

The ALIVE-Project

Activity, Life Satisfaction, Inclusion, Vitality, Elderly Women

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1 Excellence

ALIVE addresses three key concerns. First, the number of older women is increasing rapidly, and many live alone after outliving their partners, placing them at increased risk of loneliness and social isolation. Second, age-related conditions such as cardiovascular disease, musculoskeletal pain, sarcopenia, osteoarthritis, and osteoporosis contribute to reduced mobility, physical inactivity, falls, fractures, and loss of independence, thereby indirectly limiting opportunities for social participation and meaningful everyday engagement. Third, older women remain underrepresented in health research, despite being disproportionately affected by these challenges, with only 1% of Norwegian clinical trials over the past five years including this population (1). Together, these factors highlight the need for effective strategies that support health, independence, and meaningful participation in later life.

This 16-week randomised controlled trial (RCT) evaluates whether supervised group exercise at fitness clubs can reduce loneliness and improve quality of life, social connectedness, and physical fitness in women aged 75 years and older, compared with fitness club membership alone. The project will provide new knowledge on whether organised group exercise is a practical strategy to address social isolation and health-related challenges in later life.

Building on Norwegian government priorities and the Oslo Research Center for Women's Sport, Physical Activity and Health's commitment to improving women's health, ALIVE aims to strengthen the evidence base for future initiatives targeting well-being, active living, and social participation among older women. By integrating RCT findings with qualitative interviews, ALIVE provides a comprehensive approach to addressing important knowledge gaps in this area.

1.1 State of the art, knowledge needs, and project objectives

Societal state of the art

Women account for a growing proportion of the older population, with twice as many women as men living beyond the age of 85 years (2). This demographic shift is accompanied by an increased prevalence of living alone and heightened vulnerability to loneliness and social isolation among older women (3, 4). In addition, the long-term consequences of oestrogen loss after menopause contribute to increased risk of cardiovascular disease, lower urinary tract symptoms, osteoporosis, and sarcopenia in women (5-8). These conditions may affect physical functioning and thereby reduce the ability to remain socially active, maintain independence, and participate in everyday life.

In Norway, both genders experience some of the highest fracture rates globally (9), likely due to icy roads and snowy winters. When falls occur, women are more likely than men to sustain fractures, with a steep rise in hip- and wrist fractures from age 65 (10). These fractures cost over 14.5 billion NOK annually (10). The complications of these fractures, together with age-related declines in physical activity (PA) and physical fitness, can further impair everyday functioning and increase the risk of social isolation and loneliness (11). PA delays age-related psychological and physiological changes (10, 12), and may reduce fall risk by preserving strength, balance and functional capacity (13). Yet, participation rates decline with age and women generally report lower PA levels than men (14). In Norway, older women are about 27% more likely than older men to fail to meet the recommended 150 minutes of moderate-to-vigorous PA per week (14). Women also report distinct barriers to PA, including fatigue, low energy, reduced motivation, and lifelong caregiving and household responsibilities that have limited opportunities for structured activity (15). These differences contribute to lower activity levels in older women (15), highlighting the need for targeted interventions that promote healthy aging while supporting independence and social participation in this group (16).

Loneliness among older women is increasingly understood as a complex biopsychosocial phenomenon influenced by social connectedness, belongingness, and opportunities for meaningful social participation (17). Research has highlighted that social connectedness and belongingness are fundamental determinants of healthy ageing and psychological well-being, particularly among older adults who may experience

retirement, loss of partners, caregiving burden, financial circumstances, declining health, or shrinking social networks (17). Accordingly, a key challenge is to create sustainable community-based arenas that can simultaneously support social participation, belonging, quality of life, and health among older women (18, 19). Community-based PA interventions may therefore offer more than improvements in physical function, as they also provide opportunities for social participation and engagement in meaningful social roles (20).

The fitness club industry plays a pivotal role in promoting PA worldwide, engaging more than 185 million members across approximately 210,000 clubs (21). In Norway, more than 90% of the population live in a municipality that has at least one fitness club (22), and the Norwegian Directorate of Health (2020) recognizes these venues as important community arenas for fostering both PA and social participation. Fitness clubs offer accessible, safe, and year-round opportunities for exercise, making them particularly relevant in Norway's challenging seasonal climate where opportunities for both PA and social contact may otherwise be limited. Given this extensive infrastructure and public health relevance, fitness clubs represent an underutilised setting for promoting healthy ageing. Participation among adults aged 60 years and older is increasing and represents one of the fastest-growing membership segments (22), although this growth masks marked heterogeneity within the older population. Older women, especially those aged 75 and older, remain underrepresented and are among the least physically active groups (23). Across Europe, only 10–15% of fitness club members are aged 55 or older (24), and qualitative studies indicate that many older adults perceive fitness clubs as unwelcoming or socially exclusive environments (25, 26). These findings highlight an important opportunity to make fitness clubs more inclusive and better utilise their potential as arenas for healthy ageing (27).

Scientific state of the art

Important knowledge gaps remain regarding fitness-club-based interventions for older women (28, 29). Most studies have been conducted in community or clinical settings rather than in fitness clubs, leaving limited evidence on how these commercial environments can support health and mental well-being in later life (29, 30).

Group exercise is the most widely adopted and adaptable format in fitness clubs and has demonstrated benefits for physical function and adherence in older adults (31–34). However, evidence regarding psychosocial outcomes such as loneliness, social isolation, social connectedness, and mental well-being remains inconsistent and is often based on small-scale studies (27, 35). Furthermore, little is known about the mechanisms through which group-based exercise may influence these outcomes, including the potential role of social processes such as familiarity, trust, belonging, and sustained social interaction within exercise groups.

