Abstract

**Background:** Exercise referral schemes (ERS) aim to tackle non-communicable disease via increasing levels of physical activity. Health benefits are reliant on uptake and attending sessions. Hence, it is important to understand any variations in these parameters in order to target interventions to improve uptake and attendance to those who need it most.

**Method:** Secondary analysis of one ERS database was conducted to 1) profile participants’ non-uptake of exercise referral; 2) describe any differences between non-attenders and attenders; and 3) report session count of attenders, exploring any relationship between attender demographics and session count.

**Results:** The study shows, 1) sociodemographic profile of non-attenders is very similar to those who attend; 2) there is a high, early withdrawal rate of attenders where 68% exit the scheme at five exercise sessions or less and; 3) participant demographic characteristics do not influence session count.

**Conclusions:** Knowledge of sub-populations non-uptake of their referral to ERS, and when people stop attending sessions, provides critical information in understanding whom may be at risk of not benefitting from exercise referral.

Introduction

Exercise Referral Schemes (ERS) are a popular primary care-based physical activity (PA) intervention aimed at tackling non-communicable disease (NCD) (1). However, ERSs are under scrutiny for overall effectiveness (1, 2), due to a lack of evidence upon improvements in PA, or reduction in incidences
of NCD (3). Importantly, such outcomes are directly reliant upon individual uptake of ERS referral, attending the designated number of prescribed sessions, and adhering to the prescribed exercises within the programme (4).

Previous research has focused upon participants starting ERS (5, 6). Reviews by Gidlow et al. (7) and Pavey et al. (4) cited uptake in primary studies ranging between 23-60% and 28-100% respectively. However, very little focus has been placed upon explicitly detailing the subgroup who do not uptake their referral. Failing to identify subgroups non-uptake of referral reflects a crucial gap of reporting within ERS (8). Furthermore, it is widely established that dropout from ERS is an issue (9), with attendance completion rates of between from 12% and 50% being reported (9, 10). Previous research has demonstrated that increasing age and being male are positive predictors of completing a programme (11, 12, 13). However, research examining ethnicity, deprivation index, referral reason, or employment status is inconclusive (9, 11, 12, 13, 14, 15).

Common in the ERS literature, adherence is the term used to describe ‘completing the scheme’, where it is defined as either completing a set percentage of sessions within the duration of the scheme (e.g. 75%) (3) or attending an exit interview at the end of the scheme (11). However, such a definition fails to provide equity in assessment across schemes of different durations. Furthermore, it does not take into account what is performed in the exercise sessions, i.e. frequency, intensity, type or time of the exercise prescription. Definitions aside, individuals’ non-uptake of referral or choosing to not complete the designated number of sessions, are likely to limit any associated health benefits from ERS (8). Therefore, in order to understand if ERS is an effective non-pharmacological therapy for NCD, there is a requirement to know of those referred, who does not choose to uptake their treatment (i.e. prescribed exercise), and of those that are, how many sessions they complete.

This study aimed to examine routinely collected data from one ERS in Scotland. Specifically, secondary analysis of an ERS database was used to 1) profile participants’ non-uptake of ERS; 2)
describe any differences between non-attenders and attenders and; 3) report session count of
attenders, exploring relationships between attender demographics and session count.

Methods

Study Design

Anonymised historical data was retrieved on participants who were referred to an ERS in one region
in Scotland across 10 different leisure facilities between October 2016 and September 2017, and
January 2018 to June 2018. A retrospective cross-sectional analysis allowed exploration of
participant characteristics and scheme characteristics (i.e. quality of ERS site leisure facilities) and
their association with uptake and subsequent session count. The University of Stirling general
university ethics panel granted approval (GUEP 212).

Participants

The ERS accepted referrals for adults aged 18 years or above, who were judged by a health care
professional (HCP) in either primary or secondary care, as not meeting PA guidelines and/or were
suffering from a medical condition that could potentially benefit from increased PA. Paper referrals
were sent from HCPs to the nearest leisure facility that was part of the ERS. Then, leisure facility staff
contacted participants by telephone. This telephone consultation allowed staff to take further
details from the participant brief participants about the ERS and answer any questions participants
had of the scheme. Participants were then invited to attend their local facility to register onto the
scheme.

