



## Juggling with theory, evidence, practice, and real-world circumstances: Development of a complex community intervention to increase physical activity in inactive adults aged 50 years and older – The Move for Life Study

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### ABSTRACT

Despite well-known benefits of physical activity, in Ireland only 38 % of older adults are sufficiently active. Behavioural interventions are rarely developed systematically and, when reported, inadequate description often becomes a barrier for subsequent replication and scalability. In this article, we describe the development and characteristics of Move for Life, an intervention to reach and help inactive adults aged 50 years and older increase their physical activity. It was designed to fit within existing group-based structured physical activity programmes run by Local Sports Partnerships, thus maximising the likelihood of translation into policy and practice. Constructs from social cognitive theory, self-determination theory, and the conceptual model of group cohesion in exercise informed the conceptual model and the development of behavioural skills, social support, and group cohesion intervention strategies. Physical activity instructors supported by peer mentors, who also contributed to sustaining the intervention, implemented these strategies. Moving away from accounts of intervention development as a relatively simple linear process, we illustrate the complex interplay of theory, evidence, practice, and real-world contextual circumstances that shaped the development of Move for Life. Against this backdrop, we discuss issues relevant to the planning and reporting of behavioural and physical activity interventions in public health.

### 1. Background

The World Health Organization (WHO) physical activity guidelines (PAGL)<sup>1</sup> describe appropriate levels of physical activity (PA) necessary to enhance health (WHO, 2020). Significant evidence shows that meeting PAGL is important for disease prevention and promoting well-being, physical and mental health, and quality of life, as well as contributing to economic, social and cultural benefits (WHO, 2018).

Inactive lifestyles can have a significant impact on health (Lee et al., 2012; Pratt et al., 2016). In Ireland, only 38 % of older adults are sufficiently active to meet the PAGLs (Murtagh et al., 2015). In the counties of Limerick and Clare, where this study took place, local indicators report that 43–48 % of adults aged 55–69 meet guidelines of 150 min of moderate PA per week and 27–35 % of adults aged over 65 years meet that guideline (Gibney, Ward, Shannon, Moore, & Moran, 2018).

The rate of long-term illness increases with age, with 61 % of adults

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<sup>1</sup> PAGL, physical activity guidelines; PA, physical activity; MFL, Move for Life; IM, intervention mapping; LSP, local sports partnership.

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in Ireland aged 50+ having a chronic condition such as arthritis, osteoporosis, cardiovascular diseases, respiratory conditions and diabetes (Department of Health, 2016b). Tackling obesity and weight gain presents a major national issue as rates of obesity have doubled in recent years (Department of Health, 2016c). Recent research with Irish older adults identified that 43 % of those aged 50+ were overweight and 36 % were obese (Leahy, Nolan, O'Connell, & Kenny, 2014).

In addition to health risks associated with physical inactivity, there are also social and economic costs. Conservatively estimated, physical inactivity costs health care systems (INT\$) 53.8 billion worldwide in 2013 (Ding et al., 2016). In Ireland, the economic burden of physical inactivity could imply a cost of €1.5 billion per annum (Department of Health, 2016a). The Irish healthcare system would benefit from reduced costs if people became more physically active.

Despite many countries, including Ireland, adopting national policies or action plans to increase PA, the 2016 Lancet series describes their implementation as weak (Reis et al., 2016). The series concluded that the greatest progress is likely to occur through interventions that are effective in promoting PA, implemented at scale, regularly assessed and fully embedded in an enabling system (Reis et al., 2016). Consequently, we endeavored to develop and administer a community-based PA intervention, Move for Life (MFL), with potential to achieve these parameters by addressing inactivity, being easily implemented and delivered within the existing community infrastructures and framework designed for the promotion of PA for adults, aged 50+, in Ireland. In response to global and national reports of PA and ageing, MFL was designed in Limerick, Ireland, as a PA intervention, designed to be embedded within and complement existing programmes, which included a feasibility study and pilot randomised control trial (O'Regan et al., 2019) conducted by the University in collaboration with health service and community collaborators. Behavioural interventions are rarely developed systematically and, when reported, inadequate description often becomes a barrier for subsequent replication and scalability efforts (Michie, Van Stralen, & West, 2011). Providing detailed information about the theoretical basis and the components of an intervention prior to the evaluation of its impact on relevant outcomes is important to inform an understanding of what works and why (Zacarias, Shamah-Levy, Elton-Puente, Garbus, & Garcia, 2019). Furthermore, applying information from varied sources of evidence that are needed to inform intervention development is a challenge for even experienced health promotion practitioners (Fernandez, Ruitter, Markham, & Kok, 2019). This paper provides a detailed example of how the authors addressed this challenge to develop a complex community intervention to increase PA in inactive adults aged 50 years and older.

## 2. Development of the MFL intervention

Intervention Mapping (IM, Bartholomew Eldredge et al., 2006), a framework for theory- and evidence-informed health promotion program planning, was used to develop the MFL intervention. Grounded in a community based participatory research approach, IM provides a systematic process and detailed protocol for effective, step-by-step decision-making for intervention development considering multiple levels of influence on behaviour (Fernandez et al., 2019). IM has been used in the development of other interventions across a wide range of health behaviours, including: weight gain prevention, prevention of sexually transmittable infections, cancer screening, and PA. A systematic review of the literature investigated studies of disease prevention programmes using IM. Of the 22 studies under review, all of them identified the factors necessary for programme uptake, and the authors concluded that IM had been successfully used to plan, implement and evaluate prevention programmes (Garba & Gadanya, 2017). The IM protocol outlines the iterative path from problem identification to problem solving, using six steps that integrate theory with evidence and practical considerations.

