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Pre-Print Version

Title:

Factors associated with physical activity referral uptake and participation

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Exercise referral – uptake – attendance – completion – health professional

ABSTRACT

We investigated participant and scheme characteristics in relation to access, uptake and participation in a Physical Activity Referral Scheme (PARS) using a prospective population-based longitudinal design. Participants (n=3762) were recruited over a three-year period. Logistic regression analyses identified the factors associated with the outcomes of referral uptake, participation and completion (≥ 80% attendance). Participant age, gender, referral reason, referring health professional and type of leisure provider were the independent variables. Based on binary logistic regression analysis (n=2631), only primary referral reason was associated with the PARS co-ordinator making contact with the participants. In addition to the influence of referral reason, females were also more likely (1.250, 1.003-1.559, $p = 0.047$) to agree to be assigned to a leisure provider. Referral reason and referring health professional were associated with taking up a referral opportunity. Older participants (1.016, 1.010-1.023, $p < 0.001$) and males were more likely to complete the referral. In conclusion, the PARS format may be less appropriate for those more constrained by time (women, young adults) and those with certain referral reasons (overweight/obesity, mental health conditions). More appropriate targeting at the point of referral could improve participation rates by revealing or addressing barriers that might later result in dropout.

INTRODUCTION

Increasing recognition of the role of physical activity in improving public health has resulted in several policy documents aimed specifically at physical activity promotion (Department of Health, 2004a; 2005; Smith and Bird, 2004). Of the various types of primary care intervention in the UK, Physical Activity Referral Schemes (PARS) have arguably become the most prevalent (Crone et al 2004; Department of Health, 2001). Although the PARS model was developed within the UK, similar primary care-based interventions exist in other countries (e.g., Morgan, 2005). Despite the prevalence of UK PARS, as a result of inadequate recording of participant characteristics in PARS research, and the use of randomised controlled trial (RCT) approach to evaluation, it is not yet known which members of the population PARS are most appropriate for (Gidlow et al., 2005).

Recent guidance has recommended a halt to the further use of PARS other than for controlled research (National Institute for Health and Clinical Excellence, 2006). It is certainly important to further explore the long-term effects of PARS on physical activity behavior and health outcomes because to date research on PARS has included few longitudinal studies (Gidlow et al., 2005). However, it is also important to recognise that PARS (and other physical activity promotion strategies) should be guided by research that includes, but is not restricted to, controlled trials (Department of Health, 2001).

Scheme effectiveness is likely to be influenced by the characteristics of the

individual referred and whether the PARS model is appropriate for them. It is, therefore, important that we determine who gets referred and who participates to enable more appropriate targeting of those most suited to PARS. Randomised controlled trials are not designed to answer such questions as they lack the external validity necessary to faithfully replicate practice (Dugdill et al. 2005; Rothwell, 2005). It is possible to gain insight into factors associated with scheme effectiveness using a population-based longitudinal study, an approach largely ignored in PARS research to date. To our knowledge, only one study has been published for UK data using this type of design (Harrison et al, 2005), although that study did not follow participants from the point of initial referral. The aim of the present study was to investigate scheme and individual participant characteristics in relation to access (i.e., from the point of initial referral), uptake and participation in PARS using a population based longitudinal design.

METHODS

Sample

This study used data routinely collected on all participants referred to a County-wide PARS between May 2000 and May 2003. Prior ethical approval was granted by West Somerset Local Research Ethics Committee for the use of these data for research purposes. Exclusions were necessary for the purposes of analyses (Figure 1). A more detailed description of this particular PARS can be found elsewhere (Crone et al., 2004; Johnston et al., 2005). Briefly,

participants referred to this particular PARS are offered 8 to 12 weeks of bi-weekly, supervised exercise sessions at local leisure facilities. Exercise programmes are typically gym-based but can include swimming, circuits, exercise-to-music classes, depending on participant preference and available facilities.

