Healthbox CIC Strength and Balance Programme

Real World Validation facilitated by University of Chester

in partnership with The Innovation Agency 2021

HEALTH MATTERS Cheshire & Warrington

European Union
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NHS

INNOVATION AGENCY
Academic Health Science Network for the North West Coast

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Executive Summary

Real World Validation of the Healthbox Strength and Balance Programme

Healthbox have developed their Strength and Balance programme to meet one of the objectives of the Cheshire West and Chester Falls Prevention Strategy 2017-2020 Falls Prevention Strategy. The Strength and Balance programme is delivered from accessible community venues located in areas across the borough and aligned with specific need identified by demographic data. The Clinical Frailty Scale (Appendix 2) is used to as referral criteria for the programme. Individuals that are deemed to be within 5 or 6 on this scale are considered suitable for the programme.

This Real World Validation report explores outcomes for participants who have attended the programme, including falls reduction, improved frailty measures and confidence levels. The report also investigates any added value from the Strength and Balance programme, its position within the regional market place and cost effectiveness. The validation study was funded by the European Regional Development Fund Programme Health Matters (03R16P01250).

The report methodology includes assessment of literature, quantitative and qualitative data collection and analysis plus a review of published information to contextualise programme delivery within the current economic and social environment.

Key Findings

There was a 50% decrease in falls post intervention in both men and women who participated in the Strength and Balance programme.

Mean blood pressure and physiological measures based on age groups (40-49, 60-69, 70-79, 80-89, 90-99) show an improvement in all scores for muscular strength, muscular endurance and balance for all age groups based on mean values pre- and post-test.

Diastolic blood pressure, timed up-and-go and sit-to-stand measures post-intervention changes are statistically significant and therefore participants are more likely to be able to avoid a ‘long lie’ after a non-injurious fall.

All participants who completed feedback questionnaires felt they had benefitted from attending the Strength and Balance classes. (100%, n=67)

Most participants agreed that attending the programme had increased their confidence. (85% agreed, n=67). Some participants specifically mentioned that their fear of falling was less. (18% mentioned, n=67)

Most participants agreed that they had continued with activities from the classes. (69% agreed, n=67). The majority stated that they had joined a further class. (87% made this comment, n=67)

Almost all participants agreed that there is a positive social aspect to the class. (99% agreed, n=67). Most participants specifically mentioned that they felt less socially isolated. (64% mentioned, n=67)

A substantial number of participants agreed that they had used nutritional advice given during the classes. (45% agreed, n=67) with a third commenting that they had adjusted their diet following nutritional advice. (34% mentioned, n=67)

The market environment investigation identified competitors offering services regionally but Healthbox has established services within their locality that have become sustainable over time due to continued referrals into the programme, retained engagement with participants and delivery from convenient locations within the local community.

The Healthbox 12-week Strength and Balance Programme cost per participant (approx. £73.92 for a 12-week course) is an investment in preventing falls and reducing the need for secondary care. PHE give the cost for A&E attendance (no admission) at £100.53 (2016) and the cost for inpatient stay (non-hip fracture) at £7,949 (2015/16).

Conclusions

There was a 50% decrease in falls and an improvement in scores for increased muscular strength, muscular endurance and balance for all individuals who had attended the Healthbox Strength and Balance Programme.

Added value from the programme included reduced social isolation and improved feelings of wellbeing. Participants reported increased confidence and reduced fear of falling.

Most participants continued to participate in exercises they had been shown during the programme either at home or by joining further classes. A substantial number of participants had used nutritional advice given during the classes with a third stating that they had adjusted their diet.

Whilst there are competitors offering services regionally, Healthbox has successfully established a sustainable programme within Cheshire East, Cheshire West and Chester. Their strategy of service delivery from accessible community venues has encouraged referrals into the programme and retained engagement with participants over the longer term.

The Strength and Balance programme is a cost effective resource for preventing falls in older people living in the community.

Recommendations

- Reviewing course content to include IT skills and accessibility.
- Developing online course content and delivery.
- Providing takeaway hard copy information to act as aide memoirs.
- Working with nutritionists to develop further nutritional resources.
- Reviewing data collection methods.
- Ensuring qualitative data collection is ongoing.
- Linking with referrers and clinicians to establish feedback loops.

Contents

Tables and Figures

Real World Validation Programme Overview

The Innovation Agency (AHSN) through the Cheshire & Warrington Health Matters Programme provides Small Medium Enterprises (SMEs) in Cheshire & Warrington Local Enterprise Partnership with support that enables the SME to better understand, work with and sell their products, services and innovations to the NHS and other health and social care markets through understanding both market need and impact of the SME offer. Yet even when the NHS is clear about its needs, SMEs can still often have a problem in articulating the true value of their products and innovations in a way that chimes with the purchaser. By supporting Real World Validation (RWV) of innovation through the Health Matters Programme, delivered via an independent academic partner, the value proposition and case for adoption of any innovation is enhanced since the NHS needs to see evidence from the real world (i.e. a typical NHS environment) that a product has been successfully introduced and resulted in a positive impact.

This RWV report describes the findings behind the Healthbox Strength and Balance Programme established across Cheshire helping the SME and the AHSN to shape their value proposition and demonstrate impact that will support potential purchasers to develop a business case to commission the service more widely. It is proposed that this RWV report both, supports the development of an evidence base that will inform future business cases for follow-on adopters, and complements the underpinning theory drawn from literature and best practice guides that have gone before.

The Real World Validation Process

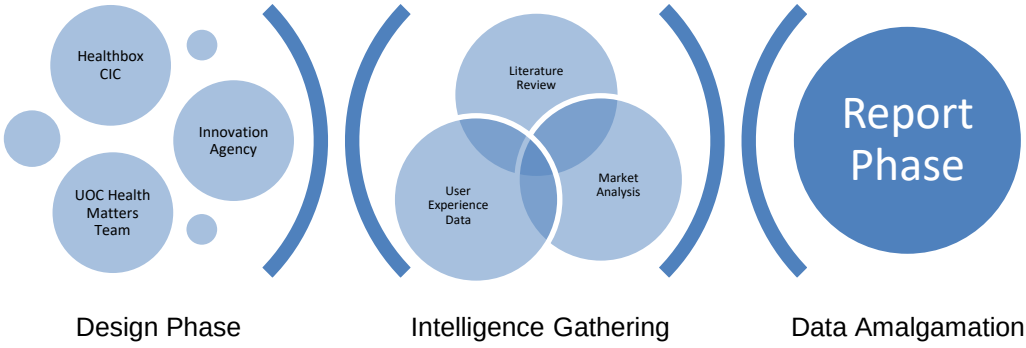

Figure 1 - Real World Validation Phases

The Real World Validation process begins with discussions between the Innovation Agency, University staff and the team at Healthbox. The University staff commenced the design and included further conversations with the SME and the Innovation Agency as the project was shaped and specific research questions were formulated. This approach was implemented to ensure that the activity would deliver outputs that the SME agreed would add value to

their proposition and ensure compliance with the delivery plan of the Health Matters programme.

The agreed objectives for the Real World Validation were documented and shared via the Innovation Agency's Project Plan framework. An extract showing the section pertaining to the Real World Validation is included as Appendix 1.

After agreement of the Real World Validation objectives, the University of Chester Health Matters Team produced the resources necessary to enable data collection and processing of the data by the SME prior to sharing with the University team ensuring compliance with GDPR. The project was granted ethical approval (proportionate review) for analysis of the data, as required by University protocols.

Background

Prevention of falls in the older population is a key public health imperative as fractures from falls can decrease the quality of life for an older person and their independence, with implications for additional support from health services. Across Cheshire West and Chester during 2011-12 just over 1,400 people aged 65 and over were admitted to hospital with an injury relating to a fall. This was a significantly higher admissions rate per head of population than the average for England. (Integrated Strategic Needs Assessment for Cheshire West and Chester 2014)

Group and home-based exercise programmes, which usually containing some balance and strength training exercises, effectively reduced falls (Gillespie, L. D., et al.,2012; Orton et al 2018). Effective exercise programmes that reduce both falls outcomes primarily involve balance and functional exercises (Sherrington C., et al., 2019). Furthermore current NICE guidelines (2019) recommend strength and balance training for older people living in the community alongside the surveillance of falls in older people: assessment of risk and prevention (NICE guideline CG161).

The Healthbox Strength and Balance Programme

Healthbox Community Interest Company is based in Ellesmere Port, Cheshire and provides health and wellbeing services to all aspects of the community. Healthbox have a multidisciplinary team who deliver services and link with social prescribing across Cheshire East, Cheshire West and Chester. The SME offers a range of asset-based health promotion services across the generations and disciplines using a community led approach. By working with schools, health communities and the individual they have a comprehensive offer including Mental Health First Aid training, nutrition, psychological services, physiotherapy, Falls Prevention classes for older people and the Strength and Balance programme that this Real World Validation examined.

This 12 week programme designed by Healthbox combines participant tailored exercise with educational advice. The programme objectives are to:

1. Reduce the risk of falling and therefore reduce the risk of fractures
2. Increase physiological fitness in the following areas
    - Flexibility
    - Strength
    - Balance
    - Postural Stability
    - Muscle Endurance
3. Improve general nutrition and falls related to nutrition
4. Reduce social isolation

Referral Pathway for the Healthbox Strength and Balance Programme

The Cheshire West and Chester Falls Prevention Strategy 2017-2020 has committed to commissioning and developing boroughwide appropriate, evidenced based services which are both individually and collectively successful in reducing the likelihood of at risk people falling and injuring themselves. It has an ambition to ensure everyone at risk of falling and injuring themselves is able to:

a) Receive a formal risk assessment from an appropriately qualified professional

b) Be able to access falls specific exercise classes that can improve their posture, balance and muscle strength

c) Be provided with a home environment check to reduce the likelihood of them falling and to ensure they have any equipment or assistive technologies they may need

Healthbox are delivering their Strength and Balance programme to meet objective (b) of this Strategy. The programme is delivered from accessible community venues located in areas across the borough and aligned with specific need identified by demographic data.

By using the *Clinical Frailty Scale* (Appendix 2) as the referral criteria for the programme, Individuals that are deemed to be within 5 or 6 on this scale are considered suitable for the programme. As this scale is not age specific, it is noted some participants that have completed the programme are younger than expected for a falls prevention programme. Generally, these younger participants that have completed the course have had a stroke or diagnosed with Parkinsons disease. The programme also enables self-referral into the programme.

Rationale

The aim of this Real World Validation therefore was to assess whether the Healthbox Strength and Balance programme is effective in improving fall prevention related measures in participants and improving their quality of life.

Specifically:

i. Is there a reduction of falls post-intervention?

ii. Does the programme result in increased muscular strength, muscular endurance and balance in individuals referred into the programme?

iii. Are participants able to retrain or maintain the ability to get up from the floor to avoid a 'long lie' after a non-injurious fall?

iv. Does the programme increase confidence and reduce the fear of falling in individuals participating in the programme?

v. What are the unintended outcomes? (e.g. sustainability, reduction in isolation, making new friends)

vi. How does the Healthbox Strength and Balance programme compare with any regional competitors or alternative services that commissioners could refer to?

vii. Is the Strength and Balance programme a cost-effective resource compared to alternative services or the cost of interventions not being provided?

Literature Review

A search of both the Cochrane Library and the Web of Science was undertaken to identify systematic reviews of interventions for reducing falls in older people living in the community. This was augmented by a further review of journals and databases for health and social care was compiled for additional context around successful interventions for preventing falls among older people living in the community. The key themes explored were:

- Falls prevention for the elderly
- Falls prevention program or exercise program
- Measures used to evaluate programmes
- Interventions for preventing falls in older people living in the community
- Exercise based falls prevention
- Cost-effective strategies to prevent falls among older people

Methodology

The Real World Validation took the form of an evaluation of the service from a user perspective as well as looking at the results relating to improvement on a range of measures described below.

