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# Retrospective cohort study of the South Tyneside Exercise Referral scheme 2009-2014: Predictors of dropout and barriers to adherence

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## Abstract

**Background:** Exercise Referral Schemes (ERS) are a prevalent method of increasing physical activity levels. However, they suffer from participant dropout and research predicting dropout or barriers to adherence is limited. This study aimed to focus upon the effect of referral characteristics on dropout, dropout predictors and whether self-reported barriers to exercise predict dropout.

**Methods:** ERS data from 2009-2014 were retrieved for analysis. Chi squared and t-tests were used to investigate differences between referral characteristics, and logistic regression used to investigate dropout predictors.

**Results:** Of 6894 participants, 37.8% (n=2608) dropped out within 6 weeks and 50.03% (n=3449) by the final 12th week. More males adhered ($p$<0.001) with dropouts being significantly younger ($p$<0.001). Dropout predictors were smoking (OR=1.58, 95% CI:1.29-1.93) or being a Tier 3 referral (OR=1.47, 95% CI:1.25-1.73). Increasing age (OR=0.98, 95% CI:0.98-0.99), drinking alcohol (OR=0.82, 95% CI:0.71-0.95), secondary care referrals (OR=0.68, 95% CI:0.52-0.90), having a lack of motivation (OR=0.81, 95% CI:0.69-0.95), or a lack of childcare (OR=0.69, 95% CI:0.50-0.95) decreased the likelihood of dropout.

**Conclusion:** ERS dropout continues to be problematic. Smoking and having moderate-high comorbidities predicted dropout. Increasing age and patient-reported barriers of a lack of time or childcare decreased dropout risk. The reasons for dropout require further investigation.

## Introduction

Exercise Referral Schemes (ERS) are used as a method of promoting physical activity (PA) in individuals who are at risk of, or who have developed, health conditions associated with a sedentary lifestyle[1]. Exercise Referral Schemes have been prominent since the 1990s, with up to 89% of primary care organisations running a scheme[2], typically running over 10-12 weeks[3]. Participants are referred following the identification of a need to increase PA by their General Practitioner or another healthcare professional.

Research has so far failed to establish the clinical and cost effectiveness of ERS to the point where the National Institute for Health and Care Excellence (NICE)[4] stated that ERS did not have sufficient evidence to support their use, unless part of a controlled trial. A commonly reported issue is a lack of participant adherence, with recent studies reporting adherence rates ranging from 43-53%[5-8]. NICE[1] recommended future research should focus upon factors encouraging uptake and adherence, and identify any barriers preventing participation, due to the limited research regarding the predictors of adherence/dropout, or analysis of barriers to adherence. This study aimed to analyse data from a local ERS, with particular focus upon participant dropout, the effect of various referral characteristics on dropout, and the predictors of dropout, including self-reported barriers to exercise.

## Methods

### Population and Measures

Data were provided for the South Tyneside Council ERS between April 2009 and April 2014 for retrospective analysis.

The ERS was delivered within partnership of the local council, National Health Service (NHS) trust and Primary Care Trust, with all those referred being residents of, and registered with a GP within the local council area. ERS inclusion/exclusion criteria are found in Table 1. The ERS lasted 12 weeks, with a consultation before the programme started, and follow-up consultations at 6 and 12 weeks. The initial consultation involved input from an exercise professional and nutritionist.

All exercise professionals employed by the ERS were members of the Register of Exercise Professionals, held at least a level 3 advanced gym instructor qualification/exercise referral qualification, and accreditation in training/fitness testing. Sessions for high-risk participants were delivered exclusively by professionals with the British Association of Cardiac Rehabilitation qualification.

The consultation aimed to identify participants' readiness to change, individual goals, and assesses the participants' health status. Within the consultation, participants' body mass index (BMI), heart rate and blood pressure were measured. Additionally, participants self-reported their smoking status (Cigarettes/day), alcohol intake (Units/week), PA levels (Number of times physically active for ≥ 30mins/week), barriers that could prevent increasing PA levels (participants selected from a list of 9 possible barriers including: Lack of time, Cost, Lack of motivation, Lack of confidence, Lack of support, Child care, Transport, Illness/disability, Don't enjoy) and disability status. This information was re-recorded at 6 and 12 week consultations.

