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Service Evaluation of an Exercise on Referral Scheme for Adults with Existing Health Conditions in the United Kingdom

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Abstract
Purpose This paper outlines a service evaluation of an exercise referral scheme for adults suffering from a variety of physical or mental health conditions or who were deemed are at risk of developing such conditions. The evaluation aimed to assess the impact of the scheme at increasing physical activity and at reducing BMI and waist circumference.
Method This was a retrospective evaluation looking at levels of physical activity and changes to anthropometric measures over a period of 6 months. Each participant self-reported their levels of physical activity for the previous 7 days at three time points: baseline (T1), at 12-week exit from the scheme (T2), and at 6-month follow-up (T3). Waist circumference and BMI were also recorded by either a health professional or self-reported at these time points.
Results Six hundred seventy participants were referred during the evaluation period, of whom 494 were eligible. Of those 494, 211 completed the 12-week scheme and 135 completed a 6-month follow-up. Significant increases in levels of physical activity were recorded between T1 and T2 and between T1 and T3. Furthermore, significant reductions in waist circumference were noted between T1 and T2 and between T1 and T3, and BMI significantly decreased between T1 and T2 but significantly increased between T2 and T3.
Conclusion The service has proven effective at increasing levels of physical activity among participants and has had a positive impact on waist circumference and BMI for clients who remain engaged with the programme.

Keywords Public health · Exercise programmes · Service evaluation · Physical activity

Introduction

Increasing physical activity (PA) levels has the potential to improve physical and mental health, lead to a reduction in mortality, improve life expectancy [1] and lower the risk of coronary heart disease (CHD) [2, 3]. The Chief Medical Officer (CMO) recommends that adults should be active daily, completing at least 150 min of moderate intensity activity per week in bouts of 10 min or more [1]. Evidence suggests these levels of PA can lower the risk for a number of chronic illnesses such as cardiovascular disease (CVD), cancer, and diabetes [4–6]. Despite this, it is estimated that between 50 and 80% of the adult population of England do not meet these guidelines [7].

The relationship between PA and reduced risk of chronic illness is linear such that even small increases can result in health benefits even if the CMO recommended levels are not reached [8–10]. Whilst a number of government schemes have been proposed which aim to increase levels of PA nationwide, exercise referral schemes (ERSs) have been shown to significantly increase the proportion of people becoming moderately active [11, 12]; however, these changes may not persist over time [13, 14].

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ERSs are commonly employed by local authorities within the UK; such schemes provide clients with advice from professionals and access to a variety of structured exercise programmes and can increase a participant's intention to engage in PA in the future [15–17]. There is often wide variation in the content, target population, length of programme, and outcome measures used in these schemes [12, 18–20]. Interventions tend to be delivered via walking schemes, aerobic classes, or gym-based activities [21] and often target different vulnerable groups such as stroke patients [22] and people with obesity, high blood pressure, and/or mental health difficulties [23]. A review by Morgan [24] concluded that ERSs are successful at promoting PA in certain groups such as older adults and those who are overweight who are already slightly active. However, Morgan also concludes that schemes can suffer from low attendance and echoes the findings of Pavey et al. [14] that there is often a lack of adherence to exercise at long-term follow-up [24]. With this in mind, and due to the wide variation in available ERSs within the UK, it is important to evaluate such schemes to see if they have any impact on increasing PA.

This paper reports a co-production evaluation which was part of a larger study between a university and a local authority in the North East of England looking at how academics and public health practitioners can work together to evaluate locally commissioned services [25–28]. Often evidence informing public health initiatives tends to be dominated by tightly controlled, university-led intervention trials, which can raise questions about how translational findings are [29]. It is hoped that by academics and practitioners working together, the results will be more meaningful to those who commission services [30]. The main aim of the evaluation was to assess the impact of the scheme at increasing physical activity for adults with an existing health condition or those at risk of developing health conditions.

