

IMPACT OF IMPLEMENTATION INTENTIONS ON EXERCISE ADHERENCE

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Abstract

Background: Participants ($n=72$) were recruited from four service user support groups in the United Kingdom to take part in a prospective, longitudinal study on exercises undertaken as part of a self-care programme. **Aims:** To investigate participants' knowledge and beliefs about a lymphoedema exercise programme and examine the impact of an intervention involving the formation of implementations intentions on exercise adherence. **Methods:** A 3x2 mixed design related to time (baseline, one- and two-month follow-up) and implementation intentions. A 24-item questionnaire elicited information utilising constructs based on the theory of planned behaviour. **Results:** The two strongest predictors of participants' intentions to adhere to lymphoedema exercise recommendations were anticipated regret ($\beta=0.32, p<0.01$) and perceived behavioural control ($\beta=0.26, p<0.01$). Analysis of both the within- and between-participant effects suggested that the intervention was successful in increasing exercise adherence. **Conclusions:** Participants' anticipated emotional response and perceived control regarding lymphoedema exercise are important factors to target in order to influence adherence. Encouraging the formation of specific plans around where and when lymphoedema exercises are undertaken may also promote therapeutic activity. **Declaration of interest:** None.

Key words

Randomised controlled trial
Lymphoedema
Exercise
Theory of planned behaviour
Implementation intentions

Lymphoedema is a chronic swelling resulting from an insufficiency in lymph drainage capacity (International Society of Lymphology [ISL], 2003). Recent evidence indicated that chronic oedema is a common problem in the community, affecting 823 people in a population of 610,000 (Moffatt et al, 2003). Lymphoedema is a debilitating condition that can cause considerable physical, psychological, physiological and economic burden (Mondry et al, 2004). Although there is no curative treatment available, a

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combination of physical therapies are utilised in order to control and reduce the symptoms associated with this condition (Mortimer and O'Donnell, 2003). There is a view that the best management of lymphoedema is simply self-help (Ryan, 2006). Long-term success depends on the ability and motivation of the service user to continue self-treatment on a daily basis, usually involving the use of a compression garment, vigilant skin care, a programme of exercise and activity and self/partner-massage.

Although slow and rhythmical exercises are perceived to be an important part of the treatment programme (Miller, 1998; Moseley et al, 2005), there is a paucity of studies examining understanding, attitudes or beliefs about recommended exercises. There is also little information to demonstrate the effect of exercise prescription on improving long-term commitment on the part of the service user to continue the self-care programme. This deficit was recognised by Bosompra et al (2002), who argued the need for further research

into 'social cognitive factors' that surround lymphoedema management behaviours, so that this information can be incorporated into education and intervention strategies.

The theory of planned behaviour (TPB) (Ajzen, 1991) is a social cognition model that has been used to investigate why people exercise (Courneya, 1995; Hagger et al, 2002). The TPB proposes that a person's intention to perform a particular behaviour is the central determinant of this behaviour, i.e. the person will only carry out the exercises if motivated to do so (Conner and Sparks, 2005). Behavioural intention is, in turn, determined by three variables that are conceptually independent of each other:

- ▶▶ attitude — the cognitive evaluation of performing a particular behaviour
- ▶▶ subjective norm — the perception of social pressures to perform a behaviour
- ▶▶ perceived behavioural control (PBC) — the belief in resources to carry out a behaviour based upon a consideration of internal control factors.

A recent comprehensive description and review of the model and its components is referenced in Conner and Sparks (2005).

An additional variable that has been suggested is 'anticipated regret' (Conner and Sparks, 2005). This construct suggests that the anticipated emotional reactions to the performance, or non-performance of a behaviour, may be important determinants of behavioural intentions (Triandis, 1977).

According to TPB, a person's intention to perform a given behaviour is the key predictor of behavioural performance. However, Orbell and Sheeran (1998) showed that this relationship was inconsistent in individuals who failed to translate their intentions into action.

