Examining the social cognitive predictors of adherence to an exercise referral scheme

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Abstract

In order to enhance the effectiveness of exercise referral schemes (ERS), further understanding is required of the important predictors of successful adherence to inform future interventions. The present study aimed to explain ERS adherence through examining social cognitive factors in the early stages of the scheme. A prospective cross-sectional design was employed with adults referred to an 8-week ERS completing self-report measures across multiple social cognitive variables at baseline (N = 124) and mid-scheme (N = 58). Findings demonstrated that baseline social cognitive factors were not significantly related to overall ERS adherence. However, when measured at mid-scheme, goal-setting, scheduling self-efficacy, barrier self-efficacy and social support from family were significant correlates of adherence, with changes in social cognitive factors from baseline to mid-scheme combining to explain 22% of the variance in ERS adherence. Our findings provide evidence for early improvements in social cognitive constructs explaining total ERS adherence, thus highlighting their importance in the initial stages of an ERS.

Keywords: exercise prescription; compliance; correlates; psychosocial factors

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Introduction

Global physical activity levels continue to be a public health concern (Rhodes, Janssen, Bredin, Warburton, & Bauman 2017; Sallis et al., 2016). Primary care settings provide an opportunity to intervene to reduce risk factors and promote healthy behaviours (Bully, Sánchez, Zabaleta-del-Olmo, Pombo, & Grandes, 2015; Fox, Biddle, Edmunds, Bowler, & Killoran, 1997). As part of primary care services, "exercise on prescription" or "exercise referral schemes" (ERS) have been utilized by health care professionals to promote sustained exercise behaviour (Hanson, Allin, Ellis, & Dodd-Reynolds, 2013). The schemes, operating across many countries around the world (e.g., Gallegos-Carrillo, García-Peña, Salmerón, Salgado-de-Snyder, & Lobelo, 2017; Sorensen, Kragstrup, Kjaer, & Puggaard, 2008), involve referral of patients deemed at-risk of developing lifestyle diseases to local exercise facilities for a course of structured exercise over an 8-12 week period at a discounted rate or free of charge. Despite their prevalence, questions have been raised regarding their effectiveness on public health, with a lack of adherence cited as a key issue (Campbell et al., 2015; Pavey et al., 2011).

Researchers have identified the important role theory has in understanding physical activity behaviour (Michie et al., 2007), with a recent systematic review emphasising the need for ERS providers to be aware of, and implement strategies to help enhance adherence to the schemes (Morgan et al., 2016). In order to inform successful exercise interventions, Antoniewicz and Brand (2016) stressed the importance of understanding the psychological variables that influence exercise maintainers behavioural decisions. Thus, through examining the predictors of successful ERS adherence, particularly guided by appropriate psychological theory, ERS providers can implement evidence-based interventions to help promote adherence and long-term engagement to exercise.

The majority of research attempting to understand the psychological factors associated with ERS adherence has predominantly used motivation theory to guide understanding (e.g., Edmunds, Ntoumanis, & Duda, 2007; Eynon, O'Donnell, & Williams, 2017; Rahman, Thogersen-Ntoumani, Thatcher, & Doust, 2011), though with limited success. For example, Edmunds and colleagues found no significant motivational predictors of adherence, whilst Rahman et al. and Eynon et al. found self-determined motivation to explain around 11-16% of the variance of adherence. Thus, alternative models are required to capture the large amount of variance unexplained of ERS adherence.

Bandura's (1997) social cognitive theory has the potential to uncover the mechanisms for which ERS adherence may be explained as the theory has been successfully applied in traditional exercise settings (Gourlan et al., 2016; Jekauc et al., 2015). The model reflects the interaction between personal factors, which include cognitive, affective, and biological events; environmental factors, which include social influences (i.e., family, friends), and physical and environmental aspects (i.e., weather, access to facilities); and behaviour, such as exercise.