Methods

Recruitment

Anonymised data was extracted from a database compiled by the service providers between January and March 2014. As this was an evaluation of an existing scheme, no control group was recruited. The scheme was available for local residents aged 17 or older, who were not meeting the CMO recommended levels of PA, with a specific focus on individuals who were participating in less than 30 min of activity per week. It was aimed at participants with existing health conditions or those at increased risk of developing health conditions. Participants were referred into the scheme by health professionals such as General Practitioners (GPs) or physiotherapists who would assess eligibility via the Physical Activity Readiness questionnaire [31].

Intervention

The ERS consisted of a structured 12-week exercise programme, delivered by trained exercise professionals in gyms and community centres. Upon entry to the scheme, clients were offered the choice of a wide variety of physical activities such as supervised gym sessions, seated aerobics, step classes, circuit training, and swimming.

Outcome Measures

The primary outcome measure for this evaluation was the total number of minutes of PA assessed using the 7-day Physical Activity Recall (7D-PAR) [32]. This was administered upon entry to the ERS by an exercise professional who asked participants to recall how much PA they had completed in the previous week. This was re-administered at 12-week exit from the scheme and at 6-month follow-up.

Waist circumference and BMI were measured by a health professional on entry to the scheme and again at 12 weeks and 6 months. In cases where a client was not available for a face to face follow-up consultation, they were asked to self-report these measures over the telephone. Data on the number of participants who self-reported their BMI and waist circumference at follow-up appointments was not recorded.

Ethical Approval

Research ethics approval was granted by Newcastle University research ethics committee and by the local authority's research governance department. All participants registered with the scheme gave written consent for their data to be used for research and evaluation purposes upon entry to the service.

Statistical Analysis

A Friedman's test was used to analyse differences in self-reported levels of PA at the three time points; where a significant result was identified, post hoc testing was performed using a Wilcoxon signed ranks test with a Bonferroni-corrected p value of 0.016 to indicate significance. Friedman's tests were used to analyse differences in PA as data were not normally distributed.

Changes in waist circumference and BMI were assessed using repeated measure ANOVAs as data was normally distributed. Where a significant result was identified, post hoc tests were performed using paired sample t tests with a Bonferroni-corrected p value of 0.016 to indicate significance.

A series of Kruskal Wallis tests was used to look for differences in levels of PA based on referral reason to the ERS, age range, gender, employment status, and ethnicity. Finally, a series of one-way ANOVAs was conducted to look for differences in waist circumference and BMI over time based on referral reason, age range, gender, ethnicity, and employment status.

Results

Participant Characteristics

Of the 670 participants who were referred to this service during this period, 176 were excluded from the analysis as they were already participating in more than the CMO recommended 150 min of PA per week upon entry to the service. All analysis below relates to the remaining 494 participants who were not already active. Attrition rates for the ERS can be seen in Fig. 1.

Of those 494 participants, 211 completed the 12-week scheme (42.7%) and 135 completed their 6-month follow-up (27.3%).

Table 1 outlines the demographic information for the cohort as a whole based on age, gender, ethnicity, employment status, and social deprivation and which health professional referred them to the ERS. This is split by those who were included in the evaluation and those who were excluded due to high levels of self-reported PA at baseline. Participants who were referred to the ERS between January and March 2014 and thus included in the evaluation were predominantly White British women, employed, and referred by a GP. As this was a retrospective evaluation, the authors cannot say why more men and ethnic minorities were not referred to the ERS; however, as it was based in the North East of England where the majority of the population is White British, it is understandable that most participants are from this ethnic background.

