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Health interventions for self-management: the role of qualitative approaches in mixed methods research

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Abstract: The long-term success of health intervention programs for self-management is often compromised by the difficulties felt by participants to maintain adherence to prescribed behavioral changes. Mixed methods research can expand understanding and the insights of complex health research problems such as self-management in chronic conditions. The purpose of this paper is to share key contents of a symposium focusing on the application of mixed methods research in the context of person-centered education, held during the 6th World Conference on Qualitative Research. More specifically, it aims at: 1) exploring examples of implementing mixed methods research in health interventions for self-management of chronic conditions and other health risks; 2) promoting insights and knowledge on the 'why and how of combinations' in mixed methods studies; and 3) exploring the valuable role of qualitative strands in mixed methods in the wider context of health research. Three studies are explored as examples of application of mixed methods in self-management programs, considering the experiences of participants for changing self-care behaviors and challenges faced for maintaining such changes. Convergent and explanatory sequential designs have been used, combining questionnaires and semi-structured interviews for data collection. Data analysis included procedures such as thematic analysis and descriptive statistics (examples 1 and 3), and thematic analysis and descriptive/inferential statistics (example 2). Results show how mixed methods designs can contribute to develop self-management strategies, to be considered in planning future interventions, and to expand understanding about their impact as well. Likewise, these examples emphasize why mixed methods can bring added value both to process and results of health research. Thus, exploring the application of mixed methods into a wider context is of utmost importance since the complexity of health phenomena is growing and requires equally complex research designs to capture them.

Keywords: Self-management; Health promotion; Person-centred education; Well-being; Mixed methods.

1.Introduction

Self-management is a term widely used in health education and health promotion programs. Overall, it reflects the person's active participation in their treatment and is a common frame for (often chronic) disease patient education programs (e.g., diabetes, chronic pain, arthritis) (Centers for Disease Control and Prevention [CDCP], 2019; Sherifali et al., 2018). Health intervention programs' common purpose is to facilitate knowledge generation and the skills development, necessary for the self-care and self-management of individuals (Chaturvedi et al., 2018). However, these self-care activities that encourage promotion, maintenance, and/or restoration of health often call for new models of behavior and change of beliefs (e.g., barriers, risks, benefits, self-efficacy). In fact, the long-term success of health promotion interventions is frequently compromised by the difficulties participants experience in maintaining adherence to prescribed behavioral changes (Middleton et al., 2013). Additionally, evidence focusing on the understanding about the impact of such programs in self-management behavior's change and maintenance is still scarce.

Health science research addresses the complexity of health problems intertwined with human phenomena such as behavioral factors contributing to disability and health, the person's point of view, and cultural and social models of illness and health (Creswell et al., 2011). Mixed methods research offers a significant option for expanding the scope and improving the understanding of complex health research problems (Tariq & Woodman, 2013). It offers the opportunity to combine the strengths of qualitative and quantitative methods to answer research questions, to examine processes along with outcomes, to voice what is relevant for participants and extend knowledge for health programs and interventions (Creswell et al., 2011). The value of mixed methods arises from both qualitative and quantitative results, and their integration leads to greater mining of the data and improved insights (Levitt et al., 2018).

Three core mixed methods designs can be used: convergent design (quantitative and qualitative strands occur at concurrent time during the same phase of the research process), explanatory sequential design (occurs in two distinctive interactive phases, initiated by collection and analysis of quantitative data and followed by collection and analysis of qualitative data that help to explain the initial quantitative phase) and exploratory sequential design (also uses sequential timing, but, in contrast to the explanatory design, begins with and prioritizes the collection and analysis of qualitative data in the first phase); more complex designs are also identified, in which the core designs can be embedded (Creswell & Creswell, 2018).