Specific social cognitive constructs have been shown to be positively related to ERS adherence previously, including high levels of self-efficacy (Edmunds et al., 2007; Jones, Harris, Waller, & Coggins, 2005), low outcome expectations (Jones, Harris, & Waller, 1998; Jones et al., 2005), and social support networks among referred patients (Stathi, Fox, & McKenna, 2010). In addition, through recent qualitative research, social cognitive factors such as self-efficacy and self-regulatory strategies have been shown to underpin ERS adherers exercise identity (Eynon, O'Donnell, & Williams, 2016). However, a predictive model of adherence consisting of social cognitive factors (i.e., goal-setting, planning, enjoyment, self-efficacy, outcome expectations and social support) has yet to be examined in ERS settings. Also, while self-efficacy is well-known as a useful predictor of ERS adherence

(e.g., Edmunds et al.; Jones et al., 2005), the type of self-efficacy (i.e., task, coping, scheduling, barrier) required for successful ERS adherence is not clear. Thus, the present study will examine a combination of social cognitive factors to explain ERS adherence and examine self-efficacy in its different forms in order to evaluate their relevance to ERS adherence.

The early weeks of an exercise programme have been cited as the most challenging period for new exercisers (Annesi & Mazas, 1997). In order for ERS interventions to be effective and promote adherence, ERS providers would need to operate early on and provide evidence-based approaches to elicit behaviour change before participants dropout. Coincided with the high attrition observed in prior studies when using an end-scheme assessment of psychological factors (e.g., Edmunds et al., 2007; Rahman et al., 2011), it is pertinent to assess how social cognitive factors in the early stages of an ERS influence overall adherence.

Based on the lack of application of social cognitive theory to understand ERS adherence, the present study aims to: (i) assess the relationships between social cognitive constructs measured at early stages of the ERS and total adherence; and (ii) examine whether total ERS adherence can be explained by social cognitive factors measured at baseline and at mid-scheme.

Methods

Participants

A total of 124 adults (75 females) aged between 20 and 70 years old (M = 48.00, SD = 11.69) were recruited opportunistically from within an existing ERS in Scotland and completed a self-report questionnaire at the start of the scheme. Participants were eligible to take part in the study if they: a) had been identified by their health practitioner (e.g., General Practitioner, Practice Nurse) as someone who would benefit from regular physical activity; b) were

referred to the exercise referral scheme provider; and c) were over 18 years of age. Participants were referred to the ERS for a wide range of physiological and psychological reasons (e.g. depression, hypertension, weight reduction) with many participants being referred for multiple health conditions. Informed consent was obtained from all individual participants included in the study.

The exercise referral scheme

The ERS was run across 11 leisure facilities in Central Scotland and was free of charge to participants, lasting 8-weeks. Referred participants attended an exercise induction with a qualified exercise instructor, which included prescription of an individualised programme of exercise through a variety of gym sessions, swimming sessions and/ or exercise classes. Participants were advised to attend a minimum of two sessions per week for the duration of the ERS, with a follow-up meeting arranged midway through the exercise referral period.

Procedure

Ethical approval was obtained from the School Ethics Committee within the University. Upon being referred to the ERS, eligible persons were sent a questionnaire pack consisting of self-report measures covering demographics and social cognitive variables as well as a covering letter and pre-paid return envelope. Participants were asked to complete the questionnaire pack and return to the University address by no later than the day of their initial induction to the exercise facility. Two days after induction, if a questionnaire pack had not been received reminder calls were made to participants to return their questionnaire pack. If a questionnaire pack was not received seven days after initial consultation with the exercise instructor, then that participant was deemed ineligible for the study. Participants who had completed and returned baseline measures were sent a follow-up questionnaire pack

consisting of the same measures with a pre-paid envelope just under 4-weeks later. A similar procedure was followed as at baseline with reminder calls being made and questionnaires were included in the study if returned within one-week of the courtesy call. Data collection took place over an 18-month period. Numeric codes were assigned to each participant to protect their anonymity.