A participant pre-test/post-test design in order to address the specific research questions numbered above i, ii, iii. A sequential approach was used collecting quantitative data from standard programme data and measures of improvement and qualitative data from participant interviews using a structured questionnaire of closed and open-ended questions to address the specific research questions numbered above iv, v. Desk research and literature review addressed the specific research questions numbered above vi, vii.

User feedback was obtained from individuals on the programme and case studies were provided by the SME. Due to the COVID-19 pandemic and lockdown, user feedback from referrers e.g. GP or nurse was not obtained, as it was felt that at this time it would be an unnecessary burden on clinicians.

The validation only included data for participants on the programme, as such there was no control group. We were also not able to randomise the sample used as this was a referral-based service.

Quantitative Data Analysis

Anonymised data from 245 participants of the programme was provided to the University of Chester Health Matters project team for analysis. The data comprised demographic details (gender, age, postcode area), falls data (before and after), blood pressure data and a number of strength and balance related measures captured before the programme and at the end of 12 weeks (pre and post data).

Measures included:

- Timed Up and Go
- Sit to stand
- Tandem stand balance (time-held)
- Single leg balance

The physiological measures are detailed in Appendix 3.

Pre and post measures were analysed to assess whether there had been any improvement. A 20% or greater reduction in Timed Up and Go score – measurement taken prior to commencing programme and post programme completion was used as an indicator. Limited data using a modified falls efficacy questionnaire was included.

Data was entered into the Statistical Package for the Social Sciences (SPSS) (IBM, version 25) for analysis. The different data measurements were analysed using descriptive statistical analysis and expressed as frequencies, percentages, means and standard deviations.

Blood pressure was classified as follows: normal blood pressure (<140/90 mmHg) and hypertension (≥140/90 mmHg). The values were then classified according to the British Hypertension Society classification of blood pressure levels (BHS-IV) (Williams *et al*., 2004) as follows:

Table 1: Classification of blood pressure levels

Category	**Systolic blood pressure (mmHg)**	**Diastolic blood pressure (mmHg)**
Optimal blood pressure	<120	<80
Normal blood pressure	<130	<85
High-normal blood pressure	130-139	85-89
Grade 1 hypertension (mild)	140-159	90-99
Grade 2 hypertension (moderate)	160-179	100-109
Grade 3 hypertension (severe)	>/= 180	>/= 110
Isolated systolic hypertension (Grade 1)	140-159	<90
Isolated systolic hypertension (Grade 2)	>/= 160	<90

Mean pre- and post-values for the measurements were compared using the paired sample t- test. Gender differences of mean values for the various measures were determined using the independent sample t- test. Differences in mean values of the measures based on age groups were compared using one-way analysis of variance (ANOVA) after which a Tukey post hoc analysis was performed for significant associations. $P \leq 0.05$ was deemed to be statistically significant for all analysis performed.

- There were 245 individuals included in the sample for quantitative analysis
- The sample comprised all participants on the programme run by Healthbox in the Chester and Cheshire West region over the past 30 months who have been referred to the service by a clinician (GP or physiotherapist)
- Participants are those who completed the programme

Qualitative Data Analysis

To evaluate user experience of the programme, Healthbox contacted a random selection of participants by telephone who had previously attended the Strength and Balance programme. Healthbox staff read out the Participant Feedback Questionnaire (Appendix 4) to participants and recorded their answers.

The questionnaire comprised a number of closed and open-ended questions. All responses to the questionnaires were compiled into an Excel spreadsheet. Analysis was undertaken on each question separately. Results are reported for each question.

67 anonymised feedback sheets were completed and provided to the University of Chester. These were analysed thematically to assess participants' perceived benefits from attending

the Strength and Balance programme, confidence and to capture any unintended consequences of the programme.

Closed question results are reported, expressed as a percentage of the total number of responses included in the analysis.

- There were 67 individuals included in the sample for qualitative analysis.
- The sample comprised participants who provided feedback when contacted by telephone by a member of the Healthbox team.
- Client feedback was captured with a post-intervention questionnaire, specifically asking about falls and related mobility activities since the intervention.
- Feedback forms were also analysed for data relating to confidence and other unintended outcomes of relevance to this age group.
- Demographic data was not collected in the client feedback questionnaire.

Additionally, Healthbox supplied case studies from five participants.

Data Challenges

The Healthbox team who collected data made some observations relating to the completeness of some data sets:

- Demographic data was collected during the Strength and Balance programme using information sheets that were mostly completed by participants themselves. During data transcribing the Healthbox team found some of the participants' handwriting difficult to read and so where responses were unclear, these details excluded from the participant data (Excel spreadsheet) that was supplied to the University of Chester.
- Some participants elected not to provide their postcode.
- Some participants were unable to provide their age due to the presence of conditions like dementia.
- Some of the tests were not undertaken. This can be due to:

  The participant themselves feeling uncomfortable in attempting a certain test. In this instance the instructor uses their professional judgement in allowing the participant to continue with the course.

  A test may be omitted due to physiological limitation. This is common in participants who have one leg disproportionately impacted by a condition such as a stroke. In instances like this, a balance test on this leg would be unsafe. Again, an instructor is reliant on their professional judgement to decide suitability.

Market Environment Investigation

An online analysis of the regional environment was included to identify similar or alternative services available to commissioners. (To address specific research question numbered vi). This was also consistent with the approaches undertaken in the systematic reviews of Supervised Strength and Balance (Lacroix et al, 2017) in addition to Homebased Systematic review undertaken by Davies et al (2009) whilst aligning with the local delivery strategy by Cheshire West and Chester.

Capturing Added Value and Economic Impact

Desk research identified resources that had analysed costs and benefits from delivery of interventions similar to Healthbox's Strength and Balance (classified as Falls Management Exercise (FaME). Resources drawn from literature published by Public Health England 2018 illustrate:

- Cost impact [of falls]
- Quality of life impact [from falls]
- Cost effectiveness [of similar interventions]

These resources to inform the economic context for commissioning services that reduce falls within the community. (To address specific research question numbered vii)

Desk research also identified resources to illustrate levels of need within the Cheshire West and Chester community by referencing demographic data and loneliness mapping published by Cheshire West and Chester Council (2016). The need identified in these resources was compared to the geographic spread of the Healthbox Strength and Balance programme delivery to indicate whether the intervention is able to provide support where it may be needed within the community. (To address specific research question vi and provide contextual information to inform research question v)

Professionals who had referred participants to the Healthbox programme were approached for completion of a short online questionnaire to capture the outcomes they perceived for their referred clients and whether they intend to continue to refer into the Healthbox programme. (To address research question numbered vii.) However, as stated earlier this activity was not undertaken due to the limitations on services imposed by the Covid-19 situation and subsequently this data is not included.

Literature Review

Falls Prevention Interventions

The Cochrane Database of Systematic Reviews was searched to identify outcomes from existing interventions to prevent falls in older people who were living in the community.

Table 2: Cochrane Database Systematic Review Results

Search Terms	Databases	Period searched	Limiters Applied	Number of Results
fall* prevent* old* or elderly exercise or intervention community	Cochrane Library	Jan 2000 – Jan 2021	Reviews English language	2

Two relevant Cochrane reviews were identified

Figure 2: Cochrane Database Systematic Review Results

The extract below from Sherrington, C., Fairhall, N. J., Wallbank, G. K., Tiedemann, A., Michaleff, Z. A., Howard, K., Clemson, L., Hopewell, S., & Lamb, S. E. (2019), identifies risk factors for falls in older people and that exercises to improve muscle strength, balance and gait are likely to reduce or prevent falls.

> Many aspects of physical functioning deteriorate with increased age and inactivity. Impairments in muscle strength, balance control and gait are particularly strong risk factors for falls (Tinetti 1988). For example, those with poor leg extensor strength were found to be 43% more likely to fall at home than their stronger counterparts (Menant 2017). Systematic reviews have found that those with gait problems have twice the odds of falling than those without (Deandrea 2010), and that measures of balance and mobility such as the Berg Balance Scale, Timed Up and Go Test, and Five Times Sit-to-Stand Test can identify individuals at greater risk of future falls (Lusardi 2017).

Exercises that address these impairments are therefore likely to reduce the risk of falling. As Cochrane Reviews have now found that exercise improves both strength (Liu 2009), and balance (Howe 2011) in older people, exercise is likely to have a fall prevention effect through its impact on these key fall risk factors. A Cochrane Review found that exercise reduces the fear of falling (Kendrick 2014), which is also a strong predictor of falls.

A previous Cochrane Review found exercise as a single intervention, prevents falls (Gillespie 2012), and to be the most commonly tested single fall prevention intervention. Economic evaluations accompanying randomised trials have found exercise to be a cost-effective fall-prevention strategy (Davis 2010).

Exercise interventions have been found to be effective when delivered in a group-based setting or on an individual basis. The optimal features of successful fall prevention exercise programmes are not yet clear, but programmes that are multicomponent (e.g. target both strength and balance; Gillespie 2012), and programmes that include balance training, appear to be particularly effective (Sherrington 2017).

Sherrington, C., Fairhall, N. J., Wallbank, G. K., Tiedemann, A., Michaleff, Z. A., Howard, K., Clemson, L., Hopewell, S., & Lamb, S. E. (2019). Exercise for preventing falls in older people living in the community. *The Cochrane database of systematic reviews*, *1*(1), CD012424. https://doi.org/10.1002/14651858.CD012424.pub2

Gillespie LD, Robertson MC, Gillespie WJ, Sherrington C, Gates S, Clemson LM, Lamb SE. (2012) conclude: Group and home-based exercise programmes, and home safety interventions reduce rate of falls and risk of falling.

Further studies were sought to supplement these systematic reviews by reviewing the “Web of Science” where the search terms “systematic review”, “strength and balance” and “cost effectiveness” were also included. These found 4 additional reviews that had similar focus and findings, although we excluded the study by Winser et al as it primarily focused on a range of neurological disorders rather than “Strength and Balance”. Key themes were recognised namely; types of interventions, cohort comparators, risk based targeted intervention (Orton et al, 2018. Lacroix et al, 2017, Davies et al 2009).

The Healthbox Strength and Balance class exercises address strength, balance and mobility. The evidence in the three reviews cited identifies that these types of exercise can reduce falls and fear of falling. The Healthbox programme also includes educational talks and workshops across different topics related to falls prevention such as hydration, nutrition and how to get up from a fall. (https://www.healthboxcic.com/services/falls-prevention/).

Healthbox has incorporated appropriate measures within their programme to capture outputs from their intervention.

Cost of Falls

Davies et al (2009) cite the cost of falls to the Figure 3 below is extracted from Public Health England published 'A Return on Investment Tool for the Assessment of Falls Prevention Programmes for Older People Living in the Community' (February 2018) to illustrate care pathways for older people following a fall.