In order to examine the relationship between intention and behaviour, Gollwitzer and Brandstätter (1997) identified 'implementation intentions'. These are specific plans around when, where, and how a particular behaviour will take place (e.g. 'I intend to do my exercises first thing in the morning before I get out of bed'). Forming implementation intentions has been found to be effective in increasing exercise behaviour (Prestwich et al, 2003). Central to the concept of implementation intentions is the distinction between the 'motivational' phase, during which a decision to perform a behaviour is made, and the 'volitional' phase of behaviour, during which specific plans are made to ensure that one's decision is acted upon.

The objectives of this study were:

1. To investigate the role of the TPB to predict behavioural intentions in relation to a daily, home-based exercise programme designed to maintain range of movement and functional independence.
2. To examine whether the formulation of implementation intentions influenced exercise adherence.

Methods

Participants

Participants were recruited from four service-user support groups in the

United Kingdom, and were selected as a predetermined sample who met the inclusion criteria. Inclusion criteria required participants to be 18 years or older, and to have received at least one year of lymphoedema treatment for arm or leg swelling. Invitations to participate, together with information on the planned research, were included in correspondence circulated to members of the groups.

Design

In this prospective, longitudinal study, participants were randomly assigned to either the 'formation of implementation intentions' (intervention group), or 'non-formation of implementation intentions' (control group). A 3x2 mixed design (i.e. adherence measures were taken on three occasions for both the intervention group and the control group) was used to allow both within — and between — participant comparisons. This relates to time (baseline, one- and two-month follow-up) and implementation intentions (intervention/control).

Procedure

Ethical approval for the study was obtained under university and British Psychological Society guidelines. Permission to approach local service user groups was obtained from the Chairman of the national group (Lymphoedema Support Network [LSN]). All participants received identical letters inviting them to complete the enclosed questionnaire about lymphoedema management exercises.

All participants were first asked to read a message advocating lymphoedema exercise adherence. The short baseline questionnaire was then administered. Participants were asked to supply their names and home addresses for the one- and two-month follow-up questionnaires to be distributed by post. Freepost return envelopes were distributed with every questionnaire and all participants were debriefed about the conclusions and implications of the study. Contact details of the main investigator were

provided to obtain further information if required.

Instruments

The baseline questionnaire for all study participants provided descriptive data around the study population. Measures of variables derived from the TPB were adapted from standard items (Conner and Sparks, 2005). Questions around current exercise behaviour included:

- ▶▶ attitude
- ▶▶ subjective norm
- ▶▶ perceived behavioural control
- ▶▶ anticipated regret
- ▶▶ behavioural intention.

These data were not collected in the one-month and two-month follow-up questionnaires.

A single item measure was designed for use within this study at each interval of data collection to measure participants' adherence to recommended lymphoedema exercise at baseline, one-month, and two-month follow-up. To assess validity, the results from this measure were compared with an assessment of physical activity using the short version of the International Physical Activity Questionnaire (IPAQ), which has been subject to extensive tests of reliability and validity in a multiplicity of settings (Booth, 2000). The IPAQ tool enables the calculation of total multiples of the resting metabolic rate as minutes per week (MET-minutes per week), providing a continuous score of weekly physical activity.

With the exclusion of demographic data and medical history, all measures utilised a 5-point unipolar (+1 to +5) Likert rating scale with written descriptions for each point on the scale. The direction of these unipolar scales was randomised, and reverse scoring was used on appropriate items based on the wording of the statements to be rated.

A final section was included in the baseline questionnaire of the individuals in the intervention group and related to their specific

implementation intentions. They received the following written instructions: 'We want you to plan your lymphoedema management exercises over the next two months in as much detail as possible. Please pay particular attention to the situations in which you will implement these plans.'

In both the one-month and the two-month follow-up questionnaires, three items assessed lymphoedema exercise adherence.

Statistical analysis

Pearson correlations were performed in order to determine any key relationships and to examine criterion validity of the adherence measure against the IPAQ tool. Chi-squared analyses on categorical data, and multiple analyses of variance (MANOVAs) on continuous variables, were utilised to examine the representativeness of the sample and the randomisation procedure.

