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Self-reported physical activity in a randomized study from Norwegian Healthy Life Centres

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Research Article

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Abstract

Aim: This study examines firstly if participation in a three-month intervention at Norwegian Healthy Life Centres (HLCs) improved self-reported physical activity (SR-PA), and secondly to what extent physical activity (PA) status at six months and changes from baseline were associated with demographic and motivational predictors. *Background:* Regular PA is promoted as a central component of public health initiatives aimed at preventing noncommunicable diseases. *Methods:* This randomized controlled trial included 118 participants (57 in the intervention group) recruited from HLCs in South-western Norway. The intervention effect was assessed by comparing the intervention group with the waiting-list control group after six months. We examined sociodemographic and motivational predictors of change combining both groups into a single cohort. This trial was registered at ClinicalTrials.gov (ID: NCT02247219). *Findings:* At six-month follow-up, participants in the intervention group reported higher levels of SR-PA compared with the control group. The estimated effect was modest ($B = 0.26$, 95% CI −0.01 to 0.53), equivalent to ≈0.37 SD. Although the confidence interval included zero, the estimate remained compatible with a modest positive effect. Autonomous motivation and social support were positively associated with SR-PA after 6 months, while psychological defiance showed a negative association. Autonomous motivation and psychological defiance impacted PA change during the 6-month period in opposite directions.

Introduction

Non-communicable diseases cause approximately 41 million deaths annually, representing 71% of all global deaths (Nanjappan and Gowda, 2022). Physical inactivity is a key modifiable risk factor, linked to coronary heart disease, type 2 diabetes, and several cancers, yet the majority of the global population remains insufficiently active (Haileamlak, 2019). In response, the WHO's Global Action Plan calls on governments to develop strategies for reducing physical inactivity (World Health Organization, 2013). In Norway, this has been operationalised through the establishment of Healthy Life Centres (HLCs) within primary health care, as municipal services targeting individuals who struggle to access appropriate health support (Norwegian Ministry of Health and Care Services, 2013); Norwegian Directorate of Health, 2016).

Several studies have examined the effects of HLC interventions. Blom *et al.* (2020) found that a three-month behaviour change programme improved health-related quality of life, with effects sustained at 15 months, though PA levels declined after the initial intervention period. In a six-month RCT with 24-month follow-up, Samdal *et al.* (2018) reported no significant intervention effect on objectively measured PA or sedentary behaviour. The authors noted that wearable devices may themselves act as a behaviour change tool, potentially confounding results in both groups. A subsequent analysis found that autonomous motivation and self-rated health supported weight loss, underscoring the role of motivational factors in HLC outcomes (Samdal *et al.*, 2021; Gryte *et al.*, 2024).

Self-determination theory (SDT) is one of the most widely used frameworks for understanding motivation in health behaviour change (Ryan and Deci, 2000). SDT distinguishes between autonomous motivation, driven by personal values and genuine interest, and controlled motivation, driven by external pressure. A third category, amotivation, refers to a lack of intention to engage in a behaviour. Autonomous motivation is consistently associated with more sustained behaviour change, while controlled motivation and amotivation tend to undermine long-term adherence (Deci and Ryan, 2008). A related concept is psychological defiance, describing a tendency to resist external advice or authority (Van Petegem *et al.*, 2013).

While previous HLC studies have relied primarily on objective PA measurement using accelerometers such as the SenseWear Armband, self-reported PA (SR-PA) offers a complementary perspective. SR-PA is widely used in public health research due to its feasibility and low cost and has been shown to correlate reasonably well with objective biological markers of

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cardiovascular health (Holen *et al.*, 2012). SR-PA captures participants' perceived activity levels, which may be more sensitive to intervention-related changes in behaviour than device-based measures, particularly when the devices themselves influence activity. However, the responsiveness of SR-PA to HLC interventions, and the motivational and sociodemographic factors that predict it, remain poorly understood.