### 2.1. Step 1: develop a logic model of the problem

The first step involved problem identification and analysis. Identification of, and consultation with, local stakeholders allowed the research team to create a logic model of the problem to be addressed. Existing local resources were mapped to maximise implementation success and heighten the likelihood of embedding any potential solution into existing infrastructure. Despite a number of PA programmes being offered locally, high proportions of adults aged 50+, particularly those of lower socio-economic status, were not meeting the PAGLs. This was identified as the primary problem to be addressed.

#### 2.1.1. Understanding the context

**2.1.1.1. Understanding the setting.** The geographical setting for MFL encompasses two counties, Clare - population of 118,817 (33.5 % aged 50+) and Limerick - population of 194,899 (31.5 % aged 50+) (Central Statistics Office, 2016). Prevalence of not meeting PAGL was high (Clare 57 %; Limerick, 63 %) and unemployment rates were higher than the national average (CSO, 2016). According to relative deprivation index scores, both Limerick and Clare are below the national average (Pobal, 2016). Additionally, Limerick has the lowest number of recreational facilities nationally (CSO, 2018). PA initiatives meeting urban and rural communities' needs that are implementable within existing structures and resources and can be upscaled require development.

**2.1.1.2. Understanding the existing PA infrastructure.** In 2005, Sport Ireland developed a network of Local Sports Partnerships (LSPs) across Ireland with the purpose of promoting participation in sport at a local level. The LSPs adhered to a "Sport for All" philosophy and were tasked with the creation and implementation of plans for long-term sustainable local sport development and delivery of programmes for all (Sport Ireland, 2016). Limerick and Clare have two LSPs, one in each county. Subsequently, Community Sport and PA Hubs were developed within LSP areas as part of the National Physical Activity Plan (Get Ireland Active, 2016). These Hubs organised by the LSP have a remit to increase engagement in PA amongst disadvantaged, marginalised and hard to reach groups. Such Hubs already existed in Clare and Limerick and had an established track record in recruiting inactive individuals and engaging them in PA programmes.

**2.1.1.3. Understanding the current provision of PA promotion to the target group.** Existing PA programmes run by both LSPs catering for inactive adults were mapped by the research team, showing over 50 different PA opportunities existed. In consultation with the LSP co-ordinators and local agencies, four programmes were identified as the most suitable activities offered to inactive adults aged 50+ years. These programmes were Men on the Move, Women on Wheels/Bike for Life, Get Ireland Walking and the Go for Life Games. All four programmes were developed by national agencies and disseminated to the LSP network for implementation. The programmes ranged from traditional researcher driven efficacious interventions (i.e., programme was evidence-based practice) or interventions that had grown organically within the LSP but as of yet had no, or limited, practice-based evidence of effectiveness (Reis et al., 2016). Table 1 provides details of the four programmes identified by the LSPs as their best examples of service provision to the local community.

Interventions based solely on evidence of efficacy often fail to achieve anticipated population outcomes (Rychetnik et al., 2012). Ideally, interventions should be both effective and usable (or translatable). Each LSP programme was assessed for its effectiveness and usability, based on criteria developed by Fixsen and colleagues (Fixsen, Blase, Naoom, & Wallace, 2009), by a member of the research team by analysing the documentation on the programme (Table 2).

**Table 1**  
Programme Description and Evidence of Effectiveness.

Name of the Programme	Target Group	Nature of the Programme	Published Evidence of Effectiveness/Theoretical framework
Men on the Move (2015)	Inactive Men	Create a preventive health culture among men through promoting PA and education on healthy lifestyles. 12 week duration; 2 sessions per week; 60 min. per session. Recreational Sport made up of leagues, friendly targeting and fielding games; leading to national games. 8 week duration; 1 session per week; 60–90 mins per session. Beginners cycling programme developed by National Governing Body for Cycling in Ireland.	Yes (Carroll et al., 2019)/Social Cognitive Theory
Go for Life Games (2012)	Inactive Older Adults	Community walking programme developed by National Governing Body for Walking in Ireland. 8-10 week duration; 1 session per week; 60–90 mins per session.	No
Women on Wheels/Bike for Life (2017)	Inactive Women/Inactive adults	Community walking programme developed by National Governing Body for Walking in Ireland. 8-10 week duration; 1 session per week; 60–90 mins per session.	No
Get Ireland Walking (2012)	Inactive Adults	Community walking programme developed by National Governing Body for Walking in Ireland. 8-10 week duration; 1 session per week; 60–90 mins per session.	No

Note. Date in brackets indicates year when the program started.

**Table 2**  
Assessment of usability of LSP PA programmes.

	Go for Life	Men on the Move	Get Ireland Walking	Women on Wheels	Bike for Life	
1	Clear Description Clear philosophy, values and principles	Yes	Yes	Yes	–	Yes
	Clear inclusion/exclusion criteria	Yes	Yes	–	Yes	–
	Clear Essential Function					
2	A clear outline of the features that must be present	Yes	Yes	Yes	–	–
	Operational Definition					
	Can it be taught?	Yes	–	Yes	Yes	Yes
3	Can it be learned?	Yes	–	Yes	Yes	Yes
	Can it be done in practice?	Yes	–	Yes	Yes	Yes
	Can it be assessed in practice?	–	Yes	–	–	–
	Practical Performance Assessment					
4	Fidelity*	Yes	Yes	Yes	Yes	Yes
	Practical enough to repeat time after time	Yes	–	Yes	Yes	Yes

Note. Yes = evidence available within programme description; - = Inconclusive based on published document.

\* Assessment of fidelity relies on reports from LSPs on factors such as quantity of sessions delivered as per programme guidelines.