The statistical analyses used to address the two main aims of the study were as follows:

1. A hierarchical multiple regression analysis (HMRA) was conducted using blocks of variables based on the tenets of the TPB (Ajzen, 1991). Based on the correlational analyses, predictor variables were retained for HMRA if statistically significant relationships were found with behavioural intentions.
2. A 3x2 mixed analysis of covariance (ANCOVA) was performed to determine the effect of the interventions on lymphoedema exercise adherence, controlling for covariates. Separate analyses of variance (ANOVAs) or ANCOVAs were run to explore any change in each condition over time (the simple within-participants effects), and any differences between conditions at each time interval (the simple between-participants effects).

Results

Descriptive findings

A total of 194 baseline questionnaires

Table 1

HMRA of behavioural intention to adhere to lymphoedema exercises

Step	Predictors	β	df	R ²	R ² change	F change
1.	Attitude	.473***	3,58	.493	.493	18.77***
	Subjective norm	.293**				
	PBC	.214*				
2.	Attitude	.269*	1,57	.551	.058	7.38**
	Subjective norm	.239*				
	PBC	.263**				
	Anticipated regret	.319**				

Note: β = standardised beta values; df = degrees of freedom; *p<0.05, **; p<0.01; *** p<0.001; R²= the percent of the variance in the dependent measure explained or predicted by the independent variables; R² change = an adjustment for the fact that when one has a large number of independent variables (IV) it is possible that R² will become artificially high, simply because some IVs' chance variations 'explain' small parts of the variance of the dependent measure; F change = the change in the significance of the regression model at each stage of the hierarchical multiple regression analysis

were distributed by post or in person, of which 72 were returned, giving a 37% return rate. Of the 72 people who returned their baseline forms (mean age=63.9 years, range=28–89 years, SD=13.6), 94.4% were women, 56.9% suffered from secondary lymphoedema. 13.9% of the participants reported that they were attending hospital in relation to their previous cancer treatment at the time of their involvement. All participants had suffered from lymphoedema for at least one year (mean=11.5 years, range=1–65 years, SD=12.19). Thirty-eight individuals were randomised to the intervention group, and 34 to the control group.

Multiple analyses of variance (MANOVAs) found no significant differences between any of the demographic or medical variables measured in relation to participants' lymphoedema exercise adherence, or social cognitive measures surrounding this behaviour. This means there were no differences in terms of lymphoedema history between those who did and did not adhere to their exercise programme. Analysis using Pearson's correlation coefficient

indicated no association between total MET-minutes per week and lymphoedema exercise adherence [*r*=0.03, *p*=0.85].

Analysis of internal reliability

Measures of variables derived from the TPB were adapted from standard items (Conner and Sparks, 2005). Cronbach's alpha (α) was calculated to examine the internal reliability of the items: attitude (four items; α=0.68), subjective norm (three items; α=0.67), perceived behavioural control (two items; α=0.71), anticipated regret (two items; α=0.84), and behavioural intention (three items; α=0.90).

Representativeness checks

Of the 72 participants who returned the baseline questionnaire, 89% (64) returned the one-month follow-up questionnaire, and 79% (57) returned the two-month follow-up questionnaire, resulting in an overall attrition rate of 20.8%. Chi-squared analyses and MANOVA indicated no significant difference in medical, demographic, or social cognitive variables between those who completed all questionnaires and those who only completed in part.