******* Figure 1: Cohort profile*******

Assessment of participant uptake and participation

Details of all referred participants were sent by referring health professionals to the PARS co-ordinator. Participants were then contacted and either assigned to a leisure provider or were removed. Removals were for psychosocial reasons (PSR) or because they could not be contacted (NC). Psychosocial reasons included 'not interested', 'family commitments', 'too busy', 'finance' and 'transport problems' (see Johnston, et al., 2005 for further discussion). For all those assigned to a leisure provider, uptake of referral (attendance of ≥1 session), and subsequent attendance levels were recorded by the supervising exercise professional and participants were categorised accordingly (Table 1).

Table 1: Categories used to determine uptake and participation outcomes

Assessment of demographic characteristics and referral reason

Data collected by health professionals at the point of referral included participant age, gender and primary referral reason (i.e., medical condition). Age was categorized into 10 yr bands for descriptive analysis, but retained as a

continuous variable for regression models. Referral reasons were clustered into seven categories (from 65 initial categories); cardiovascular disease, overweight and obesity, diabetes, musculoskeletal health, psychological well-being and mental illness, unfit/sedentary or other (including cancer). This categorization was assisted by the International Classification of Disease (World Health Organisation, 2000), and was consistent with approaches in recent policy documents (Department of Health 2004b).

Assessment of referring health professional and leisure provider

Health professionals were assigned to one of four categories; general practitioner (GP), practice nurse, physiotherapist or other. The 'other' category comprised dieticians, psychiatrists, nurse specialists, cardiac nurses, smoking cessation officers and healthy lifestyle co-ordinators. Leisure providers were categorised according to funding source; local authority, local education authority, private or individual provider.

Statistical analysis

To identify participant and scheme characteristics associated with uptake and participation (four outcomes), four binary logistic regression models were computed (Table 2). Three common independent variables were entered into each regression model: gender, referring health professional and referral reason. In addition, age and leisure provider data were available for entry into model four.

*****Table 2: Binary outcome variables for logistic regression models******

RESULTS

The majority of participants were women (62.3%). The mean age of participants was 50.3 yr (range 9-89 yr), with the majority of participants residing in the 30-69 yr age group (83%). Men and women had similar age distributions. The most prevalent primary referral reason was overweight or obesity (30.3%), followed by musculoskeletal reasons (26.3%) and cardiovascular disease (16.0%). Most referrals were made by general practitioners (72.4%), then practice nurses (13.1%) and physiotherapists (10.6%). Over half of all referred participants selected a local authority funded leisure provider (58.1%), followed by local education authority (24.3%), private (2.9%) and individual (1.4%) leisure providers.

Data from 2958 participants were included in logistic regression analysis (Figure 1). Age and leisure provider data were only available for entry into Model 4. Only primary referral reason was associated with the PARS co-ordinator making contact with participants (Model 1). The PARS coordinator was significantly less likely to successfully contact participants with a referral for overweight/obesity (0.586, 0.362-0.951, p = 0.030) or a mental health condition (0.353, 0.188-0.663, p = 0.001), compared with those referred for a cardiovascular condition.

Gender and referral reason were both associated with being successfully

assigned to a leisure provider (Model 2). Females were more likely to agree to be assigned to a leisure provider (1.250, 1.003-1.559, p = 0.047). Compared with patients with a referral for a cardiovascular condition, patients with a referral for overweight/obesity (0.695, 0.495-0.975, p = 0.035) and mental health condition (0.550, 0.338-0.896, p = 0.016) were significantly less likely to be assigned to a leisure provider.