Following the initial consultation, participants obtained a tailored exercise plan facilitating PA increase. Plans varied in terms of exercises and session number, depending on participants' individual needs. Sessions were typically gym-based, however the ERS could offer pool-based sessions for participants that could benefit from non-impact exercise.

The ERS categorised participants by "Tier", with Tiers 2 and 3 eligible for referral. Tier 2 had low-moderate comorbidities and a BMI>28kg/$m^2$, whereas Tier 3 had moderate-high comorbidities without any BMI restriction. The scheme defines low, moderate and high comorbidities using the National Quality Framework (NQF) for Exercise Referral systems[9].

Within the literature, the term adherence is often cited, yet definitions of this differ. This study defines adherence as "continued participation in the scheme", matching the most recent ERS systematic review[3] and is assessed at 12 weeks. Participants present at 12 weeks were considered as adherent, whereas those not present at either 6 or 12 weeks were considered as dropouts. Ethical approval for the study was obtained from the Northumbria University ethics committee.

**Data extraction/management**

Permission to use the data was provided by the ERS manager, and following anonymisation, was provided for analysis in electronic format.

All data were error checked, any measures missing information were coded as “not stated”, with clearly incorrect entries (e.g. age 121 years) discarded from analysis. For potentially incorrect entries that were at the extremes of normal ranges (e.g. bodyweight of 187kg), data were cross-referenced with other data entries for the same participant, and data not matching was discarded. Instances of data describing the same outcome, but described differently (i.e. “Improved” or “got better”) were standardised (i.e. changed to “improved”) to increase the consistency of terminology. Following this process, 6894 participants were available for analysis. 98 participants did not start the scheme, however this would not constitute “uptake” as described in recent studies[2 6], therefore statistical analysis was carried out excluding these participants.

Data recorded as “not stated” were not included in the analysis for gender, referral tier, referral source or disability status. Not stated was infrequently recorded, would not provide valuable insight into the relationships between participants, therefore was excluded from analysis. In the case of referral type, “not stated” was included in the analysis due to the high frequency of it being recorded (n=3251), with maternity excluded due to low number of referrals (n=1).

The final aspect of data management involved the grouping of data from each variable into categorical levels appropriate for statistical analysis. This process was carried out for referral reason, alcohol consumption, smoking and BMI. Evidence to support categorisation is limited and heterogeneous. Where possible, all categorical grouping was applied using scales that have been previously used in publications or utilised by health organisations. Referral reasons were divided into “musculoskeletal”, “mental health”, “cardiovascular/pulmonary/metabolic” and “other”. The decision to keep mental health and cardiovascular diseases separate was based upon recent research[5 6 8], which separated mental health and cardiovascular disease, whilst the use of musculoskeletal and “other” categories captured the makeup of referral reasons within the data that were not otherwise categorised. Alcohol consumption[10], smoking levels[11] and BMI[12] were all categorised using previously published guidelines or papers.

Within the 6796 participants that started the scheme, 3500 included data regarding barriers to exercise. In order to carryout logistic regression all non-continuous data utilised as predictor variables (gender, age, referral type, referral source, tier, alcohol status, smoking status, PA level, and nine separate barriers) were reduced into binary predictor variables with "not stated" entries removed, leaving 3267 participants.

### Statistical analysis

Statistical analysis was carried out using IBM SPSS version 22 for windows (SPSS, Inc., Chicago, IL). Differences in referral or personal characteristics were investigated with chi-square ($X^2$) analysis and Independent sample t-tests ($p<0.05$ with 95% CI) between participants that adhered to and dropped out of the ERS. Separate binary logistic regressions were used to investigate whether any personal/referral characteristics and patient self-reported barriers to exercise could predict dropout at 6 and 12 weeks using data collected at initial assessment. Cox & Snell $R^2$, Nagelkerke $R^2$ and Hosmer & Lemeshow were utilised to investigate the model's goodness of fit.

## Results

### Descriptive statistics

Between April 2009 and April 2014, a total of 6894 participants were suitable for analysis. 1.4% (n=98) did not start the programme. At 6 week assessment, 37.8% (n=2608) had dropped out, and by the final assessment at 12 weeks, 50.03% (n=3449) had dropped out, leaving 49.97% (n=3445) of the cohort adhering. Table 2 provides a full breakdown for each personal and referral characteristic.