Aim

This study aimed to examine changes in SR-PA following participation in a three-month behaviour change intervention at Norwegian HLCs, compared with a waiting-list control group. In addition, we explored whether motivational and sociodemographic factors predicted SR-PA levels and changes over a six-month follow-up period.

Methods

Design

Participants were eligible for inclusion if they met the criteria for services offered by the HLCs. They had to be at least 18 years old, and able to engage in a group programme delivered in Norwegian. Individuals with severe mental illness, learning disabilities, or those seeking only a tobacco cessation intervention were excluded. The study was preregistered at ClinicalTrials.gov (NCT02247219). The study protocol has been published previously (Abildsnes *et al.*, 2017) and is available online.

Randomization and allocation concealment

Participants were randomized using a random number list with a 1:1 allocation ratio. A project coordinator working outside the HLC premises assigned participants to the intervention or waiting-list control group using numbered sealed envelopes after baseline assessment and registration of inclusion data. Allocation concealment was thereby ensured for personnel involved in participant enrolment. Randomization was stratified by trial site and performed in blocks of 20 to avoid uneven distribution across HLCs. Baseline characteristics were assessed descriptively to evaluate comparability between groups following randomization.

Setting

Twelve HLCs from the West and South coasts of Norway were invited to participate in the study. Four of them declined, one due to concurrent research activity. The remaining eight municipalities represented a combined population of 630,000, including both rural and urban areas (6,000–270,000 residents). Since one HLC served three municipalities, six centres were included.

The intervention

Participants began with an individual counselling session (30–60 minutes) to set behaviour change goals using motivational interviewing and cognitive behavioural therapy techniques. During the three-month programme, they received self-help resources such as apps, recipes, and cookbooks and participated in group-based PA classes. The sessions included Nordic walking, competitive games, light strength training and stretching tailored to their health needs. Attendance at a minimum of two sessions per week was required. The specific implementation of interventions varied across HLCs depending on local policy, competence, and resources.

In addition, they were offered a Healthy Eating course (10 hours) covering nutrition fundamentals. After 12 weeks, progress was reviewed, and support could be extended for up to a year if needed. Participants were encouraged to transition to local resources to sustain their progress.

Study period, population and data collection

Self-reported measurements of physical activity

The study period, participant flow and data collection are presented in Figure 1. To assess SR-PA, the survey included two questions about exercise habits. The questions were comparable to a Norwegian population survey (Krokstad *et al.* 2013). The first question asked was: *'On average, how long are you physically active each day?'* with the following response options:

1. *Less than 10 minutes each day*
2. *11–20 minutes each day*
3. *21–40 minutes each day*
4. *41–60 minutes each day*
5. *More than 60 minutes each day*

The second question asked about exercise intensity: *'How hard do you exercise?'* with the following response options:

1. *I take it easy without getting breathless or sweaty*
2. *I get a little breathless and sweaty*
3. *I definitely get breathless and sweaty*
4. *I am almost totally exhausted*

Responses were categorized using a Likert scale with five options for one question and four for the other. The five-answer question was recoded into four categories. The scores from these two questions were then used to create a normally distributed composite score utilized in sensitivity analyses.

Predictors (explanatory variables)

Participants' education levels were categorized into three groups: Low (upper-secondary school or below), Middle (upper-secondary school general studies or vocational training), and High (university or university college).

Self-efficacy for PA was measured using a questionnaire previously utilized in Norwegian studies (Hansen *et al.*, 2014). Participants rated their confidence in carrying out planned PA despite potential barriers on a 7-point Likert scale, ranging from 'not at all confident' to 'extremely confident.'

Social support for PA from friends and family was assessed using a six-item scale. This scale was developed by Sallis *et al.* (1987) and has been previously utilized in Norwegian studies (Hansen *et al.*, 2015).

Psychological defiance, defined as a tendency to resist or reject advice and opinions from authority figures, was measured with four items originally developed in research on parenting styles and shown to have strong internal consistency. The wording of these items was adapted to the context of this study (Van Petegem *et al.*, 2013; Vansteenkiste *et al.*, 2014).