Table 2

Comparison of exercise adherence for study groups over time

Group	Baseline adherence		One-month adherence		Two-month adherence		F^a
	M	SD	M	SD	M	SD	
Intervention	3.73	1.26	4.37	0.81	4.40	0.77	11.06**
Control	3.59	1.22	3.74	1.13	3.59	1.12	0.69
F^b	3.90		18.17***		19.47***		

^a Univariate tests of differences between baseline, one-month and two-month adherence

^b Univariate tests of differences between groups

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

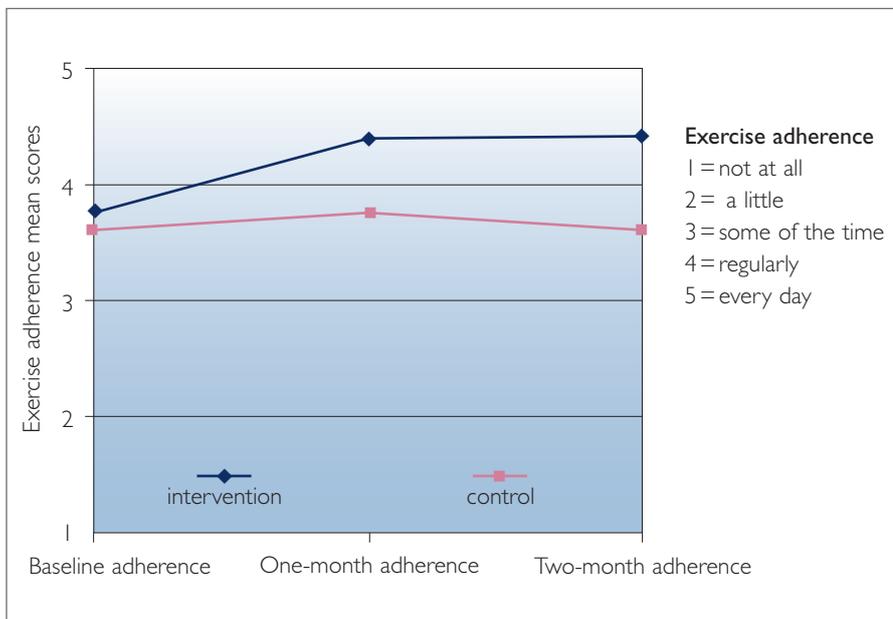


Figure 1. Exercise adherence in intervention and control conditions over time.

Randomisation checks

Chi-squared analyses and a MANOVA were also conducted to compare the intervention versus control groups on measures of medical, demographic, and social cognitive variables. The MANOVA identified a difference between measures of attitude [$F(1, 59)=5.40, p < 0.05$] and anticipated regret [$F(1, 59)=5.21, p < 0.05$]. As a result, both attitude and anticipated regret were controlled as covariates in further analyses examining the impact of the implementation intentions intervention.

Predicting intentions to adhere to lymphoedema exercise with the TPB model

In the HMRA, participants' behavioural intentions were regressed into blocks of variables relating to the factors identified within TPB (Table 1):

1. attitude, subjective norm and PBC
2. anticipated regret.

The first step of the HMRA found that attitude, subjective norm and PBC were able to explain 49% of the variance in participants' intentions to adhere to daily lymphoedema exercises [$F(3, 58)=18.77, p < 0.001$],

with all variables emerging as significant independent predictors of intention. In the second step, the addition of anticipated regret significantly improved the prediction of intention to 55% [$F(1, 57)=7.38, p < 0.01$], and anticipated regret emerged as a significant independent predictor. However, in this second stage of analysis, the two most significant predictors of intention were anticipated regret ($F=0.32, p < 0.01$) and PBC ($F=0.26, p < 0.01$).

Effect of the implementation intention interventions on lymphoedema exercise adherence

In the mixed ANCOVA there was an interaction between intervention and time (Figure 1), however, this did not reach a standard level of significance [$F(1.23, 62.57)=2.94, p=0.08$]. There was also no significant main within-participants effect of time [$F(1.23, 62.57)=2.66, p=0.10$]. The F values were corrected by the Greenhouse-Geisser adjustment.

However, analysis of the simple within-participants effects were tested by running separate ANOVAs for participants who formed implementation intentions and those who did not (Table 2). This indicated a significant difference between the three measures of exercise adherence for participants who formed implementation intentions [$F(1.13, 32.72)=11.06, p < 0.01$], in contrast to those who did not form implementation intentions [$F(1.39, 36.15)=0.69, p=0.46$].