### Analysis of dropouts

Nearly 47% of males and 52% of females dropped out, representing a significant difference between gender groups ($x^2(1)=20.113$, $p<0.001$). Age was significantly different between groups ($t(6830)=-14.435$, $p<0.001$), the mean age of those adhering being 51.1±15.3 and dropping out 45.7±15.6 years, respectively.

Primary care referrals had 51.1% dropout compared to 35.1% of secondary care referrals, which was significant ($\chi^2(1)=52.190$, $p<0.001$). Referral type differed significantly ($\chi^2(3)=95.802$, $p<0.001$) as referrals for nutrition had the highest rate of dropout (89.9%), compared to 46.6% of exercise referrals. 57.7% of referrals for a mental health condition dropped out, which was significantly different ($\chi^2(3)=30.090$, $p<0.001$) compared to musculoskeletal (50.9%), cardiovascular (48.1%) and "other" (50.9%) referrals.

Referral tier was significantly different ($\chi^2(1)=15.901$, $p<0.001$) between Tier 2 (51.5% dropout) and Tier 3 (46.5% dropout). Those consuming moderate alcohol levels had significantly ($\chi^2(5)=33.912$, $p<0.001$) lower dropout rates (44.5%), compared to non-drinkers (52.5%), not-stated (51.7%), hazardous (45.2%), harmful (61.2%) and drinkers that did not specify amount (60.6%). Differences in disability status were non-significant ($\chi^2(1)=0.592$, $p=0.442$) between adherers and dropouts.

## Predictors of 6 and 12 week dropout

*6 week dropout*

The full regression model containing all predictors was statistically significant ($p<0.001$), indicating the model was able to distinguish between participants who did and did not dropout of the ERS by 6 weeks. The model as a whole explained between 4.2% (Cox & Snell $R^2$) and 5.7% (Nagelkerke $R^2$) of the variance in attendance, and correctly classified 64.5% of cases. Five independent variables made a unique statistically significant contribution to the model (Age, Alcohol (Drinker), Smoking (Yes), Tier (3), Barrier A (lack of time)). The strongest predictors of dropping out at 6 weeks were smoking (OR=1.7, 95% CI:1.39-2.07) or being a Tier 3 referral (OR=1.24, 95% CI:1.05-1.47), whereas increasing age (OR=0.98, 95% CI:0.98-0.99), drinking alcohol (OR=0.74, 95% CI:0.63-0.85) or having a lack of time (OR=0.82, 95% CI:0.67-0.99) decreased the likelihood of dropout (Table 3).

*12 week dropout*

The full regression model containing all predictors was statistically significant, ($p$<0.001), indicating the model was able to distinguish between participants who did and did not dropout of the ERS by 12 weeks. The model as a whole explained between 5.2% (Cox & Snell $R^2$) and 6.9% (Nagelkerke $R^2$) of the variance in attendance, and correctly classified 60% of cases. Seven independent variables made a unique statistically significant contribution to the model (Age, Alcohol (Drinker), Smoking (Yes), Tier (3), Referral source (secondary care), Barrier C (lack of motivation) and Barrier F (lack of childcare). The strongest predictors of dropping out were smoking (OR=1.58, 95% CI: 1.29-1.93) or being a Tier 3 referral (OR=1.47, 95% CI: 1.25-1.73). Increasing age (OR=0.98, 95% CI: 0.98-0.99), drinking alcohol (OR=0.82, 95% CI: 0.71-0.95), being a secondary care referral (OR=0.68, 95% CI: 0.52-0.90), having a lack of motivation (OR=0.81, 95% CI: 0.69-0.95), or a lack of childcare (OR=0.69, 95% CI: 0.50-0.95) decreased the likelihood of dropout (Table 4).

## Discussion

### Main findings of this study

Dropout within this ERS was 50%, most of which occurred in the first 6 weeks. Smoking or having moderate-high comorbidities (Tier 3 referrals) were the only predictors of dropout, whereas increasing age, being an alcohol consumer, a secondary care referral and citing barriers to exercise including a lack of motivation or childcare were predictors of not dropping out before programme completion.