The recognition of qualitative research and use of multiple approaches to investigate problems in the context of health research is growing. A focused symposium about the application of mixed methods research in the context of person-centered education was held during the online 6th World Conference on Qualitative Research, aiming at enhancing the role of qualitative approaches for deepen understanding, knowledge and improving research practices. The purpose of this paper is to share key elements of the content of this symposium to a wider audience, more specifically, it aims at: 1) exploring examples of implementing mixed methods research in the context of health interventions for self-management of chronic conditions and other health risks; 2) promoting insights and knowledge on the 'why and how of combinations' in mixed methods studies; and 3) exploring the valuable role of qualitative strands in mixed methods in the wider context of health research.

2.Applying mixed methods research in health interventions

Three studies will be explored as examples of application of mixed methods research in health interventions programs for self-management, emphasizing the challenges experienced by participants for changing self-care behaviors and the difficulties to maintain adherence to such behavioral changes. A brief framework and main findings of each study is presented to provide some context, since the focus is on their methodological approach. Emphasis is placed on the role of qualitative data for the provision of a deeper understanding about the phenomenon under investigation in each of these examples.

The first example, based on a convergent design, focuses on the reasons for exercise adherence in people with Parkinson's Disease, including motivators and barriers related to exercising at home. The second example, using an explanatory sequential design, explores the impact of integrating individuals` stories and illness narratives into a self-management programme based on education and exercise for individuals living with Fibromyalgia (FM). The last example, based on a convergent design, focuses on the development and implementation of an online program to reduce caregivers' musculoskeletal risk factors and understanding it's impact on overall wellbeing and health.

The mixed methods appraisal tool (MMAT) (Hong et al., 2018) provided important guidelines for designing and analysing data in each of these examples. This tool allows the appraisal of the methodological quality of empirical studies using different study methodologies and designs such as mixed methods.

2.1.Adherence to Exercise at Home in People with Parkinson's Disease: A Convergent Mixed methods Study

Parkinson's disease is a neurodegenerative disease characterised by neural inclusions in the form of Lewy bodies and Lewy neurites, with cell loss in the substantia nigra and other brain areas (Kalia & Lang, 2015). Over the past 30 years Parkinson's disease increased in prevalence 2.5 times, becoming one of the leading causes of neurological disability (Feigin et al., 2017). The doubling of the number of individuals with Parkinson's disease is projected to occur again in the next 30 years (Dorsey et al., 2018).

Pharmacological therapy can improve patients' motor symptoms, however, over time, the effect gradually diminishes, and several characteristics of motor control are resistant to pharmacological therapy (Kalia & Lang, 2015). Non-pharmacological interventions, such as exercise, demonstrate numerous beneficial findings, including improvements in stability and balance, gait, strength, flexibility, quality of life, independence, and psychological well-being (Ni et al., 2018; Osborne et al., 2021). However, adhering to exercise on a continuous basis to maximize the benefits is a widespread challenge for this population, even in early stages of the disease (Mantri et al., 2018; Stevens et al., 2020). Few studies have examined motivators and barriers to exercise in people with Parkinson's disease. Previous qualitative studies have shown that a constant reassurance and support from a health professional was central for maintaining enrolment in an exercise program (Crizzle & Newhouse, 2012; O'Brien et al., 2016). Also, quantitative and mixed findings have shown that people with more perceived health barriers and a greater fear of falling tended to exercise less (Ellis et al., 2013; Zaman et al., 2021). However, to our knowledge, motivators, and barriers to adhere to exercise at home are unknown. In addition, given the progressive nature of the disease and the associated decline in physical function, people with Parkinson's disease may differ in their ability and willingness to exercise, as well as in their perceived benefits and barriers to exercise at home. Therefore, this study aimed to address the following questions: i) what are the perceived barriers and facilitators related to exercising at home for people with Parkinson's Disease? and ii) what are the relationships between the progression of the disease, motor, and non-motor symptoms, perceived self-efficacy for exercise and the people's adherence to exercise at home?

