DWELL

Evaluation Study of the Diabetes and WELLbeing 12-week programme

Social innovation

Canterbury Christ Church University

Interreg 2 Seas Mers Zeeën

DWELL

European Regional Development Fund

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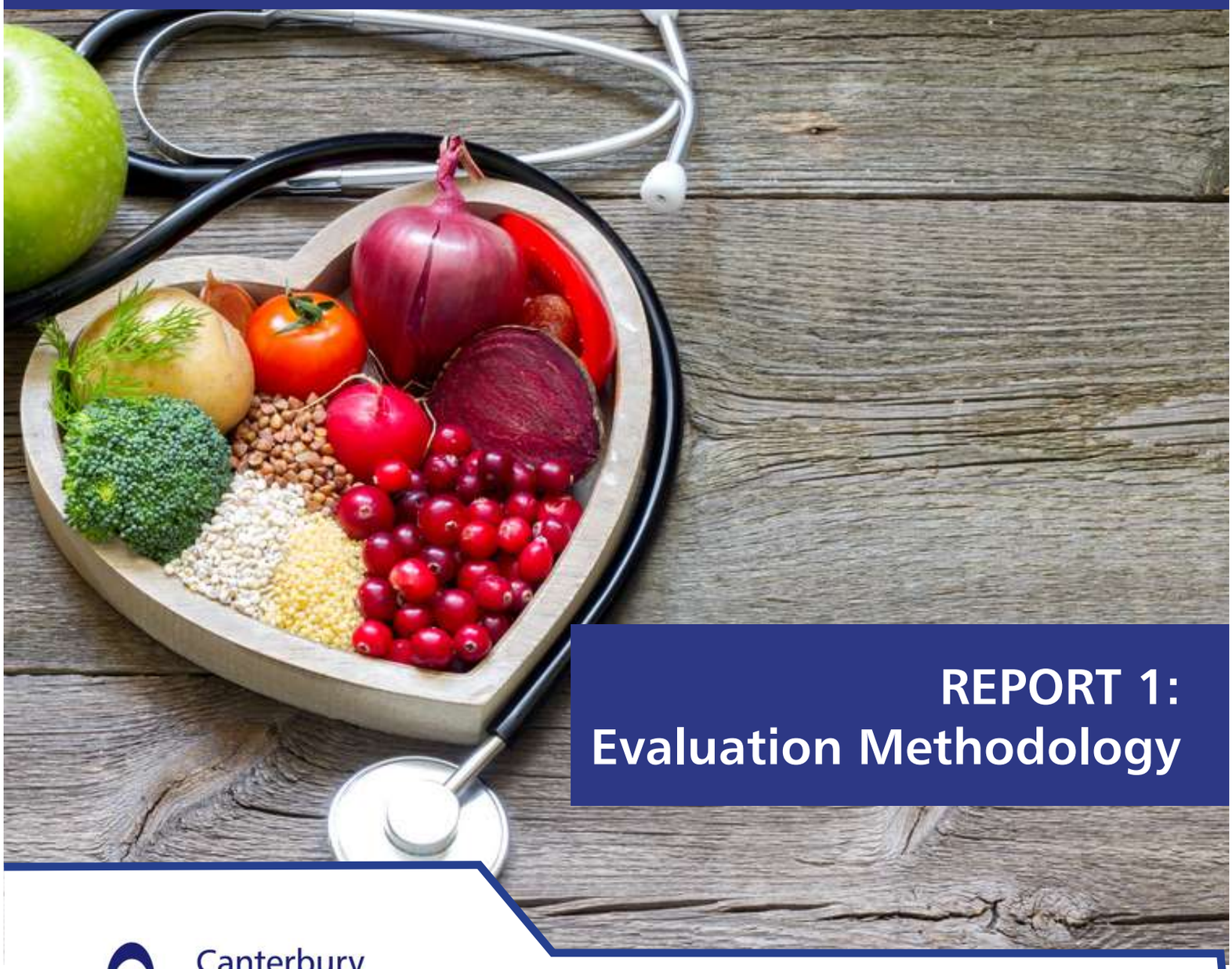

REPORT 1: Evaluation Methodology

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FOREWARD

The Diabetes and Well Being in Europe (DWELL) project was funded by the INTERREG 2 Seas Mers Zeeën Programme and ran between 2016 and March 2023. The overall aim of the project was to empower people living with Type 2 Diabetes Mellitus (T2DM) to enhance self-management of illness through a co-produced 12-week educational programme, and to improve targeted aspects of individual health and wellbeing. The project involved partners in the UK, France, Netherlands and Belgium.
Canterbury Christ Church University ('CCCU') led Work Package 4: Evaluation of the DWELL programme, which commenced delivery in 2018. The evaluation comprised four key areas: patient outcomes; system/process benefits of the programme; staff training; cost benefits of the programme.

For Output 4.1 of this Work Package, we present a set of four final project reports which relate to DWELL programme evaluation. These are as follows:

- **REPORT 1:** Evaluation Methodology
- **REPORT 2:** Participant Outcomes
- **REPORT 3:** Process Evaluation
- **REPORT 4:** Workforce training and Cost Effectiveness

Report 1 describes the Evaluation Methodology of the DWELL programme. The COVID-19 pandemic, which commenced in March 2020 as the project was still 'live', had an impact on the programme's delivery and evaluation activities; this impact is discussed where relevant throughout the reports.

We would like to acknowledge colleagues for their valuable contribution as researchers and advisors at earlier stages of the evaluation study: Dr Marlize De Vivo and Prof Kate Springett, Canterbury Christ Church University; and, Dr Katrina Taylor, University of Kent.

We are grateful to all DWELL programme participants in the four project countries for their significant contributions and support in evaluating the DWELL programme at all its stages.

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1. THE DWELL PROGRAMME

1.1. Background

The World Health Organisation (WHO) defines diabetes as:

"…a chronic disease, which occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. This leads to an increased concentration of glucose in the blood. Type 2 diabetes (non-insulin-dependent) is caused by the body's ineffective use of insulin. It often results from excess body weight and physical inactivity." (WHO, 2016; National Institute for Health Research, 2021).

Non-communicable diseases such as diabetes are the most common cause of death and disability in the EU, accounting for 86% of deaths and 77% of the disease burden. Diabetes is a long-term non-communicable disease of significant societal and economic concern, and therefore not merely a clinical issue. Ninety per cent of T2DM patients have onset generally in later life. Healthy lifestyle choices help in the management of T2DM. Research shows that consistent, careful self-management is required for patients to achieve the best outcomes, yet there is currently no standard approach for T2DM patients. This is in part due to the wide differences in response to methods of encouraging diabetes care. Furthermore, issues that impact on an individual's ability to self-manage the condition are multifactorial, including education, communication with healthcare providers, personal circumstances, provider issues and support (Wilkinson, Whitehead and Ritchie, 2014). Initiatives to increase effective, low-cost self-management are essential to the sustainability of treatment, such as education programmes that allow for incremental knowledge gain and experiential and vicarious learning and the provision of culturally sensitive care (Wilkinson, Whitehead and Ritchie, 2014).

An early evaluation of 'DESMOND', a UK structured group education programme, indicated that, for individuals newly diagnosed with type 2 diabetes, the programme changed key illness beliefs and these changes predicted quality of life and metabolic control at three-month follow-up (Skinner et al., 2006). Later on, evaluation research on the DESMOND programme showed improvements in weight loss and smoking cessation and positive improvements in beliefs about illness, however there was no difference in HbA1c levels up to 12 months after diagnosis (Davies et al., 2008). Another UK structured education programme, 'X-PERT', which has patient-centred focus based on theories of empowerment and discovery learning, showed at a 14-month follow-up that participation led to improved glycaemic control, reduced total cholesterol level, body weight, BMI and waist circumference, reduced requirement for diabetes medication, increased consumption of fruit and vegetables, enjoyment of food, knowledge of diabetes, self-empowerment, self-management skills and treatment satisfaction (Deakin et al., 2005).

Elsewhere in Europe, evaluation results from a Belgian evaluation of a community level empowerment-based group self-management education pilot programme focussed on diet and exercise, showed that BMI decreased, HbA1c declined and emotional distress scores diminished (Bastiaens et al., 2009). However, these changes were only part sustained at an 18-month follow-up, and actual behaviour only changed modestly. In addition, a study in France has shown significant positive physiological results for patients from an intervention which incorporated integrative care models and enabled participants to have access to psychologist sessions and community support free-of-charge (Mollet, 2010).

In the Netherlands, evaluation of a psycho-educational intervention, 'BeweegKuur', suggested that both healthcare professionals and patients were motivated to participate and that the programme was designed in accordance with their needs. Amongst the barriers highlighted was lack of time, specifically regarding the fact that motivational interviewing took more time than traditional counselling techniques and required intensive training and practice support. Other impeding factors were financial, since health insurance did not fully cover the costs, as well as self-efficacy perceptions as some patients were not convinced that they could maintain their healthy lifestyle after the programme. The multidisciplinary approach and the combination of physical activity and dietary behaviour change was felt to contribute to the success of the intervention as long as the impeding factors identified were overcome (Helmink, 2012).

Despite the array of studies from across the European countries involved in the DWELL project, the UK National Institute for Health Research (NICE) reports that there still remains limited robust evidence of the effectiveness of structured educational programmes for people with type 2 diabetes (NICE, 2015) and therefore points to the need for further evaluation work needed to be done in this area.

1.2. DWELL project aim and objectives

The DWELL project had the aim to develop and deliver a self-management programme for people living with T2DM, which employed personalised, effective ways of managing their condition and improving their wellbeing. This was going to be achieved through tailored support delivered by healthcare professionals and co-produced by patients.

Main objectives of the DWELL project were to:

- Co-develop a 12-week programme that would enable people with T2DM to self-manage their condition, co-produced with current patients ('DWELL ambassadors'1),
- Devise a training programme for staff and include DWELL ambassadors to deliver the 12-week support programme effectively,
- Evaluate the programme to demonstrate patient benefits as well as impact of the training on staff and DWELL ambassadors who will deliver the patient support programme,
- Develop online support systems to enhance sustainability of the changes achieved during the 12-week programme.

1.3. The 12-week DWELL programme

The DWELL programme involved participants with T2DM across five delivery sites - two in the UK, and one in Belgium, one in France and one in the Netherlands. The 12-week programme was co-developed and designed by partner organisations and people living with diabetes.

The final programme comprised four key areas: Education; Nutrition; Physical activity and Wellbeing (Figure 1). As well as core sessions in each of the four areas, participants were signposted to further 'pick and mix options' that they could undertake outside of the programme, for example local gyms or yoga classes. The programme was underpinned by peer support and self-management theories, along with motivational interviewing to ensure that content was tailored to individuals and their circumstances. The sessions and lesson plans were developed based on adult learning principles.

Participants were able to self-refer to 12-week DWELL programme or were referred by GPs and healthcare professionals involved in their care. Particularly motivated participants of the 12-week programme were recruited to become trained DWELL ambassadors. These individuals were involved in providing ongoing support to further intakes of DWELL participants, for example through motivating others, sharing their own experiences, and receiving training to co-deliver some elements of the programme alongside DWELL staff. Full details of the 12-week DWELL programme and its practical organisation can be found in the booklet 'DWELL Diabetes & Wellbeing' (Vanbosseghem, Callens and Luyens, 2020).

Figure 1. The DWELL 12-week programme

1 Further details regarding the DWELL ambassador role can be found in the '12-week DWELL programme' section that follows, and in Report 3: Process Evaluation

1.3.1. The DWELL Logic Model

Logic models represent the theory of change for complex interventions, namely how an intervention produces its outcomes (Moore et al, 2015), and they inform the development of an evaluation strategy for such interventions. The DWELL Logic Model was developed to help prioritise and structure data collection and analysis of the main aspects of the DWELL intervention and relationships between them.

Table 1. The DWELL Logic Model

CONTEXT – Type 2 diabetes mellitus (T2DM) is a long-term non-communicable disease of societal and economic concern. Consistent, careful self-management is required for people living with T2DM to make lifestyle changes and achieve the best outcomes. Initiatives to increase effective, low-cost self-management are therefore essential to the sustainability of treatment. The Diabetes and WELLbeing ('DWELL') 12-week psychoeducational programme aims to empower people with T2DM to better self-manage their condition and improve individual health and wellbeing, tailored to individuals and their circumstances, incorporating motivational interviewing and peer support. The programme will be delivered and evaluated across four countries - UK, Belgium, France, and the Netherlands, in different settings (hospital, community, etc.).It is also impacted by country-specific guidelines for diabetes care.	
GOALS (context)	• Empowerment of people with T2DM to access tailored support and engage effectively with treatment/care • Improvement of health and wellbeing • Enhanced self-management of condition • Economic benefits to health services
INPUTS (mechanisms of impact)	• Collaborative/co-creation approach (people with T2DM working with experts and facilitators) • Drawing on examples of good practice self-management programmes (e.g. X-PERT) • Knowledge-sharing between experts-by-experience and professionals • Motivational Interviewing • Peer Support • Empowerment Strategies • Self-Management Theories
ACTIVITIES (impeimentation)	• Workforce Training Needs Analysis • Programme Co-Design (people with T2DM working with professionals) • Pilot of 12-week programme • Recruitment strategies • Evaluation Design (outcomes, process, cost effectiveness) • Review and refinement on iterative basis
OUTPUTS (implementation)	• Workforce Training to fill identified needs • Delivery of 12-week programme (4 areas - education, nutrition, physical activity, wellbeing) • Motivational Interviewing and Peer support • DWELL ambassador role • Online support tool • Evaluation data collection (4 time points - Assessment Form, DWELL Tool, focus groups, interviews, MI forms, Goals forms) • Development of 'DWELL community' of participants, staff, DWELL ambassadors
OUTCOMES	• Improved metabolic health • Improved diabetes illness perceptions • Improved patient empowerment • Improved physical health • Improved eating behaviour • Improved self-care • Improved mental wellbeing • Improved quality of life • Positive 'lived' experiences of participants, staff and DWELL ambassadors
IMPACTS (short, medium, long-term)	• Immediate/short term – Learning. People with T2DM have greater understanding of condition • Intermediate/ medium-term - Behavioural Change. People with T2DM are empowered to better self-manage their condition and have improved self-care behaviours • Post-intermediate /medium-term – Metabolic Health improvements • Long-term – improved health and wellbeing; DWELL model to be applied to self-management of other long-term conditions

2. Evaluation Study of the DWELL programme

2.1 Evaluation Study Questions

The DWELL Evaluation Study aimed to assess outcomes, process, and cost effectiveness of the 12-week programme delivered in the five programme sites. The evaluation questions were:

- What was the impact of the programme in terms of metabolic health indicators, quality of life, levels of physical activity and care for people with Type 2 diabetes?
- What was the impact of the programme on self-management of diabetes in terms of attitudes and behaviours of people with Type 2 diabetes?
- How did participants people with Type 2 diabetes, staff and ambassadors view their experiences with the programme?
- What is the incremental cost-effectiveness of the programme compared with standard care?

In light of the delays caused by the COVID-19 pandemic, the project (and evaluation study) was extended, which allowed the team to collect 'legacy' longitudinal qualitative data to explore participant experiences up to 4 years after they had completed the DWELL programme, addressing the following questions:

- What was the sustainable impact of the programme in terms of quality of life, levels of physical activity and care for T2DM patients?
- What was the sustainable impact of the programme on self-management of diabetes in terms of patient attitudes and behaviours?

2.2 Evaluation Study Design

The DWELL evaluation study adopted a quasi-experimental, longitudinal, mixed-methods approach to assess change over time and effect of intervention. Pre-post intervention measures were taken at four time points: Baseline (T0), End-of-Programme (T1), 6-month Follow-up (T2) and 12-month Follow-up (T3). Also, process evaluation data were collected during the project and 'legacy' longitudinal data were collected from evaluation study participants 24 months or more after they had completed the DWELL programme. A diagram of the overall evaluation design is shown in Figure 2.

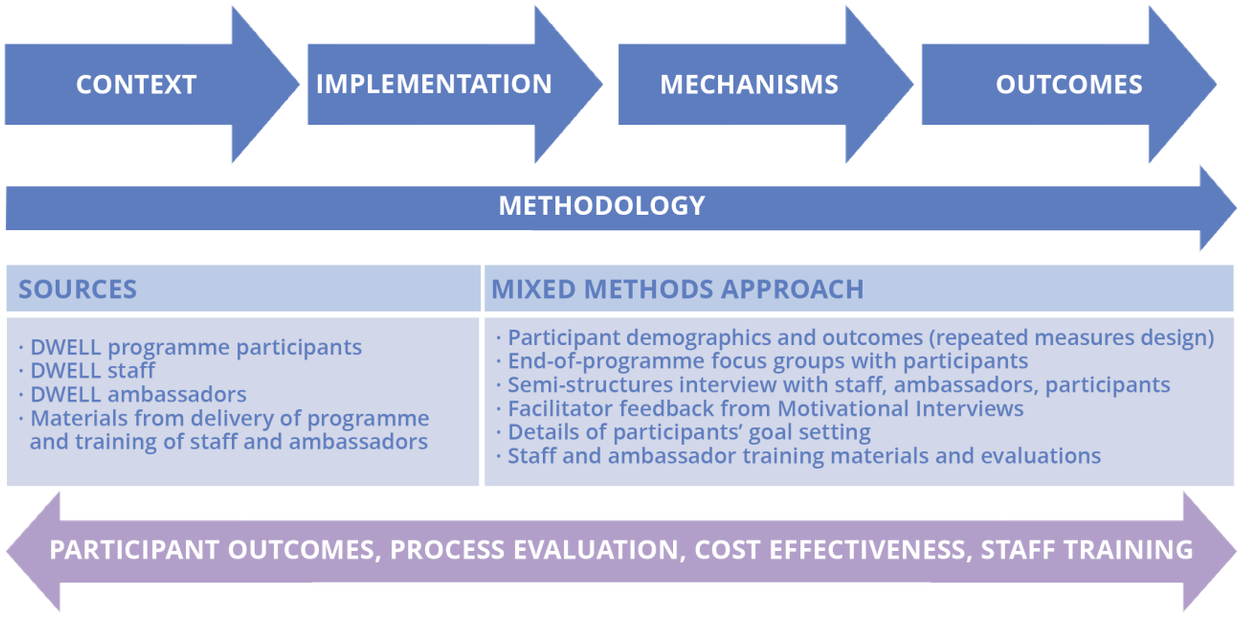

Figure 2. DWELL Evaluation Study Design

2.2.1 Participant Outcomes

Participant outcome measures relating to metabolic health, behaviours and wellbeing were collected either via staff members (metabolic health and assessment at referral) or via self-completed questionnaires which were administered with the use of the DWELL Tool at the evaluation time points as required (Table 2).

Table 2. Timeline of Participant Outcome Measures

	T0 Baseline	T1 End of DWELL Programme - At 3 months	T2 1st Follow-up At 6 months post-DWELL	T3 2nd Follow-up At 12 months post-DWELL
ASSESSMENT AT REFERRAL				
Duration of Diabetes	✓			
Demographic information	✓			
METABOLIC MEASURES				
HbA1C	✓	✓	✓	✓
Weight	✓	✓	✓	✓
Height	✓			
BMI	✓	✓	✓	✓
Waist circumference	✓	✓	✓	✓
SELF-REPORTED MEASURES				
Levels of Physical Activity	✓	✓	✓	✓
Diabetes Care	✓	✓	✓	✓
Quality of Life	✓	✓	✓	✓
Attitudes and Behaviours	✓	✓	✓	✓

A brief description of the outcome measures is presented below.

Metabolic Health

Metabolic outcome measures included weight, BMI, waist circumference and glycated haemoglobin (HbA1c). These were measured by a DWELL facilitator at the start and the end of the DWELL programme, as well as two follow-ups: six-months and 12-months later. Where a trained DWELL facilitator was not available for collection of HbA1c via blood test, participants were asked to obtain this information from their General Practitioner (GP)/physician.

The DWELL Tool

The DWELL Tool was comprised of five parts: Background, Attitudes and Behaviours, Physical Health, Self-

Care, and Health Status. In the Background, participant demographic information was collected, including age, time since diagnosis, relevant health history, information on household composition, employment, and income. In the remaining parts, self-completed psychometric scales assessed participant physical activity, diabetes perceptions, self-care behaviours, wellbeing, and quality of life (Figure 3). Measures in the DWELL Tool were selected to be cross-nationally validated and translated in the partner language. The English version of the DWELL Tool is presented in Appendix 1.

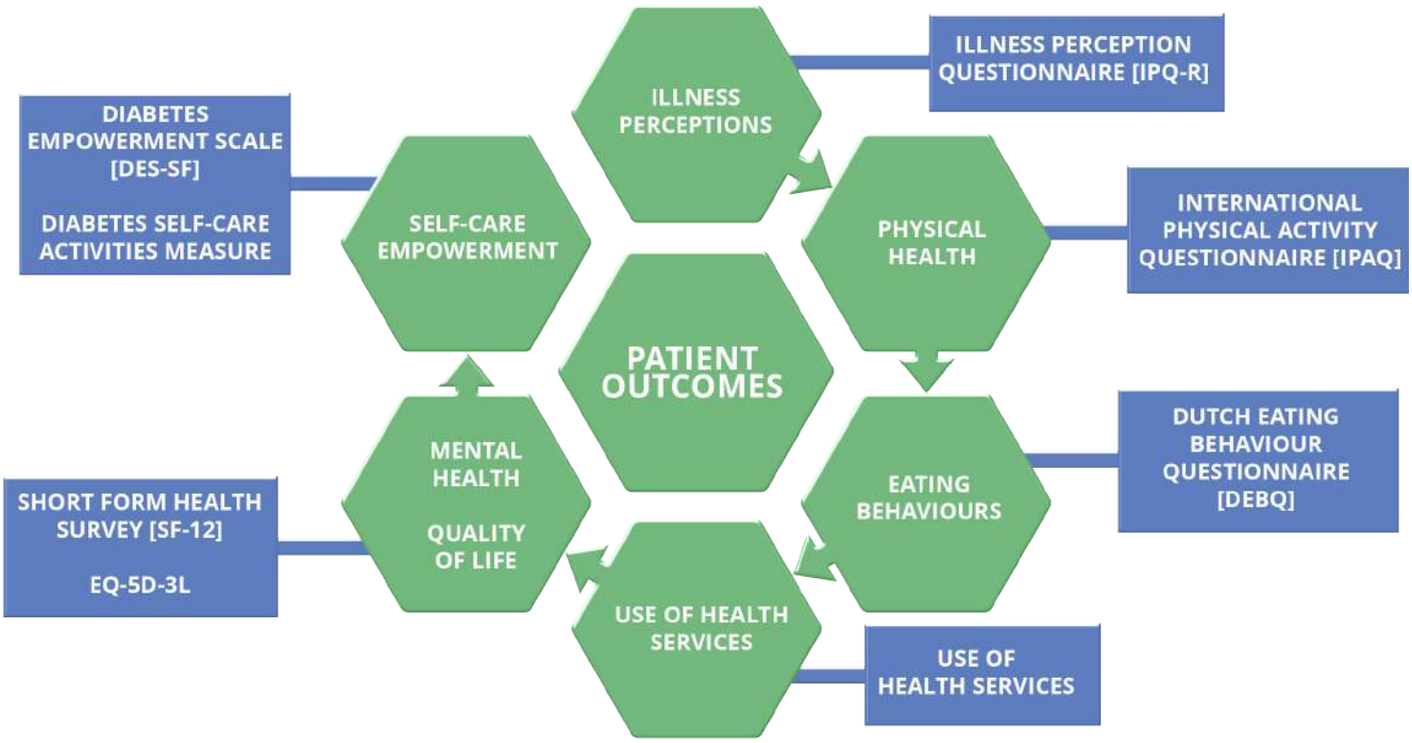

Figure 3. Participant Outcome Measures

2.2.2. Process Evaluation

Process evaluation aims to understand the functioning of an intervention, by examining three key components - implementation, mechanisms of impact, and contextual factors (Moore et al., 2015). The key components of the DWELL programme were assessed by collecting and analysing data from individuals or areas involved in the intervention. Figure 4 shows how the aspects of context, implementation and mechanisms of impact of the programme were assessed in the DWELL Evaluation Study.

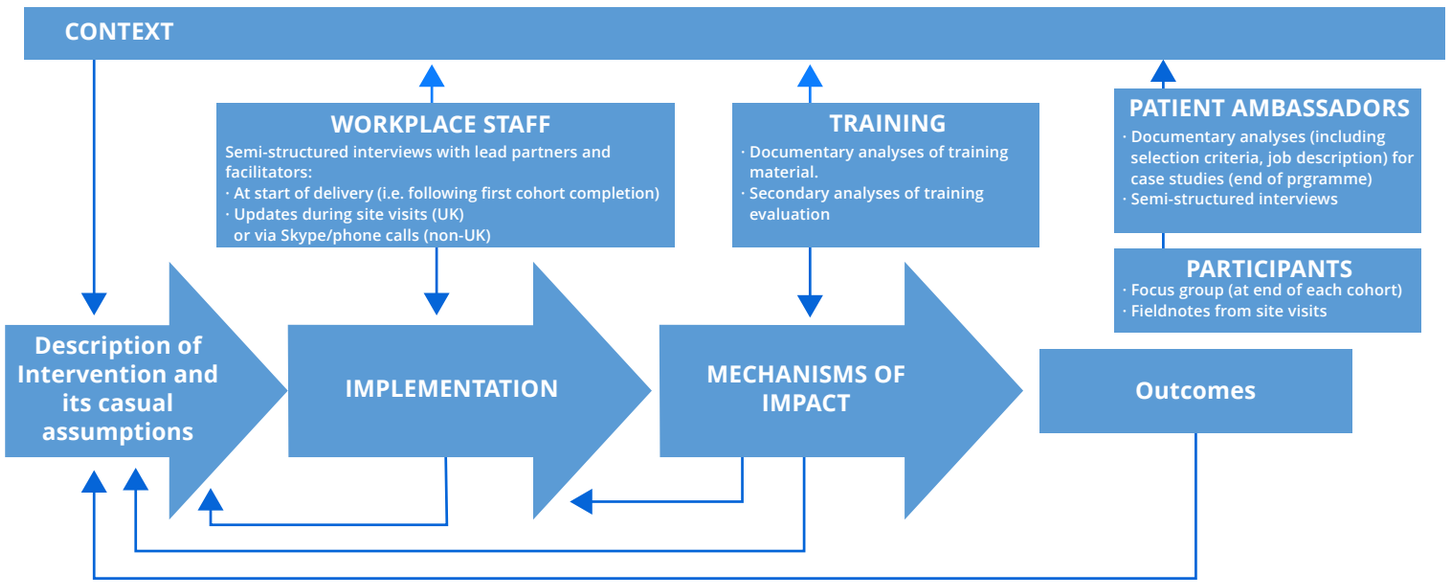

Figure 4. DWELL Process Evaluation

Data was collected from various sources via a range of methods.

Participant experiences with the programme were explored by conducting focus groups at the end of the programme for each cohort per delivery site in all countries. Focus groups were conducted by the CCCU team in the UK and by staff independent of the DWELL project at non-UK sites, to ensure participants did not feel restricted in providing their feedback. Discussions could last up to one hour and were audio recorded for analysis. The same focus group schedule was used across sites to ensure consistency of questions asked. Following focus groups, relevant anonymised feedback was provided to DWELL facilitators to ensure that changes suggested by participants could be considered and incorporated into programme delivery going forward.

In relation to key mechanisms of the programme delivery, a Motivational Interview (MI) form was developed by the research team, which was completed by DWELL facilitators following each MI with each participant to capture application of MI principles and examples of participant responses (a copy can be found in Appendix 2). The MI principles, adapted from Miller and Rollnick (1991), used in the DWELL programme are:

- Establish individual's willingness to engage in the process
- Express empathy through reflective listening
- Evoke the intrinsic motivation of the participant
- Use affirmations to acknowledge circumstances or progress of participant.
- Address ambivalence/ discrepancy between participant goals or values and current behaviour
- Adjust to participant resistance rather than oppose directly.

Also, a Goal Setting form was designed by the team to capture details of goals set by participants at their MI meetings at the start and end of each 12-week programme.

Staff experiences were explored through semi-structured interviews which at the start and towards the end of the evaluation period to explore their experiences of the implementation of the DWELL programme and its delivery. Semi-structured interviews were also conducted with site leads and DWELL ambassadors at the end of the programme delivery to understand their role and experiences.

To assess training feedback, secondary data from partner organisations, including training materials and evaluations, were collected to understand its impact on the programme. A training evaluation form was developed by the CCCU team based on the Kirkpatrick and Kirkpatrick (2016) Levels of Training Evaluation model to ensure that consistent data was captured.

Sustainability of the programme impact was also explored through Longitudinal Qualitative Interviews (LQIs), an important method to study how people experience, interpret and respond to change (Hermanowicz, 2013). An interview schedule was developed, covering the areas of the DWELL Tool and the end-of-programme focus group schedule. DWELL site staff contacted participants who had finished the programme between 2018 and March 2020 (i.e. prior to the COVID-19 pandemic) to ask if they wanted to be involved in a further interview to explore their experiences since the end of the programme. Participants who volunteered contacted the research team and were interviewed. Interviews were conducted either in-person (at the DWELL site) or via a video call, according to the preference of the participant. LQIs were only conducted in the UK and Netherlands, as in Belgium, there was a small evaluation sample which made it difficult to identify participants, and in France, there was lack of staff capacity and resources at the DWELL site.

Process evaluation tools were translated in partners' own language to ensure ease of use.

2.2.3. Cost Effectiveness

To facilitate a cost-effectiveness analysis of DWELL, a non-intervention (control) group was recruited in all countries apart from France, due to the difficulty in obtaining ethical approval for this element of the evaluation. The control group consisted of T2DM patients over the age of 18 and receiving the usual

standard care (i.e. not exposed to the DWELL programme).

Control group participants completed an adapted version of the DWELL Tool questionnaire at two time points, six months apart, to align with the follow-up time points (T2 and T3) of the intervention group. The questionnaire asked participants for demographic data and information about their use of health services, and contained validated surveys in relation to physical health, diabetes care and health status.

In the UK, initially participants were recruited via a local existing educational programme (X-PERT), which type 2 diabetes patients in the UK are routinely referred to in the UK (i.e. standard care) in order to help them make lifestyle choices to manage their blood glucose levels more effectively. The X-PERT facilitator informed programme participants of the control group study, and those who were interested in participating passed on their details for forwarding to the CCCU team, who contacted them with participant information. In September 2019, following a slow recruitment period over the summer and low numbers attending the X-PERT Programme, UK 2 posted letters regarding the DWELL programme and control group to 1000+ patients in their database who lived in the local area and had type 2 diabetes.

Additionally, further information was collated from all delivery sites in relation to the cost of each element of the intervention, including details of those involved in the programme (role, number of sessions delivered, duration of sessions, salary) and costs of venue hire, resources and consumables related to delivery.

2.2.4. Recruitment of Participants

Individuals attending the DWELL programme were invited to be part of the evaluation study at baseline, before the start of the 12-week programme. Written informed consent to participate was sought by all agreed to take part in the evaluation. The criteria for inclusion in the evaluation study were: to have diagnosis of Type 2 diabetes, be over the age of 18 and participate in the DWELL programme.

2.2.5. Ethical approval

An evaluation protocol and ethics application were developed by the CCCU team and approval to carry out the evaluation study was sought either via national/local research ethics committees or organisational management at each delivery site. For the two UK sites, the evaluation study received a favourable ethical opinion from the London – London Bridge Research Ethics Committee (REC reference: 17/LO/1480). In France and Belgium, research ethics approval was obtained by the national research ethics committees. In Netherlands, a management approval was obtained by the delivery site.

2.2.6. Data Analysis

Participant Outcomes

Participant outcome data management included data cleaning and screening, with missing data being removed, except in cases where there was specific guidance for alternative methods of treating missing cases in particular measures. Composite scores were calculated where required and tests were applied for internal consistency of measures as well as tests for normality. Non-parametric tests were used for the statistical analysis of data with SPSS v27 software. For effectiveness of the intervention at each site, paired comparisons of T0-T1 were conducted to allow analysis with maximum number of participants, unaffected by attrition at later time points. To test sustainability of changes, other comparisons of T2-T3 were conducted such as multiple regression analysis.

In practice, there were challenges experienced by the research team during collection of participant outcomes data. The evaluation protocol generated a large volume of both quantitative and qualitative data, which was subsequently associated with demands in data processing and management. Moreover, complexities of the data collection process, associated to organisational change, such as high staff turnover in some sites, led to limited oversight of data collection, stockpiling of data at partner sites, need to repeat evaluation training for staff, and additional effort to ensure accurate and prompt data collection at the four countries. These difficulties were exacerbated during the COVID-19 pandemic when some delivery sites were co-opted to help provide medical cover which impacted on their capacity to support the evaluation data collection.

Process Evaluation

Analysis of process evaluation was conducted depending on type of data collected. Interview data was transcribed, and themes were derived using the Template Analysis approach (Brooks et al, 2015; King, 2002; King, 1998), whereby a coding template was set up comprising pre-determined themes that had been identified as particularly salient to the aims of the evaluation. Separate 'analysis grids' were developed to collate workforce/staff and DWELL ambassador interview data, to ensure that key views and experiences in alignment with the process evaluation elements (context, implementation and mechanisms) could be captured. New columns were added to the grid to capture any unexpected by pertinent themes.

End-of-programme focus groups were transcribed and then coded using NVivo 12 software to enable thematic content analysis. Through successive reading and interpretation of transcripts, provisional codes were modified and added to (Gibbs and King, 2002). Gradually, codes were grouped, ungrouped and relabelled (intermediate coding), before identifying key elements in relation to theory (selective coding). The resulting list of codes was reviewed and agreed by two members of the research team, who agreed on groupings and sub-themes. From these sub-themes, the overall themes were developed.

An analysis grid was developed to collate data from the MI Forms from each site. The qualitative data was read thoroughly and repeatedly to elicit key themes, which informed the development of MI vignettes to illustrate themes. MI techniques and facilitators were also coded to enable quantitative analysis.

Goals data was added to the MI analysis grid for each participant, and a thematic analysis approach (Clarke and Braun, 2014) was adopted. T0 goals were coded and each code provided a label which captured its meaning. A further step to iteratively adjust codes was undertaken by a second member of the CCCU team to ensure they fully reflected the participant's meaning. Goals where then further combined to ensure themes were specific and concise. This process reduced the number of goal codes to 59. Using the same iterative process, these goals were then clustered into 11 sub-themes and finally four over-arching main themes.

Details relating to content and materials of DWELL staff and DWELL ambassador training were descriptively analysed. Training evaluations were collated and subject to quantitative and qualitative content analysis. Relevant details from interview data were also extracted from the aforementioned analysis grid. Analysis was cross-referenced with the DWELL staff competency framework, developed by DWELL partner Kent County Council.

Cost Effectiveness

The approach to determining the cost effectiveness of the DWELL 12-week programme differed by partner site. In order to determine cost effectiveness of the UK sites, all sessions delivered by a mix of experts, research, admin (including expert trainers, motivational interviewers, chefs, a resource group leader and finance officer) and supervision staff and any one-off equipment, education-related or other associated costs, such as, room hire, one-off costs for HbA1c machines, cooking ingredients and expert books, were costed, with all costs reported in 2019 prices. Cost effectiveness was calculated by the total cost of delivery per DWELL participant, for a group of 10 participants per programme on average.

In Belgium DWELL programme was delivered by a facilitator (with support from a coach or supervisor, where required) and an expert in the respective DWELL themes (nutrition, physical activity, education, wellbeing). These employees prepared the necessary material and equipment prior to the sessions. Additional costs incurred during that time included the production of relevant material (e.g. handouts) and catering. Because of the absence of a detailed record of staff costs for all involved in the programme delivery, the costs reported were based on the Artevelde University of Health Sciences rate and average based on national legal pay scales 'Loonbarema Paritair Comité 330'. To examine potential variation in staff experience for each cohort, costs were calculated for working staff with experience which varied from 0 years to 25 years. All costs are reported in 2020 prices.

In France the total cost of delivering the DWELL 12-week programme included all sessions delivered by facilitators with different expertise, including diabetes, physical activity, diet and wellbeing, and supervision of those staff, as well as one-off costs of resources required for each session. Cost effectiveness was calculated per participant for a group of 20 participants per programme on average, with all costs reported in 2019 prices.

In the Netherlands all sessions delivered by professionals including specialised nurses, activity providers, educators and group dynamics trainers (including supervision) and any one-off equipment or promotional material were costed per participant, for a group of 40 participants per programme on average, all costs are reported in 2019 prices.

The large amount of incomplete cost and health-related quality of life data over the duration of the study prevented a full cost-effectiveness analysis. However, the estimated intervention costs can be used as a base to determine the cost-effectiveness of the DWELL programme compared with standard care in future studies.

2.3. DWELL Delivery Sites

Each site delivered the 12-week DWELL programme within the confines of their individual context, in relation to venue, capacity, environment and resources. This meant that a multi-disciplinary team was responsible for the collection of evaluation data, including researchers, academics and practitioners, and ranged from experienced researchers to those who had not been involved in research previously. Below are details of the DWELL delivery sites, which help to give context to the evaluation study.

Country	UK (1)
Site Name	Blackthorn Trust - https://www.blackthorn.org.uk/
Brief Description	A charity which provides a social therapeutic environment in which people can recover, grow and develop. Specialist person-centred therapies and rehabilitation are offered via facilities including a biodynamic garden, vegetarian café and kitchen, craft studios and therapy rooms. Work is based on the premise that community, meaningful work, therapeutic and peer support, and daily routine are required in addition to medication to affect positive change in people. This philosophy and approach was applied to the DWELL programme.
DWELL delivery	Group sessions took place on-site (meeting rooms, craft room, kitchen). Individual MI meetings and the recording of measurements took place in meeting rooms at the site.
DWELL team	Trained X-PERT facilitators, a movement-based therapist who delivered group wellbeing sessions, and a chef who delivered practical cooking sessions. Core facilitators were also involved in conducting individual MI meetings, recording measurements and collecting evaluation data, in addition to a member of staff who just conducted MIs.

Country	UK (2)
Site Name	Medway Community Healthcare - https://www.medwaycommunityhealthcare.nhs.uk/
Brief Description	A social enterprise and Community Interest Company providing a wide range of NHS and non-NHS community services across health and social care.
DWELL delivery	A local community healthcare day centre for adults with physical and mental health conditions, with additional clinical facilities including occupational therapy, physiotherapy, speech and language therapy, podiatry and stroke services. DWELL groups, individual MI meetings and recording of measurements took place in meeting or clinical rooms at the centre. In early 2020, a room in a local church was sourced as an additional venue, and this was used instead of the community day centre when groups recommenced following the easing of COVID-19 lockdown restrictions. Late 2022/early 2023 the groups moved again from the church to a hall adjacent to the church which had been refurbished for such use.
DWELL team	Led by a diabetes specialist dietitian and educator who set up and coordinated the programme and delivered it to early groups. A diabetes educator with a background in public health then took over the facilitation of the group and individual sessions and managed evaluation activities. External providers delivered group some activities for some sessions, including wellbeing activities and foot care.

Country	Belgium
Site Name	Arteveldehogeschool (Artevelde University of Applied Sciences) - https://www.arteveldehogeschool.be/
Brief Description	Arteveldehogeschool is a university college located in Ghent.
DWELL delivery	AArtevelde partnered with local public health insurances organisations, who offer benefits and services related to health promotion, in order to recruit to and deliver the DWELL Programme. DWELL group sessions as well as individual motivational interview (MI) meetings and the recording of measurements took place in meeting rooms on the premises of the public health insurance organisations, with the exception of the cooking workshop which took place at an external venue.
DWELL team	Two nursing lecturers developed and co-led the programme and conducted MI meetings and evaluation activities. A diabetes educator delivered the group education sessions and helped with MI meetings. Nutrition group sessions were delivered by a specialist, a private personal coach facilitated physical activity sessions, and a podiatrist delivered the foot care session.

Country	France
Site Name	Centre Hospitalier de Douai - https://www.ch-douai.fr/
Brief Description	Part of the Groupement Hospitalier de Territoire (GHT), the Douai Hospital Center is the pivotal establishment of the nearby Douaisis area. It carries out its public hospital services in a sector of 64 municipalities with a population of nearly 260,000 inhabitants, with a capacity of 874 beds. It is the largest public employer in Douaisis, employing 2,300 people in the medical, paramedical, administrative and logistics fields.
DWELL delivery	DWELL participants attended initial sessions with medical staff at the hospital for individual MI meetings and recording of measurements, and were then allocated to one of four community-based sites in Douai and Aniche regions to attend the weekly group sessions.
DWELL team	Led by a Project Manager. A specialist doctor delivered the group education module, a psychologist delivered the group nutrition and wellbeing modules, a podiatrist delivered a foot care session, and a physical activity educator facilitated those sessions. A nurse was responsible for managing the MI meetings and evaluation activities.

Country	Netherlands
Site Name	Kinetic Analysis - https://www.kinetic-analysis.com/
Brief Description	Specialises in human motion data using next generation sensors and customised measurement tools, resulting in highly accurate input in order to improve lives.
DWELL delivery	Mode of delivery differed from other sites initially - in partnership with Amphia Hospital in Breda where people with type 2 diabetes are routinely seen if first line care (GP) is not successful for them. Participants referred to DWELL by the hospital endocrinologist, then attended initial sessions with research and diabetes nurses at the hospital for individual MI meetings and recording of measurements. Participants were then signposted to external providers depending on their individual goals. Although initially participants did not go through the programme as a group, from October 2019, cohorts were set up whereby participants progressed through the DWELL programme as a group.
DWELL team	Project manager in partnership with hospital consultant, diabetes nurses, and local activity providers specialising in the four areas of DWELL.

3. Conclusion

The DWELL programme was a multi-country intervention which aimed to empower people living with type 2 diabetes to enhance self-management of their illness. The purpose of this report was to present briefly the DWELL Evaluation Study Methodology, which applied a number of strategies and elements to capture the effectiveness of the intervention and determine whether it had the anticipated success, and also to refine it for future implementation. Evaluation was embedded in all stages of the project and comprised four main elements: participant outcomes and experiences; process evaluation; cost effectiveness; and staff training.

Throughout the course of the DWELL project, the CCCU team presented interim findings at national and international conferences and events, as part of the dissemination process; these included the UK Diabetes Professional Care Conference 2019 (Manship et al., 2019) and the World Congress on Public Health Conference 2020 (Hatzidimitriadou et al., 2020; Manship et al., 2020; Morris et al., 2020).

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Appendix 1 – The DWELL Tool

EVALUATION OF DIABETES AND WELLBEING (DWELL) PROGRAMME

- EVALUATION TOOL FOR PARTICIPANTS -

Thank you for taking part in the evaluation of the DWELL Programme. The questions that follow are designed to capture individual information around the key areas of DWELL (education, nutrition, physical activity and wellbeing). You will be asked to complete a version of this Evaluation Tool at the end of the DWELL Programme, and again at one or two follow-up times.

Your answers will feed into the overall evaluation of the programme and are therefore of great value to the project. If you have any queries as you complete the questions, please ask the DWELL staff member who is with you for guidance.

If you are about to start the DWELL Programme, please complete all parts of this Evaluation Tool. If you are completing this following participation in the 12-week DWELL Programme, please complete from Part 2 (page 4) onwards.

Please state date of completion here: _______________ (DD\MM\YY)

For DWELL staff completion/office use:

Participant ID: _____

Time point: T0 T1 T2 T3

PART 1: BACKGROUND

(*to be completed at the start of the DWELL Programme…if you are completing after the programme, please go straight PART 2: Attitudes and Behaviours on page 4*)

1. **Total number of persons living in your household, including yourself?** (*if you live alone, please go to question 6*)	
2. **With whom do you live?** *(please list all – partner, children, housemate, etc.)*	
3. **Do you have children at home?**	1 - Yes 2 - No
4. **What is your education?** *(please tick/circle one)*	1 - Cannot read or write 2 - Less than primary school 3 - Primary school/similar 4 - Secondary education/middle/high school 5 - University/similar 6 - Other _____ *(please specify)*
5. **Do you do paid work?**	1- Yes 2 - No *(go to question 10)* 3 - Never worked *(go to question 11)*
6. **If you do paid work, how many hours do you work per week approximately?**	
7. **If you work (paid work), have you been on sick-leave in the past year?**	1 - Yes 2 – No If yes, how long? _____ *(days)*
8. **What is/was your main job?** *(please tick one or specify under 'Other')*	

1 - Manager (e.g. chief executive, administrative manager) 2 - Professional (e.g. science and engineering, health, teaching professional) 3 - Technician/associate professional (e.g. science and engineering associate professional) 4 - Clerical support worker (e.g. general and keyboard clerk, customer service clerk) 5 - Service and sales worker (e.g. personal care worker, sales worker) 6 - Skilled agricultural, forestry and fishery worker (e.g. market-oriented skilled agricultural worker, subsistence farmer) 7 - Craft and related trades worker (e.g. building and related trades worker, handcraft and printing worker) 8 - Plant and machine operator and assembler (e.g. stationary plant and machine operator, assembler) 9 - Occupation with lesser level of skills and qualifications required (e.g. cleaner and helper/carer, labourer in construction industry or mining) 10 – Housewife/househusband 11 - Armed forces occupation 12 – Student 13 – Other _____	
9. **What is your present main source of income?** (please tick one)	1 - Work 2 - Early retirement pension 3 - Disability pension 4 - Age pension 5 - Sick leave benefits 6 - Unemployment benefits 7 - Social help/social support benefits 8 - Widow(er) pension 9 - Private income 10 - No financial support 11 - Other _____ *(please specify)*
10. **How often are you worried about the daily expenses (e.g. buying food)?**	1 - Never 2 - Sometimes 3 - Always
11. **Are you involved in any current research, or have you been involved in any research prior to this study?**	1 - Yes 2 - No If yes, please specify: _____

PART 2: ATTITUDES AND BEHAVIOURS

We are interested in your own personal views of how you now see your diabetes. Please indicate how much you agree or disagree with the following statements about your diabetes by ticking the appropriate box.

	VIEWS ABOUT YOUR DIABETES	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1.	My diabetes will last a short time					
2.	My diabetes is likely to be permanent rather than temporary					
3.	My diabetes will last for a long time					
4.	This diabetes will pass quickly					
5.	I expect to have diabetes for the rest of my life					
6.	My diabetes is a serious condition					
7.	My diabetes has major consequences on my life					
8.	My diabetes does not have much effect on my life					
9.	My diabetes strongly affects the way others see me					
10.	My diabetes has serious financial consequences					
11.	My diabetes causes difficulties for those who are close to me					
12.	There is a lot that I can do to control my symptoms					
13.	What I do can determine whether my diabetes gets better or worse					

	VIEWS ABOUT YOUR DIABETES	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
14.	The course of my diabetes depends on me					
15.	Nothing I do will affect my diabetes					
16.	I have the power to influence my diabetes					
17.	My actions will have no affect on the outcome of my diabetes					
18.	My diabetes will improve in time					
19.	There is very little that can be done to improve my diabetes					
20.	My treatment will be effective in curing my diabetes					
21.	The negative effects of my diabetes can be prevented (avoided) by my treatment					
22.	My treatment can control my diabetes					
23.	There is nothing which can help my diabetes					
24.	The symptoms of my diabetes are puzzling to me					
25.	My diabetes is a mystery to me					
26.	I don’t understand my diabetes					
27.	My diabetes doesn’t make any sense to me					
28.	I have a clear picture or understanding of my diabetes					

	VIEWS ABOUT YOUR DIABETES	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
29.	The symptoms of my diabetes change a great deal from day to day					
30.	My symptoms come and go in cycles					
31.	My diabetes is very unpredictable					
32.	I go through cycles in which my diabetes gets better and worse					
33.	I get depressed when I think about my diabetes					
34.	When I think about my diabetes I get upset					
35.	My diabetes makes me feel angry					
36.	My diabetes does not worry me					
37.	Having this diabetes makes me feel anxious					
38.	My diabetes makes me feel afraid					

In this part of the questionnaire, please circle the number in the box that gives the best answer for you.

In general, I believe that:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
1. I know what part(s) of taking care of my diabetes that I am dissatisfied with	1	2	3	4	5
2. I am able to turn my diabetes goals into a workable plan	1	2	3	4	5

3. I can try out different ways of overcoming barriers to my diabetes goals	1	2	3	4	5
4. I can find ways to feel better about having diabetes	1	2	3	4	5
5. I know the positive ways I cope with diabetes-related stress	1	2	3	4	5
6. I can ask for support for having and caring for my diabetes when I need it	1	2	3	4	5
7. I know what helps me stay motivated to care for my diabetes.	1	2	3	4	5
8. I know enough about myself as a person to make diabetes care choices that are right for me.	1	2	3	4	5

PART 3: PHYSICAL HEALTH

These questions ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your housework, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?	_____ **days per week** No vigorous physical activities *(skip to question 3)*
2. How much time did you usually spend doing **vigorous** physical activities on one of those days?	_____ **hours per day** _____ **minutes per day** Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.	
3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at	_____ **days per week** No moderate physical activities *(skip to question 5)*
4. How much time did you usually spend doing **moderate** physical activities on one of those days?	_____ **hours per day** _____ **minutes per day** Don't know/Not sure
Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.	
5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?	_____ **days per week** No walking *(skip to question 7)*
6. How much time did you usually spend **walking** on one of those days?	_____ **hours per day** _____ **minutes per day** Don't know/Not sure
The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.	
7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?	_____ **hours per day** _____ **minutes per day** Don't know/Not sure

USE OF HEALTH SERVICES FOR YOUR DIABETES	
1. **How often do you see the doctor (GP/Advanced Nurse Practitioner) for your diabetes?** *(tick or circle)*	a. Every month b. Every 3 months c. Twice a year d. Once a year e. Never
2. **During the visit to the GP/ Advanced Nurse Practitioner, you discuss** *(tick all that apply)*	a. Diet b. Treatment c. Tobacco consumption d. Alcohol consumption e. Physical activity f. Mental Wellbeing g. Symptoms and how do you feel h. Capillary blood glucose results i. Other _____ *(please specify)*
3. **Over the last 12 months, have a doctor or a nurse or a podiatrist examined your bare feet?**	a. Yes b. No
4. **How often do you see the dentist?**	a. More than once a year b. Less than once a year c. Never
5. **How often do you see the ophthalmologist?** *(or have a retinal screening (for the UK))*?	a. More than once a year b. Less than once a year c. Never
6. **How often do you see the cardiologist?**	a. More than once a year b. Less than once a year c. Never
7. **Do you see other specialists for your diabetes?**	a. Yes b. No If yes, please specify specialist and how often you see them _____

PART 4: SELF-CARE

The following questions are about your general eating behaviours. Please indicate your answer by ticking the appropriate box

	Never	Seldom	Some-times	Often	Very often
Restrained eating					
1. If you have put on weight, do you eat less than you usually do?					
2. Do you try to eat less at mealtimes than you would like to eat?					
3. How often do you refuse food or drink offered because you are concerned about your weight?					
4. Do you watch exactly what you eat?					
5. Do you deliberately eat foods that are slimming?					
6. When you have eaten too much, do you eat less the following days?					
7. Do you deliberately eat less in order not be become heavier?					
8. How often do you try not to eat between meals because you are watching your weight?					
9. How often in the evening do you try not to eat because you are watching your weight?					
10. Do you take into account your weight with what you eat?					
Emotional eating					
11. Do you have the desire to eat when you are irritated?					
12. Do you have a desire to eat when you have nothing to do?					
13. Do you have a desire to eat when you are depressed or discouraged?					
14. Do you have a desire to eat when you are feeling lonely?					
15. Do you have a desire to eat when somebody lets you down?					

	Never	Seldom	Some-times	Often	Very often
16. Do you have a desire to eat when you are cross?					
17. Do you have a desire to eat when something unpleasant is due to happen?					
18. Do you get the desire to eat when you are anxious, worried or tense?					
19. Do you have a desire to eat when things are going against you or when things have gone wrong?					
20. Do you have a desire to eat when you are frightened?					
21. Do you have a desire to eat when you are disappointed?					
22. Do you have a desire to eat when you are emotionally upset?					
23. Do you have a desire to eat when you are bored or restless?					
External eating 24. If food tastes good to you, do you eat more than usual?					
25. If food smells and looks good, do you eat more than usual?					
26. If you see or smell something delicious, do you have a desire to eat it?					
27. If you have something delicious to eat, do you eat it straight away?					
28. If you walk past the baker, do you have the desire to buy something delicious?					
29. If you walk past a snack bar or a cafe, do you have the desire to buy something delicious?					
30. If you see others eating, do you also have the desire to eat?					
31. Can you resist eating delicious foods?					
32. Do you eat more than usual when you see others eating?					
33. When preparing a meal, are you inclined to eat something?					

The following questions are about your self-care activities

1. **Which of the following has your health care team (doctor, nurse, dietitian, or diabetes educator) advised you to do?** *(please tick/circle all that apply)*	a. Follow a low-fat eating plan b. Follow a complex carbohydrate diet c. Reduce the number of calories you eat to lose weight d. Eat lots of food high in dietary fiber e. Eat lots (at least 5 servings per day) of fruits and vegetables f. Eat very few sweets (for example: desserts, non-diet sodas, candy bars) g. Other (specify): _____ h. I have not been given any advice about my diet by my health care team
2. **Which of the following has your health care team (doctor, nurse, dietitian or diabetes educator) advised you to do?** *(please tick/circle all that apply)*	a. Get low level exercise (such as walking) on a daily basis b. Exercise continuously for a least 20 minutes at least 3 times a week c. Fit exercise into your daily routine (for example, take stairs instead of elevators, park a block away and walk, etc.) d. Engage in a specific amount, type, duration and level of exercise e. Other (specify): _____ f. I have not been given any advice about exercise by my health care team
3. **Which of the following has your health care team (doctor, nurse, dietitian, or diabetes educator) advised you to do?** *(please tick/circle all that apply)*	a. Test your blood sugar using a drop of blood from your finger and a colour chart b. Test your blood sugar using a machine to read the results c. Test your urine for sugar d. Other (specify): _____ e. I have not been given any advice either about testing my blood or urine sugar level by my health care team
4. **Which of the following medications for your diabetes has your doctor prescribed?** *(please tick/circle all that apply)*	a. An insulin shot 1 or 2 times a day b. An insulin shot 3 or more times a day c. Diabetes pills to control my blood sugar level d. Other (specify): _____ e. I have not been prescribed either insulin or pills for my diabetes

Diet 5. **On how many of the last SEVEN DAYS did you space carbohydrates evenly through the day?**	0 1 2 3 4 5 6 7
Medications 6. **On how many of the last SEVEN DAYS, did you take your recommended diabetes medication?** OR **On how many of the last SEVEN DAYS did you take your recommended insulin injections?** 7. **On how many of the last SEVEN DAYS did you take your recommended number of diabetes pills?**	0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7
Foot Care 8. **On how many of the last SEVEN DAYS did you wash your feet?** 9. **On how many of the last SEVEN DAYS did you soak your feet?** 10. **On how many of the last SEVEN DAYS did you dry between your toes after washing?**	0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7

PART 5: HEALTH STATUS

Please answer every question about your general health. Some questions may look like others, but each one is different. Please take the time to read and answer each question carefully by circling the option that best represents your response.