In this context, fitness clubs may represent a unique opportunity by combining structured PA with repeated social exposure in a stable group environment. Over time, such settings may facilitate the development of meaningful social relationships while supporting sustained engagement in PA. However, robust evidence is lacking, particularly for older women aged 75 years and above, who are at heightened risk of both physical decline and social isolation. Addressing these gaps, ALIVE will examine whether supervised group exercise in fitness clubs can improve loneliness, social connectedness, quality of life, and physical fitness compared with membership alone, thereby generating new knowledge on fitness clubs as sustainable platforms for healthy and socially connected ageing.

To address these gaps, the ALIVE project will conduct a 16-week RCT comparing three study arms (Figure 1):

- A. membership at SATS fitness club with supervised group exercise and facilitated social activity (Group exercise)),
- B. membership at SATS fitness club without structured group exercise or social activity (Individual exercise), and
- C. control group (Control).

A complimentary qualitative study will explore participant experiences to illuminate how social and physical factors interact within the fitness-club context.

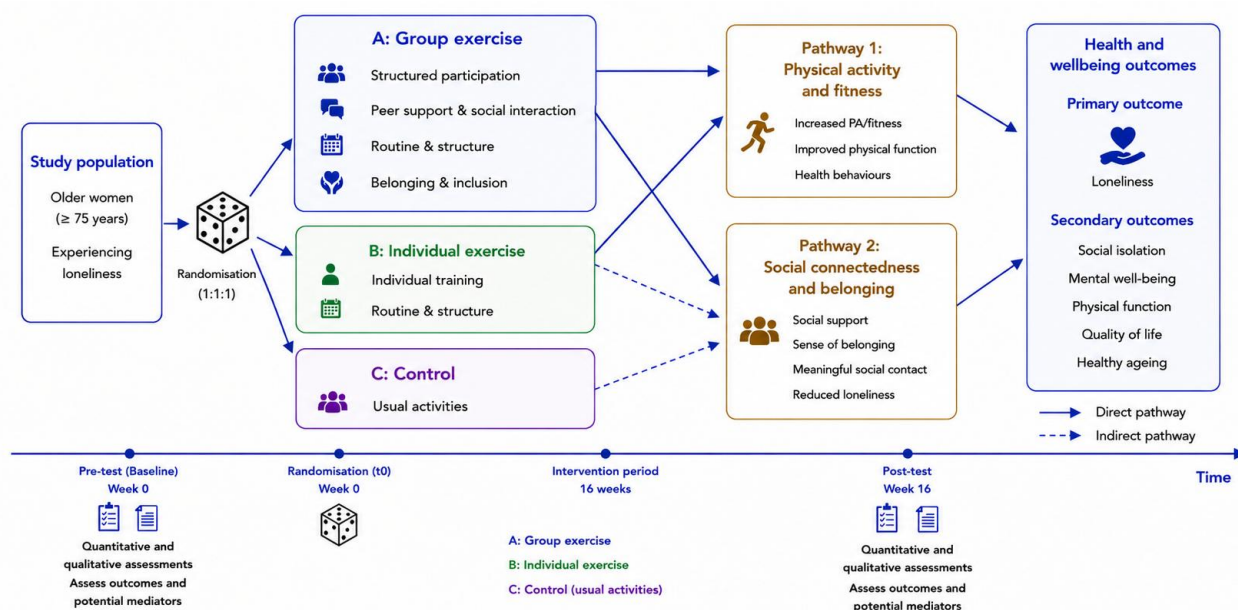


Figure 1. Conceptual framework of the ALIVE intervention.

Participants are randomised to group exercise (A), individual exercise (B), or control (C). The intervention targets two key pathways: (1) physical activity and fitness, and (2) social connectedness and belonging. These pathways may act independently or additively to influence health and wellbeing outcomes. Loneliness is the primary outcome. Secondary outcomes include social isolation, mental well-being, physical function, quality of life, and healthy ageing. Quantitative and qualitative assessments are conducted at baseline (pre-test) and after the intervention (post-test).

1.2 Novelty and ambition

The ALIVE project aligns with the research strategy of The Oslo Research Center for Women's Sport, Physical Activity and Health, which focus on the female perspective. This project also complements the Norwegian government's quality reform "A full life - all your life", by addressing key challenges in later life, including barriers to meaningful participation and everyday functioning among older women (36). The central novelty of ALIVE is that it shifts the focus from physical activity alone to social mechanisms embedded within group-based exercise as drivers of psychosocial outcomes in later life. These mechanisms are conceptualised as structured social participation in real-world exercise contexts, characterised by repeated interaction, shared engagement, and collective experience. Within this framework, fitness clubs are understood as potential infrastructures for sustained social participation and relational engagement, rather than solely settings for exercise delivery, thereby positioning them as arenas for addressing social isolation and not only physical inactivity.

Considering the ambition of ALIVE and identified research gaps, the combination of an RCT and a qualitative study (in-depth interviews) will ensure a robust evaluation of the interventions' impact. Complementing this, in-depth interviews will delve into participants' experiences, uncovering perceptions, barriers, and facilitators (such as supportive environments, resources, or behaviours that aid in overcoming obstacles), not captured by quantitative data.

1.3 Research questions, theoretical approach, and methodology

ALIVE will result in an extensive data set with several research questions:

The primary research question:

- What are the effects of two active interventions: a) fitness club membership combined with supervised group exercise and b) fitness club membership alone, compared with a control group, on perceived loneliness in women ≥ 75 years?