The Treatment Self-Regulation Questionnaire (15 items) was used to measure the extent of autonomous or self-determined motivation for a behaviour. This instrument has been validated by Levesque *et al.* (2007) and used in Norwegian studies (Mildestvedt *et al.*, 2007). The questionnaire included subscales for amotivation (3 items), controlled motivation (6 items), and autonomous motivation (6 items), all rated on a 7-point

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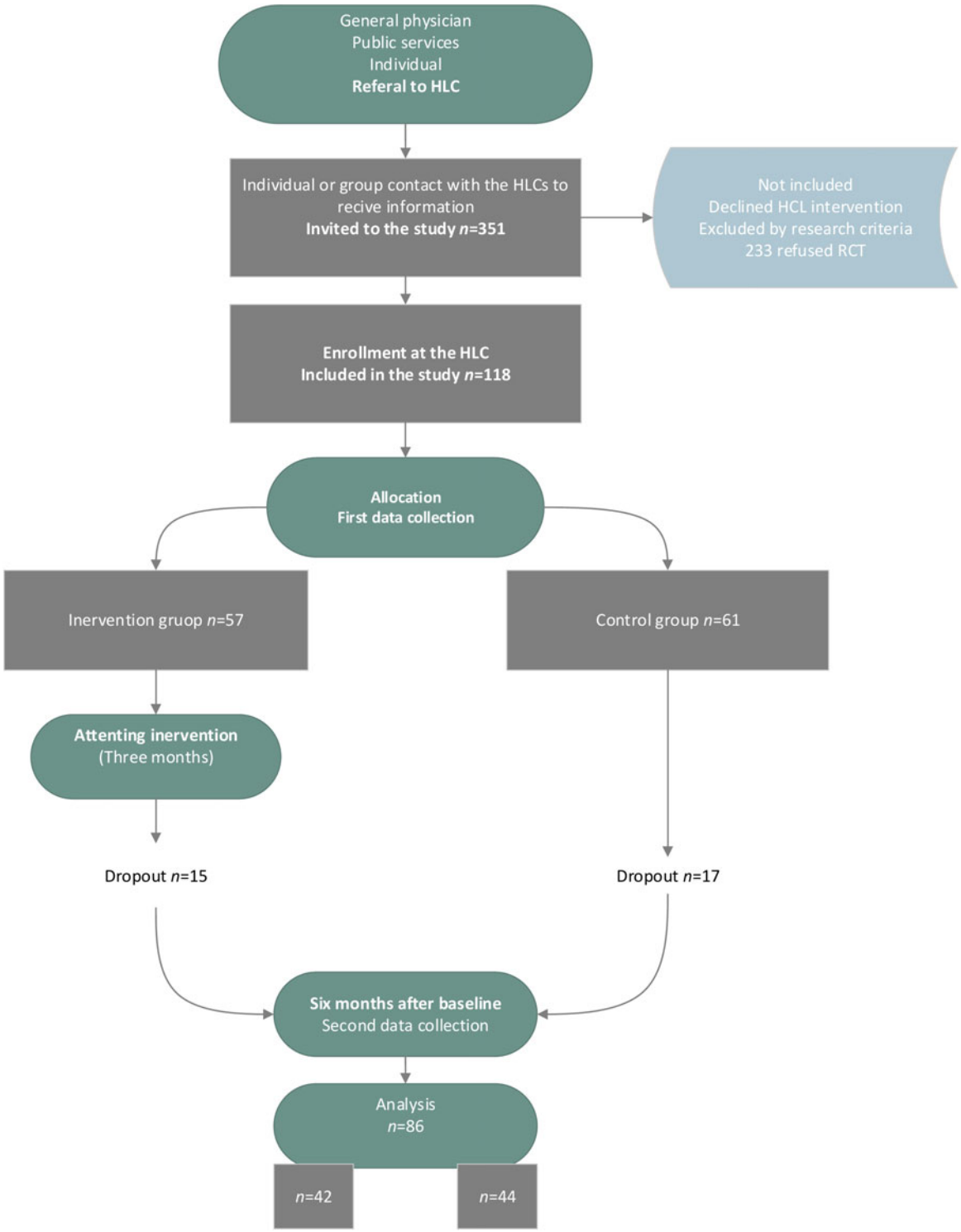