Referral reason and referring health professional were both associated with referral uptake (Model 3). Those referred for overweight/obesity (0.639, 0.501-0.814, p < 0.001), musculoskeletal health (0.759, 0.582-0.990, p = 0.042), mental health conditions (0.339, 0.275-0.579, p < 0.001), and for 'other' reasons (0.630, 0.462-0.858, p = 0.003) were significantly less likely to take up a referral opportunity compared with patients with a referral for a cardiovascular condition. Compared with patients referred by their GP, those referred by an 'other' health professional (i.e., dieticians, psychiatrists, etc) were significantly less likely to take up a referral opportunity (0.540, 0.369-0.792, p = 0.002).

Only gender and age were associated with completion of the referral (i.e., attendance at 80% or more of the planned exercise sessions). Females were less likely to complete (0.823, 0.681-0.994, p = 0.043), whereas increasing age was positively associated with completion (1.016, 1.010-1.023, p < 0.001).

******** Table 3: Binary logistic regression analysis outcomes ********

DISCUSSION

Age and gender characteristics of people referred were similar to other UK PARS evaluations (Gidlow et al., 2005) and appear to reflect higher use of primary care services among women and older people (Goddard and Smith, 2001; Office for National Statistics, 2005). The finding that obesity accounted for over a third of all initial reasons for referral is consistent with previous scheme evaluations (e.g. Lord and Green, 1995; Hammond et al., 1997; Dugdill et al., 2004). This may be due to the increasing prevalence and visual nature of the condition as well a greater awareness of the link between physical inactivity and obesity (Department of Health, 2004b). General Practitioners referred most of the participants onto the scheme (72.4%); again this is consistent with other evaluations (Lord and Green, 1995; Taylor, 1998; Dugdill et al., 2004; Harrison et al., 2005) and may reflect the fact that schemes were traditionally called 'GP Referral Schemes'. However, this finding may also reflect the greater proportion of GP's in a local surgery compared with other health professionals. The possibility that patients (rather than GPs) initiated their referral whilst visiting their GP should also be acknowledged.

An uptake rate of 65% in the present study compares favorably with RCT-style PARS evaluations (23 - 49%; **calculated as a proportion of the total sample invited to participate**) and most (43 - 60%) (Gidlow et al., 2005), but not all (79%) (Harrison et al., 2005a), prospective longitudinal evaluations. The only published study that has reported data on those removed from PARS immediately following referral involved a subgroup of participants from the

present study (Johnston et al., 2005). Johnston et al (2005) reported a similar proportion of participants (5%) had no contact with the CRM as the current study (6.7%). The researchers' analysis of removal reasons revealed that barriers such as time, cost, transport, and childcare had a significant role to play in preventing these individuals from accessing the scheme.

Women were more likely to be referred to the scheme than men but less likely to complete 80% or more of their planned sessions. Their greater exposure to the scheme may be explained by higher contact with primary care services (Goddard and Smith, 2001; Office for National Statistics, 2005). The reduced likelihood of women completing suggests that, despite their positive intention to take part, a range of barriers appear to prevent them from implementing their intention (Gollwitzer et al., 2004). A likely contributor is conflict between competing time commitments as a result of greater domestic responsibility (Kar et al., 1999; Mackey et al., 2002). Multiple social roles of women tends to result in prioritization of others' needs over their own, with detrimental consequences for health and physical activity (Aitchison, 2003), which would logically extend to problems with sustained participation in a physical activity programme. Secondly, physical activity research has shown that women attach greater importance to social support than men, but often the support they give within the home is not reciprocated (McMunn et al., 2006). Consequently, women might not receive or perceive sufficient social support to complete a physical activity programme. The nature of the exercise environment and the greater impact of negative physical self perception on physical activity in women could also help explain poorer completion rates in women (Matlin, 1993). Additional

barriers such as finance and transport issues are also likely to have played a part (Johnston, et al 2005).

Self-efficacy, provides a possible explanation for men being more likely than women to complete programmes despite similar propensity to take up referral. The main source of self-efficacy is past experience (Bandura, 1986), and its influence on physical activity behaviour is apparently stronger in men who tend to be more motivated by factors relating to performance and mastery (Biddle and Mutrie, 2001). Therefore, the increase in confidence resulting from beginning an exercise programme could have been sufficient to prompt completion in men, whereas in women, this may have been less influential.