The secondary research questions:

- What are the effects of two active interventions: a) fitness club membership combined with supervised group exercise and b) fitness club membership alone, compared with a control group, on:
 - social connectedness, quality of life, depression and anxiety in women ≥ 75 years?
 - objectively measured PA in women ≥ 75 years?
 - body composition, physical health (endurance, functional health, balance) and risk factors for cardiovascular disease (blood lipids/glucose and blood pressure (systolic/diastolic)) in women ≥ 75 years?
 - musculoskeletal complaints and urinary incontinence
- What is the feasibility of the ALIVE-project, and what are the participants' experiences, barriers, and facilitators, including aspects of social interaction, group cohesion, and experiences of belonging, competence, and autonomy (i.e., satisfaction of basic psychological needs), as well as bond formation?
 - How can supervised group exercise and facilitated social interactions be effectively implemented based on the experiences of participants and instructors, with attention to motivation, group processes, and experiences of psychological need support (i.e., feeling competent, autonomous, and socially connected)?

Additional research questions:

- What are the acute psychological responses to each supervised group exercise on perceived positive well-being, distress, and fatigue in women ≥ 75 years?
- What are the long-term effects of supervised group exercise and facilitated social interactions on mental health (loneliness/social isolation, health-related quality of life, depression, anxiety, and self-efficacy), social activities and PA two years post-trial?

A priori power calculations were conducted to determine the required sample size for the three-arm RCT, with loneliness (ULS-6) as the primary outcome. Previous studies using the ULS-6 indicated that a clinically meaningful difference corresponded to approximately 0.3–0.5 standard deviations (about a 2-point change) (37–40). Based on this, the standard deviation at follow-up was assumed to be 3.8 points, and an expected dropout rate of 18% was applied. Initial calculations were performed using two-sample t-tests for pairwise comparisons between each intervention group and the control group, in line with the planned post-hoc analyses. With an effect size of Cohen's $d = 0.53$, achieving 80% power at $\alpha = 0.05$ required 71 participants per group after adjusting for expected dropout. These estimates will ensure adequate power to detect meaningful differences between each intervention arm and the control group while accounting for relevant covariates.

A total of 213 women will be recruited, with 71 participants in each intervention arm and in the control group. Inclusion criteria: women aged ≥ 75 years, currently living alone for at least four months (including widowed or single women), residing at home in Oslo with convenient access to participating SATS fitness clubs in the Nordre Aker or Vestre Aker districts, and participating in < 60 minutes per week of planned, structured exercise at moderate-to-vigorous intensity, whether individually or in an organized setting (excluding recreational walking and other habitual physical activity). Exclusion criteria: dementia and diseases that are contraindicated to exercise or testing (such as unstable angina, recent heart attack, uncontrolled arrhythmia, or recent coronary bypass surgery) (41). Participants will be recruited using a structured, multi-channel approach involving general practitioners, patient organizations, and social media campaigns. Standardized recruitment materials will be provided to ensure consistent participant identification. To identify women who spend most of their day alone but may still have brief social interactions (e.g., a shopping trip or a phone call), we will use standardized screening questions about social life during the initial contact. To determine the safety or possible risks of exercising based on health history, current symptoms, and risk factors, all participants will complete a simple self-screening tool (the PA readiness questionnaire (PAR-Q)(42)) before randomisation.

A research assistant, who is not involved in either the recruitment or the intervention, will use a computer-generated list to assign participants in blocks of 15, ensuring a 1:1 allocation ratio across three arms:

- A) Group exercise:** Participants will engage in supervised group exercise at SATS twice a week during daytime hours, for 16 weeks with sessions led by health and exercise physiologists from NIH. Participants will remain in the same exercise group throughout the intervention period and attend sessions led by the same instructors whenever possible. Instructors will foster a sense of belonging and community by learning participants' names, providing positive feedback, and explaining exercise benefits (43), thereby actively supporting relatedness and autonomy as conceptualised in SDT, embedded in the intervention. Following each session, a social meeting area with seating is available for informal post-exercise interaction, reflecting typical social spaces found in fitness club settings, where participants may choose to purchase refreshments. Together, the stable group composition, regular contact with instructors, predictable weekly sessions, and opportunities for informal interaction are intended to promote social accountability, belonging, social identity, and the development of meaningful social ties alongside the physiological benefits of exercise. Each 60-minute exercise session, accommodating 10-15 participants, has two different main parts (40 minutes) with cardio/resistance exercises (Day 1) and circuit training (Day 2). Day 1 will contain simple aerobic dance in combination with resistance exercises that involve major muscle groups (lower body, upper body, and core muscles). Day 2 will include a circuit (3 rounds of 60 seconds work and 30 seconds rest) with different cardio and functional strength exercises. In addition, both sessions have a warm-up (10 minutes) and a cool-down (10 minutes). Given the high prevalence of urinary incontinence among older women (44), PFMT are included as part of the cool-down routine. Pelvic floor muscle exercises will be demonstrated and verbally instructed by trained instructors. Individual verification of correct contraction is beyond the scope of the study and reflects real-world implementation of community-based exercise programmes. All workouts will be conducted with music.
- To further promote both PA and social connectedness, participants will be encouraged to engage in one additional activity session per week, such as brisk walking together with other members of the group, alongside their usual daily activities, with the aim of meeting current PA guidelines of at least 150 minutes of moderate-intensity PA per week. To assess acute psychological responses, instructors will administer the 12-item Subjective Exercise Experiences Scale (SEES) immediately after each session, in which the participants rate positive well-being, psychological distress, and fatigue on a 7-point Likert scale (45). The SEES has demonstrated high internal consistency across diverse populations, including older adults (45). Scores will be used to describe acute psychological responses throughout the intervention and to explore whether repeated experiences of positive well-being are associated with adherence, changes in loneliness, and perceived social connectedness. These analyses may provide insight into mechanisms linking group exercise participation to longer-term psychosocial outcomes. The instructors will also record participants' self-reported session rating of perceived exertion (sRPE), along with any injuries or complaints (46, 47).
- B) PA Individually:** Participants will receive a 16-week membership to a different SATS fitness club in the same district, which includes access to advanced cardio and resistance equipment, but without the group-based exercises. They will be given one supervised session to learn how to use the equipment. This group represents access to a community exercise arena without structured social facilitation through group-based exercise classes, thereby allowing examination of whether access alone is sufficient, or whether structured social participation is necessary for improved mental and physical health. Importantly, this comparison enables evaluation of the added value of structured social participation beyond access to exercise facilities alone. It also allows us to explore whether simply leaving the home environment and being exposed to a social setting may in itself contribute to improved quality of life.
- C) Control group:** Participants will be asked to continue with their everyday life. To minimize demotivation, the control group will be offered a 16-week membership to a local fitness club after the intervention period, including one supervised session. During the intervention period, participants will be contacted midway through the study to report their PA levels and sense of social connectedness.