1. In general, would you say your health is *(please tick/ circle one)*	1 - Excellent 2 - Very good 3 - Good 4 - Fair 5 - Poor
The following questions are about activities you might do during a typical day. Does your **health now limit you** in these activities? If so, how much?	

	Yes, limited a lot	Yes, limited a little	No, not limited at all
2. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	1	2	3
3. Climbing several flights of stairs	1	2	3

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?	
4. **Accomplished less** than you would like	1 - Yes 2 – No
5. Were limited in the **kind** of work or other activities	1 - Yes 2 – No

During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?	
6. **Accomplished less** than you would like	1 - Yes 2 - No
7. Did work or activities **less carefully than usual**	1 - Yes 2 - No
8. During the **past 4 weeks**, how much did pain interfere with your normal work (including work outside the home and housework)?	1 - Not at all 2 - A little bit 3 - Moderately 4 - Quite a bit 5 - Extremely

These questions are about how you have been feeling during the **past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the **past 4 weeks**…

	All of the time	Most of the time	A good bit of the time	A little of the time	None of the time
9. Did you feel calm and peaceful?	1	2	3	4	5
10. Did you have a lot of energy?	1	2	3	4	5
11. Have you felt down-hearted and blue	1	2	3	4	5

12. During the **past 4 weeks**, how much of the time has your **physical health or emotional problems** interfered with your social activities (like visiting friends, relatives, etc.)?	1 - All of the time 2 - Most of the time 3 - Some of the time 4 - A little of the time 5 - None of the time

By placing a tick in one box in each group below, please indicate which statements best describe your own **health state today**

Mobility	
I have no problems in walking about	
I have some problems in walking about	
I am confined to bed	
Self-Care	
I have no problems with self-care	
I have some problems with washing or dressing myself	
I am unable to wash or dress myself	
Usual Activities (*e.g. work, study, housework, family or leisure activities*)	
I have no problems with performing my usual activities	
I have some problems with performing my usual activities	
I am unable to perform my usual activities	
Pain / Discomfort	
I have no pain or discomfort	
I have moderate pain or discomfort	
I have extreme pain or discomfort	
Anxiety / Depression	
I am not anxious or depressed	
I am moderately anxious or depressed	
I am extremely anxious or depressed	

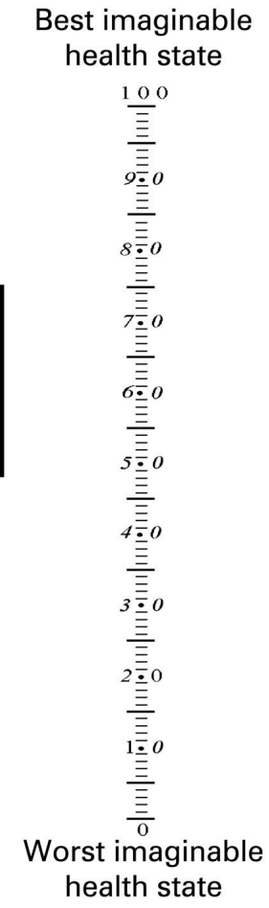
Visual Analogue Scale

Please indicate on this scale how good or bad your own health state is today.

The best health state you can imagine is marked 100 and the worst health state you can imagine is marked 0.

Please draw a line from the box to the point on the scale that indicates how good or bad your health state is today.

Your own health state today



Now, please write the number you marked on the scale in the box below.

YOUR HEALTH TODAY =

WE WOULD LIKE TO THANK YOU VERY MUCH FOR YOUR PARTICIPATION

YOUR ANSWERS WILL ASSIST US TO UNDERSTAND BETTER THE IMPACT OF DIABETES ON QUALITY OF LIFE AND WELLBEING

Appendix 2 – DWELL Motivational Interview (MI) Form

EVALUATION OF DIABETES AND WELLBEING (DWELL) PROGRAMME
- MOTIVATIONAL INTERVIEW (MI) FORM -

Date of one to one MI session: _____ /_____ /_____ (DD\MM\YY)

Location of MI session: _____

Facilitator of MI session: _____

Please indicate which MI principles you applied in the session by marking a '√' in the second column of the table below, along with an example in the third column. Please note that not all boxes need to be ticked; this exercise is to provide an indication of the MI techniques employed throughout the course of the DWELL Programme.

MI principle/technique	Mark '√' if applied	Example (*this could be something that was said by you/the participant, observed behaviour, agreed action, etc.*)
Establish individual's willingness to engage in the process		
Express empathy through reflective listening.		
Address ambivalence/ discrepancy between participant goals or values and current behaviour		
Adjust to participant resistance rather than oppose directly.		
Evoke the intrinsic motivation of the participant.		
Use affirmations to acknowledge circumstances or progress of participant.		

Are there any particular comments/feedback from you or the participant that you would like to highlight?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Kinetic Analysis
HUMAN MOTION DATA

DWELL

Evaluation Study of the Diabetes and WELLbeing 12-week programme

REPORT 2: Participant Outcomes

Canterbury Christ Church University

Interreg 2 Seas Mers Zeeën
DWELL
European Regional Development Fund

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FOREWARD

The DWELL project was funded by the INTERREG 2 Seas Mers Zeeën Programme and ran between 2016 and March 2023. The overall aim of the project was to empower people living with Type 2 Diabetes Mellitus (T2DM) to enhance self-management of illness through a co-produced 12-week educational programme, and to improve targeted aspects of individual health and wellbeing. The project involved partners in the UK, France, Netherlands and Belgium.
Canterbury Christ Church University ('CCCU') led Work Package 4: Evaluation of the DWELL programme, which commenced delivery in 2018. The evaluation comprised four key areas: patient outcomes; system/process benefits of the programme; staff training; cost benefits of the programme.

For Output 4.1 of this Work Package, we present a set of four final project reports which relate to DWELL programme evaluation. These are as follows:

- **REPORT 1:** Evaluation Methodology
- **REPORT 2:** Participant Outcomes
- **REPORT 3:** Process Evaluation
- **REPORT 4:** Workforce training and Cost Effectiveness

Report 2 presents the Participant Outcomes of the DWELL programme. Section one reports on participant demographics, referral to the DWELL programme, diabetes history, medication and comorbidities, and household, work and income. Section two presents the number of participants who were evaluated at each of the four time-points and causes for participant attrition. Section three outlines evidence of efficacy of the DWELL programme. Changes in participant outcomes are compared pre- post-DWELL, and longitudinal data are compared post-DWELL at 6 and 12 months. The COVID-19 pandemic, which commenced in March 2020 while the project was still 'live', had an impact on the programme's delivery and evaluation activities; this impact is discussed where relevant throughout the reports.

We would like to acknowledge colleagues for their valuable contribution as researchers and advisors at earlier stages of the evaluation study: Dr Marlize De Vivo and Prof Kate Springett, Canterbury Christ Church University; and, Dr Katrina Taylor, University of Kent.

We are grateful to all DWELL programme participants in the four project countries for their significant contributions and support in evaluating the DWELL programme at all its stages.

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Executive summary

A total of 593 people with type 2 diabetes took part in the evaluation study of the DWELL programme, across four countries and five sites. Significant positive changes for DWELL programme participants were evidenced from the analysis of participant outcomes of evaluation study. These changes were sustained at 6 and 12 months after the end of the programme. Statistically significant changes in metabolic health and self-reported attitudinal and behavioural benefits are reported as follows:

- Improvements in Metabolic Health
    - Weight Loss of 3.55 kg on average - by the end of programme
    - Waist Circumference reduction of 2.7cm on average - by the end of the programme
    - BMI reduction of 2.62 on average - by the end of the programme
    - HbA1c reduction of 20.5 mmol/mol on average - by the end of the programme
- Enhanced Empowerment and Self-Efficacy
- Improved Diabetes Management
    - Greater perceived personal control and understanding of diabetes
    - Decrease in negative feelings associated with diabetes
    - Increase in optimism for treatment and long-term prognosis of diabetes
    - Decrease in eating in response to emotions and external cues
    - Increase in restrained eating
- Improvements in self-care attitudes and adherence to professional advice
- Improvements in Physical and Mental health
- Improved Health-Related Quality of Life

Improvements were sustained or continued to take place post-DWELL in the medium term (6 months) and long term (12 months). Notably, there was a continued weight loss a year later in the UK and France and continued improvement in participant empowerment and self-efficacy in France. All other outcomes remained improved compared to pre-DWELL levels.

Further exploration of outcome results could shed light to how specific DWELL programme outcomes were sustained in the longer term and could offer greater insight into the associations between . participants' physiological and psychological improvements, process characteristics of delivery per site, and external factors such as policy and practice of diabetes care in the wider healthcare system.

1. Introduction

Participant outcomes of the DWELL programme were assessed via a range of metabolic health measurements which were taken at DWELL sites at the timepoints of the evaluation study as described in Report 1: Methodology.

1.2. DWELL Outcome measures

- **Metabolic Health** outcome measures included weight (in kilograms), Body Mass Index BMI, waist circumference (in centimetres) and glycated haemoglobin (HbA1c). These were measured by a DWELL facilitator according to standard procedures, before and after the DWELL programme, as well as two follow-ups: six-months and 12-months later. HbA1c readings were collected by trained professionals drawing finger-prick blood samples and analysed using the Quo-Test HbA1c Analyzer.
- **Participant Empowerment** was assessed by the Diabetes Empowerment Scale - Short Form (DES-SF) (Anderson et al., 2003). The scale measures overall diabetes-related psychosocial self-efficacy and it had eight items representing eight conceptual dimensions, i.e., assessing the need for change, developing a plan, overcoming barriers, asking for support, supporting oneself, coping with emotion, motivating oneself, and making diabetes care choices appropriate for one's priorities and circumstances.
- **Perceptions of Diabetes** were measured by the 38-item Revised Illness Perceptions Questionnaire (IPQ-R) (Moss-Morris et al., 2002) (the brief version, BIPQ-R, Broadbent et al., 2006, was used in the Netherlands). Illness perceptions are assessed across seven subscales, covering participants' understanding of diabetes, feelings of control over their condition and associated emotions. The seven dimensions are: illness coherence (Coherence), perceived control of treatment (Treatment Control), personal control over illness (Personal Control), perception of negative changes in symptoms across time (Timeline Cyclical), length of time patients anticipate their diabetes would last (Timeline Acute/Chronic), perceived negative life consequences associated with diabetes (Consequences) and reduction in negative emotions associated with diabetes (Emotion). High scores on the consequences, timeline acute/chronic and cyclical subscales represent strongly-held beliefs about the number of symptoms attributed, the negative consequences, and the chronicity and cyclical nature of diabetes. High scores on the personal and treatment control and coherence subscales represent positive beliefs about controllability and a personal understanding of diabetes.
- **Eating Behaviours** were assessed by the 33-item Dutch Eating Behaviour Questionnaire (DEBQ) (Defares et al., 1986). Eating behaviours are measured across three subscales including efforts to control and be aware of eating (Restrained Eating), eating in response to emotions (Emotional Eating) and eating in response to external food cues, such as the look and smell (External Eating).
- Physical and Mental Health were assessed by the 12-Item Short Form Health Survey (SF-12) (Ware, Keller and Kosinski, 1998). It is a multipurpose generic measure of health status and includes one or two items from each of eight health concepts: physical functioning, role limitations due to physical health problems, bodily pain, general health, vitality (energy/fatigue), social functioning, role limitations due to emotional problems, and mental health (psychological distress and psychological wellbeing).
- **Self-Care Behaviours** were measured using elements of the Summary of Diabetes Self-Care Activities Measure (SDSCA) (Toobert, Hampson and Glasgow, 2000) changes in participants recollection of healthcare advice and diet, footcare and medication adherence.
- **Physical Activity** was measured by the International Physical Activity Questionnaire (IPAQ). Metabolic equivalent minutes (MET) per week are calculated for vigorous, moderate, walking and total activity, according to the authors' instructions (IPAQ, 2005) and research tool for automatic scoring using (Zhou et al., 2016). MET minutes represent the amount of energy expended carrying out physical activity. A MET is a multiple of estimated resting energy expenditure. One MET is what you expend when you are at rest. Therefore 2 METS is twice what you expend at rest.
- **Health-related Quality of Life** was measured using the visual analogue scale (EQ VAS) from the European Quality of Life 5 Dimensions 3 Level Version questionnaire (EQ-5D-3L) (EuroQol Group 2009). It records participants' self-rating of health on a visual scale where the endpoints are labelled 'Best imaginable health state' and 'Worst imaginable health state'. The VAS can be used as a quantitative measure to assess changes in the person's perception of their own health over time.

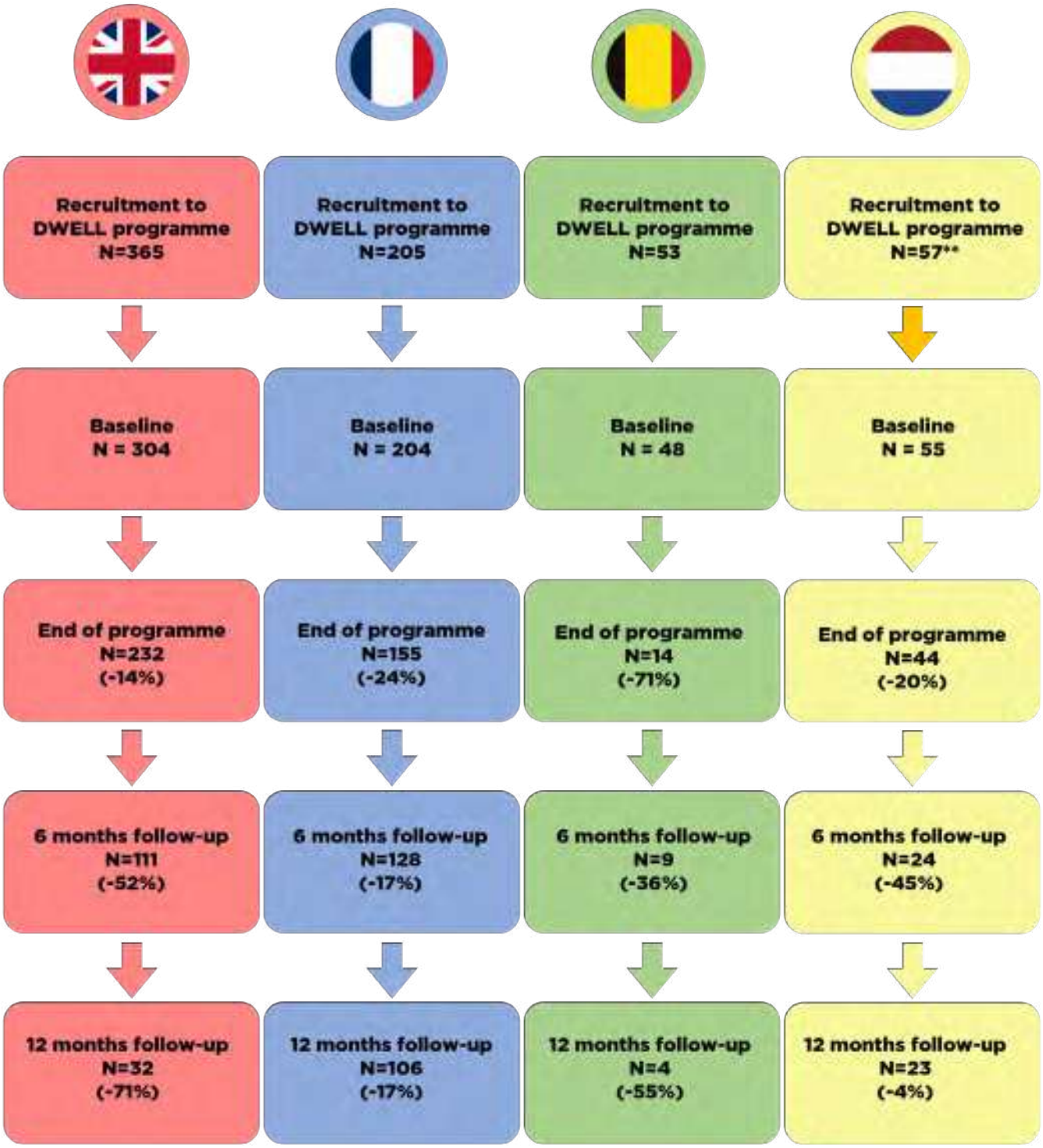
2. Sample of Participants

Participant Numbers and Attrition

Overall, the evaluation targets were aligned to those of the programme delivery recruitment. Figure 1 presents the targets per country as well as the actual samples per timepoint. The overall target of the study was 680 participants, which was the number of people recruited to the DWELL programme. 611 participants took part in the evaluation at baseline (T0, pre-DWELL), of whom 445 completed the end of programme evaluation (T1), 272 completed the 6-month follow up (T2) and 165 completed the 12-month follow up (T3).

The attrition rates between timepoints were within anticipated levels, common in longitudinal evaluations studies with a year or more after the end of the intervention. In particular, there was average attrition of 19% at the UK, France and Netherlands sites and 71% at the Belgium site between T0 and T1; average attrition of 37.5% between T1 and T2; and, 37% between T2 and T3. Specific contextual factors related to the delivery of the programme per site could be useful for understanding levels of attrition. Natural drop out over the 6-month and 12-month follow up points accounts for much of the overall study attrition. The number of responses in each measure at each timepoint also varied as participants could omit answering questions they did not feel comfortable to answer. As psychometric scales had exclusion criteria and instructions for scoring calculations, including missing cases, the number of valid cases for each outcome may differ, and this is noted as needed.

Attrition was also undoubtedly exacerbated by the COVID-19 pandemic which affected a few cohorts and participants across countries in the last period of the project after March 2020.The COVID period broadly began in March 2020 and the impact on the DWELL delivery and evaluation differed across countries, depending on lockdown policies and timeline per country. Certain DWELL cohorts could not begin their programme at all because of the pandemic, other cohorts completed the programme and the pre-DWELL evaluation but could not complete post-DWELL evaluation, or the follow up evaluations. Further, although delivery sites tried to collect evaluation data once the lockdown measures were lifted, this proved more difficult than pre-COVID as for example metabolic data was difficult to obtain. Overall, the COVID-19 pandemic was a significant reason for high levels of attrition at the later period of the evaluation study.



*Percentages refer to attrition from previous time-point

** This number does not include 56 Pre-DWELL/pilot participants who used activity monitor only

Figure 1 Participant numbers and levels of attrition for each timepoint across countries

3. Demographic Data

3.1 Participant Demographics

Across all programme sites, most participants were aged between 50 and 79 years (n=506, 87%), with a mean average age of 62.4 years. There were slightly more females than males participating in the programme (Females = 313, 52.8%, Males = 280, 47.2%). Most of the sample were of white ethnic background across all countries (n=539, 92%), with some representation from other ethnic backgrounds, mainly Asian (n=21, 3.6%), Black/African/Caribbean (n=15, 2.5%), mixed ethnic group (n=8, 1.4%) and other (n=3, .5%). Detailed participant demographics per country are presented in Table 1.

Table 1 Participant Demographics per country

Participant Demographics					
	UK (n=289)	France (n=204)	Belgium (n=45)	Netherlands (n=55)	Total (n=593)
Age (years)*					
Mean (SD)	60.97 (13.28)	63.60 (8.13)	64.24 (8.36)	60.40 (11.06)	62.38 (10.20)
≤ 19	4 (1.4%)	-	-	-	4 (0.7%)
20-29	2 (.7%)	-	-	-	2 (0.3%)
30-39	7 (2.5%)	1 (.5%)	-	3 (5.5%)	11 (1.9%)
40-49	31 (11%)	10 (4.9%)	1 (2.1%)	4 (7.3%)	46 (7.8%)
50-59	67 (23.8%)	48 (23.4%)	15 (31.3%)	16 (29.1%)	146 (24.6%)
60-69	96 (34.2%)	98 (47.8%)	17 (35.4%)	23 (41.8%)	234 (39.5%)
70-79	66 (23.5%)	41 (20%)	10 (20.8%)	9 (16.4%)	126 (21.2%)
>=80	8 (2.8%)	6 (2.9%)	2 (4.2%)	-	16 (2.7%)
Missing	8	-	-	-	8 (1.3%)
Gender					
Male	120 (41.5%)	104 (50.7%)	20 (41.7%)	36 (65.5%)	280 (47.2%)
Female	169 (58.5%)	100 (48.8%)	25 (52.1%)	19 (34.5%)	313 (52.8%)
Ethnicity					
White	253 (89.7%)	194 (95.1%)	42 (93.3%)	50 (91%)	539 (91%)
Asian	18 (6.4%)	-	2 (4.4%)	1 (1.8%)	21 (3.5%)
Black/African / Caribbean	10 (3.5%)	4 (2%)	1 (2.3%)	-	15 (2.5%)
Mixed ethnic group	-	6 (2.9%)	-	2 (3.6%)	8 (1.3%)
Other ethnic group	1 (0.4%)	-	-	2 (3.6%)	3 (0.5%)
Missing	7	-	-	-	7 (1.2%)

Participants were referred to the DWELL programme via several routes. Almost all participants in the Netherlands were recruited via their partner hospital, as the DWELL programme was delivered in hospitals, accounting for this high percentage of recruitment from this area. Self-referral was a popular route in the UK and Belgium, as participants contacted the programme after seeing leaflets at delivery sites, pharmacies, or other health facilities. The last route to the programme was the "other" which referred to recruitment done directly by site partners through their networks and other services they were providing, mainly indicated by French, UK and Belgian participants (Table 2).

Table 2 Participant Referral to the DWELL programme per country

	Country				
	UK (n = 269)	France (n = 202)	Belgium (n = 44)	Netherlands (n= 55)	Total (n=570)
GP Surgery	47 (17.5%)	13 (6.3%)	-	-	60 (10.5%)
Hospital	1 (.4%)	61 (29.8%)	-	54 (98.2%)	116 (20.4%)
Self-referral	121 (45%)	11 (5.4%)	26 (54.2%)	1 (1.8%)	159 (27.9%)
Other	100 (37.2%)	117 (57.1%)	18 (37.2%)	-	235 (41.2%)

3.2 Participant Diabetes History, Medication and Comorbidities

Data collection about the participants' diabetes history, medication and comorbidities, was not collected at all or not fully collected across all sites; Belgium did not collect this information and Netherlands did not collect family history data.

Nonetheless, available data suggested most participants had diabetes for more than 10 years (overall mean in years = 11.60) and family history of diabetes (only collected in UK and France) varied with most UK participants reporting no family history (66%) while French participants who answered this question, indicated they had family history (83%). However, low response rates in this question may indicate that those unsure of their family history left this question blank, while those with a history of diabetes in the family were more likely to know and report on it.

Across sites, the majority reported taking diabetes (n = 473, 93%) and other medication (n = 429, 89%) and having one or more comorbidities (n = 430, 88%). Common comorbidities included high blood pressure and high cholesterol.

Table 3 Participant Diabetes History, Medication and Comorbidities per country

	Country			
	UK	France	Netherlands	Total
Time since diagnosis of diabetes				
	n = 205	n = 185	n = 54	n = 444
Mean (years)	9.05	9.32	16.40	11.60
Family history of diabetes				
	n = 217	n = 59	n/a	n = 276
Yes	74 (34%)	49 (83%)	n/a	123 (44.6%)
No	143 (66%)	10 (17%)	n/a	153 (55.4%)
Diabetes medication				
	n = 254	n = 203	n = 54	n = 511
Yes	231 (90.9%)	189 (93.1%)	53 (96.4%)	473 (92.6%)
No	23 (9.1%)	14 (6.9%)	1 (1.8%)	38 (7.4%)
Other medications				
	n = 174	n = 200	n = 55	n = 429
Yes	161 (92.5%)	179 (89.5%)	41 (74.5%)	381 (88.8%)
No	13 (7.5%)	21 (10.5%)	14 (25.5%)	48 (11.2%)
Comorbidities				
	n = 230	n = 204	n = 55	n = 489
Yes	181 (78.7%)	194 (95.1%)	55 (100%)	430 (87.9%)
No	49 (21.3%)	10 (4.9%)	-	59 (12.1%)

3.3 Participant Household, Education, Employment Status and Income

Participant household composition, education, employment status and income were collected at baseline to contextualise programme participation and benefits and understand better the profile of those who took part in the DWELL.

Across sites, most participants lived with others and, in the majority, it was with a partner (n=372, 65%), however, a fourth of participants lived alone (n=140, 24%). There were no particular differences between countries (Table 4).

Table 4 Participant Household composition per country

	Country				
	UK (n=273)	France (n=204)	Belgium (n=44)	Netherlands (n=55)	Total (n=576)
Lives Alone	77 (28.2%)	51 (24.9%))	12 (25%)	-	140 (24.3%)
Lives with a Partner	167 (61.2%)	135 (65.9%)	30 (62.5%)	40 (72.7%)	372 (64.6%)
Lives with Children	69 (25.3%)	50 (24.4%)	7 (14.6%)	16 (29.1%)	142 (24.7%)
Lives with Parent	4 (1.5%)	6 (2.9%)	1 (2.1%)	-	11 (1.9%)
Lives with Housemate	4 (1.5%)	2 (1%)	-	1 (1.8%)	7 (1.2%)
Lives with Other	15 (5.5%)	5 (2.4%)	2 (4.2%)	3 (5.5%)	25 (4.3%)

Most participants were educated up to secondary school level (n = 365, 62%), with Belgium having a relatively higher percentage of participants educated to degree level (n = 23, 48%) (Table 5).

Table 5 Participant Education per country

	Country				
	UK n = 283	France n= 204	Belgium n = 47	Netherlands n= 51	Total n = 585
Cannot read / write	3 (1%)	1 (0.5%)	-	-	4 (0.7%)
Below primary ed	1 (0.4%)	3 (1.5%)	-	-	4 (0.7%)
Primary ed or similar	5 (1.8%)	27 (13.2%)	4 (8.3%)	2 (3.6%)	38 (6.5%)
Secondary ed	185 (65.4%)	126 (61.5%)	19 (39.6%)	35 (63.6%)	365 (62.4%)
University or similar	80 (28.3%)	39 (19%)	23 (47.9%)	2 (3.6%)	144 (24.6%)
Other	9 (3.2%)	8 (3.9%)	1 (2.1%)	-	18 (3.1%)

In terms of employment status, most participants across sites were not in paid employment at the start of the DWELL programme (n = 389, 67%) or never worked (n = 10, 2%). There were some differences per country; in the Netherlands, there were slightly more participants in paid work (n = 30, 54.5%) than not (n = 24, 44%), whereas in France and Belgium only a firth of participants was in paid work.

Those who were in paid employment reported the number of sick days they took in the past year; responses were very varied per country with UK and Netherlands having the fewer reported sick days (UK - mean = 6.20; Netherlands – mean = 11.45) and France the most reported sick days (mean = 97.47), followed by Belgium (mean = 65.36) These differences could be attributed to particular outlier participants and the different sickness absence policies per country.

Information about the participants' occupation (current or previous) was collected according to the International Standard Classification of Occupations (ISCO-08) and divides jobs in 10 groups. Overall, there was a diversity of occupational groups, mostly concentrating around plant and machinery (n = 105, 18%), other (n = 16%), professional (n = 87, 15%), and managerial (n = 83, 14%). There were differences between the countries. For example, in the UK, there were more participants from professional, other and managerial backgrounds; in France, more plant and machinery

and managerial; in Belgium, more professional and managerial; and, in Netherlands, more other, professional and managerial backgrounds. Details of participant employment status information per country can be found in Table 6.

Table 6 Participant Employment Status per country

	Country				
	UK	France	Belgium	Netherlands	Total
Employment status					
	n = 281	n = 204	n = 45	n = 54	n = 584
In paid work	105 (37.37%)	39 (19 %)	10 (20.8%)	30 (54.5%)	184 (31.5%)
No paid work	173 (61.57%)	157 (76.6%)	35 (72.9%)	24 (43.6%)	389 (66.6%)
Never worked	3 (1.07%)	7 (3.4%)	-	-	10 (1.7%)
Sick Days *					
	n = 103	n = 32	n = 10	n = 29	n = 175
Mean	6.20	97.47	65.36	11.45	45.12
SD	18.40	149.06	128.17	26.15	80.44
Occupation (Current or previous)					
	n = 279	n = 204	n = 47	n = 53	n = 583
Manager	42 (15.1%)	27 (13.2%)	6 (12.5%)	8 (14.5%)	83 (14.2%)
Professional	55 (19.7%)	12 (5.9%)	10 (20.8%)	10 (18.2%)	87 (14.9%)
Technician/assoc. prof	14 (5.0%)	15 (7.3%)	1 (2.1%)	2 (3.6%)	32 (5.5%)
Clerical support	37 (13.3%)	4 (2%)	3 (6.3%)	1 (1.8%)	45 (7.7%)
Services and sales	10 (3.6%)	18 (8.8%)	1 (2.1%)	-	29 (5%)
Agriculture, forestry & fishing	2 (0.7%)	3 (1.5%)	-	2 (3.6%)	7 (1.2%)
Craft & related	16 (5.7%)	1 (.5%)	-	1 (1.8%)	18 (3.1%)
Plant & machinery	7 (2.5%)	92 (44.9%)	2 (4.2%)	4 (7.3%)	105 (18%)
Low skilled job	19 (6.8%)	10 (4.9%)	3 (6.3%)	2 (3.6%)	34 (5.8%)
Home maker	11 (3.9%)	13 (6.3%)	2 (4.2%)	-	26 (4.5%)
Armed forces	2 (0.7%)	1 (.5%)	2 (4.2%)	1 (1.8%)	6 (1%)
Student	2 (0.7%)	-	-	-	2 (0.3%)
Other	54 (19.4%)	2 (1%)	17 (35.4%)	22 (40%)	95 (16.3%)
Not applicable	8 (2.9%)	6 (2.9%)	-	-	14 (2.4%)

*Relates only to those who reported doing paid work

When asked about their main source of income, most participants were receiving state pension (n = 230, 40%) with a third receiving income from work (n = 150, 26%), reflecting answers given about their employment status. Across all countries, more than half participants reported having money worries either sometimes (n = 258, 44%) or always (n = 95, 16%). There were some differences between countries with most participants in France indicating money worries (n = 142, 69%) whereas participants in Belgium having the lowest level of money worries (n = 17, 35.5%) (Table 7).

Table 7 Participant Income per country

	Country				
	UK	France	Belgium	Netherlands	Total
Main Source of Income					
	n = 284	n = 184	n= 48	n= 54	n = 570
Work	88 (31%)	27 (13.2%)	8 (16.7%)	27 (49.1%)	150 (26.3%)
Early retirement pension	36 (12.7%)	7 (3.4%)	2 (4.2%)	-	45 (7.9%)
Disability pension	10 (3.5%)	8 (3.9%)	1 (2.1%)	-	19 (3.3%)
State pension	94 (33.1%)	98 (47.8%)	26 (52.2%)	12 (21.8%)	230 (40.4%)
Sick leave benefits	2 (0.7%)	3 (1.5%)	7 (14.6%)	1 (1.8%)	13 (2.3%)
Unemployment benefits	16 (5.6%)	7 (3.4%)	2 (4.2%)	8 (14.5%)	33 (5.7%)
Social benefits	8 (2.8%)	17 (8.3%)	-	-	25 (4.4%)
Widow(er) pension	3 (1.1%)	5 (2.4%)	-	-	8 (1.4%)
Private income	7 (2.5%)	1 (0.5%)	-	2 (3.6%)	10 (1.8%)
No financial support	4 (1.4%)	1 (0.5%)	-	1 (1.8%)	6 (1.1%)
Other	16 (5.6%)	10 (4.9%)	1 (2.1%)	3 (5.5%)	30 (5.3%)
Worries about money					
	n = 284	n = 204	n = 48	n = 55	n = 591
Never	117 (41.2%)	62 (30.2%)	31 (64.6%)	28 (50.9%)	238 (40.3%)
Sometimes	119 (41.9%)	100 (48.8%)	14 (29.2%)	25 (45.5%)	258 (43.7%)
Always	48 (16.9%)	42 (20.5%)	3 (6.3%)	2 (3.6%)	95 (16.1%)

4. Efficacy of the DWELL programme

To investigate the efficacy of the DWELL programme, metabolic and validated psychometric scales were used to compare baseline and end-of-programme outcomes across all countries. Non-parametric statistical tests (Wilcoxon signed-rank tests) were undertaken on all outcome measures to demonstrate change and assess statistical significance and Cronbach alpha coefficient tests were conducted to assess the scales' internal consistency. Where there is statistically significant difference there is a note indicating this; levels of significance are: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$, and, where 'NS $p > 0.05$' is indicated, it means that the result was not statistically significant (NS).

Results are presented in terms of pre-post DWELL programme comparisons per country and long-term changes 12 months after the end of the programme delivery across sites.

4.1 Participant Outcomes at the end of the DWELL Programme

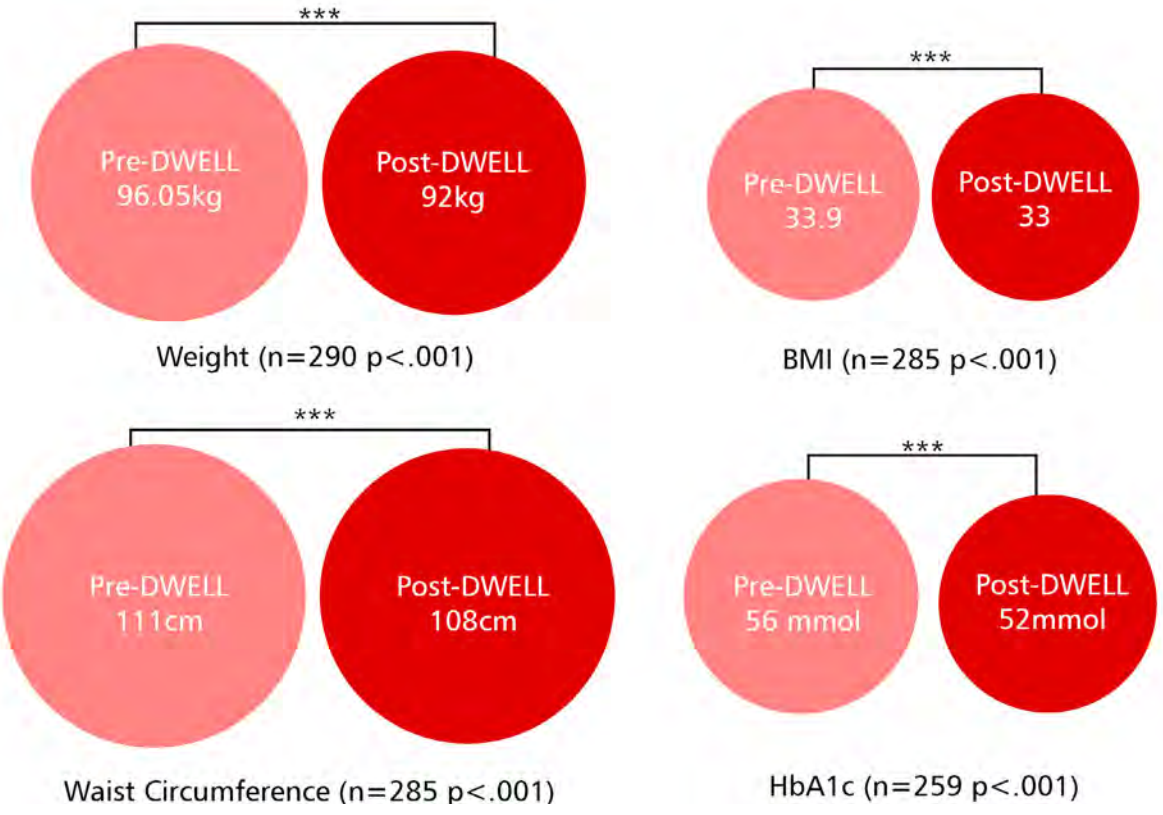
4.1.1 United Kingdom (UK)

Metabolic Health

The evaluation study hypothesis was that participation in the DWELL programme would improve participant metabolic health outcomes. In support of this hypothesis, non-parametric statistical analysis, comparing pre-post measures, showed that there were statistically significant reductions in all metabolic health areas for the UK participants (Figure 2):

- Weight loss of 4.05 kg ($z = -9.798$, $p < .001$)
- BMI reduction by 0.9 ($z = -9.249$, $p < .001$),
- Waist Circumference reduction of 3cm ($z = -8.657$, $p < .001$)
- HbA1c reduction by 4 points ($z = -6.855$, $p < .001$)

These findings support an important beneficial impact of the DWELL programme on metabolic indicators of health.



Ns P > 0.05 * P ≤ 0.05 ** P ≤ 0.01 *** P ≤ 0.001 **** P ≤ 0.0001

Figure 2 Comparison of Metabolic Health Outcomes pre-post DWELL - UK participants

Participant Empowerment

A key aim of the DWELL programme was to empower people with type 2 diabetes to improve self-management of their condition. To assess whether the DWELL programme had increased feelings of diabetes-related self-efficacy, DES-SF scores were compared pre-post DWELL. The scale had good internal consistency (Cronbach's α coefficient = .817).

In support of the study hypothesis, participation in the DWELL programme resulted in an increase in DES-SF scores and the results were statistically significant ($z = -9.402$, $p < .001$) (Figure 3). This suggests that DWELL met one of its key aims in improving diabetes-related self-efficacy of participants.

Figure 3 Comparison of Participant Empowerment scores pre-post DWELL - UK participants

Illness Perceptions

The study hypothesis was that diabetes education, one of the key elements of the DWELL programme, would increase participants' illness coherence, personal control over diabetes, and perceived treatment control. The IPQ-R scale and its sub-scales had good internal consistency (Cronbach's α coefficient ranging from .80 to .96), with the exception of the treatment control subscale (Cronbach's α coefficient = .58).

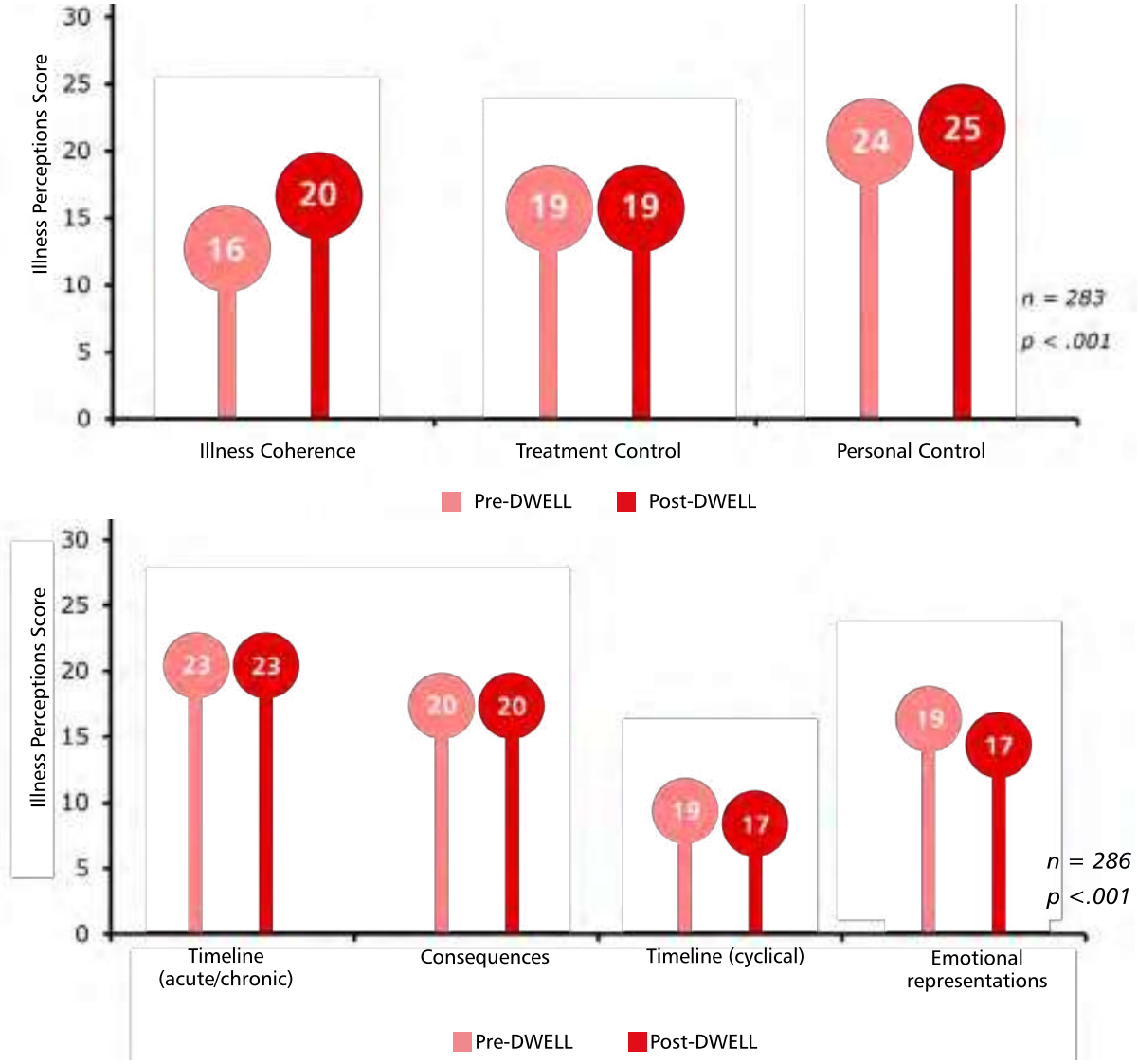
Findings confirmed that there were statistically significant improvements in illness perceptions of UK participants as follows:

- Illness Coherence increased from 16 to 20 ($z = -10.099$, $p < .001$)
- Personal Control increased from 24 to 25 ($z = -4.316$, $p < .001$)
- Treatment Control remained the same at 19 ($z = -2.725$, $p = .006$)

In addition, due to the wellbeing focus of the DWELL philosophy, it was anticipated that participation in the programme would have a positive emotional impact on participants' emotions towards diabetes, as measured by IPQ-R. In support of this hypothesis, there were improvements as follows:

- Negative Emotions associated with diabetes reduced from 19 to 17 ($z = -6.650$, $p < .001$)
- Negative fluctuation of symptoms of diabetes (timeline cyclical) reduced from 12 to 11 ($z = -2.023$, $p = .043$)
- Length of time that participants anticipated their diabetes would last (timeline acute/chronic) remained the same at 23 ($z = -2.15$, $p = .044$).

These findings suggest the DWELL programme had a beneficial effect in educating participants to have better understanding about their diabetes and improving their personal control over their condition. UK participants also reported improved positive outlook on their diabetes following the DWELL programme and an improved understanding of the cyclical nature of type 2 diabetes.



Ns P > 0.05 * P ≤ 0.05 ** P ≤ 0.01 *** P ≤ 0.001 **** P ≤ 0.0001

Figure 4 Comparison of Illness Perception scores pre-post DWELL – UK participants

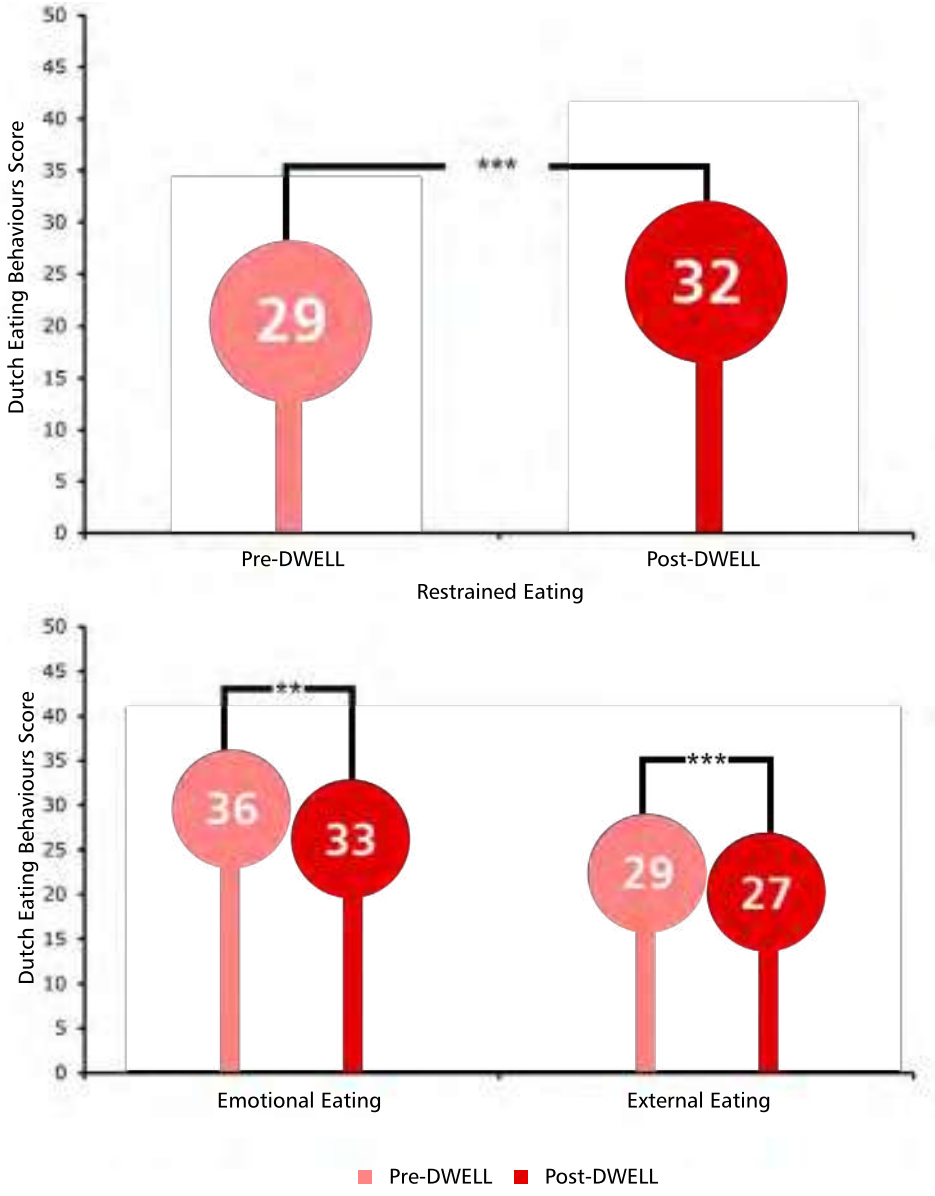
Eating Behaviours

Following nutrition and education components of the DWELL programme, it was hypothesised that participants' efforts to be aware of and in control of consumption of food (Restrained Eating), would increase, while eating in response to emotions (Emotional Eating) and eating in response to external food cues (External Eating) would decrease. Internal consistency, as measured using Cronbach's alpha, was high across all subscales (Cronbach's α coefficient ranging from .86 to .95).

In support of this hypothesis, improvements were found as follows:

- Restrained Eating increased from 29 to 32 ($z = -6.582$, $p < .001$)
- Emotional Eating decreased from 36 to 32, ($z = -3.094$ $p = .002$)
- External Eating decreased from 29 to 27 ($z = -4.830$, $p < .001$)

Taken together, these findings demonstrate beneficial effects of the DWELL programme on eating behaviours, with UK participants reporting more in control of their eating, and less influenced by emotional and external food cues.



Ns P > 0.05 * P ≤ 0.05 ** P ≤ 0.01 *** P ≤ 0.001 **** P ≤ 0.0001

Figure 5 Comparison of Eating Behaviours scores pre-post DWELL – UK participants

Physical and Mental Health

It was hypothesised that participant physical and mental health would improve following participation in the DWELL programme. Internal consistency for the SF-12 scale was good (Cronbach's α coefficient Physical Health = .82, Mental Health = .76).

Findings support the study hypothesis by confirming statistically significant changes as follows (Figure 6):

- Physical health increased from 44.55 to 47.25, (z = -2.240, p = .025)
- Mental health increased from 46.19 to 50.51 (z = -3.648, p = <.001)

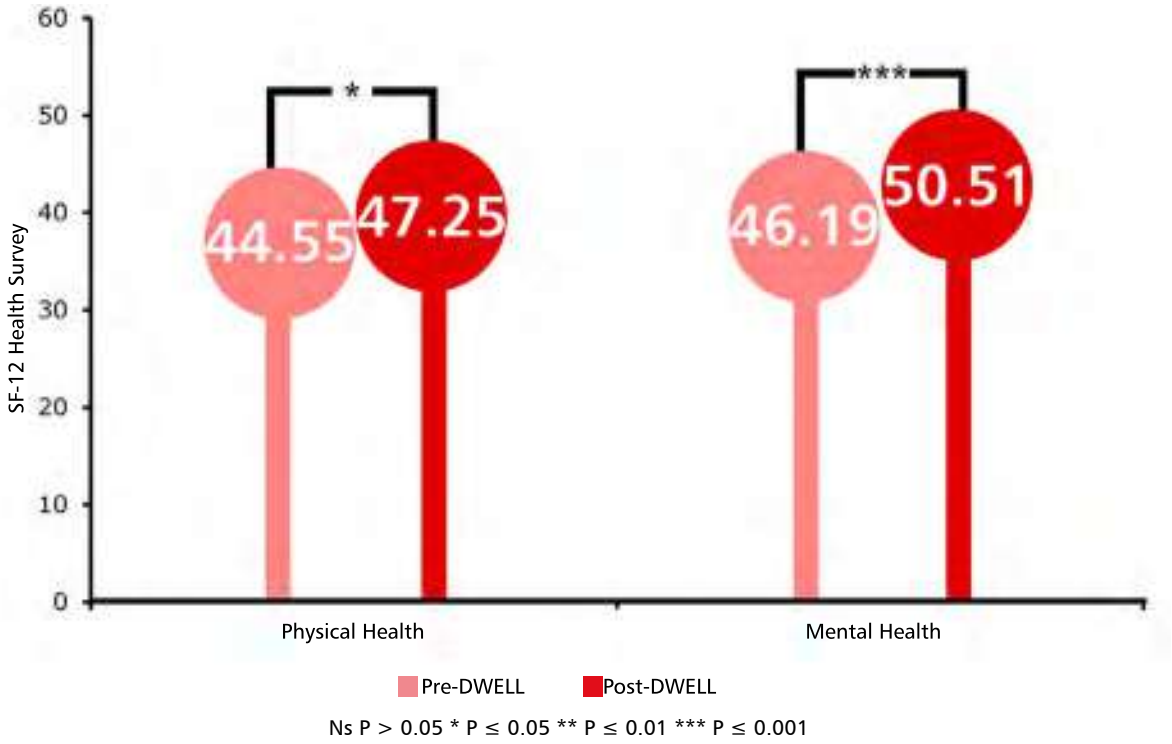


Figure 6 Comparison of Physical and Mental Health scores pre-post DWELL – UK participants

Self-care Behaviours

To assess diabetes-related self-care behaviours, participants reported the advice they recalled receiving from their health team on diet, exercise, monitoring blood sugars and medication pre-post DWELL. These findings are presented in Figures 7, 8, 9, 10 and 11. Participants with missing items were removed (pre-DWELL sample = 295, post-DWELL sample = 221)[1].

Dietary advice given by healthcare teams to participant was varied, however, there was an increase in each area when pre-post DWELL responses were compared. As expected for people with diabetes, "Eat lots of fruit and vegetables" was the most common advice pre-DWELL (43.9%) and post-DWELL (57.5%), while "Other" had the lowest response pre-DWELL (10.7%) and post-DWELL (12.2%). The only time this was not the case was the identification of "no dietary advice given" item. Although this may suggest that health professionals were giving more specific advice, this could also suggest that participants were more engaged with healthcare teams or more broadly that as participants learnt more about their disease, could better identify specific approaches to diet and were better able to grasp complex information regarding their illness, they had a better ability to recall discussing these subjects with their healthcare team.