Due to the paucity of research using predictor variables other than gender and age, it is difficult to make comparisons regarding individuals with moderate-high comorbidities (i.e. Tier 3 referrals) and those who consume alcohol, in terms of the effects that they have on ERS adherence. Previous studies regarding barriers to PA have either not focused specifically on ERS[13] or have only recorded barriers for participants that have dropped out[14], making comparisons to this study difficult. Further investigation into why a lack of motivation or childcare predict adherence is required, as the findings appear counterintuitive

At present there is no available research regarding secondary care referrals as they have been excluded from most studies and recent systematic reviews[3 15]. Despite secondary care referrals being in the minority in this study (8% of entire cohort, 9.6% included in the regression), these referrals made a significant contribution to the model, indicating that secondary care referrals were less likely to drop out.

**What is already known on this topic**

*Dropout/adherence*

This study supports the notion that ERS suffer from dropout, a consistent finding within the ERS literature. Previous work[5-8] has mirrored this study and reported that ERS adherence lies between 43-53.3%.

In the present study, the largest proportion of dropout occurred in the first half of the ERS. Between initial and 6 week assessment, 37.8% dropped out, compared to an additional 12.1% dropout between weeks 6 and 12 in the second half of the ERS. Although run over 24 weeks as opposed to 12, Hansen et al reported a similar finding whereby the highest dropout rate occurred in the first half of the ERS[5].

*Positive and negative predictors of dropout*

Smoking was predictive of drop out at weeks 6 and 12, which supports previous ERS literature where smokers have suffered higher dropout[16]. Increasing age has commonly been reported as a predictor of adherence within the literature[3 5 6 8 14]. Despite increasing age being a predictor of scheme adherence, the whole cohort was only comprised of 36.6% of participants aged over 55 years old. In terms of the 3267 participants included in the regression, 37.7% were 55 years or older. Previous work has reported a similar finding[5], the minority (48%) of a cohort being over 55 years, yet increasing age still predicted adherence. This finding lends support to a previous suggestion[5] which considers that future ERS could focus on those 55 years and older, or that further investigation of, or targeting of ERS for the under 55s is required.

## What this study adds

The use of participant self-reported barriers to PA with the aim of predicting dropout/adherence is novel and is a direct attempt to address the lack of knowledge regarding factors and barriers to ERS adherence as identified by NICE[1]. Additionally, the use of predictor variables such as disability status, referral source, smoking and alcohol consumption within a single cohort provides new insight into factors/barriers affecting ERS adherence.

## Limitations of this study

A common issue with routinely collected data is missing values or erroneous entries[17]. This study highlights the issue, as only 3267 of 6894 datasets were complete. For some analysis (e.g. gender) this was not an issue, however for referral type, over 3000 cases of “not stated” were recorded. The effect of this is seen in Tier 2/3 analysis. Chi-squared analysis analysed a larger number of participants, suggesting Tier 2 referrals were more likely to dropout. Conversely, logistic regression analysed less participants, but included more variables into the model, suggested Tier 3 referrals increased dropout likelihood. In terms of analysis, this resulted in an inability to draw associations across the many variables involved in this ERS and made interpretation difficult.

Aside from the difficulties of recall in self-reported measures[18], that may impact on the measurement of alcohol and smoking within this study, the measurement of the barriers to exercise also has limitations. At initial assessment the barriers were recorded as barriers that could prevent increasing PA levels. It is not known what the actual barriers were during the scheme. The ramification of this is that a barrier stated at initial assessment may not actually manifest itself, making it not possible to ascertain if the barriers did indeed impact on adherence, particularly in participants that dropped out. Additionally, it is conceivable (as evidenced in the findings that a lack of confidence or lack of childcare were predictors of adherence) that participants could overcome what they perceived to be barriers that could prevent PA level increases at initial assessment. Future research could measure during each assessment, the actual barriers to exercise to explore the relationships between the

barriers, adherence and changes to barriers during the course of the programme, or within participants that drop out.

If all 6894 participants had full sets of data, the effect this would have had on the logistic regression analysis is unknown. The logistic regression was able to only predict up to 60% of dropouts, as the factors analysed only provided a minimal increase in predictive accuracy, suggesting that other factors may have an influence on the rates of dropout.