Those referred for overweight or obesity and mental health conditions were less likely to be contacted, to be assigned to a leisure provider, and to uptake the referral opportunity. Thus despite people with psychological problems being more frequent users of primary care services (Kapur et al., 2004; Zantinge et al., 2005), and despite overweight or obesity being the most common referral condition, the results of the current study would suggest that people with these conditions are not well served by the PARS model. This is a concern given the prevalence of these conditions, the lower physical health status of those with mental health conditions (Biddle and Mutrie, 2001a; Corti et al., 1996; Crone et al., 2005) and the strong association of obesity with cardiovascular disease (Department of Health, 2004b).

The consistent negative association between a physically active lifestyle and overweight or obesity (Trost et al., 2002) not only reflects the role of inactivity in the development of the condition, but suggests that overweight and obese individuals experience greater barriers to becoming active. Physiological and psychological characteristics associated with obesity (e.g. physiological strain, temperature increases, fatigue, social physique anxiety, physical self perceptions) are all likely to play a part (Ball et al., 2000).

The barriers to accessing health services in those with mental health conditions have been reported elsewhere (Issakidis and Andrews, 2004). Furthermore, it has been suggested that in primary health care the physical health needs of those with mental health problems are often neglected (Friedli and Dardis, 2002). Reasons cited for dropping out of exercise therapy include logistical difficulties, side effects of medication, and dissatisfaction with the exercise programme (Herman et al., 2002; Issakidis and Andrews, 2004). In fact a link has been made between the characteristics predicting poor responses to both pharmacological and exercise therapy (Herman et al 2002). Depression, which is one of the most prevalent mental health conditions (Singleton, 2003), is characterised by increased feelings of hopelessness, which has been linked with patients lacking belief in the efficacy of treatments (Wing et al. 2002). Again, this could explain poorer progression through PARS. Further research is needed that focuses on how to encourage exercise participation among patients with mental health problems. This is particularly pertinent given the growing acknowledgement of benefits of physical activity for mental health

conditions, particularly depression (National Institute for Health and Clinical Excellence, 2006; Department of Health, 2006).

The positive relationship between age and the likelihood of completion corresponds with an age-related reduction in time constraints, the most frequently cited physical activity barrier in adults (Sports Council and Health Education Authority, 1992). Given the gender differences in domestic responsibility, constraints related to greater family commitments in younger adults could also help to explain why younger women were the least likely to complete and older men were most likely.

Again, the social exercise environment is a potential contributor. Over-representation of adults in middle- and early old-age could have created a social environment that suited certain age-gender profiles (Hardcastle and Taylor, 2001). The importance of physical activity as a means of socialisation and social contact as a primary motivator in older people (Stathi et al., 2003) could partly explain the increase in completion rate with age.

The present research demonstrates the value of, population-based longitudinal PARS evaluation. The findings from this and similar studies (Gidlow et al., in press; Harrison et al., 2005) make an important contribution to the area by addressing a gap in knowledge which is not possible through the use of controlled experimental type research.

CONCLUSION & RECOMMENDATIONS

In conclusion, the PARS format may be less appropriate for those with particular referral reasons, particularly overweight/obesity and mental health conditions. Females are more likely to take up a referral opportunity, but less likely to complete. Completion is better in older participants.

Four key recommendations result from the findings of the present study; three relating to practice and one relating to further research. Firstly, completion rates should improve in the future with better targeting. This could be achieved through a more honest and detailed exchange of information between health professional and patient: health professionals could make more informed decisions on the appropriateness of PARS for the individual; patients can be informed of what the intervention entails in the hope of identifying, and if possible addressing, barriers that might result in subsequent dropout. Unfortunately, health professionals' time is the common limiting factor.

