of the intervention, significant differences were obtained in IB (p = .045; d = 0.37), Sf3-6f (p = .003; d = 1.09) and SF-36t (p = .025; d = 0.72) (Table 2).

Table 1. Descriptives: mean, standard deviation, coeffi cient of variation

Variables	*M±DE*	*CV*
Age (years)	80.15 ± 4.20	5.24%
Sao_2 (%)	92.31 ± 5.99	6.49%
Glucose (mg/dl)	156.00 ± 77.77	49.85%
TAS (mmHg)	131.69 ± 13.20	10.02%
TAD (mmHg)	70.77 ± 9.91	14.00%
Weight (kg) (n=9)	70.98 ± 13.77	19.40%
Height (cm) (n=12)	154.25 ± 13.33	8.64%
BMI (n=8)	30.98 ± 5.08	16.40%
Muscle Mass (kg) (n=8)	40.40 ± 8.83	21.86%
Fat (kg) (n=8)	41.49 ± 7.59	18.29%
MMSE (30-0)	24.08 ± 3.77	15.66%
	Frequency	**Percentage**
Gender		
Male	6	46.15%
Female	7	53.85%
Education		
None	6	46.15%
Some	7	53.85%
Caregiver		
Relative	11	84.62%
Formal	1	7.69%
No carer	1	7.69%
Walking capacity		
Yes	9	69.23%
No	4	30.77%

M: mean ; SD:standard deviation ; CV: coe fficient of variation ; Sao 2: Oxygen saturation ; TAS. Systolic blood pressure ; TAD: Diastolic blood pressure ; BMI: Body mass index ; mmHg : mm of mercury ; kg: kilograms ; cm : centímetres ; MMSE: Mini-Mental State Examination.

High scores were obtained for the participants' satisfaction with the course (44 out of a possible 52), which indicates a very positive evaluation. Bearing in mind the total possible answers, for items 1, 2, 8, 11, 12 and 13, regarding satisfaction and perception of the need for this type of program, 78.20% of the total assessments were the maximum score (*"always"*). For the items related to the benefits of the program, (5, 6, 7, 9 and 10) 72.30% of the scores were *"always" or "almost always"* on the Likert scale.

In relation to the suitability of the program (items 3 and 4), 76.92% of the answers were again the maximum score. Table 3 gives details of the percentages assigned to each question by the participants. Table 4 gives details of the scores awarded by the clinical staff, considering their total answers to items 1, 2 and 12, (degree of satisfaction and overall score for the program and trainer), for which 80% of the answers were the maximum score.

Secondly, regarding the benefits to the patients (items 3, 4, 5 and 6), 65% of the answers were the maximum score and 25% were the second highest (*"almost always"*). Regarding the staff's perception of the patients' satisfaction (items 7, 8, 9, 10 y 11), 92% gave the training program the maximum score and the doctors and nurses in general gave it a mean score of 9.8 points out of 10. All of these indicated a need to include this type of interventions in the HHU service based on the different perceptions and commentaries offered by the patients. To emphasise: the improved perception of health related QoL; making the caregivers' burden lighter and the fact that they looked forward to being able to carry out their daily activities again.

The relationship was also analysed between the program evaluation and those variables with significantly positive changes throughout the intervention (Δ1-4IB and Δ1-4Sf-36). As can be seen in Table 5, the perception of the health related QoL did not have a significant correlation with the program rating. On the other hand, the change in the degree of independence did have a relationship with this rating, although negative.

Table 2. Effects of intervention

Phases	Supervised training (Ev_{1-3})				Autonomy (Ev_{1-4})
Weekly sessions	Ev_1	Ev_2 *2S+1A*	Ev_3 *1S+2A*	p_{1-3}	Ev_4
Barthel	32.69 ± 32.70	**48.08 ± 32.37[1]**	**46.15 ± 27.05[1]**	.026*	44.23 ± 30.13[1]
Sf-36m	36.54 ± 23.30	46.00 ± 26.05	44.38 ± 24.96	.216	44.92 ± 23.82
Sf-36f	20.38 ± 15.44	**34.54 ± 18.08[1]**	33.85 ± 22.32	.024*	39.31 ± 18.99[1]
Sf-36t	29.15 ± 19.09	41.77 ± 21.55	40.31 ± 22.69	.072†	43.54 ± 20.72[1]
30s-CST	2.15 ± 3.13	**3.54 ± 3.02[A]**	**3.15 ± 3.29[A]**	.109	3.19 ± 2.96

Ev1: Preliminary program evaluation ; Ev2: Evaluation after 36 training sessions (24 supervised and 12 autonomous); Ev3: Evaluation after 12 sessions (4 supervised and 8 autónomous); Ev4: Evaluation after 1 month of autonomy; p1-3: Friedman's test (IB and 30s_CST) and ANOVA (Sf_36). Sf_36m: Sf_36 mental; Sf_36f: Sf_36 physical; Sf_36t: Sf_36 total; 30s_CST: 30 s standing and sitting. *Significance p<.05; † tendency to significance p<.1. 1 significant differences vs. Initial evaluation (Ev1); A tendency to significance vs. Initial evaluation (Ev1).