## Conclusion

Participant dropout within the South Tyneside ERS was 50%, with those who smoke, are younger, or a tier 3 referral, more likely to dropout. This highlights the complexity of ERS adherence, suggesting that different subgroups of participants require different approaches to increase PA levels, or may not be suitable for ERS in isolation. However, further investigation into why these participants are more likely to dropout is required. From this study, it appears citing a lack of motivation or childcare as barriers to exercise predicts ERS adherence; this is unique within the literature and requires further investigation.

## Conflict of interest

Diane Walker is the manager of South Tyneside Exercise Referral Scheme. She was not involved in the analysis or interpretation of the data.

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**Table 1:** Exercise Referral Scheme inclusion and exclusion criteria

| Inclusion | Exclusion |
|---|---|
| Adults 16 +. | People with BMI≤ 28 with no co-morbidities |
| BMI28⩾ with or without a stable co-morbidity. | People who have previously been referred to the scheme |
| Those with a BMI28⩾ with one or more of the following co-morbidities. | People who are already exercising on a regular basis |
| Osteoporosis. | Less than 16 years old |
| Arthritis or joint problems. | People who are not motivated and demonstrate no desire to make lifestyle changes |
| Anxiety, depression or stress. | People whose mental health or ability to learn would not allow them to participate in the programme |
| Asthma, bronchitis/Emphysema/COPD. | Those showing symptoms or traits considered absolute contraindications to exercise: |
| Angina/Post MI/CABG/PCI/Completed phase III. | -Unstable angina |
| Mild to moderate heart failure. | -Unstable to acute heart failure |
| Suffered from or are recovering from a stroke. | -Specific cardiac problems |
| Claudication | Active myocarditis |
| Balance problems as a result of Parkinson's disease, MS etc. | -Exercise induced ventricular arrhythmias |
| Awaiting or recovering from surgery (not cardiac). | -Hypertrophic obstructive cardiomyopathy |
| Non acute severe mental illness | -Significant aortic stenosis |
| Family history of heart diseases | -Resting blood pressures above the recommended levels (cardiac patients 180/100, general population and patients diagnosed with hypertension 180/110) |
| Cholesterol levels consistently over 5 total cholesterol | -Uncontrolled tachycardia, a resting heart rate ≥100bpm (≥120bpm for COPD) |
| Hypertension (less than 100 diastolic) | Unstable diabetes |
| All types of stable diabetes | Any unstable condition |
| Hyperlipidaemia | Severe COPD with FEVI <40% with functional limitations disproportionate to the severity of the disease. |
| Inflammatory bowel disease | |
| Food intolerance or allergies | |
| Renal/liver problems | |
| Other dietary problems i.e. Coeliac disease | |
| Hyperglycaemia-HbAIC level ≤10 at least 15 months | |