Measures

Adherence to the ERS. To measure participants' adherence to the ERS, attendance data was provided by an electronic membership card swiping system. This measure was operationalized as a proportion of adherence measure, with 100% attendance reflected as attendance to a minimum of 16 sessions over the 8-week ERS, in line with recommendations made by the exercise instructor to participants regarding exercise frequency. The computed criterion variable of % adherence was developed using procedures outlined by Gelman and Hill (2007) providing a variable that met the assumptions of the subsequent analysis, with this approach having been adopted in previous related research (Visek, Olson, & DiPietro, 2011).

Self-regulatory behaviours. Participants' self-regulatory behaviours were measured by the 10-item Exercise Goal-Setting Scale and the 10-item Exercise Planning and Scheduling Scale (Rovniak, Anderson, Winett, & Stephens, 2002). Items were scored on a 5-point scale with higher scores reflecting high self-regulation. Mean scores were computed for each scale separately. Rovniak and colleagues have shown the scales to have good internal consistency (α=0.89 and α=0.87 respectively). Reliability analyses for all measures in the current sample are shown in Table 1.

Enjoyment. Participants' exercise enjoyment was measured by the 18-item Physical Activity Enjoyment Scale (Kendzierski & DeCarlo, 1991). Items were scored on a 7-point

scale with higher scores reflecting higher perceived enjoyment of physical activity. Kendzierski and DeCarlo have shown the scale to exhibit good internal consistency (α=0.93).

Self-efficacy. Self-efficacy was assessed using the 9-item Multidimensional Self-Efficacy for Exercise Scale (Rodgers, Wilson, Hall, Fraser, & Murray, 2008). Items were scored on an 11-point scale with higher scores reflecting high levels of self-efficacy. Subscales of the measure are task, coping, and scheduling. Rodgers and colleagues reported good internal consistency for task self-efficacy (α=0.84), coping self-efficacy (α=0.81), and scheduling self-efficacy (α=0.85).

Barrier self-efficacy was assessed using the 9-item Self-Efficacy for Exercise Scale (Resnick & Jenkins, 2000). Items were scored on an 11-point scale with higher scores reflecting high levels of self-efficacy. Resnick and Jenkins have shown the scale to demonstrate excellent internal consistency (α=0.92).

Outcome expectations. Outcome expectations were assessed using the 9-item Outcome Expectations for Exercise Scale (Resnick, Zimmerman, Orwig, Furstenberg, & Magaziner, 2000). Items were scored on a 5-point scale with higher scores reflecting higher outcome expectations. Resnick and colleagues reported very good internal consistency (α=0.89) for the scale.

Social support. Social support was assessed using the 10-item subscale of the Social Support and Exercise Survey (Sallis, Grossman, Pinski, Patterson, & Nader, 1987). Items were scored on a five-point Likert scale with higher scores reflecting higher perceived levels of social support. Mean scores were computed for family and friend social support separately. Marquez and McAuley found excellent internal consistency scores for family participation (α=0.91) and friend participation (α=0.93).

Data analysis

Data were analyzed using SPSS (v23). The first aim was examined using Pearson correlation to assess the relationships between social cognitive constructs and proportion of adherence to the ERS. The second aim was examined using hierarchical linear regression to explain proportion of adherence to the ERS from the examined social cognitive variables.

Results

Participant's characteristics

Descriptive statistics were computed for all psychosocial variables measured at baseline and at 4-weeks (see Table 1).

INSERT TABLE 1 HERE

Correlations between social cognitive constructs and proportion of adherence

The correlation analysis from baseline assessment showed that there were no constructs that were significantly correlated with proportion of adherence to the ERS.

From assessment at 4-weeks, the correlation analysis showed there were four measures significantly correlated with proportion of adherence to the ERS (see Table 2). The correlations between the constructs and proportion of adherence to the ERS were medium in strength for goal-setting (r = .39; p = .003), and scheduling self-efficacy (r = .35; p = .008), and small in strength for barrier self-efficacy (r = .27; p = .043), and social support from family (r = .29; p = .029).