An ROI Tool: Assessment of Falls Prevention Programmes for Older People Living in the Community

Figure 1: Summary of care pathway following a fall (Craig et al. 2013 [26], NHS Digital [27])

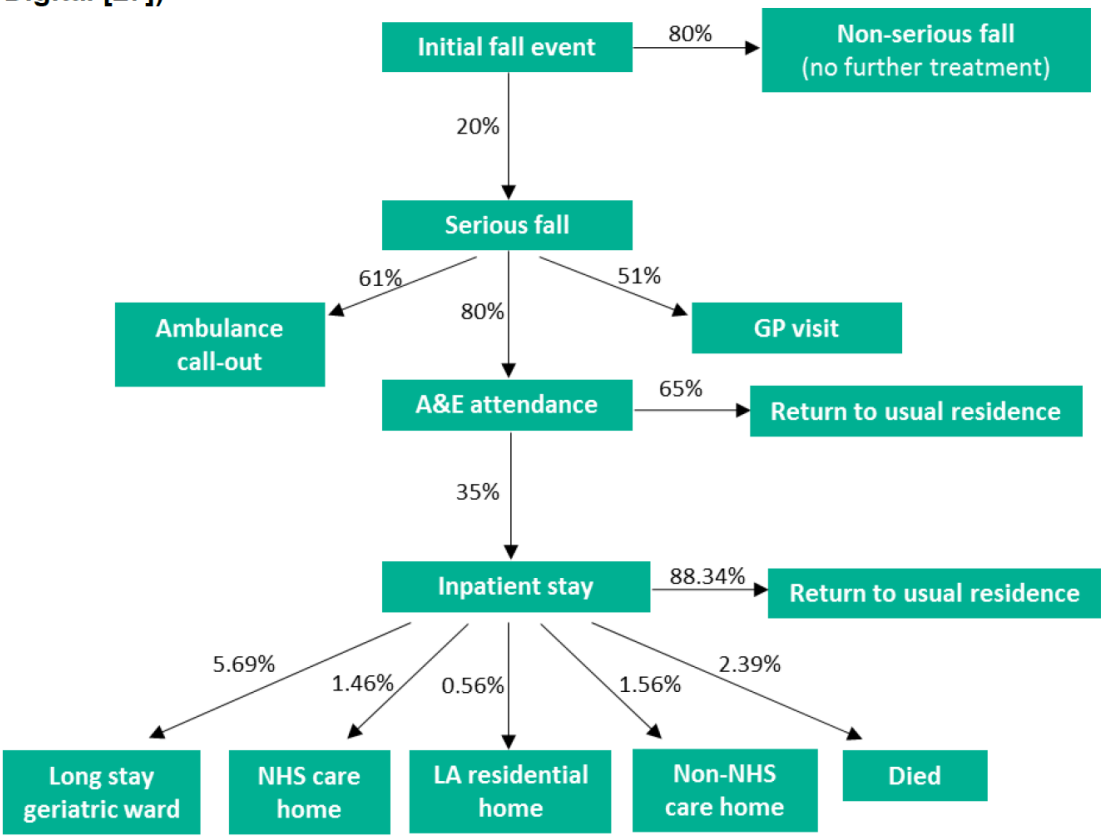

Figure 3: Summary of care pathway following a fall

This publication analyses four interventions implemented to reduce the number of falls for older people living in the community and analyses the Return on Investment (ROI) for each. The Healthbox Strength and Balance programme aligns with the descriptor, for Falls Management Exercise (FaME) and so this model used as an example cost analysis for this report.

Figure 4 below captures cost impact, quality of life impact and cost effectiveness for a FaME and can be used to illustrate the likely impacts and cost effectiveness of the Healthbox Strength and Balance Programme.

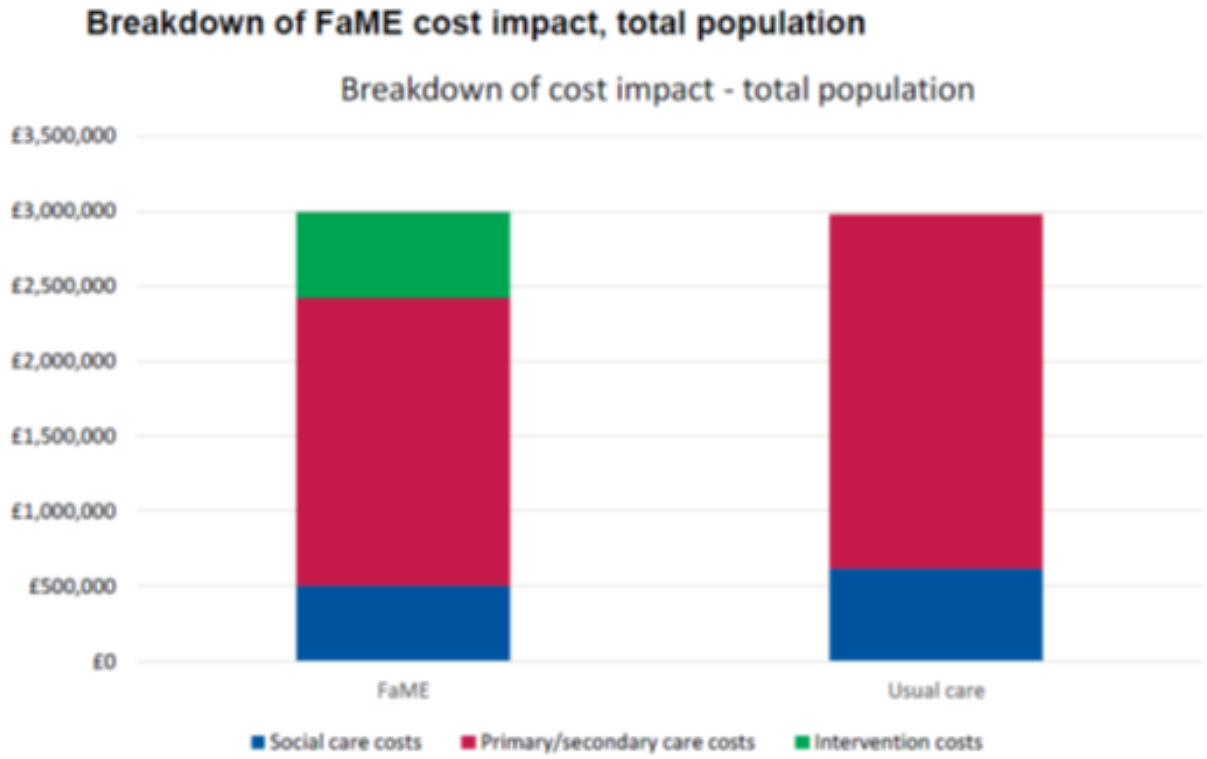

Figure 4: Summary of costs and benefits of Falls Management Exercise programmes

In the study the extracts identified the impact that FaME had on quality of life, as measured by the number of QUALY's (Quality Adjusted Life Years). Additionally, its societal return on investment (ROI) in which benefits are classified as the number of additional QUALYs generated by the intervention plus the cost savings from the intervention. Including the improved quality of life benefits exceeding costs; for every £1 invested benefits equivalent to £2.28 are generated by the intervention, indicating there is a positive return of £1.28. (PHE, 2018)

Quality of life impact of FaME for the total population and per person

	FaME	*Usual care*	Difference
Total QALYs	7,140	7,128	11.98
QALYs per person	2.8349	2.8301	0.005
Value of QALYs, per person	£170,094	£169,809	£285
Societal ROI - Benefits to cost ratio	**£2.28 : £1.00**		

Figure 5: Quality of Life Impact from FaME programmes

Additionally, the following extract from same said PHE study, shows the cost effectiveness of FaME as measured by the ICER (incremental Cost Effectiveness Ratio) and NMB (Net Monetary Benefits).

Cost-effectiveness of FaME per person

	FaME	*Usual care*	*Difference*
Total per person costs	£1,185	£1,183	£2
Total per person QALYs	2.8349	2.8301	0.005
Incremental cost-effectiveness ratio (ICER)			**Dominant**
Net monetary benefit (NMB)			**£283.07**

Figure 6: Cost-effectiveness of FaME programmes

Under these measures, the national review demonstrates the intervention is cost effective and should be commissioned, it is therefore useful to consider if the Healthbox model of application commissioned for Cheshire West and Chester deliver said benefits also.

Need Within Cheshire West and Chester

Demographic Data and Loneliness Mapping

Healthbox delivers its Strength and Balance programme from community venues across the Cheshire West and Chester Borough. Need for the programme has been identified by the local authority both in terms of its public health and the potential need within the community indicated by its demographic data and loneliness mapping.

In Cheshire West and Chester in 2014/15:

• There were 1,564 hospital admissions for people aged 65 and over, with an injury related to a fall. This figure was significantly higher than the average admission rate for England

• 68% of these admissions were in people aged over 80 years

• Falls in the over 80's were more likely to result in a fractured neck of femur, accounting for over a quarter (26%) of falls in this age group, compared to 21% in those aged 65-79

• There were 378 hospital admissions for hip fractures in people aged 65 and over. This equates to hospital costs of £2,171,232, or £5,744 per person

Extract from Cheshire West and Chester Council (2016) Improving Public Health Outcomes 2016 Public Health Annual Report

Data from the 2011 Census informed analysis undertaken by Age UK and additionally by Cheshire West and Chester Council to produce a heat map of predicted loneliness in older people. This analysis identifies that there are pockets of loneliness need predicted across the Cheshire West and Chester area.

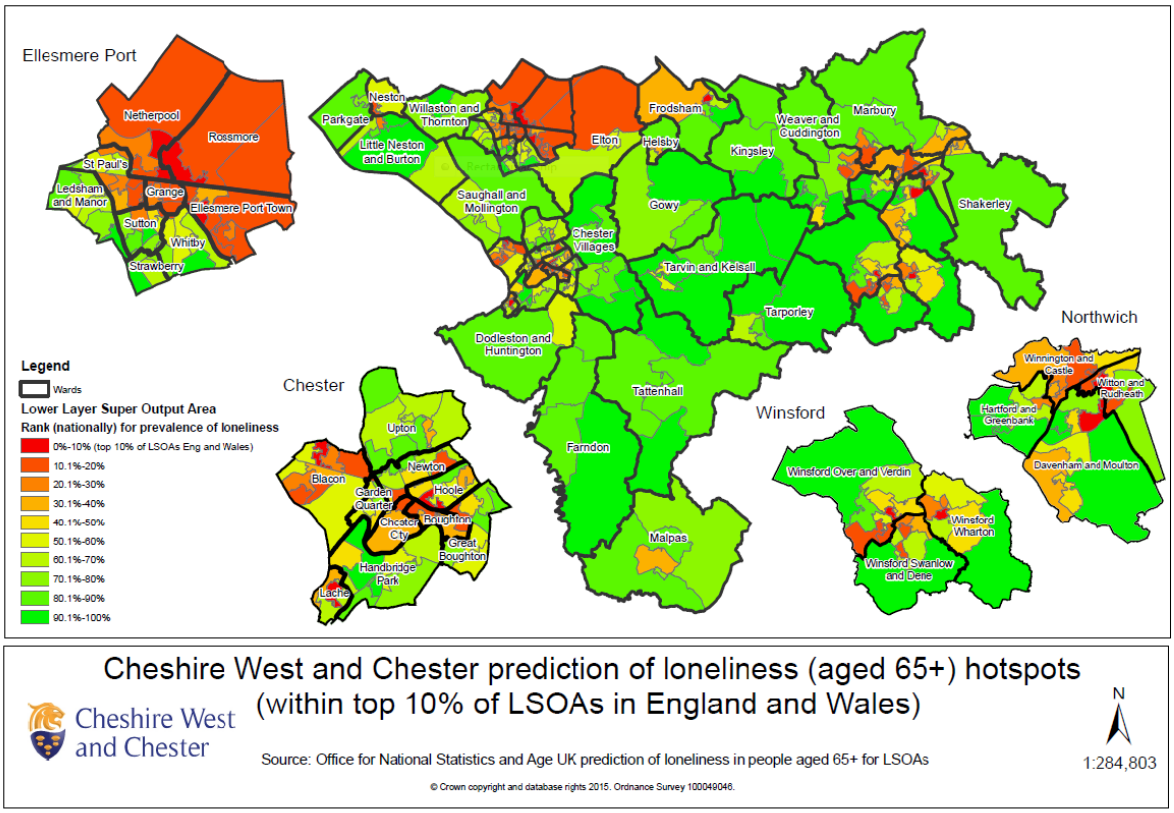

Figure 7: Cheshire West and Chester Prediction of Loneliness in Older People Map

There are ten LSOAs out of the 212 in Cheshire West and Chester which come in the top 10% of all LSOAs in England and Wales for highest predicted levels of loneliness. These are areas within the following wards;

- Blacon, Lache and Hoole in Chester
- Ellesmere Port Town, Netherpool and Rossmore in Ellesmere Port
- Witton and Rudheath, Davenham and Moulton, Winsford Over and Verdin and Winsford Wharton in Northwich and Winsford
- One LSOA in Frodsham also ranks in the top 10% nationally.