Figure 1. A total of 351 individuals were invited to participate, referred by either a general physician or public services. After applying research criteria and excluding those who declined the intervention, 118 participants were enrolled and randomized to an intervention group ($n = 57$) and a control group ($n = 61$). Following three months of intervention and a six-month follow-up, 32 participants dropped out (15 from the intervention group, 17 from the control group), leaving 86 participants (42 in the intervention group, 44 in the control group) for final analysis. Data collection was conducted at baseline and at six months.

Likert scale from 'strongly disagree' to 'strongly agree.' Example items included: 'I really don't think about it,' 'Because I want others to see that I can do it,' and 'Because I feel responsible for my health.'

Internal consistency reliability in the current sample was acceptable to high for most scales. Cronbach's alpha was 0.93 for self-efficacy for physical activity, 0.85 for social support for physical activity, 0.81 for autonomous regulation, 0.73 for

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Table 1. Baseline characteristics of participants by intervention and control group. Continuous variables are presented as means and standard deviations (SD). Categorical variables are presented as counts (n) and percentages (%)

Variables		Total	Intervention	Control group
Total	*n (%)*	118 (100)	57 (48.3)	61 (51.7)
Self-reported PA (1–4)	*Mean (SD)*	2.4 (0.7)	2.4 (0.8)	2.4 (0.7)
BMI	*Mean (SD)*	34.0 (5.8)	33.8 (6.2)	34.1 (5.4)
Female	*n (%)*	91 (77.1)	45 (78.9)	46 (75.4)
Age in years	*Mean (SD)*	48.6 (13.4)	47.7 (13.3)	49.4 (13.5)
Education				
Low: upper-secondary school or below	*n (%)*	44 (37.6)	17 (29.8)	27 (45.0)
Middle: upper-secondary school general studies	*n (%)*	21 (17.9)	15 (26.3)	6 (10.0)
High: university college and/or university	*n (%)*	52 (44.4)	25 (43.9)	27 (45.0)
Gross family income				
≤400,000 NOK	*n (%)*	46 (39.3)	23 (41.0)	23 (37.0)
>400,000 NOK	*n (%)*	71 (60.7)	33 (58.8)	38 (62.2)
Amotivation (1–7)	*Mean (SD)*	2.3 (1.3)	2.4 (1.2)	2.3 (1.3)
Autonomous regulation (1–7)	*Mean (SD)*	6.1 (0.9)	6.1 (1.0)	6.1 (0.8)
Controlled regulation (1–7)	*Mean (SD)*	4.1 (1.2)	4.0 (1.3)	4.0 (1.1)
Defiance (1–5)	*Mean (SD)*	1.9 (0.8)	2.0 (0.9)	1.9 (0.8)
Social support for PA (1–6)	*Mean (SD)*	3.2 (1.0)	3.3 (1.0)	3.1 (1.0)
Self-efficacy for PA (1–7)	*Mean (SD)*	4.6 (1.6)	4.4 (1.8)	4.8 (1.4)

controlled regulation, 0.56 for amotivation, and 0.73 for general social support (OSS-3).

Statistical analysis

All statistical analyses were conducted using SPSS (IBM Statistical Package for the Social Sciences, version 29.0.1.0). We report unstandardized regression coefficients (B) with 95% confidence intervals (CI), emphasizing effect sizes and their precision rather than p-value thresholds. In addition, intervention effects were expressed in standardized units by dividing B by the pooled SD at follow-up, providing an effect size comparable to Cohen's d.