1 No measure of statistical significance was carried out on these comparisons.

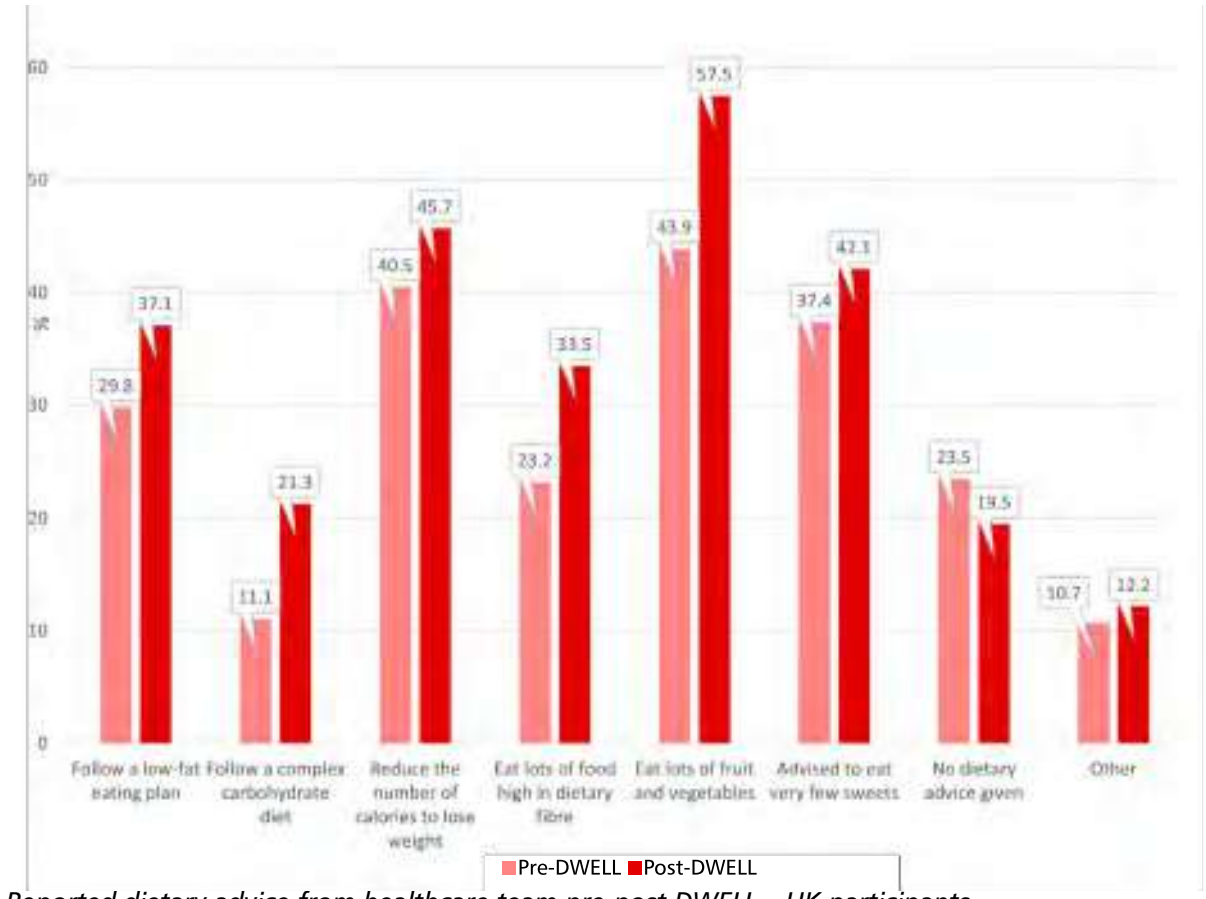


Figure 7 Reported dietary advice from healthcare team pre-post DWELL – UK participants

This pattern of increased reporting at the end of the programme continued with exercise advice. This supports the previous suggestion that participants increased their understanding and their ability to take on advice.

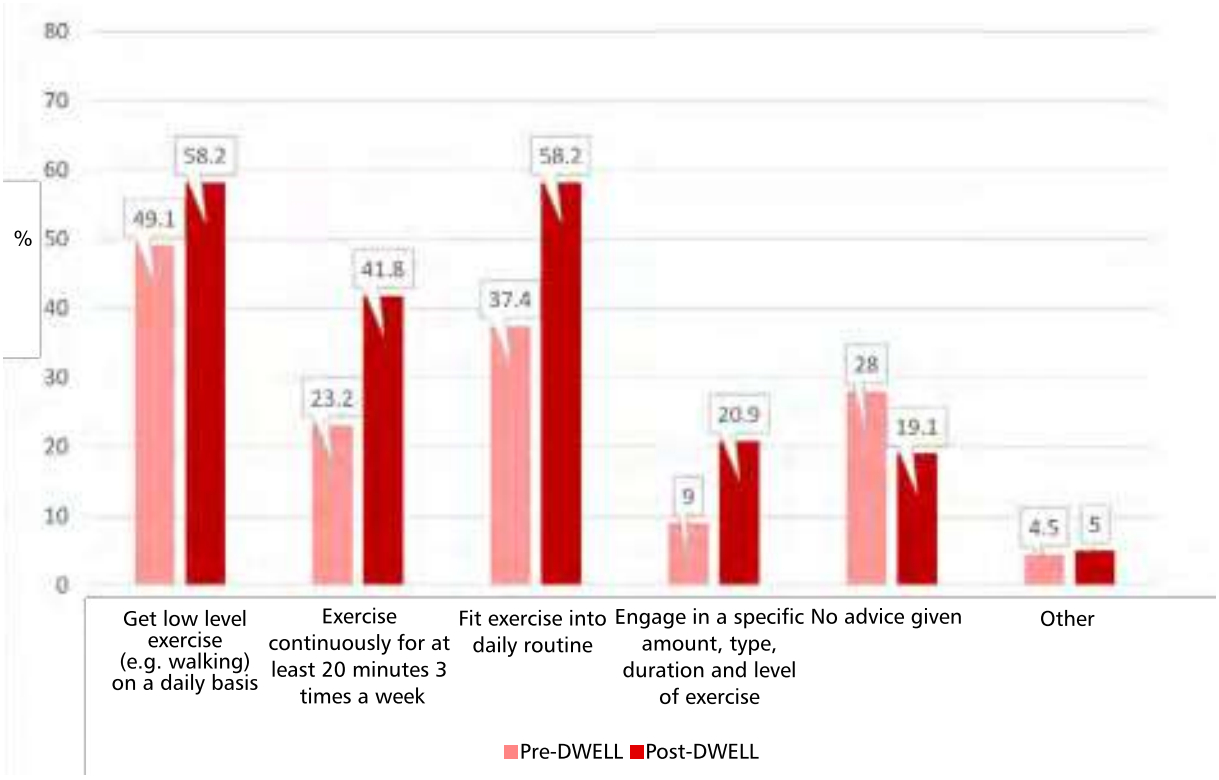


Figure 8 Reported exercise advice from healthcare team pre-post DWELL – UK participants

In terms of reported blood sugar testing advice, responses remained consistent pre-post DWELL. This might be expected with such specific advice likely to be key part of routine diabetes care regime by professionals, therefore attendance in a psychoeducational programme would not affect it much.

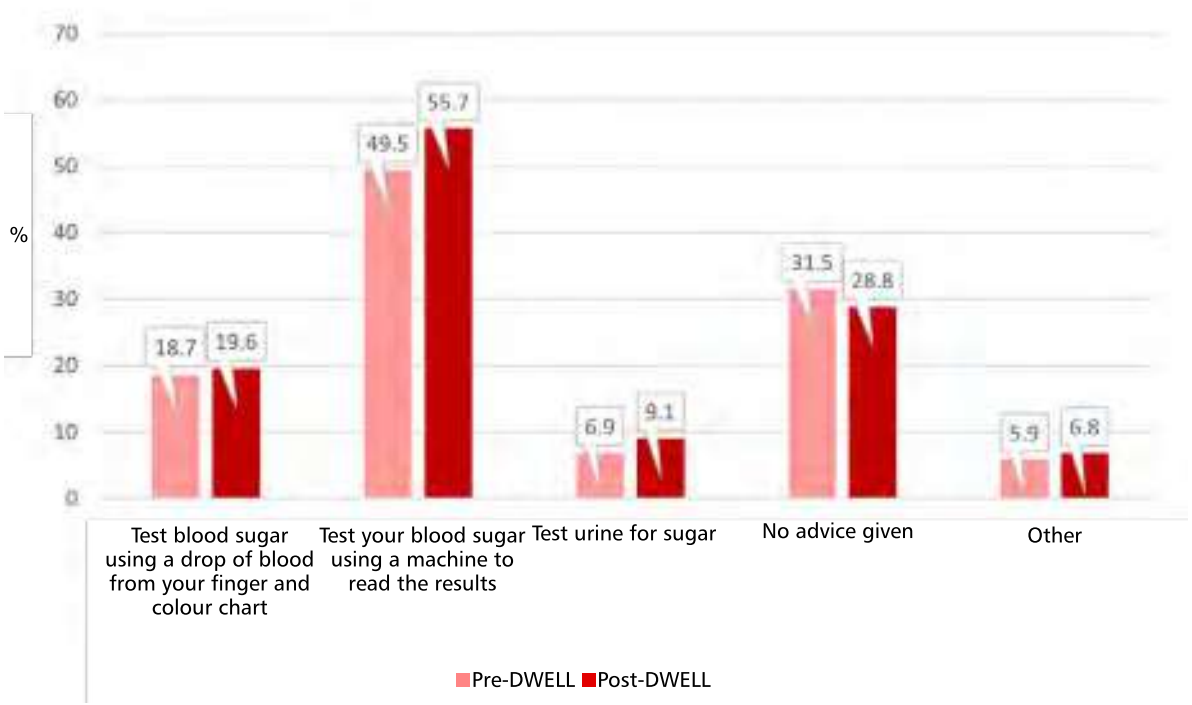


Figure 9 Reported blood sugar measurement advice from healthcare team pre-post DWELL – UK participants

Participant recollection of medication advice remained very consistent pre-DWELL and immediately post-DWELL. This is likely to be because the specificity of the advice, the regularity of taking medication, the importance medication plays for management of diabetes and the straightforward relationship between medication adherence and health improvement, mean medication advice remains in the forefront of participants' minds. This may mean that participant education during the DWELL programme has less impact on participant medication adherence than other areas of advice such as diet or exercise.

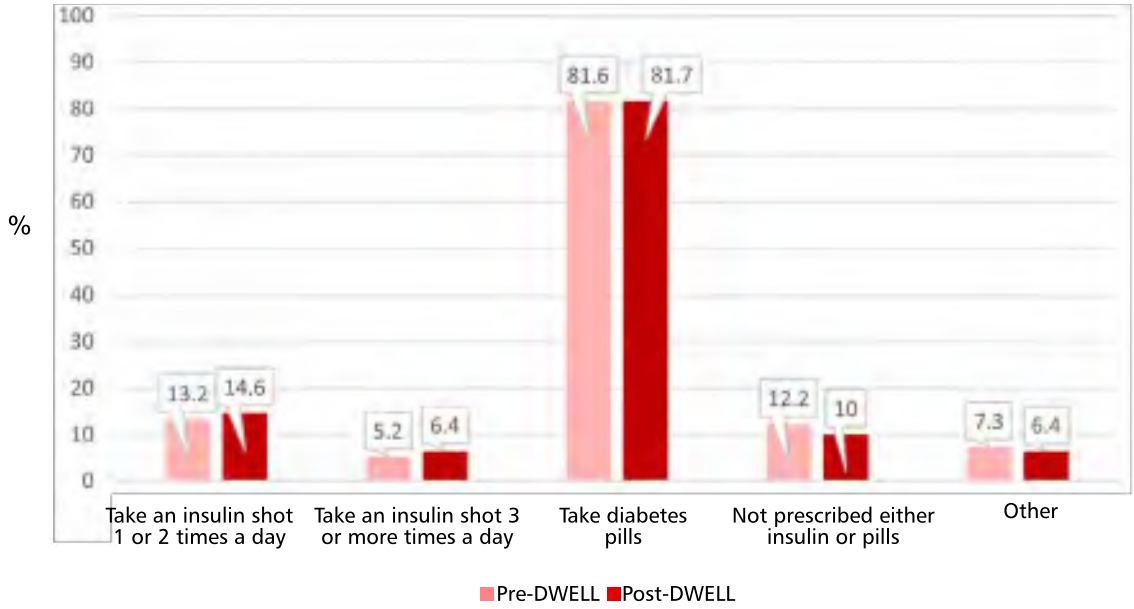


Figure 10 Reported medication prescription from healthcare team pre-post DWELL – UK participants

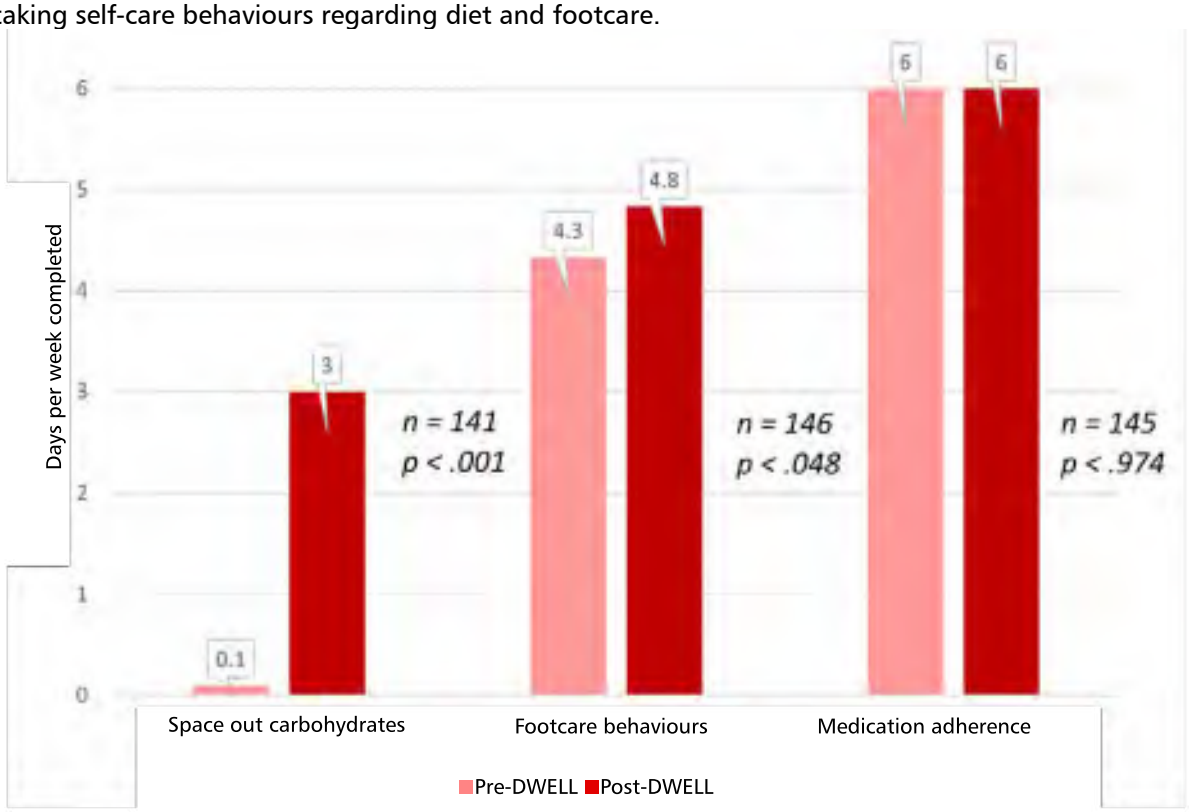
Also, statistical comparison tests pre-post DWELL were conducted in relation to median number of days per week that participants engaged in diet, footcare and medication adherence self-care behaviours (Figure 11).

Adherence to taking prescribed medications did not improve following DWELL remaining at 6 (z = -.033, p = .974). Almost all participants took their medication every day, suggesting regularity, therefore no particular improvements would be expected when participants were already consistently adhering to medication advice.

The above increased reporting on dietary advice was also reflected in reported adherence to diet self-care behaviours, with a marked improvement in participants reporting the spacing out carbohydrates. This rose from a median average of much less than one day a week pre-DWELL to three days post-DWELL (z = -4.209, p = <.001). This suggests that participants appeared to have learnt more about nutrition and could better identify specific approaches to diet, were better able to grasp complex information regarding dietary habits and take more care over their diet once they had completed the DWELL programme.

Footcare adherence scores were calculated from an average number of days participants followed recommendations of washing their feet, drying between their toes and not soaking feet. Following DWELL, footcare behaviours were improved to an average half a day more relative to baseline (z = -1.974, p = .048).

Findings demonstrate that following participation in the DWELL programme, participants were more regularly undertaking self-care behaviours regarding diet and footcare.



Ns P > 0.05 * P ≤ 0.05 ** P ≤ 0.01 *** P ≤ 0.001 **** P ≤ 0.0001

Figure 11 Comparison of diet, footcare and medication adherence self-care behaviours pre-post DWELL – UK participants

Physical Activity

To assess levels of physical activity, participants completed the International Physical Activity Questionnaire (IPAQ). In line with the scale's instructions, participants who presented as outliers, had missing data, or who reported they did not know how much time they spent on exercise were removed from the analysis. This resulted in reduced sample for analysis consisting of 95 participants. Pre-post DWELL comparisons of median MET minutes per week for vigorous, moderate, walking and total activity were calculated and are presented in Figure 12.

As physical activity was a core part of the DWELL programme, it was hypothesised that there would be an increase post-DWELL. In support of this hypothesis, findings suggest the following improvements:

- Total MET-minutes per week increased from 1386 to 2040 MET-minutes (z = -2.821, p = .005)
- Moderate activity increased in 0.1 - 120 (z = -1.302, p = .193); however, the difference was non-statistically significant
- Vigorous activity remained the same 0.1 – 0.1 (z = 2.942, p = .003)
- Walking activity increased from 693 to 732 (z = -676., p = .499); however, the difference was non-statistically significant

These results indicate that the total physical activity levels improved for UK DWELL participants. In relation to particular types of activity, although they showed some positive changes, analysis did not support any statistically significant results.

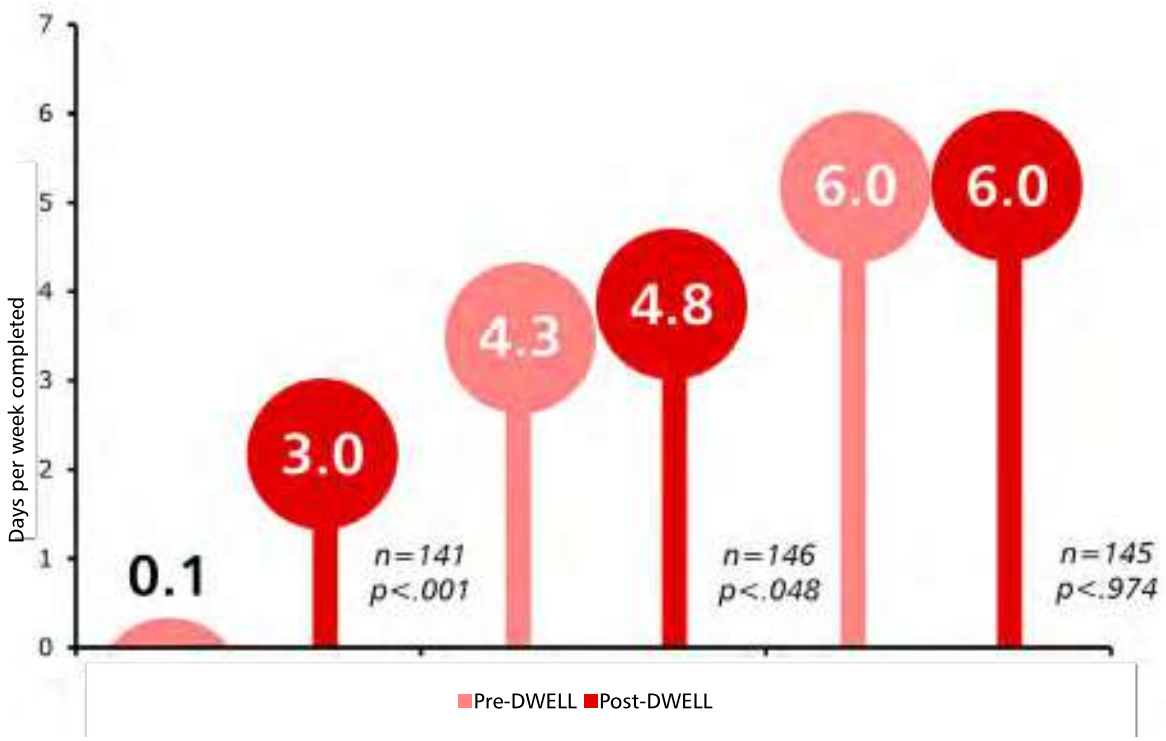


Figure 12 Median MET-minutes per week spent on vigorous, moderate, walking and total physical activity pre-post DWELL – UK participants

Health-related Quality of Life

Health-related Quality of life was measured by the European Quality of Life - 5 Dimensions - 3 Level Version questionnaire (EQ-5D-3L) (EuroQol Group 2009). EQ-5D-3L is a generic tool for Patient Reported Outcomes (PRO) that assesses patients' quality of life, irrespective of the disease. The visual analogue scale (EQ VAS) from this measure was used to record participant's self-rating of health on a visual scale, expressed as 0 (the worst health imaginable) to 100 (the best health imaginable).

There was a clear improvement in participants' health when measured on this visual scale when pre-post DWELL results were compared from 60 to 75 ($z = -4.925$, $p = <.001$).

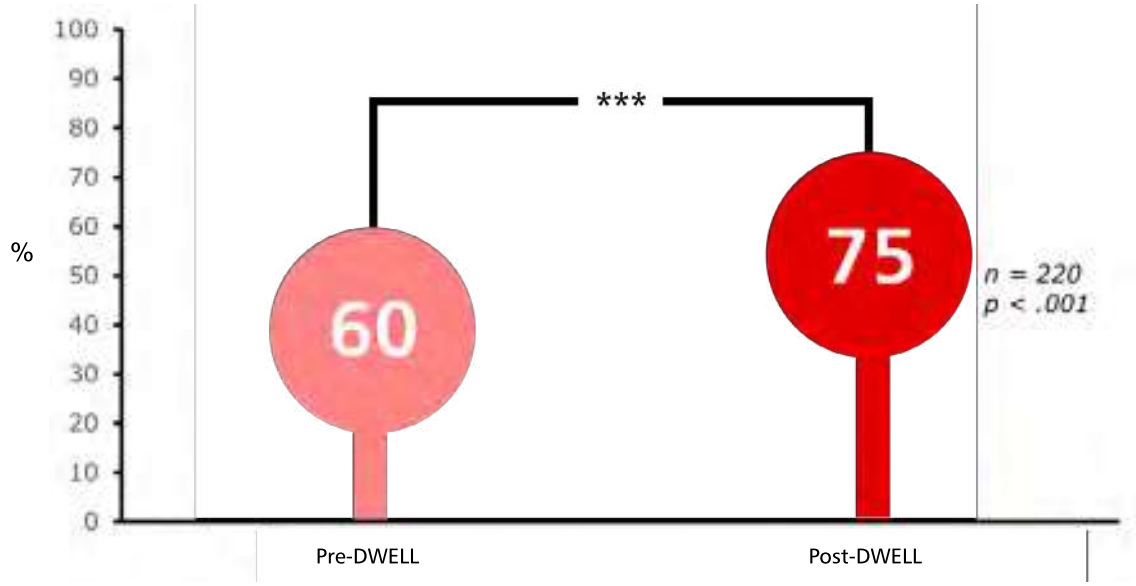


Figure 13 Health-related Quality of Life scores pre-post DWELL – UK participants

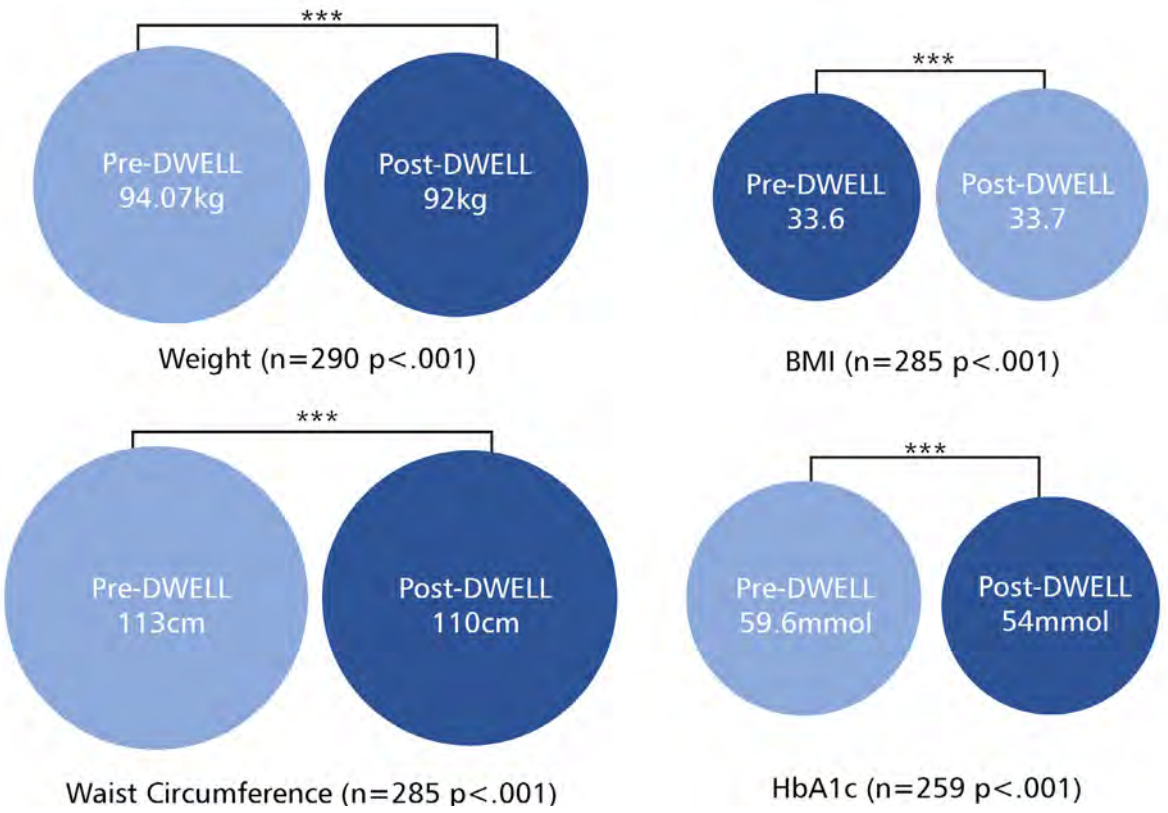
4.1.2 France

Metabolic Health

Analysis of metabolic health outcomes for French DWELL participants showed significant improvements:

- Weight reduction of 2.7 kg (z = 4.645, p = <.000)
- Waist circumference reduction of 3cm (z = 5.321, p = <.000)
- HbA1c reduction of 5.6 mmol/mol (z = 3.813, p = <.000)

These findings support a beneficial impact of the DWELL programme on metabolic health outcomes. However, BMI remained consistent post-DWELL – pre - 33.6 – post - 33.7 (z = 4.006, p = <.000).

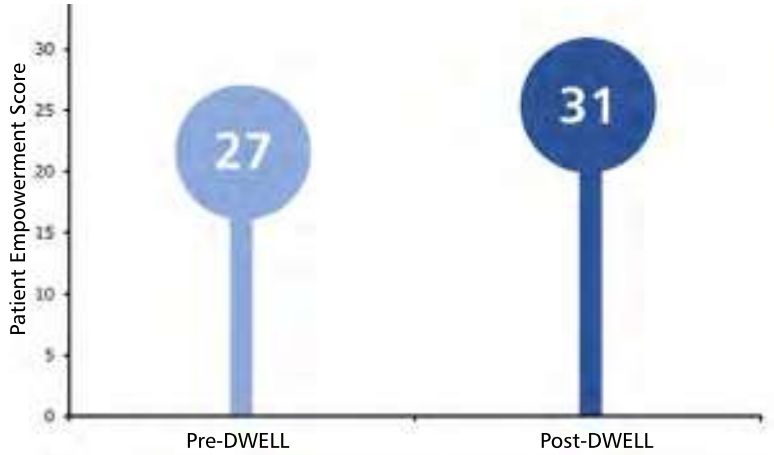


Ns P > 0.05 * P ≤ 0.05 ** P ≤ 0.01 *** P ≤ 0.001 **** P ≤ 0.0001

Figure 14 Comparison of metabolic health outcomes pre-post DWELL - French participants

Participant Empowerment

In France, participation in the DWELL programme resulted in a statistically significant increase in median DES-SF participant scores from 27 to 31 (z = 7.721, p = <.001). These results support DWELL's impact on participants' empowerment and self-efficacy levels, a key aim of the DWELL programme.



Ns P > 0.05 * P ≤ 0.05 ** P ≤ 0.01 *** P ≤ 0.001 **** P ≤ 0.0001

Figure 15 Comparison of Participant Empowerment scores pre-post DWELL – French participants

Illness Perceptions

Results from the French participants broadly match those of the UK:

- Illness Coherence improved from 17 to 19 ($z = -6.290$, $p < .001$)
- Personal Control improved from 23 to 24 ($z = -3.104$, $p < .002$)
- Negative Emotions associated with diabetes reduced from 18 to 16 ($z = -.204$, $p < .001$)
- Treatment Control scores remained the same at 19 ($z = -1.803$, $p = .071$)
- Length of Time anticipated diabetes would last (timeline acute/chronic), remained the same at 24 - 25 ($z = -.850$, $p = .395$)
- Negative life consequences of diabetes remained the same at 18 ($z = -1.908$, $p = .056$)

Findings suggest that the DWELL programme in France had a beneficial effect in educating participants about their diabetes, changing positively attitudes towards diabetes and improving their personal control over their condition.

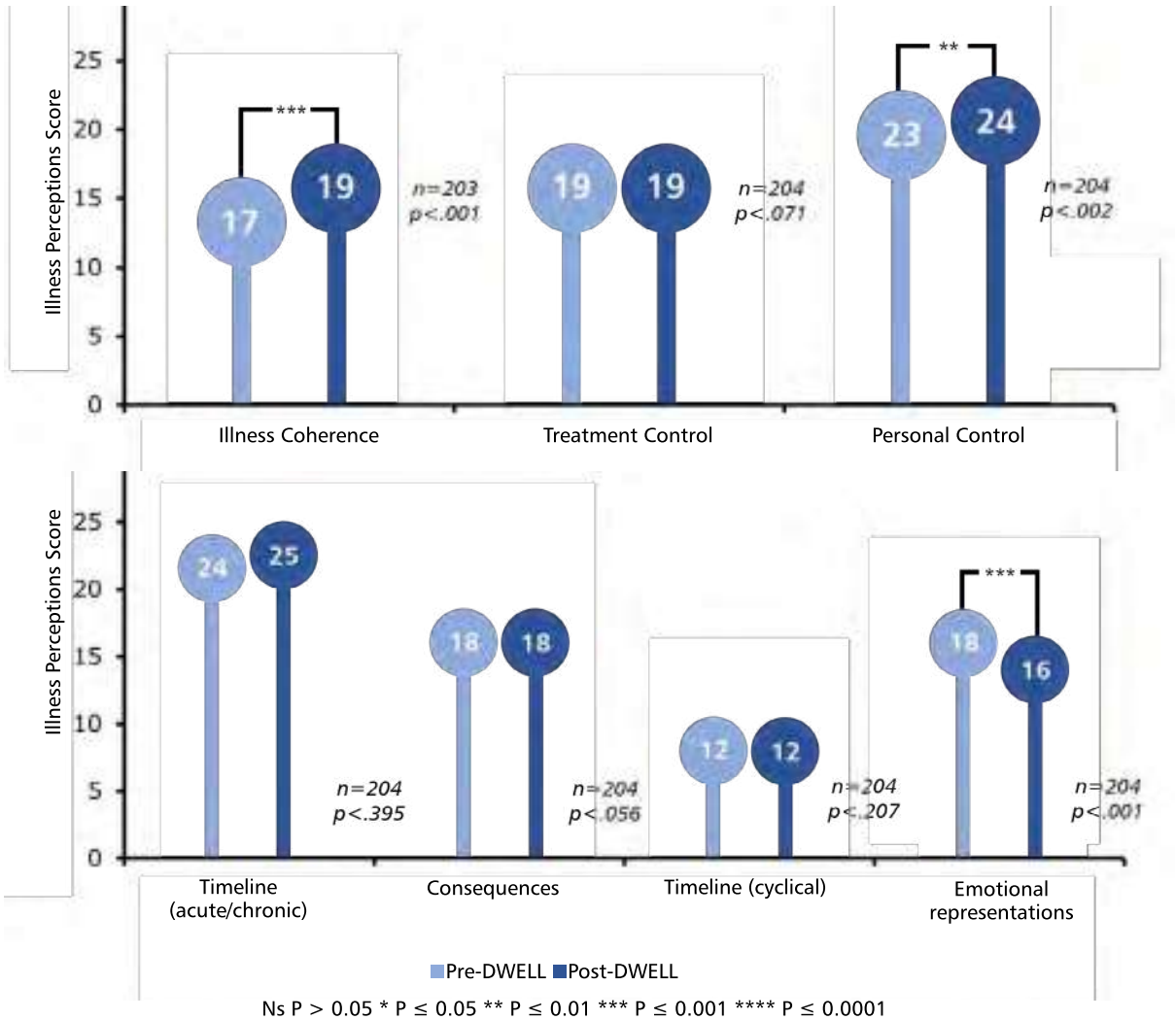


Figure 16 Comparison of Illness Perception scores pre-post DWELL – French participants

Eating Behaviours

In terms of eating behaviours, French participants reported positive changes similar to the UK:

- Emotional Eating was reduced from 27 to 26 ($z = -2.677$, $p = .007$)
- External Eating was reduced from 23 to 21 ($z = -4.049$, $p < .001$)

These findings demonstrate beneficial effects of the DWELL programme on participants' psychological responses to food, with participants less influenced by emotional and external food cues. Restraint eating remained the same at 30 ($z = -1.891$, $p < .059$).

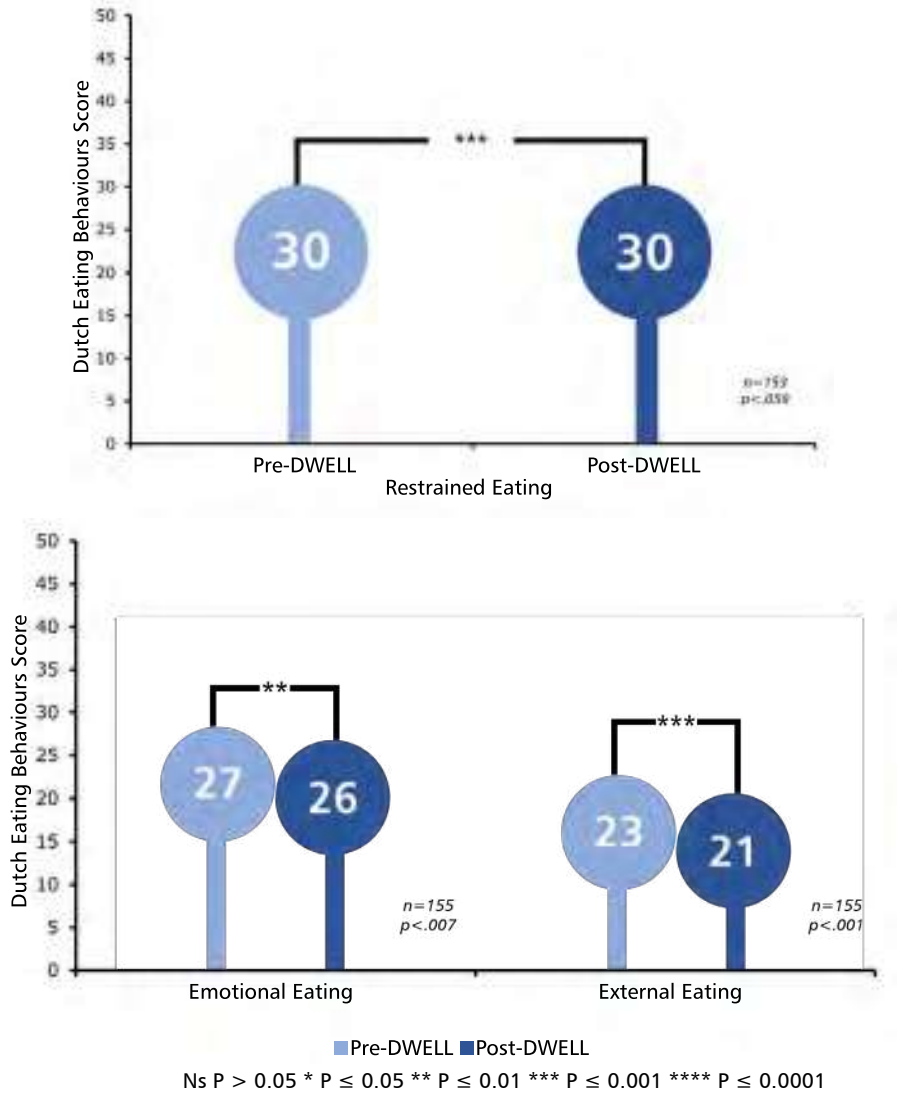


Figure 17 Comparison of Eating Behaviours scores pre-post DWELL – French participants

Physical and Mental Health

Like the UK, positive change in perceived physical and mental health confirmed the study hypothesis:

- Improved Physical Health 41.7 – 45.8 (z = -3.768, p < .001)
- Improved Mental health, 42.7 – 46 (z = -2.749, p = .006).

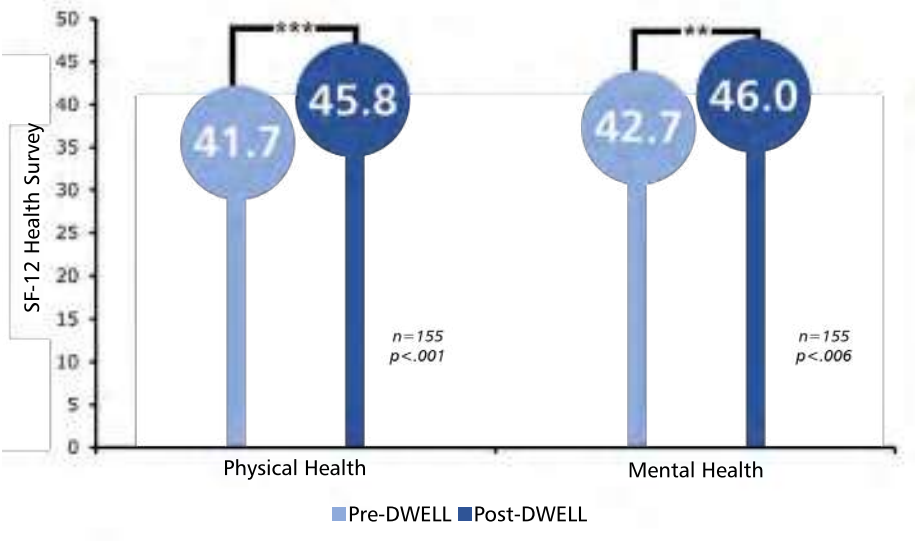


Figure 18 Comparison of Physical and Mental Health scores pre-post DWELL – French participants

Self-care Behaviours

Relative to the UK, much fewer participants in France reported receiving "no dietary advice", with only 6.4% pre-DWELL compared to 23.5% in the UK and immediately post-DWELL 2.6% compared to 19.5% in the UK. Moreover, unlike the UK dietary advice, pre-post DWELL dietary advice remained relatively stable. This difference between countries is likely to be due to broader cultural and social focus on food, which has traditionally been associated with France. Advice relating to "hunger and satiety" and "no foods off limits" appears to increase at the end of the DWELL programme which could be a result of particular education on nutrition during the programme.

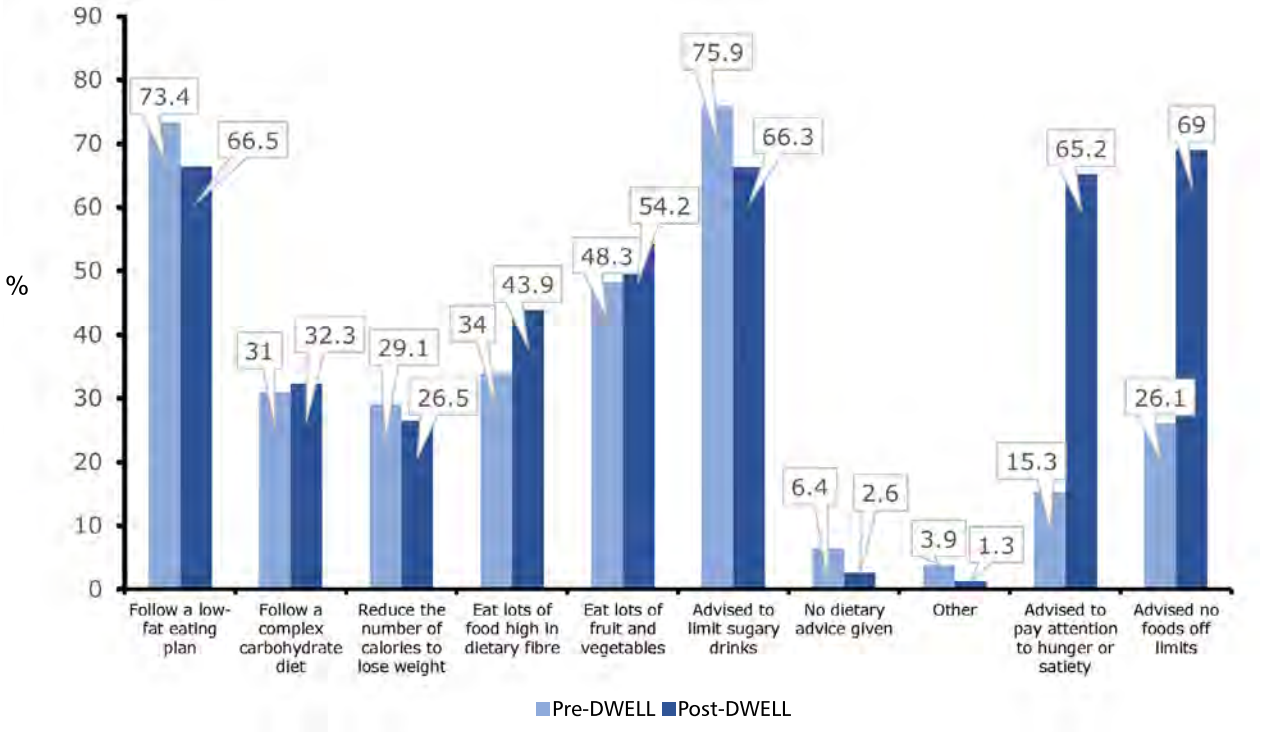


Figure 19 Reported dietary advice from healthcare team pre-post DWELL – French participants

Other than the "no advice" option, there was an increase in the exercise advice participants recalled being given by their healthcare teams when pre- and immediately post-DWELL were compared. These results reflect those of the UK much more closely and therefore suggest that again participants either received more advice, were more engaged in their treatment or more able to recall healthcare advice once they had completed the DWELL programme.

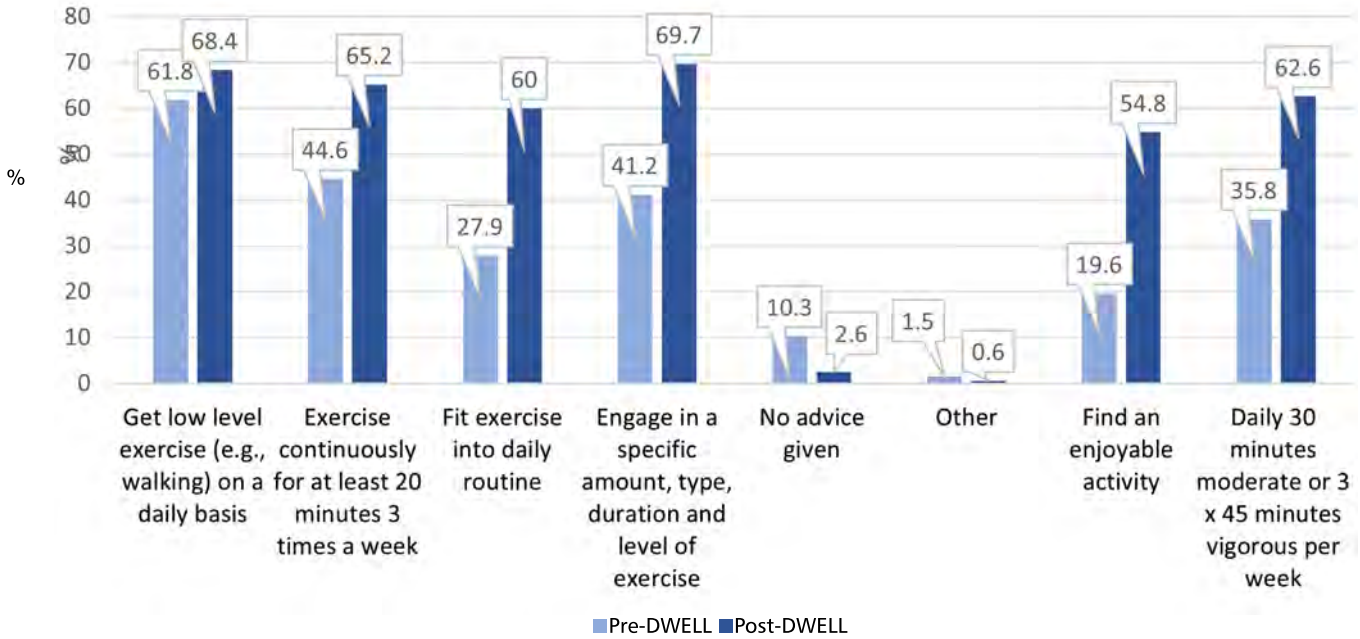


Figure 20 Reported exercise advice from healthcare team pre-post DWELL – French participants

France had very similar results to the UK in participant recollection of blood sugar measurement advice, which remained same pre-post DWELL. This could mean that the DWELL programme has less of a significant impact on whether participant's recollect blood sugar measurement advice compared to other areas of advice such as diet or exercise.

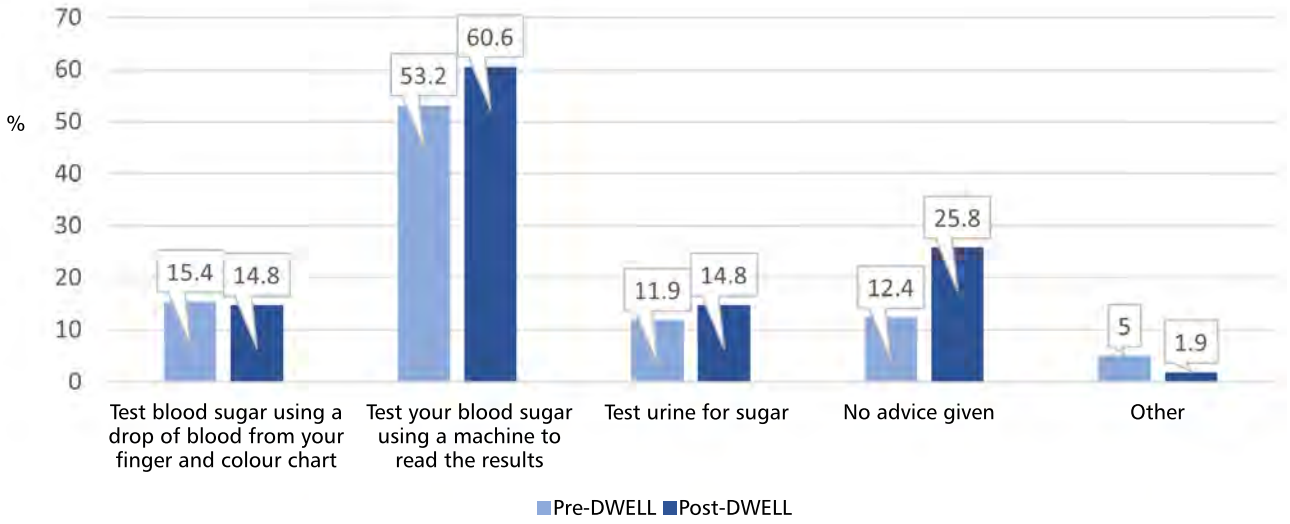


Figure 21 Reported blood sugar measurement advice from healthcare team pre-post DWELL – French participants

Similar to UK, participants' recollection of advice about medication prescription remained stable pre-post DWELL, confirming the straightforward relationship between medication adherence and health improvement, which means medication advice was both a focus of healthcare teams and remained in the forefront of participants' minds.

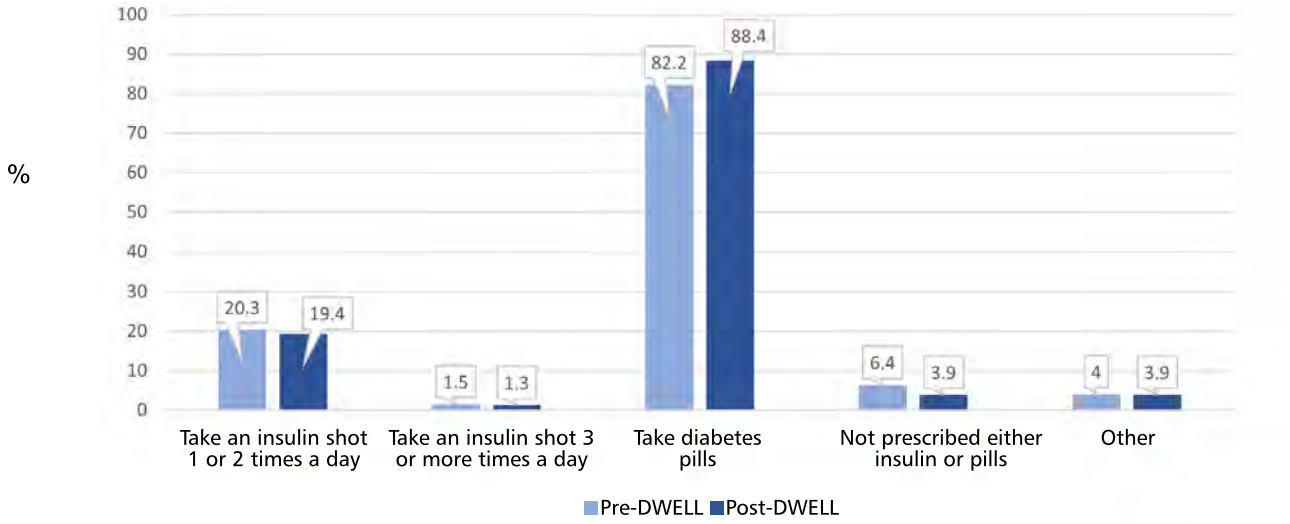


Figure 22 Reported medication prescription from healthcare team pre-post DWELL – French participants

In France, data was also gathered on footcare advice. These results suggest that footcare advice was an aspect of self-care which became more pertinent after participants had attended the DWELL programme. Participants' recollection of advice increased in all areas of footcare, apart from the "other" and "no advice given" options which fell. Once again, this may be because healthcare teams mentioned this aspect more, however, it is likely that participants in the DWELL programme became more engaged with their disease leading to a better understanding, more inclination to engage in subjects with their healthcare team and a greater ability to recollect important aspects of diabetes.

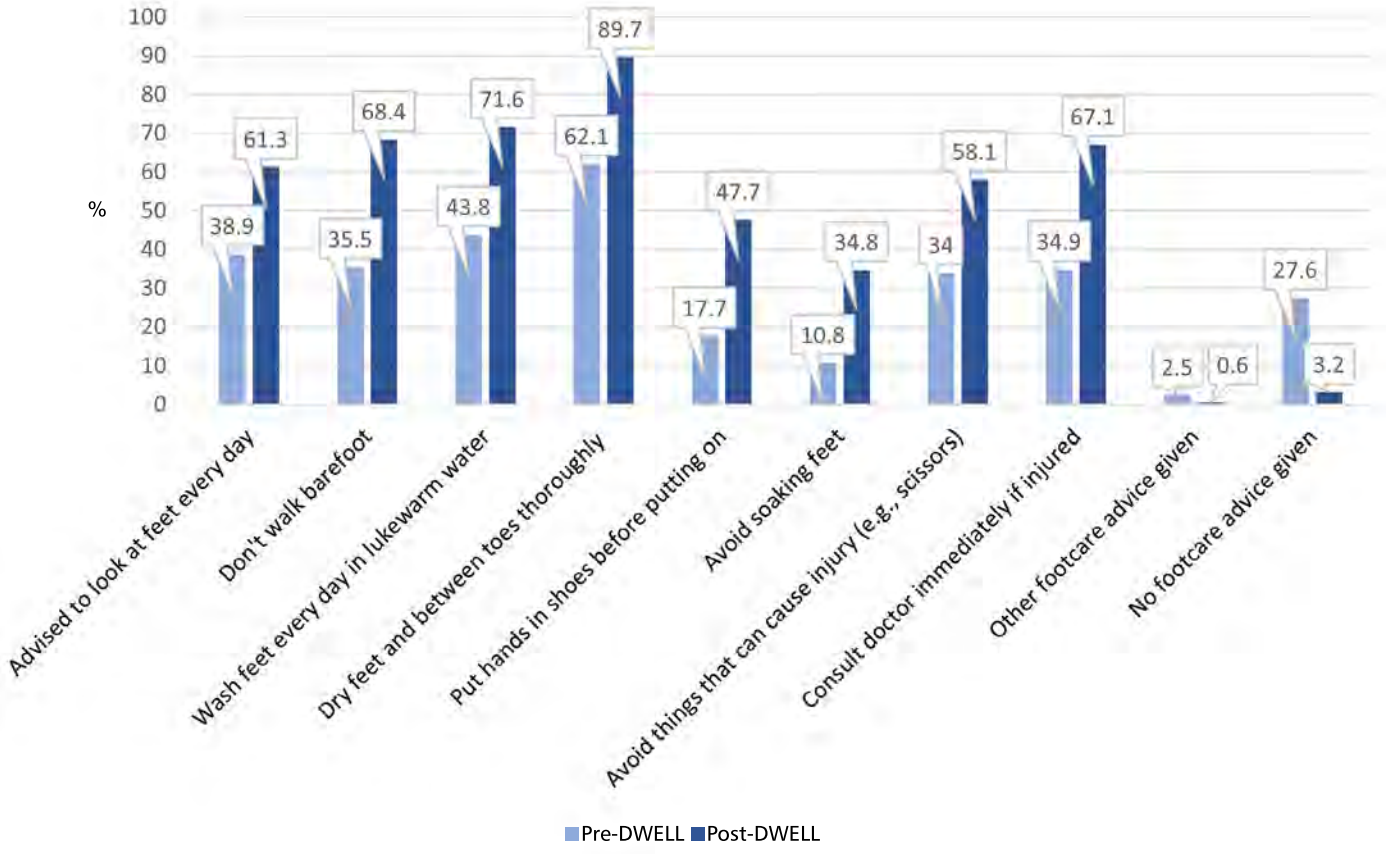


Figure 23 Reported footcare advice from healthcare team pre-post DWELL – French participants

In terms of daily adherence to spacing carbohydrate intake, washing and drying but not soaking feet and taking prescribed medication, French data showed no change pre-post DWELL; carbohydrate intake remained at 3 days per week ($z = -2.655$, $p = .008$), footcare behaviours remained at 4.3 days a week ($z = -3.691$, $p = <.001$) and medication adherence remained at 3 days per week ($z = -1.912$, $p = .056$). These results differed from the UK ones, possibly indicating the different care systems and protocols between countries.