A mixed methods approach was undertaken using in-depth semi-structured interviews and structured questionnaires, including the Movement Disorder Society - Unified Parkinson's Disease Rating Scale (UPDRS)- part II (Motor Aspects of Experiences of Daily Living), the modified Hoehn and Yahr (H&Y) Scale and the Physical Exercise Self-Efficacy Scale. The topic guide of the interview focused on: 1) the experience and perceived benefits of exercising at home; 2) the perceived motivators and barriers to enrol in an exercise programme at home; 3) the strategies used by participants to maintain motivation and physically active, and 4) recommendations to healthcare services/ professionals for remote exercise guidance. By adopting a mixed approach, this research aimed to allow expression of different facets of knowledge and experience. An integrated approach with a convergent design was used, with qualitative and quantitative data being collected and analysed during a similar timeframe (Creswell & Creswell, 2018).

Participants were recruited from the National Association of Parkinson's disease and a private rehabilitation clinic in the region of Lisbon, Portugal. A purposive sample was selected to maximise the possibility of collecting rich data. Eligibility criteria included: a clinical diagnosis of Parkinson's disease; age > 18 years; ability to understand and commit to the study aims and willingness to give informed consent for participation in the study. Participants were excluded if: they had a Mini-Mental State Examination score of less than 22 (0-2 years of schooling), 24 (3-6 years of schooling) or 27 (for $\geq$ 7 years of schooling); were at stage 5 on the modified H&Y scale; had visual difficulties that limited the reading and understanding of the documentation provided by the research team or had a clinical diagnosis of depression or other neuropsychiatric manifestations that compromised their participation in the study. After obtaining the written consent, a convenient date, place, and time for data collection was scheduled with participants. The setting was chosen according to the participants' preferences and convenience. Ethical approval was obtained from the ethics committee of the Health School of the Polytechnic Institute of Setubal.

Multiple and complementary methods of analysis were used. Integration through merging of data occurred after the descriptive statistical analysis of the numerical data and qualitative analysis of the interviews based on a thematic analysis (Braun & Clarke, 2021), with the two databases being analysed together. Numerical data (e.g., domain and total scores) were compared with qualitative data. Accordingly, the authors examined the relationship between higher scores of self-efficacy for exercise (> 10 in the Physical Exercise Self-Efficacy Scale) and the qualitative quotes from those participants, as well as the relationship between the Parkinson's disease stage (< 2.5 or > 3 in the modified H&Y) and the qualitative quotes from the participants. Qualitative data analysis followed an inductive process through the *six-phase process* of thematic analysis: data familiarization, systematic data coding, generating initial themes, developing themes, refining, and naming themes and producing the report (Braun & Clarke, 2021). For ensuring the quality of the study, the investigator triangulation was used with two researchers analysing separately the data.

A total of 12 individuals diagnosed with Parkinson's disease (mean age 70.4 years ± 8.65; 7 male) were included in the study. Seven participants had the diagnosis for over 10 years (mean duration of DP= 7.9 years ± 6.64) and most of them were between stages 1.5 and 3 in the modified H&Y (mean score= 2.83 ± 0.7), indicating mild to moderate Parkinson's disease. Most participants were retired or not working (75%), married (83%), had a compulsory education or higher (83%) and practised physical activity on a regular basis or were interested in adopting at home (67%).

Three main themes derived from the data: i) "valuing by doing it": perceiving the benefits of exercise; ii) Participating in exercise decision-making, and iii) Support from others. The exercise experience provided an opportunity for participants to perceive the benefits and recognise the importance of exercise for minimising the disease progression. However, not all would fit for an exercise programme at home. The involvement of the person with Parkinson's disease in decision-making about the exercise model revealed to be central to remain enrolled in exercise. By understanding and defining the exercise purposes for themselves, as well as by being involved in the selection of modalities and exercises, participants appeared to increase their ability and willingness to exercise. Likewise, the support from others, including health professionals, carers and other people with Parkinson's disease were described as important motivators. Receiving feedback and having some sort of supervision were valued, highlighting the importance of support for exercise and the social interaction.