**Table 1:** Descriptive statistics of referrals.

| | Referrals (n) | DNA Ax (n) | % | 6/52 Drop out (n) | % | 12/52 Drop out (n) | % | Started (n) | Completed (n) | Completed (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Gender** | | | | | | | | | | |
| Female | 4043 | 65 | 1.6 | 1598 | 39.5 | 2111 | 52.2 | 3978 | 1932 | 48.6 |
| Male | 2807 | 29 | 1.0 | 986 | 35.1 | 1311 | 46.7 | 2778 | 1496 | 53.9 |
| Not Stated | 44 | 4 | 9.1 | 24 | 54.5 | 27 | 61.4 | 40 | 17 | 42.5 |
| **Age** | | | | | | | | | | |
| 16-24 | 535 | 3 | 0.6 | 264 | 49.3 | 350 | 65.0 | 532 | 185 | 34.8 |
| 25-34 | 940 | 8 | 0.9 | 436 | 46.4 | 574 | 61.0 | 932 | 366 | 39.3 |
| 35-44 | 1249 | 16 | 1.3 | 493 | 39.5 | 668 | 53.0 | 1233 | 581 | 47.1 |
| 45-54 | 1585 | 21 | 1.3 | 604 | 38.1 | 815 | 51.0 | 1564 | 770 | 49.2 |
| 55-64 | 1346 | 25 | 1.9 | 423 | 31.4 | 548 | 41.0 | 1321 | 798 | 60.4 |
| 65-74 | 900 | 21 | 2.3 | 286 | 31.8 | 352 | 39.0 | 879 | 548 | 62.3 |
| 75+ | 277 | 3 | 1.1 | 77 | 27.8 | 101 | 36.0 | 274 | 176 | 64.2 |
| Not stated | 62 | 1 | 1.6 | 25 | 40.3 | 41 | 66.0 | 61 | 21 | 34.4 |
| **Referral Source** | | | | | | | | | | |
| Primary care | 6276 | 86 | 1.4 | 2421 | 38.6 | 3209 | 51.1 | 6190 | 3067 | 49.5 |
| Secondary care | 555 | 1 | 0.2 | 149 | 26.8 | 195 | 35.1 | 554 | 360 | 65 |
| Not stated | 63 | 11 | 17.5 | 38 | 60.3 | 45 | 71.4 | 52 | 18 | 34.6 |
| **Type of referral** | | | | | | | | | | |
| Exercise | 2349 | 14 | 0.6 | 830 | 35.0 | 1090 | 46.0 | 2335 | 1259 | 53.9 |
| Both | 1166 | 8 | 0.7 | 467 | 40.0 | 614 | 53.0 | 1158 | 552 | 47.7 |
| Nutrition | 127 | 74 | 58.3 | 110 | 87.0 | 114 | 90.0 | 53 | 13 | 24.5 |
| Maternity | 1 | 0 | 0.0 | 0 | 0.0 | 1 | 100.0 | 1 | 0 | 0 |
| Not Stated | 3251 | 2 | 0.1 | 1201 | 37.0 | 1630 | 50.0 | 3249 | 1621 | 49.9 |
| **Reason** | | | | | | | | | | |
| C/P/R/V/M | 4534 | 80 | 1.8 | 1639 | 36.1 | 2180 | 48.1 | 4454 | 2354 | 52.9 |
| MSK | 1116 | 7 | 0.6 | 424 | 38.0 | 568 | 50.9 | 1109 | 548 | 49.4 |
| Other | 212 | 7 | 3.3 | 82 | 38.7 | 108 | 50.9 | 205 | 104 | 50.7 |
| Mental health | 1032 | 4 | 0.4 | 463 | 44.9 | 593 | 57.5 | 1028 | 439 | 42.7 |
| **Year** | | | | | | | | | | |
| 2009-2010 | 306 | 0 | 0.0 | 135 | 44.1 | 169 | 55.2 | 306 | 137 | 44.8 |
| 2010-2011 | 1570 | 0 | 0.0 | 551 | 35.1 | 790 | 50.3 | 1570 | 780 | 49.7 |
| 2011-2012 | 1368 | 2 | 0.1 | 510 | 37.3 | 666 | 48.7 | 1366 | 702 | 51.4 |
| 2012-2013 | 1546 | 31 | 2.0 | 547 | 35.4 | 703 | 45.5 | 1515 | 843 | 55.6 |
| 2013-2014 | 1244 | 47 | 3.8 | 452 | 36.3 | 586 | 47.1 | 1197 | 658 | 55 |
| 2014-2015 | 860 | 18 | 2.1 | 413 | 48.0 | 535 | 62.2 | 842 | 325 | 38.6 |
| **Referral Tier** | | | | | | | | | | |
| Tier 2 | 3827 | 62 | 1.6 | 1490 | 38.9 | 1971 | 51.5 | 3765 | 1856 | 49.3 |
| Tier 3 | 2689 | 34 | 1.3 | 949 | 35.3 | 1250 | 46.5 | 2655 | 1439 | 54.2 |