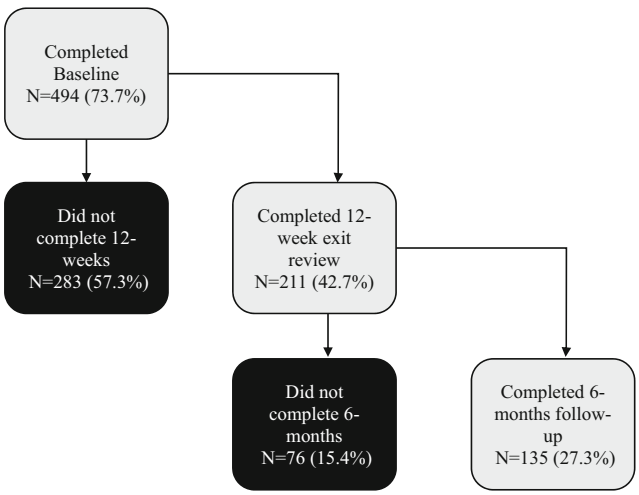

Fig. 1 Attrition rates from the service

Ages of participants ranged from 17 to 91 years old (M = 51.7, SD = 15.7). Participants were referred to the scheme for a variety of health conditions or if they were deemed at risk of developing a health condition in the future, for example if they had a high BMI. The most common reasons for referral to the ERS were BMI > 30 (20.9%), back pain (15.4%), mild to moderate depression (13.4%), and diabetes (7.9%). Table 2 outlines the various referral reasons for participants, split by those who were included in or excluded from the evaluation.

Changes in Self-Reported Levels of PA

A total of 123 participants completed this measure at least twice (baseline, 12-week follow-up, and 6-month follow-up). The Freidman test demonstrated that there was a significant change in the number of minutes engaging in at least moderate levels of PA, from baseline (median = 0), rising to 12-week follow-up (median = 180), and at 6-month follow-up (median = 180) ($\chi^2(2, N = 117) = 103.9$, $p < .001$).

Post hoc testing revealed that there was a large significant increase in the median level of PA between baseline and 12 weeks ($p < 0.001$) ($r = -0.68$) and a moderately significant increase in median levels of PA between baseline and 6 months ($p < 0.001$) ($r = -0.53$). However, when comparing 12 weeks to 6 months, no differences were observed. These results are summarised in Table 3.

No differences were observed when looking at changes in PA over time based on referral reason, age range, gender, employment status, or ethnicity of participants.

Changes in Waist Circumference (cm)

A total of 131 participants provided waist measurements at at least two time points (baseline, 12-week follow-up, and 6-month follow-up). A repeated measure ANOVA demonstrated that there was a significant change in the mean waist circumference between baseline (105.6 cm (SD = 15.3)), 12-week follow-up (102.6 cm (SD = 14.2)), and 6-month follow-up (101.4 cm (SD = 14.6)); ($F(2, 56) = 26.9$ $p < 0.01$).

Post hoc testing revealed that there was a small significant reduction in the mean waist circumference between baseline and 12 weeks ($p < 0.001$) ($r = -0.18$) and a small significant decrease in waist circumference between baseline and 6 months ($p < 0.001$) ($r = 0.29$). No difference was observed when comparing 12-week follow-up and 6-month follow-up ($p > 0.016$) ($r = -0.07$). These results are summarised in Table 4.

There was a statistically significant difference in waist circumference at 12 weeks between men and women ($F(1,$

Table 1 Participant characteristics

	All referrals	Excluded from evaluation	Included in the evaluation
	N	*N*	*N*
Age			
17–24	32	7	25
25–34	64	11	53
35–44	86	14	72
45–54	113	14	99
55–64	143	36	107
65–74	120	17	103
75+	30	9	21
Not stated	82	68	14
Gender			
Male	171	59	112
Female	499	117	382
Deprivation decile			
20% most deprived	165	33	132
21–40%	190	68	122
41–60%	194	44	150
61–80%	89	23	66
81–100% least deprived	25	7	18
Not stated	7	1	6
Employment			
Unemployed	119	33	86
Employed	307	72	235
Student	4	0	4
Retired	198	66	132
Other	0	0	0
Not stated	42	5	37
Ethnicity			
White British	569	168	401
Other White	4	1	3
Caribbean	2	0	2
Chinese	2	0	2
White and Black	3	1	2
Other	2	0	2
Not stated	88	6	82
Referrer			
GP	380	96	284
Physio	101	26	75
Nurse	114	31	83
OT	1	1	0
Dietician	1	0	1
Cardiac	63	19	44
Other	10	3	7
Not stated	0	0	0
Total	670	176	494

124) = 6.799, $p = 0.01$ $\eta p^2 = 0.052$). A significant difference was also observed when comparing waist circumference at 12 weeks by referral reason ($F(15,106) = 2.107$, $p = 0.015$, $\eta p^2 = 0.230$). No other differences were observed.