Additionally, an earlier stage of Parkinson's disease and less motor impairments seemed not associated with the participants' willingness to exercise at home. However, participants with higher scores at the Physical Exercise Self-Efficacy Scale described higher levels of physical activity at home on a regular basis and previous experiences of physical activity before the diagnosis. These participants also reported the importance of defining specific exercise goals, highlighting the importance of their active participation in the exercise decision-making.

This mixed methods study explored the motivators and barriers of exercise at home in a group of people with Parkinson's disease, to better inform design of interventions to increase physical activity levels. The findings suggest the importance of the assessment of self-efficacy beliefs about the ability to take part in exercise. Facilitating an increase of individual's self-efficacy, autonomy and competence for independent achievements, and ability to overcome barriers to exercise seems to be important to increase their physical activity levels at home.

Furthermore, our findings support the importance of future programmes for people with Parkinson’s disease to be tailored, designed with their active participation and with emphasis in the development of self-management skills (O’Brien et al., 2016; Stevens et al., 2020), as well as with the involvement of others, including other people with Parkinson’s disease and carers/ family (Afshari et al. 2017).

2.2.Person-Centred Education for Self-Management in the Context of Fibromyalgia: An Explanatory Sequential Mixed methods Study

FM is classified by the International Association for the Study of Pain as a chronic primary pain disorder (Treede et al., 2019). It is characterised by a robust clinical phenotype with principal features that include widespread pain and tenderness, as well as high levels of sleep disturbance, fatigue, cognitive dysfunction, and emotional distress (Arnold et al., 2019; Cheng et al., 2018; Littlejohn, & Guymer, 2018; Wolfe et al., 2016). In terms of prevalence, FM is the third most common musculoskeletal condition, being preceded by low back pain and osteoarthritis. Nevertheless, there may be inaccuracies in prevalence estimates due to several problems such as discrepancies between administrative and epidemiological data or failures in recognising the syndrome (Sarzi-Puttini et al., 2020). Yet, global data identify a higher proportion of females diagnosed and an increased prevalence in middle age (50-60 years) (Sarzi-Puttini et al., 2020). In Portugal, FM is among the three rheumatic diseases with worst impact on function and quality of life (Branco et al., 2016).

Guidelines for the treatment of individuals diagnosed with FM have emphasised the importance of person-centred approaches, aligned with the biopsychosocial model of care (Fitzcharles et al., 2017; Häuser et al., 2017; Macfarlane et al., 2017). With respect to specific treatment modalities, exercise and education have been the most recommended, with an emphasis placed on self-management (e.g., Andrade et al., 2020; Musekamp et al., 2019; Sosa-Reina et al., 2017). Nevertheless, in what concerns to person-centred education, there is conflicting evidence regarding its effectiveness as well as several unanswered questions about the best educational approaches and delivery (Amer-Cuenca et al., 2020; Bernardy et al., 2018; Musekamp et al., 2019).

Person-centred care requires the provision of care that is consistent and responsive to the person`s values, needs and preferences (Vennedey et al., 2020; Wijma et al., 2018). To achieve this, health professionals need to explore and understand individuals` narratives and experiences with illness and disease and place them at the centre of person-centred education planning and delivery.

Although person-centred education for self-management of FM has been recommended in several studies (Du et al., 2017; Garcia-Rios et al., 2019; Musekamp et al., 2019), little is known about the integration of individuals` stories and illness narratives into the educational process. Additionally, few studies have explored individuals` experiences of living with FM and little is known about their perceptions regarding education for self-management (Calner et al., 2021; Leake et al., 2021).

Following the previous background, two research questions were formulated: 1) Is a combined programme of exercise and education (incorporating peoples` narratives) more effective than exercise alone in individuals with FM? and, 2) What are the perceptions of the participants, who attended the aforementioned combined programme, regarding the educational approach and its impact on self-management?

According to the previous research questions, a mixed methods explanatory sequential design was implemented including 2 strands – the first was based on quantitative data collection and analysis, while the second was based on qualitative data collection and analysis (Creswell & Creswell, 2018).