This design allows us to compare the intervention groups not only against each other, but also against a usual care condition, providing a clearer understanding of the added value of structured exercise and social participation beyond normal daily life.

Data collection and outcomes

Data will be collected at baseline and immediately following the intervention (16 weeks) by a paper-based or online based questionnaire (20 to 25 minutes to complete), assessments of physical health, and device-measured PA. Details for data collection to answer the research questions are given below.

Questionnaire:

The questionnaires will be adapted to the target population and tailored to the projects design. In some cases, the order of response options will also be adjusted to improve clarity and ensure the questions are easier for participants to understand and respond to.

- **Background information:** Based on *The HUNT 4 Study* (48), including age, weight, height, education, monthly retirement pension, and lifestyle habits (such as smoking, alcohol use, eating patterns, friends, family, and neighbourhood)
- **Loneliness and social isolation:** *The Revised UCLA Loneliness Scale* (6 items) (RULS-6) (49)
- **Health-related quality of life:** *The MOS 36-item short-form health survey* (SF-36) (50)
- **Depression and anxiety:** *Hospital Anxiety and Depression Scale* (HADS) (51)
- **Functional independence:** *The Lawton Instrumental Activities of Daily Living Scale* (IADL)
- **Musculoskeletal complaints:** Based on *The HUNT 4 Study* (48)
- **Urinary incontinence:** *The International Consultation on Incontinence Questionnaire on Urinary Incontinence Short Form* (4 items) (ICIQ-UI-SF) (52)

Testing of physical health:

- **Endurance:** The 6-Minute Walk Test (53, 54)
- **Functional fitness:**
 - 30-Second Chair Stand Test (55)
 - Hand grip strength using a hydraulic dynamometer (56)
- **Balance:** One leg standing test (57)
- **Risk factors for CVD**
 - Finger prick tests for measurement of glucose, cholesterol (HDL, LDL), and triglycerides
 - Blood pressure
- **Body composition:** Bioelectrical impedance analysis (Inbody 770) (58)

Device-measured PA:

- **Total PA level and sedentary time:** Accelerometer (ActiGraph GT1M) for seven consecutive days (59)
- **Adherence:** In the PA + Social connectedness group, adherence rates, including both workouts and participation in social activities, will be registered by the instructors. We are aiming for ≥75% adherence, equivalent to attending at least 24 out of 32 sessions (60). In the PA individually group, attendance will be obtained by electronic recordings (membership card swipe).

In-depth interviews:

Immediately following the intervention, we will conduct in-depth interviews lasting 45 to 60 minutes to gain a comprehensive understanding of the intervention's impact and effectiveness. To adhere to the saturation principle, we will include a minimum of eight participants from each intervention arm, continuing data collection until no new themes emerge. This approach ensures adequate representation of diverse perspectives within each arm. The interview guide will focus on participants' experiences of

relatedness, autonomy, and competence within the group-based exercise context, as well as perceived social interaction, group cohesion, motivation, and barriers to participation.

All data from the interviews will be analysed and coded using Braun and Clarke's six-stage model for thematic analysis (61). The stages include: 1) familiarizing with the data, 2) generating initial codes, 3) searching for specific themes, 4) organizing and categorizing themes, 5) defining and naming themes, and 6) interpreting each theme using quotes from the data.

To minimize the risk of contamination in ALIVE, we will implement several strategies. First, we will use concealed allocation to mask group assignments from both participants and assessors. In addition, all intervention arms will be treated identically except for the specific intervention they receive. Due to the nature of the intervention, blinding of participants, instructors, and outcome assessors during data collection are not feasible. Group allocation will therefore be concealed at the level of randomisation, and the allocation code will be securely stored and inaccessible to the research team until all data analyses are completed, ensuring blinded data analysis. To reduce the likelihood of interaction and information exchange between intervention groups, participants in Group A and Group B will attend different SATS fitness clubs within the same districts. Participants will also receive detailed information about the importance of adhering to their assigned group. Lastly, we will analyse the data on an intention-to-treat (ITT) basis. Thus, participants will be included in the analysis according to the group to which they were initially allocated, regardless of their adherence to the assigned protocol. Missing data will be handled using multiple imputation under the assumption that data are missing at random.

1.4 User Participation

To ensure the relevance and feasibility of the study procedures, the questionnaire has been pilot tested among ten older women recruited through a local senior center. Feedback from the participants was used to refine the questionnaire, including adjustments to wording, structure, and comprehensibility before the start of data collection. A collaboration has been established with SATS Norway to facilitate the delivery of the intervention. Participants in Group A will complete the intervention at designated SATS fitness centers in two districts of Oslo. SATS will also support the study by providing a supervised introductory exercise session for participants in Group B at the start of the intervention. The contact person at SATS Norway is Vegard Ølstørn.

A stakeholder panel, including the NIH student clinic (contact person: Kristine Tveitan), SATS fitness clubs (contact person: Vegard Ølstørn, SATS Norge), geriatric physician Jon Skjævestad (Oslo University Hospital), and group exercise instructor for seniors Toril Moe (SATS Norge) will meet quarterly to support the project. User representatives will also contribute throughout the project by providing input on the interpretation of findings, co-developing dissemination activities and materials, and advising on strategies for long-term integration of the intervention. Following the intervention, the user group, stakeholder panel, and project team will collaborate to facilitate implementation within the local community.

