Identification of dropout predictors to a community-based physical activity programme that uses motivational interviewing

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Abstract

Background: Participant dropout reduces intervention effectiveness. Predicting dropout has been investigated for Exercise Referral Schemes (ERSs), but not physical activity (PA) interventions with Motivational Interviewing (MI). **Methods:** Data from attendees (n=619) to a community-based PA programme utilising MI techniques was analysed using chi-squared to determine dropout and attendance group differences. Binary logistic regression investigated the likelihood of dropout before 12-weeks. **Results:** 44.7% dropped out, with statistical (*P*<0.05) differences between groups for age, PA, and disability. Regression for each variable showed participants aged 61-70 years (OR=0.28, CI=0.09 to 0.79; *P*=0.018), >70 years (OR=0.30, CI=0.09 to 0.90; *P*=0.036), and HEPA (OR=0.40, CI=0.20 to 0.75; *P*=0.006) reduced dropout likelihood. Endocrine system disorders (OR=4.24, CI=1.19 to 19.43; *P*=0.036) and musculoskeletal disorders (OR=3.14, CI=1.84 to 5.45; *P*<0.001) increased dropout. Significant variables were combined in a single regression model. Dropout significantly reduced for 61-70 year olds (OR=0.31, CI=0.10 to 0.90; *P*=0.035), and HEPA (OR=0.39, CI=0.19 to 0.76; *P*=0.008). Musculoskeletal disorders increased dropout (OR=2.67, CI=1.53 to 4.75; *P*<0.001). **Conclusions:** Age, PA, and disability type significantly influence dropout at 12-weeks, the first results specific to MI based programmes indicating the inclusion of MI and highlight the need for further research.

Introduction

The physical activity (PA) levels of individuals increase through participation in an Exercise Referral Scheme (ERS)[1,2]. ERSs increase the number of sedentary participants becoming moderately active[3], and provide health benefits to specific populations[4]. However, the current level of evidence put forward by the National Institute for Health and Care Excellence (NICE) suggests ERSs have a marginal added effect compared to other methods of increasing PA[5]. NICE recommend alternative approaches to increase PA; one of which is brief advice[5]. Brief advice can be implemented in various formats, one being Motivational Interviewing (MI). MI provides an evidence based clinical approach that is used to deliver a range of benefits to patients, healthcare professionals, and organisations[6]. It is a client centred approach, using a direct method to increase, guide, elicit, and strengthen intrinsic motivation to change, explore and resolve ambivalence[7,8].

In addition to increasing PA, MI in primary care can produce significant improvements in behaviour change and wider social support over a six-month period[9]. A recent systematic review and meta-analysis[10] reported a small effect for MI increasing PA levels for individuals with chronic health conditions, relative to comparison groups. O'Halloran et al.[10] suggested that adding MI to usual care can lead to modest improvements in PA. However, the studies within this systematic review did not report dropout or adherence. A substantial challenge to the effectiveness of exercise is overcoming low adherence and high dropout[11], which negatively impacts cost effectiveness, putting programmes at risk when sourcing new funding[12]. Adherence can be defined as a situation where participants who initially take part continue to take part[12]. The opposite is dropout (sometimes called non-attendance), where participants who initially take part but do not continue, removing themselves from the scheme.

Two studies[13,14] predicted the likelihood of ERS dropout, reporting variables that show opposing effects that impact on participant dropout. The medical condition or reason for referral highlighted that certain conditions increase the likelihood of dropout, however not all conditions do. Younger participants are more likely to dropout, as are smokers, and those who take part in less PA. Whereas, a lack of motivation and lack of childcare barriers decrease the likelihood of dropout. As there are only two studies that predict dropout for ERS, further

research is warranted. The data reported to date provides vital and interesting findings that could provide the key to help reduce participant drop out.

Currently there is a lack of available literature relating to the adherence and dropout of participants focusing specifically on MI interventions. Yet, within ERSs there have been several studies[2,13–18] that look to predict those that adhere or dropout of schemes. By definition MI is a collaborative, person-centred approach that guides and strengthens personal motivation to change[8]. This interaction, that is not part of traditional ERSs, may be a key mechanism to support individuals and thus reduce dropout. The aim of this study is to explore the predictors of dropout within a community-based PA programme that utilises MI techniques. This will further understanding of the effectiveness of such interventions, as well as advance academic literature on dropout and adherence to PA interventions.