In the 1st strand, a double-blind, multi-centre, parallel randomised controlled trial was carried out to compare the effectiveness of an eight-week physiotherapy programme, incorporating an educational approach based on individuals` narratives and exercise, with exercise alone in individuals with FM. Participants for the study were recruited through medical referral and via self-inscription after dissemination of the study in social networks from patient associations. To be included in this strand, participants needed to have the diagnosis of FM, according to the latest American College of Rheumatology criteria (Wolfe et al., 2016) and had to be aged from 18 to 65 years old. Additionally, several exclusion criteria were defined to guarantee the safety and suitability of interventions (e.g., ongoing oncological pathology, under treatment or severe osteoporosis and osteoarthritis). Data were collected at baseline (T0), 4 weeks later (T1), 8 weeks later (T2), which corresponded to the end of intervention for both groups and 12 weeks after the end of intervention. The primary outcome was change in pain intensity (assessed by the Numeric Pain Rating Scale). Secondary outcomes included: disability and impact of fibromyalgia (assessed by the Revised Fibromyalgia Impact Questionnaire); quality of life (assessed by the EuroQol 5D 3L); and participants` perception of improvement in clinical status (assessed by the Patient Global Impression of Change Scale).

In the 2nd strand, a qualitative study, based on a thematic analysis, was carried out to explore the participants` perceptions regarding the educational approach implemented in the first strand of the study. Participants, from the first strand, who had been allocated to the experimental group were invited to participate. A semi-structured interview schedule, based on exploratory open-ended questions, was used to collect data in focus groups. The questions explored the participants` perceptions about the contents, methods, and delivery of the educational approach under investigation. The focus groups were moderated by two researchers, audio-recorded and transcribed verbatim. Data analysis followed the *six-phase process* suggested by Braun and Clarke (2021) that included researchers` familiarization with data, systematic coding of the data, generation of initial themes, development of themes, refining and naming themes and, finally, writing. Several strategies were employed to ensure the rigour of this study, namely: - investigator triangulation, two researchers were involved in coding, analysis, and interpretation; - members check, a preliminary analysis was sent to the participants and their feedback on the researchers` interpretation of data was requested; and - audit trail, a record of the research path, particularly the procedures related to data analysis was kept throughout the study.

Ethical approval for this study was obtained from the institutional ethics committees where data was collected.

A total of 82 individuals were assessed for eligibility. From these, 10 were excluded for not meeting the inclusion/ exclusion criteria (n=7) or declining to participate (n=3). 72 were included, with 36 allocated to each group. There were no significant differences between groups in demographic and clinical variables at the baseline. Statistical analysis procedures provided useful information on the changes in the outcome measures within and between groups. Both groups reported statistically significant differences on the selected outcomes at the end of interventions. Nevertheless, the research team reached this point with unanswered questions regarding the role and impact of patient-centred education in the participants` lives.

Qualitative findings from the second strand provided interesting and deeper information that helped the research team to better understand the implementation of patient-centred education in the context of this study. Although the superiority of this intervention in the outcomes assessed has not been demonstrated in the first strand, its impact on self-management and relevance have been uncovered through the qualitative data collected from this study`s participants in the second strand. Two master themes were generated from data analysis of the focus groups carried out with 14 participants, who agreed to maintain their participation in the second strand. In the first master theme, the role of education sessions in self-management of FM was explored and the importance of learning and reinterpreting pain to deal and control it was highlighted by the participants. In the second master theme, the intervention attributes that promote self-management were explored and the health professional competency was also considered relevant to promote the development of the participants` capabilities for self-management.