1.5 Ethical considerations

ALIVE was originally approved by the Regional Committee for Medical and Health Research Ethics (REK 494165), including risk assessment and an emergency preparedness plan. Amendments have been submitted to the committee to account for minor changes made since the original approval in 2022. It is registered with the Norwegian Centre for Research Data (now SIKT) (NSD 779182) and will be listed on ClinicalTrials.gov. Data will be de-identified and kept confidential according to the law. The NIH IT department will manage data storage given the sensitivity of participants' health information. According to Norwegian regulations, all raw research data will be stored for at least five years after the study completion.

Informed consent will detail project participation, emphasizing voluntary involvement and the option to withdraw anytime without explanation. The randomisation might disappoint those not selected for the intervention, which could affect their motivation to participate. Hence, to minimize the number lost to follow-up, the control group will receive a 16-week NIH fitness club membership post-intervention. Given the age of the participants, ensuring physical safety is crucial. The group exercise program will be tailored to participants' abilities, and sessions will be supervised by certified Health and exercise physiologists to prevent injuries. Recognising that our participants may be emotionally vulnerable, instructors will be available for support before and after group exercise sessions. Except from membership and access to group exercise at a SATS fitness club, no financial compensation will be given. Through transparent communication, collaboration with user group in study design, strategies to minimize attrition rates, and safety protocols, we have addressed relevant ethical issues with conducting ALIVE.

Participation in the project does not involve any harmful or invasive procedures, but some potential risks should be acknowledged. For example, using questionnaires and in-depth interviews to collect data on mental health might introduce response bias or cause temporary emotional discomfort, particularly when participants are asked about sensitive topics such as loneliness or social isolation. Furthermore, self-reporting these feelings may exacerbate existing psychological issues or bring them to the forefront, potentially causing temporary distress. To minimise these risks, we will provide training for research staff to emphasise the importance of sensitivity, empathy, and ethical conduct when interacting with our participants. In addition, participants will be directed to mental health services if necessary. During in-depth interviews, questions will be phrased empathetically to ensure participants' comfort. Older participants may face risks of acute or overuse injuries, muscle soreness, fatigue, and minor incidents like fainting or cardiovascular events during exercise sessions. To manage these risks, qualified instructors will supervise sessions, provide proper exercise instructions, and limit groups to 15 participants. As outlined in point 1.3, a cool-down period will be implemented after moderate to high intensity exercise to lower the risk of sudden drop of blood pressure and instances of fainting. In terms of physical health tests, the test battery is commonly used both in research and in sports medicine, generally posing a low injury risk. Before baseline testing, we will ensure that test personnel undergo thorough training in accordance with standardised testing procedures and practice pilot testing on the user group. Further, all instructors and test personnel in ALIVE will receive training in first aid and cardiopulmonary resuscitation (CPR) and have access to a first aid kit to manage acute injuries and incidents. Any incident will be systematically registered, and, in the case of medical emergencies, standard protocols for emergency assistance will be followed promptly.

2 Impact

2.1 Potential impact of the proposed research

Beyond its contribution to academic research, the primary societal impact of ALIVE is in providing a reference framework for fitness clubs and other activity stakeholders to develop and implement similar initiatives in local communities. In a contemporary society characterized by increasing digitalisation, self-service technologies, and fewer spontaneous everyday meeting places, opportunities for natural social interaction have become more limited, making structured arenas for social participation increasingly important for older adults. For intervention participants and the broader target group, expected benefits of the ALIVE project include reduced loneliness and social isolation, improved self-efficacy, quality of life, physical function, and potentially a reduced burden of age-related musculoskeletal complaints. In the longer term, these improvements may contribute to healthier ageing and a greater likelihood of maintaining independent living. If similar initiatives are successfully implemented on a larger scale, they could potentially reduce pressure on healthcare and residential care services and generate societal benefits. However, these outcomes will not be directly assessed within the ALIVE project.

In addition, by addressing the mental and physical health challenges faced by older women through fostering a supportive community and regular PA, ALIVE aligns with the UN's sustainable development goal 3, which emphasizes lifelong health and well-being for all, regardless of age. ALIVE also contributes to

sustainable development goal 5, which focuses on gender equality and the empowerment of all women and girls. Consequently, our findings will likely have global implications, benefiting many countries facing the challenges of an aging population.

2.2 Measures for communication and exploitation

The findings will be published as research articles in open-access journals. The results will also be presented at national and international scientific conferences. In addition, our research group will develop one-day courses and workshops targeting the fitness club industry, older women, and professionals working in the field of aging and health. Study participants will have the opportunity to speak at these events and share their experiences. The sessions will focus on 1) addressing social isolation and improving mental and physical health among older women, 2) guiding and promoting health-enhancing behaviours and PA levels, and 3) highlighting fitness clubs as venues for socialisation and PA within local communities. In addition, the ALIVE-project and findings will be communicated through various media channels, including newspapers, social media platforms, and podcasts. Presentations and lectures will be delivered within our professional network, and to bachelor's and master's students at NIH. Finally, we will develop a reference manual tailored to the fitness club industry to support the implementation of ALIVE, in addition to educational courses for students at NIH that will enable them to serve as instructors and thereby meet the demand across different arenas.

3 Implementation

Although the intervention will be delivered in collaboration with SATS during the project period, the ALIVE model is not dependent on a specific commercial fitness provider and is designed to be transferable across different exercise and community settings. Similar programmes could be implemented in other fitness club chains, municipal training facilities, healthy living centres (Frisklivssentraler), and community-based activity arenas, thereby increasing scalability and long-term sustainability.