Descriptive statistics were used to summarize the data. Means and standard deviations (SD) were calculated for continuous variables, while categorical variables were reported as counts (*n*) and percentages (%) (Table 1).

SR-PA was the primary outcome, derived from two survey questions and recoded into a composite score with a normal distribution. This score formed the basis for the main analyses and was further examined in sensitivity analyses and correlation tests. Analyses were conducted as complete-case analyses including participants with available baseline and six-month follow-up data. Missing outcome data were not imputed due to the relatively small sample size and exploratory nature of the analyses.

The effect of the intervention on SR-PA was estimated using linear regression models (Tables 2 and 3). In subsequent analyses, associations between SR-PA and sociodemographic or motivational factors were examined with regression models. Two complementary approaches were applied:

1. **Temporal causal analysis** (Table 4): Predictors were entered individually into regression models adjusted for age, gender, and randomization group. This approach provides insight into predictors of SR-PA at follow-up but may be biased if baseline differences exist.
2. **Residual change analysis** (Table 5): Regression models were additionally adjusted for baseline SR-PA, allowing estimation of change in PA over time while controlling for initial activity levels.

Both approaches have strengths and limitations. Temporal causal models are useful for identifying predictors without conditioning on baseline, but residual confounding remains a concern. Residual change models better control for baseline activity and estimate within-person changes, though they may be sensitive to measurement error. Previous methodological work highlights the importance of adjusting for time-varying confounding and clearly stating model assumptions (Mansournia *et al.*, 2019; Simonsen *et al.*, 2025).

Tables are referenced consistently, and results are presented with regression coefficients, CI, and effect size estimates to ensure transparency and interpretability.

Model assumptions were evaluated prior to regression analyses. Multicollinearity was examined using the Variance Inflation Factor, with all predictors showing values close to 1 (ranging from 1.0 to 1.1), indicating no issues with collinearity. Independence of residuals was examined with the Durbin–Watson statistic, which was close to 2 (≈2.1), indicating that the residuals were independent of each other. Inspection of residual and P–P plots further indicated that residuals were normally distributed and randomly dispersed.

Normality of the SR-PA variables was examined by skewness and kurtosis. For baseline and six-month follow-up SR-PA, skewness ranged from −0.04 to 0.10 and kurtosis from −0.69 to

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Table 2. SR-PA at baseline and 6-month follow-up for the intervention and control groups. Results are presented as means (SD), as well as regression coefficients (B), *p*-values, and 95% confidence intervals (CI)

Outcome	*Baseline*			*6 months follow-up*			*Regression*		
SR-PA	*N*	Mean	SD	N	Mean	SD	B	*p*-Value	95% CI
(Control)	61	2.4	0.7	43	2.4	0.7	0.00		Ref
Intervention	57	2.4	0.8	42	2.6	0.7	0.21	0.18	(−0.10; 0.52)

Table 3. Linear regression analysis of change in SR-PA from baseline to 6-month follow-up, adjusted for baseline SR-PA. Results are presented as unstandardized regression coefficients (B), *p*-values, and 95% confidence intervals (CI)

	B	*p*-Value	95% CI
Baseline SR-PA	0.49	<0.001	(0.31; 0.68)
Intervention	0.26	0.06	(−0.01; 0.53)

−0.61, all within acceptable thresholds (skewness < 2, kurtosis < 1). Group-specific analyses (intervention vs. control) confirmed similar values, with skewness ranging from –0.15 to 0.07 and kurtosis from –0.97 to –0.37. Motivational predictors (autonomous and controlled regulation, amotivation, social support, defiance, and self-efficacy) likewise showed values within acceptable limits. These results support the assumption of approximate normality and justify the use of linear regression.

Ethical approval

Prior to enrolment, all participants provided informed consent. The study was approved by the Regional Committee for Medical and Health Research Ethics (no. 2013/1291).