INSERT TABLE 2 HERE

Examining predictors of adherence to the ERS

Hierarchical linear regression analysis was conducted to examine the predictors of proportion of sessions attended during the ERS. Change scores from baseline to mid-scheme were

entered into the regression model based on no significant correlations between social cognitive factors and adherence at baseline, and significant correlations at mid-scheme. The following variables were entered into the regression model: goal-setting (step 1), scheduling self-efficacy, barrier self-efficacy, social support from family, outcome expectations, and enjoyment. At step 1, the model showed that changes in goal-setting from baseline to mid-scheme significantly explained 5.4% of the variance in proportion of adherence to the ERS, $F(1, 57) = 4.23$, $p = .044$ (see Table 3). At step 2, the model showed that changes in social cognitive factors from baseline to mid-scheme significantly explained 22.0% of the variance in proportion of adherence to the ERS, $F(6, 57) = 3.67$, $p = .004$. There were no independent predictors of proportion of adherence.

INSERT TABLE 3 HERE

Discussion

The present study had two main objectives: (i) to assess the relationships between social cognitive constructs measured at early stages of the ERS and total adherence; and (ii) to examine whether total ERS adherence can be explained by social cognitive factors measured at baseline and at mid-scheme. The findings provide evidence that early improvements in social cognitive factors from baseline to mid-scheme are predictive of total ERS adherence. However, when measured at baseline, social cognitive factors were not significantly related to adherence to the scheme.

It was demonstrated that at 4-weeks into the ERS, goal-setting, scheduling self-efficacy, barrier self-efficacy and social support from family were significantly correlated with adherence to the scheme with improvements in social cognitive factors from baseline to mid-scheme significantly explaining 22% of the variance in proportion of adherence to the ERS. Although 22% may be considered to be a relatively small amount of explained variance

it is favourable compared to other studies conducted within the ERS context. Previous research that has examined ERS adherence from a motivational perspective has typically reported either no effects or effects of a smaller magnitude to those reported in the current study (e.g., Edmunds et al., 2007; Eynon et al., 2017; Rahman et al., 2011). Thus, the findings from the present study provide additional insight into the psychosocial predictors of adherence to an ERS, highlighting a potential role for early changes in social cognitions over and above self-determined motivation. This novel finding is particularly important given the early weeks of an exercise programme being the most challenging period for new exercisers (Annesi & Mazas, 1997) and consequently having an influence on overall adherence. As such, ERS providers may look to positively influence social cognitive constructs in the early weeks of the scheme to enhance adherence before dropout occurs.

The combined findings regarding social cognitive constructs influencing adherence to the schemes is consistent with theory as social cognitive theory dictates that personal factors (i.e., self-efficacy, self-regulated behaviour) have a significant impact on human action (Bandura, 1997). Whilst a combination of factors within the theory have yet to be applied to understanding ERS adherence, significant findings have been observed in traditional exercise settings regarding social cognitive theory (e.g., Gourlan et al., 2016; Jekauc et al., 2015). For example, Jekauc and colleagues compared the predictive ability of a number of different theories to explain exercise maintenance in college students over a 20-week period. The authors observed that social cognitive theory had the highest predictive power of exercise maintenance, explaining 28% of the variance of exercise behaviour. Whilst the findings from the present study showed the theory to not explain as much variance of exercise behaviour, they provide a basis in understanding of the application of social cognitive factors in influencing ERS adherence.

It is important to note that there were no significant correlations between social cognitive constructs measured at baseline and proportion of adherence to the ERS. Such findings are not uncommon within the ERS domain, with studies that have assessed other psychosocial variables (e.g., motivation, need satisfaction) showing no difference between adherers and non-adherers at baseline (e.g., Edmunds et al., 2007; Jones et al., 2005). This highlights the issue that such psychosocial measures related to exercise may not be relevant to participants entering an ERS as they are likely to be physically inactive. It may be useful for future research to place more of a focus on investigating the changes in psychological processes that take place during an ERS.