Method

Population

Data was collated from 619 participants who attended the first year (June 2015 – May 2016) of a community based PA programme (Let's Get Moving [LGM]) that utilises MI techniques, delivered across the county of Essex, United Kingdom. Participants were invited to take part in the programme if their GP records stated they were aged 18-74 years, and had a body mass index (BMI) between 28-35kg.m^{-2}. All participants attended an initial appointment with a Community Exercise Professional where a MI took place. Each MI session lasted for 30 minutes and consisted of two phases. Phase one was to enhance intrinsic motivation for change, and phase two aimed to strengthen change[7]. At the end of the appointment one of two pathways were followed depending on the pathway assigned to their GP surgery; (1) a standard MI pathway, and (2), a Social Action (SA) group pathway. The standard MI pathway involved the signposting of suitable local activities. Participants then returned for a 12-week MI appointment. There was no contact between appointments. Those within the SA group pathway met weekly for 12-weeks in groups up to 25 with the Community Exercise Professional in local community centres. These weekly sessions involved learning about and discussing a range of topics that help lead a healthy lifestyle, including regular PA, confidence,

weight management, and having fun with friends and family. Participants did not take part in any PA during these sessions. Participants then returned for a 12-week MI appointment.

Data were collected at initial appointments with attendance of follow up determined from their 12-week appointment record. Community Exercise Professionals working within GP surgeries, conducted baseline and 12-week appointments, recording relevant data. Each Community Exercise Professional was trained in MI techniques, safeguarding procedures and guidelines, and technical training ensuring data was collected and reported accurately.

All participants provided written informed consent and ethical approval for this research was obtained from the Ethics Committee at St Mary's University, Twickenham. Further ethical approval from the London – Hampstead Research Ethics Committee was obtained for the LGM programme.

Measures

Baseline demographic data were collected from participants who attended the first year of the LGM programme. This included gender, age, ethnicity, and disability or medical condition. Baseline self-reported PA levels were collected using the short-form International Physical Activity questionnaire (IPAQ). The IPAQ is valid (criterion validity Spearman's coefficient of 0.40 for total PA), reliable (Test-retest Spearman's reliability coefficient of 0.69 for all PA intensities), and an international standard developed and evaluated as an instrument for self-report, population-level research[19]. Further, the IPAQ represents the most feasible approach for this population[20], allowing for comparison between programmes and a collation of findings. Attendance at the 12-week follow up appointment was determined by the completion of the IPAQ at this time point, if no IPAQ data was collected a participant was deemed to have dropped out. By dropping out participants left the intervention which meant they no longer attended the weekly SA group sessions or did not receive a follow up MI session.

Data Management

All data were recorded and securely stored using Lumeon (1.90.18.dev, Lumeon, London, UK) before being anonymously exported for analysis. Data collection used predetermined categories meaning data input errors (e.g. a misspelling of female) were minimised, although

all data were checked for obvious errors. For disability, where a response was missing it was considered to indicate that a participant had no known disability or medical condition. Disabilities were collected in 17 predetermined categories used as part of the LGM reporting, with an additional category added for those with multiple conditions. Ethnicity was collected and categorised into five ethnic groups in accordance with the Office of National Statistics guidance measuring equality [21]. IPAQ analysis was conducted in accordance with published guidelines, and categorised into inactive, minimally active, and Health Enhancing Physical Activity (HEPA)[22].

Statistical analysis

All data analysis was conducted using R version 3.4.3 (https://cran.r-project.org/). Chi-squared (χ^2) analysis was conducted to determine any differences in age, gender, ethnicity, PA, disability or medical condition, and pathway between the dropout group and attendance group. Binary logistic regression was used to investigate the ability of the following independent variables measured at baseline to predict dropout before 12-weeks; gender, age, PA level, disability or medical condition, and pathway. Multiple regression models were used for each independent variable to determine which had a significant effect on dropout before 12-weeks. Each significant variable was then combined into a single regression model to determine which of these influences dropout before 12-weeks. Likelihood ratio tests, McFadden R^2, Cox and Snell R^2, and Nagelkerke R^2, and Wald test were used to investigate the models overall fit, variance, and statistical significance of the single regression model.