ALIVE requires minimal organisational adaptation and can be integrated into existing services and public health partnerships. Fitness clubs, instructors, and social meeting spaces are already in place, supporting implementation within current community infrastructures.

A key opportunity lies in workforce development, where institutions such as the Norwegian School of Sport Sciences could contribute to targeted education and training of instructors to meet demand across sectors, including local, municipal, and commercial arenas.

From a health-economic perspective, implementation may be supported through a combination of individual membership structures and targeted public subsidies, recognising that while participation involves costs for the individual, the societal cost of inactivity and chronic disease is substantially higher. Strategic public investment or earmarked funding schemes could therefore enhance accessibility and participation, while contributing to reduced long-term healthcare expenditure and pressure on hospitals and residential care services.

3.1 Researcher and project group

Prof. Lene A.H. Haakstad (LAHH) initiated the project and will serve as project manager. **Prof. Wendy Brown (WB, UQ/Bond)** and **Assoc. Prof. Christina Gjestvang (CG)** will collaborate closely with LAHH in leading the project. Together, they bring extensive expertise, with a combined 635 publications in research areas such as women's health, physical activity, "exercise is medicine," and health behaviour among fitness club members. They have collectively supervised 34 Ph.D. candidates and 88 master's students. **Emilie**

Mass Dalhaug (EMD, Ph.D) will serve as research coordinator. She has solid experience in research focusing on women's health and will play a key role in organizing and overseeing the project's operational aspects. The team will jointly coordinate recruitment and data collection, train instructors and testing personnel, and ensure proper management and analysis of data.

In ALIVE, the project group consists of experts from different departments at NIH, as well as other academic institutions, both within Norway and overseas (the University of Oslo (UiO), Oslo Metropolitan University (OsloMet), the University of Agder (UiA), and the University of Queensland (UQ) and Bond University. In addition to the main group, the project members are Prof. Frank E. Abrahamsen, Prof. Kari Bø, and Prof. May Arna Risberg (NIH), Prof. Hilde S. Robinson (UiO), Assoc. Prof. Therese Brovold, Assoc. Prof. Elisabeth W. Telenius, Assoc. Prof. Guro G. Tangen (OsloMet), and Assoc. Prof. Hilde Lohne-Seiler (UiA). The project group has extensive experience with health research and high expertise in various fields: physical and mental aging, mental health (self-efficacy, life satisfaction, and psychological effects of exercise), physical health (physical fitness and musculoskeletal disorders), preventive health care research, behaviour change, as well as RCT-studies and in-depth interviews. The project group will meet monthly to develop test protocols, questionnaires, and interview guides, ensure quality in the research work, and co-author articles based on the various research questions. In addition, ALIVE will engage three to four master students in the data collection, who will participate in the project group and write their master thesis based on study results.

3.2 Project organization and management

LAHH, together with CG, WB, and EMD, will be responsible for all three work packages (Table 1). In addition, three master students, representants from the project group and user group will contribute to each work package dependent on expertise and area of interest.

Table 1. Overview of work packages (WP) and milestones indicated by red lines

	2026				2027				2028			
Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
WP 1 User participation in recruitment, design, and evaluation												
Responsible: LAHH, WB, CG and EMD (NIH)												
Contributors: HSR, TB, EWT, GGT, user group												
Task 1.1 Identification and inclusion of the user group												
Task 1.2 Identify needs, preferences, and challenges that can inform the recruitment and study design												
Task 1.3 Evaluation of the intervention												
Task 1.4 Create user-friendly presentations about ALIVE												
Task 1.5 Dissemination of results to users												
WP 2 Intervention, data collection, and in-depth interviews												
Responsible: LAHH, CG and EMD (NIH)												
Contributors: FEA, KB, MAR, EWT, HLS, WB, and SM												
Task 2.1 Plan the intervention												
Task 2.2 Develop questionnaires/interview guides												
Task 2.3 Plan test protocols												
Task 2.4 Recruitment												
Task 2.5 Pre-tests												
Task 2.6 Start of intervention												
Task 2.7 Intervention period												
Task 2.8 Post-tests												
Task 2.9 In-depth interviews												
Task 2.10 Data plotting, transcription, and analysis												
WP 3 Publication, and implementation												

Responsible: LAHH, WB, CG and EMD (NIH)													
Contributors: FEA, KB, HSR, TB, HLS, EWT, user group, and stakeholder panel													
Task 3.1 Article writing													
Task 3.2 Educational courses for students													
Task 3.3 Develop Reference tool/manual													

4 References

1. Norwegian Institute of Public Health. Sex and Gender-based Analyses in Norwegian Treatment Studies: a Scoping Review.; 2022.
2. United Nations. World Population Prospects 2022: Data Sources. . Department of Economic and Social Affairs. 2022.
3. Freedman A, Nicolle J. Social isolation and loneliness: the new geriatric giants Approach for primary care. Can Fam Physician. 2020;66(3):E78–E85.
4. Surkalim DL, Luo MY, Eres R, Gebel K, van Buskirk J, Bauman A, et al. The prevalence of loneliness across 113 countries: systematic review and meta-analysis. Bmj-Brit Med J. 2022;376.