Secondly, a greater range of physical activities, not necessarily facility-based, could improve participation. For example, walking programmes in the local community may be more appealing to some participants.

Thirdly, schemes could provide and promote greater flexibility for more time constrained individuals (i.e., younger adults, women), or for people with mental health problems, to allow them to freely drop in and out of schemes, particularly where illness symptoms may fluctuate during their time on the scheme.

Finally, in addition to future research into PARS effectiveness, it is important to

further explore *why* certain groups (e.g. younger adults, women, those with overweight/obesity or mental health conditions) are less suited to PARS, possibly using qualitative methodologies. This may help to determine if these groups can be catered for through adapting the existing PARS model or whether alternative strategies are required.

REFERENCES

Aitchison C.C. (2003). *Gender and leisure: social and cultural perspectives*. London: Routledge

Ball K., Crawford D., Owen N. (2000). Too fat to exercise? Obesity as a barrier to physical activity. *Australian and New Zealand Journal of Public Health*, 24 (3), 331-333

Bandura A. (1986). *Social foundations of thought and action: a social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall

Biddle S. and Mutrie N. (2001). *Psychology of physical activity*. London: Routledge

Crone D., Johnston L., Grant T. (2004). Maintaining quality in exercise referral schemes: a case study of professional practice. *Primary Health Care Research and Development*, 5 (5), 96-103

Crone D., Heaney L., Herbert R., Wilson J., Johnston L., Macpherson R. (2005). A comparison of lifestyle behaviour and health perceptions of people with severe mental illness and the general population. *Journal of Mental Health Promotion*, 3 (4), 19-25

Department of Health (2001). *Exercise referral systems: a national quality assurance framework*. London: The Stationery Office

Department of Health (2004a). *Choosing health? Choosing activity: a consultation on how to increase physical activity*. London: The Stationery Office

Department of Health (2004b). *At least five a week: Evidence on the impact of physical activity and its relationship to health: A report from the Chief Medical Officer*. London: Crown copyright

Department of Health (2005). *Choosing activity: a physical activity action plan*. London: The Stationery Office

Department of Health (2006). *Choosing Health: Supporting the physical needs of people with SMI*. London: HMSO

Dugdill L. and Graham R.C. (2004). Promoting physical activity: building sustainable interventions. In J. Gormley and J. Hussey (Eds.) *Exercise therapy: prevention and treatment of disease* (pp. 240-255) Oxford: Blackwell Science Publishing

Dugdill L., Graham R. C. and McNair F. (2005) Exercise referral: the public health panacea for physical activity promotion? A critical perspective of exercise referral schemes; their development and evaluation. *Ergonomics*, 48, 1390-1410.

Friedli L. and Dardis C. (2002). Not all in the mind: mental health service user

perspectives on physical health. *Journal of Mental Health Promotion*, 1 (1), 36-46

Gidlow C., Johnston L.H., Crone D., James D.V.B. (2005). Attendance of exercise referral schemes in the UK: a systematic review. *Health Education Journal*, 64 (2),168-186

Gidlow C., Johnston L., Crone D., Morris C., Smith A., Foster C. and James, D. (in press). Socio-demographic patterning of referral, uptake and attendance in Physical Activity Referral Schemes. *Journal of Public Health*.

Goddard M., and Smith P. (2001). Equity of access to health care services: theory and evidence from the UK. *Social Science and Medicine*, 53, 1149-1162

Gollwitzer P.M., Fujita K., Oettingen G. (2004). Planning and the implementation of goals. In R.F. Baumeister & K.D. Vohs (Eds.) *Handbook of self-regulation: Research, theory and applications* (pp. 211-228). New York: Guilford Press

Hammond J., Brodie D., Bundred P. (1997). Exercise on prescription: guidelines for health professionals. *Health Promotion International*, 12, 33-41