Results

Descriptive analysis

A total of 619 participants attended an initial MI appointment with 277 (44.7%) dropping out before the 12-week point. Overall, 41.6% of males and 47.0% of females dropped out (

Table 1), with a non-statistically significant difference between the dropout and attendance groups ($\chi^2_{(1)} = 1.52$, P=0.217) for gender.

Between those who dropped out and attended, age was significantly different ($\chi^2_{(5)}$ = 33.74, *P*<0.001). The lower age groups, specifically those under 30 and between 31-40, saw the largest percentage drop out, 62.5% and 61.1% respectively.

More than half of Black or Black British participants (54.8%) and Asian or Asian British participants (57.1%) dropped out. The lowest number of dropouts came from the White or White British participants (n=203; 42.1%) (

Table 1). However, there was no significant difference in ethnicity between dropout and attendance groups ($\chi^2_{(4)}$ = 6.39, *P*=0.172).

Half (50.2%) of participants who self-reported being minimally active at baseline dropped out, with a slightly smaller percentage of inactive participants dropping out (45.0%) (

Table 1). PA level was statistically significant between the dropout and attendance group ($\chi^2_{(2)}$ = 11.53, *P*=0.003).

Disability or medical condition was statistically significant between the dropout and attendance group ($\chi^2_{(16)}$ = 35.892, *P*=0.003). Just over a third (38.6%) of participants without a disability or medical condition dropped out, as well as 44.3% of participants who had multiple disabilities or medical conditions (

Table 1).

More participants on the MI pathway dropped out at 12-weeks (47.0%), compared to 38.7% of participants on the SA pathway (

Table 1), however this difference was not significantly different ($\chi^2_{(1)}$ = 3.10, *P*=0.079).

Table 1. Baseline and 12-week descriptive analysis including the percentage of dropouts and chi-squared results between the dropout and attendance group for each variable.

	Baseline (n=619)		**12-weeks: dropout (n=277)**		**12-weeks: attended (n=342)**		**Overall % dropout**
	n	**%**	**n**	**%**	**n**	**%**	
Gender							
Male	245	39.6%	102	36.8%	143	41.8%	41.6%

Female	370	59.8%	174	62.8%	196	57.3%	47.0%
Not stated	4	0.6%	1	0.4%	3	0.9%	25.0%
							$\chi^2_{(1)} = 1.52$
							$P=0.217$
Age							
Under 30	16	2.6%	10	3.6%	6	1.8%	62.5%
31-40	72	11.6%	44	15.9%	28	8.2%	61.1%
41-50	109	17.6%	63	22.7%	46	13.5%	57.8%
51-60	167	27.0%	77	27.8%	90	26.3%	46.1%
61-70	180	29.1%	57	20.6%	123	36.0%	31.7%
Over 70	72	11.6%	24	8.7%	48	14.0%	33.3%
Not stated	3	0.5%	2	0.7%	1	0.3%	66.7%
							$\chi^2_{(5)} = 33.74$
							$P<0.001$*
Ethnicity							
White or White British	482	77.9%	203	73.3%	279	81.6%	42.1%
Black or Black British	62	10.0%	34	12.3%	28	8.2%	54.8%
Asian or Asian British	28	4.5%	16	5.8%	12	3.5%	57.1%
Mixed	7	1.1%	3	1.1%	4	1.2%	42.9%
Other	1	0.2%	0	0.0%	1	0.3%	0.0%
Not stated	39	6.3%	21	7.6%	18	5.3%	53.8%
							$\chi^2_{(4)} = 6.39$
							$P=0.172$
PA							
Inactive	322	52.0%	145	52.3%	177	51.8%	45.0%
Minimally active	235	38.0%	118	42.6%	117	34.2%	50.2%
HEPA	53	8.6%	13	4.7%	40	11.7%	24.5%
Not stated	9	1.5%	1	0.4%	8	2.3%	11.1%
							$\chi^2_{(2)} = 11.53$
							$P=0.003$*
Disability							
Asthma	17	2.7%	8	2.9%	9	2.6%	47.1%
Autoimmune disorders	3	0.5%	1	0.4%	2	0.6%	33.3%
Cancer	10	1.6%	2	0.7%	8	2.3%	20.0%
Cardiovascular system disorders	25	4.0%	13	4.7%	12	3.5%	52.0%
Diabetes	2	0.3%	2	0.7%	0	0.0%	100.0%
Digestive system disorder	2	0.3%	0	0.0%	2	0.6%	0.0%
Endocrine system disorders	11	1.8%	8	2.9%	3	0.9%	72.7%
High blood pressure	28	4.5%	12	4.3%	16	4.7%	42.9%
Learning disability	6	1.0%	3	1.1%	3	0.9%	50.0%
Mental health condition	15	2.4%	5	1.8%	10	2.9%	33.3%
Multiple	149	24.1%	66	23.8%	83	24.3%	44.3%
Musculoskeletal disorders	75	12.1%	50	18.0%	25	7.3%	66.7%
Neurological disorders	3	0.5%	0	0.0%	3	0.9%	0.0%
None	262	42.3%	102	36.8%	160	46.8%	38.9%