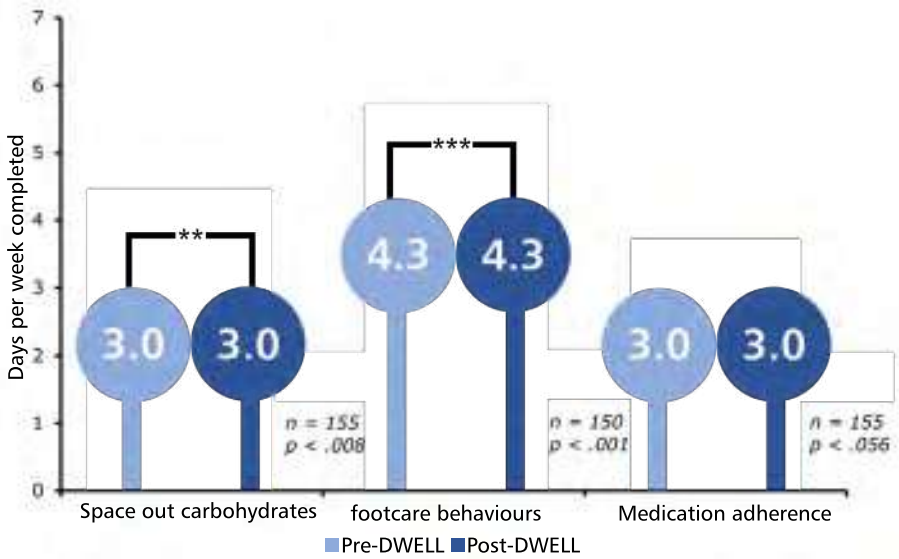


Figure 24 Comparison of diet, footcare and medication adherence self-care behaviours pre-post DWELL – French participants

Physical Activity

When physical activity was compared pre-post DWELL in France, all activity measures indicated an increase, however, only the walking activity results were statistically significant. This lack of statistical significance might be due to relatively low response rate in this scale:

- Total MET-minutes per week increased from 1671 to 2226 MET-minutes (z = -1.751, p = .080)
- Walking activity increased from 396 to 693 (z = -2.695, p = .007)
- Moderate activity increased from 520 to 780 (z = -.514, p = .607); however, the difference was non-statistically significant
- Vigorous activity remained the same 0 (z = -2.177, p = .029)

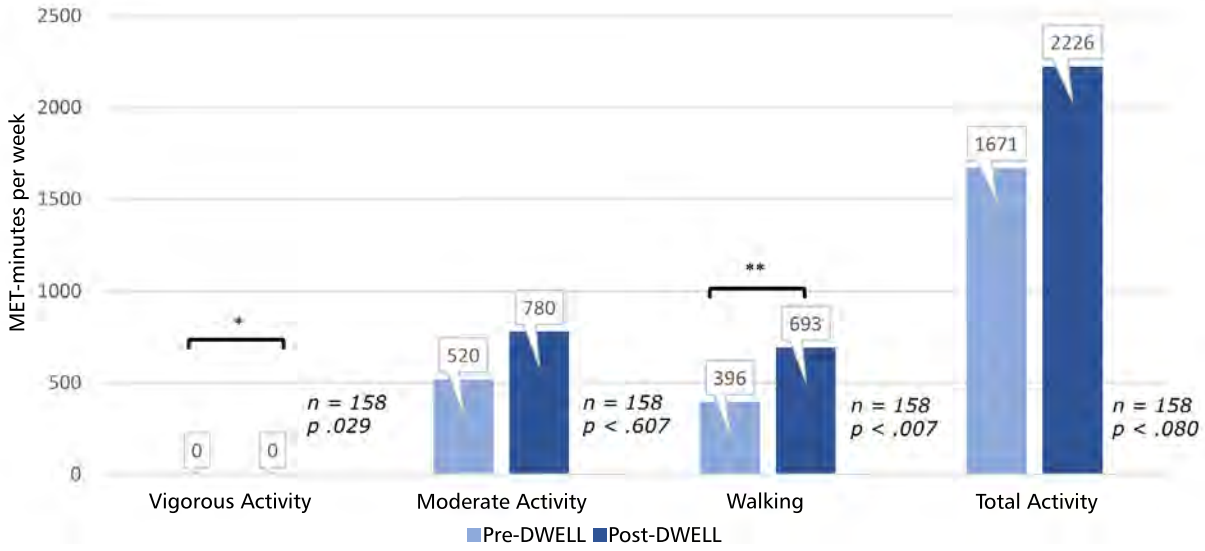


Figure 25 Median MET-minutes per week spent on vigorous, moderate, walking and total physical activity pre-post DWELL – French participants

Health-Related Quality of Life

The EQ visual analogue scale (EQ VAS) records respondent's self-rating of health on a visual scale, expressed as 0 (the worst health imaginable) to 100 (the best health imaginable). In the figure below, the median values for EQ VAS rating are presented. There was no clear increase in how participants saw their health from pre-DWELL to post-DWELL with a median result at both time-points of 70 (z = -4.318, p = <.001).

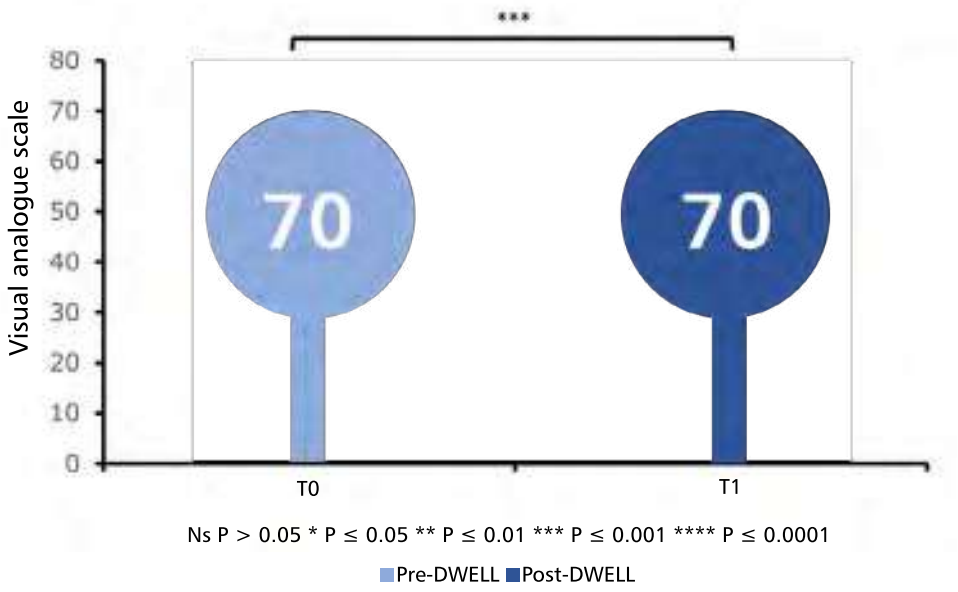


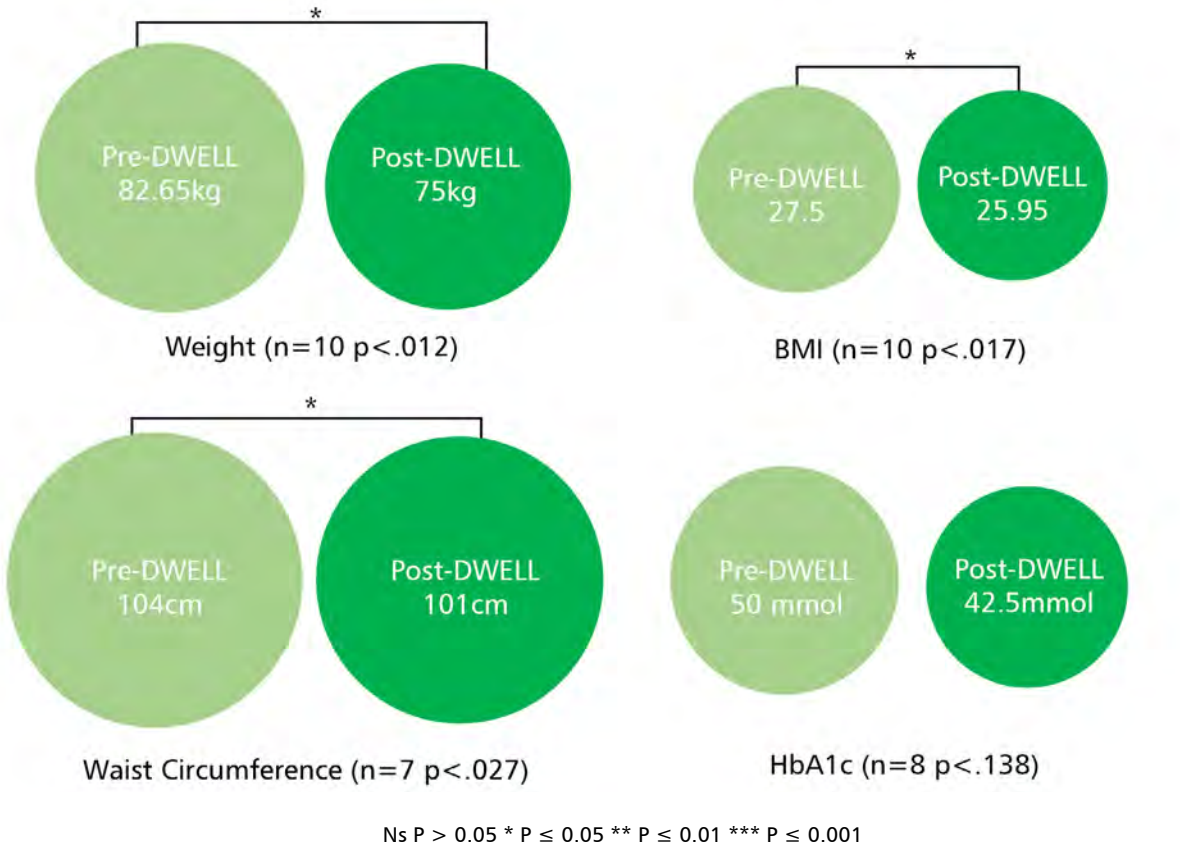
Figure 26 Health-related Quality of Life scores pre-post DWELL – French participants

4.1.3 Belgium

Metabolic Health

Belgium participant numbers were smaller than those in the UK and France, with participant numbers measured for metabolic outcomes for weight (n = 10), BMI (n = 10), waist circumference (n = 7) and HbA1c (n = 8). Despite small sample size, comparisons of pre-post DWELL metabolic health outcomes indicated positive changes as follows:

- Weight loss of 7.65 kg (z = 2.527, p = .012)
- BMI reduction of 1.3 (z = 2.395, p = .017)
- Waist circumference reduction of 3cm (z = 2.207, p = .027)
- HbA1c reduction of 7.5mmol/mol (z = 1.483, p = .138.) – non-statistically significant difference.



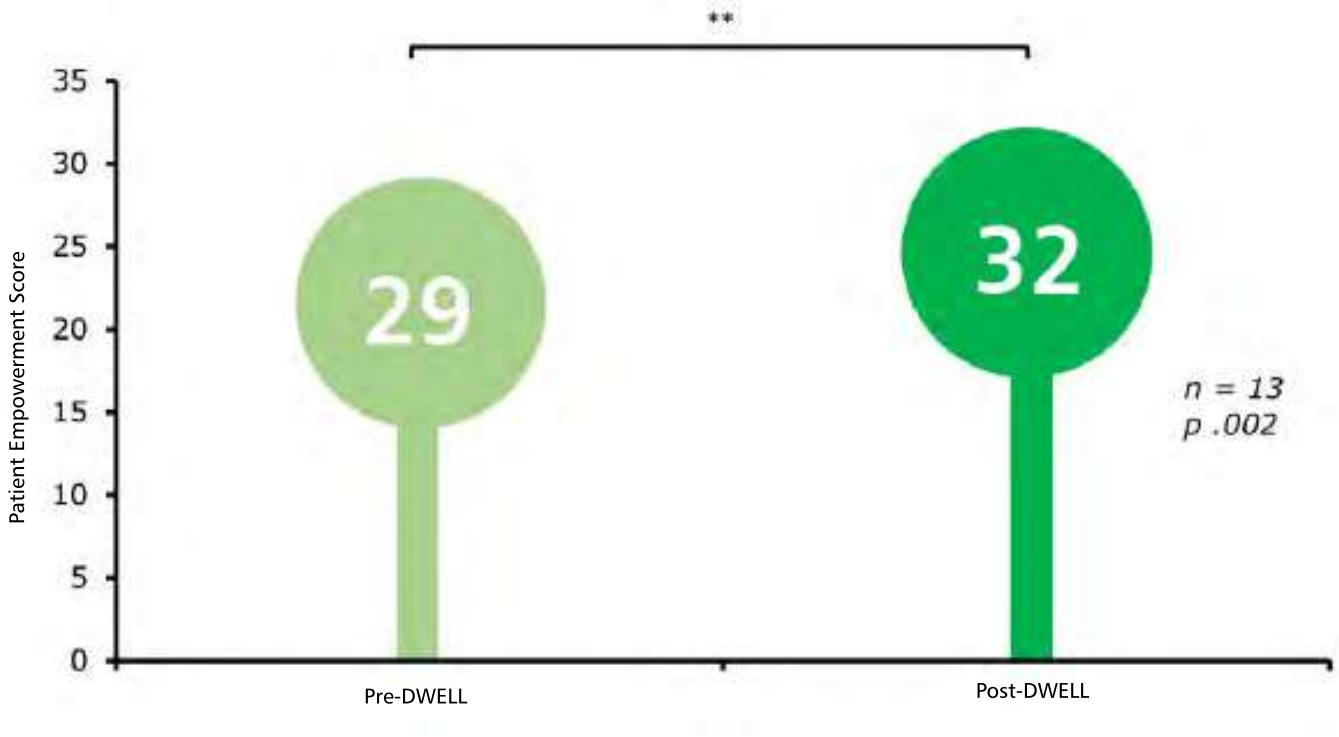
Ns P > 0.05 * P ≤ 0.05 ** P ≤ 0.01 *** P ≤ 0.001

Figure 27 Comparison of metabolic health outcomes pre-post DWELL - Belgian participants

Participant Empowerment

In Belgium, despite the small sample size (n = 13), participation in the DWELL programme resulted in in statistically significant increase of empowerment and self-efficacy:

- Participant Empowerment and Self-Efficacy increased from 29 to 32 (z = 3.066, p = .002).



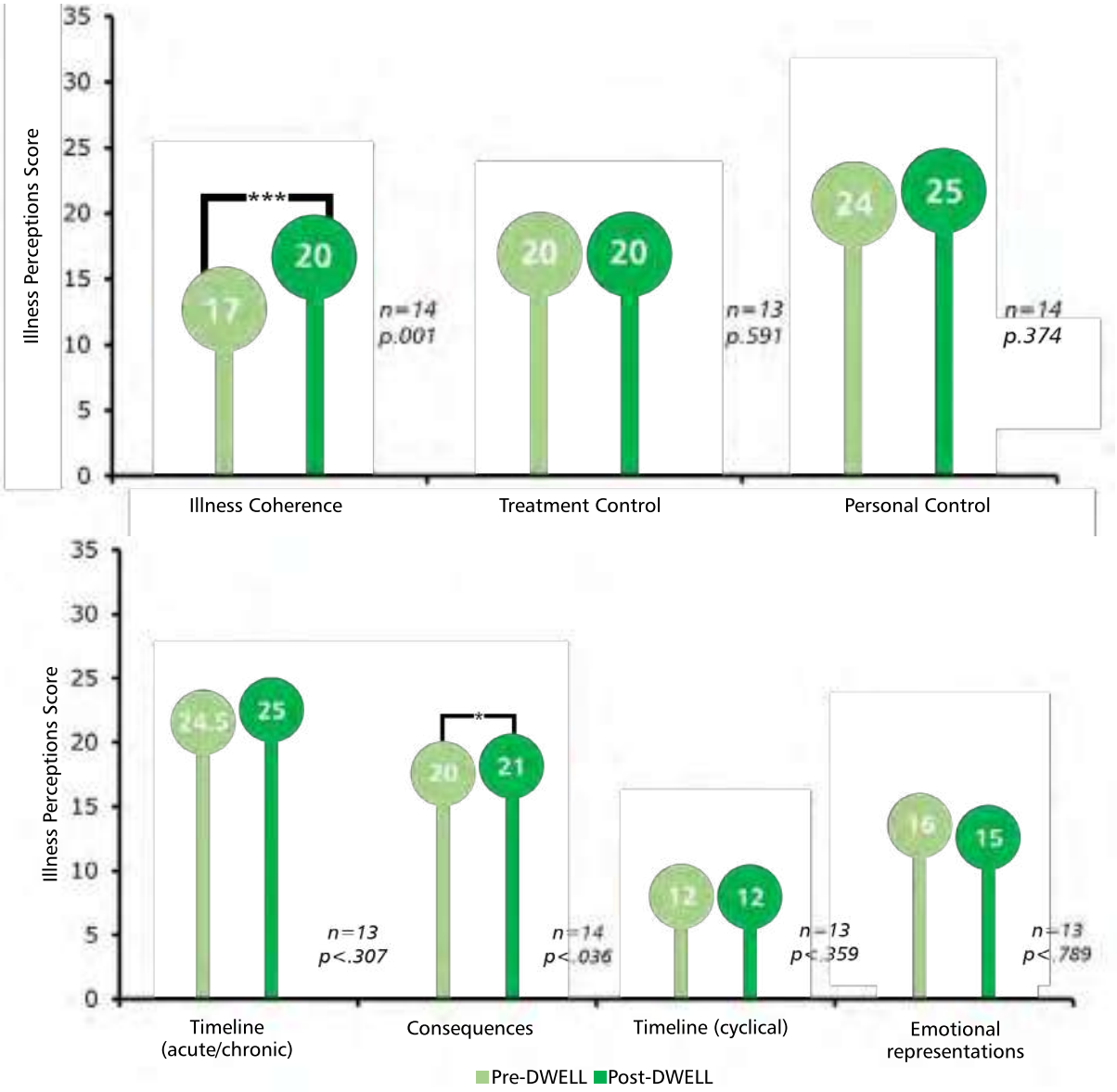
Ns P > 0.05 * P ≤ 0.05 ** P ≤ 0.01 *** P ≤ 0.001

Figure 28 Comparison of Participant Empowerment scores pre-post DWELL – Belgian participants

Illness Perceptions

In Belgium, no statistical significance was found in most Illness Perception scores, likely owing to the small sample size. Nonetheless, there was a positive impact in two areas:

- Illness Coherence from 17 to 20 (z = 3.175, p = .001)
- Perceived negative life consequences of diabetes from 20 to 21 (z = 2.100, p = .036)



Ns P > 0.05 * P ≤ 0.05 ** P ≤ 0.01 *** P ≤ 0.001

Figure 29 Comparison of Illness Perceptions scores pre-post DWELL – Belgian participants

Eating Behaviours

Similarly to UK and France, Belgian participants reported positive changes in eating behaviours at the end of the DWELL programme, despite the fact that not all perceived changes were statistically significant due to the small sample size:

- Restrained Eating improved from 30.5 - 28 (z = 2.317 p = .020)
- External Eating was reduced from 30.5 to 28 (z = .970, p = .332).

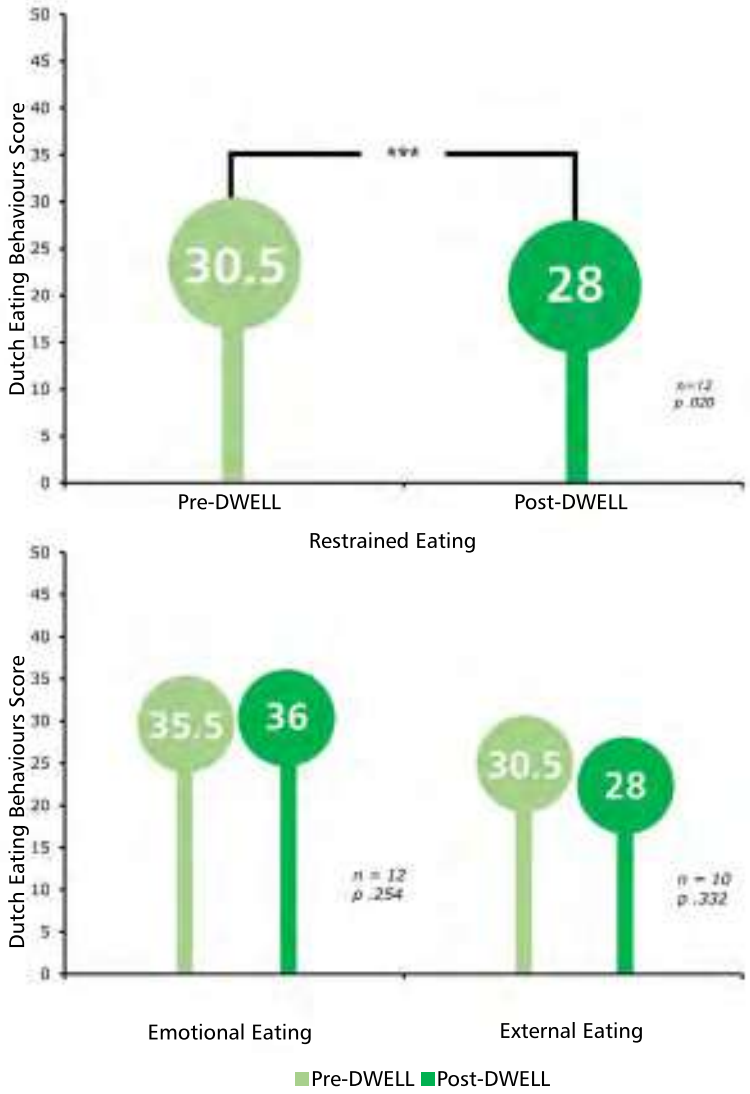
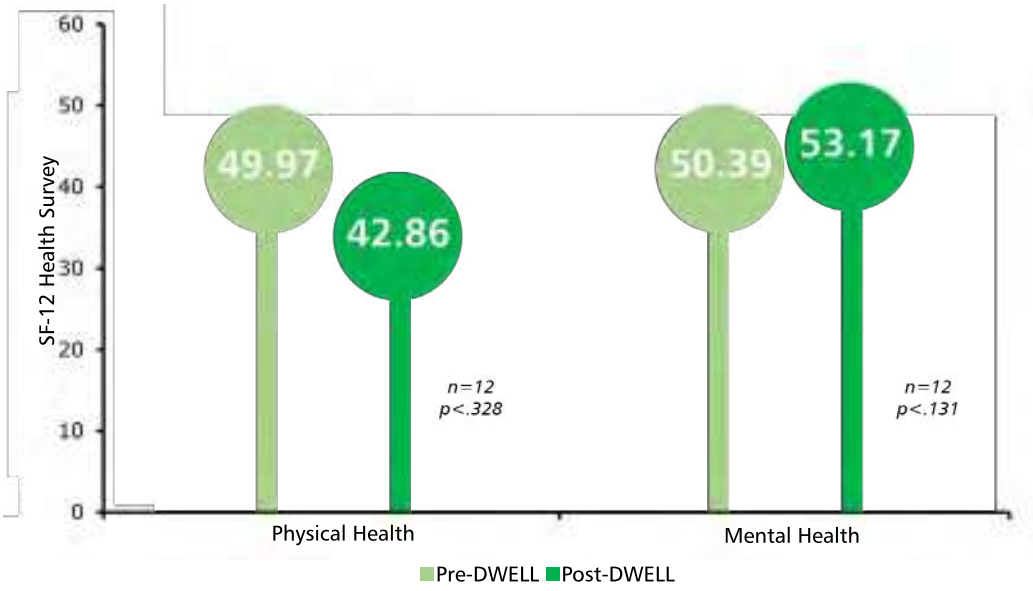


Figure 30 Comparison of Eating Behaviours scores pre-post DWELL – Belgian participants

Physical and Mental Health

Aligned with UK and France, Belgian participants reported positive change to mental health, however due to the small sample size (n = 12), this change was not statistically significant:

- Mental health improved from 50.39 to 53.17 (z = 1.511, p = .131)



Ns P > 0.05 * P ≤ 0.05 ** P ≤ 0.01 *** P ≤ 0.001

Figure 31 Comparison of Physical and Mental Health scores pre-post DWELL – Belgian participants

Self-care Behaviours

Like in UK and France, most positive change was reported by Belgian participants in relation to dietary and exercise advice with an increased level of advice received at the end of the DWELL programme. This suggests that participants recalled their advice more clearly immediately post-DWELL. There was only a slight change in reported blood sugar measurement and medication prescription advice, possibly suggesting that the DWELL diabetes education may have assisted participants to engage more with advice given by healthcare professionals about their day-to-day management of the condition.

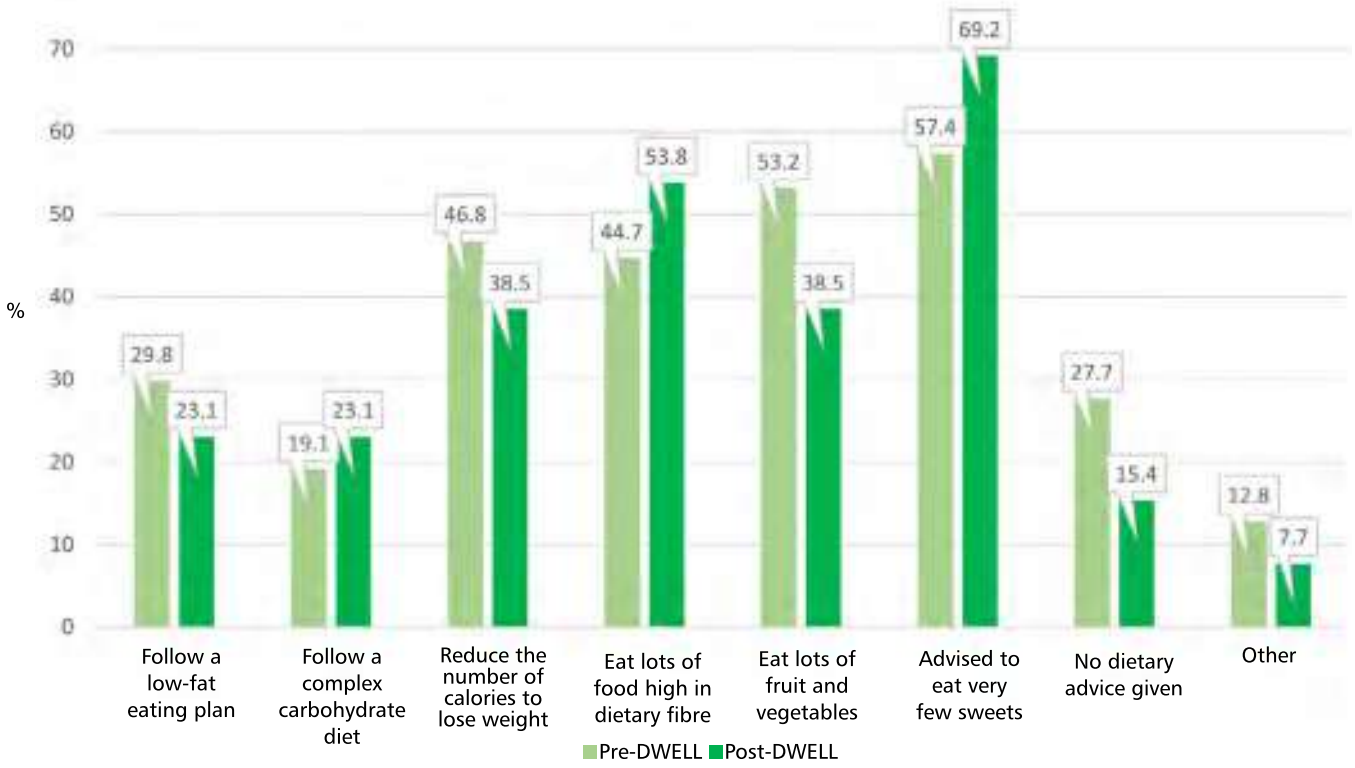


Figure 32 Reported dietary advice from healthcare team pre-post DWELL – Belgian participants

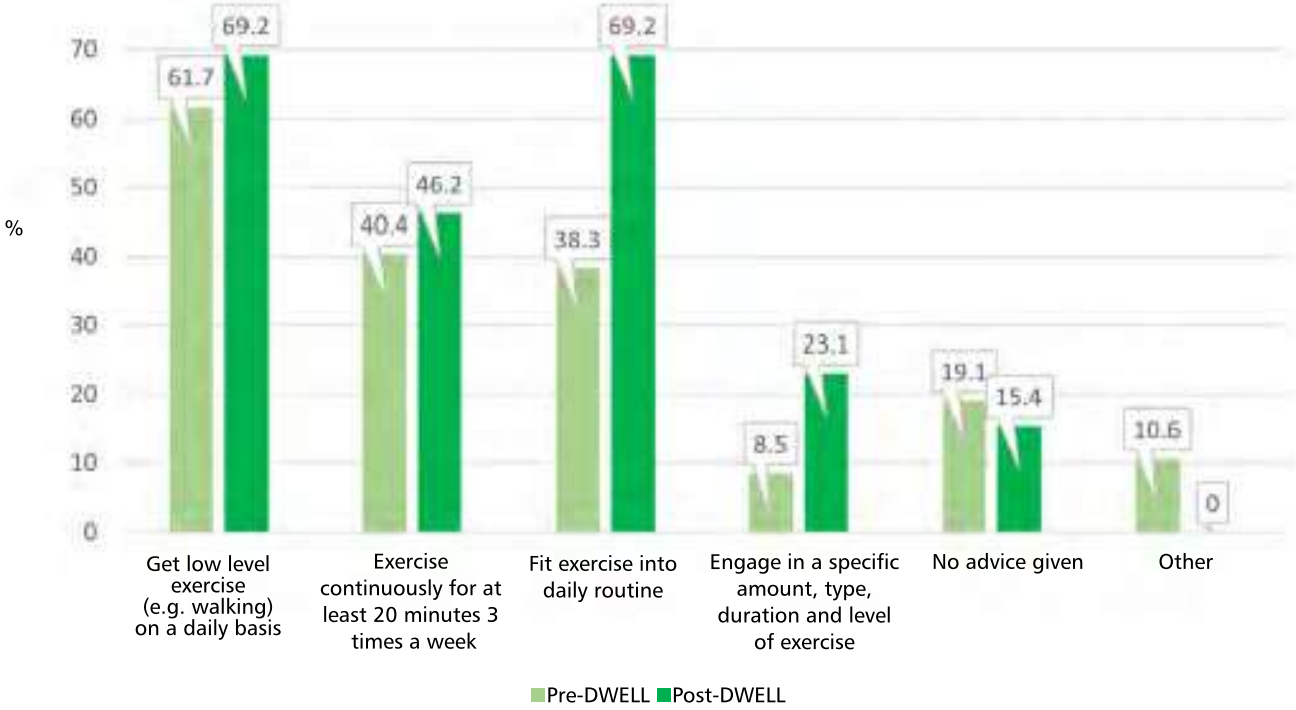


Figure 33 Reported exercise advice from healthcare team pre-post DWELL – Belgian participants

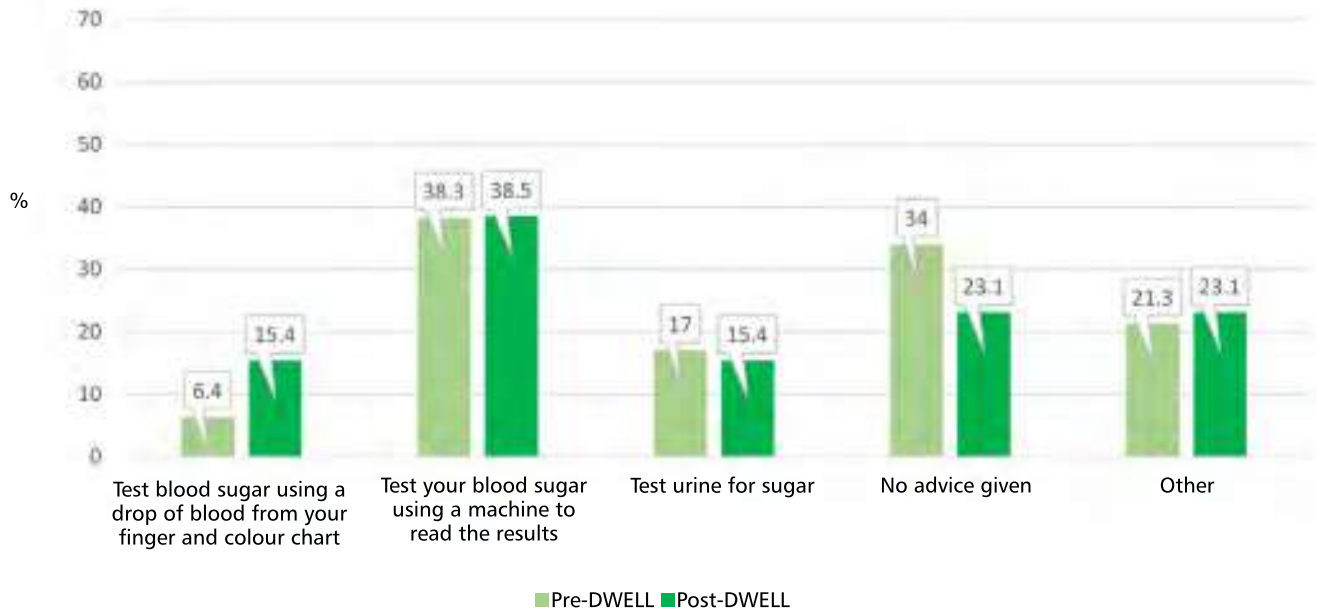


Figure 34 Reported blood sugar measurement advice from healthcare team pre-post DWELL – Belgian participants

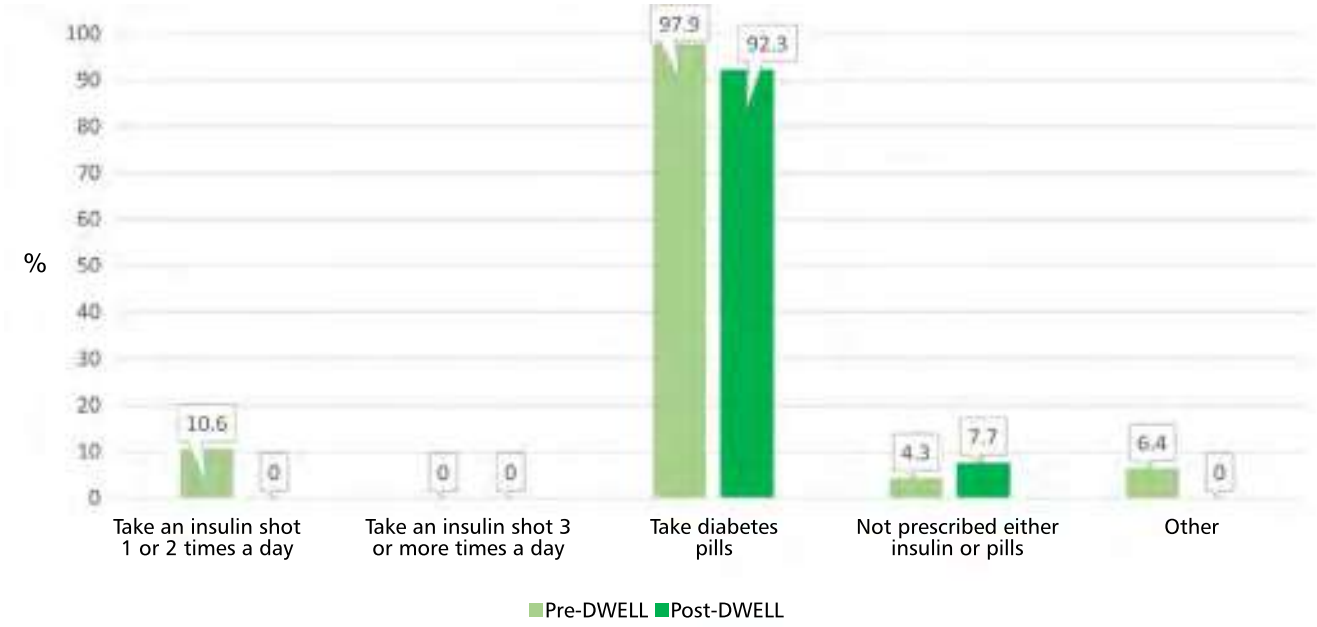
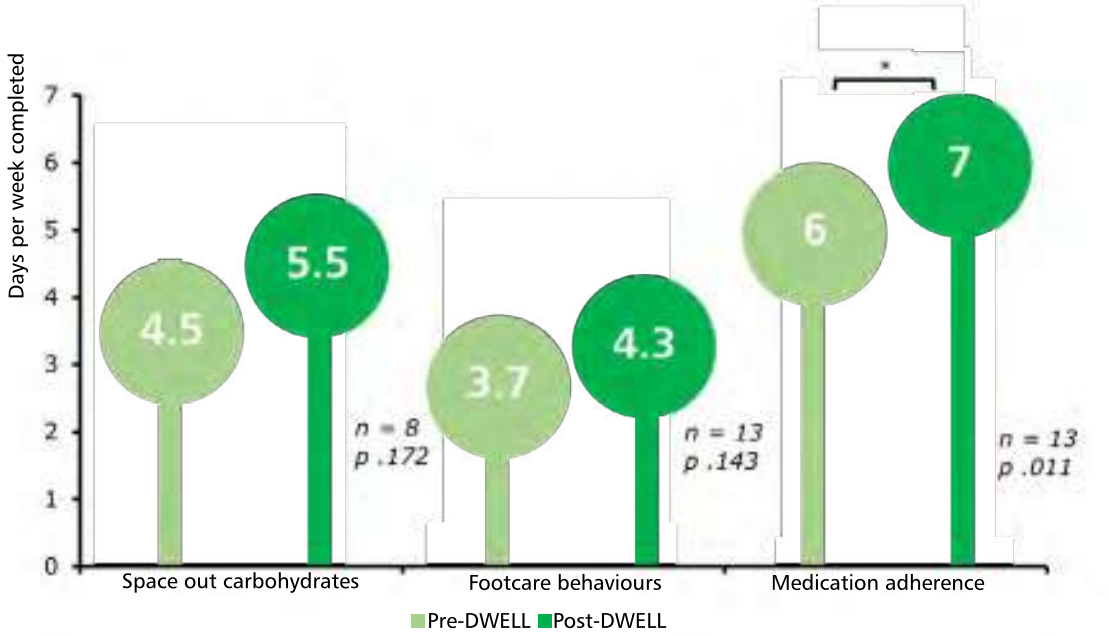


Figure 35 Reported medication prescription from healthcare team pre-post DWELL – Belgian participants

Unlike UK and France, Belgian participants reported improvements in all self-care behaviours however, due to low number of responses, only medication adherence results were statistically significant:

- Space out carbohydrates' adherence improved from 4.5 to 5.5 ($z = -1.367$, $p = .172$)
- Footcare behaviours improved from 3.7 to 4.3 ($z = -1.465$, $p = .143$)
- Medication adherence improved from 6 to 7 ($z = -2.530$, $p = .011$)

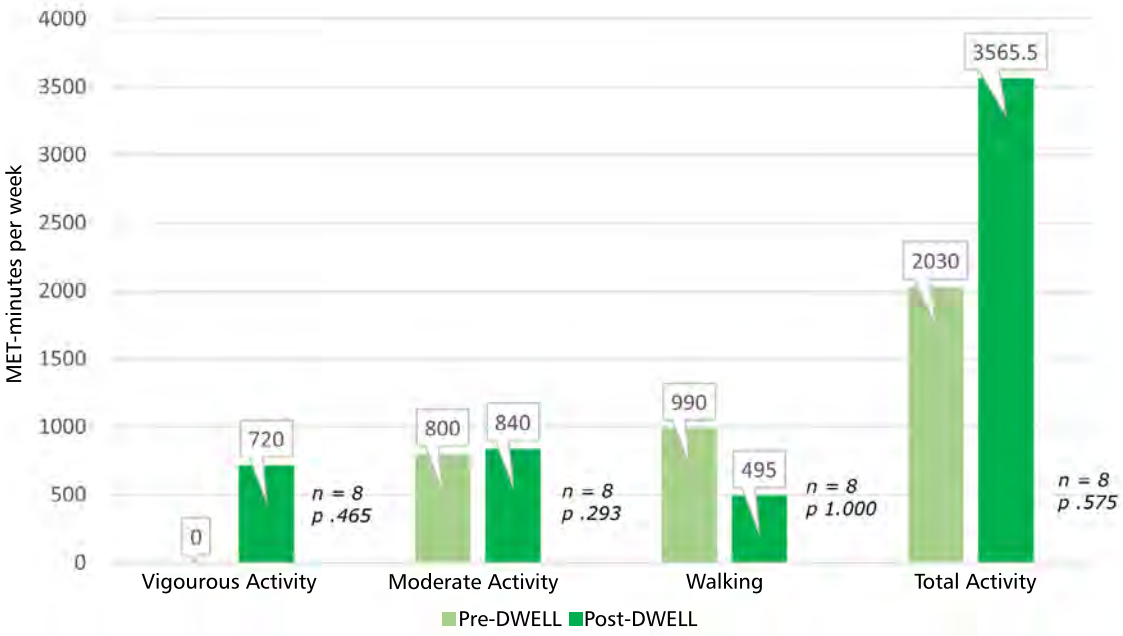


*Ns P > 0.05 * P ≤ 0.05 ** P ≤ 0.01 *** P ≤ 0.001 **** P ≤ 0.0001*

Figure 36 Comparison of diet, footcare and medication adherence self-care behaviours pre-post DWELL – Belgian participants

Physical Activity

In relation to reported physical activity, although results were not statistically significant, the trend appeared to broadly follow that of the UK and France with increased total activity from 2030 to 3565.5 MET minutes (z = -.730, p = .465).



Ns P > 0.05 * P ≤ 0.05 ** P ≤ 0.01 *** P ≤ 0.001 **** P ≤ 0.0001

Figure 37 Median MET-minutes per week spent on vigorous, moderate, walking and total physical activity pre-post DWELL – Belgian participants

Health-Related Quality of Life

Belgium DWELL participants, like their counterparts in the UK and France, reported improvement of health-related quality of life, however results were not statistically significant, likely due to the small sample size (n = 14). There was an increase in how participants saw their health pre-post DWELL with a median result pre-DWELL 72.5 and immediately post-DWELL 75 (z = -.767, p = .443).

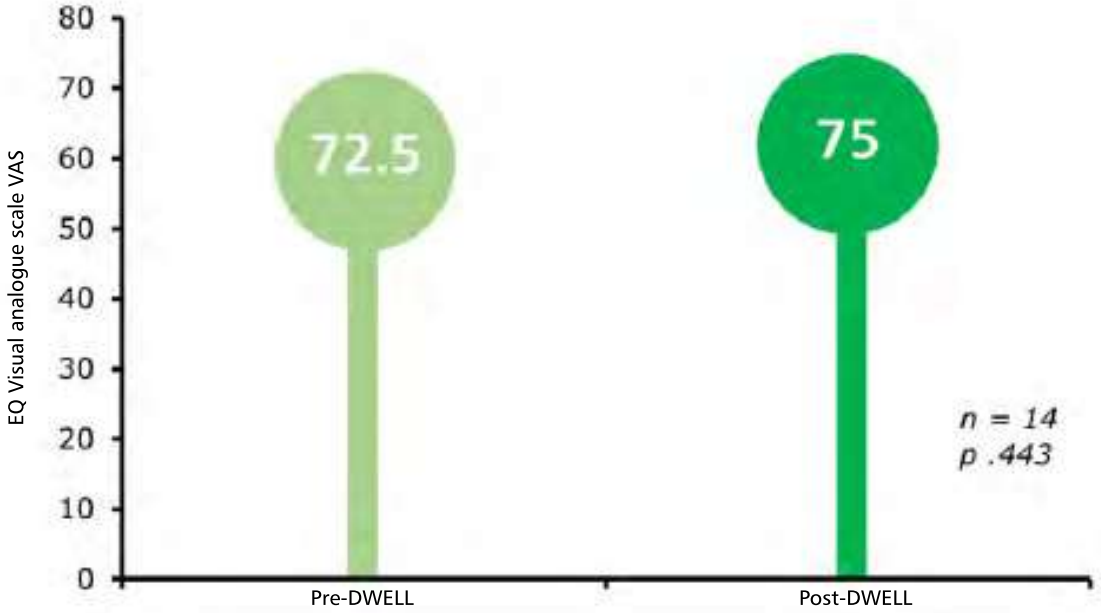
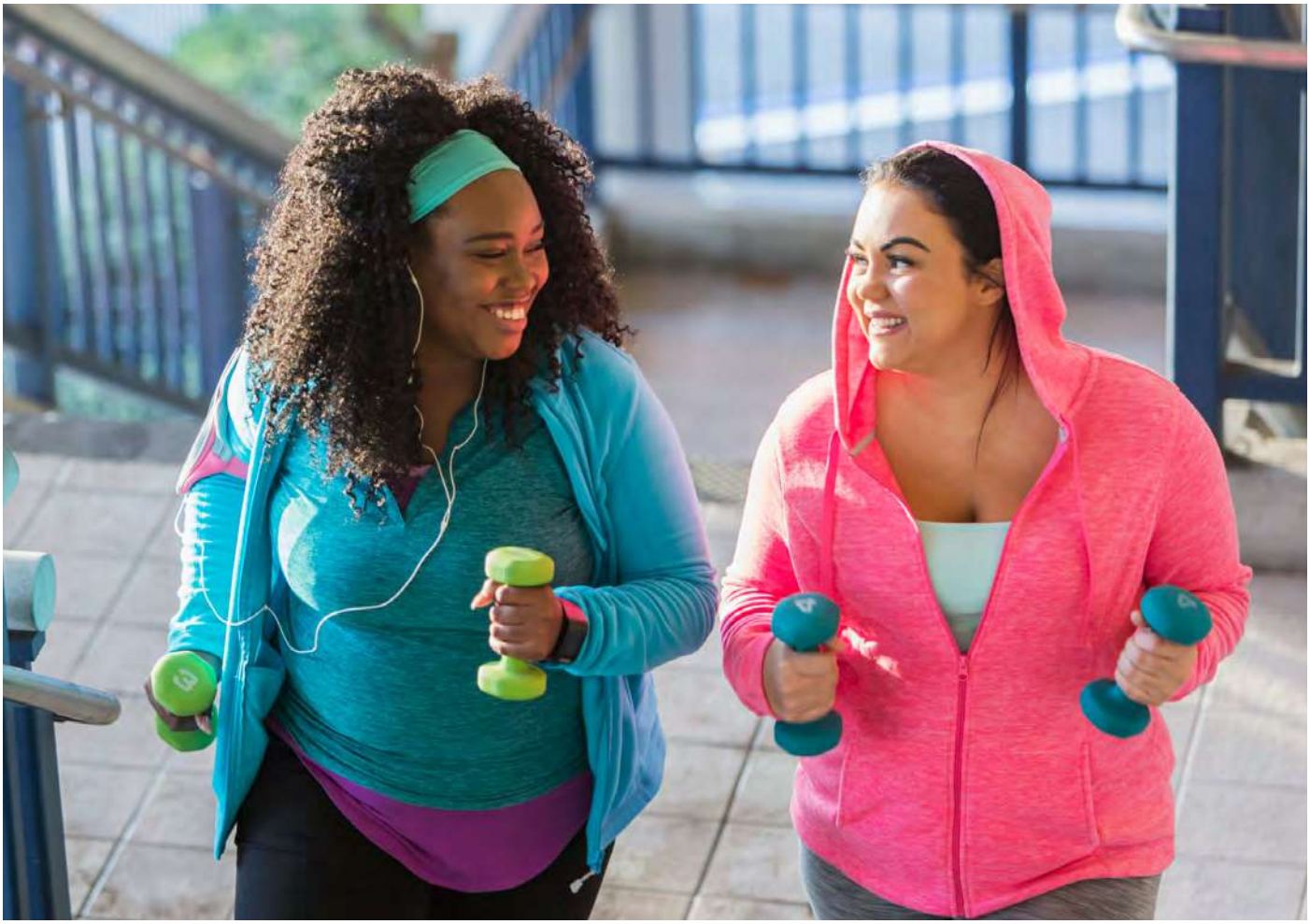


Figure 38 Health-related Quality of Life scores pre-post DWELL – Belgian participants



4.1.4 The Netherlands

Metabolic Health

Similar to Belgium, Dutch participant numbers were smaller than those in the UK and France (weight/BMI n=35, waist circumference n=29 and HbA1c n=33). Immediately post-DWELL scores for the Netherlands site demonstrated reductions in weight: 97.2kg – 95.5kg (z = .715, p = .472), waist circumference: 111cm – 110cm (z = .315, p =.752) and HbA1c: 81 -74 (z = 1.561, p = .118), and a slight increase in BMI: 30.86 – 31.09 (z = .627, p = .531). Although these results support findings in the UK, France and Belgium demonstrating the trend of improvement following participation in the DWELL programme, differences were not statistically significant when tested.

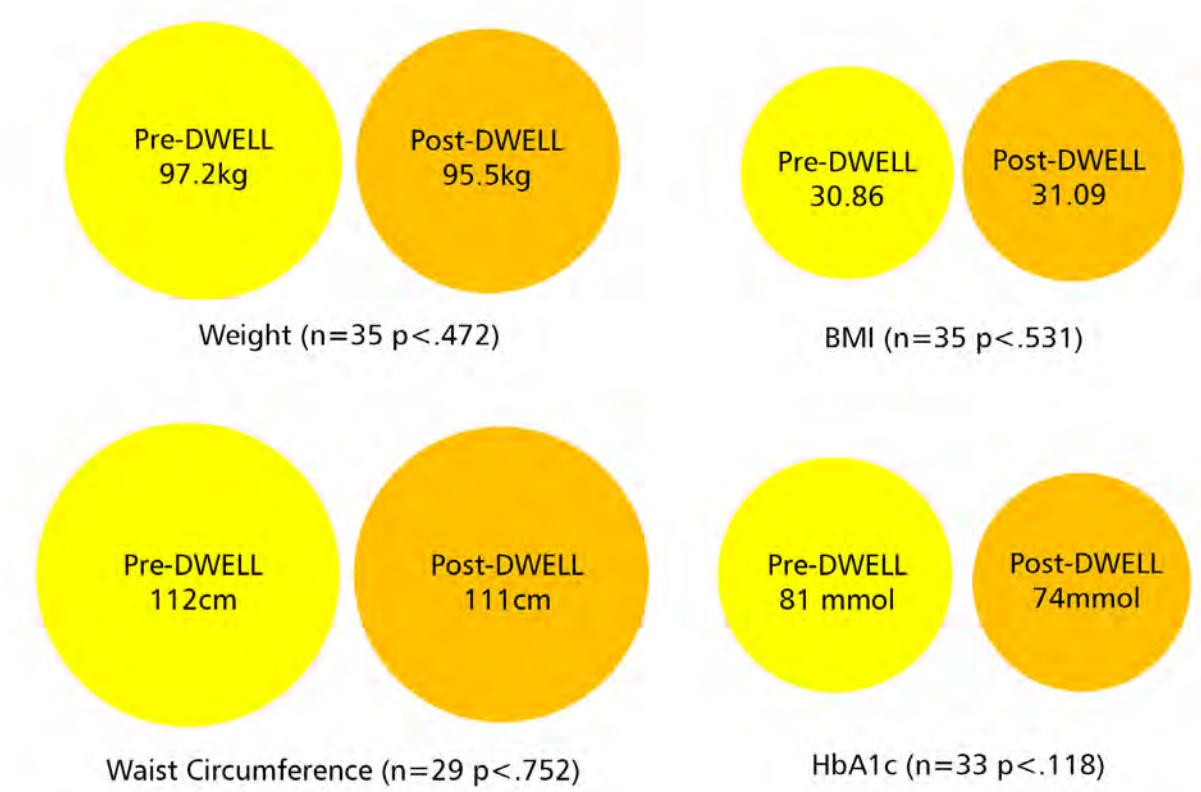


Figure 39 Comparison of metabolic health outcomes pre-post DWELL - Dutch participants

Participant Empowerment

In the Netherlands, participation in the DWELL programme resulted in a statistically significant increase in participant empowerment and self-efficacy, with scores increasing from 28 to 31 (z = 2.723, p = .006).

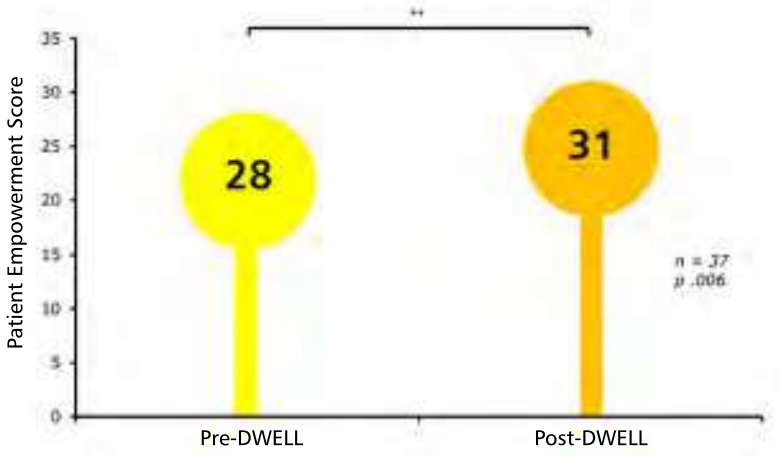


Figure 40 Comparison of Participant Empowerment scores pre-post DWELL – Dutch participants

Illness Perceptions

In the Netherlands, participants' perceptions of diabetes was measured using the Brief version of the Revised Illness Perceptions Questionnaire (BIPQ-R) (Broadbent et al., 2006). Illness perceptions were measured similarly to the IPQ-R using only nine items, compared to the 38 items found in the full IPQ-R questionnaire.