Hardcastle S. and Taylor A.H. (2001). Looking for more than weight loss and fitness gain: psycho-social dimensions among older women in a primary health

care exercise referral scheme. *Journal of Aging and Physical Activity*, 9, 313–328

Harrison R.A., McNair F., Dugdill L. (2005). Access to exercise referral schemes - a population based analysis. *Journal of Public Health Medicine*, 27 (4), 326-330

Herman S., Blumenthal J.A., Babyak M., Khatri P., Craighead W.E., Krishnan K.R., Doraiswamy P.M. (2002). Exercise therapy for depression in middle-aged and older adults: predictors of early dropout and treatment failure. *Health Psychology*, 21(6):553-63

Issakidis C. and Andrews A. (2004). Pretreatment attrition and dropout in an outpatient clinic for anxiety disorders. *Acta Psychiatry Scandinavia*, 109, 426–433

Johnston L.H., Warwick J., De Ste Croix M., Crone D., Sidford A. (2005). The nature of all 'inappropriate referrals' made to a countywide physical activity referral scheme: implications for practice. *Health Education Journal*, 64 (1), 58-69

Kapur N., Hunt I., Lunt M., McBeth J., Creed F., McFarlane G. (2005). Primary care consultation predictors in men and women: a cohort study. *British Journal of General Practice*, 55 (511), 108–113

Kar S.B., Pascual C.A., Chickering K.L. (1999). Empowerment of women for health promotion: a meta-analysis. *Social Science and Medicine*, 49, 1431-1460

Lord J. and Green F. (1995). Exercise on prescription: does it work? *Health Education Journal*, 54, 453–464

Mackey-Jones W. and McKenna J. (2002). Women and work-home conflict: a dual paradigm approach. *Health Education*, 102, 249–59

Matlin, M. W. (1993). *The psychology of women: second edition*. Fort Worth, TX: Harcourt Brace Jovanovich

McMunn A., Bartley M., Hardy R., Kuh D. (2006). Life course social roles and women's health in mid-life: causation or selection? *Journal of Epidemiology and Community Health*, 60 (6), 484-489

Morgan O. (2005) Approaches to increase physical activity: reviewing the evidence for exercise-referral schemes. *Public Health*, 119, 361-370.

National Institute for Health and Clinical Excellence (2006). *Four commonly used methods to increase physical activity: brief interventions in primary care, exercise referral schemes, pedometers and community-based exercise programmes for walking and cycling: Public Health Intervention Guidance no. 2*. London: NIHCE

Office for National Statistics (2005). *Use of health services by gender and age, 1998-99: social focus on men*. Available at http://www.statistics.gov.uk/StatBase/ssdataset.asp?vlnk=4457&Pos=1&ColRank=1&Rank=272 March 2005

Rothwell P. M. (2005) External validity of randomised controlled trials: "To whom do the results of this trial apply?" *The Lancet,* 365, 82-93.

Singleton N., Bumpstead R., O'Brien M., Lee A., Meltzer H. (2003). Psychiatric morbidity among adults living in private households, 2000: summary report. *International Review of Psychiatry*, 15 (1-2), 65-73

Smith A. and Bird S. (2004). From evidence to policy: reflections on emerging themes in health-enhancing activity. *Journal of Sports Science*, 22, 791-799

Sports Council and Health Education Authority (1992). *Allied Dunbar National Fitness Survey: a report on activity patterns and fitness levels: main findings*. London: Sports Council and Health Education Authority

Stathi A., McKenna J., Fox K. (2003). The experiences of older people participating in exercise referral schemes. *Journal of the Royal Society for the Promotion of Health*, 124, 18–23

Taylor A.H., Doust J.H., Webborn N. (1998). Randomised controlled trial to examine the effects of a GP exercise referral programme in Hailsham, East Sussex, on modifiable coronary heart disease risk factors. *Journal of Epidemiology and Community Health*, 52, 595-601