Figure 8: Reported Findings by LSOA

Cheshire West and Chester Council

Key Findings

Predictions of loneliness for older people

July 2015

In Cheshire West and Chester, the areas with highest levels of predicted loneliness are all urban areas and tend to be areas that are also deprived, though not always. General health is the main factor in predicting the likelihood of loneliness, so much so, that an older person is more likely to be lonely if they are in poor health and live with someone else than if they are in good health and live alone.

The Office for National Statistics (working with Age UK) has predicted the prevalence of loneliness amongst usual residents, living in households, aged 65 and over in England and Wales. The results are available for Local Authorities and smaller geographies including Lower Super Output Areas (LSOAs). They have not been produced for wards.

Background

The prediction values are based on analysis[1] by Age UK on the English Longitudinal Study of Ageing (ELSA) survey. ONS have applied these values to 2011 Census data. The published statistics are 'log odds' of prevalence of loneliness which form an index that can be used to compare and rank areas in terms of prevalence of loneliness. The prediction of loneliness is based on a number of factors. These are listed below in order of magnitude of effect. **'General health is bad or very bad'** is the factor that has **greatest impact on increasing the prevalence of loneliness.**

Factors that increase loneliness prevalence:

- General health is bad or very bad
- General health is fair
- Widowed or a surviving partner from a same-sex civil partnership
- Marital status is divorced, a dissolved same-sex civil partnership or separated.

Factors that decrease loneliness prevalence:

- Household status is 'do not live alone'
- Aged 75 to 79.

Not living alone has the greatest effect on decreasing the prevalence of loneliness for an individual, however this decrease could be outweighed by the increases in prevalence due to either bad or fair general health or widowed marital status. In other words, a person in poor health who did not live alone would be more likely to be lonely than someone in good health who did live alone. Age UK research[1] indicates that an older person in poor health is ten times more likely to feel lonely than one in excellent health.

[1] Davidson, S, Rossall, P (2015). Evidence Review: Loneliness in Later Life, Age UK. Accessed online www.ageuk.org.uk

1

Produced by Strategic Intelligence as part of the Joint Strategic Needs Assessment

Figure 9: Cheshire West and Chester Prediction of Loneliness in Older People

Falls Data 2014 Cheshire West and Chester

Figure 8 below produced by Cheshire West and Chester Council recommends that people with a history of falls should practise strength and balance training.

This publication also referred to the evidence based on two Cochrane reviews that group and home-based exercise can be recommended.

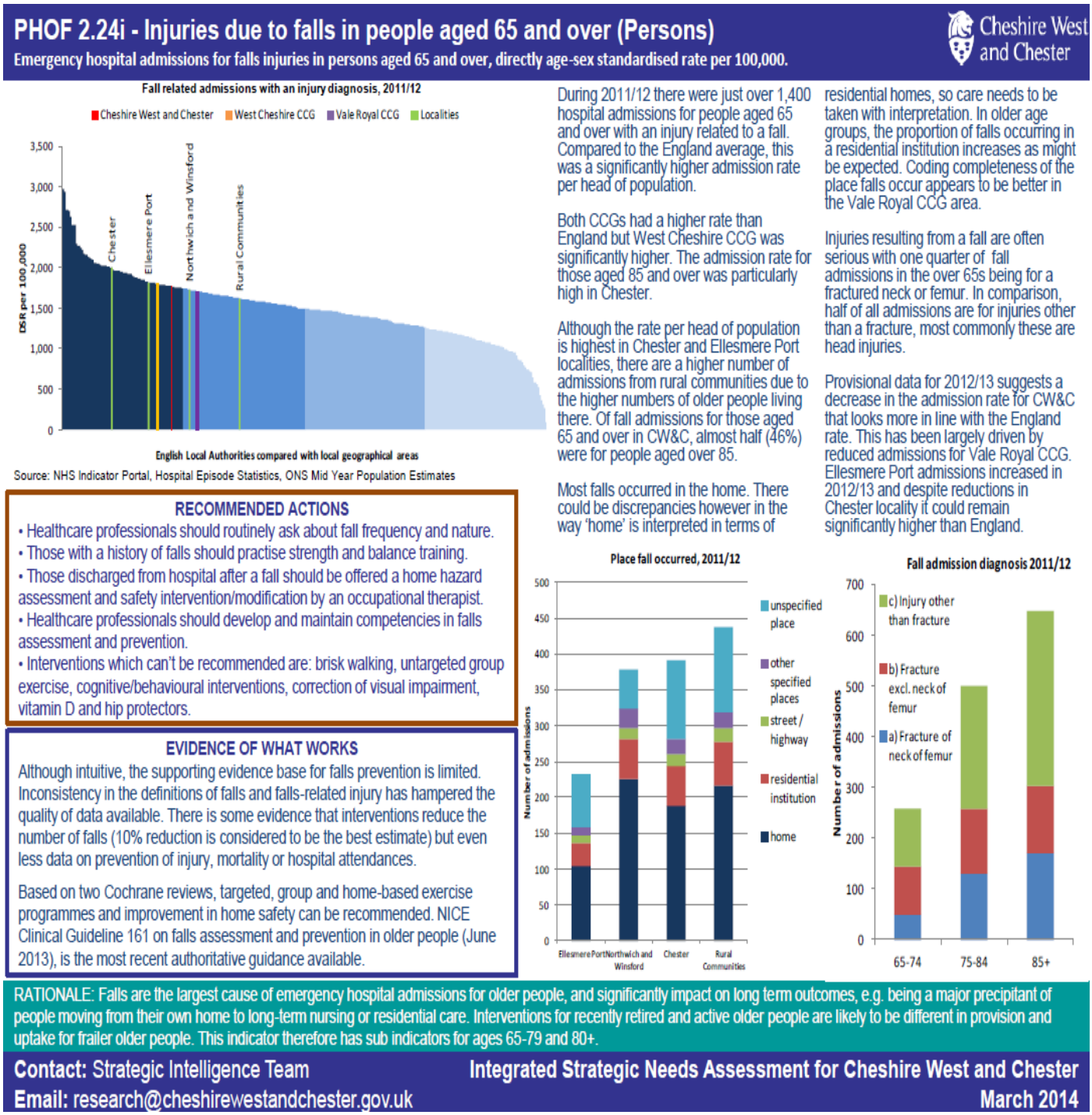

Figure 8: Injuries Due to Falls in People Aged 65 and Over Cheshire West and Chester

Regional Market Place

The Healthbox Strength and Balance programme is currently delivered across Chester and Cheshire West unitary authority area. Other organisations and agencies deliver substitute or competing services across the same area and more widely across the North West region, summarised in Table 3 below. Alternative services may be available for commissioners to consider when allocating resource to frailty services. Organisations identified as collaborators have existing links with Healthbox either for service delivery or referral pathways or possibly are new relationships to develop. Competitors are delivering similar services within region or with potential to reach into the area.

Table 3: Identification of Potential Collaborators / Alternative Services / Competitors

Organisation	Category	Location
Brio Leisure (wholly owned by Cheshire West and Chester Council)	Collaborator	Cheshire West and Cheshire
Acute Frailty Network	Collaborator	National (England)
British Geriatrics Society	Collaborator	National
Joining Up Care in Cheshire West	Collaborator	Local Cheshire Strategy
Frailty Toolkit	Collaborator	Online across England
Chartered Society of Physiotherapy	Collaborator	Across UK
Centre for Aging Better	Collaborator	Greater Manchester
Social Care	Collaborator	Via Local CCG
GP	Collaborator	Via Local CCG
Falls Coordinator	Collaborator	Via Local CCG
Geriatrician	Collaborator	Via Local CCG
Frailty Clinic / Nurses	Collaborator	Via Local CCG
Occupational Therapy	Alternative Service	Via Local CCG
Physiotherapy	Alternative Service	Via Local CCG
Dietitian	Alternative Service	Via Local CCG
NHS UK Online resources	Alternative Service	Online across UK
Moving Medicine	Competitor	Online across UK
Age UK	Competitor	Across UK
Age Well Exercise Class Referral via GP http://bridgewater.nhs.uk/haltonsthelens/fallsprevention/	Competitor	Halton Borough Council: Daresbury, Hale, Moore, Preston Brook, Runcorn, Widnes
Dance to Health®	Competitor	Crewe, Congleton, Macclesfield
Live Well Cheshire East	Competitor	Sandbach, Poynton, Alsager, Holmes Chapel, Macclesfield, Knutsford, Nantwich, Crewe, Wilmslow
Moves 4 Me	Competitor	Cheshire based, online across UK

Local Results: Targeted Programme Delivery

Healthbox is delivering services from accessible locations within local communities, which have been attended by participants living in close proximity of the venue.

Table 4 below shows participants* attending each venue, identified by postcode area, with heat mapping applied to show concentration of participant by postcode.

Table 4: Geographic Spread of Participants Attending Classes Delivered at Community Venues

	CH1	CH2	CH3	CH4	CH5	CH65	CH66	CW6	CW7	CW8	CW9	LL13	SY13	SY14	WA6	**Venue Total**
Abbots Wood CH2	1	17														**18**
Deva Point CH1	12	1	2													**15**
Ellesmere Port CH65/CH66			1			20	25								6	**52**
Farndon CH3			8	2	1							2		1		**14**
Helsby WA6															7	**7**
Hollymere CH65						4	3									**7**
Kingswood CH2	1	28	7										1	1		**38**
Lache CH4	1	2	1	7												**11**
Malpas SY14														3		**3**
Northwich CW9										15	29					**44**
Tarporley CW6			4					11								**15**
Winsford CW7								1	15							**16**
Participant Postcode Total	**15**	**48**	**23**	**9**	**1**	**24**	**28**	**12**	**15**	**15**	**29**	**2**	**1**	**5**	**13**	**240**

*Postcode data collected during attendance at Strength and Balance Classes over the previous 30 months.

Results: Quantitative Analysis

For the quantitative assessment pre- and post -intervention measures were undertaken for participants, including: falls history, blood pressure, timed-up-go, sit to stand and balance tests. Results are presented as tables with pre and post intervention identified. Data was collected by Healthbox staff during programme delivery. Details of physiological measures are included in Appendix 3.

Table 5 shows age and gender of the quantitative sample with heat mapping applied to show the highest volumes in the darker shades of green. The age group 80-89 years had the most participants (55.5%) and there were more female participants than males. Table 6 shows the fall history categorized by gender. 56.3% of the participants had previously experienced a fall.

Table 5 Age and gender of participants.

Age Band (years)	Female (%)	Male (%)	Total in Age Band (%)
40-49	2 (0.8)	1 (0.4)	3 (1.2)
50-59	4 (1.6)	2 (0.8)	6 (2.4)
60-69	14 (5.7)	1 (0.4)	15 (6.1)
70-79	41 (16.7)	16 (6.5)	57 (23.3)
80-89	105 (42.9)	31 (12.7)	136 (55.5)
90-99	11 (4.5)	14 (5.7)	25 (10.2)
Not Given	1 (0.4)	2 (0.8)	3 (1.2)
Gender Total	**178 (72.7)**	**67 (27.3)**	**245 (100.0)**

Table 6: Fall history and gender

Falls History	Female (%)	Male (%)	Total (%)
No Fall	83 (33.9)	24	107 (43.7)
Fall	95 (38.8)	43	138 (56.3)
Total	**178 (72.7)**	**67 (27.3)**	**245 (100.0)**

Table 7 presents the difference falls data by gender pre and post intervention. There is a 50% decrease in falls post intervention in both men and women.