Results were consistent to feedback provided in the other three countries, namely statistically significant increase of personal control, which supports a beneficial effect of DWELL in improving participant confidence in managing their condition:

- Personal Control improved from 6 to 7 (z = 2.402, p = .016)

In addition, positive changes were reported by participants in relation to:

- Perceived negative consequences of diabetes were decreased from 7 to 6 (z = 2.341, p = .019)

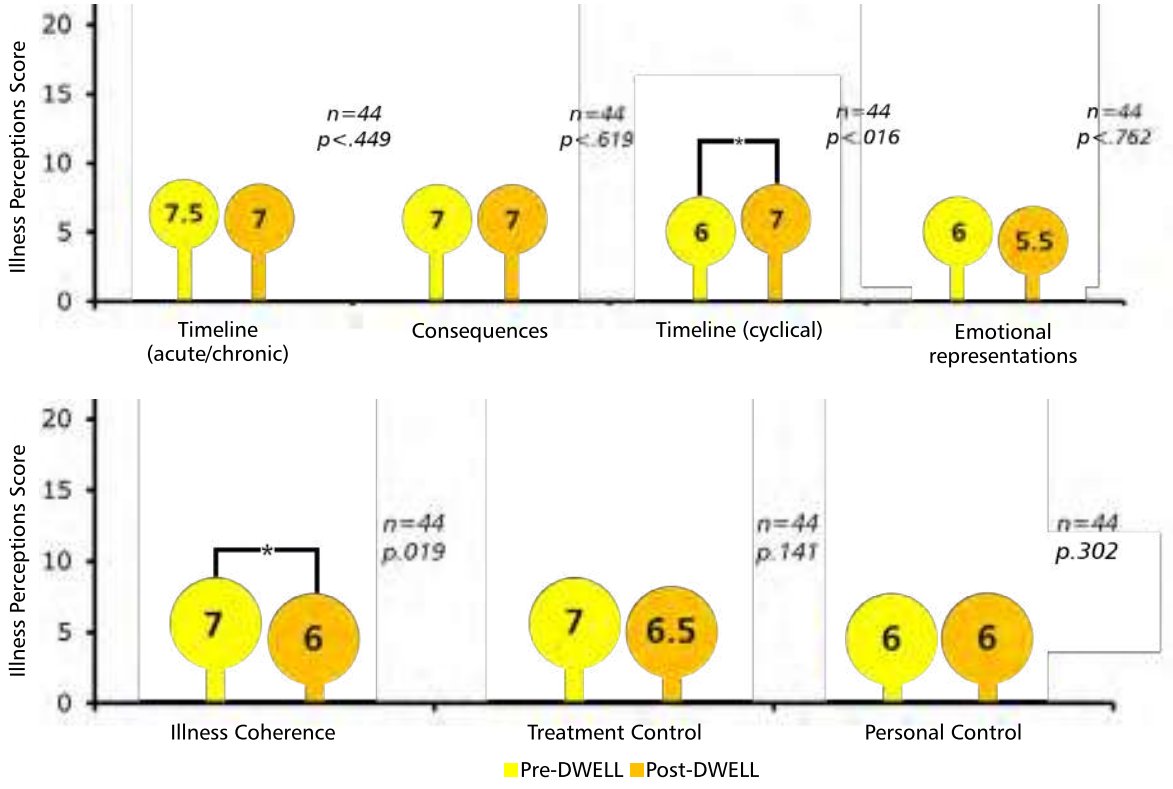


Figure 41 Comparison of Illness Perception scores pre-post DWELL – Dutch participants

Eating Behaviours

Similarly to the other three countries, there was a statistically significant decrease in participants' emotional eating from 34 to 26 (z = 4.023, p = < .001) while there was a marginally statistically significant increase of external eating from 22 to 23 (z = 1.824, p = .068). Also, there was a trend for restrained eating to increase following participation in the DWELL programme, from 25 to 27 (z = .703, p = .482), however the difference was not statistically significant.

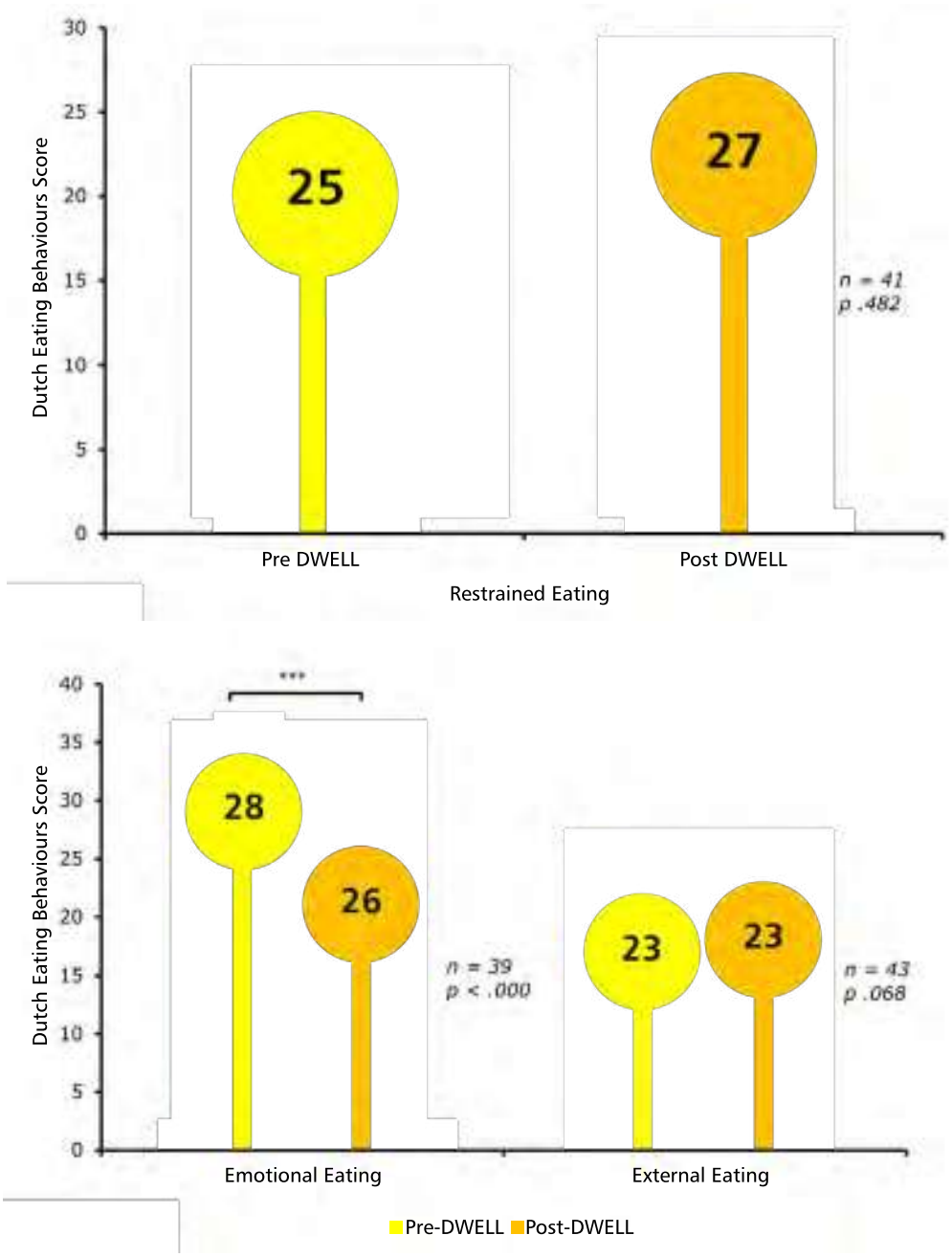


Figure 42 Comparison of Eating Behaviours scores pre-post DWELL – Dutch participants

Physical and Mental Health

Unlike the feedback received in the other three countries, no statistically significant changes were shown pre-post DWELL in either perceived physical or mental health, although there was a positive shift in mental health from 52.16 to 54.23, as found in other countries. Absence of statistically significant improvement may be due to the small sample size or the way DWELL was delivered in Netherlands, i.e. on individual rather than group basis.

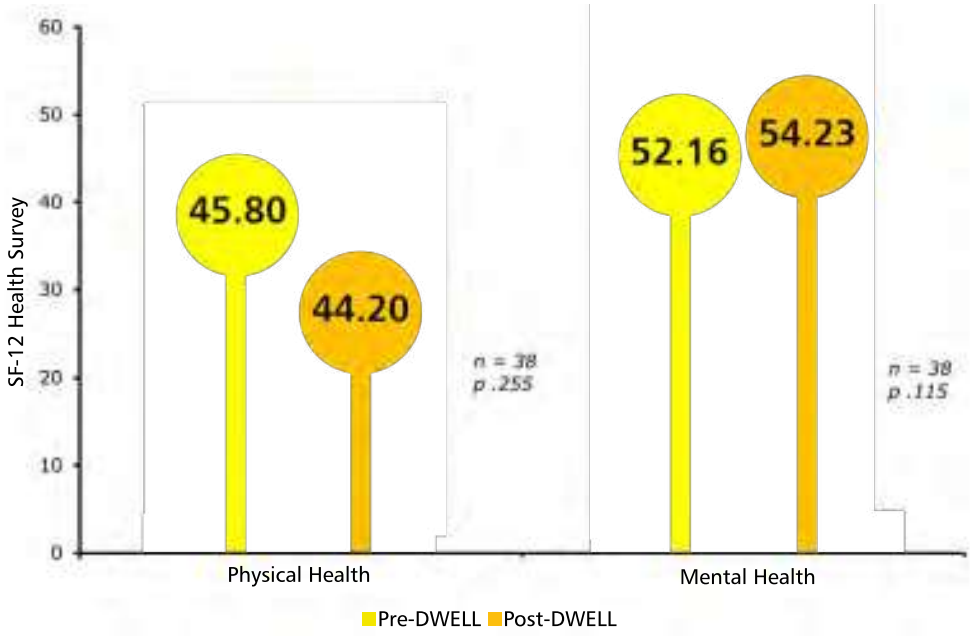


Figure 43 Comparison of Physical and Mental Health scores pre-post DWELL – Dutch participants

Self-Care Behaviours

Reported advice Dutch participants received pre- post DWELL regarding diet, exercise, testing blood sugar and medication was varied. In line with other countries, "no advice" responses post-DWELL fell, indicating potentially that learning from the DWELL programme activated participants to engage more with available advice given by healthcare professionals.

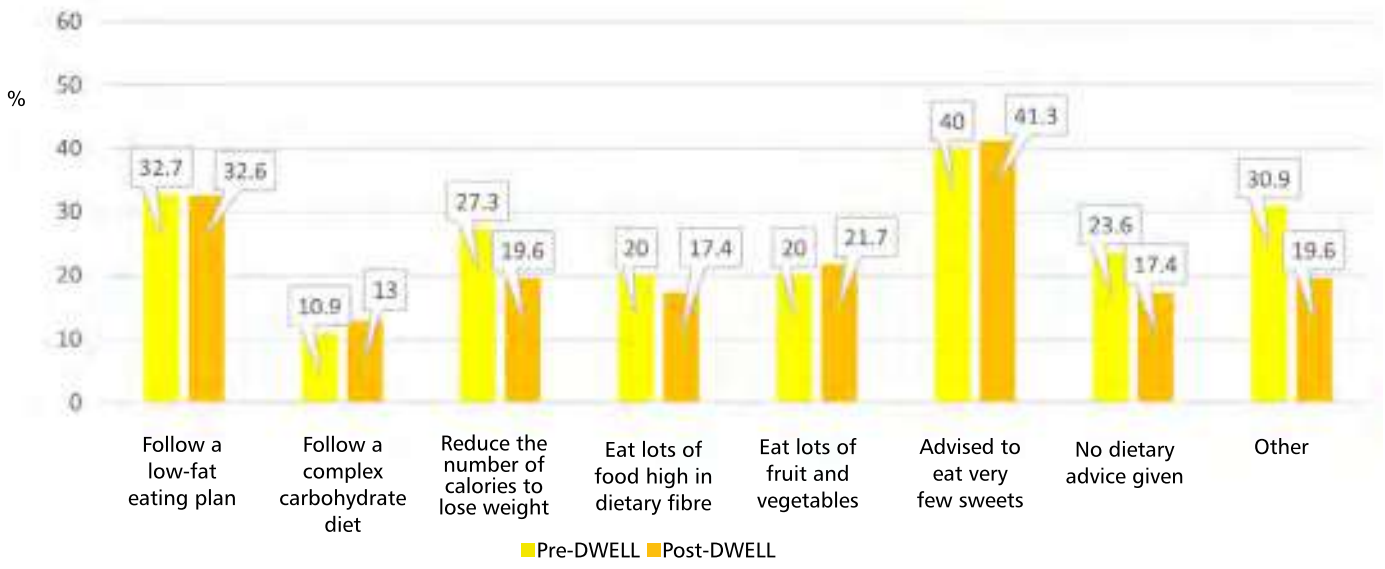


Figure 44 Reported dietary advice from healthcare team pre-post DWELL – Dutch participants

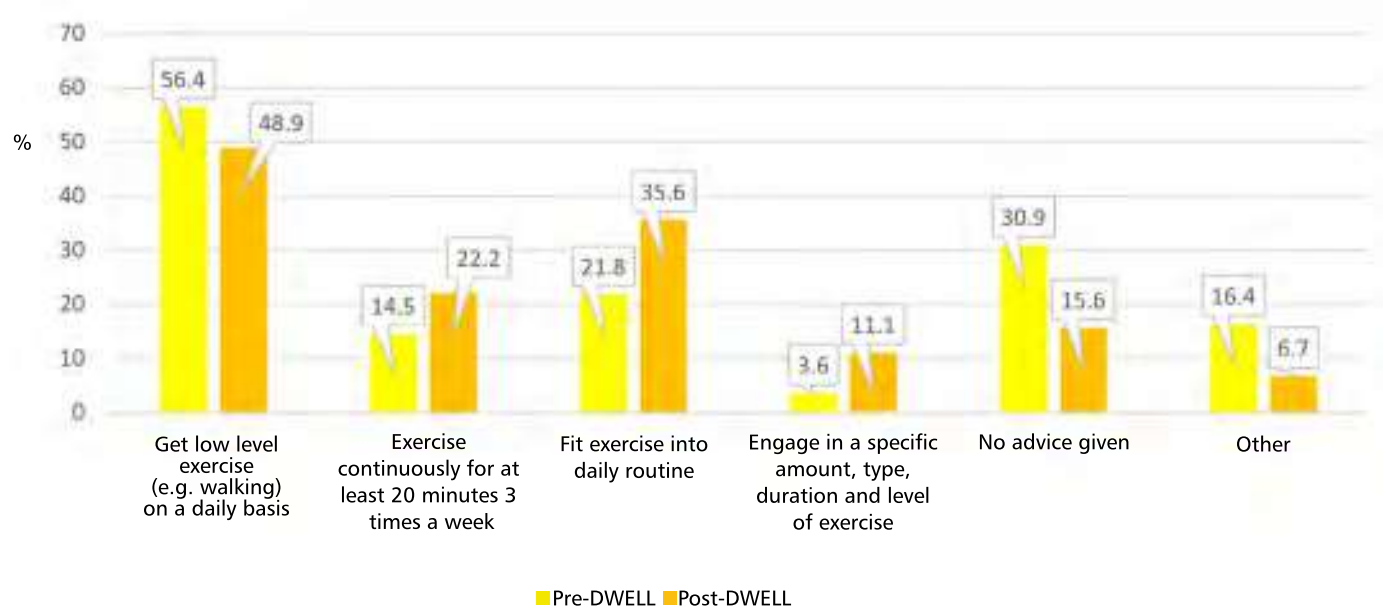


Figure 45 Reported exercise advice from healthcare team pre-post DWELL – Dutch participants

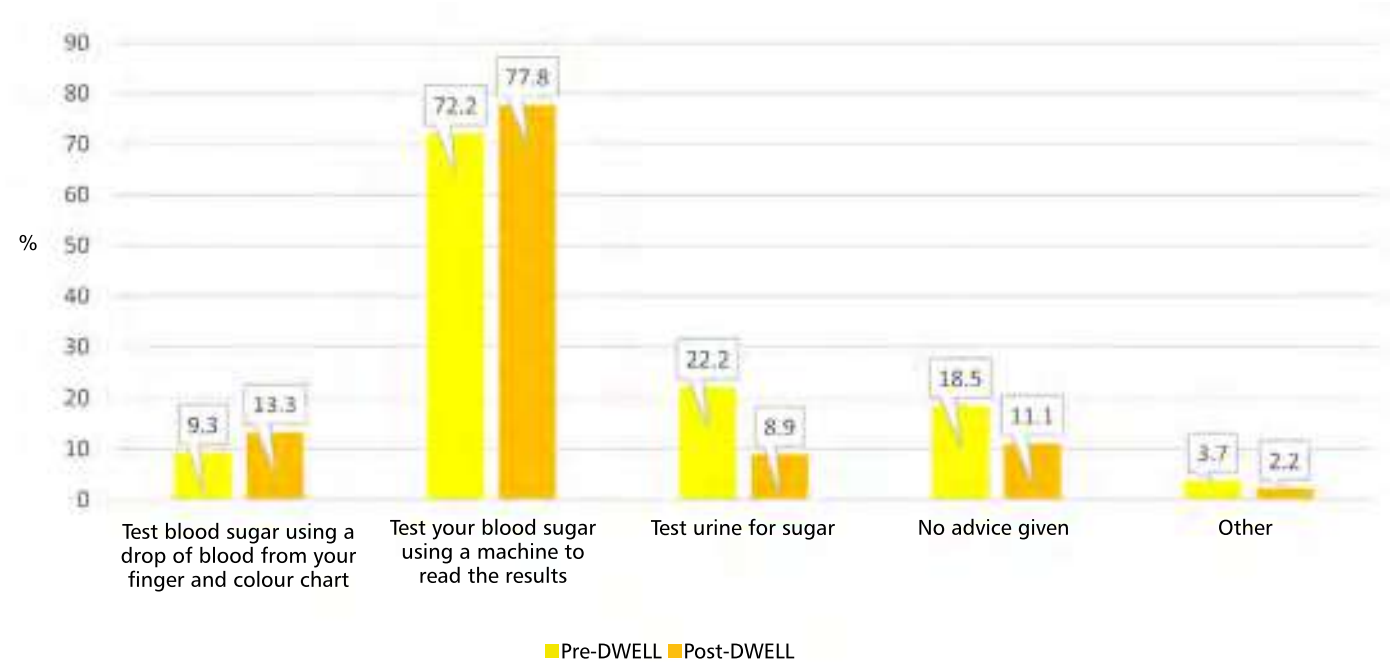


Figure 46 Reported blood sugar measurement advice from healthcare team pre-post DWELL – Dutch participants

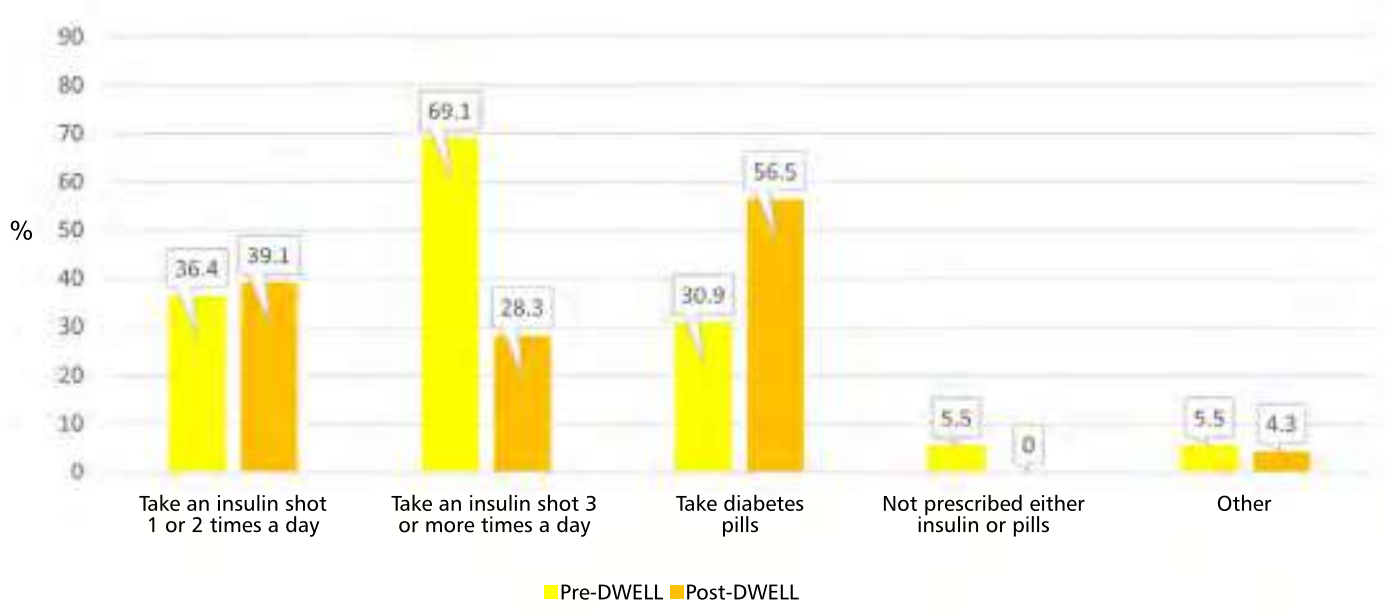


Figure 47 Reported medication prescription from healthcare team pre-post DWELL – Dutch participants

Pre-post-DWELL comparisons of participants' daily adherence to spacing carbohydrate intake, washing and drying but not soaking feet and taking prescribed medication, confirmed there were no statistically significant changes. Nonetheless, these results matched the trends found in the UK, France and Belgium.

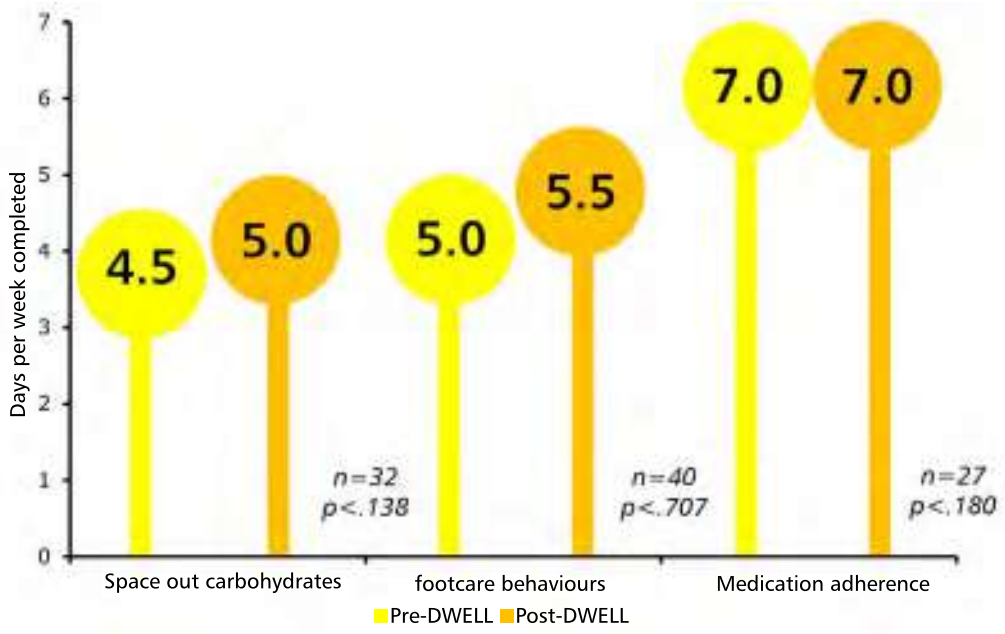


Figure 48 Comparison of diet, footcare and medication adherence self-care behaviours pre-post DWELL – Dutch participants

Physical Activity

When comparing Dutch participants' physical activity levels pre-post DWELL, there were no statistically significant improvements, however, the trend appeared to broadly follow that of the UK, France and Belgium with increased total activity, although to a lesser extent (Total activity increased from 3036 to 3068 (z = -.267, p = .790).

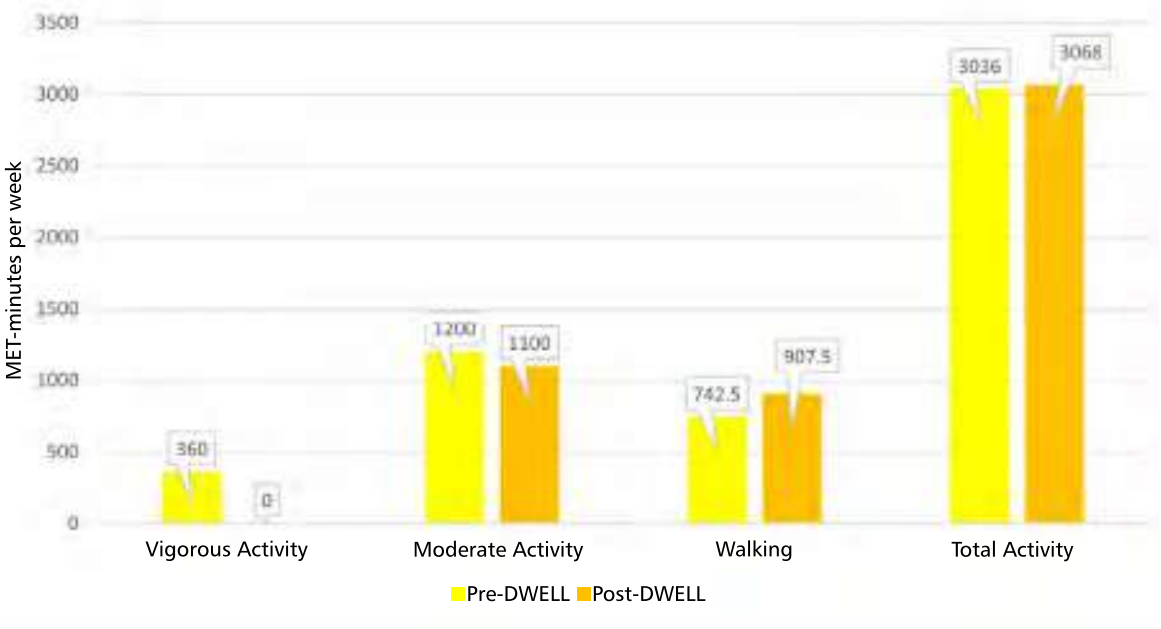


Figure 49 Median MET-minutes per week spent on vigorous, moderate, walking and total physical activity pre-post DWELL – Dutch participants

Health-Related Quality of Life

Health-related quality of life reported by Dutch participants remained at the same levels, although results were not statistically significant.

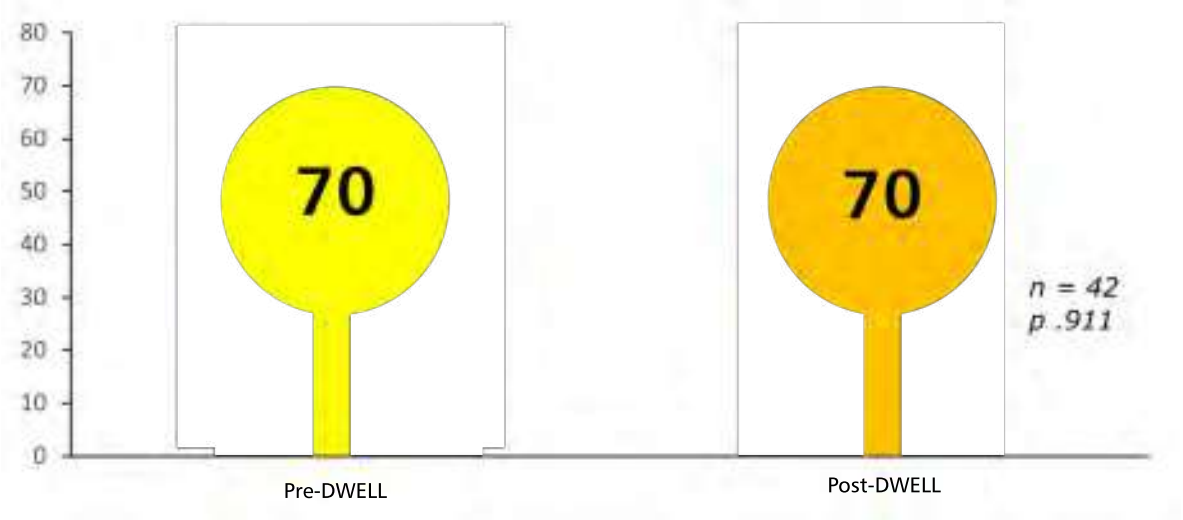


Figure 50 Health-related Quality of Life scores pre-post DWELL – Dutch participants

4.2 Longitudinal Effects of the DWELL programme

The sustainability and long-term efficacy of the DWELL programme was investigated over the mid-term (6 months) and long-term (12 months) follow up period after the end of the programme. Comparisons were made for those participants who had completed all four time-points: baseline, end of programme, 6 months and 12 months post-DWELL. Where analysis could not establish meaningful comparisons for the whole 12-month follow up period, results from participants who completed three evaluation time-points are presented. A positive longitudinal result would be indicated either by continued improvement, or a maintenance of the improvement achieved by the end of the DWELL programme. In this section, the longitudinal results of all sites are presented under the key outcome areas.[2]

4.2.1 Metabolic Health

Participants' metabolic health was measured at all four timepoints of the evaluation, which gave the opportunity to assess long-term changes after the end of the DWELL programme. Findings were stronger in UK and France, whereas this analysis was not possible in Belgium and Netherlands due to the small sample sizes and high attrition rates in T2 and T3 measurement points.

In the UK, there was a steady reduction, which was statistically significant, from end of programme to a year later in:

- Weight loss - from 98.7 kg to 91.8kg ($z = 2.710$, $p = <.007$) (n=29)
- BMI reduction - from 34.2 to 32 ($z = 2.801$, $p = .005$) (n=29)

These results demonstrate that these metabolic health gains were maintained a year after the intervention had ended. Despite the small sample of this longitudinal analysis (n = 29), non-parametric statistical analysis (Friedman test) to detect differences across multiple timepoints, showed a statistically significant positive change for metabolic outcomes from baseline to 12 months post-DWELL in weight ($\chi^2 = 14.453$, df = 3 $p = .002$) and BMI ($\chi^2 = 13.185$, df = 3 $p = .004$).

In addition, statistically significant changes were found to be sustained 6 months after the end of the programme in relation to:

- Waist Circumference reduction - from 113cm to 111cm ($z = 3.869$, $p = <.001$) (n=107)
- HbA1c reduction – from 54.1 to 53.05 mmol/mol ($z = -2.366$, $p = .018$) (n=84)

Results from non-parametric statistical analysis (Friedman Test) demonstrated statistically significant changes both in waist circumference ($\chi2 = 35.770$, df = 2 $p = <.001$) and HbA1c ($\chi2 = 18.596$, df = 2 $p = <.001$). Similar trends were observed for those who also completed the 12-month follow up, albeit with no statistical significance.

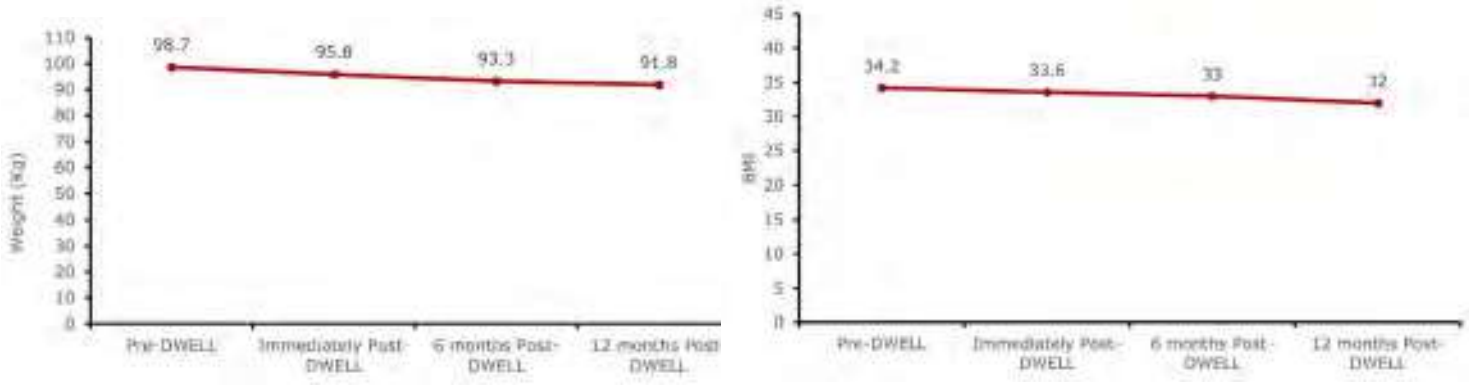


Figure 51 Longitudinal metabolic health changes in weight and BMI over 15 months (from baseline to 12 months after the end of programme) – UK participants

2. Due to natural drop out over the mid- (6-months) to long- (12-months) term and the Covid-19 pandemic which affected certain sites, the number of participants, for each measure, at each site and at each timepoint varied considerably. In this context, longitudinal comparisons were not always possible. Where there were small sample numbers, or the results were not statistically significant, participants who completed the 12-month post-DWELL time-point were removed and changes were investigated comparing baseline to 6-months post-DWELL programme results. However, on occasion, where no further clarity was provided by this longitudinal evaluation, this analysis is not included.

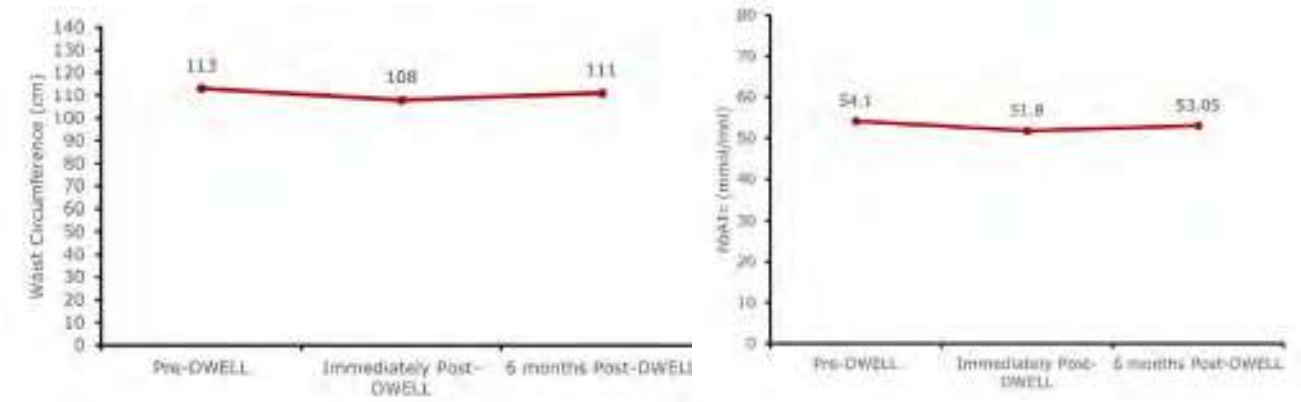


Figure 52 Longitudinal metabolic health changes in waist circumference and HbA1c over 9 months (from baseline to 6 months after the end of programme) - UK participants

Similarly, in France, there was a steady and statistically significant positive change in all metabolic health outcomes across the overall evaluation period:

- Weight loss - from 94.7 kg to 91.7kg (z = -3.719, p = <.001) (n=93)
- BMI reduction - from 33.6 to 33.18 (z = -3.826, p = <.001) (n=94)
- Waist circumference reduction – from 113cm to 110cm (z = 4.576, p = <.001) (n=92)
- HbA1c reduction - from 59.6 to 52 (z = -2.753, p = .006) (n=92)

These findings confirm improvements achieved during the DWELL programme were still present one year later. Non-parametric test results (Friedman test) demonstrated statistically significant changes for all metabolic health outcomes over 15 months since baseline - weight (χ^2 = 19.720, df = 3 p = <.001), BMI (χ^2 = 21.219, df = 3 p = .001), waist circumference (χ^2 = 46.457, df = 3 p = <.001), and HbA1c (χ^2 = 9.113, df = 3 p = .028).

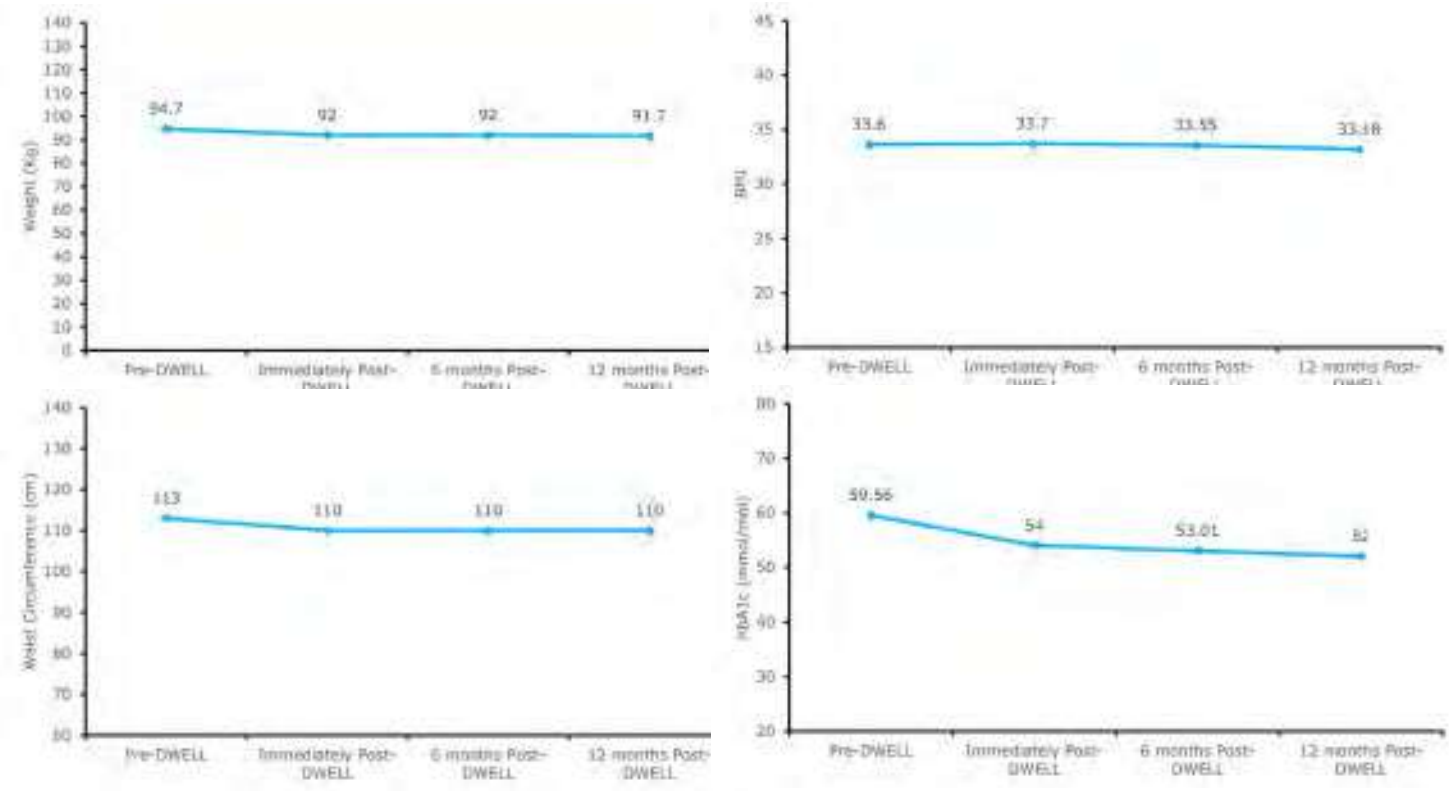


Figure 53 Longitudinal metabolic health changes in weight, BMI, waist circumference and HbA1c over 15 months of the evaluation (from baseline to 12 months after the end of programme) – French participants

In Belgium and Netherlands, high attrition, coupled with COVID-19 interruption and missing cases, meant there were insufficient numbers of participants for analysis of metabolic health outcomes at 6 and 12 months post-DWELL.

4.2.2 Participant Empowerment

Longitudinal changes in self-reported participant empowerment and self-efficacy were also assessed across the four countries.

In the UK, analysis revealed a statistically significant improvement at the end of the programme, which plateaued six months later and was maintained 12 months after the end of the programme, above baseline levels. Non-parametric analysis (Friedman test) confirmed changes after the end of the programme were statistically significant ($\chi^2 = 24.096$, df = 3 p = <.001) (n=34).

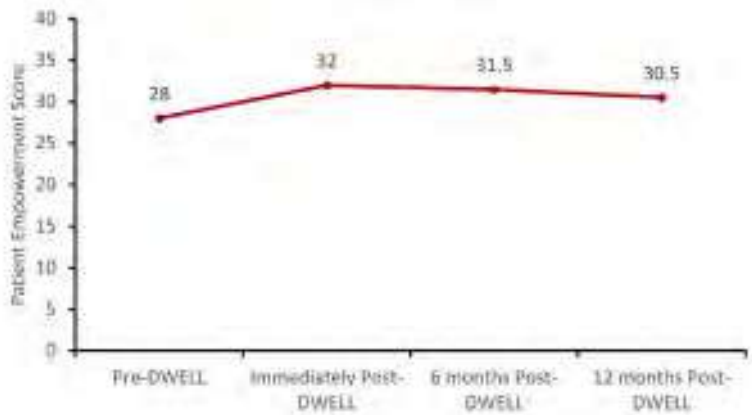


Figure 54 Longitudinal Participant Empowerment changes over 15 months of evaluation (from baseline to 12 months after the end of the programme) – UK participants

In France, analysis confirmed a statistically significant improvement in participant empowerment and self-efficacy 6 months after the end of the programme which rebounded to baseline levels at 12 months. Non-parametric analysis (Friedman test) confirmed observed changes were statistically significant ($\chi^2 = 58.019$, df = 3 p = <.001) (n=103).

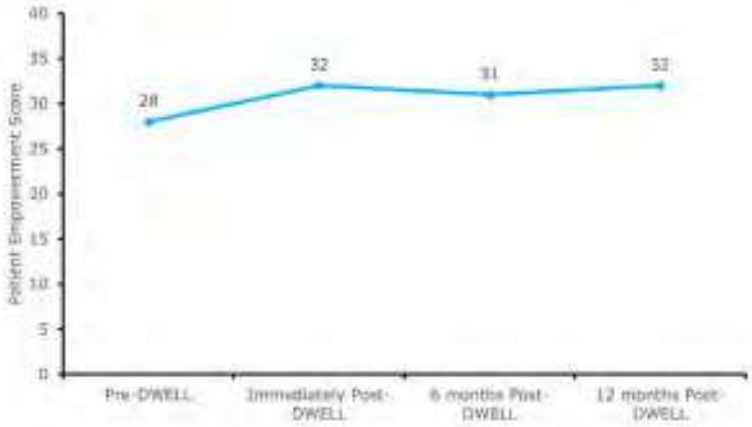


Figure 55 Longitudinal Participant Empowerment changes over 15 months of evaluation (from baseline to 12 months after the end of the programme) – French participants

In Belgium, attrition, coupled with COVID-19 interruption and missing cases, meant there were insufficient cases for analysis across all four timepoints. Therefore, longitudinal comparison of participant empowerment at the Belgian site was restricted up to 6-months post-DWELL only. Positive changes at the end of the programme tailed off slightly at the 6-month follow up. Non-parametric analysis (Friedman test) confirmed that changes were statistically significant (χ2 = 9.188, df = 2 p = <.010) (n=9).

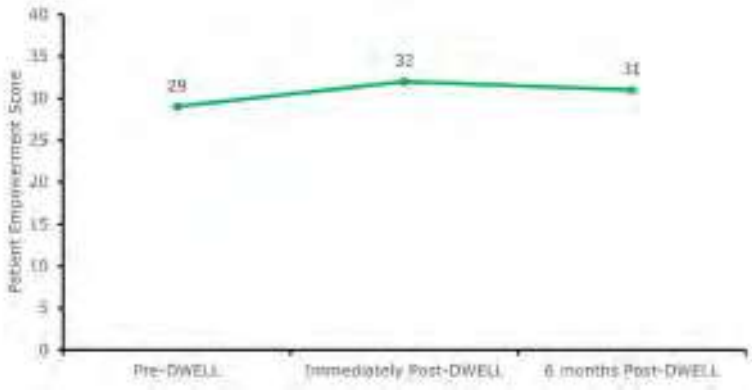


Figure 56 Longitudinal Participant Empowerment changes over 9 months of evaluation (from baseline to 6 months after the end of the programme) – Belgian participants

In the Netherlands, there was a statistically significant improvement from baseline to 12-months post-DWELL in participant empowerment. Non-parametric analysis (Friedman test) confirmed that changes were statistically (χ^2 = 7.85, p = .049) (n=13).

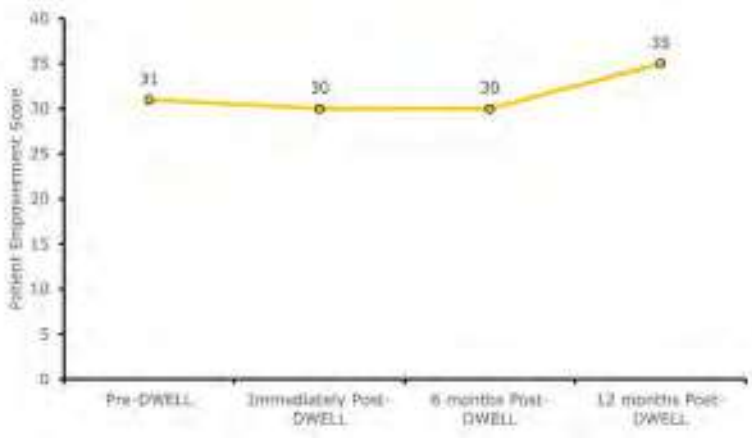


Figure 57 Longitudinal Participant Empowerment changes over 15 months of evaluation (from baseline to 12 months after the end of the programme) – Dutch participants

4.2.3 Illness Perceptions

The longitudinal effect of the DWELL programme on participants' illness perceptions were investigated across the four countries.

In the UK, one of the dimensions of illness perceptions which was most evident in the pre-post evaluation, illness coherence, showed consistent, statistically significant changes over time (z = -3.194, p = .001), suggesting that participants had retained what they had learnt about diabetes during the DWELL programme, a finding which demonstrates continued engagement and understanding of their condition. Non-parametric analysis (Friedman test) confirmed that positive changes across the whole evaluation period were statistically significant (χ2 = 32.443, df = 3, p <.001).

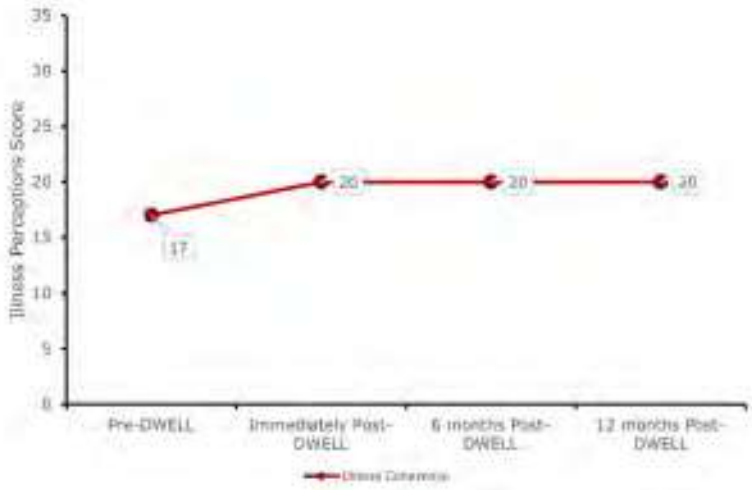


Figure 58 Longitudinal Illness Coherence changes over 15 months of evaluation (from baseline to 12 months post-DWELL) – UK participants

Changes were also investigated from end of programme to the two follow up timepoints of 6 and 12 months post-DWELL. Statistically significant results were found in relation to Personal Control and Emotion subscales. When comparing from baseline to 6 month post-DWELL, there was a statistically significant reduction in participants' scores on negative emotions associated with diabetes (z = -4.444, p = <.001), while perceived personal control rose increased during the same period (z = -3.2, p = .001). Non-parametric tests confirmed that these changes were statistically significant both for Emotion (χ^2 = 22.921, df = 2, p = <.001) and Personal control (χ^2 = 14.567, df = 2, p = <.001).

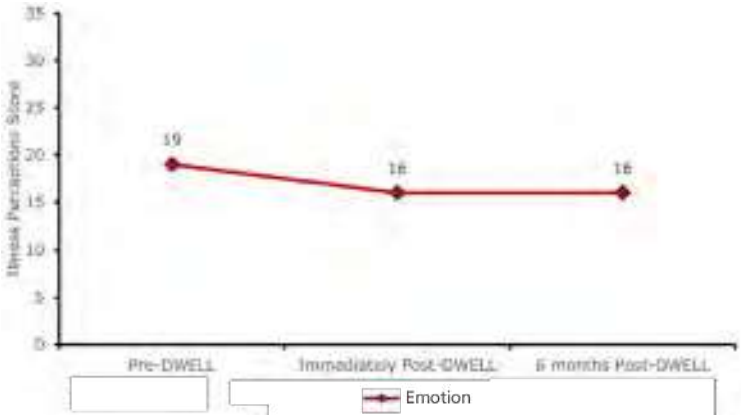


Figure 59 Longitudinal Emotion changes over 9 months of evaluation (from baseline to 6 months post-DWELL) – UK participants

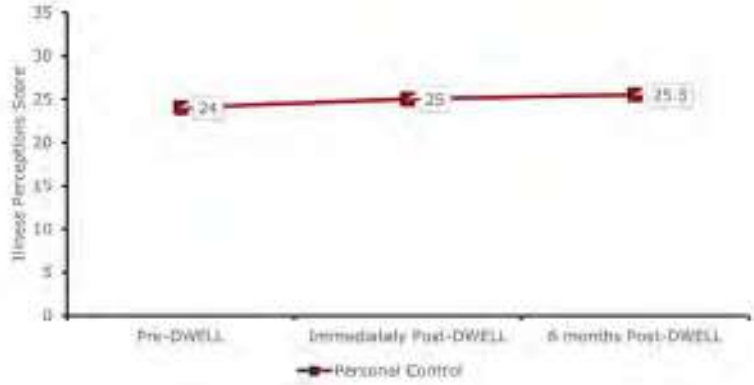


Figure 60 Longitudinal Personal Control changes over 9 months of evaluation (from baseline to 6 months post-DWELL) – UK participants

In France, similarly to the UK, illness coherence positive changes were sustained one year after the end of the programme, which suggests that participants' personal and psychological improvement is sustained over the long term. Another aspect which showed improvement over the long term was reduction in negative emotions associated with diabetes (Emotion). Non-parametric tests confirmed these changes were statistically significant (Illness Coherence - $\chi^2 = 29.265$, df = 3 p = <.001; Emotion - $\chi^2 = 13.358$, df = 3 p = <.004).

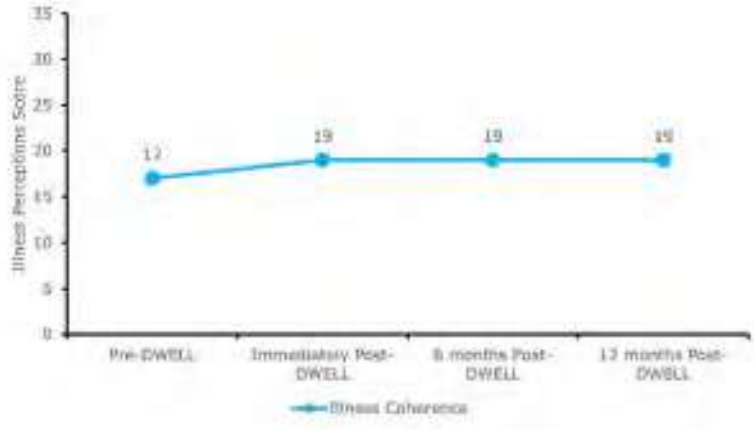


Figure 61 Longitudinal Illness Coherence changes over 15 months of evaluation (from baseline to 12 months post-DWELL) – French participants

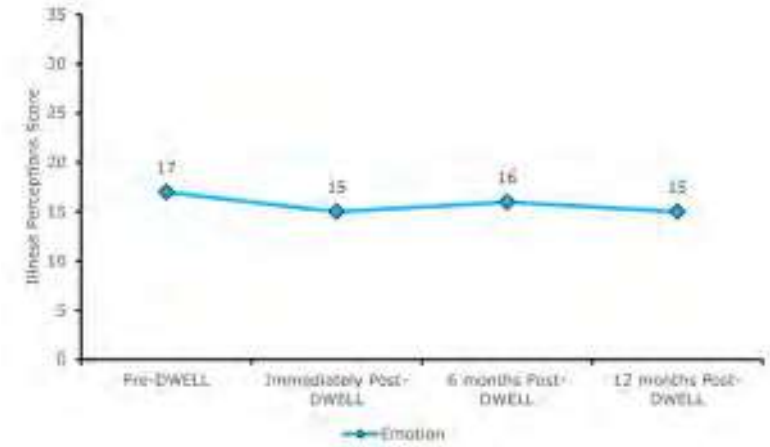


Figure 62 Longitudinal Emotion changes over 15 months of evaluation (from baseline to 12 months post-DWELL) – French participants

Statistically significant changes were also found in Consequences (how participants perceived negative life consequences associated with diabetes) from baseline to 6 months post-DWELL, as demonstrated by non-parametric test results ($\chi 2 = 3.470$, $df = 2$, $p = .176$) (n=125).