Table 3. Frequencies (expressed as a percentage) of the evaluation of the patients' satisfaction questionnaire towards the training program (n = 13)

Question	Never	Seldom	Sometimes	Almost always	Always
1. In general I am satisfied with the exercise program carried out.			7.7%	7.7%	84.6%
2. I am happy with the treatment received.					100%
8. I looked forward to the sessions.	7.7%		7.7%	23.1%	61.5%
11. I think this type of program is important to improve my health.				23.1%	76.9%
12. I would recommend other elderly people to take part in the course.				7.7%	92.3%
13. I think these 4-5 months were enough to improve my physical condition.	15.4%		15.4%	15.4%	53.8%
5. I'm aware of an improvement in my physical condition.		7.7%	23.1%	38.5%	30.8%
6. My mood has improved.	7.7%	15.4%	15.4%	23.1%	38.5%
7. I find myself more alert and with a better mental capacity.		7.7%	30.8%	30.8%	30.8%
9. I feel better on the days when I have a training session.	7.7%		7.7%	30.8%	53.8%
10. I always feel better after physical exercise.			15.4%	38.5%	46.2%
3. The exercises were tailored to my capacity and possibilities.	7.7%			38.5%	53.8%
4. I had all the necessary material for my workouts, whether supervised or autonomous sessions.					100%

Table 4. Frequencies expressed as a percentage of the questionnaire on doctors and nurses' satisfaction with the training program (n = 5)

Question	Never	Seldom	S0metimes	Almost always	Always
1.Are you satisfied with the training program in general?					100%
2.Do you think the program achieves its goals?				20%	80%
12.In spite of the short duration, do you consider that the program could help to reduce the health service burden?			40%		60%
3.Do you think this type of program is important and beneficial to HHU patients?					100%
4.Do you think this type of program benefits and improves the patients' physical condition?				20%	80%
5. Do you think this type of program improves the patients' cognitive abilities?			20%	40%	40%
6. Do you think this type of program leads to psycho-social improvements in the patients?			20%	40%	40%
7. At the end of the program, would you say that the patient has improved significantly?			20%	20%	60%
8. Do you think the patients are happy with the trainer's behaviour?					100%
9. Do you think the patients are happy with their exercise program?					100%
10. Have the patients made favourable comments on the program?					100%
11. Have the patients made any negative comments on the program?	100%				

Discussion

To improve the prescription of home-based training programs for elderly hospitalized or HHU chronic multimorbid and/ or palliative patients, the effect of a multicomponent program with a cognitive orientation (EFAM-UV©) was first analysed on their levels of independence, perception of health-related QoL and lower-limb strength. Secondly, we evaluated the participants' satisfaction and perception of the need for such a physical exercise program, as well as the clinical staff's evaluation of its benefits. Finally, we analysed the relationship between the participants' rating and the possible improvements due to the program.

The initial diagnosis showed the participants' severe degree of dependence, low QoL and lower-limb strength (Rikli & Jones, 1999; Shah et al., 1989; Vilagut et al., 2005). In spite of this, and as the first finding, the training program significantly improved their independence in all the stages of the exercise program, and the perception of health after the most intensely supervised stage. These improvements were maintained after the month of autonomous training. In the latter period there was also a significant improvement in their perception of total health.

As regards lower-limb strength, the mean values were higher in all the evaluations after the initial one, although they only showed a tendency to significance in the second and third. These changes could have been responsible for the improved independence and health perception in relation to QoL Previous studies had already shown how a good home-based training program can improve the physical condition of frail older people (Boongird et al., 2017; Martel et al., 2018). In line with our results, this type of intervention has been shown to be successful in improving independence, functionality, mobility and QoL in elderly fragile persons (Clegg et al., 2012).

The perceived mental health did not show any significant improvement, although the scores in the evaluations were all higher than the initial score. These insignificant changes could have been due to the longer time needed to achieve improvements in mental/cognitive health (Blasco-Lafarga et al., 2020). Related to this, the delay in appreciating improvements in the perception of physical health supports the importance of including lasting supervised interventions, since a longer time is required to produce a visible improvement in the state of health (Blasco-Lafarga et al., 2020). The progressive slowdown in improvements during the semi-supervised phase (Ev3) and detraining (Ev4) in independence and strength, confirms these needs (supervision and longer lasting interventions), since ending the exercise training means that in most cases the benefits are lost (Blasco-Lafarga et al., 2021; Sanchis-Soler et al., 2021). These losses during detraining are in agreement with the findings of other studies; (Vogler et al. 2012), in a study on a sample of aged fragile adults (average age 79) found that after a 12 -week home training intervention, 12 weeks later the improvements achieved in balance and risk of falls had disappeared (Cadore et al.. 2014) carried out an 8-week multi -component training program with demented elderly patients and found that their physical and cognitive conditions, and dependence, had deteriorated after 12 and 24-weeks of detraining.