| Maternity | 67 | 0 | 0.0 | 29 | 43.3 | 54 | 80.6 | 67 | 13 | 19.4 |
| Not stated | 311 | 2 | 0.6 | 140 | 45.0 | 174 | 55.9 | 309 | 137 | 44.3 |
| **Disability** | | | | | | | | | | |
| No | 5602 | 5 | 0.1 | 2036 | 36.3 | 2746 | 49.0 | 5597 | 2856 | 51.0 |
| Yes | 630 | 1 | 0.2 | 237 | 37.6 | 319 | 50.6 | 629 | 311 | 49.4 |
| Not stated | 662 | 92 | 13.9 | 335 | 50.6 | 384 | 58.0 | 570 | 278 | 48.8 |
| **PA no. times active ≥30mins/week** | | | | | | | | | | |
| 0 | 2955 | 0 | 0.0 | 1178 | 39.9 | 1568 | 53.0 | 2955 | 1387 | 46.9 |
| 1 | 691 | 0 | 0.0 | 239 | 34.6 | 321 | 46.0 | 691 | 370 | 53.5 |
| 2 | 1038 | 0 | 0.0 | 331 | 31.9 | 453 | 44.0 | 1038 | 585 | 56.4 |
| 3 | 754 | 0 | 0.0 | 246 | 32.6 | 340 | 45.0 | 754 | 414 | 54.9 |
| 4 | 369 | 0 | 0.0 | 129 | 35.0 | 179 | 49.0 | 369 | 190 | 51.5 |
| 5 | 350 | 0 | 0.0 | 124 | 35.4 | 160 | 46.0 | 350 | 190 | 54.3 |
| 5+ | 594 | 0 | 0.0 | 235 | 39.6 | 299 | 50.0 | 594 | 295 | 49.7 |
| Not stated | 143 | 98 | 68.5 | 126 | 88.1 | 129 | 90.0 | 45 | 14 | 31.1 |
| **Alcohol intake (units/day)** | | | | | | | | | | |
| Non drinker | 1479 | 0 | 0.0 | 621 | 42.0 | 776 | 52.5 | 1479 | 703 | 47.5 |
| Yes | 33 | 0 | 0.0 | 12 | 36.4 | 20 | 60.6 | 33 | 13 | 39.4 |
| Moderate (≤21 M, ≤14 F) | 1540 | 0 | 0.0 | 498 | 32.3 | 685 | 44.5 | 1540 | 855 | 55.5 |
| Hazardous (>21-50 M, >14-35 F) | 376 | 0 | 0.0 | 129 | 34.3 | 170 | 45.2 | 376 | 206 | 54.8 |
| Harmful (>50 M, >35 F) | 49 | 0 | 0.0 | 21 | 42.9 | 30 | 61.2 | 49 | 19 | 38.8 |
| Not stated | 3417 | 98 | 2.9 | 1327 | 38.8 | 1768 | 51.7 | 3319 | 1649 | 49.7 |
| **Smoking status (Cigarettes/day)** | | | | | | | | | | |
| No | 5662 | 1 | 0.0 | 1932 | 34.1 | 2628 | 46.0 | 5661 | 3034 | 53.6 |
| Yes | 1061 | 1 | 0.1 | 538 | 50.7 | 673 | 63.0 | 1060 | 388 | 36.6 |
| <9 | 1 | 0 | 0.0 | 1 | 100 | 1 | 100.0 | 1 | 0 | 0 |
| 10>19 | 9 | 0 | 0.0 | 7 | 77.8 | 9 | 100.0 | 9 | 0 | 0 |
| >20 | 9 | 0 | 0.0 | 7 | 77.8 | 9 | 100.0 | 9 | 0 | 0 |
| Not stated | 152 | 96 | 63.2 | 123 | 80.9 | 129 | 85.0 | 56 | 23 | 41.1 |
| **BMI (kg/m$^2$)** | | | | | | | | | | |
| Underweight (<18.5) | 22 | 0 | 0.0 | 11 | 50.0 | 13 | 59.1 | 22 | 9 | 40.9 |
| Normal (18.5-24.99) | 686 | 0 | 0.0 | 264 | 38.5 | 345 | 50.3 | 686 | 341 | 49.7 |
| Overweight (25-29.9) | 1867 | 0 | 0.0 | 628 | 33.6 | 840 | 45 | 1867 | 1027 | 55.0 |
| Obese Class 1 (30-34.99) | 2118 | 0 | 0.0 | 777 | 36.7 | 1023 | 48.3 | 2118 | 1095 | 51.7 |
| Obese Class 2 (35-39.99) | 1268 | 0 | 0.0 | 493 | 38.9 | 656 | 51.7 | 1268 | 612 | 48.3 |
| Obese Class 3 (>40) | 794 | 0 | 0.0 | 319 | 40.2 | 451 | 56.8 | 794 | 343 | 43.2 |
| Not stated | 139 | 98 | 70.5 | 116 | 83.5 | 121 | 87.1 | 41 | 18 | 43.9 |
| Total | 6894 | 98 | 1.4 | 2608 | 37.8 | 3449 | 50.03 | 6796 | 3445 | 49.97 |