Results

Of the 118 participants included, 77% were women with a mean age of 48.5 years. Average SR-PA was 2.4 on a four-point scale across all groups. BMI values were similar, most participants (44%) had a high level of education, and 61% reported a gross family income above 400,000 NOK.

Psychosocial measures were likewise similar. Autonomous regulation was consistently high (mean 6.1), whereas amotivation and defiance were low (2.3 and 1.9, respectively). Social support for PA and self-efficacy for PA showed small differences but remained comparable between groups. Overall, the intervention and control groups were well matched on demographic and psychosocial characteristics, with only negligible differences (Table 1).

Tables 2 and 3 show the estimated effect of the intervention on SR-PA. At the 6-month follow-up, participants in the intervention group reported higher SR-PA (mean 2.6, SD 0.7) compared with the control group (mean 2.4, SD 0.7). In the adjusted regression model, the intervention was associated with increased SR-PA (B = 0.26, 95% CI −0.01 to 0.53), which corresponds to ≈0.37 SD, indicating a small-to-moderate standardized effect size. While the confidence interval included zero, the estimate remained compatible with a modest positive intervention effect. Baseline SR-PA was a strong predictor of follow-up levels (B = 0.49, 95% CI 0.31−0.68), underlining the importance of initial activity patterns when evaluating intervention effects.

Multiple linear regression analyses examined the associations between predictors and SR-PA at follow-up, adjusted for age, gender, and randomization group (Table 4). Autonomous regulation, social support for PA, and self-efficacy for PA were all positively associated with SR-PA, suggesting that higher internal motivation, greater confidence in engaging in PA, and external social support contribute to increased activity. In contrast, defiance was negatively associated with SR-PA, indicating that individuals resistant to external influence may be less likely to engage in PA. Participants with middle education reported lower SR-PA compared with those with higher education (B = −0.44, 95% CI −0.86−0.00), with the upper bound at zero indicating uncertainty.

Table 4. Associations between psychosocial and demographic predictors and SR-PA at 6-month follow-up (temporal causal model). Linear regression analyses were conducted to examine associations between each predictor SR-PA at follow-up, without adjusting for baseline SR-PA. All models were adjusted for age, gender, and RCT group. Results are presented as unstandardized regression coefficients (B), *p*-values, and 95% confidence intervals (CI)

Self-reported physical activity at 6 months			
Variables	*B*	*p*-Value	95% CI
Gender	0.12	0.51	(−0.25; 0.50)
Age	−0.001	0.87	(−0.1; 0.01)
RCT	0.21	0.18	(−0.10; 0.52)
Low education	0.03	0.86	(−0.31; 0.37)
Middle education	−0.44	0.05	(−0.86; 0.00)
High education	0 (ref)	0 (ref)	
Income ≤ 400,000 NOK	0 (ref)	0 (ref)	
Income > 400,000 NOK	0.10	0.56	(−0.23; 0.43)
Amotivation	−0.03	0.63	(−0.16; 0.10)
Autonomous regulation	0.19	**0.04**	(0.01; 0.37)
Controlled regulation	0.07	0.33	(−0.07; 0.21)
Defiance	−0.20	**0.04**	(−0.39; −0.01)
Social support for PA	0.21	**0.01**	(0.05; 0.36)
Self-efficacy for PA	0.11	**0.04**	(0.01; 0.21)

In Table 5, the model was further adjusted for baseline SR-PA to assess change in PA rather than absolute levels. This adjustment resulted in several notable differences in effect sizes and significance.

After adjustment for baseline SR-PA, autonomous regulation remained positively associated with change in SR-PA (B = 0.18, 95% CI 0.03−0.33), while defiance remained negatively associated (B = −0.23, 95% CI −0.40 to −0.07). Social support and self-efficacy showed little evidence of association with change, as the 95% CI included zero. The intervention effect was estimated as B = 0.26 (95% CI −0.01 to 0.53); although the CI included zero, the estimate remained compatible with a modest increase in SR-PA. Estimates for education, income, age, gender, amotivation, and controlled regulation were close to null or had wide CIs spanning zero.