2.2. Step 2: logic model of change

Staff shortages can complicate the delivery of health promotion efforts, thus interventions that are peer-delivered or peer-assisted could have considerable implications for reach and sustainability (Matz-Costa, Howard, Castaneda-Sceppa, Diaz-Valdes Iriarte, & Lachman, 2019; Petosa & Smith, 2014). The strategy employed by MFL was to explore how best to enhance the effectiveness and to broaden the reach of the professional PA instructor to the participants (inactive 50+) by augmenting existing PA programmes with training for instructors and the addition of a peer-assisted mentor support element (Matz-Costa et al., 2019). If effective, this approach would maximise impact of any PA programme run by LSPs, consequently increasing likelihood of real change, sustainability and scalability. Table 3 shows the MFL logic model of change, including situation, assumptions and external factors that may possibly affect success of the intervention.

While the logic model was being developed, key informant interviews were also conducted to help refine this model, inform the MFL intervention development and maximise the likelihood of its successful implementation (O'Regan et al., 2020). Three groups of stakeholders were recruited: participants of existing PA programmes, professionals involved in the design and delivery of programmes and community advocates who would be aware and supportive of PA promotion for this population. The intervention design team were specifically interested in finding out from these stakeholders how to optimise recruitment, sustainability and scalability.

The intervention designers employed a purposive recruitment strategy to ensure that participant representation was balanced across the stakeholder groups, and so that participants from each of the existing programmes was represented. Data collection involved both one-to-one interviews (n = 18 participants) and four focus groups (N = 29 participants). Participants' experiences were investigated and theoretical concepts, e.g. peer mentoring, were explored. The data were transcribed verbatim, coded by an interdisciplinary team of experienced qualitative researchers, and analysed thematically.

It can be challenging to recruit older adults to PA interventions (Martinson et al., 2010), and strategies to overcome this emerged from this phase of the process, including: age-appropriate messaging; involving community assets; and non-traditional recruitment methods such as 'scouting' to target harder to reach older adults. Principles underpinning programme sustainability included: suitable infrastructure; individually tailored activities; local ownership; and 'full value contract', whereby all participants are made to feel respected. Finally, for future scaling-up of this intervention, the following were considered important: identifying local assets and involving them early in the planning.

2.2.1. Determinants of change

Identification of mechanisms through which the behavioural change objectives could be achieved involved a dual process: a review of the literature and a synthesis of data from the stakeholder interviews. In light of the expected outcomes and the population of interest, the evidence supported the use of multiple theoretical frameworks. The social cognitive theory (Bandura, 1998) was initially selected as a guiding framework. It posits a multi-faceted model whereby personal, environmental and behavioural factors influence each other reciprocally to shape an individual's self-efficacy, a key determinant of PA and exercise behaviour in adults (Rhodes, Zhang, & Zhang, 2020). Self-determination theory (Deci & Ryan, 2004) was also incorporated as a guiding framework due to its complementary focus on addressing factors affecting a person's basic psychological needs for competence, autonomy and relatedness when taking part in activities, which research suggests are important for understanding PA and exercise behaviour in adults (Teixeira, Carraça, Markland, Silva, & Ryan, 2012).

Data from the key informant interviews were largely supportive of the theoretical determinants of PA participation identified above,

**Table 3**  
The MFL logic model of change including situation, assumptions and external factors.

Programme Goals					
To enhance the effectiveness of existing PA programmes in increasing PA in inactive 50+					
To broaden the reach of the existing programmes and to make them more sustainable long term					
SITUATION	INPUTS/RESOURCES	ACTIVITIES	AUDIENCE	OUTPUTS	OUTCOMES
Inactive adults aged 50+ are not engaging in LSP led opportunities to become more physically active	<ul style="list-style-type: none"> <li>Established PA Hubs within each community</li> <li>Established PA programmes suitable for target population</li> <li>Funding to run programmes</li> <li>Tutors to teach programmes</li> <li>Access to potential peer mentors to assist with programmes</li> <li>Physical venues/facilities</li> </ul>	8–12 week LSP structured exercise programmes – MOTM, GFL, GIW and WOW/BFL  MFL Tutor training workshop* x6 hours. Including MFL training manual, with capacity building interactive sessions, online support	Inactive older adults aged 50+ years  Tutors of the LSP programmes	# LSP programmes offered  # Tutors trained for MFL  # MFL lessons run by Tutors during the LSP programme  # Peer mentors recruited and trained for MFL	Short term (3 months) <ul style="list-style-type: none"> <li># Inactive 50+ recruited</li> <li>Average programme attendance rate</li> <li>Increased MVPA, LIPA, and compliance with PA guidelines</li> <li>Decreased SB</li> <li>Enhanced behaviour change capacity (social support and connections, BCT use and confidence in PA)</li> </ul> Medium Term (6 months)
Staff shortages in LSPs make it difficult to reach those who are most in need of PA and sustain efforts	<ul style="list-style-type: none"> <li>Equipment for programme activities</li> <li>Access to established recruitment networks</li> </ul>	MFL Peer mentoring workshop* by 3 h. Including MFL handbook, with capacity building interactive sessions to generate peer support and online support	Peer mentors within the LSP programmes	# MFL peer mentors actively promoting PA after programme	<ul style="list-style-type: none"> <li># participants still in contact for PA support</li> <li>Increased MVPA, LIPA, and compliance with PA guidelines</li> <li>Decreased SB</li> <li>Enhanced behaviour change capacity</li> <li>Improved QoL, MWB</li> </ul>
Assumptions: Insufficiently active 50+ will be interested in MFL. LSP tutors will be technically competent. Hubs are functioning physical settings with required space and equipment. Existing PA programmes are usable but evidence of efficacy is limited. Peer mentors will be easy to recruit. The broad age range 50–100 years will be challenging to meet.			External Factors: Influence of physical environment (quality and availability of venues for PA programmes), seasonality and weather (very hot to very cold), co-morbidity of participants, influence of social environment (friends and family), actual number who attended classes, unexpected changes to the programmes due to staffing.		