Table 2 Primary referral reason

	All referrals	Excluded from the evaluation	Included in the evaluation
Referral reason	*N*	*N*	*N*
Depression—mild to moderate	78	12	66
Anxiety/other mental health	25	7	18
IGT/IFG	3	2	1
Diabetes	59	20	39
COPD	27	4	23
Rheumatoid arthritis	5	1	4
Back pain	99	23	76
BMI > 30	129	26	103
Hypertension (on medication)	22	5	17
Hypertension (no medication)	26	5	21
Stable angina	8	1	7
Cardiac event	59	26	33
CVA	4	0	4
Osteoarthritis	35	7	28
Osteoporosis	1	0	1
Hyperlipidaemia	2	1	1
> 20% CHD risk	1	0	1
CHD prevention	1	1	0
Sedentary lifestyle	12	5	7
Asthma	20	2	18
Smoking	1	1	0
Other	53	27	26
Total	670	176	494

Changes in BMI over Time

A total of 137 participants completed this measure at at least two time points (baseline, 12 weeks, and 6 months). A repeated measure ANOVA showed that there was a significant change in BMI between baseline ($M = 32.1$ (SD = 7.5)), 12-week follow-up ($M = 23.7$ (SD = 15.6)), and 6-month follow-up ($M = 31.9$ (SD = 8.0); $F(2, 70) = 14.675$, $p < 0.001$.

Post hoc testing revealed that there was a large significant reduction in the mean BMI between baseline and 12 weeks ($p < 0.001$) ($r = -0.68$) and a moderate significant increase in BMI between 12 weeks and 6 months ($p < 0.001$) ($r = 0.53$). No difference was observed when comparing baseline and 6-month follow-up ($p > 0.016$) ($r = -0.22$). These results are summarised in Table 4.

Table 3 Differences in PA score over time

Comparison	*N*	Median change	*Z*	*p*	Effect size
T1-T2	123	− 180.0	− 10.731	< 0.001	− 0.68
T1-T3	123	− 180.0	− 8.254	< 0.01	− 0.53
T2-T3	123	0.0	− 0.923	0.356	− 0.06

There was a statistically significant difference in BMI at baseline between men and women as determined by a one-way ANOVA ($F(1, 320) = 6.799$, $p = 0.01$, $\eta p^2 = 0.010$). A significant difference was also observed when comparing BMI at baseline by referral reason ($F(23, 448) = 4.675$, $p < 0.001$, $\eta p^2 = 0.194$) and at 12 weeks ($F(18, 146) = 2.460$, $p = 0.002$ $\eta p^2 = 0.233$). Finally, there was a statistically significant difference observed when comparing BMI at baseline by employment status ($F(11,454) = 2.444$, $p = 0.006$, $\eta p^2 = 0.056$). No other differences were observed.

Discussion

The results of this study have emphasised the potential for ERS schemes to improve the health of adults with existing health conditions. Whilst studies in the past have found ERSs to have some impact at increasing PA, the impact tends to be short term [14]. However, this current study has demonstrated a continued impact on engagement in physical activity with moderately significant increases in PA levels observed between baseline and 12 weeks and baseline and 6 months. Whilst no difference was observed in levels of PA between

Table 4 Differences in waist circumference and BMI score over time

Comparison	*N*	*M*	SD	*t*	Confidence interval	*p*	Effect size (*r*)
Waist circumference							
T1-T2	123	2.9	4.5	7.082	2.091–3.713	< 0.001	− 0.18
T1-T3	68	4.2	5.5	6.343	2.903–5.568	< 0.001	− 0.29
T2-T3	60	1.0	5.4	1.487	− 0.357–− 2.424	0.142	− 0.07
BMI							
T1-T2	70	8.4	13.4	5.226	5.167–11.458	< 0.001	− 0.68
T1-T3	70	1.7	6.6	2.185	0.150–3.311	0.03	− 0.22
T2-T3	70	6.6	14.2	− 3.904	− 10.013–− 3.240	< 0.001	0.53

12 weeks and 6 months, this suggests that participants have maintained their increased levels after leaving the scheme. With research suggesting that people engaging in a new behaviour at 6 months are likely to maintain that change, this suggests that this ERS has the potential to increase engagement in PA long term [33, 34].