Exercise referral scheme

Administration of ERS in this study is through a leisure trust, registered as a Scottish charity, on
behalf of the local council. The scheme investigated in the present study operated out of 10 different
leisure facilities and was free to attend for participants. Participants enrolled in a 10-week
programme; however, the ERS did not stipulate that the 10 weeks must run consecutively, or when
the programme must start. Referral sessions were run by an exercise referral instructor who held, as
a minimum, a qualification commonly referred to as ‘GP referral’ or ‘exercise referral’ qualification
(11). Participants were enrolled on to one of three different weekly sessions, internally named as
cardio-1, cardio-2, and strength and balance. There was no discernible difference between cardio-1
and cardio-2. Which session participants undertook was based upon their referral condition and
discussion with the exercise referral instructors. Participants were encouraged to attend two
sessions a week. Referral sessions were a mixture of aerobic and resistance style exercises, taken in
a group setting. Sessions lasted between 50 and 60 minutes; consisting of 15 minutes warm up and
cool down, positioned either side of a 20 or 30-minute exercise period. Intensity of the sessions was
recorded on a self-monitoring basis.

Data recording

An in-house routine service database captured data on participants. Data extraction from this
database was completed by one staff member (Health Development Officer) employed at the ERS.
The study used two different sets of data, captured at two different time points. First, data captured
between October 2016 and September 2017 was related to participants’ registration for an ERS
membership and card (which granted access to the facility) and who presented at the leisure facility
and performed a minimum of one exercise referral session. For the purposes of this study, this group
of participants were classified as attenders. Second, between January 2018 and June 2018 data was
captured about participants who were referred to the ERS but chose not uptake referral; that is,
they did not present at the leisure facility. For the purposes of this study, this group are classified as
non-attenders. These were mutually exclusive categories (attenders/non-attenders). Historically
within the ERS, data on non-attenders were never retained. As part of this study, the ERS retained
these data to provide an insight into non-uptake of ERS.
Data made available included the following variables: gender, age, indices of deprivation, reason for referral to ERS, date of obtaining ERS membership (this date was used to calculate time lag, defined below), site location, and date of session. Gender (male and female) was extracted from referral forms, which were pre-populated by the referring HCP. Age was recorded in years extracted from referral forms. Participants were grouped into the following age bands: 16-44, 45-54, 55-64, 65-74 and 75+. Ages from 16 through to 44 were grouped due to small numbers and the data being heavily skewed to older age ranges. Participants’ home postcodes were converted into indices of deprivation according to the Scottish Index of Multiple Deprivation (SIMD) official tool for identifying areas of deprivation (16). Quintiles were measured between one (living in most deprived areas), to five (living in least deprived areas). Referral reasons were grouped into six health conditions, following James et al. (13): cancers, respiratory, neurological, frailty and mobility, musculoskeletal (MSK) and cardiovascular. Time lag was defined as the sum of days between signing a membership agreement and first swiping their membership card to enter the facility in order to undertake their first exercise session. Additionally, time lag was used as a variable of analysis of high and low attendance (defined below). Site location represented where a participant was referred too, and if appropriate, where they undertook their attended ERS. James and colleagues grouped leisure sites via their funding source, i.e., local authority-funded provider (14). Similarly, Hanson (11) grouped schemes across two providers, however no indication is given on the distinction between them. All leisure sites within this research study came from one funding source. Therefore, leisure facilities were graded according to the VisitScotland Quality Assurance Grading Scheme for Visitor Attractions, with grades of 5* Exceptional, 4* Excellent, 3* Very Good, 2* Good, 1* Acceptable (17). Since there was no legal requirement for facilities to sign up for this Quality Assurance Grading Scheme, five sites do not have a grading. Site locations were grouped into the following categories: VisitScotland Quality Assurance star grade 5, 4, 3, 2, or 1 or no record of assessment. Date of sessions was used to create exercise session count, recorded via membership swipe card entry into the facility. Session count was used to represent attendance, which is defined as the number of sessions completed.
This study included two dependant outcome variables, which were (i) non-attendance vs attendance and (ii) session count of attenders. Following Taylor and colleagues (18), a median split of session count acted as a threshold for high or low session count. In addition, in an attempt to compare data with previous research which has reported mean and median figures, the data was assessed for distribution, where the median value was deemed an appropriate measure of centrality in representing skewed data, which is a feature of this dataset. Therefore, those attending median count of sessions or below were classified as low attenders; those completing above the median threshold were classified as high attenders.

**Statistical Analysis**

Analyses were performed using Statistical Package for the Social Sciences version 23 (SPSS Inc., Chicago, IL, USA). Exploratory analyses were undertaken to establish descriptive measures of all independent variables; age, gender, SIMD, referral reason, site location and time lag. Data are presented as mean (range: minimum-maximum) or in pre-defined age bandings. Mean and median (range: minimum-maximum) data is presented for the following results; session count and time lag to provide appropriate clarity on measures of centrality for skewed data. Chi-squared ($\chi^2$) analysis was used to investigate differences between high and low attendance, and attenders and non-attenders; statistical significance was set at $p \leq 0.05$. Where data was unreported (referral reason, SIMD, and gender), individuals are excluded from analyses.