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Table 5. Associations between psychosocial and demographic predictors and change in SR-PA from baseline to 6-month follow-up (residual change model). Linear regression analyses were conducted to examine associations between each predictor and change in SR-PA from baseline to follow-up. All models were adjusted for age, gender, RCT group, and baseline SR-PA. Results are presented as unstandardized regression coefficients (B), *p*-values, and 95% confidence intervals (CI). Bold indicates $p < 0.05$

Self-reported physical activity changes during 6 months			
Predictors	*B*	*p*-Value	95% CI
Gender	0.13	0.43	(−0.19; 0.45)
Age	0.00	0.73	(−0.01; 0.01)
RCT	0.26	0.06	(−0.01; 0.53)
Baseline SR-PA	0.50	**<0.001**	(0.31; 0.68)
Low education	−0.05	0.76	(−0.35; 0.26)
Middle education	−0.27	0.17	(−0.66; 0.18)
High education	0 (ref)	0 (ref)	
Income < 401,000 NOK	0 (ref)	0 (ref)	
Income ≥ 401,000 NOK	0.02	0.88	(−0.27; 0.31)
Amotivation	−0.03	0.66	(−0.14; 0.09)
Autonomous regulation	0.18	**0.02**	(0.03; 0.33)
Controlled regulation	0.07	0.24	(−0.05; 0.19)
Defiance	−0.23	**0.01**	(−0.40; −0.07)
Social support for PA	0.12	0.09	(−0.02; 0.27)
Self-efficacy for PA	0.03	0.57	(−0.07; 0.12)

Sensitivity and reliability analyses

Sensitivity analyses showed moderate positive correlations between SR-PA and objectively measured MVPA by armband. At baseline, SR-PA correlated with MVPA ($r = 0.43$, $p < 0.001$, $N = 116$). At six-month follow-up, the correlation remained significant though slightly attenuated ($r = 0.37$, $p < 0.001$, $N = 79$).

The two SR-PA items (duration and intensity) demonstrated a Cronbach's alpha of 0.47, indicating modest internal consistency. This suggests that the two items should not be interpreted as interchangeable indicators of a single construct. However, the items may capture related but partially distinct dimensions of physical activity behaviour, including duration and intensity. The corrected item–total correlation was 0.31, and moderate correlations with objectively measured MVPA support some degree of construct validity.

Discussion

This study examined changes in self-reported physical activity (SR-PA) following participation in a three-month behaviour change programme at Norwegian HLCs. Autonomous motivation, self-efficacy for PA, and social support were positively associated with SR-PA, while psychological defiance showed a negative association. Education level was also a potential predictor, with individuals in the middle education category reporting lower SR-PA compared with those with higher education. The intervention effect was not statistically significant ($B = 0.26$, 95% CI −0.01 to 0.53, ≈0.37 SD). The confidence interval included zero, and the finding should be interpreted with caution.

While the finding is inconclusive, even modest increases in PA may carry public health relevance, given that small improvements in activity levels are associated with reduced risk of non-communicable diseases (Yerrakalva *et al.*, 2023; Ekelund *et al.*, 2024).

Our findings contrast with those of Samdal *et al.* (2018), who reported no intervention effect on MVPA measured with accelerometers. This discrepancy likely reflects fundamental differences between measurement approaches. SR-PA captures perceived activity, which may be more sensitive to intervention-related changes in behaviour, while accelerometers reflect objective movement. Importantly, wearing an activity monitor may itself function as a behaviour change technique, potentially inflating PA levels in both groups and obscuring true intervention effects (Samdal *et al.*, 2017). SR-PA is not without limitations either. Studies show that self-report instruments tend to overestimate PA compared to accelerometer-based measurements, and validity varies by individual factors such as obesity and gender (Steene-Johannessen *et al.*, 2016; Davies *et al.*, 2024; Arumugam *et al.*, 2024). Despite this, SR-PA has shown reasonable validity against objective biological markers of cardiovascular health (Holen *et al.*, 2012), and in our study demonstrated construct validity through expected associations with motivational factors.