Findings from the first strand focused on the effects of the interventions on the outcomes selected, which did not provide any information about the participants perceptions of the role and impact of the educational sessions on their lives. Data from the second strand provided researchers with the opportunity to follow-up data from the first strand and develop a deeper interpretation and understanding of data. These findings suggested a transformation on the participants` lives that resulted from learning about the disease, getting validation, reinterpreting pain, and becoming empowered to deal with FM. These findings are coherent with recommendations from treatment guidelines and suggest that person-centred education for self-management should be considered as a relevant treatment approach for individuals with FM (García-Rios et al., 2019). Further research on individuals` narratives and their incorporation on person-centred education sessions for individuals with FM is recommended. The use of a mixed methods approach, drew on the strengths of qualitative and quantitative data, seems to provide a more complete understanding of the phenomenon under investigation than either approach alone.

2.3.Combined Intervention to Prevent Musculoskeletal Injuries in Informal Caregivers: A Convergent Mixed methods Study

A caregiver is an adult who provides physical, social, or emotional care to another person with a certain degree of dependency (Sabzwari et al., 2016; Sullivan & Miller, 2015). The informal caregiver promotes the independence of a family member or friend, without specific training, aiming to meet their needs and elicit best possible functional levels (Chan et al., 2020).

Given the characteristics of this group (caring informally), not all countries provide systems to account for how many people provide this type of care, respective characteristics, or circumstances. However, (EUROCARERS, 2021) suggests that 12,5% of the Portuguese population gives assistance or informal care to people in need. Women represents 61% of informal careers and provide care, at least 10h per week.

Their reduced knowledge and training for the role or tasks performed, places them at a greater risk of developing musculoskeletal injuries, namely fatigue, lower back pain, and muscle contractures (Darragh et al., 2015). In addition, they also have little or no time to care for their own nutrition and physical activity levels (Grady & Rosenbaum, 2015). Musculoskeletal injuries are in turn, one of the main reasons identified for stopping caring for a friend or family member (Darragh et al., 2015).

Existing evidence suggests the need for new models of care which involve, among others, informal caregivers, emphasizing potential benefits of resources' use, costs, and caregiver experience, however this remains to be explored (Gualtieri-Reed & Morris, 2020). In addition, Chan et al. (2020), identify the lack of research towards this problem, which has been exacerbated by the pandemic situation, due to the limited access to social services and restricted physical contacts.

Within the above theoretical context, one research question was formulated: How will an online program, focused on the development of strategies to diminish musculoskeletal injury risk factors, impact on caregivers' overall wellbeing and health?

A mixed methods study, with a convergent design (Creswell & Creswell, 2018) was implemented, where both qualitative and quantitative data were collected simultaneously, and analyzed separately, being later compared. An initial assessment was conducted before the implementation of the combined education/exercise program. An analysis of the impact of the program on risk factors for developing musculoskeletal injury, as well as the understanding of its influence on caregivers' wellbeing and health was carried out.

A purposeful sample was used (Creswell & Creswell, 2018). Participants were recruited through fourteen caregivers' organizations. People were invited if older than 55 years and having been informal caregivers for at least 6 months. Those who presented a background of any musculoskeletal condition and any condition who precluded them to perform exercise, were excluded. Six potential participants were identified but only four initiated the program. One participant dropped out at week 4, since the person he was caring for passed away. The remaining three completed the program.

Informed Consent was given, and socio-demographic data was collected prior the intervention. Qualitative and quantitative data collection were combined to inform on musculoskeletal injury risk factors (physical and behavioral) and to promote a deeper understanding of the program's impact. Both were collected prior and at the end of the education/exercise program. To ensure the rigour of this study, *member checking* was conducted as the preliminary analysis of the semi-structured interviews was validated with the participants, via telephone, to guarantee researchers' interpretation of the answers given; *peer debriefing* was used as the results of each interview were reviewed and reflected upon by an external person, allowing interpretation beyond the researcher (Creswell and Creswell, 2018).

The following quantitative variables and respective tools were used: (a) Self-perception of Functional Limitations (Likert Scale structured questionnaire, based on functional activities, individually identified for each subject); (b) Exercise Self-Efficacy (Exercise Self-Efficacy Scale); (c) Lower Limb Strength (Five Seconds Sit to Stand performance test); (d) Strength of the core muscles (Curl Up performance test). A semi-structured interview was conducted via telephone, focusing on the following dimensions: perceived susceptibility, perceived severity, perceived benefits, costs, and self-efficacy towards the risk of musculoskeletal injury. At the end of the program, another semi-structured interview, organized in four main dimensions (impact on health, behavioral change, perception in the project's used strategies, other needs, and concerns), was used to evaluate the impact of the program on individuals' wellbeing and health.