**Results**

**Attenders**

During a one-year period (October 2016 – September 2017), 405 participants were classified as attenders. Attenders were predominately female (58% vs 42%, N = 384), referred with a cardiovascular condition (32%) or frailty and mobility issues (24%), and over 65 years of age (70%). Aside from those classified as residing in a SIMD 2 catchment area (27%), attenders were spread
evenly across SIMD catchment area. Referrals were spread evenly across referral sites (see Table 1).

Mean age of attenders was 70 (20-93) years, with males and females being on average 69 (20-91) and 70 (32-93) years, respectively.

Non-attenders

During a six-month period (January 2018 – June 2018) 93 participants chose not to uptake the exercise referral programme. Concurrent data on number of attenders were not available during this period. Non-attenders were predominately female (55% vs 45%), referred for cardiovascular (36%) or MSK conditions (34%) and above 65 years of age (70%). Those classified as residing in SIMD 2 (26%) and SIMD 3 (24%) catchment areas represented half of non-attenders. Referrals were spread evenly across the 10 referral sites. Mean age of non-attenders was 68 (31-89) years, with males and females being on average 68 (31-89) and 69 (42-85) years, respectively.

Attenders vs non-attenders

While acknowledging an inability to draw definitive conclusions from non-concurrent data, χ2 analysis revealed no statistically significant differences by age, sex, index of multiple deprivation, and referral reason, between participants classified as non-attenders or attenders.

Session count of attenders

Mean (range) time lag between referral and obtaining ERS membership and presenting for their first session was 46 (0-427) days; median time lag was 14 days (Figure 1). Eighteen percent (N = 73) of participants obtained ERS membership and performed their first exercise referral session on the same day. Thirty-seven percent (N = 149) of the participants presented at the leisure facility for their first session within seven days. Mean and median session count was five and four (1-25), respectively (Figure 2). Sixty-one percent (N = 248) of ERS participants completed five-exercise sessions or less, however, one person attended 25 exercise referral sessions.
The median value of four exercise sessions completed was the threshold used to classify high or low attendance. Similar percentages were observed across variables (referral reason, age, sex, index of multiple deprivation and VisitScotland quality assurance-grading scheme) below or above median session count (Figure 3). χ² analysis revealed no statistical significance between those classified as high and low attenders.

Discussion

The aim of this study was to; 1) profile participants who chose not to uptake (non-attenders) ERS; 2) describe any differences between non-attenders and attenders and; 3) report session count of attenders, exploring any relationship between attender demographic characteristics and session count. Non-attenders were predominately female, aged 65 years of age and above, classified as living in areas of greater deprivation and experiencing cardiovascular disease or MSK condition.

While concurrent comparison between non-attenders and attenders was not possible; demographic characteristics of participants classified as attenders appear similar to non-attenders. Session count of attenders was low, with a median and mean session count of four and five sessions, respectively.

There was no statistical evidence to suggest that participant demographics or ERS site quality influenced session count.

Participant profiling of non-attenders vs attenders

Previous research reporting participant demographic characteristics are generated directly from those who start ERS (5, 6), with little focus on the subgroup that do not uptake referral. Data from this study reports female, older adults, and those experiencing a cardiovascular of MSK condition, as being the prominent demographic characteristics for non-attenders, which may reflect greater rates of referral for these population sub-groups. This study therefore suggests that non-attenders from this particular ERS are fairly representative of people referred to ERS i.e. predominantly female, aged
65 and suffering from cardiovascular conditions. Nonetheless, which demographic characteristics are associated with uptake of ERS remains unclear.

Scottish primary care has seen a 20% increase in patients aged 65 years and over (19). Furthermore, consultation rates increase with age, are more common in females and in lower quintiles of deprivation (20). Mortality from cardiovascular disease in the UK is declining, however, prevalence of cardiovascular disease appears to have increased in Scotland (21), with data suggesting the largest increases were in those aged over 65 years (21). This may shed light on why a greater proportion of non-attenders are older, female, and experiencing a cardiovascular condition. In this study data capture of attenders and non-attenders did not overlap, and while it is not possible to draw strong conclusions from non-concurrent groups, it is important that research does begin to draw comparisons and highlight where possible differences and similarities between these mutually exclusive groups. The present study has revealed no evidence of statistical differences between non-attenders and attenders. As discussed, the similarity of groups may reflect primary care use and subsequent HCP referral.