5. Sato Y, Kawakami R, Sakamoto A, Cornelissen A, Mori M, Kawai K, et al. Sex Differences in Coronary Atherosclerosis. *Curr Atheroscler Rep*. 2022;24(1):23–32.
6. Hamilton KJ, Hewitt SC, Arao Y, Korach KS. Estrogen Hormone Biology. *Curr Top Dev Biol*. 2017;125:109–46.
7. Radak Z, Torma F, Berkes I, Goto S, Mimura T, Posa A, et al. Exercise effects on physiological function during aging. *Free Radical Bio Med*. 2019;132:33–41.
8. Robinson D, Cardozo LD. The role of estrogens in female lower urinary tract dysfunction. *Urology*. 2003;62(4 Suppl 1):45–51.
9. Kinge JM, Dieleman JL, Karlstad O, Knudsen AK, Klitkou ST, Hay SI, et al. Disease-specific health spending by age, sex, and type of care in Norway: a national health registry study. *Bmc Med*. 2023;21(1).
10. The Norwegian Directorate of Health. Fallforebygging hos eldre. <https://www.helsedirektoratet.no/faglige-rad/fallforebygging-hos-eldre/bakgrunn-metode-og-prosess2024> [Available from: <https://www.helsedirektoratet.no/nyheter/fall-hos-eldre-kan-forebygges>].
11. Smith TO, Dainty JR, Macgregor A. Trajectory of social isolation following hip fracture: an analysis of the English Longitudinal Study of Ageing (ELSA) cohort. *Age Ageing*. 2018;47(1):107–12.
12. Taylor D. Physical activity is medicine for older adults. *Postgrad Med J*. 2014;90(1059):26–32.
13. Sherrington C, Fairhall N, Wallbank G, Tiedemann A, Michaleff ZA, Howard K, et al. Exercise for preventing falls in older people living in the community: an abridged Cochrane systematic review. *Br J Sports Med*. 2020;54(15):885–91.
14. Hansen BH, Kolle E, Steene-Johannessen J, Dalene KE, Ekelund U, Anderssen SA. Monitoring population levels of physical activity and sedentary time in Norway across the lifespan. *Scand J Med Sci Sports*. 2019;29(1):105–12.
15. Pedersen MRL, Hansen AF, Elmose-Osterlund K. Motives and Barriers Related to Physical Activity and Sport across Social Backgrounds: Implications for Health Promotion. *Int J Env Res Pub He*. 2021;18(11).
16. World Health Organization. UN Decade of Healthy Ageing: Plan of Action 2021-2030.; 2020.
17. Czaja SJ, Moxley JH, Rogers WA. Social Support, Isolation, Loneliness, and Health Among Older Adults in the PRISM Randomized Controlled Trial. *Front Psychol*. 2021;12:728658.
18. Vansteenkiste M, Soenens, B., & Ryan, R. M. Chapter 4, Basic Psychological Needs Theory: A Conceptual and Empirical Review of Key Criteria. In *The Oxford Handbook of Self-Determination Theory* Oxford University Press 2023. p. 84–123.
19. Wang JCKH, M. S. Chapter 36, Self-Determination Theory in Physical Activity Contexts. In *The Oxford Handbook of Self-Determination Theory*, Oxford University Press 2023. p. 740–59.
20. Liddle J, Stowell M, Ali M, Warwick S, Thompson A, Brittain K, et al. Community-based physical and social activity for older adults with mild frailty: a rapid qualitative study of a collaborative intervention pilot. *BMC Geriatr*. 2024;24(1):1011.
21. The IHRSA Global Report 2023. [Available from: <https://www.healthandfitness.org/2023-ihrsa-global-report/>].
22. Virke Trening. Treningssenterbransjen 2025. 2025.
23. Matuszewska M, Surdacka J, Lipiak A, Chawłowska E. Active Scandinavia: examining physical activity levels across Norway, Sweden, and Denmark: a systematic review. *Bmc Public Health*. 2025;25(1):2128.
24. Europe Active. European Health and Fitness Market Report 2025.: EuropeActive; 2025.
25. Sossa Rojas A. Body, Meanings, and Physical Exercise in Older Adults: The Qualitative Perspective of Frequent Gym-Goers. *Qualitative Sociology Review*. 2022;18:106–24.
26. Thomas Y, Blank, A., Frank, H. Active Aging: Perceptions and Experiences of Older Adults who Attend a Seniors Gym. *Am J Biomed Sci & Res*. 2023;19(AJBSR.MS.ID.002654.).
27. Brady S, D'Ambrosio LA, Felts A, Rula EY, Kell KP, Coughlin JF. Reducing Isolation and Loneliness Through Membership in a Fitness Program for Older Adults: Implications for Health. *J Appl Gerontol*. 2020;39(3):301–10.
28. Di Lorito C, Long A, Byrne A, Harwood RH, Gladman JRF, Schneider S, et al. Exercise interventions for older adults: A systematic review of meta-analyses. *J Sport Health Sci*. 2021;10(1):29–47.
29. Pinheiro MB, Oliveira JS, Baldwin JN, Hassett L, Costa N, Gilchrist H, et al. Impact of physical activity programs and services for older adults: a rapid review. *Int J Behav Nutr Phys Act*. 2022;19(1):87.
30. Taylor J, Walsh S, Kwok W, Pinheiro MB, de Oliveira JS, Hassett L, et al. A scoping review of physical activity interventions for older adults. *Int J Behav Nutr Phys Act*. 2021;18(1):82.
31. Golaszewski NM, LaCroix AZ, Hooker SP, Bartholomew JB. Group exercise membership is associated with forms of social support, exercise identity, and amount of physical activity. *Int J Sport Exerc Psychol*. 2022;20(2):630–43.
32. Farrance C, Tsofliou F, Clark C. Adherence to community based group exercise interventions for older people: A mixed-methods systematic review. *Prev Med*. 2016;87:155–66.
33. Sherrington C, Fairhall NJ, Wallbank GK, Tiedemann A, Michaleff ZA, Howard K, et al. Exercise for preventing falls in older people living in the community. *Cochrane Database Syst Rev*. 2019;1:CD012424.
34. American College of Sports M, Chodzko-Zajko WJ, Proctor DN, Fiatarone Singh MA, Minson CT, Nigg CR, et al. American College of Sports Medicine position stand. Exercise and physical activity for older adults. *Med Sci Sports Exerc*. 2009;41(7):1510–30.
35. Shekelle PG, Mlake-Lye IM, Begashaw MM, Booth MS, Myers B, Lowery N, et al. Interventions to Reduce Loneliness in Community-Living Older Adults: a Systematic Review and Meta-analysis. *J Gen Intern Med*. 2024;39(6):1015–28.
36. The Norwegian Directorate of Health. A full life - all your life — A Quality Reform for Older Persons. <https://www.regjeringen.no/contentassets/196f99e63aa14f849c4e4b9b9906a3f8/en-gb/pdfs/stm201720180015000engpdfs.pdf>; 2018.
37. Shvedko A, Whittaker AC, Thompson JL, Greig CA. Physical activity interventions for treatment of social isolation, loneliness or low social support in older adults: A systematic review and meta-analysis of randomised controlled trials. *Psychol Sport Exerc*. 2018;34:128–37.
38. Neto F. Psychometric analysis of the short-form UCLA Loneliness Scale (ULS-6) in older adults. *Eur J Ageing*. 2014;11(4):313–9.