There are some methodological limitations of the present study. Firstly, whilst the present study utilized objective methods in the form of electronic attendance data to assess ERS adherence, this measure does not provide an indication into the intensity of exercise engaged in. Given the growing importance of accelerometer-based measurements of physical activity (Rosenberger et al., 2013), objective measures of intensity would be an insightful enquiry for future ERS investigations. Secondly, as adherence was calculated based on the proportion of sessions attended over the course of the ERS, this may not distinguish between high attending dropouts and high attending completers. In order to counteract this issue future research could seek to investigate the pattern of adherence being displayed across the entire duration of an ERS and whether any changes in adherence can be linked to specific psychological variables (e.g. self-efficacy). Third, there was an evident attrition rate within our sample which has resulted in a relatively small final sample size. This is an issue that is persistent within ERS research and requires considerable attention.

In conclusion, the present study has provided evidence for early improvements in social cognitive constructs to be significantly related to total ERS adherence. This highlights the importance of social cognitive constructs in the initial stages of an ERS. Social cognitive

factors have scarcely been investigated in ERS settings and should be examined further to build theory driven research and intervention approaches to better understand and facilitate adherence to exercise referral schemes and respond to the global health burden of physical inactivity.

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Table 1

Reliability analyses (Cronbach's coefficient α) and descriptive statistics for social cognitive constructs and proportion of adherence measured at baseline and at 4-weeks.

Variable (scale)	Baseline					4-weeks				
	N	α	*M*	*SD*	Study Range	*N*	α	*M*	*SD*	Study Range
Goal-setting (1–5)	124	.88	1.63	0.68	1–4.2	58	.88	1.72	0.70	1.2–3.8
Planning for exercise (1–5)	124	.78	2.44	0.59	1.2–4	58	.76	2.60	0.61	1–3.9
Enjoyment (7–126)	124	.93	80.74	18.26	28–119	58	.95	78.59	21.01	17–119
Task self-efficacy (0–10)	124	.95	5.59	2.83	0–10	58	.90	5.94	2.43	0–10
Coping self-efficacy (0–10)	124	.88	3.37	2.29	0–9	58	.87	3.50	2.20	0–8.67
Scheduling self-efficacy (0–10)	124	.92	4.69	3.08	0–10	58	.90	4.45	3.11	0–10
Barrier self-efficacy (0–10)	124	.93	4.35	2.53	0–10	58	.93	4.54	2.57	0–10
Outcome expectations (1–5)	124	.95	3.74	0.88	1–5	58	.94	3.86	0.77	2.1–5
Family social support (10–50)	124	.89	18.34	8.86	10–48	58	.92	17.97	8.87	10–46
Friend social support (10–50)	124	.91	15.91	8.12	10–46	58	.91	15.56	7.69	10–45

Table 2

Correlation matrix of social cognitive variables measured at 4-weeks and proportion of adherence to the ERS.

	1	2	3	4	5	6	7	8	9	10
1. Percentage of adherence										
2. Goal-setting	.39**									
3. Exercise planning	.13	.54**								
4. Enjoyment	.12	.34**	.19							
5. Task self-efficacy	.24	.48**	.23	.49**						
6. Coping self-efficacy	.11	.25	.40**	.55**	.36**					
7. Scheduling self-efficacy	.35**	.54**	.46**	.57**	.57**	.61**				
8. Barrier self-efficacy	.27*	.38**	.40**	.40**	.46**	.70**	.81**			
9. Outcome expectations	.17	.37**	.24	.65**	.56**	.57**	.57**	.47**		
10. Social support - family	.29*	.35**	.38**	.25	.06	.11	.15	.09	0.05	
11. Social support - friends	.23	.17	.09	.25	.08	.23	.30*	.35**	.36**	.19

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 3

Multiple regression analysis results explaining proportion of ERS adherence.

Predictor	*β*	*t*	*p*	Adj R^2 (cum)
Step 1				
Constant		9.63	.000	
Goal-setting	.27	2.06	.044	.054*
Step 2				
Constant		10.64	.000	
Goal-setting	.13	1.07	.290	
Scheduling self-efficacy	.24	1.78	.081	
Barrier self-efficacy	.20	1.44	.157	
Social support from family	.21	1.67	.102	
Enjoyment	.23	1.89	.064	
Outcome Expectations	-.18	-1.45	.155	.220*

*$p < .05$