Other	2	0.3%	1	0.4%	1	0.3%	50.0%
Respiratory disorders	3	0.5%	0	0.0%	3	0.9%	0.0%
Sensory Impairment	6	1.0%	4	1.4%	2	0.6%	66.7%
							$\chi^2_{(16)} = 35.89$
							P=0.003*
Pathway							
MI	451	72.9%	212	76.5%	239	69.9%	47.0%
Social Action	168	27.1%	65	23.5%	103	30.1%	38.7%
							$\chi^2_{(1)} = 3.10$
							P=0.079

* indicated χ^2statistically significant difference between the dropout and attendance group (α=0.05).

Each independent variable

Regression models analysed each independent variable in isolation and can be seen in Table 2. Gender and ethnicity were not found to be statistically significant predictors of dropout at 12-weeks. Age was found to be a significant predictor of dropout, with the two oldest age ranges demonstrating a statistically significant contribution to the model, with odds that reduce the likelihood of 12-week dropout (61-70 years (OR=0.28, CI=0.09 to 0.79; *P*=0.018); over 70 years (OR=0.30, CI=0.09 to 0.90; *P*=0.036)). Those participants who reported HEPA at baseline were significantly less likely to dropout at 12-weeks (OR=0.40, CI=0.20 to 0.75; *P*=0.006). Two disabilities or medical conditions were statistically significant predictors of dropout at 12-weeks. Participants with endocrine system disorders (OR=4.18, CI=1.18 to 19.43; *P*=0.037) were the most likely to dropout at 12-weeks followed by those with musculoskeletal disorders (OR=3.14, CI=1.84 to 5.45; *P*<0.001). The pathway was not found to be a statistically significant predictor of dropout at 12-weeks.

Table 2. Results for each individual binary logistic regression model (α = 0.05).

		95% CI		
Gender	**OR**	**2.5%**	**97.5%**	***P***
Female	1.00	(ref)		
Male	0.80	0.58	1.11	0.188
Age				
Under 30	1.00	(ref)		
31-40	0.94	0.29	2.83	0.918
41-50	0.82	0.26	2.38	0.722