Descriptive statistics were performed with quantitative data for describing the evolution of risk factors, before and after the 12-week education/exercise program. All interviews were audio-recorded and transcribed verbatim. Data was analyzed according to the following phases: researchers` familiarization with data, systematic coding of the data, generation of initial themes, development of themes, refining and naming themes and writing (Braun & Clarke, 2021).

The combined education/exercise program was developed based on the best available evidence (Davudi et al., 2016; Gary et al., 2020; Kang, 2015; Lin et al., 2020; Muñoz-Bermejo et al., 2019). Three young researchers analyzed the literature and developed an initial draft of the program, later verified by two experts – a physiotherapist and a psychologist. The basic structure of the program consisted of 12 - via telephone - sessions, four education and eight exercise based, implemented throughout 12 weeks. This was later personalized to individuals' needs.

Two guiding manuals were developed and sent by post, to each participant, to guide the implementation of the program. The first manual focused on caregivers' tasks and tips to facilitate them, whilst the second focused on exercises to strengthen lower limb and core muscles. A self-care diary was included, for participants to register their exercise routine and personal goals.

The qualitative information gathered through the semi structured interviews allowed us to personalize the program, adjusting the examples, exercises, tips, and recommendations to the individuals' needs and expectations. In addition, allowed a deeper understanding of the exact benefits, and changes, that the program had introduced in caregivers' lives. Examples of these are, greater perceived awareness of the benefits of the exercise, greater perceived awareness of the benefits of using supporting aids and adequate postures, and different ways of conducting the daily tasks with less risk.

The participants aged 58 (male, caregiver for 4 years), 63 (female, caregiver for 3 years) and 68 (male, caregiver for 3 years) all improved the quantitative indicators, namely improved their lower limb strength, increased their core strength, improved their self-perception of functional limitations, and improved their exercise self-efficacy, in accordance with what has been explored by Muñoz-Bermejo et al. (2019). These improvements seen in the quantitative indicators, were confirmed by the themes that emerged in the thematic analysis, which were: (a) health benefits, which included aspects like awareness of one's own body, self-perception of one's health, mental and physical health improvements, (b) preventive behavior, which involved all the new behaviors' adopted in the caregiving tasks, including the tips and strategies learnt during the program, as well as the new physical competences acquired and the exercises now practiced, which helped in daily living and increased awareness of the risks present on a daily basis; (c) the caregiver's perceptions, needs and concerns involved aspects related with the process itself, the type/means of program, the weekly monitoring, and the effectiveness and added valued of the materials used (manuals, photographs, etc.).

The combined exercise/education telephone-led program induced the desired effects of increased strength, exercise self-efficacy, perceived susceptibility, severity, benefits, costs, and self-efficacy towards the risk of musculoskeletal injury. Moreover, participants acknowledged a significant impact of the program in relation to health benefits, behaviors, and beliefs. These findings seem to confirm what has been described by Gary et al. (2020), for caregivers of other population groups. Semi-structured interviews played an important role in such achievement, expanding the level of interpretation about the needs and consequent personalization of the program, thus minimizing time constraints previously identified for adherence to health programs in this population.

The strengths of the combination of quantitative and qualitative data collection tools were the deeper and more personalized understanding of the results of the program in each participant, as well as the identification of common trends among the three participants. The qualitative perspective enlightened aspects of the program that would not be visible otherwise, which are crucial for future implementations of the program. Further studies are required to investigate the benefits and shortcomings of telephone-led interventions, towards the reduction of the risk of musculoskeletal injuries of caregivers, as well as on their overall wellbeing, on a long-term basis.