Table 7: Difference between pre and post intervention falls data

		same falls before and after (no change in falls)	increase in fall from before	decrease in fall from pre	no fall before or after	Total
Gender	Female	48 (19.6)	3 (1.2)	47 (19.2)	80 (32.7)	178 (72.7)
	Male	22 (9.0)	0 (0.0)	21 (8.6)	24 (9.8)	67 (27.3)
	Total	**70 (28.6)**	**3 (1.2)**	**68 (27.8)**	**104 (42.4)**	**245 (100.0)**

Table 8 presents the frequency of each classification of blood pressure (using both types of classification, see earlier). Pre-intervention more of the participants have high blood pressure/hypertension (48.2%). Post intervention this number reduces (33.1%).

Table 8 Prevalence of high blood pressure/ hypertension among participants

	Pre- intervention (N=245)	Post intervention (N=245)
Classification 1*		
Normal	127 (51.8)	164 (66.9)
High blood pressure/ hypertension	118 (48.2)	81 (33.1)
Classification 2#		
Optimal	41 (16.7)	43 (17.6)
Normal	32 (13.1)	59 (24.1)
High normal	54 (22.0)	62 (25.3)
Hypertension grade 1 (mild)	5 (2.0)	6 (2.4)
Hypertension grade 2 (moderate)	10 (4.1)	4 (1.6)
Hypertension grade 3 (severe)	6 (2.4)	1 (0.4)
Isolated systolic hypertension Grade 1	74 (30.2)	60 (24.5)
Isolated systolic hypertension Grade 2	23 (9.4)	10 (4.1)

Data presented as frequency (%). # British Hypertension Society Classification. *For classification 1, normal blood pressure (BP) was defined as BP< 140/ 90 mmHg, otherwise, hypertension.

Table 9 presents the analysis of mean pre- and post-intervention measures for blood pressure and physiological measures. The findings show a mean improvement post-intervention for all the measures. However, for diastolic blood pressure, timed up-and-go and sit-to-stand measures the post-intervention changes are statistically significant ($p<0.05$).

Table 9: Comparing mean blood pressure and motion test values before and after intervention

Variable	Pre- intervention mean±SD	Post- intervention mean±SD	p- value
SBP (mmHg) n=245	138.84±19.91	133.22±15.84	< 0.001
DBP (mmHg) n=245	74.77±11.17	72.91±9.63	0.006
TUG (seconds) n=243	18.26±9.57	14.00±7.45	< 0.001
STS (repetitions in 30 seconds) n=243	8.16±3.46	9.52±3.18	< 0.001

Paired sample t- test was used to compare mean values. SBP: systolic blood pressure, DBP: diastolic blood pressure, TUG: timed up-and-go, STS: sit-to-stand.

Table 10 presents the analysis of the blood pressure and motion test analysed according to gender. 178 females and 67 males participated in the intervention. For most values there was no statistically significant observable difference between males and females. The exception is for DBP which improved significantly in females post intervention.

Table 10: Comparing mean blood pressure and physiological measures values between males and females

Variable	Male (N= 67) mean±SD	Female (N= 178) mean±SD	p-value
Blood pressure (mmHg)			
SBP pre	137.61±20.22	139.30±19.82	0.556
SBP post	131.13±16.90	134.01±15.40	0.207
DBP pre	74.30±13.10	74.94±10.39	0.718
DBP post	70.73±10.16	73.72±9.32	0.030
Timed up-and-go (seconds)			
Pre	18.08±9.51	18.32±9.62	0.860
Post	14.68±9.51	14.31±8.45	0.769

Sit-to-stand (repetitions in 30 seconds)			
Pre	8.46±3.77	8.04±3.29	0.391
Post	9.99±3.57	9.26±3.01	0.118

Mean values were compared using independent sample t- test. P- values in bold are significant at 0.05 confidence level. SBP: systolic blood pressure, DBP: diastolic blood pressure.

Table 11 compares mean blood pressure and motion tests based on age groups (40-49, 60-69, 70-79, 80-89, 90-99). There were 9 participants below age 60. Overall, we can see an improvement in all scores for all age groups based on mean values pre and post-test.

Table 11 Comparing mean blood pressure and motion test values based on age groups

Variable	**Age (years), Mean = 80.78±9.3**					**p-value**
	40-59 N = 9	60-69 N = 15	70-79 N = 57	80-89 N = 136	90-99 N = 25	
Blood pressure (mmHg)						
SBP pre	136.22±13.43	142.00±17.68	139.02±20.44	139.55±20.12	137.20±20.02	0.938
SBP post	135.33±13.53	133.27±13.36	131.07±16.96	135.04±15.25	129.36±17.86	0.349
DBP pre	79.33±9.06	74.73±7.63	75.39±11.30	74.43±11.15	74.92±13.47	0.781
DBP post	78.67±11.66	74.13±8.90	72.60±8.76	73.31±9.73	69.52±10.20	0.145
Timed up-and-go (seconds)						
TUG pre	15.80±6.39	13.39±4.75*	14.56±7.86#$	19.71±10.00	22.08±9.57	< 0.001
TUG post	11.69±4.09	10.48±4.45	11.04±4.78#$	15.80±9.95	17.20±7.90	0.001
Sit-to-stand (repetitions in 30 seconds)						
STS pre	8.89±2.80	8.73±33.33	9.35±3.27#$	7.86±3.38	6.56±3.70	0.006
STS post	9.89±1.97	11.47±3.31* @	10.58±2.74#$	9.01±3.21	8.04±3.75	< 0.001

Data presented as mean±SD. Mean values were compared using one-way analysis of variance (ANOVA) followed by a Tukey's post hoc test to determine groups that were significant. Symbols indicate mean values for age groups that were significant: * for 60-69 and 90-99; @ for 60-69 and 80-89; # for 70-79 and 80-89; and $ for 70-79 and 90-99. Mean differences are significant at 0.05 level. SBP: systolic blood pressure, DBP: diastolic blood pressure, TUG: timed up-and-go, STS: sit-to-stand

For timed-up-and-go test

1. Before intervention, 60-69 year olds took significantly fewer seconds to complete the timed-up-and-go test compared to 90-99 year olds (13.39±4.75 vs 22.08±9.57 p< 0.001) however, after the intervention, the time taken to complete the test by the two groups was not significantly different.

2. Before intervention, 70-79 year olds took significantly fewer seconds to complete the timed-up-and-go test compared to 80-89 year olds (14.56±7.86 vs 19.71±10.00 p< 0.001) and similarly after the intervention 70-79 year olds took significantly fewer seconds to complete the timed-up-and-go test compared to 80-89 year olds (11.04±4.78 vs 15.80±9.95 p= 0.001)

3. Before intervention, 70-79 year olds took significantly fewer seconds to complete the timed-up-and-go test compared to 90-99 year olds (14.56±7.86 vs 22.08±9.57 p< 0.001) and similarly after the intervention 70-79 year olds took significantly fewer seconds to complete the timed-up-and-go test compared to 80-89 year olds (11.04±4.78 vs 17.20±7.90 p= 0.001)

For sit-to-stand repetitions in 30 seconds

1. Before intervention, 70-79 year olds did significantly more sit-to-stand repetitions compared to 80-89 year olds (9.35±3.27 vs 7.86±3.38 p= 0.006) and similarly after the intervention 70-79 year olds did significantly more sit-to-stand repetitions compared to 80-89 year olds (10.58±2.74 vs 9.01±3.21 p< 0.001)

2. Before intervention, 70-79 year olds did significantly more sit-to-stand repetitions compared to 90-99 year olds (9.35±3.27 vs 6.56±3.70 p= 0.006) and similarly after the intervention 70-79 year olds did significantly more sit-to-stand repetitions compared to 90-99 year olds (10.58±2.74 vs 8.04±3.75 p< 0.001)

3. Before intervention, 60-69 year olds did not do significantly more sit-to-stand repetitions compared to 90- 99 year olds however, after the intervention, 60-69 year olds did significantly more sit-to-stand repetitions compared to 90-99 year olds (11.47±3.31 vs 8.04±3.75 p< 0.001).

4. Before intervention, 60-69 year olds did not do significantly more sit-to-stand repetitions compared to 80- 89 year olds however, after the intervention, 60-69 year olds did significantly more sit-to-stand repetitions compared to 80-89 year olds (11.47±3.31 vs 9.01±3.21 p< 0.001).

All other comparisons between the age groups were not significant.

Table 12 presents the data for the balance on one leg tests. This shows that the number of valid responses is lower than the number of overall participants because this test was only preferred if the participant felt confident or was able to (see earlier). Table 13 presents this data broken down further by age group of participants, possible number in group who could participate and the number who actually took the test and successfully completed it.

Table 12: Response rate for balance tests

Test	N	Valid responses	Did not take test
Tandem stand balance time held (seconds)			
Pre- right	245	170 (69.4)	75 (30.6)
Post- right	245	167 (68.2)	78 (31.2)
Pre- left	245	166 (67.8)	79 (32.2)
Post- left	245	165 (67.3)	80 (32.7)
Single leg stance time held (seconds)			
Pre- right	245	58 (23.7)	187 (76.3)
Post- right	245	73 (29.8)	172 (70.2)
Pre- left	245	58 (23.7)	187 (76.3)
Post left	245	74 (30.2)	171 (69.8)

Data as frequency (%).

Table 13: Response rate for balance tests based on age groups

Number in group N=		**Age groups**				
		40-59 N=9	**60-69 N=15**	**70-79 N=57**	**80-89 N=136**	**90-99 N=25**
TSB Pre right	Took test	5 (55.6)	10 (66.7)	34 (59.6)	97 (71.3)	22 (88.0)
	No test	4 (44.4)	5 (33.3)	23 (40.4)	39 (28.7)	3 (12)
TSB Pre left	Took test	5 (55.6)	10 (66.7)	34 (59.6)	96 (70.6)	19 (76.0)
	No test	4 (44.4)	5 (33.3)	23 (40.4)	40 (29.4)	6 (24.0)
TSB Post right	Took test	4 (44.4)	8 (53.3)	32 (56.1)	100 (73.5)	21 (84.0)
	No test	5 (55.6)	7 (46.7)	25 (43.9)	36 (26.5)	4 (16.0)
TSB Post left	Took test	4 (44.4)	8 (53.3)	32 (56.1)	99 (72.8)	20 (80.0)
	No test	5 (55.6)	7 (46.7)	25 (43.9)	37 (27.2)	5 (20.0)
SLS Pre right	Took test	**4 (44.4)**	4 (26.7)	20 (35.1)	28 (20.6)	1 (4.0)
	No test	5 (55.6)	11 (73.3)	37 (64.9)	108 (79.4)	24 (96.0)
SLS Pre left	Took test	**4 (44.4)**	4 (26.7)	20 (35.1)	28 (20.6)	1 (4.0)
	No test	5 (55.6)	11 (73.3)	37 (64.9)	108 (79.4)	24 (96.0)
SLS Post right	Took test	**5 (55.6)**	6 (40.0)	25 (43.9)	34 (25.0)	2 (8.0)
	No test	4 (44.4)	9 (60.0)	32 (56.1)	102 (75.0)	23 (92.0)
SLS Post left	Took test	**5 (55.6)**	7 (46.7)	25 (43.9)	34 (25.0)	2 (8.0)
	No test	4 (44.4)	8 (53.3)	32 (56.1)	102 (75.0)	23 (92.0)

Data presented as frequency (%). Column proportions are presented. TSB: tandem stand balance, SLS: single leg stance. The age group with the highest proportion of participants performing each test is highlighted in bold.

Figure 9 summarizes balance test results of participants before and after intervention. Before intervention, 6.5% of participants were unable to complete the balance test compared to only 1.6% after the intervention. Participants who were able to complete the single leg balance increased from 24% pre-intervention to 31% post-intervention. Those who completed the tandem balance test reduced from 69% pre-intervention to 67% post-intervention.