Note: MOTM = Men on the Move; GFL = Go for Life; GIW = Get Ireland Walking; WOW = Women on Wheels; BFL = Bike for Life; MVPA = moderate to vigorous physical activity; LIPA = light physical activity; SB = sedentary behaviour; QOL = quality of life; MWB = mental wellbeing; BCT = behaviour change technique. \*Workshop based on addressing determinants of change outlined in MFL conceptual framework.

highlighting, for example, factors such as the importance of achieving improvements in skill and/or fitness from their PA programme, while in parallel recognising the social dimension of participation and the importance of an enjoyable, safe and welcoming environment. The prominence of the social dimension of participation in the key informant accounts, along with the realisation that the MFL intervention attempts to change individual behaviour in a group context (Beauchamp & Eys, 2008), led to the incorporation of a conceptual framework for designing group dynamics-based PA interventions (Carron & Spink, 1993). In particular, task (i.e. how well participants work together toward a common goal) and social (i.e., how much participants enjoy working with each other toward the goal) dimensions of group cohesion became targets for the development of strategies to increase group cohesion and improve primary and secondary behavioural outcomes.

2.3. Step 3: select theory-based intervention methods and translate them into practice

Theory-based methods, or behaviour change methods, are general techniques or processes that have been shown to change one or more determinants of behaviour (Kok et al., 2016). We used three strategies to translate the MFL model into practical behaviour change techniques (BCTs). These included 1) evaluating the literature, specifically probing existing evidence-based interventions that targeted a similar population, context and outcomes; 2) an iterative process whereby members of the research team proposed, assessed, adopted and/or rejected BCTs matched to the theoretical model for inclusion, and 3) a co-design process, whereby key stakeholders provided input into the

development of the MFL intervention.

The literature identified key BCTs to directly address the personal, behavioural or social determinants identified as important for achieving the MFL primary outcomes. Specifically, the use of cognitive and behavioural skills incorporated into the MFL programme was informed by the Walking for Wellbeing in the West programme (Fitzsimons et al., 2008) and the PATHway project (Walsh et al., 2019). It was also informed by existing taxonomies and reviews of effectiveness of behaviour change techniques (French, Olander, Chisholm, & Mc Sharry, 2014; Michie et al., 2013) and available evidence-based resources for practitioners, such as the Physical Activity Counselling Toolkit (Centre for Active Living, 2018).

Strategies to address the different types of social support (tangible, emotional) were derived from the literature on effectiveness of PA interventions for adults (Partnership for Prevention, 2013) and existing practical applications of this literature in local and international contexts (Irish Heart Foundation, 2015; Partnership for Prevention, 2008). Self-determination theory factors, namely the basic psychological needs for autonomy and relatedness were addressed through strategies derived from the literature (Deci & Ryan, 2004) and existing practical applications, for example the Go for Life Fitline resource manual (Age and Opportunity, 2018). Finally, task and social dimensions of group cohesion were addressed by means of strategies drawn from the literature (Beauchamp & Eys, 2008), and practical applications of underlying theory (Estabrooks & Glasgow, 2006; Estabrooks, Fox, Doerksen, Bradshaw, & King, 2005).

The behaviour change methods derived through this process were mapped to a taxonomy of BCTs (Michie et al., 2013), which resulted in

37 identified BCTs. Information provided in Tables 4 and 5 show intervention features and link the various intervention components to the theory they were derived from and the specific BCTs employed. To enhance the likelihood of intervention acceptance and implementation, a co-design process was recognised as an integral aspect of the preparatory work. This involved stakeholder and participant consultation to create a context specific, fit-for-purpose, user-centred intervention. Although the MFL Working Group and the Steering Committee included appropriate representation of stakeholders such as local government and non-government agencies, researchers from several relevant disciplines, and practitioners in the field, additional input was sought from key stakeholder groups including LSP administrators and PA professionals, and potential MFL participants. This was done to ensure appropriateness of the programme to target the local participant population and context. Feedback from these meetings led to some changes in content and format resulting in a more user friendly and realistic programme.

2.4. Step 4: integrate the practical applications into an organised programme

MFL was designed to be easily embedded within existing group-

**Table 4**  
Example of the MFL features for Week 1 of 12-week programme mapped to behaviour change techniques used and MFL conceptual framework.

Week #: MFL feature	Description	Behaviour Change Technique used	MFL Conceptual Framework
1: Welcome & Warm up	Welcome participants using names and handshake, invite participants to shake hands and say hello to each other. 'Grab a partner' and have a chat about their favourite physical activities and hobbies as they complete the warm-up Activities corresponding to specific MFL programme. Emphasis on clear explanation of tasks and demonstration of skills (when necessary), appropriate progressions, and specific feedback and encouragement to participants. Use autonomy supportive style of communication. Participants share reasons for joining program (partnered or small group cool-down involving appropriate activity)	3.3 Social support (emotional)	SCT: Person/Social Environment.
		3.1 Social support (un-specified)	Group Integration/Cohesion
1-12: Main body of the class; specific practical and technical skills		2.2 Feedback on behaviour	SCT: Behaviour
		2.7 Feedback on outcomes of behaviour	
		4.1 Instruction of how to perform PA behaviour	
		6.1 Demonstration of PA behaviour	SDT: Autonomy
1: Cool Down		8.1 Behavioural Practice/rehearsal	
		8.7 Graded tasks	
1: Homework	Introduce and explain health benefits of PA hand-out as 'homework'	5.1 Information about health consequences 5.2 Salience of consequences 5.6 Information about social and emotional consequences	

Note: SCT = Social Cognitive Theory; SDT = Self-Determination Theory.