DNA: Did not attend. C/P/R/V/M: Cardio pulmonary/respiratory/vascular or metabolic. PA: Physical activity. M: Male, F:Female.

**Table 3:** Logistic regression to predict drop out at 6 weeks.

| Predictor | B | *p* | *OR* | 95% *CI* |
|---|---|---|---|---|
| Gender (Female) | 0.005 | 0.95 | 1.01 | (0.862-1.173) |
| Age | -0.017 | 0.00 | 0.98 | (0.978-0.988) |
| Referral type (Exercise) | -0.141 | 0.09 | 0.87 | (0.737-1.023) |
| Referral source (Secondary) | -0.225 | 0.13 | 0.8 | (0.597-1.066) |
| Tier (Tier 3) | 0.213 | 0.01 | 1.24 | (1.045-1.466) |
| Alcohol (Drinker) | -0.308 | 0.00 | 0.74 | (0.633-0.853) |
| Smoking (Smoker) | 0.528 | 0.00 | 1.7 | (1.391-2.067) |
| PA | 0.015 | 0.43 | 1.02 | (0.978-1.054) |
| BMI | 0.004 | 0.56 | 1 | (0.992-1.016) |
| Lack of time | -0.202 | 0.04 | 0.82 | (0.677-0.986) |
| Cost | -0.194 | 0.07 | 0.82 | (0.67-1.013) |
| Lack of motivation | -0.064 | 0.44 | 0.94 | (0.796-1.105) |
| Lack of confidence | 0.090 | 0.38 | 1.09 | (0.896-1.336) |
| Lack of support | 0.393 | 0.10 | 1.48 | (0.929-2.36) |
| Child care | -0.152 | 0.37 | 0.86 | (0.616-1.197) |
| Transport | 0.136 | 0.58 | 1.15 | (0.708-1.853) |
| Illness/disability | 0.022 | 0.83 | 1.02 | (0.837-1.249) |
| Don’t enjoy | -0.100 | 0.69 | 0.91 | (0.55-1.488) |
| Constant | 0.235 | 0.43 | 1.27 | - |

Brackets indicate dichotomous variable chosen to code as the variable considered as being present. B:Beta value. OR: Odds Ratio

**Table 4:** Logistic regression to predict drop out at 12 weeks.

| Predictor | B | *p* | *OR* | 95% *CI* |
|---|---|---|---|---|
| Gender (Female) | 0.073 | 0.33 | 1.08 | (0.927-1.249) |
| Age | -0.02 | 0.00 | 0.98 | (0.975-0.985) |
| Referral type (Exercise) | -0.16 | 0.05 | 0.85 | (0.727-1) |
| Referral source (Secondary) | -0.39 | 0.01 | 0.68 | (0.517-0.895) |
| Tier (Tier 3) | 0.384 | 0.00 | 1.47 | (1.245-1.731) |
| Alcohol (Drinker) | -0.19 | 0.01 | 0.82 | (0.712-0.953) |
| Smoking (Smoker) | 0.458 | 0.00 | 1.58 | (1.294-1.932) |
| PA | 0.031 | 0.09 | 1.03 | (0.995-1.07) |
| BMI | 0.01 | 0.09 | 1.01 | (0.999-1.022) |
| Lack of time | -0.18 | 0.06 | 0.84 | (0.702-1.005) |
| Cost | -0.05 | 0.62 | 0.95 | (0.779-1.162) |
| Lack of motivation | -0.22 | 0.01 | 0.81 | (0.687-0.945) |
| Lack of confidence | 0.162 | 0.11 | 1.18 | (0.967-1.432) |
| Lack of support | 0.08 | 0.74 | 1.08 | (0.678-1.731) |
| Child care | -0.37 | 0.03 | 0.69 | (0.499-0.953) |
| Transport | 0.089 | 0.71 | 1.09 | (0.681-1.755) |
| Illness/disability | 0.019 | 0.85 | 1.02 | (0.839-1.238) |
| Don’t enjoy | -0.21 | 0.40 | 0.81 | (0.201-1.314) |
| Constant | 0.46 | 0.11 | 1.58 | - |

Brackets indicate dichotomous variable chosen to code as the variable considered as being present. B:Beta value. OR: Odds Ratio