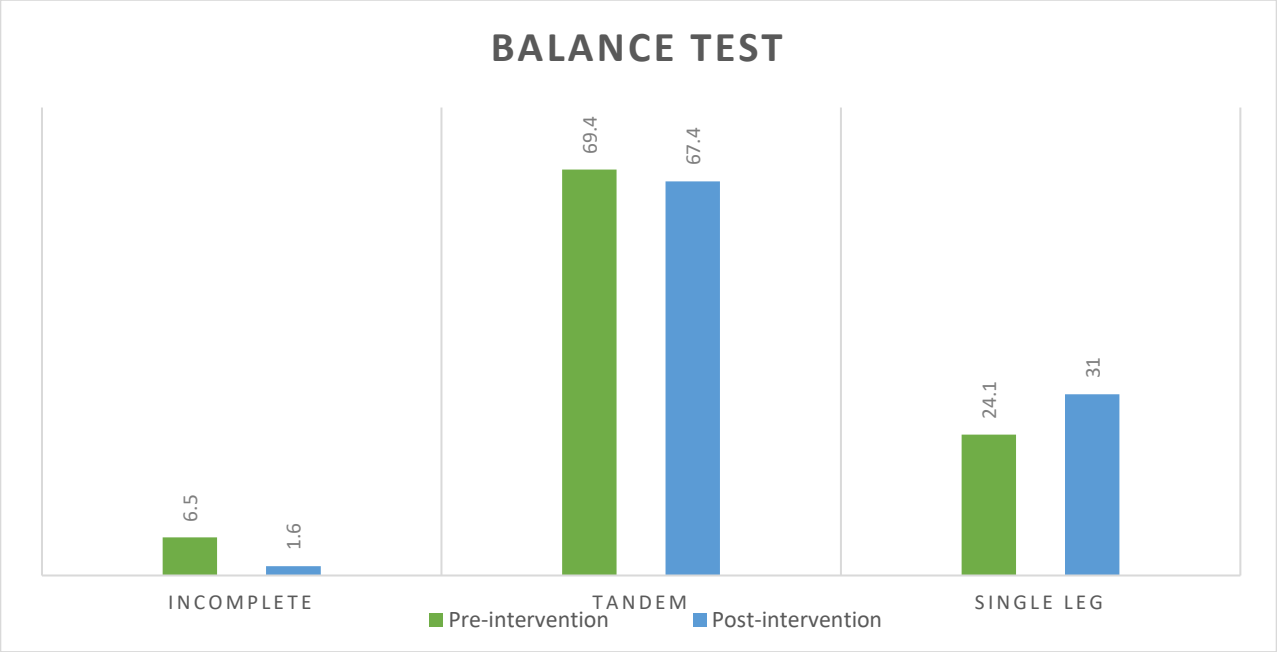

Table 14 presents the findings from analysis of mean the balance tests pre and post intervention. All tests showed a statistically significant improvement overall.

Table 14: Comparing mean values for balance tests before and after intervention

Variable	Pre- intervention mean±SD	Post- intervention mean±SD	p- value
Tandem stand balance (seconds)			
TSB Right, n=153	3.51±4.21	8.01±7.75	< 0.001
TSB Left, n=149	4.23±5.10	8.37±8.68	< 0.001
Single leg stance (seconds)			
SLS Right, n=57	6.40±7.45	13.92±10.10	< 0.001
SLS Left, n=58	7.89±9.05	15.10±11.43	< 0.001

Paired sample t- test was used to compare mean values.
TSB: tandem stand balance, SLS: single leg stance.

Table 15 compares the mean balance test values between males and females. There were no statistically significant differences in gender and the performance of these tests.

Table 15 Comparing mean balance test values between males and females

Variable	Male (mean±SD)	Female (mean±SD)	p-value
Tandem stand balance (seconds)			
Pre Right: M=49, F=121	3.63±.94	3.69±4.04	0.936
Pre Left: M=47, F=119	4.11±4.16	4.55±5.44	0.619
Post Right: M=54, F=113	8.17±9.46	7.39±6.47	0.533
Post Left: M=54, F=111	8.29±9.30	7.77±7.98	0.713
Single leg stance (seconds)			
Pre Right: M=10, F=48	7.36±9.64	6.12±6.95	0.636
Pre Left: M=10, F=48	6.33±6.74	8.21±9.49	0.554
Post Right: M=10, F=63	9.41±11.97	13.50±9.16	0.206
Post Left: M=10, F=64	10.25±5.71	14.85±11.33	0.213

Mean values were compared using independent sample t- test. P- values in bold are significant at 0.05 confidence level. M; male, F; female

Table 16 compares the mean balance test values by age group of participants. Statistically significant results are indicated in bold and described below the table.

Table 16 Comparing mean balance test values based on age groups

Variable	Age (years)					p-value
	40-59	60-69	70-79	80-89	90-99	
Tandem stand balance (seconds)						
Pre Right N=168	6.88±8.69	7.06±7.41*@	5.04±6.56	2.91±2.28	2.47±1.99	**0.001**
Pre Left N= 164	8.61±7.12	4.38±4.51	5.88±6.81	4.04±4.64	2.50±2.13	0.052
Post Right N=165	7.42±4.68	11.26±11.54	10.34±11.92	6.68±5.54	6.44±4.79	0.087
Post Left N=163	9.85±5.42	9.36±6.12	10.27±11.75	7.11±7.81	6.82±5.22	0.381
Single leg stance (seconds)						
Pre Right N=57	6.20±6.17	9.79±7.96	6.90±7.78	5.78±7.59	*1.29*	0.821
Pre Left N=57	7.51±4.89	6.84±5.47	8.92±10.67	7.70±9.16	*1.76*	0.946
Post Right N=72	10.90±6.84	20.24±10.59	13.96±9.58	11.45±9.44	12.17±9.84	0.303
Post Left N=73	12.59±5.09	21.96±17.70	13.84±10.04	13.06±10.27	18.05±12.35	0.374

Data presented as mean±SD. Mean values were compared using one-way analysis of variance (ANOVA) followed by a Tukey's post hoc test to determine groups that were significant. Symbols show mean values for age groups that were significant: * for 60-69 and 90-99, @ for 60-69 and 80-89. Group with italic mean without standard deviation had only one participant. Mean differences are significant at <0.05 level.

Results: Qualitative Analysis

Qualitative data was collected using a structured feedback sheet. Participants who had previously attended the Health and Balance programme were contacted via telephone and the questionnaire was read out with the Healthbox team member writing down the verbal responses. 67 feedback sheets were completed and thematically analysed to assess perceived benefits, confidence and to capture any unintended consequences of the programme and these were converted to variables and totaled.

Open question results were analysed thematically grouping together for key words or expressions to inform total number and turned into variables for each question. The variables for each open question are expressed as a proportion of the total number of responses, including blank or non-responses. Some participants may have mentioned more than one variable in response to any open question. Results are presented in tables with heat maps applied to highlight responses with a higher proportion of agreement among participants (indicated in green background).

Table 17 presents the analysis of all the closed questions in the participant questionnaire. All responses are presented. Some participants gave more than one response. Results express the number of participants who mentioned a specific factor. A darker shade of green represents a higher response volume for the question. Notably all participants report a benefit from participation in the programme. Strong agreement is shown for a positive social aspect to the class. More than two thirds of participants continued with activities from the classes.

Table 17 Closed questions, all themes, all responses

Completed Participant Questionnaires N = 67				
Theme	Specific Question	% Respondents Agree	% Respondents Disagree	% No Response
Perceived Value	Do you feel you have benefitted from participating in the exercise class?	100%	0%	0%
Falls History	Do you remember having any falls during the time you attended class?	30%	70%	0%
Falls Since Class	Do you remember having any falls since the class has finished?	21%	66%	13%
Changes to Exercise Routine	Have you continued with any activities from the classes?	69%	4%	27%
Covid-19 Impact	Has the Covid-19 situation affected your health and exercise routine?	88%	10%	1%
Confidence	Did taking part in the classes improve your confidence?	84%	12%	4%
Social Interaction	Do you think there is a positive social aspect to the class?	99%	1%	0%
Class Promotion	Would you recommend the sessions to a relative or friend?	97%	3%	0%
Changes to Nutrition	Did you use any of the nutritional advice?	45%	48%	7%
Class Structure	Was any section of the classes particularly enjoyable or helpful?	97%	1%	1%
	Is there any section of the classes you have NOT enjoyed?	19%	81%	0%

Table 18 presents thematic analysis of responses to the open question: Can you describe what improvements you have noticed? More than a third of respondents felt stronger after attending the classes, more than a third of respondents noticed improved mobility and a third stated their balance had improved.

All responses are presented. Some participants gave more than one response. Results express the number of participants who mentioned a specific factor. A darker shade of green represents a higher response volume for the question.

Table 18: Perceived benefits from participating in the exercise class

Participants N=67	
Can you describe what improvements you have noticed?	% Participants mention factor
Improved Strength/Feel stronger	37%
Improved Movement/Mobility/Walking Better	37%
Improved Balance/Stability/Surer Footed/ Sturdier	33%
Improved Fitness/Endurance/Less Breathless	16%
Improved Flexibility/Suppleness/Dexterity	16%
Reduced Pain/Ache	12%
Improved Wellbeing/Feel More Positive/Mental Improvement	10%
Fewer Falls	7%
Increased Confidence	4%
Improved Concentration	3%
No response given	1%

Table 19 presents thematic analysis of responses to the question: How has your routine changed? Most participants continued to engage with further classes, either with Healthbox or with other providers in the community.

All responses are presented. Some participants gave more than one response. Results express the number of participants who mentioned a specific factor. A darker shade of green represents a higher response volume for the question.

Table 19: Ongoing activity following on from attending classes

Participants N=67	
How has your routine changed?	% Participants mention variable
Joined further class(es)	87%
Continue to exercise outside of class	24%
No exercise outside class	3%
No response given	1%

Table 20 presents thematic analysis of responses to the question: What difference(s) has Covid-19 made to you? Almost two thirds of participants commented that the Covid-19 situation had prevented them from attending exercise classes. More than half of participants were trying to exercise at home instead.

All responses are presented. Some participants gave more than one response. Results express the number of participants who mentioned a specific factor. A darker shade of green represents a higher response volume for the question.

Table 20 Impact of Covid-19 situation on participants' health and exercise routines

Participants N=67	
What difference(s) has Covid-19 made to you?	% Participants mention factor
Can no longer attend class	63%
Try to exercise at home/from home instead	55%
Doing less exercise	22%
Impact on wellbeing	19%
More isolated	13%
Lost mobility or confidence gained during class	10%
No response given	6%

Table 21 presents thematic analysis of responses to the question: Can you describe any differences you noticed? [in confidence level] Half the participants (51%) stated that they felt more confident after attending the Strength and Balance sessions.

All responses are presented. Some participants gave more than one response.
Results express the number of participants who mentioned a specific factor.
A darker shade of green represents a higher response volume for the question.

Table 21 Confidence

Participants N=67	
Can you describe any differences you noticed?	% Participants mention factor
More confident	51%
Improved mobility	40%
Less worried about falling	18%
Improved social connections	15%
Improved balance	10%
None noted	9%
Feel better	6%
Felt stronger	3%
No response given	10%

Table 22 presents thematic analysis of responses to the question: Can you comment about how this [positive social aspect to the class] made you feel? Almost two thirds of participants (64%) felt that attending the classes had made them feel less isolated.

All responses are presented. Some participants gave more than one response.
Results express the number of participants who mentioned a specific factor.
A darker shade of green represents a higher response volume for the question.

Table 22: Social interaction

Participants N=67	
Can you comment about how this made you feel?	% Participants mention factor
Less isolated	64%
Enjoy	43%
Improved wellbeing	40%
Peer support	25%
Look forward to class	12%
More confident	4%
No response given	1%

Table 23 presents thematic analysis of responses to the question: Why would you recommend the sessions? More than half of the participants would recommend the Strength and Balance classes because they are beneficial.