**Table 5**

The full MFL programme mapped into theory-based behaviour change techniques and their sequence.

Person	Environment: Social	Behaviour
<u>Beliefs/Attitudes/Knowledge</u>	<u>Social Support/Relatedness/Group Cohesion</u>	<u>Programme attendance</u>
5.1 Information about health consequences (Wk 1,4)	3.1 Social support (un-specified) (Wk 1-12)	2.2 Feedback on behaviour (Wk 1-12)
5.2 Salience of consequences (Wk 1,2,3,4)	3.2 Social support (practical) (Wk 1,2,4,8)	<u>Increase MVPA</u>
5.6 Info about social & emotional conseq. (Wk 1,4)	3.3 Social support (emotional) (Wk 2, 4, 5,8)	2.2 Feedback on behaviour (Wk 1-12)
9.1 Credible source (Wk 2)	6.3 Information about others' approval	2.6 Biofeedback (Wk1-12)
10.9 Self-reward (Wk 12)	10.4 Social reward (Wk 10, 12)	4.1 Instruction of how to perform PA behaviour (Wk 1-12)
10.10. Reward (outcome) (Wk 12)	10.5 Social incentive (Wk 9, 10)	6.1 Demonstration of PA behaviour (Wk 1-12)
15.1 Verbal persuasion about capability (Wk 2,5,6,7)	12.2 Restructuring of the social environment. (Wk 3)	8.1 Behavioural Practice/rehearsal (Wk 1-12)
15.3 Focus on past success (Wk 2)		8.4 Habit Formation (Wk 1-12)
<u>Intentions</u>		
1.3 Goal setting (behaviour) (Wk 5,6,7)		
1.5. Review behaviour goal(s) (Wk 8)	16.3 Vicarious consequences (Wk 8)	
1.4 Action planning (Wk, 6,8,10, 12)		
<u>Autonomy</u>		
1.2 Problem Solving (Wk 3, 8,10,11,12)		
2.3 Self-monitoring of behaviour (Wk 4,5,10)		
2.7 Feedback on outcomes of behaviour (Wk 7,9,10,11)	Environment: Physical	8.7 Graded tasks (Wk 1-12)
1.8 Behavioural contract (Wk 7, 9,11)	<u>Physical</u>	
<u>Outcome Expectations</u>		
9.2 Pros and Cons (Wk 4,5)		
9.3 Comparative imagining of future outcomes (Wk 2)	12.1 Restructuring the physical environment (Wk 3)	
13.5 Identity associated with changed behaviour (Wk 11)		

Note. Sequence assumes 12-week programme duration.

based structured PA programmes run by the LSPs. MFL consists of three components designed to target the theory derived BCTs identified as the active ingredients for change: a workshop for LSP professional PA instructors supported by a programme handbook, a workshop for peer mentors and a programme handbook for MFL participants.

The instructor training workshop was facilitated by the research team and took place over six hours on two separate occasions. The learning outcomes were for instructors to become familiar with a behaviour change programme designed to encourage inactive 50+ to become more active (Table 6). The instructors would then teach the programme to the MFL participants by embedding it within their already structured PA programme. Such programmes took place over 12-, 10- or 8 weeks. Adaptations were made to the originally developed 12-week MFL augmented programme to fit the needs of shorter programmes. In addition to exposure to the behaviour change strategies targeted in the

**Table 6**  
Behaviour Change Strategies Covered in MFL Training Workshop.

Cognitive and Behavioural Skills	
Aim/Dimension	Strategy
<ul style="list-style-type: none"> <li>• Reasons for participation</li> <li>• Benefits of PA</li> <li>• Knowledge of PA guidelines</li> <li>• Rating perceived effort</li> <li>• Opportunities to increase PA</li> <li>• Decisional balance (pros and cons)</li> <li>• Goal setting and self-monitoring</li> <li>• Overcoming barriers/problem solving</li> <li>• Relapse prevention</li> </ul>	<ul style="list-style-type: none"> <li>• Instructor-facilitated group discussion (e.g., provide information, reinforce progress, address barriers)</li> <li>• Partnered and small group activities involving sharing/discussion</li> <li>• 'Homework' weekly handouts (concise info + self-reflection)</li> </ul>
Social Support	
Aim/Dimension	Strategy
<ul style="list-style-type: none"> <li>• Build, strengthen, and maintain social networks that support increases in PA</li> <li>• Instrumental (providing direct assistance)</li> <li>• Informational (sharing knowledge about resources)</li> <li>• Emotional (demonstrating concern, caring, or affection)</li> </ul>	<ul style="list-style-type: none"> <li>• Partnered and small group activities involving sharing/discussion</li> <li>• Ongoing feedback and encouragement from other participants</li> <li>• PA contract</li> <li>• Buddy system</li> <li>• 'Social time' after activity</li> </ul>
Group Cohesion	
Aim/Dimension	Strategy
<ul style="list-style-type: none"> <li>• Provide opportunities for group social interaction</li> <li>• Foster positive group dynamics</li> <li>• Develop appropriate group norms</li> <li>• Develop sense of group identity/distinctiveness</li> <li>• Build a sense of group integration around task and social aspects of activity</li> </ul> <p>■ Pedagogy underpinned by autonomy support and mastery climate, augmented by peer mentoring and support</p>	<ul style="list-style-type: none"> <li>• Cooperative activities and group challenges</li> <li>• 'Friendly' competition games</li> <li>• Develop sense of group distinctiveness</li> <li>• Assign group roles to participants</li> <li>• Group goal setting and problem solving</li> <li>• 'Social time' after activity</li> <li>• Occasional 'get togethers' outside of activity</li> </ul>