Similar results were observed when looking at reductions in waist circumference, with participants who completed the ERS significantly more likely to have reduced their waist circumference at both 12-week follow-up and 6-month follow-up, although the observed differences were small. As, with PA, no difference was observed when looking at waist circumference between 12 weeks and 6 months suggesting waist circumference has remained stable upon exit from the scheme.

However, when looking at BMI, whilst there was a large, significant reduction in BMI between baseline and 12 weeks, there was also a large, significant increase in BMI between 12 weeks and 6 months. This suggests that whilst engaging in the scheme can have a positive impact on BMI, these differences are not maintained long term. Research suggests that reducing waist circumference can reduce the risk of CVD [35] and diabetes [36] whilst high BMI and waist circumference has been associated with premature mortality [37]; this suggests that participation in this scheme has the potential to reduce the risk of developing health conditions. Furthermore, we noted within-group differences in BMI scores for referral reason, gender, and employment status. Within-group differences were also observed in waist circumference for referral reason and gender. However, we were unable to determine the direction of this relationship with the data available. Therefore, work in the future could focus on gender, employment status, and health conditions to ascertain for whom this type of intervention would be most effective.

Whilst there appears to be benefits from participation in this scheme, it should be noted that attrition from this service was high. However, around 42% of those participants included in the evaluation who completed a baseline assessment were still in the scheme at 12-week exit review from the service. Whilst more than half of the cohort dropped out of the service before the end, this compares favourably with similar schemes in the UK, with a recent systematic review showing that an average of 37% of participants complete such schemes [17].

Finally, despite the positive outcomes of this service, there were some limitations which were highlighted by the evaluation. Firstly, due to inconsistencies in data collection methods across the sites used for this service, around 25% of the identified clients had to be excluded from the evaluation as they were recording baseline levels of PA which were higher than CMO recommended levels. This would suggest that either they should not have been referred onto the scheme in the first place or that they were inaccurately reporting their levels of activity. However, it should also be noted that levels of physical activity were self- reported using the 7D-PAR, meaning the results are subjective, and whilst the 7D-PAR has been used extensively in studies looking at population level PA, it has been shown to be a poor predictor of individual level energy expenditure [38]. It is possible that had these individuals been included in the evaluation, then the outcomes could have been different. Furthermore, as this was a service evaluation, we do not have a comparison group; therefore, we cannot say with any certainty that this service was effective at increasing levels of PA. However, we can look at similar studies which have shown that ERSs can significantly increase the number of people becoming moderately active [12]. However, the impact of these schemes reduces over time, such that by 12-month follow-up, participants tend to return to their original levels of activity [39]. Furthermore, some follow-up consultations were conducted via telephone, meaning that BMI and waist circumference for these individuals were also self-reported. However, as the service providers did not record whether a consultation was conducted in person or via the telephone, we are unable to determine how many participants this affected. It may be beneficial in the future if providers of such schemes supplied participants on such schemes with pedometers or direct them to digital lifestyle applications which may help more accurately record engagement in PA.

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Compliance with Ethical Standards

Ethical Approval Research ethics approval was granted by Newcastle University research ethics committee and by the local authority's research governance department. All participants registered with the scheme gave written consent for their data to be used for research and evaluation purposes upon entry to the service.

Conflict of Interest The following authors are, or were previously, employed by Durham County Council who commissioned the evaluation of this service: Gillian O'Neill, Dawn Phillips, and Dr. Lynn Wilson.

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