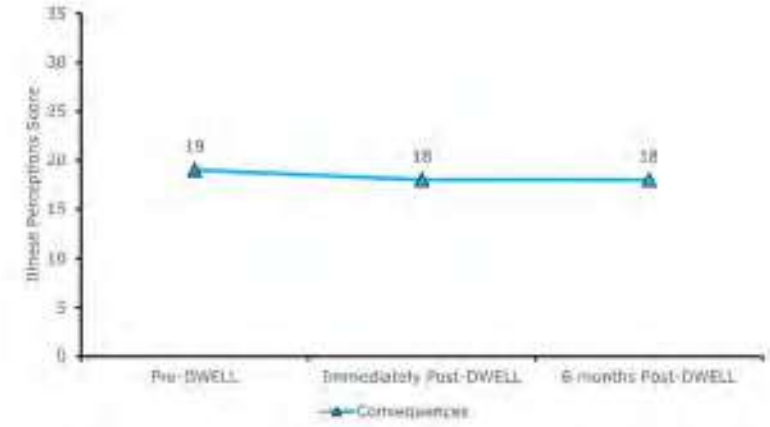


Figure 63 Longitudinal Consequences changes over 9 months of evaluation (from baseline to 6 months post-DWELL) – French participants

In Belgium, longitudinal analysis of Illness Perceptions was not possible due to small sample completing T2 and T3 measures.

In Netherlands, post-hoc comparisons revealed that there was only one aspect of illness perceptions that showed statistically significant results over the evaluation period, perceived Personal Control, which had sustained improvement, as demonstrated by non-parametric analysis results ($\chi 2 = 9.06$, $p = .028$) (n=16).

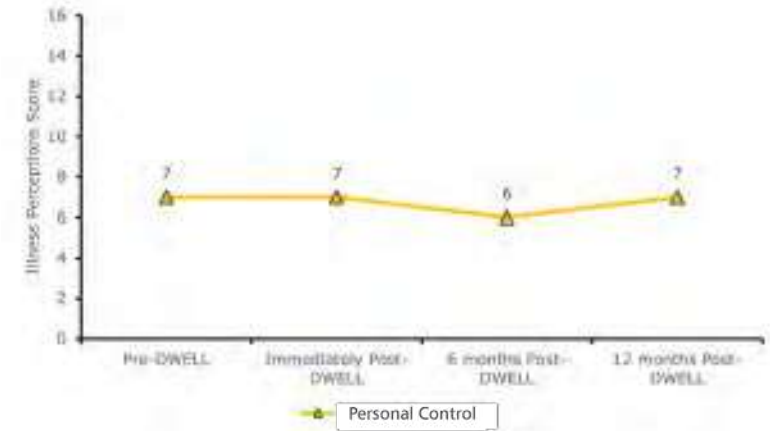


Figure 64 Longitudinal Personal Control changes over 15 months of evaluation (from baseline to 12 months post-DWELL) – Dutch participants

4.2.4 Eating Behaviours

In the UK, due to high attrition at T3, analysis was carried out only with participants who had completed the evaluation at three timepoints. Restrained Eating was sustained over the medium term (6-months), although, like other measures, the greatest improvement was found immediately post-DWELL and began to tail off over the mid-term. External

Eating also appeared to be maintained 6 months post-DWELL. Non-parametric tests confirmed statistically significant changes for restrained eating ($\chi 2 = 13.370$, df = 2, p = .001) (n=103) and external eating ($\chi 2 = 2.507$, df = 2, p = .012) (n=112).

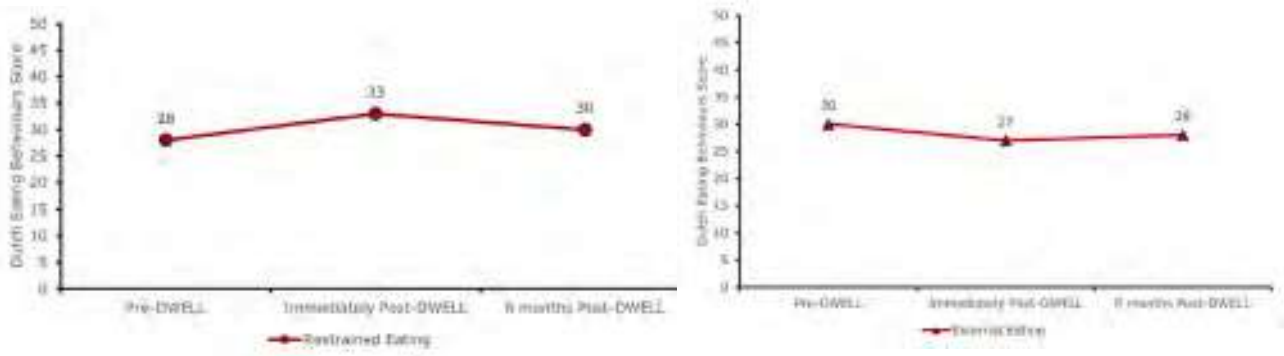


Figure 65 Longitudinal Restrained and External Eating changes over 9 months of evaluation (from baseline to 6 months post-DWELL) – UK participants

In France, analysis revealed a statistically significant improvement in External Eating. While improvement in Emotional Eating was sustained 6 months post-DWELL, it returned to baseline levels one year after the end of the programme. Non-parametric tests confirmed statistically significant changes for external eating ($\chi 2 = 14.171$, df = 3, p = .003) (n=105) and emotional eating ($\chi 2 = 11.831$, df = 3, p = .008) (n=105).

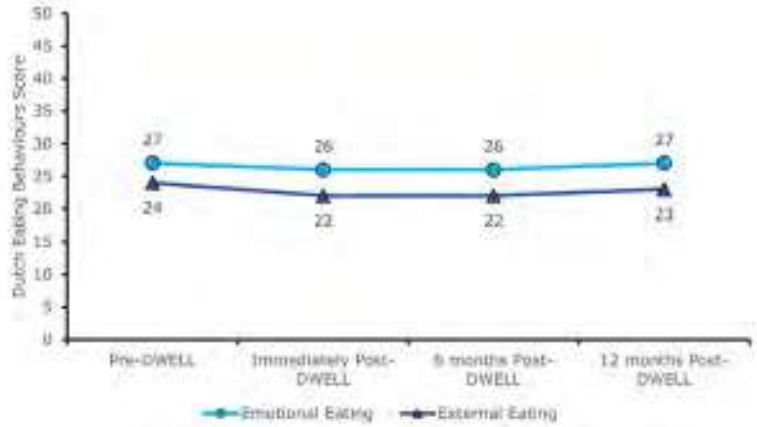


Figure 66 Longitudinal External and Emotional Eating changes over 15 months of evaluation (from baseline to 12 months post-DWELL) – French participants

In Belgium, there were too few valid cases to conduct longitudinal analysis.

In Netherlands, analysis revealed a statistically significant improvement in Emotional Eating, with improvement tailing off at 6 months and 12 months. Non-parametric tests confirmed statistically significant changes over the 15-month evaluation period ($\chi 2 = 11.618$, df = 3, p = .009) (n=13).

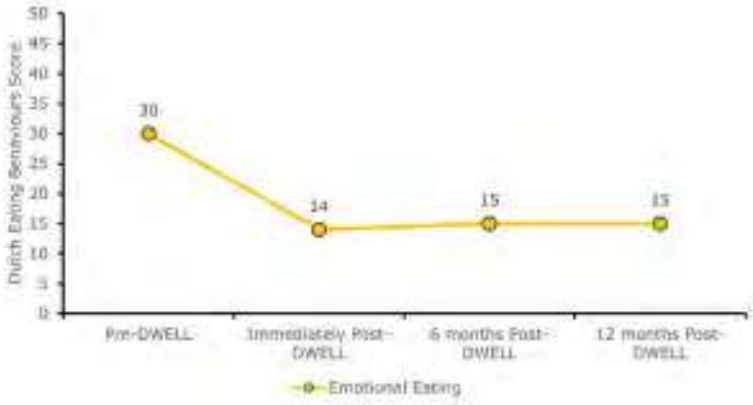


Figure 67 Longitudinal Emotional Eating changes over 15 months of evaluation (from baseline to 12 months post-DWELL) – Dutch participants

4.2.5 Physical and Mental Health

In the UK, analysis did not show any statistically significant results in participants' physical and mental health from baseline or end of programme to 6 and 12 months follow ups.

In France, post-hoc comparisons revealed statistically significant improvement were maintained at 6 months post-DWELL both in perceived physical and mental health. Non-parametric tests confirmed statistically significant changes both for physical health ($\chi 2 = 13.516$, df = 2, p = .001) (n=128) and mental health ($\chi 2 = 9.037$, df = 2, p = .011) (n=128).

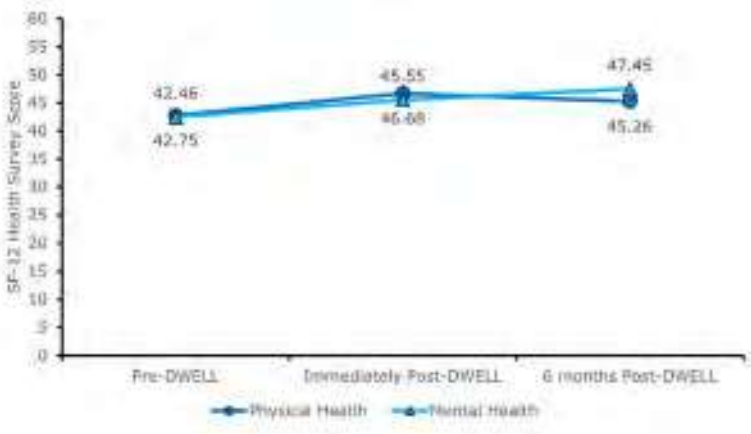


Figure 68 Longitudinal Physical and Mental Health changes over 9 months of evaluation (from baseline to 6 months post-DWELL) – French participants

In Belgium and Netherlands, due to small sample size in T2 and T3, it was not possible to conduct meaningful longitudinal comparisons.

4.2.6 Note on further longitudinal analysis across countries

Due to natural attrition exacerbated by the COVID-19 pandemic which affected sample sizes at follow up points, it was not possible to conduct meaningful longitudinal analysis for Self-Care Behaviours, Physical Activity and Health-Related Quality of Life.

5. Conclusions

5.1 Efficacy, Trends and Cross-Border Learnings

Analysis of metabolic and psychometric outcome measures for participants who completed the 12-week DWELL programme revealed improvements across all project sites. These results were clearer in the UK and France, where larger samples enabled more robust statistical analysis which yielded high levels of statistical significance in several outcome improvements. Even where levels of statistical significance did not reach sufficient levels, results tended to follow overall positive trends.

Participants reported statistically significant positive metabolic health improvements at the end of the DWELL programme in weight loss, BMI reduction, waist circumference reduction and HbA1c reduction across countries, even in sites where we had small samples and statistical significance could not be demonstrated[3].

As well as positive metabolic results, participants also had a more coherent understanding of diabetes and felt more empowered across all sites. This may help to explain why participants also felt more personal control, experiencing increased positive feelings about changes in symptoms. Participants also felt better equipped to deal with life consequences associated with diabetes. Overall, participants reported reduced negative emotions associated with their diabetes and improved overall mental health.

Behaviours around eating and food also improved with better control and awareness of eating (Restrained Eating) and reduction in eating habits related to emotions (Emotional Eating) and external cues (External Eating).

Participants improved their adherence to dietary, footcare and medication advice in most countries. Broadly, they reported receiving more advice on diet, exercise, blood sugar measurement and medication prescriptions after they had completed the DWELL programme and there was a decrease of participants who received no advice from their GP or healthcare professional. This may suggest that upon DWELL programme completion, having learnt more about diabetes, participants were more engaged with services, and were more receptive to specific diet advice, footcare and medication management. Wider cultural and healthcare systems factors may have impacted on engagement with and uptake of services.

Findings suggest that the effect of the DWELL programme reached a peak at the end of the programme delivery. Comparative analysis of pre-post DWELL outcomes demonstrated improved self-reported physical and mental health and overall physical activity at all sites, with those results in the UK and France being statistically significant.

Longitudinal analysis highlighted some broad patterns in participant outcomes. In the medium-term post-DWELL, there were improvements in both metabolic and psychosocial outcomes. In the long term, a year after the programme, most outcomes either continued to improve, or remained at end-of-programme levels, although still being improved from pre-DWELL levels.

More sustained outcomes were found in relation to weight loss (in UK and France); HbA1c reduction (in France); empowerment and personal control (in UK, France and Belgium); and, mental health (in France). In all these outcomes, improvements continued when comparisons were made across all four evaluation timepoints.

In a few cases, positive changes noted at the end of the programme or at the medium term post-DWELL, appeared to be 'reversed', i.e. returned to baseline levels, This was observed in two cases, participant empowerment levels in Netherlands and emotional eating in France, where 12-month post-DWELL results indicated that scores were reverted back to pre-DWELL levels. There may be a number of reasons for this finding, including the 'maintenance' issue flagged up by participants in the process evaluation (namely, continuing to be in contact with DWELL facilitators and peers after the end of the programme) or level/type of support provided post-DWELL in each delivery site.

Another interesting finding which emerged from longitudinal analysis was the difference between outcomes which

3 Where measure results were not statistically significant, they are only reported where their inclusion is pertinent and helps to demonstrate overall trends.

relied on personal cognitive and psychological improvement, and outcomes which relied on the contribution of others or factors beyond the direct control of participants. Long-term positive changes, personal control and mental health, were related to the first type of outcomes and this was demonstrated from the pre-post analysis and improvements in illness coherence, empowerment, personal control, dealing with negative emotions, consequences and symptoms, overall mental health and control, awareness, and response to food cues. However, there were no sustained changes in outcomes of the second type, i.e., feeling of control over treatment, which relies on external factors (healthcare professionals and care provision systems), and perception of duration of diabetes (there is no cure for type 2 diabetes and can be beyond the direct control of participants).

5.2 Future Research

Further analysis of DWELL evaluation data will offer greater insight into the programme's impact on participants' lives. The relationship between participants' personal, cognitive and psychological improvements and externally determined factors such as healthcare systems would benefit from a more detailed analysis. This may require investigating correlations between participant outcomes and site differences in delivery of the DWELL programme, but also demographic differences, such as gender, ethnicity and economic background, as well as societal differences in healthcare system, political decision-making and even societal relationship to food and exercise.

Additional analysis could also shed greater light on how DWELL programme elements affected participants, at country level considering in more detail the local aspects of diabetes care. For example, it would be beneficial to know why in France BMI did not improve following the DWELL programme, whether this had anything to do with the discrepancy in dietary advice and whether this was the result of broader cultural and social focus on food, which has traditionally been associated with cultural attitudes towards eating in this country.

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Kinetic Analysis
HUMAN MOTION DATA

DWELL

Evaluation Study of the Diabetes and WELLbeing 12 week programme

REPORT 3: Process Evaluation

Canterbury Christ Church University

Interreg 2 Seas Mers Zeeën

DWELL

European Regional Development Fund

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FOREWARD

The Diabetes and Well Being in Europe (DWELL) project was funded by the INTERREG 2 Seas Mers Zeeën Programme and ran between 2016 and March 2023. The overall aim of the project was to empower people living with Type 2 Diabetes Mellitus (T2DM) to enhance self-management of illness through a co-produced 12-week educational programme, and to improve targeted aspects of individual health and wellbeing. The project involved partners in the UK, France, Netherlands and Belgium.
Canterbury Christ Church University ('CCCU') led Work Package 4: Evaluation of the DWELL programme, which commenced delivery in 2018. The evaluation comprised four key areas: patient outcomes; system/process benefits of the programme; staff training; cost benefits of the programme.

For Output 4.1 of this Work Package, we present a set of four final project reports which relate to DWELL programme evaluation. These are as follows:

- **REPORT 1:** Evaluation Methodology
- **REPORT 2:** Participant Outcomes
- **REPORT 3:** Process Evaluation
- **REPORT 4:** Workforce training and Cost Effectiveness

Report 3 presents the Process Evaluation of the DWELL programme, focussing on implementation, mechanisms and outcomes o the programme delivery, captured by qualitative data collected throughout the project.

We would like to acknowledge colleagues for their valuable contribution as researchers and advisors at earlier stages of the evaluation study: Dr Marlize De Vivo and Prof Kate Springett, Canterbury Christ Church University; and, Dr Katrina Taylor, University of Kent.

We are grateful to all DWELL programme participants in the four project countries for their significant contributions and support in evaluating the DWELL programme at all its stages.

We would like to thank all our project partners for their invaluable help in data collection and in particular:

UK - Julie Webster, Anne Eltringham-Cox and Jane Redding, Medway Community Healthcare; Nathalie Belmas and Sue Shaw, Blackthorn Trust; Stephen Cochrane, Kent County Council
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The Netherlands - Maarten Gijssel, Linda van Wijk, and Melvin Franken, Kinetic Analysis

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Executive Summary

Process evaluation of the DWELL programme allowed an in-depth understanding of the key mechanisms of implementation, mechanisms and outcomes.

DWELL Implementation

- Motivating factors for participants to engage with the programme were: better management of their diabetes; experiencing negativity such as stigma and feeling dismissed by healthcare providers; being referred to the programme by a healthcare professional; and wanting to meet others with the condition.
- The DWELL programme enhanced health literacy and self-efficacy of participants.
- Programme set up was effective and flexible. Reported issues regarding content in relation to the wellbeing and physical elements were addressed by the teams. There were also some operational and logistical barriers such as lack of follow-up (for participants) and resources and recruitment (for staff). Adjustments by sites during the project included: facilitation; content; session timings; recruitment strategies; resources; and allowing partners of participants to attend sessions.
- The DWELL programme compared favourably to other educational programmes for type 2 diabetes that participants had previously attended.
- Differing contexts across countries and sites impacted on how the DWELL programme was implemented. The COVID-19 pandemic created challenges in implementation during that period, namely, substantial difficulty in recruiting participants to the programme and making changes to the set up and mode of delivery. However, for many participants, the DWELL programme provided the opportunity to maintain a sense of normality and interact with other participants in person after lockdown restrictions were lifted.

DWELL Mechanisms

- DWELL incorporated key mechanisms to facilitate empowerment and better self-management of participants: peer support, motivational interviewing (MI) and goal setting
- The effectiveness of peer support came out very strongly in both the focus group and interview data across all delivery sites. A sense of community was established through facilitators ambassadors and participants sharing problems and solutions, working together and motivating each other
- The most applied MI principle was establishing willingness to engage in the programme
- DWELL Participant Goals had four overarching themes: Management of Illness, Management of Nutrition, Management of Physical Activity and Management of Wellbeing
- Goals set by majority of participants across all sites at the start of the 12-week programme were in relation to Management of Illness
- Five particular goals participants identified were: Metabolic Health, Diabetes Education, Physical Activity and Mobility, Nutrition Education and Empowerment and Mental Wellbeing

DWELL Outcomes

- Qualitative feedback illustrated significant positive outcomes of the DWELL programme:
  - Enhanced self-management of diabetes
  - Making important lifestyle changes
  - Enhanced wellbeing (for programme participants and DWELL ambassadors)
- Sustainable outcomes were elicited from ‘legacy’ participants:
  - Recognition that progress is not a linear journey
  - Sustained empowerment and autonomy
  - Navigating challenges during the COVID-19 pandemic
- Participant recommendations for programme delivery in the future include:
  - Provision of follow-up support
  - Considering online or blended delivery of the programme

1. Introduction

Good practice in public health research is synonymous with the inclusion of a process evaluation alongside an outcome evaluation. Data collected as part of the process evaluation explain the outcome evaluation results (Munro and Bloor, 2010). Process evaluations aid our understanding of how and why public health interventions work (or do not work), which in turn has implications for both research and practice (Linnan and Steckler, 2002). Moore and colleagues' (2015) guidance was adopted to develop process evaluation of the DWELL 12-week programme. This framework builds on earlier United Kingdom Medical Research Council (MRC et al., 2014) guidance for developing and evaluating complex health interventions. Three key components and the relations between them define the framework - context, implementation, and mechanisms.

This report is structured in alignment with the DWELL Logic Model (see Report 1: Methodology) which informs the intervention and process evaluation. Therefore, the results are divided four sections: context, implementation, mechanisms and outcomes.

Figure 1 below shows how the Process Evaluation Framework was applied to the evaluation of the DWELL programme. The first component of the framework describes the intervention and the factors which may facilitate or hinder its implementation (the context). These factors are external, such as the DWELL site settings and wider healthcare practices and regulations. The second component refers to how the programme was implemented and adapted. In the case of DWELL, this includes the delivery teams, venues and resources. The third component of the framework explores the mechanisms through which interventions bring about change. For DWELL, this includes motivational interviewing and peer support. The final component is the outcomes, i.e. the impact that DWELL had on participants, including those completing the programme, DWELL ambassadors, site leads and facilitators.

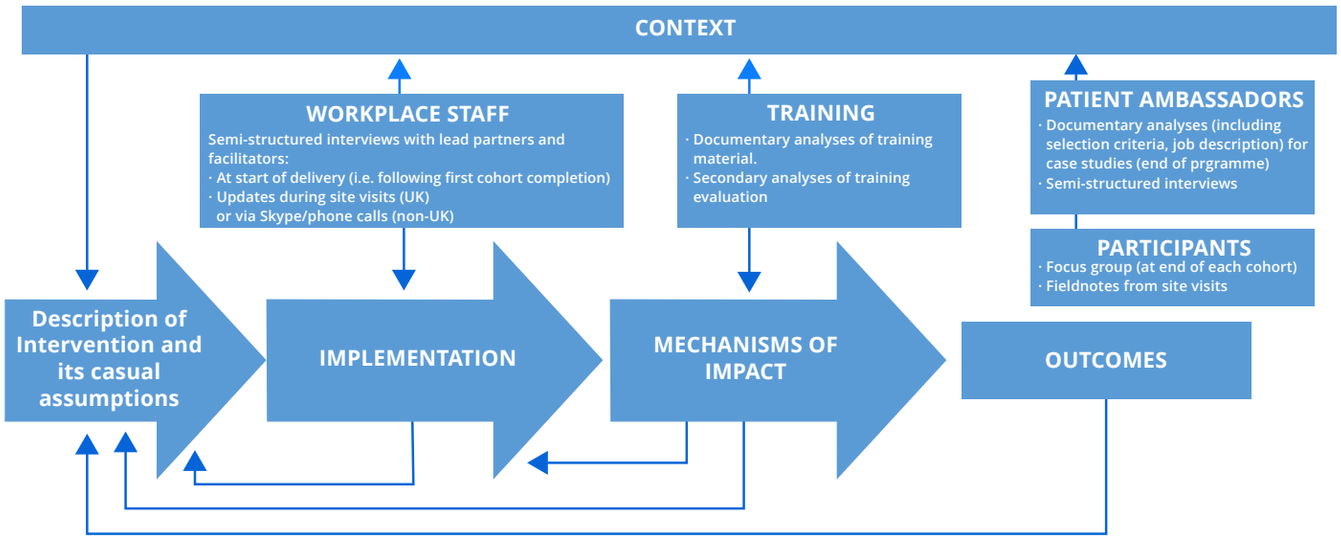

Figure 1 Application of process evaluation framework to DWELL evaluation

2. Methodology

The process evaluation components were assessed by gathering information from key groups and sources involved in the intervention:

1. Participants attending the 12-week programme
2. Workforce/Staff - Sites Leads and Facilitators delivering the programme
3. Patient (DWELL) Ambassadors
4. Training materials

The following methods were employed to collect Process Evaluation data:

- Focus groups with participants at the end of the programme
- Semi-structured interviews with staff and patient ambassadors
- Facilitator feedback following individual motivational interviews
- Participant Goal setting information during the programme
- Feedback from staff/ambassador training

For full details regarding the methodological and data analysis approaches of the process evaluation elements of the DWELL study, refer to Report 1: Methodology.

3. Context

Delivery of the 12-week programme took place across five sites: two sites in the UK and one site each in Belgium, France and the Netherlands. Each site delivered the programme according to their specific context (case study details of each delivery site are presented in Report 1). Sites were operating under different national and regional health care systems, differing guidelines for the care of people with type 2 diabetes, and also varied in workforce and venue capacity and resources (Table 1).

Table 1. National and regional health care contexts of delivery sites

				
HEALTH CARE PROVISION	Funded from general taxation, providing universal access, which is free at the point of use. Devolved responsibility in the four nations of the UK (European Commission, 2019d)	Funded through either compulsory or voluntary health insurance which covers 95% of population and based mainly on a social health insurance (SHI), with a traditionally strong role for the state (European Commission, 2019b)	A mix of government mandated insurance for curative care, with additional premiums covering services outside the main packages, a single payer system for long-term care and local tax-funded social care (European Commission, 2019c)	A mix of mandatory public health insurance augmented by private health insurance and individual cost-sharing arrangements. Health care system is federated, with nearly universal coverage (European Commission, 2019a)
CURRENT HEALTH SITUATION	60% of adults in England overweight or obese, which has led to many more people living with type 2 diabetes (Number of people with diabetes reaches 4.7 million | Diabetes UK, 2019). As with many behaviourally related health risks, results are affected by lower education or income (European Commission, 2019d)	Over one in seven adults was obese in 2017, up from one in ten in 2000. More than three in five people aged 65+ reported having at least one chronic condition. Large gaps in life expectancy by sex and socioeconomic status can be explained at least partly by differences in education level and living standards (European Commission, 2019b)	60% of the Netherlands is overweight. Obesity has increased from 10% in 2000 to 13% in 2017. Wide disparities in health care exist in prevalence by education level, with people with the lowest level of education are nearly three times as likely to live with diabetes (European Commission, 2019c)	One in six adults obese in 2018, up from one in eight adults in 2001. Health continues to be affected by inequalities, large disparities in unmet medical care needs by income group and education (European Commission, 2019a)

				
PREVALENCE OF DIABETES	10% of people over 40 living with a diagnosis of type 2 diabetes, approx. 3.42 million people in total. Thought to be almost 1 million more people living with type 2 diabetes who remain undiagnosed. By 2030 it is predicted the total number of people with type 2 diabetes in the UK will rise to 5.5 million. 4.3% potentially preventable admissions due to diabetes (Potentially preventable emergency admissions | The Nuffield Trust, 2017)	8% prevalence in 2016 (WHO, 2016b). Morbidity linked to diabetes has steadily increased since 2000 (Chevreul et al., 2015). With hospital admission rates for diabetes almost 20% higher than EU average (European Commission, 2019b). Avoidable hospital admission rates not available (Chevreul et al., 2015)	6.1% prevalence of diabetes (WHO, 2016a) with just over 1 million of the total population currently have a form of diabetes (Raaijmakers, 2014). Avoidable admissions for diabetes are among the lowest in the EU (European Commission, 2019c)	Exact number of people with diabetes not known as no registration system. From available health insurance data, diabetes has an estimated prevalence of 6.1%. However, Belgian Health Examination Survey revealed a prevalence of 10%, indicating that one third of people with diabetes are not aware of it. Hospital admissions for diabetes has reduced over the past decade and are overall currently at the EU average level (Gerkens and Merkur, 2020)
DIABETES CARE PROVISION	Operational policies, strategies and action plans cover diabetes. Diabetes care is set out through NHS Diabetes Prevention Programme and PHE's Next Steps (NICE, 2018). A range of medicines, procedures, and basic technologies are available, with 90% of people with type 2 diabetes offered structured education, and 10.4% attending (Whicher, O'Neill and Holt, 2020). No specific details on diabetes registry or recent risk factor survey	Operational policies, strategies and action plans cover diabetes (WHO, 2016b). Social health insurance has developed disease management programmes and pathway guidance (Chevreul et al., 2015). Metformin and insulin available, but no specific data is available on basic technologies. No diabetes registry or recent risk factor survey (World Health Organization, 2016b)	Operational policies, strategies, action and monitoring plans for diabetes and evidence-based national diabetes guidelines/protocols/ standards (European Commission, 2017). Nationwide Diabetes registry. No national risk factor survey. Insulin, Metformin and Sulphonylurea available. Range of basic technologies and more complex procedures available (European Commission, 2019c)	Operational policies, strategies and action plans which cover diabetes. With specific diabetes new care pathways (WHO, 2016). Evidence-based national diabetes guidelines/ protocols/standards and standard criteria for referral. Medicines available include insulin, metformin. Range of procedures and basic technologies (European Commission, 2019a). As of 2016 it does not include diabetes registry or recent national risk survey (WHO, 2016)
FUNDING OF DIABETES SERVICES	Average of EUR 2,900 per person compared to the EU average EUR 2,884. Expenditure is considerably lower than similarly wealthy EU countries such as Germany (EUR 4,300 per capita) and France (EUR 3,626. Spending has been relatively stable over time, but it has not kept pace with growing demand for health services (European Commission, 2019d). 10% of NHS entire budget on diabetes, 80% of this is spent treating complications (Whicher, O'Neill and Holt, 2020)	EUR 3,626 per capita on health, 25 % more than the EU average, sixth overall. Spending has increased from 10.3 % in 2007 to 11.3 % in 2017. Spending on prevention accounted for less than 2% of all health spending, a share lower than the 3.1 % EU average. Private voluntary insurance plays an important role in France, accounting for about 7 % of total spending (compared to less than 4 % in the EU) (European Commission, 2019b)	EUR 3,791 per person. The Netherlands is the fourth highest spender on health care per capita in the EU with 10.1% of GDP devoted to health. 3% health spending on prevention (European Commission, 2019c)	EUR 3,554 in 2017. 20% more than in the EU as a whole (EUR 2,884) but less than in all its neighbouring countries. 10.3% of its GDP on health in 2017, up from 8.9% in 2006. Disease prevention, allocating only 2.2% (European Commission, 2019a)

4. Implementation

Each site delivered similar core content in relation to the four main areas of DWELL – education, nutrition, physical activity and wellbeing. However, the implementation of the programme varied at different sites due to the national and regional context, as discussed in the previous section, and the varying resources and staff capacity across sites. For example, some sites had kitchen facilities and were therefore better equipped to deliver nutrition workshops and provide 'hands-on' experience for participants. There were also site-specific challenges experienced in terms of venue sourcing, timetabling and availability, which added to the administrative burden of delivery teams. This section explores further how the DWELL programme was implemented across the sites. Detailed information about the 12-week programme can be in the booklet 'DWELL Diabetes & Wellbeing' (Vanbosseghem, Callens and Luyens, 2020).

4.1 Participants

Evaluation data in relation to implementation and mechanisms was collected via end-of-programme focus groups with programme participants and interviews with staff (site leads and facilitators) and programme ambassadors.
Fifty-six focus groups were conducted across the five DWELL sites. Of the 274 participants, the majority were from the two UK sites where a higher number of cohorts ran. Focus group data collection took place in various ways per site. In the UK, focus groups were taking place at the final week of the programme so most participants were able to attend. In France, participants were invited in the focus group following the end of the programme and, for some cohorts, no focus groups took place, which accounts for a lower proportion of focus group compared to programme participants. In Belgium, there was a small number of cohorts, and only one focus group of 6 participants (first cohort) took place. In Netherlands, the delivery of the programme was on an individual basis, therefore feedback was relayed to motivational interview facilitators by individual participants (n=22). This was incorporated into the write up of the analysis, where feasible, to enhance points made, but was not included in the overall total of participants as the data was not collected via a focus group.
Nineteen of these focus groups, involving 65 participants, were conducted with cohorts which ran after March 2020 (when COVID-19 started). Twelve focus groups at UK sites (UK1 = 9; UK2 = 3) and seven in France. There were no post-COVID focus groups in Belgium or the Netherlands as these sites were not able to resume delivery of the programme following the easing of lockdown restrictions. This data was analysed alongside the original focus group data, and in most cases, the themes reported below relate to the full sample of focus group participants (i.e. from 2018 to 2022). Where there are differences between pre- and post-COVID data, this is noted.

Table 2. End-of-programme Focus Groups per site

Site	No. of focus groups	No. of focus group participants
UK 1	23	112
UK 2	20	95
France	10	50
Belgium	2	11
Netherlands	1	6
Total	**56**	**274**

Across the sites, 15 semi-structured interviews with site leads and 30 interviews with facilitators working in the programme were conducted. Depending on available resources per site, there were some variation to this data collection. For example, in France, a focus group with 4 facilitators instead of individual interviews was conducted, whereas, in Netherlands, feedback received from 13 facilitators was gathered via group interviews or email, especially with those who were involved in the programme to a lesser degree.

Table 3. Site Lead and Facilitator Interviews per site

Site	Site Lead Interviews	Facilitator Interviews	TOTAL
UK 1	3	7	10
UK 2	3	3	6
France	2	5	7
Belgium	3	2	5
Netherlands	3	13	16
Total	**15**	**30**	**45**

Table 4. Demographic profile of DWELL Ambassador interviewees

	DWELL Ambassador interviewees (N = 18)
Age (years)	Mean: 57.33
Age Band	< 19 years: -
	19 – 30 years: -
	30 – 39 years: 1 (5.6%)
	40 – 49 years: 3 (16.7%)
	50 – 59 years: 5 (27.8%)
	60 – 69 years: 8 (44.4%)
	70 – 79 years: 1 (5.6%)
	> 80 years: -
Gender	Male: 12 (67%) Female: 6 (33%)
Time since diagnosis	Mean: 11.29 years

4.2 Motivation to attend the programme

4.2.1 Better management of condition

Most of participants who provided feedback at the end of the 12-week programme were keen to make positive changes in order to manage better their type 2 diabetes and overall health. They were compelled to join the DWELL programme due to lack of knowledge and self-efficacy, the reasons for which included receiving little information or guidance from GPs and healthcare professionals. Some participants reported a sense of being treated with medication for symptoms but otherwise being abandoned, "left to get on with it" or being expected to know what to do themselves:

> *"After my diagnosis, my GP just gave me a prescription for medication. I received almost no information"* [Belgium participant]

Participants therefore entered the DWELL programme with differing personal models of diabetes, which were not necessarily accurate nor, in many instances, aligned with the medical view of the condition, which created a sense of frustration. Another reason behind participants' lack of knowledge was inconsistent and contradictory messages from different sources.

The most common areas where further knowledge was required were in relation to blood glucose, nutrition, medication, long-term health implications and complications, lifestyle changes, reversal of the condition, and wellbeing. There was a strong sense that participants wanted to take control of the condition and their overall health. Many reported complacency, struggle or despondency with doing so before attending DWELL:

> *"Even if we pay attention, our measurements* [weight, blood sugar] *go up and down, and that's what really hurts"* [France participant]

A smaller number of reports were made in relation to wanting to reduce or stop medication, or to prevent having to start taking it. These factors suggest that participants had intrinsic reasons for attending the DWELL programme, and before attending they tended to take a more passive role in their illness.

4.2.2 Experiences of negativity

UK participants in particular reported negative reactions from healthcare professionals in relation to their type 2 diabetes, often feeling chastised, dismissed or not being given enough time:

> *"With the diabetic nurse/at the surgery you don't get the time to go through things in detail - you're in and out"* [UK 2 participant]

Perhaps due to their personal representations, models and beliefs about type 2 diabetes, other participants reported that their diagnosis evoked fear and shock, as well as shame and overwhelm, whilst others reported denial or avoidance in addressing their diabetes:

> *"It was more of a shock to me to be diagnosed with type 2 diabetes than it was when I was told I had cancer…with diabetes, I felt guilty that I had put myself there, and it is now all my responsibility to take action for that."* [UK 1 participant]

4.2.3 Referral routes to the programme

The most common route was via a healthcare professional, including diabetic nurse, GP, dietitian and facilitators of other education programmes.. The next most common referral route was through programme advertising, i.e. participants seeing promotional materials, including leaflets and posters in GP surgeries, community pharmacies and other healthcare settings;, information stands in local libraries; advertisements in local press; and, social media e.g. Facebook, Twitter etc. Many participants were encouraged to join the programme by 'word of mouth' recommendations of those who had completed DWELL.

4.2.4 Meeting others with diabetes

Wanting to meet others who have type 2 diabetes or be part of a group was evident in feedback from participants and emerged more clearly in focus groups conducted after the pandemic, likely due to the fact that people had experienced social distancing and isolation and were more in need of company:

> *"To meet other diabetic people, to have an opinion different from mine"* [France participant]

> *"It's for the group because we are better able to work on our issues with exchanges, this allows us to put a number of things into perspective"* [France participant]

4.3 Facilitating factors

Participants were asked which elements of the DWELL programme they felt worked well. This section presents the most common themes in relation to these facilitating factors.

4.3.1 'Pick and mix' and experiential content

Participants reported that the four areas of DWELL – education, nutrition, physical activity and wellbeing – were well linked in each of the delivery sites. Higher engagement and enthusiasm was apparent where sites were able to incorporate these elements to a higher degree. For example, all sites provided sessions regarding nutrition, which were felt to be very valuable in clarifying misunderstandings and improving health literacy. Furthermore, Belgium, UK 1 and France sites had kitchen facilities available, enabling participants to be physically involved via hands-on cooking sessions. The opportunities to learn new skills, try new food, cook recipes, learn about alternative ingredients and satiety, and eat together at the end of the session were well received by participants, which was also noticed by staff:

> *"It inspired you and made you want to cook. It was surprising how quick easy it was to prepare lovely food."* [UK 1 participant]

> *"They're having fun, getting stuck in with cooking stuff, and it tastes good…it's the flip side of the 'you can't eat this, you can eat that."* [DWELL team member, UK 2]

4.3.2 Flexible programme delivery

Participants commented favourably on the programme set up, particularly in group size and course duration. Keeping group size small was conducive open communication, as well as group bonding and interaction, which are protective factors to health (Marmot and Bell, 2012):

> *"I think the small group size* [6] *is key…we have talked to and encouraged each other, built relationships…I like the flexibility of the sessions and that I can listen to other people and find out what their experiences are."* [UK 2 participant]

It was also important to participants in all sites that evening sessions were available:
"I couldn't believe there was something I could attend that wasn't during the day…I never expected that. So, when it did, even though it was a big commitment…I had to come on it." [UK 2 participant]
Staff reported that the environment played a part in the effectiveness of the programme. A welcoming, informal venue was preferred, and those sites that delivered DWELL in non-medical setting felt that this helped to reduce or overcome barriers and promoted communication exchange:

> *"As DWELL takes place outside of the hospital environment, it removes certain barriers that may exist between caregiver and patient - there is a social bond and friendships are created… people stay connected."* [DWELL team member, France]

A theme that emerged in 'post-COVID' focus groups was flexibility, particularly around attendance of the programme. Several participants had work or family commitments or travel issues and appreciated being given the opportunity to join some sessions via video link, which is something that was only made available as a result of COVID when delivery sites were required to develop new virtual ways of working.

4.4 Challenges and improvements during implementation

Participants were asked which elements of the DWELL programme they felt did not work well and were invited to suggest improvements. This feedback was passed anonymously to the delivery teams who used it to further shape and enhance the programme.

4.4.1 Content 'outside of comfort zone'

The element of the programme which received the most feedback were the wellbeing sessions, which included sessions such as self-care, guided conversations, creative activities, mindful walks, body image, singing and ukulele playing. Some programme participants found sessions to be "outside of their comfort zone" initially. However, despite initial reluctance, there were numerous comments made in relation to making the link between mental and physical health, which was also noticed by staff:

> *"I didn't appreciate how stress could affect your HbA1c…you push it aside and you carry on, until you come to something like this programme, and it starts to ring bells…stress catches up with you."* [UK 2 participant]

> *"I think the wellbeing element is really working...For some participants it was a bit difficult to see their talents on their own, but many later mentioned that they had not looked at or thought about it in this way. They ended up feeling more able to take a holistic approach to their T2DM and mechanisms for coping with it."* [DWELL team member, Belgium]

There were suggestions made as to how the wellbeing element could be improved, including a better explanation at the outset as to its importance and links with type 2 diabetes, management of expectations, and making it one of the optional 'pick and mix' offerings after an initial introduction, for those that were more interested.
Another critique of the DWELL programme was that the physical activity element was not as prominent as anticipated, particularly in the UK sites. At sites where physical activity was incorporated as part of the programme it was motivating:

> *"Walking, yes that helped me a lot…socialising and walking. It helped me to be with other people, to go for a walk, to be in a group. I am very happy with that…Sport on my own I wouldn't have been there. Together, that motivates me."* [France participant]

Suggestions from participants included incorporating physical activity into the programme and tailoring it to different levels and abilities, for example having optional time at the end of each session for a walking group for those that participants that were interested. Another suggestion was the provision of free or subsidised local gym memberships for the duration of the programme to improve access for participants.

4.4.2 Operational and logistical barriers

Most participants felt well equipped to sustain their progress at the end of the programme. The follow-up evaluation assessment at 6 and 12 months was perceived as a useful incentive to keep up with positive changes they had achieved. Some felt concerned about sustaining progress after the end of the programme and felt it would be beneficial to be provided with ongoing sources of support by the sites. Similar feedback was given by participants who undertook the programme after the COVID-19 lockdown restrictions eased, especially as they did not have regular access to healthcare appointments, professionals and education during lockdown and valued support received through DWELL. Suggested follow-up could be regularly (weekly or monthly) or maintaining contact with and have ad-hoc support by staff.
Overall, participants across the sites felt that the timing and duration of sessions were appropriate. There was some feedback that was taken on board by sites and adaptations were made. For example, early programme cohorts reported daytime delivery as a barrier for those in full-time employment who either found it difficult or impossible to attend sessions. As a result, programme leads and facilitators added the option of joining an evening group, which proved a popular choice. Feedback was also received about programme sessions running two consecutive days per week in some sites, which was felt to be a major time commitment for participants; this consideration led to adjustments.
From the perspective of DWELL staff, the main operational challenges were in terms of resources and recruitment. Resource issues included staff turnover, availability of external facilitators, running costs and suitable venues. Recruitment was challenging in a variety of ways, such as engaging with primary care professionals to refer people to the programme, assessing suitability of potential participants and time constraints (which linked back to available resources).
During the project lifetime, staff refined and shaped the programme in response to participant feedback. Changes made included:

- **Facilitation** - introducing new experts to run sessions, replacing staff who left the project, main facilitators covering sessions when external providers were no longer able to do so
- **Content** - adding or amending activities based on participant feedback, adding further 'pick and mix' activity

options

- **Timing** – implementing evening sessions, adjusting the duration of sessions, staggering dates of cohorts to allow for recruitment activities
- **Recruitment** – developing new strategies to recruit to the programme
- **Resources** – adjusting staff hours, sourcing new venues, amending materials in line with facilitator and participant feedback
- **Attendance** - allowing partners of participants to attend sessions alongside them for support.

4.5 DWELL and other educational programmes for diabetes

Participants reported that DWELL compared favourably to other educational programmes they had attended in relation to type 2 diabetes. The main reasons for this positive feedback included that the smaller group size, longer duration and level of detail of DWELL. Skinner and Cradock (2000) suggest that if information provided is too generic, it can be rationalised by the participant as not relevant. However, in the DWELL programme, dual process theory was employed whereby individuals were involved in the learning process as much as possible and given the opportunity to ask questions, gain clarity and have ample time assimilated and retain learning.

> "[On the other course] *we were bombarded with four hours of information…I don't remember coming away with the don't eat carbs, as you do with DWELL. It was too much information all at once, and you didn't have time to ask any questions."* [UK 1 participant]

The delivery style of DWELL was also preferred compared to other programmes:

> "[The other programme] *was like being in school again…just sitting there listening and you're too scared to ask anything"* [UK 2 participant]

4.6 COVID-related challenges

In March 2020, the 12-week programme delivery was paused across all sites due to the COVID-19 pandemic, interrupting ongoing cohorts. When delivery resumed, following the easing of lockdown restrictions, the subject of the impact of COVID-19 and its impact came up naturally in end-of-programme focus groups. The themes that arose highlight valuable points for consideration, not just for DWELL but for similar psychoeducational programmes which focus on long-term health conditions.

The general consensus was that the pandemic had resulted in diminished self-efficacy, i.e. the ability of participants to enact the lifestyle behaviours learnt during DWELL and follow through on their action plans due to being more sedentary, becoming unwell with COVID and the mental strain of social distancing, isolation and long periods of lockdown. Access to health services was an additional challenge experienced during lockdown; programme participants were reluctant to visit their GP for their HbA1c tests or other issues due to the risk of exposure to the virus. Also, participants experienced challenges in relation to nutrition, e.g. not being able to access certain ingredients or not being able to visit shops.

Some participants chose not to put themselves under undue pressure, with a view to getting back on track at a later date. There was a sense of confidence that they would be able to continue with the lifestyle changes and progress they had started to make:

> *"I've kind of backed off a little bit during lockdown, but I actually felt the strength of the programme is that I know I've learnt enough, then when it's back up it won't be a problem."* [UK 1 participant]

The challenges experienced by DWELL participants during the COVID-19 pandemic and lockdown align with Dahlgren and Whitehead's (1991) social determinants of health model, in that an individual's environmental, living, working and social conditions have a direct influence on health.

From the perspective of staff, challenges with recruitment continued post-pandemic. There was a lot of anxiety amongst participants to return to group settings and sites found it difficult to recruit to evening groups, especially given that the momentum they had built from 'word of mouth' recruitment had been lost during the pandemic. Group sizes therefore tended to be much smaller in post-COVID groups compared to before March 2020. However, facilitators noticed that participants flourished as the programmes continued and felt that the programme became even more effective, particularly for those who were more socially isolated. For example, in one group, an elderly male participant who lost his wife during lockdown was described by the facilitator as being at "rock bottom" when they joined the group and felt very uncertain about attending the group as he had lost confidence. However, the facilitator noticed a big change in him as the programme progressed:

> *"He did come, and you could see his confidence building. One of others pointed out to him that*

at the start he didn't talk, and by the end he was one of the cheeky ones. He said it had been his first step back into doing things again...Without DWELL, I can't image how he would have achieved that." [DWELL Facilitator, UK 1]

4.7 Cross-border learning

Process evaluation highlighted commonalities and differences across the DWELL delivery sites and countries. In terms of common themes, all participants acknowledged as facilitating factors of the programme the following: strong peer support; experiential diabetes education (e.g., on-site cooking lessons); inclusive facilitation approach; motivational goal setting; and delivery flexibility (e.g., availability of evening sessions).

In terms of motivation for attending the programme, all participants noted that they had experienced absence of accessible information about type 2 diabetes. Also, most participants had previous negative feedback or attitudes about their management of the condition, especially in the UK, in terms of feeling dismissed or chastised by healthcare professionals and experiencing stigma or guilt about their condition, or they were given contradictory advice by professionals and service providers. Therefore, the main common motives were to have reliable information about diabetes and learn how to manage better their condition.

Key points from DWELL Implementation:

- Motivating factors for participants to engage with the programme were: better management of their diabetes; experiencing negativity such as stigma and feeling dismissed by healthcare providers; being referred to the programme by a healthcare professional; and wanting to meet others with the condition.
- The DWELL programme enhanced health literacy and self-efficacy of participants
- Programme set up was effective and flexible. Reported issues regarding content in relation to the wellbeing and physical elements were addressed by the teams. There were also some operational and logistical barriers such as lack of follow-up (for participants) and resources and recruitment (for staff). Adjustments by sites during the project included: facilitation; content; session timings; recruitment strategies; resources; and allowing partners of participants to attend sessions.
- The DWELL programme compared favourably to other educational programmes for type 2 diabetes that participants had previously attended.
- Differing contexts across countries and sites impacted on how the DWELL programme was implemented. The COVID-19 pandemic created challenges in implementation during that period, namely, substantial difficulty in recruiting participants to the programme and making changes to the set up and mode of delivery. However, for many participants, the DWELL programme provided the opportunity to maintain a sense of normality and interact with other participants in person after lockdown restrictions were lifted.

5. Mechanisms

Three of the main mechanisms utilised in the DWELL programme were peer support, motivational interviewing and goal setting.

5.1 Peer support

Peer support is defined as *"support from a person who has knowledge from their own experiences with diabetes, a person with diabetes, or a person affected by diabetes (eg, immediate family member or caregiver)"* (Litchman et al, 2019). Peers can provide ongoing support that is needed for sustained self-management of diabetes. Key functions of effective peer support include assistance in daily management, social and emotional support, linkage to clinical care, and ongoing availability of support (Fisher et al, 2012). Peer support, alongside other support, has been shown to help people learn to live with their condition, day-to-day, giving them the confidence, knowledge and support required to manage the complexities of living with a long-term-condition (NHS England, 2022). Group peer support as a DWELL mechanism was identified very strongly by programme participants, staff and ambassadors across all delivery sites. A sense of community was established through sharing problems and solutions, working together and motivating each other:

"Being a diabetic is extremely isolating. There's no-one round me that understands diabetes and I've had to go through it alone, which I've found very difficult. But I found being in a group of other like-minded people has helped enormously … we are sharing the experience of our diabetes, so instead of feeling like we're carrying this problem on our own, it's more a problem that we know other people are sharing." [UK 2 participant]

"The group element of the programme works very well and is massively powerful. You can see people support each other and motivate each other…from giving someone a lift to making sure if they are okay if they don't turn up to giving someone confidence who is feeling a bit insecure during the education session. Also in terms of feeding back and being accountable to each other." [DWELL team member, UK 1]

Participants enjoyed the others' company and maintained contact with each other between sessions via social media, email, WhatsApp groups and meeting up in-person:

> *"We had great meetings, and we are all very close together, so I liked it also to meet people … We all went to eat at the restaurant, simply, it was the fact of being together."* [France participant]

Also, participants were very positive about the supportive and inclusive approach of programme facilitators, involving them in the process, an important element which enhances understanding and leads to information being considered as relevant by the individual. For the facilitators, there was very much a sense of accompanying the participant on their journey:

> *"We are there together, we progress together. The notion of 'professionals' disappears and we are just companions."* [DWELL team member, France]

The introduction of DWELL Ambassadors was an additional strong peer support element. DWELL Ambassadors were 'peers', people with type 2 diabetes who were involved from the start of the project as 'experts-by-experience' in the co-design and delivery of the programme. Each DWELL Ambassador was involved in ways that suited their own preferences, skills and capacity, such as: providing feedback at the pilot of the programme; acting as ambassadors of the programme in national project meetings, events and conferences; promoting DWELL to others in the community; setting up programme social media accounts and producing newsletters; initiating and running activities in the DWELL programme. For example, in the UK, an Ambassador implemented a weekly craft group for DWELL participants, and, in France, Ambassadors attended sessions alongside participants and set up walking groups, which enabled further opportunities for support and connection:

> *"I had a good exchange with them* [Ambassadors]*, I talked with them about diabetes, the physical* [aspects]*, we talked with them about their motivation."* [France participant]

> *"I meet different people, whether at the walks or at the cooking workshop, and we have created a fairly intimate bond and the bond is very strong because we stay in contact even if we meet them walking 3 times a week…if they are sick we hear from them, if they are in difficulty they call us and we are there to inform them and give them good advice."* [DWELL Ambassador, France]

5.2 Motivational Interviewing

Motivational interviewing is a directive, person-centred counselling style for eliciting behaviour change by helping clients to explore and resolve ambivalence (Rollnick and Miller, 1995). The motivational interviews (MIs) were an innovative part of DWELL, and although previous studies involving people with type 2 diabetes tended to focus on feedback from participants receiving motivational interviews (Heinrich et al., 2010; Chen et al., 2012; Dellasega, Añel-Tiangco and Gabbay, 2012), the DWELL research team opted to elicit data and feedback from those facilitating the MIs. The main reason was to understand from the facilitators' point of view how the MI approach was applied and how MI principles impacted on participants' experiences of the programme.

At the end-of-programme focus groups, participants noted that they appreciated the tailored support offered by MIs, which allowed them to set and discuss goals at the start and end of the programme. The MI approach enabled facilitators to take a holistic view of individuals and consider wider issues they were facing in their lives which might be affecting their management of diabetes. Furthermore, MI discussions enabled participants to feel secure, be actively involved in the process decision making in relation to their health and empowered with the locus of control to set intrinsic personal goals:

"[The MI] *was probably one of the most valuable parts of the programme. It made me think better about my own process behind weight gain and eating … The facilitator has a good skill in getting to me and my own mental processes."* [UK 1 participant]

"We weren't told what to do, we were encouraged to decide for ourselves and given suggestions … That made us want to do it rather than feel like we had to." [UK 2 participant]

5.2.1 Application of MI principles in the DWELL programme

Four MI principles relate to 'positive framing' (establishing willingness to engage, expressing empathy, evoking intrinsic motivation, using affirmations), and two principles address negative participant behaviours (addressing ambivalence, adjusting to resistance). Figures 2 and 3 below demonstrate how frequently these MI principles were applied by facilitators at each delivery site, at the beginning and end of the programme.

At the beginning of the DWELL programme, the most frequently applied MI principle across all sites was 'establishing willingness to engage', followed by 'express empathy'. The least frequently applied MI principles at the start of the programme were 'addressing ambivalence' and 'adjusting to resistance', which were applied at broadly equal frequencies. Similarly, at the end of the programme, the most frequently applied MI principle was 'establishing willingness to engage', followed by 'using affirmation'. The least frequently used were again 'addressing ambivalence' and 'adjusting to resistance', although the latter was much less frequently applied at the end compared to the beginning of the programme.

The application of more positively framed principles aligns with the DWELL ethos of empowerment, peer support and the holistic approach.