programme, the training workshop for instructors covered fundamental pedagogical principles about how to present tasks and give specific feedback and encouragement to learners, as well as applied notions of intrinsic motivation, autonomy supportive communication, and creating a mastery- or learning-oriented climate. Discussions also took part to elicit the instructors' views on the role of peer mentors. As part of such discussions, the instructors shared ideas on how to facilitate the role of peer mentors and were encouraged to express their needs for support from the research team concerning working with mentors.

A programme of training of three hours in duration was developed and delivered for the peer mentors by the research team. The training programme included the rationale for mentoring and its potential impact, and principles of effective communication with mentees based on motivational interviewing and suggestions for group facilitation and sustainability. The concept was to develop a 'social network' or a 'community of practice' for PA promotion within their community Hub (Pyrko, Dörfler, & Eden, 2017). In addition, the peer mentors' role included becoming a source of organisational (e.g. ensuring the hall was ready or equipment was available) and informational support (e.g. knowing what other opportunities were available locally for their group). To assist in this role, a member of staff from their local LSP discussed how to make the best use of local opportunities, giving contact details and answering any questions on insurance, health screening, financial matters and access to instructors at the end of the PA

programme.

### 2.5. Step 5: adoption, implementation, and sustainability of the programme in real-life contexts

Adoption, implementation, and sustainability of the programme in real-life contexts was an overarching consideration from the programme's inception that we incorporated at every step of the intervention development process. To maximise potential for adoption, implementation and sustainability of MFL, we took advantage of an existing network of publicly funded LSPs across Ireland tasked with the creation and implementation of plans for long-term sustainable local sport development and delivery of programmes for all. Specifically, we formed a partnership with Limerick and Clare LSPs, where Community Sport and PA Hubs with a remit to increase engagement in PA amongst disadvantaged, marginalised and hard to reach groups already existed and had an established record of recruiting inactive individuals and engaging them in PA programmes.

Rather than using a common approach in which researchers create a programme, implement it in a community setting and then evaluate and disseminate it, we engaged in a co-design process with LSP and other relevant stakeholders. The result was not a new programme that the instructors had to become familiar with and that needed accommodation into LSP structures and resources. Uniquely, rather than 'reinvent the wheel', MFL became embedded within existing well-known 8, 10 or 12-week walking, cycling and multi-activity programmes, aiming to strengthen their impact.

For similar purposes, part of the instructor role was conceived as enlisting the support of peer mentors to help with organisation, information and some behaviour change facilitation. This conceptualisation allowed for the provision of instructional technical skills to remain within the professional model, while facilitating a substantial increase in delivery and organisational capacity through peer mentors both during and after the intervention. Furthermore, after the instructor training took place, a member of the research team (NOS) was assigned to provide ongoing support for implementation to instructors via in-person meetings or online consultation as required. In the next step, we outline how we further considered issues related to implementation and sustainability in the design of the evaluation plan.

### 2.6. Step 6: generate an evaluation plan to conduct outcome and process evaluations to measure programme effectiveness

Consistent with the logic model of the problem outlined in Step 1, daily minutes of moderate to vigorous physical activity (MVPA), and self-reported compliance with PA guidelines, were selected as the main behavioural change objective or primary outcome measure of the intervention. Daily minutes in light intensity PA, daily hours spent in sedentary behaviour and self-management capacity (behaviour change strategy use) were chosen as the secondary behavioural change objectives or outcome measures. To examine both effectiveness and potential for sustainability of the intervention, cost-effectiveness was also selected as secondary outcome measure (Shelton, Cooper, & Stirman, 2018).

The design of the MFL process evaluation was informed by the Medical Research Council (MRC) guidance on the process evaluation of complex interventions (Moore et al., 2015) which identifies three essential features of understanding the process through which outcomes are achieved: context, implementation and mechanisms of impact. In addition, we used the RE-AIM framework to inform the selection and development of questions for feasibility and process evaluation. The RE-AIM framework provides a way of assessing key factors that indicate potential for public health impact and widespread application of interventions, and particularly community-based interventions (Glasgow et al., 2019).

A process evaluation questionnaire, complemented with interviews and focus groups with participants, instructors, and other relevant

stakeholders, was designed to further assess issues related to implementation, feasibility, and potential for sustainability of the MFL programme and its expected effects. Questions were designed to assess, for example, the extent to which participants find the programme enjoyable, interesting, and worth their time; whether they develop new friendships within their community as a result of being part of the programme and are more likely to remain active due to these friendships. Other questions were designed to assess potential of the programme to become embedded into existing LSP services. Examples of the latter are whether participants are more aware of their local LSP PA opportunities because of being part of the programme, more likely to contact their local LSP for information about existing PA opportunities, and to have volunteered to help their LSP and organised PA activities for their HUB. In addition, comprehensive checklists to be completed after each session by instructors were designed to assess compliance (implementation fidelity) with intervention strategies. Additional details on the evaluation plan of MFL have been provided elsewhere (O'Regan et al., 2019).