All responses are presented. Some participants gave more than one response.
Results express the number of participants who mentioned a specific factor.
A darker shade of green represents a higher response volume for the question.

Table 23: Perceived value of classes: recommendations to family or friends

Participants N=67	
Why would you recommend the sessions?	% Participants mention factor
Class is beneficial	57%
Social element	33%
Enjoyable	22%
Improve wellbeing	22%
Have recommended already	18%
Good instructor, good class	13%
No response given	1%

Table 24 presents thematic analysis of responses to the question: Can you describe what you did differently? [relating to nutrition] A third of participants had made changes to their diet.

All responses are presented. Some participants gave more than one response.
Results express the number of participants who mentioned a specific factor.
A darker shade of green represents a higher response volume for the question.

Table 24: Nutritional education

Participants N=67	
Can you describe what you did differently?	% Participants mention factor
Made changes to diet	34%
Better awareness of a balanced diet	27%
Can't remember advice	21%
Improved hydration	16%
No change made or needed	10%
Tried new recipes	10%
Changed food preparation	4%
Reduced salt intake	4%
Joined another class	3%
No response given	25%

Table 25 presents thematic analysis of responses to the question: Can you describe which section this was? [that you enjoyed the most] Almost two thirds of participants had enjoyed all aspects of the sessions.

All responses are presented. Some participants gave more than one response.
Results express the number of participants who mentioned a specific factor.
A darker shade of green represents a higher response volume for the question.

Table 25 Shaping services: most enjoyable or helpful aspect of classes

Participants N=67	
Can you describe which section this was?	% Participants mention factor
All aspects	64%
The exercises	39%
The social side	18%
The educational talks	15%
The music	10%
Improving strength	10%
Improving balance	7%
The instructor	6%
The warmup	3%
No response given	0%

Table 26 presents thematic analysis of responses to the question: Can you describe which section this was? [that you enjoyed the least] Three quarters of the participants did not provide any response to this question, implying that they did not find any aspect of the classes unenjoyable or unhelpful.

All responses are presented. Some participants gave more than one response. Results express the number of participants who mentioned a specific factor. A darker shade of green represents a higher response volume for the question.

Table 26: Shaping services: least enjoyable or helpful aspect of classes

Participants N=67	
Can you describe which section this was?	% Participants mention factor
Exercises that are difficult to do	9%
Room environment	4%
Parking at venue	3%
Talks	1%
Acoustics	3%
Specific exercises	4%
All of the sections were good	1%
No response given	76%

Table 27 presents thematic analysis of responses to the question: Can you suggest any improvements or adjustments? [specifically, during the pandemic] A third of participants stated that no improvements or adjustments to the classes were needed.

All responses are presented. Some participants gave more than one response.
Results express the number of participants who mentioned a specific factor.
A darker shade of green represents a higher response volume for the question.

Table 27: Shaping services: suggestions for improvements or adjustments during pandemic

Participants N=67	
Can you suggest any improvements or adjustments?	% Participants mention factor
No changes	34%
Larger space at venue	27%
Digital options	7%
More talks	7%
Add new or more activities	7%
Refresher course	6%
Bring own equipment or not use equipment	6%
Warmer venue	1%
Name tags	1%
Assistance into building	1%
Different drinks	1%
Another tea towel	1%
No response given	4%

Five case studies were supplied by the SME. These are presented in Table 28 showing age, gender, engagement, outcomes and summary.

Table 28: Case study summary

Gender	Age	Engagement	Outcomes
Male	95	44 sessions	Improved balance Improved mobility and stamina
This participant was heavily reliant on using a walking frame due to balance and co-ordination problems. He was only able to walk short distances before needing to rest prior to taking part in the class. He has completed 44 exercise sessions and pays to take part in what is now a sustainable session. He is now able to move around his apartment and walk short distances with a stick and has recently started going on walks with a local history group once a week.			
Female	86	32 sessions	Improved balance Improved confidence Improved wellbeing
Prior to starting the exercise sessions, this participant used two crutches for walking and reported a lack of confidence when walking due to previous falls. She has completed 32 exercise sessions and is now paying to take part in a sustainable session. She now only uses one crutch in most instances and has reported feeling much more confident when walking and especially when transferring from sitting to standing. She has also reported feeling happier as she enjoys the classes and meeting new people.			
Female	92	74 sessions	Improved pain management Improved wellbeing
Prior to the classes this participant was struggling with her balance and joint pain from osteoarthritis. She has completed 74 sessions and has said her joint pain is much more manageable and she is taking considerably less pain medication. Also, she has reported feeling much happier as she is getting out a lot more and taking part in various activities.			

Female	81	14 sessions	Improved confidence Improved wellbeing
This participant completed 14 sessions before undergoing hip replacement surgery. She reported that although she will be disappointed to miss classes for a while post-surgery, coming to the classes beforehand has made her more confident and the moral support from participants and instructors has helped her feel positive about the operation and motivated her to come back to the class after the operation. This lady has since returned to the class which is now a sustainable session.			
Female	71	14 sessions	Fall reduction Improved confidence
Prior to taking part in the exercise sessions this participant reported having frequent falls that had severely decreased her confidence in completing activities of daily living. She also expressed disappointment in now feeling unable to tend to the communal garden where she lives, something she really enjoys. She has completed 14 sessions. Reporting she has not had any further falls since participating in these sessions, attributing this to implementing some of the interventions given in the educational portion of the sessions as well as using the exercise tea towel regularly at home. This has considerably improved her confidence and she hopes to get back in the garden this coming summer.			

Findings

i. Is there a reduction of falls post-intervention?

There was a 50% decrease in falls post intervention in both men and women who participated in the Strength and Balance programme.

This finding is illustrated in *Table 7: Difference between pre and post intervention falls data* on page 25.

ii. Does the programme result in increased muscular strength, muscular endurance and balance in individuals referred into the programme?

Mean blood pressure and physiological measures based on age groups (40-49, 60-69, 70-79, 80-89, 90-99) show an improvement in all scores for all age groups based on mean values pre and post-test.

This finding is illustrated in *Table 9: Comparing mean blood pressure and motion test values before and after intervention* on page 26.

iii. Are participants able to retrain or maintain the ability to get up from the floor to avoid a 'long lie' after a non-injurious fall?

The findings show diastolic blood pressure, timed up-and-go and sit-to-stand measures post-intervention changes are statistically significant.

This finding is illustrated in *Table 11 Comparing mean blood pressure and motion test values based on age groups* on page 27.

iv. Does the programme increase confidence and reduce the fear of falling in individuals participating in the programme?

Most participants who completed the feedback questionnaire agreed that attending the programme had increased their confidence. (85% agreed, n=67)

This finding is illustrated in *Table 17 Closed questions, all themes, all responses* on page 32.

Some participants specifically mentioned that their fear of falling was less. (18% mentioned, n=67)

This finding is illustrated in *Table 21 Confidence* on page 34.

v. What are the unintended outcomes?

Sustainability

Most participants who completed the feedback questionnaire agreed that they had continued with activities from the classes. (69% agreed, n=67)

This finding is illustrated in *Table 17 Closed questions, all themes, all responses* on page 32.

Most participants who completed the feedback questionnaire stated that they had joined a further class. (87% made this comment, n=67)

This finding is illustrated in *Table 19: Ongoing activity following on from attending classes* on page 33.

Reduction in Isolation

Almost all participants who completed the feedback questionnaire agreed that there is a positive social aspect to the class. (99% agreed, n=67)

This finding is illustrated in *Table 17 Closed questions, all themes, all responses* on page 32.

Most participants specifically mentioned that they felt less socially isolated. (64% mentioned, n=67)

Some participants specifically mentioned that attending the classes improved their feeling of wellbeing. (40% mentioned, n=67)

Both of these findings are illustrated in *Table 22: Social interaction* on page 35.

Improved Falls Related Nutrition

A substantial number of participants who completed the feedback questionnaire agreed that they had used the nutritional advice given during the classes. (45% agreed, n=67)

This finding is illustrated in *Table 17 Closed questions, all themes, all responses* on page 32.

A third of participants who completed the feedback questionnaire commented that they had adjusted their diet following nutritional advice. (34% mentioned, n=67)

This finding is illustrated in *Table 24: Nutritional education* on page 36.

vi. How does the Healthbox Strength and Balance programme compare with any regional competitors or alternative services that commissioners could refer into?

Data from agencies who refer into the Healthbox Strength and Balance programme was not collected due to limitations imposed by the Covid-19 situation.

The market environment investigation identified that there are competitors offering services regionally but Healthbox CIC has established services within their locality that have become sustainable over time due to continued referrals into the programme, retained engagement with participants and delivery from convenient locations within the local community.

Table 29 below shows attendees at each service delivery location by age band and with a heat map applied to illustrate engagement with the programme across the Cheshire West and Chester area. Higher volume is indicated by a darker shade of green.

Table 29 Attendance by Location and Age

Age Band	40-49	50-59	60-69	70-79	80-89	90-99	Not Given	Location Total
Abbots Wood				7	9	2		18
Deva Point	1		4	1	8	1		15
Ellesmere Port	1	3	4	12	33		1	54
Farndon	1		1	5	6	1		14
Helsby				3	3	1		7
Hollymere			2	1	5			8
Kingswood			3	7	22	6	1	39
Lache		2		6	3			11
Malpas				1	3			4
Northwich		1		8	26	8	1	44
Tarporley			1	3	10	1		15
Winsford				3	8	5		16
Age Band Total	**3**	**6**	**15**	**57**	**136**	**25**	**3**	**245**

Data source: Healthbox Strength and Balance Participant Baseline and Exit Measurements supplied for Real World Validation 2020

vii. Is the Strength and Balance programme a cost-effective resource compared to alternative services or the cost of interventions not being provided?

The Literature Review: Cost of Falls identified the positive net value of Falls Management Exercise Programmes (FaME), as illustrated in the table below. (A Return on Investment Tool for the Assessment of Falls Prevention Programmes for Older People Living in the Community, Public Health England, 2018)

Table 30: Costs of Falls (PHE, 2018)

Intervention	Financial ROI	Societal ROI
Otago	£0.95 : £1.00	£2.20 : £1.00
FaME group exercise	£0.99 : £1.00	£2.28 : £1.00
Tai Chi	£0.85 : £1.00	£1.97 : £1.00
Home assessment and modification	£3.17 : £1.00	£7.34 : £1.00

Specifically, the Healthbox 12 week Strength and Balance Programme has an approximate cost of £73.92 per participant. (Source: Healthbox CIC, November 2020).

This can be compared to approximate costs for primary and secondary care following a fall, illustrated below. (Public Health England, 2018)

Table 31: Primary/Secondary care unit costs (2015/16 prices) (PHE, 2018)

Event/Resource	Unit cost	Reference
GP visit	£36.00	NHS Reference Costs 2016 [31]
A&E attendance – no admission	£100.53	NHS Reference Costs 2016 [31]
A&E attendance - admission	£90.29	NHS Reference Costs 2016 [31]
Ambulance call-out	£236	NHS Reference Costs 2016 [31]
Inpatient stay – non-hip fracture	£7,949	Craig 2013 (inflated to 2015/16 prices) [26]
Inpatient stay – hip fracture	£8,955	Leal 2016 (inflated to 2015/16 prices) [8]
Hip fracture – 1st year follow-up	£527	Leal 2016 (inflated to 2015/16 prices) [8]
Hip fracture – 2nd year follow-up	£2,212	Leal 2016 (inflated to 2015/16 prices) [8]
Geriatric long stay	£14,659	ISD Scotland 2016 [32]*

*The mean number of weeks per stay (7.85) calculated by dividing the total number of inpatient weeks (47,011) by the number of discharges (5,992). This was then multiplied by the net cost per inpatient week (£1,868) to estimate the total unit cost. (Public Health England (2018) A Return on Investment Tool for the Assessment of Falls Prevention Programmes for Older People Living in the Community.)