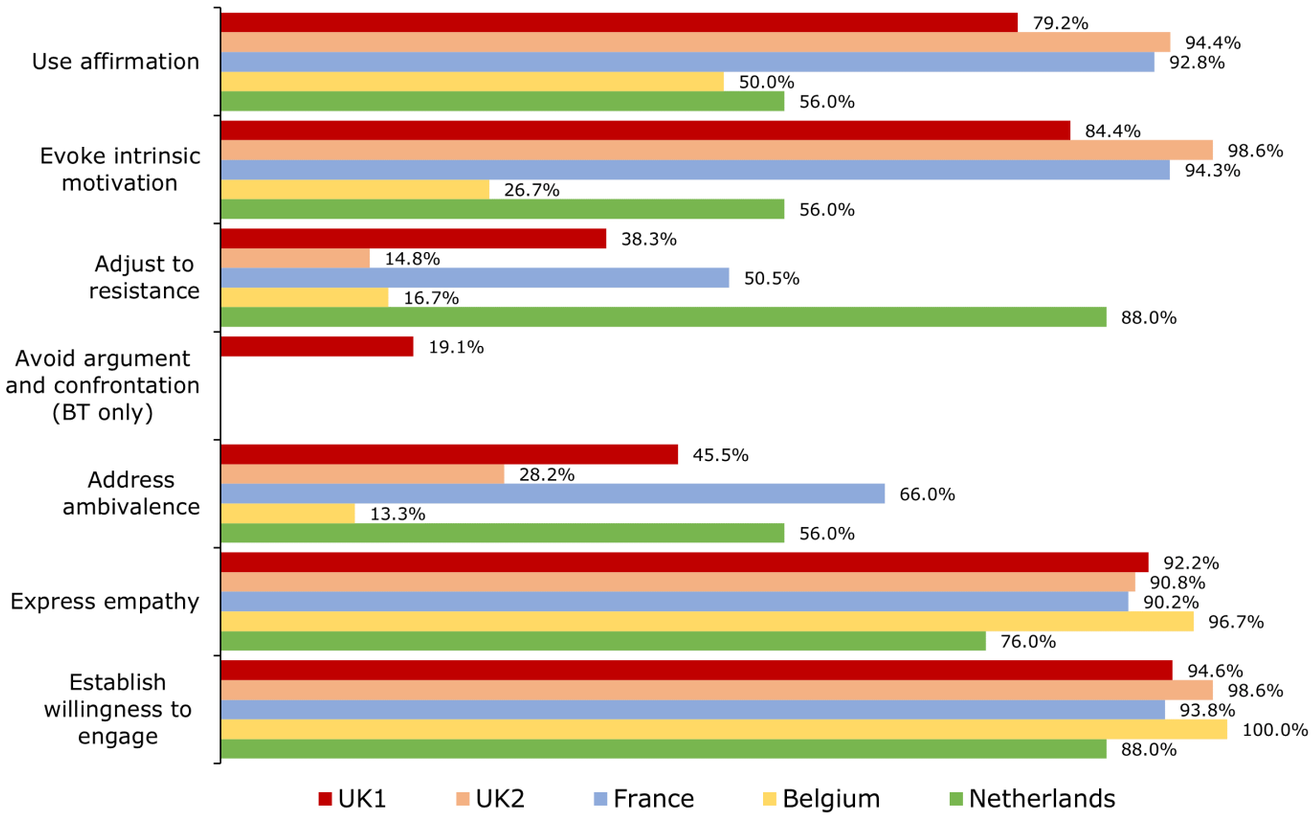

Figure 2. MI principles applied at the start of DWELL programme across sites

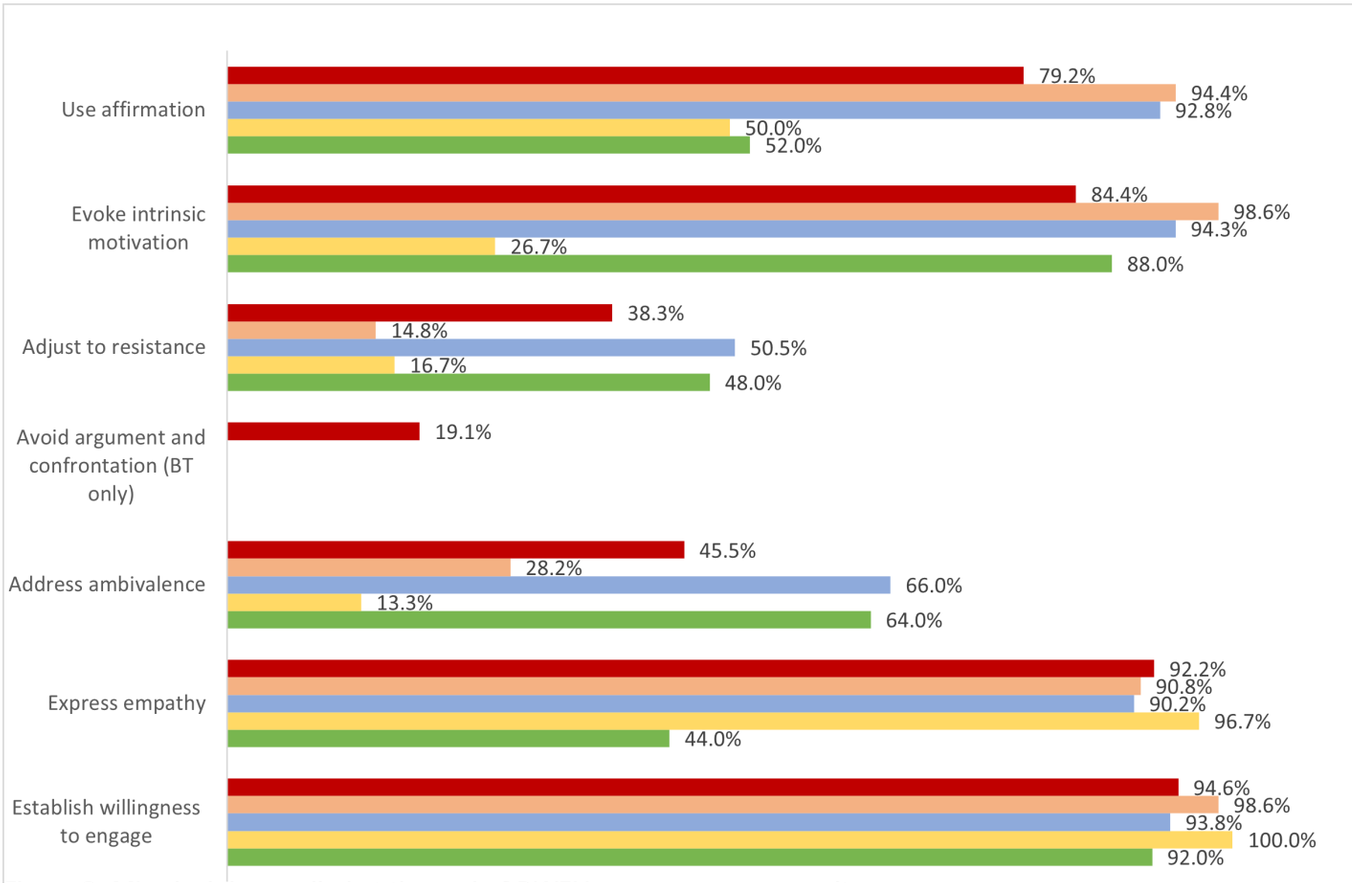

Figure 3. MI principles applied at the end of DWELL programme across sites

Further analysis of the MI data collected from facilitators uncovered how principles were effectively applied and their impact on the success of the participants, as the following vignettes highlight.

Using affirmations

Acknowledging and affirming progress, even in cases where the change in metabolic health as not to the degree the participant anticipated, was an important element of the MI process.

Vignette A

During their first MI, the participant told the facilitator about their personal issues, including a difficult background, recent bereavements, relationships with remaining family members, significant health challenges, and very limited mobility. The conversation uncovered a general feeling of isolation and lack of support. The participant was initially unwilling to change diet initially and was encouraged by the MI facilitator to attend the sessions if they felt they were able to.

At the second MI, although the participant felt that not much had changed, the facilitator highlighted that s/he had achieved much more than s/he realised, despite personal challenges. Achievements included setting feasible goals, making substantial dietary changes, and increasing levels of physical activity. The participant recognised s/he was finding it easier to meet new people and make friends, which was a huge step for them considering how socially isolated they felt at the start of the programme.

Despite the participant's early reservations about changes, s/he achieved weight loss (decreased by end of the programme from 201kg to 198kg and even further to 192kg 12 months later). Their HbA1c levels remained the same (69 mmol/mol) during the programme but reduced to 60 mmol/mol 12 months later. More importantly, the participant reported behavioural improvements - control over emotional eating had increased, with an above average increase in eating restraint. S/he also had a better understanding of their diabetes (above average) and their ability to predict the effects of their diabetes had also increased (above average).

Site: UK 1, cohort: 1

Addressing ambivalence and resistance

The MI feedback uncovered a variety of ways in which participants were resistant to change and how facilitators addressed ambivalence between goals and current behaviour, rather than opposing the situation directly. This process was managed through active listening as well as providing encouragement for what the participant could do or had already achieved.

Vignette B

The participant felt that s/he wanted to make changes but was experiencing resistance. The facilitator listened and asked them what benefits she might experience if she was to implement behaviour changes. In the lead up to the second MI, the participant had not attended some sessions and felt that perhaps the DWELL programme did not work for her. However, through applying MI principles the facilitator was able to affirm that the participant had already made a number of small behaviour changes that she had not recognised, which resulted in a positive outcome to the MI meeting.
Although the participant did not have metabolic measures taken nor did she complete the DWELL Tool at the end of the programme, the facilitator reflected on their progress and the impact of the MI:

"She said that she felt the programme had not resulted in any changes for her, but we discussed it further and she recognised that she had in fact made some big changes. She was now walking three times a week, which she was not doing before DWELL. Furthermore, she had been walking with a friend after learning in the session that social context is important. Following that session, she had called friends to set up a regular weekly walk with them."

Site: Belgium, cohort: 1

5.2.2. Overcoming challenges during motivational interviewing

The MI data uncovered some of the challenges faced by facilitators in eliciting behaviour change, including participants becoming defensive when questioned or not being ready or willing to open up about their issues. There was a sense that, for some participants, a 12-week programme was not long enough to unpick and address longstanding issues. However, there were often numerous positive changes noted between the start and end of the programme, despite initial challenges.

Vignette C

Despite a long conversation, the facilitator found it difficult to obtain a sense of this participant's motivation as they would regularly digress. However, through applying the MI principles, including expressing empathy and addressing ambivalence, the facilitator was able to deduce a number of things - the participant had experienced cultural displacement in moving to the UK, they did not like to think about stressful things (including their health), they felt they received very little support for their diabetes, and had ingrained habits around food (such as eating rice at most mealtimes and being unable to resist sweets).

By the second MI, the participant reported significant dietary changes, including giving up rice almost entirely, after years feeling convinced that they needed it. Additionally, they had set new goals – to sustain their progress and to lose weight slowly. The participant described DWELL as *"epic"*, and the improvement of their physiological measurements further highlights the progress they made despite their initial challenges. Their HbA1c levels reduced from 64 mmol/mol to 54 mmol/mol and reported significant illness perception changes - reduction (above average) in the time they felt their condition would last and in feelings that their condition would have negative life consequences. They also felt better able to predict development of their condition, had better personal control, control of their treatment, more restraint in terms of external food cues, and felt also more able to understand their condition.

Site: UK 1, cohort: 2

5.3 Goal setting

Goal setting was another mechanism employed during the 12-week DWELL programme to encourage participants to focus on making lifestyle and behaviour changes to enhance empowerment and self-management of their type 2

diabetes.
All delivery sites captured goal setting at the beginning of the programme, with some sites adding additional time points (e.g. weekly or mid-point goals). Therefore, reported goal setting refers to the beginning of the programme. Goals were initially coded and classified into sub-themes from which four main overarching themes were formed (Figure 4). A table containing the full list of initial codes can be found in Appendix 1.

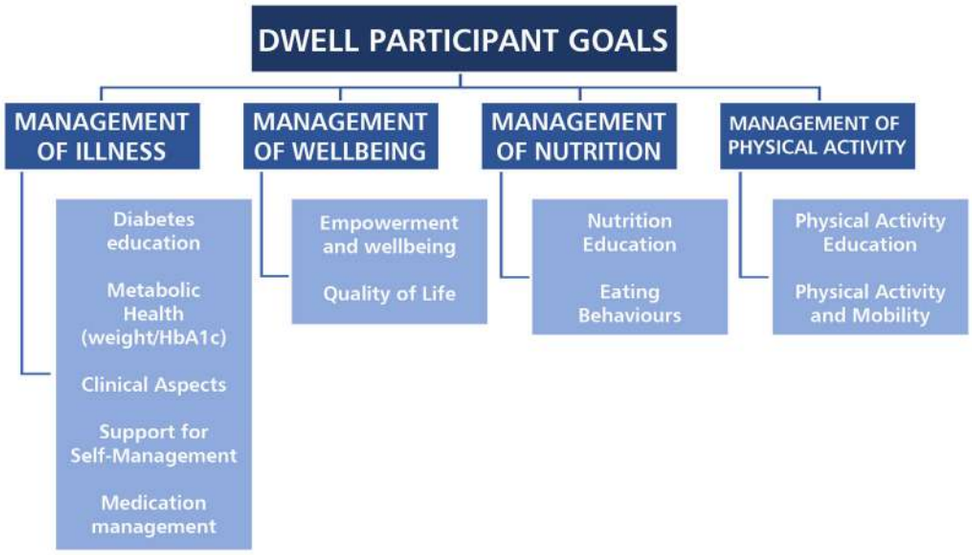

Figure 4. Key areas of Goal Setting at the start of the programme across all sites

The most common types of goals set were in relation to overall Management of Illness, and the least common were in relation to Management of Physical Activity. Further analysis of the broad themes showed that participants focussed on specific areas such as improving metabolic health, diabetes education, maintaining or increasing physical activity/mobility, obtaining education about nutrition and enhancing empowerment and wellbeing. Figures 5 and 6 show that themes and sub-themes of goals set by participants across all sites at the start of the 12-week programme.

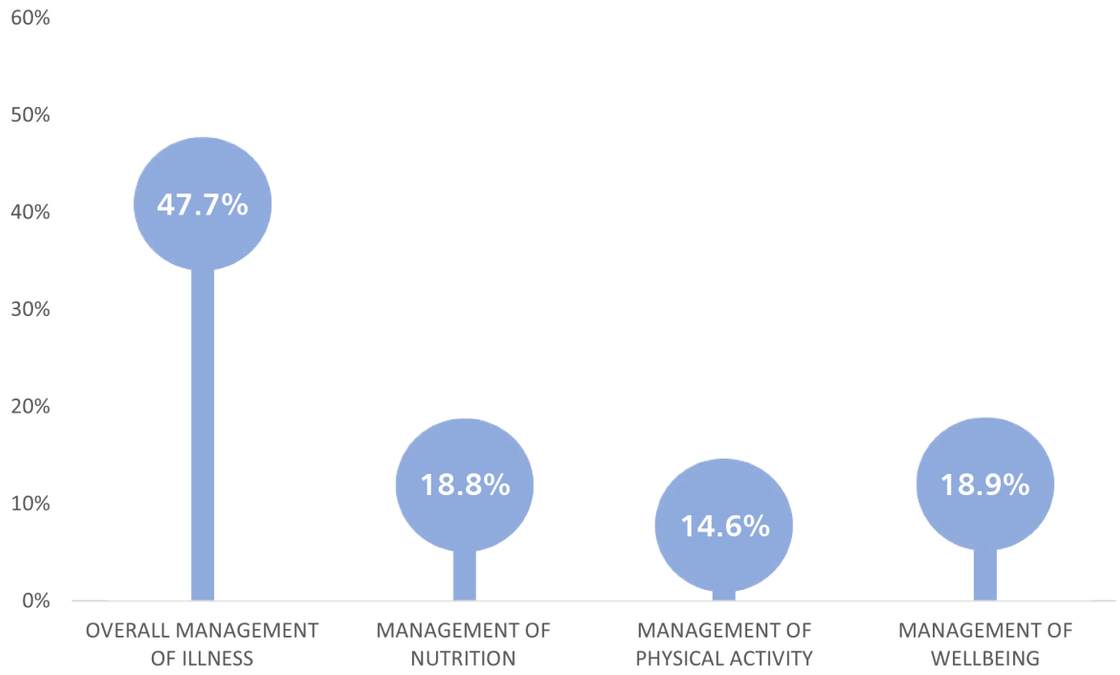

Figure 5. Participant Goal themes across sites

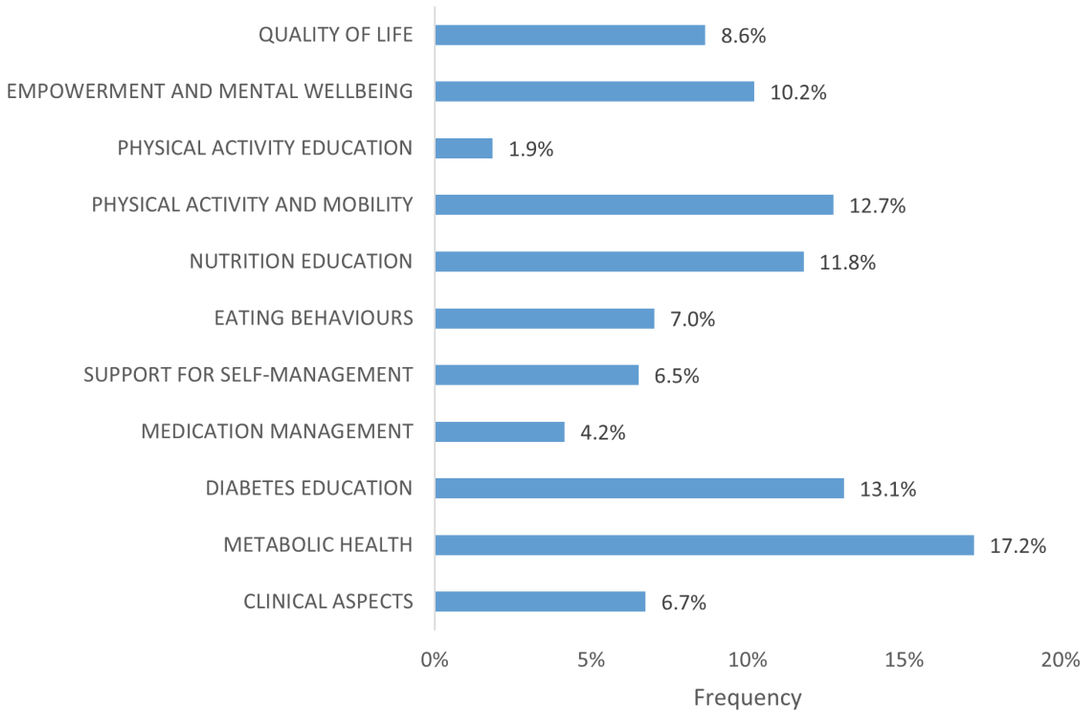

Figure 6. Participant Goal sub-themes across sites

6. Outcomes

The qualitative findings in relation to programme outcomes in this section should be read in conjunction with Report 3 'Participant Outcomes', which presents the results of the outcome measures collected by the 'DWELL Tool' questionnaire at four different time points.

Key Points from DWELL Mechanisms

- DWELL incorporated key mechanisms to facilitate empowerment and better self-management of participants: peer support, motivational interviewing (MI) and goal setting
- The effectiveness of peer support came out very strongly in both the focus group and interview data across all delivery sites. A sense of community was established through facilitators ambassadors and participants sharing problems and solutions, working together and motivating each other
- The most applied MI principle was establishing willingness to engage in the programme
- DWELL Participant Goals had four overarching themes: Management of Illness, Management of Nutrition, Management of Physical Activity and Management of Wellbeing
- Goals set by majority of participants across all sites at the start of the 12-week programme were in relation to Management of Illness
- Five particular goals participants identified were: Metabolic Health, Diabetes Education, Physical Activity and Mobility, Nutrition Education and Empowerment and Mental Wellbeing

6.1 Enhanced self-management of diabetes and health literacy

Many participants had little knowledge about type 2 diabetes prior to joining the DWELL programme. Through the course of the 12 weeks, their improved knowledge led to enhanced self-efficacy and improved illness beliefs, as illustrated by the below quotes from end-of-programme focus groups:

> *"There have been so many lightbulb moments, where I have thought 'I understand why that is happening now'."* [UK 1 participant]

> *"What I've come out of it with is an understanding of really how it all works…how different things affect me and what I can do to counter that. And so I know that if I've been 'bad', I know why it is having the effect it is having."* [UK 1 participant]

Commonly reported as newfound/improved knowledge by participants was also in relation to nutrition, namely the effect of carbohydrates on blood glucose levels:

> *"All the advice I was given previously was to stop eating sweets. So, I never knew how important the carbs were because I was a carb lover…I thought diabetes was just only to do with sugar."* [UK 2 participant]

Participants also reported better medication management, having not previously fully understood how it was helping them, when and how to take it:

> *"I'm now getting up early. I used to feel lazy in the mornings – I didn't want to get up for work, didn't want to get up for anything. But changing the times I take my medication, as advised by the facilitator…and probably the food I'm now eating…has made a difference to my energy…I get up before the alarm now."* [UK 1 participant]

> *"I have got a better relationship with the way I use insulin now…I now understand how it works in my body and what it's there for…realising the impact of carbs on insulin and how much you should be using and at what times has really helped…therefore I am not feeling as rough as I used to. I used to feel quite poorly sometimes as my blood sugar was swinging one way and the other. In the mornings, I was getting up and it was 18-20, but through the education side of* [DWELL]*, well this morning I was 10.4. A combination of everything we have learnt on this course has really worked for me"* [UK 1 participant]

The MI data collected from DWELL facilitators also highlighted the improved health literacy of participants.

Vignette D

At the start of the DWELL programme, this participant was on the waiting list for bariatric surgery due to ongoing struggles to keep their weight at a healthy level. They were feeling unsure about going ahead with the surgery, but felt it was their last resort. During DWELL, they set a variety of weekly goals, including keeping a food diary, checking food labels, reducing food portion sizes, implementing mindful breathing exercises and making time for themselves.

By the end of the programme, the participant was feeling much more knowledgeable about their diabetes and the factors that impacted on it. They felt much more in control and had made a lot of progress. Their weight and BMI decreased slightly, their waist circumference reduced from 147cm to 137cm, and their HbA1c decreased from 74.7 mmol/mol to 58.8 mmol/mol. They reported having made good friends through the programme, their relationship with their partner had improved and, importantly, they felt empowered to make the decision not to go through with the bariatric surgery due to the progress they had made on their own.

There was also a notable increase in empowerment, control over eating when dealing with emotional and external eating cues, and increased eating restraint behaviour in terms of managing their diet.

Site: UK 2, cohort: 6

6.2 Making lifestyle changes

DWELL participants reported significant lifestyle changes due to their learning in the programme. There was an overall sense that participants had realised through the DWELL programme that they needed to maintain long-term lifestyle changes, rather than "quick fix" attempts, such as strict diet plans:

> *"The course helped me to realise that I had to live in another way and that I need to change my life or to adapt some of the things in my life."* [Belgium participant]

For example, following nutrition sessions, participants reported learning about alternative ingredients, portion sizes, new recipes and cooking with fresh ingredients. This led to greater awareness and improved behaviours in terms of food shopping and the ability to make positive, informed choices:

> *"Since starting DWELL my diet has changed almost completely. I look at everything we eat now. I feel that I have got more energy as a result."* [UK 2 participant]

"Prior to coming on this course, I probably pretty much lived on ready meals…The education made me realise how bad they are for diabetics, and I now know it is possible to make nice food for yourself……I feel more confident about cooking, which is a complete sea change for me." [UK 1 participant]

Also, participants reported new healthy behaviours in terms of physical activity levels after attending programme sessions. Increased awareness regarding the benefits of being active on their diabetes led to participants finding ways to be less sedentary and starting or returning to regular movement, in particular walking:

"Although I am not usually one to exercise, I am now trying...I now walk up the stairs to my flat…I can go right up to my floor now without stopping on the landings…I am using a floor cycle…I have been into town on my own on the bus, which I hadn't done for two years. I'm setting goals for myself, like walking back from the group." [UK 1 participant]

6.3 Enhanced wellbeing

During the programme, participants learnt about the relationship between mental health and diabetes. They were introduced to tools and techniques to manage emotions and stress which they could maintain on their own at home, such as mindfulness, meditation, breathing exercises and music.
Most participants reported feeling empowered in general, as well as in relation to their management of diabetes. Improved health literacy led to greater autonomy in making decisions about their health. For example, participants felt able to initiate discussions with their physician/GP:

"I have learnt more in the last 12 weeks than I have in the 15 years since my diagnosis. And I have taken control…I have told my GP what tests I want, and I know that I am entitled to them, and have been able to discuss and take control of my medication as well." [UK 1 participant]

"You have to take charge yourself. You shouldn't rely too much on others. You are given tools to work with, then it's up to you to sharpen the tools to make them last a long time." [France participant]

One of many examples of improved self-care is highlighted by a quote from a participant who had started setting boundaries with others and taking time to look after themselves:

"It taught me that I matter…I have continued to take the afternoons I was attending DWELL as my own time. I do arts and crafts, go for a walk, watch a film or read a book. When you take control of your life and doing things that are positive, you've got a handle, you've got control." [UK 2 participant]

The DWELL programme also gave participants a more positive perspective, including more acceptance of their condition, increased motivation and energy, less fear, and more hope and confidence for the future:

"It's given me hope. Hope that I can reduce my medication and I can possibly even reverse the condition, whereas before I didn't think it was possible." [UK 1 participant]

The MI feedback by facilitators also highlighted improvements experienced by participants in relation to wellbeing, including enhanced empowerment and self-care.

Vignette E

At the initial MI, the participant shared a sense of a loss of control, not just in terms of diabetes but with life in general. The facilitator expressed empathy about the participant's caring responsibilities, which resulted in them having little time to focus on themselves and their own health. The participant's perception of being the only person who was able to undertake the caring role of a family member was uncovered, and there was a sense of feeling overwhelmed. The participant initially showed resistance to making lifestyle and behaviour changes - ***"There's no point. I have these other commitments and there's nothing I can do about them".***

The facilitator suggested that the participant could focus on small and simple goals initially and build on them. At the second MI, the participant was very pleased with their results and reported having more energy and focus, as well as having put new boundaries in place in order to look after themselves better - ***"My Tuesday and Wednesday afternoons are for me now…I'm getting up an hour earlier each day…Even though I have the same responsibilities as before, I am handling them much better."***

The participant's weight had decreased from 130kg to 117.9kg, waist circumference had gone from 137cm to 128.5cm, and HbA1c was down from 61 mmol/mol to 51 mmol/mol. Six months after the DWELL programme, the participant's metabolic health had further improved (weight was down a further 4kg, waist circumference down 5cm, and HbA1c had reduced to 42.7 mmol/mol, which put them into the pre-diabetic range (42-47 mmol/mol).

These changes were also reflected in self-perceptions and behaviours – there was a notable decrease in perceived negative consequences of their diabetes and in the length of time they anticipated their diabetes would last. Furthermore, they felt much more able to predict their illness, had increased feelings of control in relation to external eating cues, personal control, control of their treatment, understanding of their illness and empowerment.

Site: UK 1, cohort: 1

DWELL Ambassadors also reported enhanced wellbeing as a result of their involvement in the project, for example through finding fulfilment and purpose, and empowerment through being part of conversations with healthcare professionals and experts in the field:

> *"I'm in such a better place than I was four years ago. You know, depression and everything… it's helped me...it picks up your mood that you're actually doing something for other people… doing the* [DWELL] *Ambassador programme has given me a sense of purpose...it's been life changing"* [DWELL Ambassador, UK 1]

> *"Since I became a* [DWELL] *Ambassador, I have been more serene, I have smiled more...I make them laugh, which I did not do before. I was a reserved person, I was always at home. I blossomed."* [DWELL Ambassador, France]

6.4 Sustainability of the DWELL Programme

Longitudinal qualitative interviews were conducted with a sub-sample of 16 DWELL participants who had completed the programme more than 24 months ago (up to 48 months). The 'legacy' interviews were conducted between January and May 2022, with the purpose of exploring sustainability of the programme with those who completed the programme before March 2020.

Table 5. Legacy interview demographics

	UK1	UK2	NL	Total
No. of interviews	8	5	3	16
Gender				
Male	6 (75%)	4 (80%)	1 (33%)	11 (69%)
Female	2 (25%)	1 (20%)	2 (67%)	5 (31%)
Year of DWELL completion				
2018	2 (25%)	1 (20%)	0	3
2019	3 (37.5%)	3 (60%)	3 (100%)	9
2020	3 (37.5%)	1 (20%)	0	4

6.4.1 Legacy of the DWELL programme

"Life gets in the way"

Participants who had completed the programme more than 24 months ago reported that "life gets in the way" at times when it comes to managing long-term conditions such as diabetes. Individual and circumstantial events that had impacted on the progress of participants included medication changes, weight loss or gain, family issues, bereavements, and the occurrence of other illnesses (including COVID-19).

'I have broken that wall down'

There a varied spectrum of experiences, from those struggling to manage their diabetes to those able to sustain most or all changes they had achieved after taking part in the DWELL programme. Most common issues were in relation to eating behaviours and physical activity.

In terms of eating behaviours, many participants had sustained lowering their carbohydrate and sugar intake, were managing their portion control, eating less processed food, experimenting with intermittent fasting, calorie counting, and reading and understanding food labels.

In relation to physical activity, participants spoke of continuing changes they made through DWELL, including more walking, gardening, swimming, and chair-based exercises.

There was also evidence that learning obtained during wellbeing sessions had remained with participants long after the end of the programme:

> *"I remember one session,* [the facilitator] *gave us a lump of plasticine … I built a wall out of bricks. And on the other side of the wall were all the things that I need to sort out which, when I was working, I never had the time to do. I'm very poor at throwing things away. So that's one of the tasks. I have broken that wall down, and I'm pouring through the wall. I am getting rid of huge amounts of paperwork that have accumulated over 20 plus years"* [UK1, 2019 cohort]

"Progress is not a linear journey"

There was a strong sense of progress with participants feeling they were heading in right direction since DWELL, but there was also recognition that the journey was not linear. The trend observed with DWELL long-term quantitative outcomes (see Report 3: Participant Outcomes), where physiological measures seem to have improved, dropped then improved again, was reflected in the interview data:

> *"There are times when it goes completely out of control. And then I sort of pull it back in…I know what I need to do, it's just a matter of doing it."* [UK1, 2020 cohort]

Empowerment and Autonomy

Participants continued to feel empowered to raise issues about their diabetes care with their physician/GP and other healthcare professionals since DWELL. There was a sense of autonomy that developed from increased knowledge, confidence, and acknowledgement that management of the condition was a two-way process:

> *"I kept saying hang on a minute, the nurses and everything…in some ways, they didn't know what they were doing. They were just saying take this and take that. And I turned around and*

said 'Well. I'm not going to…I'm not going to not take so much Metformin,' so I only have one in the morning and one in the afternoon, and we will review that" [UK1, 2019 cohort]

6.4.2 Impact of COVID-19 pandemic

All 'legacy' participants were adversely impacted in some way by the pandemic. As highlighted by participant feedback at the end of the programme, there was a sense of everyone being "in the same boat", whereas the pandemic brough to the fore health inequalities, as reported in a UK Public Health report 'Disparities in the risk and outcomes of COVID-19' (PHE, 2020).

Many participants were less physically active during lockdown restrictions. Half of them had experienced poor wellbeing, including depression, sleep difficulties, employment challenges and isolation. There was increased anxiety about catching COVID-19, and uncertainty whether having type 2 diabetes meant they were clinically vulnerable and at higher risk of complications:

> *"I was terrified to be around people, even my mum - if she'd been near the grandchildren, I wouldn't see her. I probably saw her four times the first year. And even after she'd gone, and she's as clean as me and everything, I'd go around with my steamer and just steam everything, because I was just that paranoid about it."* [UK1, 2018 participant]

Conversely, there were some positive impacts of the COVID-19 pandemic mentioned by participants such as improved eating habits – restrained eating and better food choices. Participants reflected on the lockdown period as an opportunity to focus on their health and wellbeing, having more time to explore hobbies at home, being more physically active – e.g. walking and gardening.

6.4.3 Recommendations for programme delivery in the future

Participant recommendations about future iterations of the programme were mainly based around increased follow-up support and consideration of delivery options.

Follow-up support

Similar to feedback received at the end of the programme, 'legacy' participants suggested that continued contact and support after the programme would be valuable, particularly in a group format, possibly on a weekly or monthly basis:

> *"One of the biggest things for me was the usefulness of being with other people because diabetes, or indeed any illness, can be a very isolating thing, and it's great to be in a room with lots of other people that are in the kind of similar position … And you know, just the camaraderie, if you will, was I thought perhaps the most important thing that helped."* [UK2, 2019 cohort]

Suggestions for the content of follow-up sessions or groups included refreshers on the education element, updates on diabetes guidelines, weigh-ins and HbA1c checks. Those who attended the programme with their partners found this opportunity very valuable, and suggested that partners should be involved in follow-up sessions. There were also suggestions about involving DWELL Ambassadors in ongoing support activities.

Online or blended delivery

'Legacy' participants spoke about the potential for online or 'blended' (in-person and online) sessions, particularly given that people became more familiar with communicating via technology since the COVID-19 pandemic. Although in-person sessions helped to aid group interaction and cohesion, and were indeed necessary for cooking sessions, it was felt that some sessions could be delivered virtually, or at least for online attendance to be offered as an option. This was particularly the case for the UK1 site, where participants attended two sessions per week on consecutive days.

Key points from DWELL Outcomes

- Qualitative feedback illustrated significant positive outcomes of the DWELL programme:
    - Enhanced self-management of diabetes
    - Making important lifestyle changes
    - Enhanced wellbeing (for programme participants and DWELL ambassadors)
- Sustainable outcomes were elicited from 'legacy' participants:
    - Recognition that progress is not a linear journey
    - Sustained empowerment and autonomy
    - Navigating challenges during the COVID-19 pandemic
- Participant recommendations for programme delivery in the future include:
    - Provision of follow-up support
    - Considering online or blended delivery of the programme

7.Conclusion

The DWELL Logic Model set out the anticipated delivery intervention components, mechanisms and intended outcomes of the programme. This report illustrates how the programme unfolded in reality compared to the original plan.

Each site delivered the 12-week DWELL programme within their individual national and organisational context – different venues, environments, capacities, and resources.

Although all sites delivered the same programme content over 12 weeks, the course structure varied, and each of the four elements of the programme – education, nutrition, physical activity and wellbeing – were implemented in different ways, depending on available resources at each site.

The individualised delivery style, tailored to individuals, groups and environment, was a major facilitating factor in achieving positive change in the DWELL programme. Operational challenges, especially at the start of the programme, included demand on available resources, difficulties in participant recruitment at the time when the programme was not known to the healthcare professionals, and barriers to implementing particular activities, in particular physical activity, due to lack of access to available facilities and expertise. Most of these challenges were overcome during the implementation period.

Three main mechanisms utilised in the DWELL programme were peer support, motivational interviewing and goal setting. Peer support was experienced among participants and was also referenced by DWELL facilitators and Ambassadors. Previous research highlights the importance of social networks and social participation acting as protective factors to and determinants of health (Dahlgren and Whitehead, 1991; Marmot and Bell, 2012). Motivational interviewing proved to be a highly effective mechanism that enabled participants to be proactive and take control of their lives, including the management of diabetes. Autonomous motivation relates to doing things for intrinsic reasons, which is predictive of successful self-care.

Among positive outcomes reported by programme participants, DWELL staff and Ambassadors, included significant lifestyle and behaviour changes due to enhanced knowledge and illness beliefs, and wellbeing outcomes such as enhanced empowerment, self-care, social wellbeing and quality of life.

8. Recommendations

Recommendations for further implementation of the DWELL or similar psychoeducation programmes for other long-term conditions are set out below:

- Ensure adequate funding and budget for necessary resources, including staff time, evaluation and appropriate venues
- Have buy-in from local GPs, healthcare professionals, local services providers and community organisations to assist with promotion, referral and recruitment processes
- Facilitate programme cohorts at different times of the day (i.e. morning, afternoon, evening sessions) and virtual/online options to ensure there is equal provision for all
- Consider relevance of programme to people who are ‘pre-diabetic’ or on the borderline, i.e. as a preventative intervention
- Maintain and strengthen involvement of DWELL Ambassadors to help deliver the programme, potentially as a formal/paid role
- Establish a robust training and development curriculum for DWELL staff and Ambassadors
- Develop provision for post-programme follow-up, in line with the National Institute for Clinical Excellence quality standards in the UK to provide annual refreshers of education programmes (NICE, 2015), such as regular drop-in sessions for all previous participants to reaffirm learning, obtain advice and maintain social networks, as well as keeping in touch with participants via newsletters and updates.

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Appendix 1 – DWELL Participant Goals: thematic analysis

THEME	SUB-THEME	CODES
MANAGEMENT OF ILLNESS	CLINICAL ASPECTS	Prevent progression/future complications & avoid infection
		Reversal of T2DM
		Decrease pain/pain management
		Maintain health
		Reduce risk of falls/improve balance
		General/overall health benefits/lifestyle changes
		Sexual health
		Sleep related
		Reduce fatigue/Increase energy
	METABOLIC HEALTH	Lower/manage blood glucose (HbA1c)
		Weight related - weight loss/maintain weight
	DIABETES EDUCATION	Obtain information/knowledge about T2DM
		Maintain habits/lessons learnt about diabetes
	MEDICATION MANAGEMENT	Medication (treatment) - not have to start taking it
		Medication (treatment) - stop/reduce
	SUPPORT FOR SELF MANAGEMENT	Acceptance of diagnosis
		Better management of condition
		Take condition more seriously
		Find support
		Finish DWELL course
MANAGEMENT OF NUTRITION	EATING BEHAVIOURS	Reduce snacking
		Reduce alcohol intake
		Reduce carbohydrate intake
		Reduce sugar intake
		Change eating habits (Praxis) - Plan/make better choices and/or change habits/eat less
		Maintain diet
		Less guilt around eating
		Understand emotional eating/habits
	NUTRITION EDUCATION	Learn new recipes/skills
		Better understanding of nutrition and food (learning) - Understand diet impact of different food/drink/nutrition on T2DM
		Address/reduce cholesterol
MANAGEMENT OF PHYSICAL ACTIVITY	PHYSICAL ACTIVITY & MOBILITY	Chair-based exercises
		Dog walking & More walking
		Enhanced general fitness/mobility/exercise/increase exercise
		Go to the gym
		Swimming
		Maintain exercise
		Resume exercise
	PHYSICAL ACTIVITY EDUCATION	Learn more about exercise and impact on diabetes
		Learn about the human body

MANAGEMENT OF WELLBEING	EMPOWERMENT & MENTAL WELLBEING	Address mental/emotional challenges (including: guilt, hoarding, anxiety, depression)
		Mental balance
		Enhance or maintain positivity/enjoyment of life/wellbeing/quality of life/fun
		Feel in control/empowered/independence
		Mindfulness/meditation/relaxation/reduce stress
		More confidence
		Maintain wellbeing
	QUALITY OF LIFE	Purpose/meaningful activities & Take up new/rediscover/maintain old activities/hobbies
		Self-care
		Socialise & reduce social isolation/form friendships (enhance social wellbeing)
		Increase/maintain motivation
		Evaluate mental health
		Positive impact on family
		Travel
		Finance goals
		Job/work related
		Stop smoking
		Become patient ambassador & Help/support/work with others with T2DM
		Participate in a research project


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BLACKTHORN
TRUST


MCH
medway community healthcare


Centre
Hospitalier
de DOUAI


artevelde
university of applied sciences


Kinetic Analysis
HUMAN MOTION DATA

DWELL

Evaluation Study of the Diabetes and WELLbeing 12-week programme

REPORT 4: Workforce Training and Cost Effectiveness

Canterbury Christ Church University

Interreg 2 Seas Mers Zeeën

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FOREWARD

The DWELL project was funded by the INTERREG 2 Seas Mers Zeeën Programme and ran between 2016 and March 2023. The overall aim of the project was to empower people living with Type 2 Diabetes Mellitus (T2DM) to enhance self-management of illness through a co-produced 12-week educational programme, and to improve targeted aspects of individual health and wellbeing. The project involved partners in the UK, France, Netherlands and Belgium.
Canterbury Christ Church University ('CCCU') led Work Package 4: Evaluation of the DWELL programme, which commenced delivery in 2018. The evaluation comprised four key areas: patient outcomes; system/process benefits of the programme; staff training; cost benefits of the programme.

For Output 4.1 of this Work Package, we present a set of four final project reports which relate to DWELL programme evaluation. These are as follows:

- **REPORT 1:** DWELL Evaluation Methodology
- **REPORT 2:** DWELL Participant Outcomes
- **REPORT 3:** DWELL Process Evaluation
- **REPORT 4:** DWELL Workforce training and Cost Effectiveness

Report 4 presents feedback on Workforce Training and results of the Cost Effectiveness analysis undertaken for the DWELL programme.The COVID-19 pandemic, which commenced in March 2020 while the project was still 'live', had an impact on the programme's delivery and evaluation activities; this impact is discussed where relevant throughout the reports.

We would like to acknowledge colleagues for their valuable contribution as researchers and advisors at earlier stages of the evaluation study: Dr Marlize De Vivo and Prof Kate Springett, Canterbury Christ Church University; and, Dr Katrina Taylor, University of Kent.

We are grateful to all DWELL programme participants in the four project countries for their significant contributions and support in evaluating the DWELL programme at all its stages.

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- The Netherlands - Maarten Gijssel, Linda van Wijk, and Melvin Franken, Kinetic Analysis

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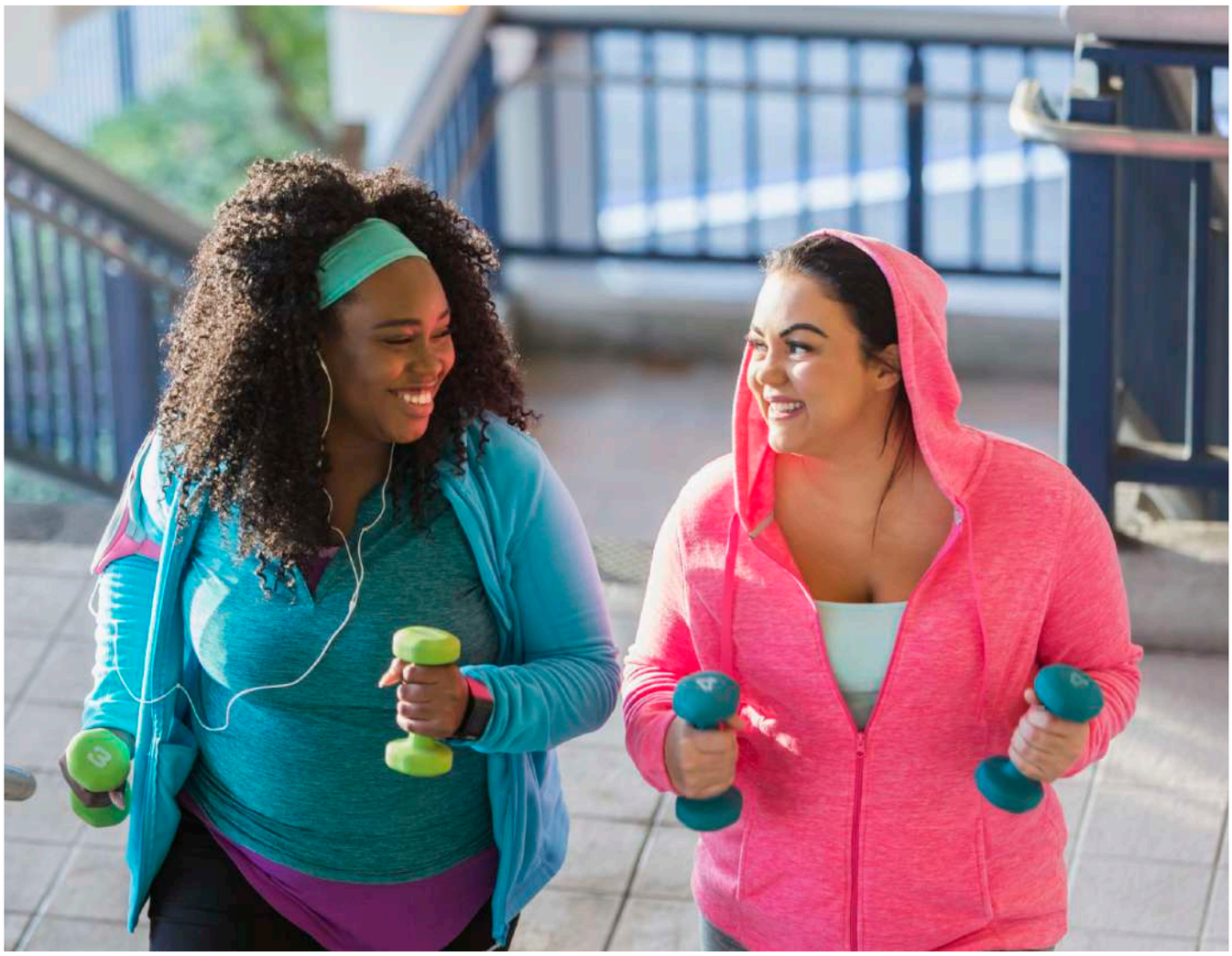
    - **Level 1: Reaction** – participants were overwhelmingly positive regarding the content and efficacy of the training,
    - **Level 2: Learning** – participants reported increased skills, attitudes and knowledge,
    - **Level 3: Behaviour** – participants reported the value of the training and increased confidence in applying their new skills to their role.
- In France, regular formal debrief meetings were set up between the DWELL team and ambassadors
- Otherwise, a piecemeal approach to training was undertaken, including mentoring and ad hoc support from DWELL teams, which was deemed very valuable by Ambassadors
- Some DWELL Ambassadors reported receiving no formal training

DWELL Staff Training

- DWELL staff in all countries received training as part of the core training programme and additional training, as required, since many DWELL staff were trained professionals who joined the project with relevant expertise and a comprehensive skillset
- Training was also delivered to healthcare professionals who could refer participants to the programme and students in training
- Formal evaluation of training only occurred in one instance in France regarding 'Understanding Diabetes', which was well received
- Interview data demonstrates that staff training was effective in terms of Kirkpatrick's (Kirkpatrick and Kirkpatrick, 2016) model at the following levels:
    - **Level 1: Reaction** – participants were positive regarding the content and efficacy of training
    - **Level 2: Learning** – participants reported increased skills, attitudes and knowledge, particularly in terms of motivational interviewing and diabetes education
    - **Level 3: Behaviour** – there were examples of staff receiving specific training which resulted in changed practice due to the application of new skills
- The DWELL competency framework, developed by Kent County Council, reflects existing skills of DWELL staff as well as identifies any gaps so that they can be addressed.

DWELL Cost Effectiveness Analysis

- The DWELL programme was delivered in different ways across the countries participating in the project, with some putting emphasis on the role of the facilitator (UK, Belgium, France) in all stages of the programme whilst others (Netherlands) relying more on clinical staff such as nurses, diabetes expert and specialist activity providers.
- Despite the diversity of staff involved in DWELL programme delivery and different intensity of sessions provided, interestingly, the total cost per participant on average did not vary substantially across the four countries, except for France where a lower cost may be due to the differences in workforce costs and mode of delivery of the programme.
- Any further conclusions should be tempered given the different health systems across all participating countries. The estimated intervention costs in each country, however, can be used as a base to determine detailed cost-effectiveness of the DWELL programme compared with standard/routine care in future studies.



1. Workforce Training

Project partners developed and delivered cross-border training for DWELL Ambassadors and site workforce staff in relation to the delivery of the DWELL programme. The aim was for them to gain new skills and increase their knowledge on understanding the best way to motivate patients with type 2 diabetes to be able to self-manage their condition. This would help to facilitate a shift from the traditional medical-led model of diabetes care to the holistic patient-led model which underpins DWELL.

The training delivered differed across sites since professionals from different disciplines were involved. Furthermore, some staff did not require specific training since their professional roles facilitated their competence in certain areas. Another activity of the project involved the development of a DWELL staff competency framework, which is discussed with reference to the evaluation in further detail later in this report.

1.1 DWELL Ambassador Training

DWELL Ambassadors had face-to-face training sessions across delivery sites. In addition, French Ambassadors were invited to monthly formal supervision (debriefing) meetings with programme staff; 11 meetings took place and had 2 hours duration each time. Belgium recruited one DWELL Ambassador, however they were unable to commence activities and training due to COVID-19 lockdown restrictions coming into force.

Table 1. DWELL Ambassadors Training across sites

Title of Training	Site of training	DWELL Ambassadors trained (N)
Listening to and supporting patients to maintain behaviour change	France	2
DWELL Approach, Resilience and Self Care	UK 1 UK 2	2 7
Listening Skills, Communication, Facilitation	UK 1 UK 2	2 7
Common Language	France	5
Relationship, Support and Listening	France	6
Facilitator Training	UK 1 Netherlands	2 5

As part of the process evaluation of the programme, interviews were conducted towards the end of the programme with 18 DWELL Ambassadors across sites to establish their experiences and views of their involvement in the programme (findings are presented in Report 3: Process Evaluation). During interviews, ambassadors were invited to share what training they received during DWELL and how effective they found it, including the impact on their role as ambassador.

It was agreed at the outset of the project that DWELL Ambassadors should be provided with the opportunity to undertake training in motivational interviewing and other programme-related topics, which could potentially enable them to take 'ownership' of the activities to and sustain the delivery of the programme. During initial recruitment discussions with site leads, those interested in the DWELL Ambassador role were provided with further information about the DWELL Approach and the ethos of the programme. However, other training took place in a 'piecemeal' approach across the four countries and tended to be set up according to the needs of individuals.

Most DWELL Ambassadors in the UK attended two core training sessions organised by the two delivery sites. As process evaluation interviews took place towards the end of the programme, a couple of years had elapsed since this training had taken place. Therefore, although the participants recalled that the training adding value to their role and

provided an opportunity to connect with other ambassadors, most were unable to recall the detail of the sessions during their interviews. However, their feedback was captured at the time of the training via evaluation forms, which are reported on in the next section.

Some ambassadors reported not having received any formal training. Nonetheless, all of them mentioned the valuable support and mentorship they received from the DWELL site leads and facilitators, as well as from each other, e.g. in France, ambassadors were invited to regular debrief sessions to discuss how the programme was working and any improvements required. In all sites, DWELL Ambassadors felt very supported in their roles, whatever activities they chose to be involved in.

1.1.1 DWELL Ambassador Training evaluation

The research team developed an evaluation form template to be used following DWELL ambassador and site workforce staff training, which aligned with Kirkpatrick's (Kirkpatrick and Kirkpatrick, 2016) four levels of training evaluation model.

In practice, this form was only used to evaluate two DWELL ambassador training sessions which were co-developed for UK ambassadors by UK 1 and UK 2 sites. Further details about the content of these sessions are below:

'DWELL Approach, Developing Resilience and Self-Care' was hosted by UK 2 and included:

- Background to DWELL project
- The DWELL programme, approach and philosophy
- DWELL evaluation and anticipated results
- Develop an understanding of resilience, its importance and reflect on aspects of the ambassador role and its impact
- Recognising signs and symptoms of stress, strategies for coping
- Reflecting on personal needs and planning next steps for self-care

'Listening Skills, Communication and Facilitation' was hosted by UK 1 and included:

- Information and tips about active listening so DWELL Ambassadors could understand the perspective of others (e.g. through observing body language, self-awareness, summarising, etc.) and blocks to listening
- Key presentation skills – communication, planning and structuring, adapting to the audience, confidence
- Accompanying – helping others find their own solutions and empowering them to follow their own advice and advocate for themselves

A summary of UK training feedback is presented.

Experiences of Training

DWELL Ambassadors were asked to rate their experiences of the training in terms of whether:

- They understood learning objectives
- Training was delivered in the way they were expecting
- Training content was what they were expecting
- Content was relevant to the DWELL programme
- They were appropriately challenged
- They learnt something new
- They were confident to apply what they had learned to their DWELL ambassador role

Feedback was very positive for both training sessions - strongly agreed or agreed in all cases. There was just one participant who neither agreed/disagreed that the training was delivered in the way they expected. This was perhaps due to them not having any expectations at the outset. Figures 1 and 2 below show the answers of participants as percentages.

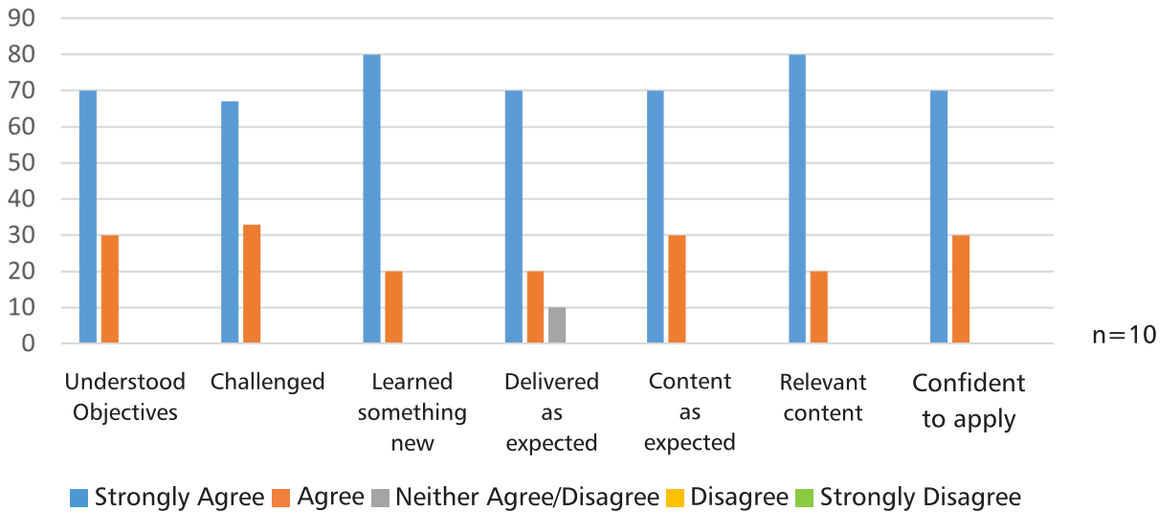


Figure 1. Experiences of DWELL Approach, Developing Resilience and Self-Care - UK

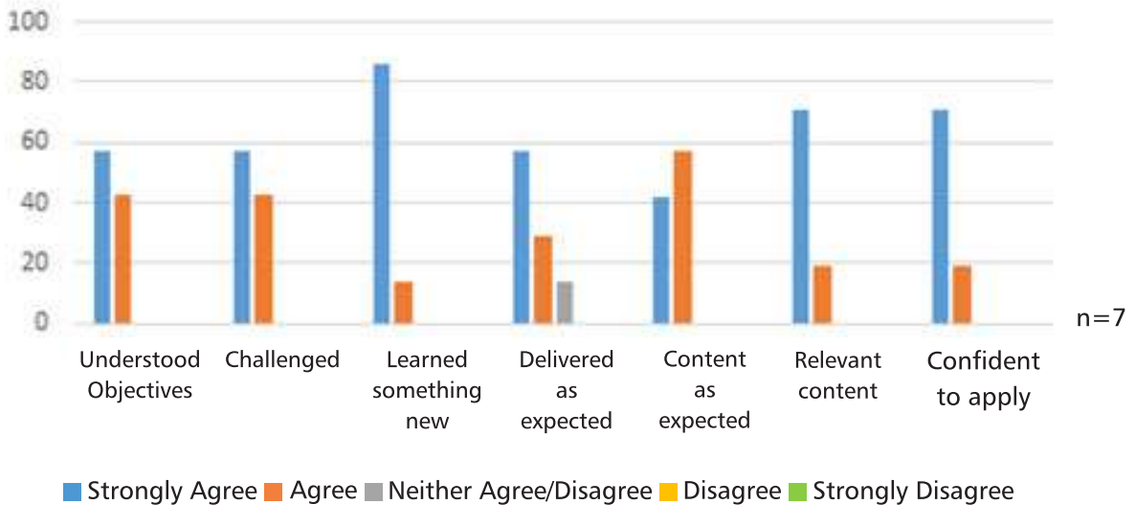


Figure 2. Experience of Listening Skills, Communication, Facilitation - UK

Views on Training Delivery and Presentation

DWELL Ambassadors were asked to rate their views of the training in terms of:

- Presentation
- Pace of delivery
- Quality of materials/handouts
- Knowledge of facilitator/trainer

Figures 3 and 4 below show the answers of participants as percentages. In the case of both sessions, all areas were rated as excellent or good.