### 3. Discussion

The development of effective health promotion interventions often necessitates examination of the literature, selection and use of theories, collection of data, and involvement of academic and non-academic stakeholders in the planning process. Integrating information from these diverse sources to inform intervention development is a challenge for many health promotion practitioners (Fernandez et al., 2019). The present work attempts to provide readers with a first-hand account of how the authors responded to the challenge of integrating varied sources of evidence for the development of a complex community intervention to increase PA in inactive adults aged 50 years and older.

Many behavioural interventions are not developed systematically and descriptions often lack the level of detail required for adequate assessment (Michie et al., 2011). Furthermore, a lack of conceptual clarity renders replicability and scaling-up of effective interventions difficult and hinders the opportunity to learn from failure (Hanson, Cross, & Jones, 2016). MFL was developed systematically drawing on the best available evidence from both the traditional evidence-to-practice and the complementary practice-to-evidence pathways (Ogilvie et al., 2020; Reis et al., 2016). Attempts to improve practice should address a range of evidence sources and consider practitioner's specific needs depending on factors such as career stage, participant group characteristics, resources and policies, along with other pragmatic considerations (McCurtin & Clifford, 2015). Gathering the perspective of stakeholders prior to, and throughout, the development of the intervention was instrumental in this regard. Such consultation provided the intervention developers with valuable insights from key individuals grounded in practice and policy, and from former programme participants, on how to improve participant recruitment and retention, intervention sustainability and scalability, and on the potential role of peer mentors (O'Regan et al., 2020). Similarly, consultation with these individuals and other stakeholders afforded an opportunity to discuss the feasibility and acceptability of intervention strategies and materials and how these could be improved. This also increased the contextual relevance of the programme, which contributes to striking the necessary balance between scientific rigour and real-world pragmatism in intervention development and implementation (Pfadenhauer et al., 2017; Reis et al., 2016).

IM provided a useful template for developing systematically the MFL intervention and we used such template in a flexible manner to fit the needs and priorities of the development process. For example, while Bartholomew Eldredge et al. (2006) argued that completion of tasks within an IM step creates the conditions that guide the next step, we undertook tasks corresponding to Step 5, i.e. planning for adoption, implementation and sustainability of the programmes in real-life contexts, from inception of the intervention and considered them at every

step of the protocol. In this regard, the iterative nature of IM, allowing designers to move backwards and forwards between steps, proved one of the most useful features of this planning model in the development of MFL. Echoing this observation, Fernandez et al. (2019) remarked how, throughout the process of using IM, planners gain new knowledge about factors such as population characteristics, behavioural determinants, the environment, and/or effective and appropriate methods that sometimes requires revisiting earlier steps to expand or refine the program, as was our case. For example, through successive rounds of stakeholder consultations, we gained a better understanding of characteristics of the target population and cultural setting that prompted us to make modifications to some of the behaviour change methods initially planned. Whereas IM helps planners develop a program that is based upon best available evidence from various sources, commentators have noted that it is a time-consuming approach that may not always be practical because research funders expect time frames that are not compatible with the work involved (McEachan, Lawton, Jackson, Conner, & Lunt, 2008). While our experience using IM to plan the MFL intervention aligns with previous reports indicating the usefulness of the framework (see Fernandez et al., 2019), we also experienced intense demands on our time during the planning phases to ensure the intervention was ready for implementation and evaluation within the time frames expected by the funders. Furthermore, critics argue that there is no clear evidence that theoretically-informed guiding frameworks, such as the one used for the development of MFL, are better than common sense in the form of a group's tacit knowledge to enhance implementation success or the effectiveness of an intervention (Bhattacharyya, Reeves, Garfinkel, & Zwarenstein, 2006).

IM aims to assist planners with identifying theory-based social-cognitive and environmental determinants of behaviour and linking them to methods for behaviour change and practical applications that operationalise these methods (Fernandez et al., 2019; Kok et al., 2016). In this regard, IM is related to a long tradition in program evaluation (e.g., Chen & Rossi, 1983) that advocates the importance for evaluators of bringing to the surface the theoretical assumptions implicit in the program about the nature of the problem it addresses and how it expects to bring about change. While the theory-driven nature of IM is a notable strength of the framework, difficulties can arise when implementing theory-based methods in 'real-world' settings, unless practical application is considered together with indicators of effectiveness (Kok et al., 2016). Furthermore, stating that a program is "theory-based" is by no means a guarantee that it will be rigorous and effective (Crosby & Noar, 2011). Given that program planning is a larger and more comprehensive effort compared to the subordinated task of theory selection and application (Crosby & Noar, 2011), sufficient consideration needs to be given to all the phases contemplated in a chosen program planning framework, as illustrated in the different steps of the IM protocol and the functions they purportedly serve.

Insufficient description of interventions in research protocols and published reports represents a problem for identifying the active, effective components within interventions and a barrier to translational efforts (Michie et al., 2013). To counter this issue, taxonomies of behaviour change methods/techniques have been published to provide developers with rigorous ways of characterizing the components or active ingredients of interventions and facilitate implementation fidelity and replication (Kok et al., 2016; Michie et al., 2013). We mapped MFL strategies to a taxonomy of BCTs (Michie et al., 2013). While this taxonomy provides a useful method for the reliable characterisation of interventions based on a comprehensive set of 93 behaviour change techniques, the mapping process revealed some inadequacies to code the active components/ingredients of MFL. This was particularly true when it comes to specific social support and group cohesion strategies used in MFL based on the literature. As Michie et al. (2013) indicated, further development and evaluation of the taxonomy is expected to provide greater precision and specificity for characterising active components of interventions across different theoretical domains. While this seems

warranted, it is worth mentioning that coding intervention descriptions has been cast more like a necessary evil than desirable in itself (Kok et al., 2016). Notably, Kok et al. (2016) argued that coding is redundant when thorough documentation is provided detailing the intervention components, and justifications for the decisions made. On the other hand, proponents of this practice argue that rigorous coding of intervention content may be advantageous in the replication and faithful implementation of effective interventions, or facilitating the extraction of information and interpretation of results in systematic reviews and meta-analyses (Hughes, Salmon, Galvin, Casey, & Clifford, 2019; Michie et al., 2013). Additional evidence on the relative merits of coding intervention content using taxonomies of behaviour change techniques is needed to inform the current debate.