Session count of attenders

This study reports a low session count by attenders and is in keeping with previous studies reporting high dropout (reported as adherence in their studies) (9, 11). However, only limited studies have reported data directly upon session count (11, 18). This is an important omission because health benefits are associated with completion of ERS (22). From a scheme which ran for 24-weeks, Hanson and colleagues (11) report mean session attendance as four sessions for participants who stopped attending before the 12-week midpoint (a comparable time duration to the ERS in the present study). However, a higher mean session count of nine was reported in a 10-week RCT (18). The heterogeneous nature of defining terms, measuring and reporting of ERS becomes problematic when comparing across schemes (8). For example, previous reviews have defined attendance (reported as adherence in the reviews) as percent participation of total number of available sessions.
This approach fails to consider that ERS often have different durations; meaning one referral programme's 80% attendance threshold may not represent the same number of sessions as another ERS. However, the reporting of session count is not standard practice within ERS (8). There needs to be a drive for standardised definitions and measures across ERS. This study advocates the use of the term attendance to representative of sessions count. Adherence, therefore, should be defined and measured as a combination of session count (attendance) and performing the required exercise prescription (frequency, intensity, type and time).

It is important to acknowledge the impact that dropping out of ERS may have on participants. Failure to complete the duration may reduce any potential opportunity a participant has for achieving positive benefits. Additionally, there is a lack of evidence upon what happens to those who choose to exit ERS early. For example, do they go on and become independent exercisers; unfortunately, the present study was unable to assess PA engagement external to the ERS. The current evidence does suggest that schemes with a longer length (20+ weeks) have a positive impact on health and improving PA levels (24). This raises the question on how many sessions should be performed in order to promote long term behaviour change, be that at ERS or to become independently active.

Promotion of PA habits requires individuals to frequently practice the activity in stable contexts. One previous review suggest that PA habits can develop over a period of weeks, however, there is considerable inter-individual variability in how quickly habits can be formed (25). This suggests that if participants were able to complete the allotted ERS programme, they place themselves in a better position than those who do not complete, to promote positive behaviour change. More importantly, and pertinent to this study, further research is needed, especially on factors and approaches that may facilitate or impede attendance at ERS.

Acknowledging heterogeneity of ERS (e.g. scheme duration, definitions of terms), it is important to start drawing comparisons, where possible, between schemes to determine what might be influencing session count. However, the present study found no statistical evidence to suggest that
demographic characteristics influenced session count. Further, the present study found that site location did not influence session count. However, VisitScotland quality assurance-grading scheme does not account for provision of ERS, rather grading sites overall. Only two other studies have considered site location as a potential factor which found conflicting results. Hanson reported site location significantly predicted uptake, 12-week attendance, and scheme completion, however, the reasons for this are unclear (11). James reported that site variable did not improve the model fit, therefore was not included in the final model analysis (14). Direct comparisons of these studies is difficult, due to an inability to distinguish any objective differences between referral sites (11) and all leisure sites within this research study came from one funding source.

Strengths and Limitations

This study benefits from strong ecological validity, which is important in determining and reporting real life factors that may play a role within the success of ERS. Furthermore, the breadth of data collected is consistent with previous research and commonly collected within ERS. Thus, providing a comparable baseline across schemes. There are some key limitations to this study. First, it is important to acknowledge that periods of data collection for attenders and non-attenders do not directly overlap; hence, a true reflection of differences between non-attenders vs attenders cannot be inferred. Subsequently, the authors acknowledge the potential for confounding effects of seasonal variation, referrer habits or staff developments that are beyond our control. There may be potential for misrepresentation of session count from using membership cards into the leisure site as a proxy of session count, since exercise instructors could allow participants into the facility without the need to swipe their membership card. However, with no registers taken within sessions, this was the only means available to track number of sessions completed. Finally, although the study examined participant’s uptake and attendance with the scheme, it is unable to identify barriers and facilitators of uptake or attendance. Furthermore, due to the study data being database
It was not possible to assess if the ERS influenced PA engagement outside of the ERS sessions.

**Conclusion**

Demographic characteristics or site characteristics do not appear to be associated with non-attendance or with the number of sessions attended. Furthermore, attendance within this ERS was low, with over half the participants exiting the scheme on or before their fifth session. Therefore, there is a need to identify additional factors influencing participants choice to uptake their ERS referral and to complete the duration of the scheme. Non-uptake and reduced attendance may limit any associated health benefits that may be achieved from ERS.

**References**


**Acknowledgments**

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**Funding source**

This work was undertaken as part of a PhD thesis with the lead author receiving funding from the University of Stirling as part of the Impact Studentship Scheme.
Table 1. Descriptive count and percent of total participant count of participant demographics, and VisitScotland quality assurance grading scheme of referral site, for non-attenders and attenders.

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Figures.

*Figure 1. Time lag in days between signing contract and presenting at the leisure facility for first exercise session with + and * representing mean and median time delay, respectively.*
**Figure 2.** Count of participants exiting scheme with + and * representing mean and median session count across ERS, respectively. For illustrative purposes, 61% (N = 248) of participants exited on or before their fifth sessions.

**Figure 3.** Participant demographics and ERS site quality percentage above or below median session count.