This deterioration of the results after the periods with detraining and less supervision could be partly explained by the difficulty of convincing elderly patients to stick to the training program. Factors such as incomplete understanding or even being unaware of their benefits,

Table 5. Bivariate correlation between the rating in the satisfaction questionnaire and the improvements in autonomy and QoL related to perception of health

	Satisfaction with the program	
	p	Correlation
$\Delta_{1\text{-}4}$Barthel	**.039**	-.577*
$\Delta_{1\text{-}4}$Sf-36f	.180	-.396
$\Delta_{1\text{-}4}$Sf-36t	.377	-.267

Pearson's for Sf36 and Spearman's for Barthel's Index. Ev4: final evaluation; Δ1-3 : delta (degree of change from initial evaluation to evaluation 3. Change caused by training); Δ1-4: delta (degree of change from initial evaluation to evaluation 4. Change caused by the intervention); Sf-36m: Sf-36 mental; Sf-36f: Sf-36 physical; Sf-36t: Sf-36 total. *Significance *p*<.05.

fear of falls on being alone and /or lack of interest or strength at these ages are possible barriers to fragile elderly persons practicing regular physical activity (Rodrigues et al., 2017). To this can be added many other types of barriers, such as the difficulty of introducing this type of exercise training programs earlier on the health care system (Annear et al., 2014; Thomas et al., 2019). As far as we understand, identifying these barriers could help to include more training programs in the hospital context and ensure the compliance of the patients. It would thus be important to evaluate both the users and doctors' perceptions.

The second finding was that the questionnaires indicated that both users and doctors considered the intervention to be highly positive. Different authors have recently begun to carry out studies in this direction. For example, Evensen et al. (2017) found that 93% of elderly adults confessed to an interest in doing physical exercises during their stay in hospital, although 27% claimed they did not know anything about the available activities and 33% did not know anything about the physical training options after being discharged. As we have already mentioned, fear of falls, lack of interest or transport or considering oneself to be too old for a physical training program could be seen as barriers to these persons practicing physical activity (Rodrigues et al., 2017). Conversely, it is important to point out that allowing patients to choose their exercises, and the fact of feeling less pain and fatigue after training, are enticements to train (Hager et al., 2019; Rodrigues et al., 2017). We did not strictly assess these items in our study, but the improved perception of health related QoL and the rating of better physical condition following exercise training would be helpful and aligned with this idea. What does seem to be clear from our data is that having all the material to hand, tailoring the sessions, clear instructions and the consideration shown by the trainer are very important points for the satisfaction and completion of the program in these populations.

The third and final finding of our study was that the persons that begin with the lowest levels are reluctant to make a greater effort, especially in the exercises that demand the biggest exertion, and may even have a lower opinion of the program than those who are fitter, even if they make better progress. It is thus important to emphasise the need to keep the intensity and/or demands high to achieve the highest improvement (Bull et al., 2020). Early interventions make it possible to carry out more intense training for longer periods, which would help to improve performance and/or the changes achieved (Cadore et al., 2014). In any case, the patients were considered to value the program positively and also their assessments agreed with the (even more positive) opinions of the clinical staff. A balance must also be made between demanding and motivating the participants, which is not at all easy in these populations.

All the improvements obtained in relation to the initial evaluation were in general maintained, in spite of the sessions becoming gradually more autonomous, even after detraining, indicating that the program continued to be effective and maintained the patients' positive physical evolution. Indeed, their improved mental and physical health perception continued to increase after the autonomous period, confirming the impact on their welfare after these multi-component, cognitive and entertaining home training programs, also in MPO-P patients. Besides, both the significance and medium-high effect size indicate the need, capacity and benefits of exercising on independence in everyday activities and their repercussion on the health perception of MPO-Ps. For this reason, due to the high cost of caring for the chronically ill (Krůtilová et al., 2021), including home physical exercise programs coordinated by HHUs could help to reduce these costs and improve the independence of debilitated elderly persons, reducing both medication costs and frequent hospital admissions (Garrett et al., 2011). There thus is a need for early long-lasting interventions, since greater commitment to and control of the patients (Gelaw et al., 2020) combined with early physical training interventions, or at the first indications of pre-fragility or being out of condition, will thus help to optimise the training, obtain greater benefits, encourage adhesion to the practice of physical exercise and thus maintain the improvement acquired.

Limitations

As this was a pilot study, it was carried out on a relatively small patient sample, lacked a control group, and the questionnaires were not previously validated. Apart from their validation, as an important contribution of having experienced this program, it is recommended to enrich future programs on qualitative methods to obtain an in-depth understanding of their benefits for these patients. Also, it is difficult to distinguish between autonomy and detraining. Defective health and physical condition, even after completing one of these programs, makes it difficult to consider that the patients are capable of being responsible for their own exercises, while it appears that a longer-lasting intervention is required in all cases.

Conclusions

A multi-component training program (EFAM-UV©) adapted to the HHU home context improves elderly patients' degree of independence and health-related QoL perception. Even though the improvements start to decline after stopping the supervised sessions, the values still remain above those of the initial evaluation after a month of autonomous training. Both the patients and clinical staff consider that this type of program would be a good strategy against the fragility-dependence binomial in the health system. The negative association of the assessment of the program with the improvement in autonomy could be explained by the greater effort required in the less independent population to carry out physical exercises.

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