For progress to occur, greater emphasis on rigorous evaluation studies of real-world programmes is needed, particularly since practice moves faster than research (Pratt et al., 2016; Reis et al., 2016). Instead of creating an intervention based only on theory and research, we used a co-design process to augment well-known existing programmes with research-based components. The result is an original and rare example of intervention that draws upon the four pillars of evidence-based practice outlined by (Thompson, McCaughan, Cullum, Sheldon, & Raynor, 2002): research evidence, practice evidence, participant evidence, and contextual evidence. In a similar vein, this effort represents a contribution to a more nuanced approach to appraising the value of a practice-based evidence pathway as an essential complement to the more established evidence-based practice pathway when designing and evaluating population health interventions (Ogilvie et al., 2020).

The augmentation of existing programmes consisted of three key components: a training workshop for LSP professional PA tutors supported by a programme handbook, a training workshop for peer mentors, and a programme handbook for the participants. The peer mentor role, based on findings from a systematic review, was envisaged mainly as organisational, informational, and motivational (Petosa & Smith, 2014). This design meant that MFL could fit within current group-based PA programmes, thus maximising its likelihood to be translated into real-world policy and practice, embedding it within an established system, i.e., publicly funded LSPs (Reis et al., 2016). Rather than reinventing the proverbial wheel, MFL builds on existing community assets and strengths (Morgan & Ziglio, 2007), which contributes further to its potential for adoption and sustainability. This is important because long-term change in PA patterns requires ongoing support to maintain effective interventions (Bush & Bengoechea, 2015; Sallis, Carlson, & Mignano, 2012).

There is evidence for the use of PA programmes for adults aged 50 years and over, with improvements documented in cognitive function and in lifestyle habits related to PA (Northey, Cherbuin, Pumpa, Smeed, & Rattray, 2018). However, there is insufficient indication of long-term improvements (Olanrewaju, Kelly, Cowan, Brayne, & Lafortune, 2016), and evidence that after 20 weeks following a programme PA behaviour returns near to baseline levels (Gomersall, Maher, English, Rowlands, & Olds, 2015). MFL is a simple and potentially cost-effective intervention that could be easily scaled into existing PA programmes. As well as LSP involvement with the design, MFL was also co-designed with the end-users, a factor that has been shown to increase engagement and feelings of ownership among the latter (Salsberg et al., 2017). The intervention was built using a cascading model, where professional PA instructors trained in behaviour change principles nurture local participants to become peer mentors. The peer mentors then assist the instructors with motivational, organisational and/or teaching elements of the programme (Petosa & Smith, 2014).

MFL adds thus value to existing LSP programmes by training professional PA instructors in delivering evidence-based behaviour change strategies that complement in a fluid manner their regular PA programme. Likewise, MFL adds value to existing programmes by training volunteer participants to become peer mentors. In turn, mentors support professional PA instructors in implementing behaviour change strategies

and strive to keep participants together and active at the end of the programme, potentially countering the return of PA levels to baseline values commonly seen over time following many PA programmes.

Greatest progress is likely to occur by developing interventions that are effective in fostering PA participation, implemented at scale, regularly assessed, and fully embedded in a system (Reis et al., 2016). Pending evaluation of outcomes and related processes, development of the MFL intervention, we argue, represents a promising step forward in promoting PA in inactive adults aged 50 years and older.

#### 4. Conclusion

Intervention development is a crucial stage in the process of developing the evidence base necessary to improve public health outcomes. However, behavioural interventions are rarely developed systematically and, when reported, poor description of active components often become a barrier for subsequent replication and scaling-up. In this paper, we have provided a detailed account of the development and characteristics of MFL, a community-based intervention to reach and help inactive adults aged 50 years and older increase their PA. Moving away from accounts of intervention development as a relatively simple linear process, we illustrate through the different planning phases, guided by an intervention mapping protocol, the complex interplay of theory, evidence, practice, and real-world contextual circumstances that shaped the development of MFL. This provides the backdrop for highlighting issues relative to the planning and reporting of behavioural interventions in PA promotion and public health.

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#### CRedit authorship contribution statement

**Enrique García Bengoechea:** Conceptualization, Methodology, Investigation, Writing - original draft, Writing - review & editing, Supervision. **Amanda M. Clifford:** Conceptualization, Methodology, Writing - review & editing, Funding acquisition. **Stephen Gallagher:** Conceptualization, Methodology, Writing - review & editing, Funding acquisition. **Andrew O' Regan:** Investigation, Writing - review & editing. **Nollaig O'Sullivan:** Methodology, Investigation. **Monica Casey:** Investigation, Writing - review & editing, Project administration. **Liam Glynn:** Conceptualization, Writing - review & editing, Funding acquisition. **Phelim Macken:** Conceptualization, Funding acquisition. **John Sweeney:** Conceptualization, Funding acquisition. **Alan Donnelly:** Conceptualization, Funding acquisition. **Andrew Murphy:** Conceptualization, Funding acquisition. **Catherine B. Woods:** Conceptualization, Methodology, Investigation, Writing - original draft, Writing - review & editing, Supervision, Project administration, Funding acquisition.

#### Declaration of Competing Interest

The authors report no declarations of interest.

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