Trost S.G., Owen N., Bauman A.E., Sallis J.F., Brown W. (2002). Correlates of adults participation in physical activity: Review and update. *Medicine and Science in Sports and Exercise*, 34, 1996-2001

Wing R.R., Phelan S., and Tate D.F. (2002). The role of adherence in mediating the relationship between depression and health outcomes. *J Psychosomatic Research*, 53, 877-881

World Health Organisation (2000). International Classification of Disease. Available at www.who.int/msa/mnh/ems/icd10/icd10.htm March 2005

Zantinge E.M., Verhaak P.F.M., Bensing J,M. (2005). The workload of GPs: patients with psychological and somatic problems compared. *Family Practice*, 22, 293–297

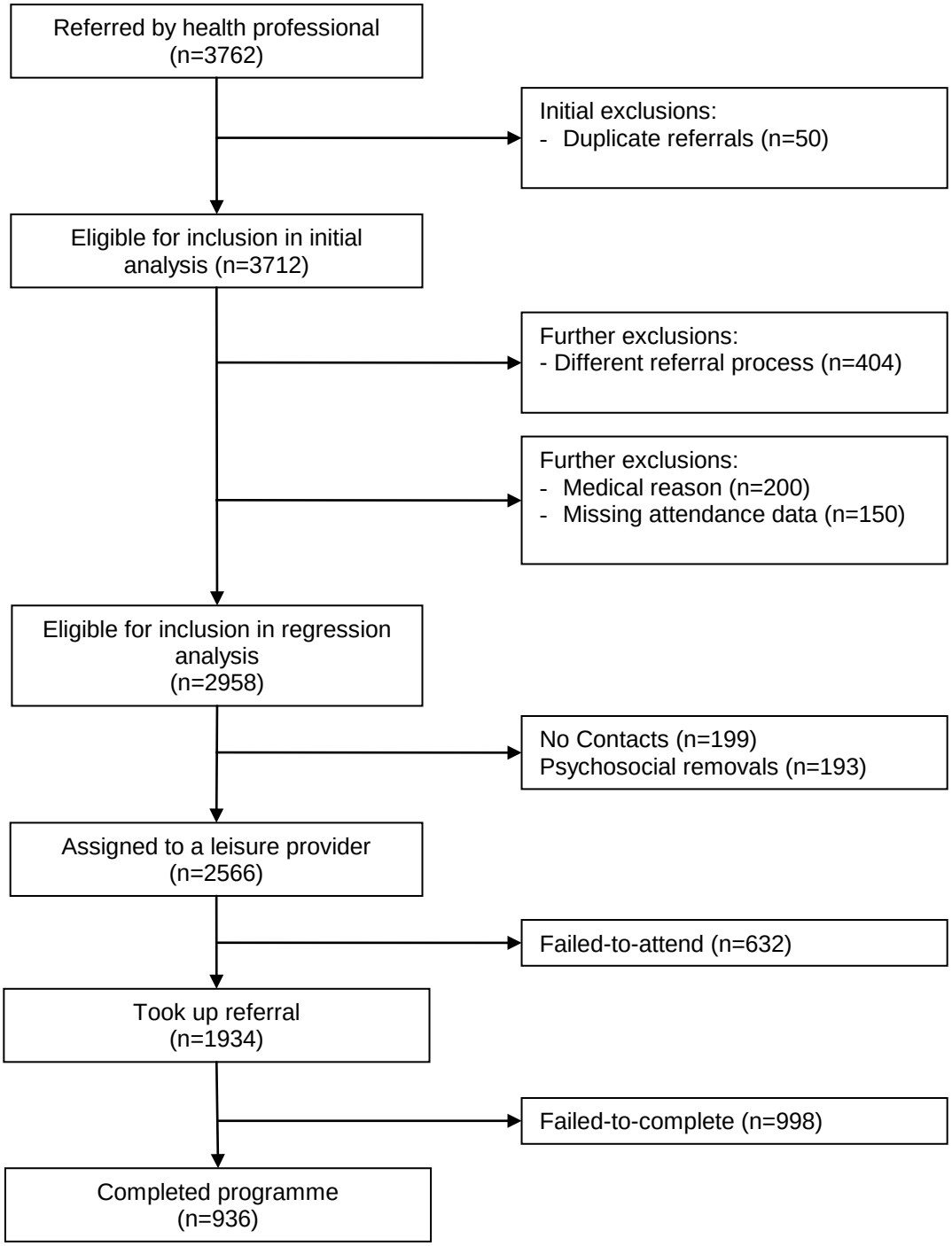

Figure 1: Cohort Profile

Table 1: Categories used to determine uptake and participation outcomes

Category	Description
No contact (NC):	Not contactable by PARS co-ordinator following referral
Psychosocial removal (PSR):	Chose not to proceed with the referral
Fail-to-attend (FTA):	Assigned to a leisure provider - did not take up referral
Fail-to-complete (FTC):	Took up referral - attended <80% of exercise sessions
Complete (Comp):	Took up referral - attended ≥80% of exercise sessions

Table 2: Binary outcome variables for logistic regression models

Model	Binary outcome 0		Binary outcome 1
1	No contact (NC)	vs.	Contacted (PSR + FTA + FTC + Comp)
2	Self -removal (NC + PSR)	vs.	Assigned to leisure provider (FTA + FTC + Comp)
3	Did not take up referral (NC + PSR + FTA)	vs.	Took up referral (FTC + Comp)
4	Took up referral, failed to complete programme (FTC)	vs.	Completed programme (Comp)