39. Bahadori F, Asadollahi A, Ghajari O, Yarelahi M. Psychometric properties and cross-cultural adaptation of the UCLA loneliness scale, 6-item among older Iranian people. *BMC Psychol.* 2025;13(1):592.
40. Panayiotou M, Badcock JC, Lim MH, Banissy MJ, Qualter P. Measuring Loneliness in Different Age Groups: The Measurement Invariance of the UCLA Loneliness Scale. *Assessment.* 2023;30(5):1688–715.
41. Pelliccia A, Sharma S, Gati S, Back M, Borjesson M, Caselli S, et al. 2020 ESC Guidelines on Sports Cardiology and Exercise in Patients with Cardiovascular Disease. *Rev Esp Cardiol (Engl Ed).* 2021;74(6):545.
42. ACSM. The Physical Activity Readiness Questionnaire for Everyone 2023 PAR-Q+ 2023 [Available from: <https://www.acsm.org/docs/default-source/files-for-resource-library/par-q-acsm.pdf>.
43. Standage M, Ryan, ED. Self-Determination Theory and Exercise Motivation: Facilitating Self-Regulatory Processes to Support and Maintain Health and Well-Being. *Advances in motivation in sport and exercise* G C Roberts and D C Treasure: Champaign, IL, Human Kinetics, Inc.; 2012. p. 233–70.
44. Wang C, Wei W, Ma D, Yu H, Yu L. Prevalence and Determinants of Stress Urinary Incontinence in Middle-Aged and Older Women: A Systematic Review and Meta-Analysis. *Arch Esp Urol.* 2025;78(1):46–55.
45. Mcauley E, Courneya KS. The Subjective Exercise Experiences Scale (Sees) - Development and Preliminary Validation. *J Sport Exercise Psy.* 1994;16(2):163–77.
46. Kallinen M, Markku A. Aging, Physical-Activity and Sports Injuries - an Overview of Common Sports Injuries in the Elderly. *Sports Medicine.* 1995;20(1):41–52.
47. Foster C, Boulosa D, McGuigan M, Fusco A, Cortis C, Arney BE, et al. 25 Years of Session Rating of Perceived Exertion: Historical Perspective and Development. *Int J Sport Physiol.* 2021;16(5):612–21.
48. The Trøndelag Health Study (HUNT). The HUNT 4 Study. [cited 2024 30.04]. Available from: <https://www.ntnu.edu/hunt/hunt4>.
49. Wongpakaran N, Wongpakaran T, Pinyopornpanish M, Simcharoen S, Suradom C, Varnado P, et al. Development and validation of a 6-item Revised UCLA Loneliness Scale (RULS-6) using Rasch analysis. *Brit J Health Psych.* 2020;25(2):233–56.
50. Ware JE, Jr., Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care.* 1992;30(6):473–83.
51. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand.* 1983;67(6):361–70.
52. Avery K, Donovan J, Peters TJ, Shaw C, Gotoh M, Abrams P. ICIQ: a brief and robust measure for evaluating the symptoms and impact of urinary incontinence. *Neurourol Urodyn.* 2004;23(4):322–30.
53. Kammin EJ. The 6-Minute Walk Test: Indications and Guidelines for Use in Outpatient Practices. *Jnp-J Nurse Pract.* 2022;18(6):608–10.
54. Laboratories ATSCoPSfCPF. ATS statement: guidelines for the six-minute walk test. *Am J Respir Crit Care Med.* 2002;166(1):111–7.
55. Jones CJ, Rikli RE, Beam WC. A 30-s chair-stand test as a measure of lower body strength in community-residing older adults. *Res Q Exerc Sport.* 1999;70(2):113–9.
56. Sasaki H, Kasagi F, Yamada M, Fujita S. Grip strength predicts cause-specific mortality in middle-aged and elderly persons. *Am J Med.* 2007;120(4):337–42.
57. Vellas BJ, Rubenstein LZ, Ousset PJ, Faisant C, Kostek V, Nourhashemi F, et al. One-leg standing balance and functional status in a population of 512 community-living elderly persons. *Aging Clin Exp Res.* 1997;9(1-2):95–8.
58. Anderson LJ, Erceg, D.N., Schroeder, E.T. Utility of Multifrequency Bioelectrical Impedance Compared to DEXA for Assessment of Regional Lean Mass. *Medicine & Science in Sports & Exercise.* 2011;43.
59. Hansen BH, Bortnes I, Hildebrand M, Holme I, Kolle E, Anderssen SA. Validity of the ActiGraph GT1M during walking and cycling. *J Sports Sci.* 2014;32(6):510–6.
60. Hawley-Hague H, Horne M, Skelton DA, Todd C. Review of how we should define (and measure) adherence in studies examining older adults' participation in exercise classes. *BMJ Open Sport Exerc Med.* 2016;6:6.
61. Braun V, Clarke, V. Thematic analysis : a practical guide.: SAGE; 2022.