Conclusions

There was a 50% decrease in falls and an improvement in scores for increased muscular strength, muscular endurance and balance for all individuals who had attended the Healthbox Strength and Balance Programme.

Added value from the programme included reduced social isolation and improved feelings of wellbeing. Participants reported increased confidence and reduced fear of falling.

Most participants continued to participate in exercises they had been shown during the programme either at home or by joining further classes. A substantial number of participants had used nutritional advice given during the classes with a third stating that they had adjusted their diet.

Whilst there are competitors offering services regionally, Healthbox has successfully established a sustainable programme within Cheshire East, Cheshire West and Chester. Their strategy of service delivery from accessible community venues has encouraged referrals into the programme and retained engagement with participants over the longer term.

The Strength and Balance programme is a cost effective resource for preventing falls in older people living in the community.

Recommendations

Review course content to include IT skills and accessibility

The Covid-19 pandemic had forced many participants to suspend attendance at classes. Online resources that can be delivered remotely may become an essential resource. Inclusion of access to IT and IT skills may be considerations for future workshops within the Strength and Balance programme in order to maintain engagement and build resilience within the programme.

Develop online course content and delivery

There may be potential for Healthbox to develop an app or source an appropriate one already on the market which can be tailored to support online delivery of their Strength and Balance programme, for example creating a library of video tutorials, to ensure usability and retain and improve engagement.

Provide takeaway hard copy information to act as aide memoirs

Nutritional advice was used by less than half of participants, with some feedback that participants had not remembered the information after leaving the class. It may be helpful for resources to be available for participants to take home that remind them about key messages.

Work with nutritionists to develop further nutritional resources

It would add value to the resources for the Strength and Balance programme to work with nutritionists and develop meal options specifically to address the dietary requirements of an elderly age group, particularly with a focus on protein. Age UK have also published guidance around healthy eating for the older population. Development of additional resources for the Strength and Balance dietary workshops could include meal or recipe cards for distribution during the programme, as mentioned previously, to help participants remember the sessions and make changes to their eating routines.

Review data collection methods

The Healthbox staff team reported challenges when transcribing some data collected during the programme. There may be opportunities to look at collecting information via electronic formats or by staff members assisting with handwritten form completion but with the objective of collecting accurate data in an accessible way rather than making the process more onerous than necessary.

Ensure qualitative data collection is ongoing

Addressing loneliness across Cheshire will become an increasing need in the short term as a result of the pandemic and in the longer term as the population ages. The Strength and Balance programme is already helping to reduce social isolation as articulated by comments collected from participants. A strategy for capturing this outcome more formally would be a useful addition to the measurements currently in place to demonstrate the value added by the programme across the region.

Link with referrers and clinicians to establish feedback loops

Ongoing data collection and information exchange to involve input from and feedback to referrers including clinicians is recommended together with regular opportunities to gather feedback from participants in their own words.

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Appendices

Appendix 1:

Extract from the Innovation Agency's Project Plan framework completed for Healthbox CIC. Section 4: Conducting the Validation

Appendix 2:

Clinical Frailty Scale (© 2007-2009. Version 1.2. All rights reserved. Geriatric Medicine Research, Dalhousie University, Halifax, Canada. Permission granted to copy for research and educational purposes only.)

Appendix 3:

Falls Service Physiological Measures

Appendix 4:

Healthbox Participant Follow Up Questionnaire: Strength and Balance Class

Appendix 1

STAGE FOUR: CONDUCTING THE VALIDATION

Methodology

This validation will use mixed research methods to analyse qualitative and quantitative data and provide analysis of the wider market environment. Cost benefit data will be included where this can be identified.

Logic model framework for the evaluation

Inputs	Activities	Outcomes	Impacts
Anonymised data supplied by Healthbox	Analyse existing client data	• Strength and balance related measurements. • Confidence level assessed	• Improved strength and balance should lead to reduction in falls. • Reduction in falls has a positive impact in health economy modelling in terms of reduced hospital admissions, reduced medical appointments and reduced reliance on support services. • Improved confidence should maintain independent living for longer
Anonymised data collected / supplied by Healthbox	Analyse new client data	• Falls occurrence measured. • Ongoing engagement with strength and balance activities measured. • Social aspect of class measured • Impact of Covid-19 on activities measured	• Improved strength and balance maintained over medium and longer term should lead to reduction in falls. • Increased social links should reduce risk of social isolation and loneliness. • Changes in routine arising from Covid-19 situation will inform future planning.
Anonymised data collected / supplied by Healthbox	Analyse new data from referrers	• Improvement in strength following referral measured • Improvement in balance following referral measured • Improvement in endurance following referral measured • Improvement in flexibility following referral measured • Improvement in coordination and functional movement following referral measured • Improvement in confidence following referral measured • Reduced fear of falling following referral measured • Improvement in ability to get up after a fall following referral measured • Reduction in social isolation following referral measured • Intention to continue making referrals to Healthbox measured.	• Improved strength and balance should lead to reduction in falls. • Reduction in falls has a positive impact in health economy modelling in terms of reduced hospital admissions, reduced medical appointments and reduced reliance on support services. • Improved confidence should maintain independent living for longer. • Increased social links should reduce risk of social isolation and loneliness. • Referral pathway maintained and increased demand for Healthbox programme
Competitive environment analysis	Desk research undertaken by University of Chester	• Analysis of regional competitors • Analysis of alternative services available regionally	• Improved awareness of the business operational environment • Identify opportunities for growth • Identify opportunities for strategic alliances to improve referral pathways and social prescribing

Work with key stakeholders to articulate evaluation questions on which to focus the evaluation

This RWV will address these questions:

1. Does the programme result in increased muscular strength, muscular endurance and balance in individuals referred into the programme?
2. Does the programme increase confidence and reduce the fear of falling in individuals participating in the programme?
3. Is there a reduction of falls post-intervention?
4. Are participants able to retrain or maintain the ability to get up from the floor to avoid a 'long lie' after a non-injurious fall?
5. What are the unintended outcomes? (e.g. sustainability, reduction in isolation, making new friends)
6. How does the Healthbox programme compares with any regional competitors or alternative services that commissioners could refer into.
7. Is the Healthbox programme is a cost-effective resource compared to alternative services or the cost of interventions not being provided.

Develop and implement learning and dissemination plans. Ensure selected evaluation methods can be integrated to maximise learning

RWV report will be available for SME to inform business development decisions and increase marketability of services.

Co-design an evaluation protocol with the implementation team

Three way conversations implemented between Healthbox, University of Chester and Innovation Agency

- Existing data will be anonymised and supplied to University of Chester as a data sheet.
- Questionnaire developed by University of Chester to enable Healthbox to collect new data from their clients.
- Questionnaire developed by University of Chester to enable Healthbox to collect new data from referrers into the Strength and Balance programme.

Ensure alignment with governance of the wider intervention

Ongoing dialogue between University of Chester, Healthbox and Innovation Agency

Track patient recruitment activity and be prepared to adapt to maximise numbers

Ongoing dialogue between University of Chester and Healthbox

Agree accountabilities across evaluators and implementers

Ongoing dialogue between University of Chester and Healthbox

Obtain relevant ethics clearance on evaluation protocol, if needed

Via University of Chester Faculty of Business and Management.

University of Chester application for Ethical Approval was reviewed by Chair's Action on Thursday 23rd July 2020 – Title: Evaluation of a falls prevention programme.

Outcome: Application has been successful

Appendix 2

Clinical Frailty Scale*

1 **Very Fit** – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.

2 **Well** – People who have **no active disease symptoms** but are less fit than category 1. Often, they exercise or are very **active occasionally**, e.g. seasonally.

3 **Managing Well** – People whose **medical problems are well controlled,** but are **not regularly active** beyond routine walking.

4 **Vulnerable** – While **not dependent** on others for daily help, often **symptoms limit activities.** A common complaint is being "slowed up", and/or being tired during the day.

5 **Mildly Frail** – These people often have **more evident slowing,** and need help in **high order IADLs** (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.

6 **Moderately Frail** – People need help with **all outside activities** and with **keeping house**. Inside, they often have problems with stairs and need **help with bathing** and might need minimal assistance (cuing, standby) with dressing.

7 **Severely Frail** – **Completely dependent for personal care**, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).

8 **Very Severely Frail** – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.

9. **Terminally Ill** - Approaching the end of life. This category applies to people with **a life expectancy <6 months**, who are **not otherwise evidently frail.**

Scoring frailty in people with dementia

The degree of frailty corresponds to the degree of dementia. Common **symptoms in mild dementia** include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In **moderate dementia**, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

In **severe dementia**, they cannot do personal care without help.

* 1. Canadian Study on Health & Aging, Revised 2008.
2. K. Rockwood et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489-495.

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Appendix 3

Falls Service Physiological Measures

Timed Up and Go (TUG)

Description	To determine fall risk and measure the progress of balance, sit to stand and walking.
Equipment	Stopwatch, Standard chair without arms, Measured distance of 3 meters (10 feet)
Patient Instructions:	“My commands for this test are going to be ‘ready, steady, go’. When I say go, I want you to stand up from the chair. You may use the arms of the chair to stand up or sit down. Once you are up, you may take any path you like, but I want you to move as QUICKLY as you feel safe and comfortable until you pass this piece of tape (or end of marked course) with both feet. Turn around and walk back to the chair. I will stop the clock when your back touches the back of the chair”.
Instructor Instructions:	Start timing on the word “GO” and stop timing when the subject is seated again correctly in the chair with their back resting on the back of the chair. The subject wears their regular footwear, may use any gait aid that they normally use during ambulation, but may not be assisted by another person. There is no time limit. They may stop and rest (but not sit down) if they need to.

30 Second Sit to Stand Test

Description	The 30 Second Sit to Stand Test is also known as the 30 second chair stand test (30CST), is for testing leg strength and endurance in older adults.
Equipment	Stopwatch, Standard chair without arms.
Patient Instructions:	"My commands for this test are going to be 'ready, steady, go'. When I say go you have 30 seconds to stand up from the chair and sit back down as many times as you can within that time frame. Ensuring you return back to the chair fully between each stand. You can rest in between attempts or repetitions if required."
Instructor Instructions:	The 30 seconds begins on the word "GO". While monitoring the participant's performance to ensure proper form, silently count the completion of each correct stand. The score is the total number of stands within 30 seconds (more than halfway up at the end of 30 seconds counts as a full stand). Incorrectly executed stands are not counted.

Single Leg Stance Test

Description	A measure of the ability to stand on one leg and maintain balance
Equipment	Stopwatch
Patient Instructions:	"I am going to time how long you can stand on one leg for each leg, keeping your hands on your hips. We will randomly pick one leg to start. I will start the clock when your foot lifts off the floor. You may balance using any method that you like as long as you are on one leg and the other leg is unsupported. I will stop the clock either when your foot touches the ground, your hands come off your hip, you move your standing foot or the opposite foot braces against the standing leg."
Therapist Instructions:	The test should, ideally, be performed with the patient's shoes off. Demonstrate the test for the patient. Use a coin to determine randomly which leg they will do first each time.

Appendix 4

Strength and Balance Class - Participant Feedback

Do you feel you have benefitted from participating in the exercise class? If so, how have you benefited?

_____
_____
_____

Has taking part improved your confidence?

_____

Do you believe there is a positive social aspect to the class?

_____

Would you recommend the sessions to a relative or friend?

_____

Is there any section of the classes you have found particularly enjoyable or helpful?

_____
_____

Is there any section of the classes you have NOT enjoyed?

_____
_____

Can you suggest any improvements we can make to the classes? (e.g. more exercises, more talk topics, larger venue)

_____
_____

Thank you for completing this form, we value your opinion.