Table 3: Binary logistic regression analysis outcomes

	Model 1 OR (95%CI)	*p*	Model 2 OR (95%CI)	*p*	Model 3 OR (95%CI)	*p*	Model 4 OR (95%CI)	*p*
Gender	N/I				N/I			
Male			1.000 (ref)				1.00 (ref)	
Female			1.250 (1.003 to 1.559)	0.047			0.823 (0.681 to 0.994)	0.043
Age (continuous)	N/A		N/A		N/A		1.016 (1.010 to 1.023)	<0.001
Referral reason		0.014		0.011		<0.001	N/I	
Cardiovascular	1.000 (ref)		1.000 (ref)		1.000 (ref)			
Overweight/Obesity	0.586 (0.362 to 0.951)	0.030	0.695 (0.495 to 0.975)	0.035	0.639 (0.501 to 0.814)	<0.001		
Diabetes	0.988 (0.415 to 2.353)	0.978	1.585 (0.806 to 3.119)	0.182	1.003 (0.659 to 1.525)	0.990		
Musculoskeletal	0.796 (0.477 to 1.328)	0.382	1.013 (0.708 to 1.451)	0.942	0.759 (0.582 to 0.990)	0.042		
Mental Health	0.353 (0.188 to 0.663)	0.001	0.550 (0.338 to 0.896)	0.016	0.339 (0.275 to 0.579)	<0.001		
Unfit/Sedentary	1.030 (0.481 to 2.203)	0.940	0.779 (0.483 to 1.258)	0.307	0.758 (0.533 to 1.079)	0.124		
Other	0.722 (0.390 to 1.339)	0.302	0.814 (0.527 to 1.257)	0.354	0.630 (0.462 to 0.858)	0.003		
Health professional	N/I		N/I			0.006	N/I	
General practitioner					1.00 (ref)			
Practice nurse					1.032 (0.817 to 1.304)	0.790		
Physiotherapist					1.218 (0.919 to 1.615)	0.170		
Other					0.540 (0.369 to 0.792)	0.002		
Leisure provider	N/A		N/A		N/A		N/I	
Local authority								
Local education auth.								
Private								
Individual								

Note: N/A indicates that data were not available; N/I indicates that variable did not improve the model fit, so was not included in the final model