Figure 3. Views of Training: DWELL Approach, Developing Resilience and Self-Care - UK

Figure 4. Views of Training: Listening Skills, Communication, Facilitation - UK

In a couple of cases, participants provided further explanation for their answers regarding the Listening Skills, Communication and Facilitation training, where they said the enjoyed the session and found it very informative.

Learning from the Training

Participants were asked to state the three most important things they learned from the training.

In the case of the DWELL Approach, Developing Resilience and Self-Care training, the most popular responses (44%) were with regards to participants learning self-care skills, including ensuring they made time for themselves, tools for being grounded and relaxed, and improving mental wellbeing. The next most common learning (40%) was around obtaining information and knowledge about the background of the DWELL programme and its approach. The third and final theme (16%) was learning detail about the ambassador role worked in practice, such as the support available, how to support others, and the flexibility of making the role their own.

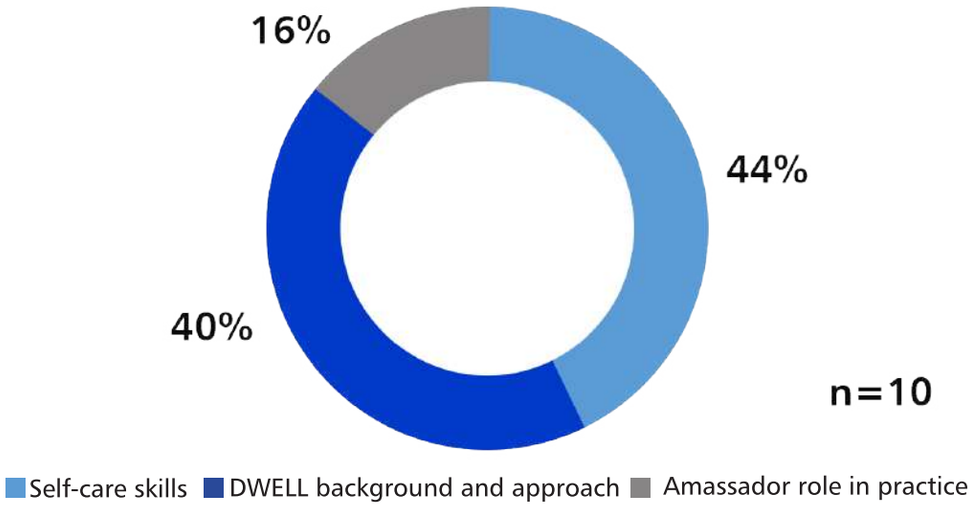


Figure 5. Learning from training: DWELL Approach, Developing Resilience and Self-Care - UK

In the case of the Listening Skills, Communication and Facilitation training, 43% of responses were around practical facilitation and communication skills, such as tips on presenting, keeping to time, delivery approach and running group exercises. The same amount of responses (43%) were around learning listening skills, including active listening, expressing understanding and empathy and being non-judgemental. A smaller proportion of responses (14%) where around participants practising self-care when supporting others, such as putting boundaries in place and not putting pressure on themselves to solve all the problems of others.

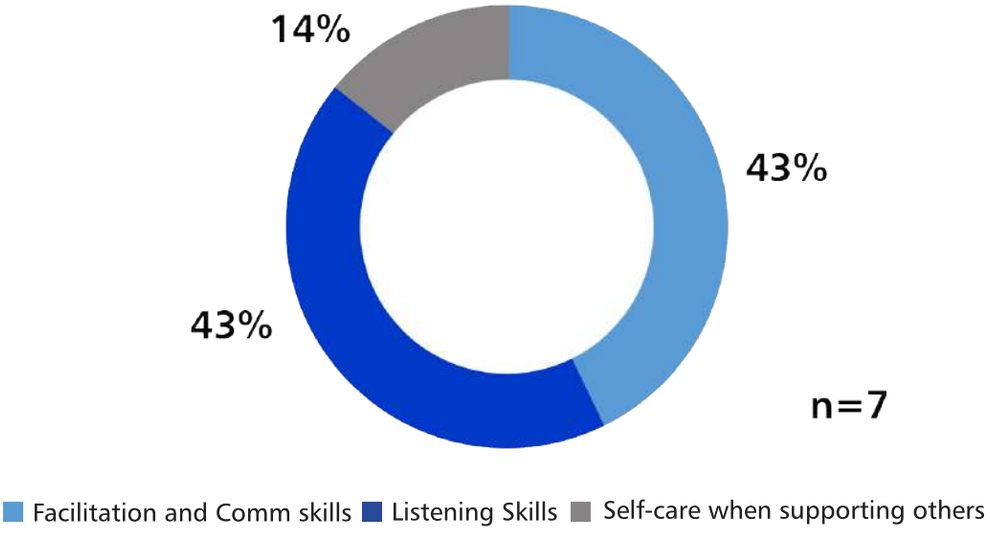


Figure 6. Learning from training: Listening Skills, Communication and Facilitation - UK

Impact of training on DWELL Ambassador role

In both sessions, participants reported that the training was both useful and valuable, and that after the training they felt more confident to apply their new skills to the DWELL patient ambassador role. They felt the training would help them to help others and increased their awareness, both in terms of themselves and others.

Key findings: DWELL Ambassador Training

- Formal training was developed and delivered to DWELL Ambassadors in the UK regarding the DWELL approach, self-care, listening and presentation skills. These sessions were received very well and feedback demonstrates the training was effective in terms of Kirkpatrick's (Kirkpatrick and Kirkpatrick, 2016) model at the following levels:
    - **Level 1: Reaction** – participants were overwhelmingly positive regarding the content and efficacy of the training
    - **Level 2: Learning** – participants reported increased skills, attitudes and knowledge
    - **Level 3: Behaviour** – participants reported the value of the training and increased confidence in applying their new skills to their role
- In France, regular formal debrief meetings were set up between the DWELL team and ambassadors
- Otherwise, a piecemeal approach to training was undertaken, including mentoring and ad hoc support from DWELL teams, which was deemed very valuable by ambassadors
- Some DWELL Ambassadors reported receiving no formal training

1.2 Workforce Training

As part of the DWELL project activities, a cross-border staff training programme was developed to enable staff to deliver the 12-week DWELL programme to people with type 2 diabetes, incorporating new ways of delivering diabetes care and moving away from the 'physician led' approach to supporting self-management by patients.

Most site staff members, who were recruited to design and deliver the programme, had a comprehensive understanding of type 2 diabetes, so partners co-developed lesson plans for a core staff training programme comprising elements that were directly relevant to DWELL. These sessions were developed as part of Work Package 1 of the project Development of Training Programme and are described below.

DWELL Approach

The purpose of the session was to provide the participant with a background and understanding of the DWELL programme. In terms of learning outcomes, by the end of the session participants will have:

- Understanding of the concept of the DWELL research project
- Awareness of the impact of type 2 diabetes on the lives of individuals
- Awareness of the different partners involved in the project and how the project is funded
- Understanding of what the DWELL programme for participants contains and how it will be delivered
- Understanding of the DWELL philosophy
- Awareness of the on-going support being developed for DWELL participants including the role of the DWELL Ambassador
- Understanding of the DWELL staff training programme
- Awareness of the expected outcomes of the DWELL project and how they will be measured

Understanding Diabetes

Although most staff joined DWELL with a background and understanding of type 2 diabetes, the purpose of this session was for those who may have had less knowledge to obtain knowledge regarding normal glucose metabolism and the changes that occur with diabetes, symptoms management and medications. The learning outcomes were:

- Awareness of the prevalence and financial impact of diabetes
- Understand normal glucose metabolism
- Understand the development of diabetes and the different types of diabetes

- Understand symptoms of diabetes related to high blood glucose
- Awareness of the complications of diabetes
- Awareness of management of diabetes

Facilitation Skills

The purpose of the session was to provide those involved in delivering the DWELL programme with the understanding and skills to facilitate groups. In terms of learning outcomes, by the end of the session, staff would have:

- Reached a basic understanding of what it means to facilitate
- Gained an understanding of how factors including personality types affect participant's behaviour within the group
- Have an awareness of their natural facilitation style
- Gained an understanding of the different ways in which adults learn
- Developed some key facilitation skills
- Gained confidence as a facilitator

Motivational Interviewing

The purpose of the session was to train staff to deliver motivational interviews with participants of the DWELL programme. By the end of the session, participants would:

- Understand the concept and principles of motivational interviewing and their application to diabetes
- Have learnt motivational interview skills and techniques and how to apply them to help DWELL participants evoke change

DWELL Evaluation Tools

The session was delivered by the evaluation partner to all delivery sites to:

- Introduce staff to the research study element of the DWELL programme
- Advise on research best practice and guidelines (including participant information, obtaining consent, etc.)
- Instruct staff on how and when to collate data via specific forms, including administering the DWELL Tool

Details of the core training delivered to DWELL staff across the five delivery sites are presented in Table 2.

Table 2. Core training for staff delivering DWELL programme across sites

m = minutes
h = hours
d = days

	DWELL APPROACH		UNDERSTANDING DIABETES		FACILITATION SKILLS	
	No. staff trained	Average duration	No. staff trained	Average duration	No. staff trained	Average duration
UK 1	5	1h	8	3h-4d	1	12d
UK 2	1	2h				
Belgium	4	45m				
France			17	13h-2d		
Netherlands	16	3h				

	MOTIVATIONAL INTERVIEWING		DWELL EVALUATION TOOLS		HBA1C LEVEL TESTING	
	No. staff trained	Average duration	No. staff trained	Average duration	No. staff trained	Average duration
UK 1	5	2d	4	3h	7	2h
UK 2	2	2d	3	3h	2	1.5h
Belgium			3	3h		
France	8	2d	1	3h		
Netherlands	6	4h	4	2h		

In addition to this, additional training was delivered as follows:

- How to conduct glycated haemoglobin (HbA1c) level tests using specific medical equipment – duration: 1.5-2 hours. In the UK, 9 staff undertook training/refresher sessions. In non-UK sites, participants visited their GP for HbA1c tests or had them at the hospital site, so this training was only relevant in UK, where HbA1c tests could take place on-site if required.
- Good Clinical Practice (GCP) Training – duration: 1 day. In the UK, GCP is the international ethical, scientific and practical standard to which all clinical research is conducted (NIHR, 2021). Although the DWELL project was not a clinical study, it was a requirement of the site that staff involved in research undertake this training. 2 staff received this training in site UK 2.
- DWELL Approach training was also delivered to healthcare professionals who could refer patients to the 12-week programme:
    - UK 2 – n = 40, duration: 1 hour
    - Belgium – n = 63 (including 23 diabetes educators), duration: 1 hour
    - Netherlands – n = 15, duration: 3 hours

- Motivational interview training was delivered to 2 healthcare professionals in the Netherlands who could refer patients to the 12-week programme – duration: 4 hours
- DWELL Training was delivered to students (e.g. nursing and other healthcare professions) at two sites. These individuals could potentially refer participants to the 12-week programme in future, thus they form part of the legacy of DWELL:
    - Belgium: DWELL Approach – n = 341, duration: 25 minutes
    - Netherlands: DWELL Approach and Motivational Interviewing – n = 79, duration: 3 hours per session.

1.2.1 Staff Training evaluation

The research team developed an evaluation form template to be used following staff training, which aligned with Kirkpatrick's (Kirkpatrick and Kirkpatrick, 2016) four levels of training evaluation model. However, in practice the form was not widely used since most staff involved in delivery of the 12-week programme were trained healthcare professionals who already possessed many of the skills required to deliver DWELL (see 'DWELL Staff Competency Framework' section). Much of the staff training was therefore ad hoc or delivered 'on the job' and was not routinely evaluated.

Evaluation of staff training was undertaken more formally in France, where feedback was obtained from 10 participants who attended the 'Understanding Diabetes' session. The feedback form incorporated learning reflections and whether participants found the training useful, although the standard evaluation form developed by the research team was not used in this instance. Additionally, two participants completed evaluation forms providing feedback about levels of satisfaction. Although the format of the feedback and numbers do not lend themselves to statistical analysis, analysis of training outcomes was conducted by comparing training feedback against set aims.

The purpose of the Understanding Diabetes session was to understand normal glucose metabolism and the changes that occur with diabetes, symptoms management and medications. The learning outcomes were:

- Awareness of the prevalence and financial impact of diabetes
- Understand normal glucose metabolism
- Understand the development of diabetes and the different types of diabetes
- Understand symptoms of diabetes related to high blood glucose
- Awareness of the complications of diabetes
- Awareness of management of diabetes

Overall, the training was well received by the participants, e.g. the topic was *"well covered"*, training was *"very in depth and enriching"* covering *"important aspects of diabetes"*. For those participants who answered via a scale, feedback was positive noting that training was *"overall very interesting"*.

The areas which elicited most response from the participants were food and diet and physical activity. The training offered was a *"detailed and precise"* insight into food and diet for people with diabetes, while another was given *"a whole different perspective on food"*.

As well as overall feedback, specific areas of learning were identified by those receiving the training, e.g., focus on carbohydrates, diet balance, food classification, differences between type 1 and type 2 diabetes, issues related to HbA1c measurement, regulating physical activity, diabetes diagnosis/risk factors/symptoms/treatment and use of insulin. Almost all also highlighted learning about communication with people with diabetes to provide help and support, including how to listen, advise, communicate and exchange ideas without judgment or imposing ideas.

As part of the Process Evaluation (Report 3: Process Evaluation), interviews were conducted with 10 DWELL site leads and 29 facilitators of the programme to establish their experiences and views of their involvement in DWELL. In the interviews, staff were invited to share what training they received as a result of DWELL and how effective they found it, including the impact on their working practice.

Most staff were healthcare and other professionals who came to DWELL having already gained a variety of skills, such as facilitating groups, or diabetes educators who had extensive expertise regarding the subject. Training, therefore, was mainly planned around individual's existing skills. Furthermore, training was often conducted 'on the job', such

as new team members being taken through the DWELL Approach and Evaluation Tools training on a one-to-one basis by another team member.

Most staff undertook motivational interview training in order to support participants in setting tailored goals to evoke behaviour changes. In some cases, even staff who had been trained in this area previously and attended as a 'refresher' found it very beneficial:

> *"Although I was practising MI* [prior to DWELL]*, I hadn't understood it to the same degree that I do now. It helped that we worked in small groups and got the opportunity to practice on each other in a supportive environment."* (DWELL team member, UK 2)

> "[Motivational interview] *training was a nice addition to the already existing knowledge of MI. Especially going over real-life cases was helpful, this way examples of real-life were discussed. It also provided some tools to get started."* (DWELL team member, Netherlands)

Two UK facilitators attended training delivered by the provider of an existing educational programme in the UK ('X-PERT') which type 2 diabetes patients are referred as part of standard care in order to help them make lifestyle choices to manage their blood glucose levels more effectively. The facilitators attended the training to gain further insight into the education element of DWELL, since they were new to working with people with type 2 diabetes. They reported finding the content of the five-day course challenging in places, but absolutely necessary in terms of being able to deliver their sessions effectively. However, another UK facilitator, who was a diabetes educator, did not gain as much from attending the X-PERT training since they felt they did not learn anything new. However, they did find it very valuable to shadow a local X-PERT trainer to observe how the sessions were facilitated in practice, and they were able to apply this learning to their facilitation of the DWELL programme.

Some facilitators reported that, prior to DWE LL, they had experience in working with individuals on a one-to-one basis, but had little or no experience of working with groups. To address this gap, one facilitator opted to attend an external Group Facilitation Skills course which took place one weekend per month for six months. They found the course reasonably helpful, but as it was more theory based than practical it was difficult to transfer their learning to DWELL. What this facilitator found invaluable and much more practical was sourcing a 'mentor' who they met with for peer support to ask specific questions in relation to DWELL. Together they worked out how best to approach issues. In a similar vein, all of the DWELL site leads and facilitators reported having regular team or one-to-one meetings for clinical/peer support, to solve problems, debrief, and share advice and ideas. This approach to training and support was felt to be beneficial, particularly for a programme such as DWELL where participants often required a high level of support:

> *"People are unwell. And there's a lot of fear and anxiety wrapped into that very often. A lot of difficult lives that make it difficult for people to make changes they need to make. So it felt like there was a lot there that needed quite skilful handling."* (DWELL team member, UK 1)

1.2.2 DWELL Staff Competency Framework

One of the DWELL project partners, Kent County Council, developed a DWELL Trainer Competency (Skills) Framework (Cochrane, 2021), which sets out measurable criteria required by those delivering the 12-week programme in key skills areas:

- Core skills including governance
- Equality and equity
- Diabetes subject knowledge
- Interpersonal skills

Since most DWELL staff (site leads and facilitators) came to the project with existing skills, they did not require certain training. The competency framework therefore reflects existing skills as well as identifies any gaps so that they can be addressed.

1.2.3 QISMET Accreditation

At the time of writing, the UK DWELL delivery sites were developing an application for Quality Institute for Self-Management Education and Training (QISMET) accreditation. QISMET is an independent not-for-profit body that supports self-management education providers and commissioners to achieve the highest possible quality service for people living with long-term health conditions.

QISMET provides accreditation (or certification) of self-management education interventions though testing providers against Quality Standards they have developed which define good practice in self-management education.

The Quality Standards cover management of the programme, clarify that programmes are evidence-based and suit the needs of participants, have a structured curriculum, are delivered by trained educators and incorporate performance management.

If QISMET accreditation is obtained, it will raise the profile of the DWELL programme amongst commissioners and stakeholders and help provide a legacy for implementation to continue.

Key findings: DWELL Staff Training

- DWELL staff in all countries received training as part of the core training programme and additional training, as required, since many DWELL staff were trained professionals who joined the project with relevant expertise and a comprehensive skillset
- Training was also delivered to professionals who could refer participants to the programme and students in training
- Formal evaluation of training only occurred in one instance in France regarding 'Understanding Diabetes', which was well received
- Interview data demonstrates that staff training was effective in terms of Kirkpatrick's (Kirkpatrick and Kirkpatrick, 2016) model at the following levels:
    - Level 1: Reaction – participants were positive regarding the content and efficacy of training
    - Level 2: Learning – participants reported increased skills, attitudes and knowledge, particularly in terms of motivational interviewing and diabetes education
    - Level 3: Behaviour – there were examples of staff receiving specific training which resulted in changed practice due to the application of new skills
- The DWELL competency framework developed by Kent County Council reflects existing skills of DWELL staf as well as identifies any gaps so that they can be addressed, and should be read in conjunction with this report

2. Cost Effectiveness of the DWELL Programme

About 32.3 million adults were diagnosed with diabetes in the European Union in 2019, up from an estimated 16.8 million adults in 2000. An additional 24.2 million people in Europe were estimated to have diabetes but be undiagnosed in 2019 (IDF, 2019). With prevalence of diabetes increasing in all ages across the 2 Seas region, health services will be overwhelmed by cere demands to manage diabetes and complications if holistic and inclusive strategies are not put in place. According to the International Diabetes Federation, countries need a stronger strategic approach, especially in cases where there is no national diabetes plan (e.g. Belgium and France).

The economic burden of diabetes is substantial. The health expenditure allocated to treat diabetes and prevent complications are estimated at about EUR 150 billion in 2019 in the EU, with the average expenditure per diabetic adult estimated at about EUR 3 000 per year (IDF, 2019). Whilst people with diabetes could potentially be heavy users of health care resources, as the condition is long-term and life-changing, there is also a strong expectation of diabetes self-management on daily basis by state healthcare service providers.

The cost of long-term conditions will become unsustainable across Europe unless new ways of working are introduced, with patients as partners, encouraging self-management and empowering patients to educate and help each other in a responsible way. DWELL aimed to provide a more efficient and effective healthcare provision for people with type 2 diabetes leading to reduced costs as patients will have fewer disease related complications (amputations, heart attacks, strokes, blindness) and need to access services less frequently.

As part of the DWELL Evaluation study, a cost benefit analysis was undertaken in each country to assess the outcomes from a cost analysis perspective. Results are reported at country-specific level due to differences in healthcare delivery systems. Details on the cost-effectiveness methodological approach are presented in Report 1: Methodology.

2.1 DWELL intervention costs – UK

Several health professionals were involved in the DWELL delivery in the UK, with small staff differences across the two sites (UK1 and UK2). In UK1, a mix of experts, research and admin staff (including expert trainers, motivational interviewers, chefs, a resource group leader and finance officer) were at the forefront of the programme delivery (see Table 3 for more details). The role of motivational interviewers was key in the delivery of DWELL, with them taking part in 40 sessions in total lasting 1.75 hours each. Resource group leaders were the least involved, being present in 6 sessions lasting 4 hours each. All staff were supervised during the programme by several senior clinical and research staff, such as the clinical lead and the project co-ordinator. Supervision time depended on the seniority of the supervisor as well as the role of supervisees and was considered when costing the programme. All costs are reported in 2019 prices. The total cost of supervision in UK1 was estimated to £887.48 per programme. Additional costs incurred were the cost of special equipment and educational material – specifically, cooking ingredients (£450 per week) and one-off costs for a HbA1c machine (£509.10) and expert books (£130).

Table 3. Staff involved in the DWELL delivery and associated salaries - UK1

Staff role	Sessions	Duration (per session)	Salary (per year)	Salary source
Expert trainer	12	3 hours	£25,692	DWELL team
Motivational interviewer	40	1.75 hours	£25,692	DWELL team
Chef (x2)	12	5 hours	£23,656	DWELL team
Resource group leader	6	4 hours	£35,208	DWELL team
Finance officer	12	3 hours	£28,547	DWELL team
Supervisor (1) – CEO	n/a	8 hours[a]	£39,794	DWELL team
Supervisor (2) – Project manager	n/a	18 hours[a]	£36,844	DWELL team
Supervisor (3) – Clinical lead	n/a	3.75 hours[a]	£36,711	DWELL team
Supervisor (4) – Project coordinator	n/a	22 hours[a]	£25,692	DWELL team

In UK2, the DWELL programme was delivered mainly by facilitators with some direct involvement of the DWELL programme lead (see Table 4 for more details). The facilitators were supervised by the programme lead, clinical director or research lead, with supervision time varying by supervisory staff. Indicatively, the research lead was involved in 20 hours of supervision while the clinical director in 10 hours, bringing the total cost of supervision to £2,668.20 per programme. Additional costs incurred involved cooking ingredients (£50 per cohort), exercise bands (£87.76 per cohort), room hire for the motivational interviews (£1,325 per cohort), exercise and mindfulness sessions (£50 and £68.85 respectively per cohort), and one-off costs for a HbA1c machine (£509.10), expert books (£919.20) and metabolic scales (£2,090).

Table 4. Staff involved in the DWELL delivery and associated salaries – UK2

Staff role	Sessions	Duration (per session)	Salary (per year)	Salary source[d]
DWELL programme Lead	42	3.30 hours[b]	£49,969	NHS Agenda for Change 2018-19
DWELL facilitator (1)	130	3.30 hours[b]	£43,041	NHS Agenda for Change 2018-19
DWELL facilitator (2)	109	3 hours[b]	£43,041	NHS Agenda for Change 2018-19
Expert facilitator[a]	n/a	3 hours	£29,608	NHS Agenda for Change 2018-19
Diabetes dietitian[a]	n/a	3 hours	£43,041	NHS Agenda for Change 2018-19
Supervisor (1) – DWELL programme lead	n/a	60 hours[c]	£49,969	NHS Agenda for Change 2018-19
Supervisor (2) – Clinical Director	n/a	10 hours[c]	£85,333	NHS Agenda for Change 2018-19
Supervisor (3) – Research Lead	n/a	20 hours[c]	£59,964	NHS Agenda for Change 2018-19

aAt pilot stage.

bThis includes 30 minutes of preparation before and after each session.

cTotal hours of supervision.

dhttps://www.nhsemployers.org/pay-pensions-and-reward/nhs-terms-and-conditions-of-service---agenda-for-change/pay-scales-1819/annual-1819

The total cost of delivering DWELL in the UK comprises the cost of all sessions delivered by several staff (including supervision) and any one-off equipment, education-related or other associated costs, summing up to £4,636.81 for UK1 and £4,600.73 for UK2. This is equivalent to £463.68 and £460.07 per participant for UK1 and UK2 respectively for a group of 10 participants per programme on average.

To be able to conduct a cost-effectiveness analysis we need to consider non-missing health-related quality of life and health resource use in all time points of the study (i.e., T0-T3). In the UK, we identified 10 participants from the control group and 21 from the intervention group fulfilling these criteria. All 10 participants in the control group were from UK2 while in the intervention group 10 were from UK1 and 11 from UK2. On average, participants were aged over 60 years, with two thirds (70%) in the control group and about half (52%) in the intervention group being male. Looking at gender differences across the two UK sites in the intervention group, 60% and 46% were male in UK1 and UK2 respectively. Responses to the health-related quality of life questionnaire were converted into scores (as described in Report 1: Methodology), and variations over time are shown in Figure 7. We do not have information about health-related quality of life in T0 and T1 for the control group, as recruitment began later. However, we can see that for the intervention group, health-related quality of life remained relatively stable over the duration of the study, with a small increase in T3.

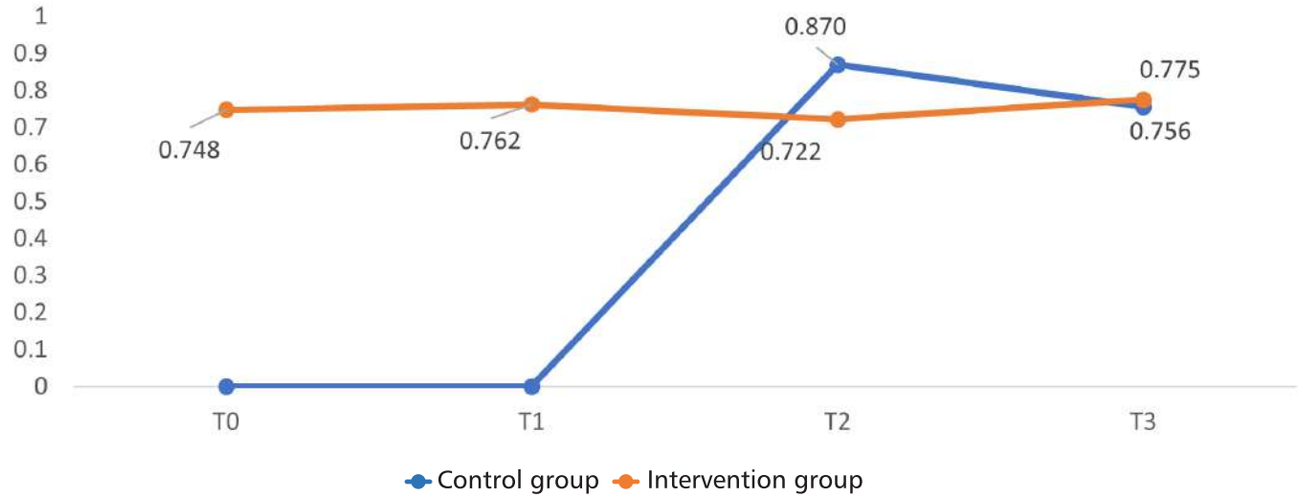


Figure 7. Health-related quality of life in the UK

The participants reported using a range of health and hospital services (see Figure 8). The most frequently used were pharmacist, GP and psychologist, irrespective of the study group. Indicatively, control participants reported on average 2.6 visits to a pharmacist in T2 and 4.3 in T3. For the intervention group, this was 1.3 and 0.8 visits respectively. Changes over time vary highly by service type, for example, more GP visits were reported in T3 than T2 in either control or intervention groups. Participants reported almost no hospital inpatient stays and Accident and Emergency visits. Finally, participants were asked to report whether they had used the diabetic screening service, with over two thirds responding negatively in the intervention group in either T2 (71%) or T3 (81%). The picture was mixed for the control group – two thirds (70%) responded positively in T2 and half (50%) in T3. Among the specialists reported providing this service, optometrist was the most common followed by diabetologist and retinal scan technician. Resource use can be combined with national unit costs (see Appendix, Table A1 for more details) to obtain a total cost for each service across all participants. However, given the small sample size and the possibility of outliers driving the overall costs, this exercise was not conducted as part of the UK analysis.

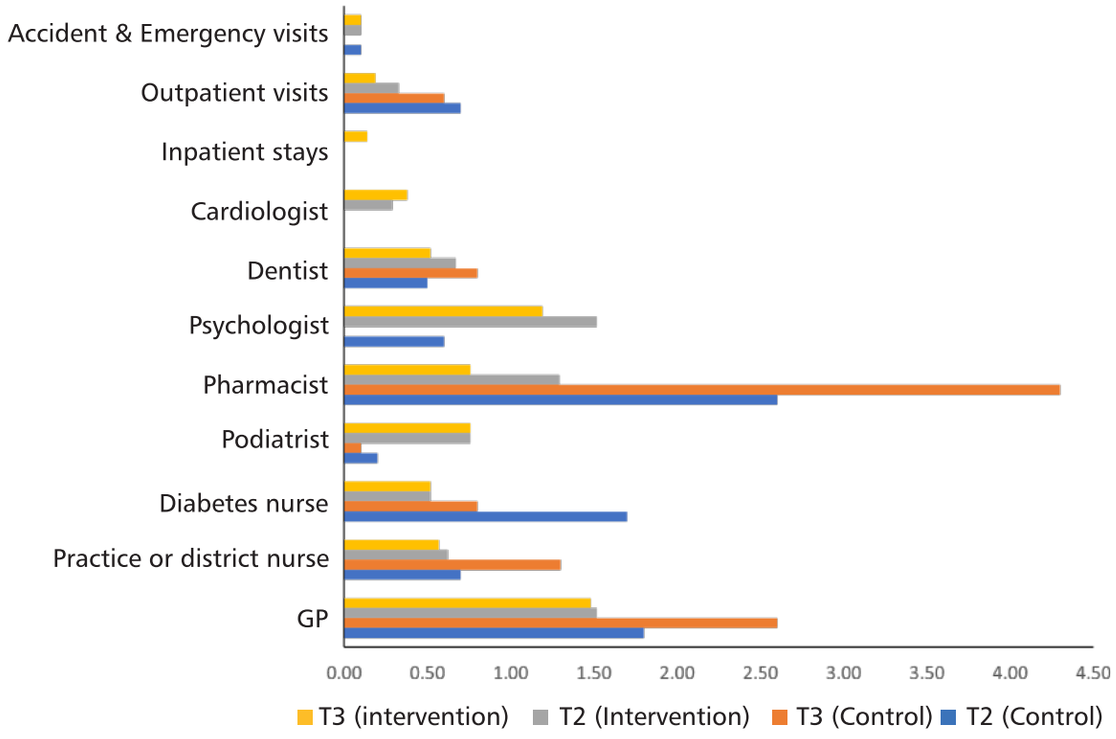


Figure 8. Health resource use in the UK

2.2 DWELL intervention costs – Belgium

Each session of the 12-week DWELL programme in Belgium was delivered by a facilitator (with support from a coach or supervisor, where required) and an expert in the respective theme (nutrition, physical activity, education, wellbeing). For cohorts 1-3, the role of the facilitator involved several activities prior to, during and after each session of the programme whilst also being the main point of contact for the participants. The facilitator responsibilities are listed in detail in Table 5, and included for example, preparing the necessary material and equipment prior to the sessions, as well as responding to questions of the experts after the end of the session. For cohorts 4 -5, the facilitator had more of a coach role and followed all the sessions, i.e. not just to introduce the expert during the session, which has implications for the total cost of the DWELL programme delivery. On the other hand, the expert in each theme was responsible for preparing the content of each session and handing the relevant documents (e.g. info sheets, slides) to the facilitators.

Table 5. Facilitator responsibilities in the DWELL delivery in Belgium

In the absence of a detailed record of staff costs for all involved in the programme delivery, the costs reported are based on two (staff) cost scenarios: (a) 65 Euros per hour based on the Artevelde University of Health Sciences rate; (b) 33 Euros per hour with 10 years of working experience on average based on national legal pay scales 'Loonbarema Paritair Comité 330'.[1] However, acknowledging potential variation in staff experience for each cohort, we further considered several additional analyses where the working staff experience varied from 0 years to 25 years. All costs are reported in 2020 prices.

Table 6 reports the number of staff involved and the time spent in delivering the programme, separately for each session. Facilitators spent on average three quarters of an hour preparing for each session for either participant cohort. However, their actual contact time, on average, differed by cohort – over an hour for cohorts 1-3, and 3 hours for cohorts 4-5, which is related to the increased presence of the facilitator in cohorts 4-5. At the same time, the number of facilitators involved over the twelve weeks of the programme did not differ by participant cohort, with one facilitator per session except for those sessions with motivational interviews, in which case 3 facilitators were involved. Additional costs incurred during that time included the production of relevant material (e.g. handouts) and catering. Specifically, 265 Euros were spent in printing material and 110 Euros in catering over the duration of the programme.

1 Nurse, health promotor, diabetes educator, physiotherapist, dietitian (Scale 1.55-1.61-1.77).

Table 6. Staff involved in the DWELL delivery in Belgium

Cohorts 1-3	Facilitators			Experts		
Session	Preparation (hours)	Contact (hours)	Staff involved	Preparation (hours)	Contact (hours)	Staff involved
Intro and MI	0.75	3	3	0	0	0
Nutrition 1	0.75	0.5	1	1.5	3	1
Nutrition 2	0.75	0.5	1	1.5	3	1
Physical Activity 1	0.75	0.5	1	1.5	3	1
Physical Activity 2	0.75	0.5	1	1.5	3	1
MI	0.75	3	3	0	0	0
Education 1	0.75	0.5	1	1.5	3	1
Education 2	0.75	0.5	1	1.5	3	1
Wellbeing 1	0.75	0.5	1	1.5	3	1
Wellbeing 2	0.75	0.5	1	1.5	3	1
Cooking workshop	0.75	0.5	1	1.5	4	1
Closing and MI	0.75	3	3	0	0	0

Cohorts 4-5	Facilitators			Experts		
Session	Preparation (hours)	Contact (hours)	Staff involved	Preparation (hours)	Contact (hours)	Staff involved
Intro and MI	0.75	3	3	0	0	0
Nutrition 1	0.75	3	1	1.5	3	1
Nutrition 2	0.75	3	1	1.5	3	1
Physical Activity 1	0.75	3	1	1.5	3	1
Physical Activity 2	0.75	3	1	1.5	3	1
MI	0.75	3	3	0	0	0
Education 1	0.75	3	1	1.5	3	1
Education 2	0.75	3	1	1.5	3	1
Wellbeing 1	0.75	3	1	1.5	3	1
Wellbeing 2	0.75	3	1	1.5	3	1
Cooking workshop	0.75	3	1	1.5	4	1
Closing and MI	0.75	3	3	0	0	0

The total cost of delivering DWELL in Belgium for each staff cost scenario is: (a) 5.997,50 Euros for Cohorts 1-3 and 7.460 Euros for Cohorts 4-5; (b) 3.264,89 Euros for Cohorts 1-3 and 4.016,59 Euros for Cohorts 4-5. For a group of 12 participants, these would be equivalent to: (a) 499,79 to 621,67 Euros; (b) 272,07 to 334,72 Euros per participant for Cohorts 1-3 and 4-5 respectively. For other scenarios, where we consider fewer or more than 10 years of working experience, the total cost would range from 2.563,32 to 5.025,52 Euros depending also on the extent of the facilitator's involvement – for a group of 12 participants per programme on average, this would be equivalent to a minimum of 213,61 Euros and a maximum of 418,79 Euros per participant (see Table7 for more details).

These cost estimates can inform future studies aiming to determine the cost-effectiveness of the DWELL programme compared with standard care.

Table 7. Total costs of DWELL delivery by years of staff experience in Belgium

Costs (Euros)	Working experience					
	0 years	5 years	10 years	15 years	20 years	25 years
Cohorts 1-3	2.563,32	2.811,41	3.264,89	3.474,77	3.855,66	4.065,55
Cohorts 4-5	3.132,54	3.445,16	4.016,59	4.281,06	4.761,04	5.025,52

2.3 DWELL intervention costs – France

DWELL was delivered by facilitators with different expertise, including diabetes, physical activity, and diet and wellbeing. Some facilitators were further involved in the conduction of motivational interviews as part of the programme. For instance, the diet and wellbeing facilitators were involved in 8-9 sessions over the duration of the programme, with each of them also conducting 6 motivational interviews. Each session lasted 2 hours whilst the motivational interviews lasted 1.5 hours each. Some facilitators were supervised by more senior staff responsible for the planning and implementation of the programme (see Table 8 for more details). Supervision time was considered when costing the programme. All costs are reported in 2019 prices. The total cost of supervision was 1.150,22 Euros.

Additional costs incurred were the cost of educational resources (109.10 Euros) and cooking ingredients (100 Euros). The total cost of delivering DWELL in France comprises the cost of all sessions delivered by the different facilitators and staff supervision as well as one-off costs of resources required for each session, summing up to 4.124,16 Euros – this is equivalent to 206,21 Euros per participant for a group of 20 participants per programme on average.

These cost estimates can inform future studies aiming to determine the cost-effectiveness of the DWELL programme compared with standard care.

Table 8. Staff involved in the DWELL delivery and associated salaries in France

Staff role	Sessions	Duration (per session)	Salary (per month)	Salary source
Diabetes expert & facilitator	3	2 hours	12.437,11 Euros	DWELL team
Diabetes facilitator	4	2 hours	4.875,49 Euros	DWELL team
Physical activity facilitator[a]	6	2 hours	2.850,33 Euros	DWELL team
Diet and wellbeing facilitator (1)[b]	9	2 hours	4.217,35 Euros	DWELL team
Diet and wellbeing facilitator (2)[c]	8	2 hours	4.089,40 Euros	DWELL team
Supervisor (1)	n/a	8 hours	5.157,55 Euros	DWELL team
Supervisor (2)	n/a	10 hours	12.437,11 Euros	DWELL team

n/a, not available.

[a]Also, conducted 8 motivational interviews lasting 1.5 hours each.

[b]Also, conducted 6 motivational interviews lasting 1.5 hours each.

[c]Also, conducted 6 motivational interviews lasting 1.5 hours each.

2.4 DWELL intervention costs – Netherlands

Several health professionals were involved in the DWELL delivery, including specialised nurses, activity providers, educators and group dynamics trainers. A detailed list of the different staff together with the number of sessions involved and duration is included in Table 9.

The role of nurses (specialised or not) was key in the delivery of the programme, with nurses being present in 150 sessions in total lasting 4 hours each, and diabetic nurses in 56 sessions lasting 40 minutes each. Some staff – nurses and educators – were supervised by project team members (including the Principal Investigator), with supervision time considered when costing the programme. All costs are reported in 2019 prices. A total of 50 hours were spent in staff supervision equivalent to 5.000 Euros. Additional costs incurred were the cost of equipment – specifically, 20 monitors at a cost of 100 Euros each – and promotional material at approximately 1.500 Euros.

The total cost of delivering DWELL in the Netherlands comprises the cost of all sessions delivered by several professionals (including supervision) and any one-off equipment or promotional costs, summing up to 19.556,59 Euros, which is equivalent to 488,91 Euros per participant for a group of 40 participants per programme on average.

Table 9. Staff involved in the DWELL delivery and associated salaries in Netherlands

Staff role	Sessions	Duration (per session)	Salary[a] (per month)	Salary source
Diabetic nurse	56	40 minutes	3.604,75 Euros[b]	CAO Ziekenhuizen
Nurse	150	30 minutes	3.174,82 Euros[b]	CAO Ziekenhuizen
Head nurse	20	30 minutes	3.738,55 Euros[b]	CAO Ziekenhuizen
Research nurse	50	240 minutes	3.943,19 Euros	CAO Ziekenhuizen
Activity provider	12	240 minutes	4.021,18 Euros	Project team
Educator	8	60 minutes	4.021,18 Euros	Project team
Assistant educator	30	60 minutes	3.688,37 Euros	Project team
Group dynamics trainer	12	240 minutes	400 Euros[c]	Project team

[a]It includes 8,3% holiday and 8,3% allowances/pension composition.

[b]Adjusted to 2019 prices using the CCEMG-EPPI Centre Cost Converter (https://eppi.ioe.ac.uk/costconversion/default.aspx).

[c]per day.

In order to be able to conduct a cost-effectiveness analysis we need to consider non-missing health-related quality of life and health resource use in all time points of the study (i.e. T0-T3). In the Netherlands, we identified 6 participants from the control group and 15 from the intervention group fulfilling these criteria. On average, participants aged over 50 years in the control group and over 60 years in the intervention group. Almost two thirds (67%) in either study group were male. Responses to the health-related quality of life questionnaire were converted into scores as described in Report 1 (Evaluation Methodology), and variations over time are shown in Figure 9. We can see that for the intervention group, health-related quality of life remained relatively stable over the duration of the study whereas for the control group it dropped significantly in T1, reaching almost T0 levels in T2 and T3.

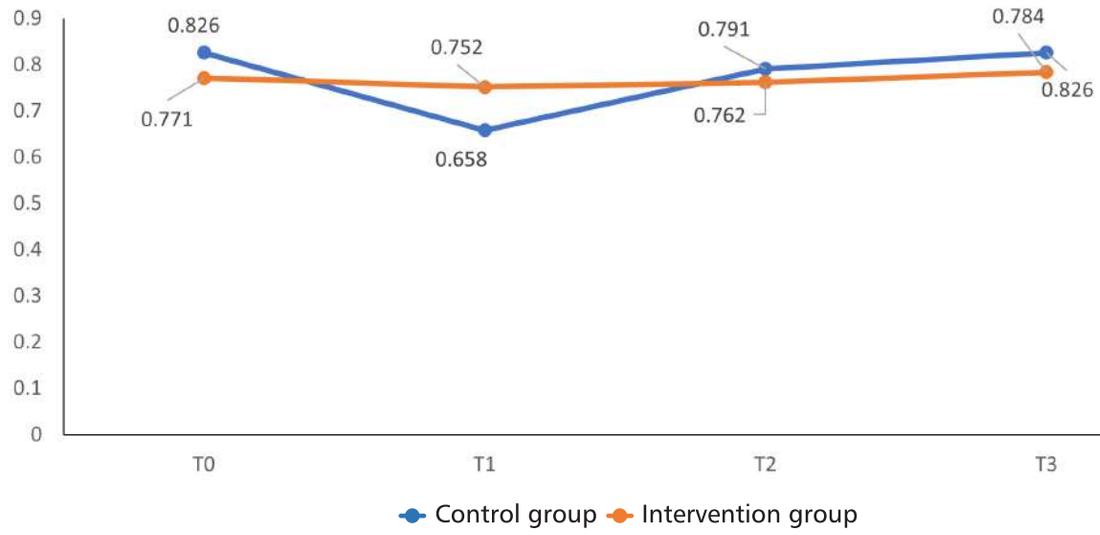


Figure 9. Health-related quality of life – Netherlands

The participants reported using a range of health and hospital services (see Figure 10). The most frequently used were physiotherapist and GP, irrespective of the study group. Indicatively, control participants reported on average 2.8 visits to a physiotherapist in T2 and 1.7 in T3. For the intervention group, this was 1.7 and 1.8 visits respectively. Changes over time vary highly by service type, for example, more GP visits were reported in T3 than T2 in the control group while the opposite happened in the intervention group. Participants in either study group reported almost no hospital inpatient stays. Resource use can be combined with national unit costs (see Appendix, Table A2 for more details) to obtain a total cost for each service across all participants. However, given the small sample size and the possibility of outliers driving the overall costs, this exercise was not conducted as part of the Dutch analysis.

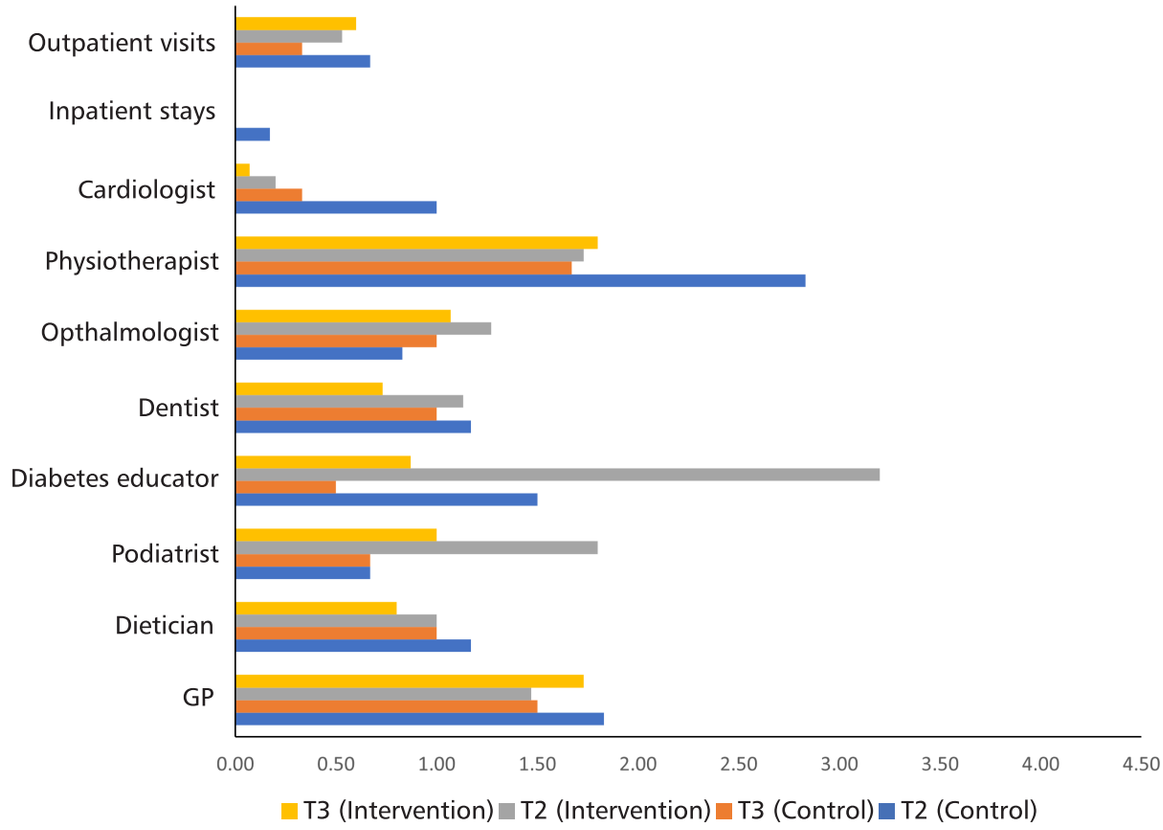


Figure 10. Health resource use – Netherlands

Key findings: Cost Effectiveness of the DWELL Programme

The DWELL programme was delivered in different ways across the countries participating in the project, with some putting emphasis on the role of the facilitator (UK, Belgium, France) in all stages of the programme whilst others (Netherlands) relying more on clinical staff such as nurses, diabetes expert and specialist activity providers.

Despite the diversity of staff involved in DWELL programme delivery and different intensity of sessions provided, interestingly, the total cost per participant on average did not vary substantially across the four countries, except for France where a lower cost may be due to the differences in workforce costs and mode of delivery of the programme. Any further conclusions should be tempered given the different health systems across all participating countries. The estimated intervention costs in each country, however, can be used as a base to determine detailed cost-effectiveness of the DWELL programme compared with standard/routine care in future studies.

Notably, for the UK and Netherlands, there was a large amount (>60%) of incomplete resource use and health-related quality of life data in T2 and T3, therefore multiple imputation was not considered appropriate given the high percentage of missingness. It is difficult to determine whether incomplete data were due to low or no participant engagement in the cost-effectiveness element of the evaluation study, as other factors (including the COVID-19 pandemic) beyond the research team's control may have also played a role. As a result, it was impossible to calculate Quality Adjusted Life Years (QALYs) and subsequently conduct a full cost-effectiveness analysis for these two countries.

On the other hand, France did not secure ethics approval for recruitment of control group participants, which meant that we could not observe the acceptability of the resource use questionnaire, make any comparisons between the intervention and control groups, as well as conduct a cost-effectiveness analysis for this country.

Finally, Belgium had not finished with follow-up recruitment by the end of the study, which also resulted in not reporting any health-related quality of life and resource use findings, both required for a cost-effectiveness analysis. More research is required to establish a clearer picture per country and evaluate further the cost benefits of these changes.

In relation to use of health services, although the results from the UK and Netherlands do not provide much detail (i.e. no differentiation between whether participants were using health services for diabetes or other matters), it can perhaps provide some idea of general trends between the intervention and control group participants. Further detail would also help determine whether such trends were positive or negative, for example are people more knowledgeable about their health/diabetes and therefore seeking the right help more frequently (a positive result) or is it because of a decline in health status (a negative result). Nonetheless, some interesting differences between the control and intervention groups suggest that DWELL participants may have changed the way they use health resources.

Despite the data quality issues mentioned above, it is worth highlighting several points that could be considered in future studies with regards to recruitment of control group participants, follow-up and resource use data. For example, if the DWELL programme delivery was shortened or lengthened, then the follow-up points will need to be reconsidered. In addition, if a blended approach is followed in the delivery of the programme, this should be recorded and considered when costing the intervention. In this study, in some countries due to mitigating circumstances, recruitment of the control group participants began after T1 had elapsed, which made it impossible to observe any differences in resource use at T0 and T1. In future studies, recruitment of both intervention and control groups should be concurrent. Finally, resource use data was based on self-report, which potentially puts a strain on participants (given the retrospective element of such questions) and can subsequently result in inaccurate or incomplete data. Alternative sources regarding the use of health services could be considered in the future, including for example, accessing patient records through GP practices, providing that the relevant approvals are obtained. Patient records can also be insightful in terms of the mode of delivery of primary care services (face-to-face, telephone), which can lead to more accurate costing of the different services.

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Appendix A

Table A1: Service user-reported health care use and associated unit costs – UK

Item	Unit cost (£)[a]	Source
Health Services		
GP	34	Unit Costs of Health and Social Care, Personal Social Services Research Unit (2019), pp. 120, per surgery consultation lasting 9.22 minutes (including direct care staff costs and qualifications)
Practice or district nurse	40	National Schedule of Reference Costs (2018/19), NHS trusts and NHS foundation trusts, Community Health Services-Nursing (face-to-dace), Code: N02AF
Diabetes nurse	72	National Schedule of Reference Costs (2018/19), NHS trusts and NHS foundation trusts, Community Health Services-Diabetic Nursing/Liaison (face-to-face), Code: N15AF
Podiatrist	47	Unit Costs of Health and Social Care, Personal Social Services Research Unit (2019), pp. 143, (Band 6, per hour)
Pharmacist	47	Unit Costs of Health and Social Care, Personal Social Services Research Unit (2019), pp. 143, (Band 6, per hour)
Psychologist	46	Unit Costs of Health and Social Care, Personal Social Services Research Unit (2019), pp. 143, (Band 6, per hour)
Dentist	133	Unit Costs of Health and Social Care, Personal Social Services Research Unit (2019), pp. 124, per hour of patient contact
Cardiologist	107	National Schedule of Reference Costs (2018/19), NHS trusts and NHS foundation trusts, Non Consultant Led (follow-up), Code: WF01A
Hospital services		
Inpatient stay	589	National Schedule of Reference Costs (2018/2019), NHS trusts and NHS foundation trusts, Non-elective Short Stay (National Average)
Outpatient visit	148	National Schedule of Reference Costs (2018/19), NHS trusts and NHS foundation trusts, Outpatient procedures (National Average)
Accident & Emergency visit	166	National Schedule of Reference Costs (2018/19), NHS trusts and NHS foundation trusts, Accident & Emergency (National Average)

Table A2: Service user-reported health care use and associated unit costs – Netherlands

Item	Unit cost (€)[a]	Source
Health Services		
GP	9,38	for less than 20 minutes, DWELL team
Dietitian	15,24	for 15 minutes, DWELL team
Podiatrist	81,23	standard consultation, DWELL team
Diabetes educator	25,40	per topic; standard consultation, DWELL team
Dentist	21,34	standard consultation, DWELL team
Ophthalmologist	139,46	per hospital visit, DWELL team
Physiotherapist	30,23	for minimum 21 minutes, DWELL team
Cardiologist	179,86	standard consultation, DWELL team


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