Compared to a study focusing on Chinese adolescents (Yiming *et al.*, 2023), our findings similarly demonstrated that both social support and self-efficacy play crucial roles in promoting PA. While their study highlighted these factors as key mediators in adolescent activity levels, our results extend this insight to an adult population, showing strong associations between social support, self-efficacy, and increased SR-PA. These findings suggest that interventions targeting self-efficacy and social support may be effective across different age groups and settings.

An important aspect that emerged was the interplay between autonomy and defiance. A recent systematic review found that competence, intrinsic regulation, and identified regulation, which are key constructs of Self-Determination Theory, positively influence PA across different age groups (Xu *et al.*, 2025). This aligns with earlier SDT-based research demonstrating that autonomy fosters sustained behaviour change, whereas perceived external control can provoke defiance and undermine adherence (Van Petegem *et al.*, 2015; De Meyer *et al.*, (2015). In our study, participants who approached the intervention with a sense of autonomy appeared to derive greater benefit, whereas those showing signs of defiance experienced lower PA levels during and after the 6-month observation period.

This highlights the importance of how interventions like HLCs are communicated and delivered. Interventions that support participants' sense of ownership and autonomous decision-making, rather than imposing external pressure, may enhance long-term adherence and effectiveness. Ahmadi *et al.* (2023) developed a classification of SDT-based motivational behaviours, identifying specific actions that support autonomy, competence and relatedness, as well as behaviours that should be avoided. This framework may offer practical guidance for how HLC counsellors structure their interactions with participants.

The two SR-PA items (duration and intensity) demonstrated a Cronbach's alpha of 0.47, indicating modest internal consistency, as discussed by Tavakol and Dennick (2011). This suggests that the two items should not be interpreted as interchangeable indicators of a single construct. However, the items may capture related but partially distinct dimensions of physical activity behaviour, including duration and intensity. The corrected item–total correlation was 0.31, and moderate correlations with objectively measured MVPA support some degree of construct validity. In contrast, Samdal *et al.* (2018) reported that motivational factors

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did not predict objectively measured MVPA, highlighting possible differences between self-reported and device-based assessments.

The intervention was delivered across several HLCs with some variation in implementation, staffing, and available resources. Although this reflects real-world primary care practice and strengthens ecological validity, it may also have introduced heterogeneity in intervention exposure and reduced the ability to detect consistent effects across sites.

Beyond measurement considerations, participant attrition represents another limitation. The study experienced a dropout rate of approximately 30%. Participants with mental health challenges, musculoskeletal issues, or chronic somatic diseases were more likely to leave the study. This may be due to these groups facing greater challenges in adhering to the intervention. However, the study administration did not receive permission from Regional Committee of Ethics to ask the participants why they left the study.

This level of attrition may have introduced selection bias, as participants who remained in the study were likely more motivated and healthier at baseline, which could limit the generalizability of our findings to broader HLC populations. Complete-case analyses may also have introduced bias if participants lost to follow-up differed systematically from participants who completed the study. However, attrition rates were similar in both groups, which may have reduced the risk of differential attrition bias between intervention and control participants.

Conclusion

Participation in the Healthy Life Centre programme was associated with a small increase in SR-PA at six months. While the effect estimate was imprecise ($B = 0.26$, 95% CI −0.01 to 0.53), corresponding to ≈0.37 SD, the estimated effect size was compatible with a modest increase in SR-PA. Autonomous motivation was positively associated and defiance negatively associated with activity. These findings underline the importance of motivational and psychosocial factors in sustaining behaviour change. Although the intervention effect was modest, even small improvements in PA may have meaningful public health benefits.

Data availability statement. The data supporting the findings of this study are not publicly available due to ethical restrictions. De-identified participant data may be made available upon reasonable request to the corresponding author.

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