51-60	0.51	0.17	1.45	0.216	
61-70	0.28	0.09	0.79	0.018	*
Over 70	0.30	0.09	0.90	0.036	*
Ethnicity					
White or White British	1.00	(ref)			
Black or Black British	1.67	0.98	2.86	0.059	
Asian or Asian British	1.83	0.85	4.04	0.123	
Mixed	1.03	0.20	4.72	0.969	
Other	1.76×10^{-06}	NA	$4.33 \times 10^{+41}$	0.980	
PA					
Inactive	1.00	(ref)			
Minimally active	1.23	0.88	1.73	0.227	
HEPA	0.40	0.20	0.75	0.006	**
Disability					
None	1.00	(ref)			
Asthma	1.39	0.52	3.76	0.508	
Autoimmune disorders	0.78	0.04	8.29	0.843	
Cancer	0.39	0.06	1.60	0.242	
Cardiovascular system disorders	1.70	0.74	3.92	0.207	
Diabetes	$9.03 \times 10^{+6}$	6.22×10^{-64}	NA	0.988	
Digestive system disorder	2.72×10^{-7}	NA	$3.95 \times 10^{+63}$	0.988	
Endocrine system disorders	4.18	1.18	19.43	0.037	*
High blood pressure	1.18	0.52	2.58	0.686	
Learning disability	1.57	0.29	8.62	0.586	
Mental health condition	0.78	0.24	2.27	0.666	
Multiple	1.25	0.83	1.88	0.288	
Musculoskeletal disorders	3.14	1.84	5.45	<0.001	***
Neurological disorders	0.00	NA	$1.10 \times 10^{+41}$	0.986	
Other	1.57	0.06	39.96	0.751	
Respiratory disorders	2.72×10^{-07}	NA	$1.10 \times 10^{+41}$	0.986	
Sensory Impairment	3.14	0.60	22.93	0.191	
Pathway					
Motivational Interviewing	1.00	(ref)			
Social Action Group	0.71	0.49	1.02	0.065	

* $P<0.05$; ** $P<0.01$; *** $P<0.001$

Significant variable model

The single regression model containing only the statistically significant independent variables from each individual model can be seen in

Table 3. Age, PA level, and disabilities or medical conditions each significantly influence the dropout at 12-weeks. Participants aged 61-70 years had a reduced likelihood of dropping out (OR=0.31, CI=0.10 to 0.90; *P*=0.035). Similar results were found for participants who reported HEPA at baseline (OR=0.39, CI=0.19 to 0.76; *P*=0.008). Musculoskeletal disorders were statistically significant predictors of dropout at 12-weeks (OR=2.67, CI=1.53 to 4.75; *P*<0.001).

Table 3. Binary logistic regression results for the model containing only the statistically significant independent variables from each individual model.

		95% CI			
	OR	**2.5%**	**97.5%**	***P***	
(Intercept)	1.20	0.43	3.630	0.738	
31-40	0.88	0.27	2.75	0.833	
41-50	0.93	0.29	2.75	0.894	
51-60	0.61	0.19	1.76	0.365	
61-70	0.31	0.10	0.90	0.035	*
Over 70	0.35	0.10	1.07	0.071	
Minimally active	1.19	0.83	1.71	0.332	
HEPA	0.39	0.19	0.76	0.008	**
Asthma	1.21	0.43	3.37	0.720	
Autoimmune disorders	1.07	0.05	12.13	0.957	
Cancer	0.39	0.06	1.65	0.248	
Cardiovascular system disorders	1.60	0.68	3.80	0.284	
Diabetes	$4.46 \times 10^{+06}$	3.37×10^{-64}	NA	0.988	
Digestive system disorder	0.00	NA	$3.61 \times 10^{+63}$	0.989	
Endocrine system disorders	4.02	1.07	19.38	0.051	
High blood pressure	1.38	0.59	3.17	0.447	
Learning disability	1.33	0.23	7.52	0.736	
Mental health condition	1.01	0.30	3.04	0.980	
Multiple	1.38	0.90	2.12	0.142	
Musculoskeletal disorders	2.67	1.53	4.75	<0.001	***
Neurological disorders	0.00	NA	$3.75 \times 10^{+40}$	0.985	
Other	1.26	0.05	32.53	0.871	
Respiratory disorders	0.00	NA	$1.44 \times 10^{+41}$	0.986	
Sensory Impairment	2.80	0.51	21.16	0.252	

* *P*<0.05; ** *P*<0.01; *** *P*<0.001

Discussion

Main findings of the study

This study explored predictors of dropout within a community-based PA programme that utilises MI techniques. Age, PA, and disability or medical condition significantly impacted participant dropout. This study reveals, for the multiple logistic regression models for each independent variable in isolation, those over 61 years of age are significant less likely to dropout, as are HEPA participants. Participants with musculoskeletal disorders and endocrine system disorders have a significantly increased likelihood of dropout. Combining these significant variables into a single model demonstrated that participants aged between 61 and 70 years, and HEPA participants are less likely to dropout. Participants suffering with musculoskeletal disorders were statistically significant predictors of dropout before the 12-week point.