3.Final Considerations

Three examples of community-based health research focusing on the needs of specific groups (Parkinson's disease and Fibromyalgia patients, and Informal caregivers) have been explored. The two examples based on convergent design demonstrate how mixed methods may be used to inform the development of self-management intervention strategies, since they identify perceived facilitators and barriers that should be considered to plan future interventions. The other example based on the explanatory sequential design illustrates how mixed methods can contribute to reach a deeper understanding of the impact of such intervention programs. Overall, these studies offer unique opportunities to explore diverse perspectives of different population groups and uncover common grounds amongst self-management in chronic conditions.

Moreover, they reflect how different approaches and techniques can be used and combined during intervention programs to expand its interpretive level, or with an exploratory purpose, where qualitative results can guide the development of future interventions. These pieces of research underline the richness and diversity of methods that can be used in health research, enhancing why mixed methods could be used, as well as how and at what stages of a research project (e.g., data collection, data analysis, sequenced, simultaneously) the combination may bring added value, worthiness, and sense, both to the process and respective results.

The results presented, and the strengths of the use of mixed methods highlighted above, should be read and interpreted considering the limitations of each example presented, such as, in example 1, the possible bias of having a physiotherapist conducting the interviews, as participants may have tried to highlight what they thought the physiotherapist would want to hear; in example 2 the added value of having had a third researcher in the process of analysis, to enhance the discussion about convergences and divergences between the analysis of the two researchers involved in this process; and, the reduced sample size in example 3 which may have impacted the overall significance of the quantitative data obtained.

The potential demonstrated in these examples, of the use of mixed methods within health-related research, lead us to consider that future research could focus on the use of mixed methods to explore individuals' perspectives to promote and facilitate person-centred care. Similarly, the use of mixed methods studies could also be transferred for research contexts dealing with the development of technologies for health education and healthcare support (eHealth) or challenges arising in research conducted during pandemics, as in our third example.

A rigorous use of mixed methods requires meeting the standards of both quantitative and qualitative research methodology in the design, implementation, and reporting stages (Levitt et al., 2018) and tools are available to ensure such rigor (e.g., MMAT among others). Thus, exploring examples of application on how to implement the combinations of mixed methods into a wider context is of utmost importance since the complexity of health phenomena is growing and requires equally complex research designs to capture them.

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The work developed in the study provided as the second example has been integrated into "SHARE – Health and Humanities working together", a research project funded by FCT - Fundação para a Ciência e Tecnologia (PTDC/LLT-OUT/29231/2017). The research team involved in this work has included researchers from different areas: Alda Correia (Universidade Nova de Lisboa – Faculdade de Ciências Sociais e Humanas), Eduardo Cruz (Instituto Politécnico de Setúbal – Escola Superior de Saúde), Fernando Pimentel (Universidade Nova de Lisboa – Faculdade de Ciências Médicas), Isabel Fernandes

(Universidade de Lisboa – Faculdade de Letras) and Rita Fernandes (Instituto Politécnico de Setúbal – Escola Superior de Saúde). It has also integrated a research fellow, Patrícia Falcão, as well as physiotherapists and students from Master and Bachelor degrees in Physiotherapy: Berta Nogueira, Cristiano Martins, Joana Fernandes, Márcia Reis from the Master degree in Physiotherapy and Isabel Camacho, Rafael Faustino e Sara Azevedo from the Bachelor Honors in Physiotherapy from Instituto Politécnico de Setúbal. This research team was coordinated by Carmen Caeiro, co-author of this chapter.

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The study reported in example 3 is included in a wider study focused on Caregivers of older people needs’ of Instituto Politécnico de Setúbal, Escola Superior de Saúde. The authors would like to acknowledge the contributions of three students from the Physiotherapy Bachelor Program, namely Cátia Fernandes, Débora Alves and Gonçalo Cardoso. The research team would also like to acknowledge the participants who agreed to participate in the study, as well as the Informal Carers Association, a partner of this part of the Project.

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