What is already known on this topic

Current understanding of adherence and dropout prediction is limited to ERSs, with more research published on adherence prediction[2,15–18] than dropout[13,14]. The current findings demonstrate a lower percentage of drop outs (44.7%) when compared to previous ERS literature (51%[12], 80%[23], and 88%[24]), although these studies only report adherence (with the opposite reported here as dropout). The inclusion of MI appointments for all participants, supporting motivation to change, may have contributed to the lower dropout reported. The understanding of the needs and motivations of each participant ensure appropriate activities are signposted or support is provided. Nevertheless, a higher percentage of drop outs was found in this study compared to a specific MI intervention targeted at cardiac rehabilitation patients which reported dropout at 36%[25]. Findings from the current study further support the ERS literature that has identified gender as not being a significant predictor, but increasing age does decrease dropout[13,14]. Self-reported PA is similar to previous findings in that the more active participants are less likely to dropout, however inactive participants do not dropout[14].

What this study adds

This is the first study to identify these predictors for a specific MI based intervention that looks to increase PA levels. The predictors identified demonstrate dropout likelihood within a new area, and they are also comparable to previous ERS research[13,14]. The dropout

percentage result suggest that by utilising a brief intervention, as suggested by NICE[5], dropout can be reduced by at least 6.3% compared to the lowest ERS dropout reported by Pavey et al.[12].

The current study is the first to report dropout prediction for ethnicity and disability or medical condition. Results indicate that ethnicity is not a significant predictor of dropout, whereas participants with musculoskeletal disorders were 2.7 times more likely to dropout, a significant effect. These two variables have however been reported in adherence literature, with both ethnicity [15] and disability significantly influencing the adherence [15–17]. However, for disability, the conditions differed across the studies meaning any link is difficult to identify.

These findings will help to refine and improve the service offered to ensure additional support is in place for those most at risk of dropout to improve retention. This research also has wider implications on the future development and commissioning of services to support inactive individuals due to the greater understanding of what is required. This can be used to inform policy makers and commissioners when deciding on services for specific areas or demographics.

Limitations of this study

Although the use of the IPAQ to collect self-reported PA levels is valid and reliable [19] there is no valid and reliable measure to collect disability or medical condition through self-report. Participants may be inaccurate, not knowing or misreporting their condition. Accessing accurate medical records would alleviate this. However, this solution may not be feasible in practice. A further limitation, and common issue within real-world data collection, is the missing data or incorrect entry of data[26], although this was minimised due to the standardised data collection fields.

Conclusion

This study identified three variables that significantly influenced the likelihood of dropout of a community-based PA programme within primary care that utilises MI techniques; PA level, age, and disability or medical condition. The first study of its kind, it determined the predictors of dropout for a PA programme that includes MI techniques. The findings build upon and advance ERS research, increasing the understanding of how dropout can be reduced.

This study had a lower dropout percentage overall compared to previous ERSs[12,23,24] highlighting how providing a brief MI session can support individuals make motivated decisions around behaviour change. Overcoming low adherence is key to the success of PA interventions[11], offering preventative provision through the benefits associated with PA.

Practitioners, project deliverers, and project funders will use this information to ensure specific strategies are incorporated for different age groups (especially younger than 60), and ensure deliverers are equipped to understand and support participants with conditions that could cause dropout, overcoming a major limitation of PA based public health interventions. Effective interventions that increase PA and minimise dropout can be a powerful tool to support the NHS and wider health care.

Therefore, additional research into the dropout of PA initiatives that incorporate MI techniques is warranted to explore further and advance the knowledge within this field. If this is to happen for MI specific interventions, or even ERSs, then consistent data reporting should be followed. Determining the most appropriate format for each variable may prove difficult due to the limitations discussed but the increase in consistency will ultimately create more accurate and deeper understanding of the research findings.

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