Table 2 also displays the results of ANCOVAs examining the simple between-participants effects controlled for the measures of anticipated regret and attitude. Although there was no significant difference between groups at baseline adherence [$F(1, 64)=3.90, p=0.053$], there was a highly significant difference at both one month [$F(1, 62)=18.17, p < 0.001$], and two months [$F(1, 56)=19.47, p < 0.001$].

Discussion

Although exercise prescription forms a routine part of treatment provision for people with lymphoedema, there

is a paucity of evidence on which factors influence motivation and involvement, and how these influence long-term commitment to exercise. Some authors have identified the need to explore factors that hinder self-management behaviours and to examine strategies for overcoming them (Bosompra et al, 2002). This is the first study to examine the application of interventions towards improving lymphoedema management behaviour, while applying a theoretical framework to understand the social cognitive factors that influence this. As the focus of this study was to investigate the role of the TPB to predict behavioural intentions at the point where patients were self-treating, a detailed analysis of the cause and site of swelling was not undertaken. A multiple analysis of variance found no significant differences between any of the demographic or medical variables within the study population, indicating that the cause and duration of swelling did not influence exercise adherence.

The first objective of this study was to apply the TPB as a theoretical framework. This was used to examine individual beliefs, attitudes, and knowledge in relation to lymphoedema exercise, and whether this predicted intention to perform daily exercises over a two-month period. The three independent variables described within TPB (attitude, subjective norm, and perceived behavioural control) were shown to strongly influence behavioural intention within this study, and explained 49.3% of the variance in intention. This is consistent with the figure reported in a recent meta-analysis that found that these social cognitive constructs predict 50.3% of intention to engage in exercise behaviour (Hagger et al, 2002). However, in the present study, an additional effect was also found of the inclusion of anticipated regret, with the final model accounting for 55.1% in behavioural intention. The attenuation effect of anticipated regret significantly reduced the attitude-intention and subjective norm-intention relationships. However, each variable was a significant predictor of intention to perform

lymphoedema exercises in the final step of the analysis. Anticipated regret and PBC emerged as the strongest independent predictors of intention. The strong effects of anticipated regret on behavioural intention in this study add to the evidence base indicating that measures of anticipated regret increase the capacity of the TPB to predict behavioural intentions (Richard et al, 1996). In addition, the strong effects of PBC are consistent with the only study to have applied the TPB to examine exercise behaviour in cancer survivors (Jones et al, 2005). Overall, these results suggest that lymphoedema exercise adherence could be enhanced through the use of strategies that increase the emotional response associated with not performing lymphoedema exercises.

The results demonstrate that intention to exercise, irrespective of the time since initial lymphoedema diagnosis and treatment, can be influenced by two significant predictors, i.e. anticipated regret and perceived behavioural control.

Educational initiatives to promote confidence in perceived resources, and opportunities to perform lymphoedema exercises successfully, are also likely to promote behavioural intention.

The second study objective was to examine whether forming implementation intentions relating to daily lymphoedema exercise increased exercise adherence over the two-month period. The results indicated that the formation of specific plans of when, where, and how daily lymphoedema exercises will be performed did increase participants' exercise adherence. This provides further support for the argument that health interventions are likely to be most effective when they incorporate volitional strategies that translate motivation into action, as described by Gollwitzer and Brandstätter (1997). To

date, only one other published study has examined the impact of implementation intentions on a single complex repeated behaviour in a non-student sample (Jackson et al, 2005), which found consumption of fruit and vegetables was not improved by the implementation intentions. However, the success of implementation intention formation found in this study is validated by other effectiveness studies with patient populations, such as that described by Orbell and Sheeran (1998). The indication that implementation intentions increased lymphoedema exercise adherence throughout the period of study is encouraging, as the maintenance of healthy behaviour is often essential for health benefits to emerge. The need for sustained effort is required as recommendations are usually given for a programme of daily exercise (Hughes, 2000; McKenzie and Kalda, 2003). This study measured motivation to undertake exercises as part of a self-treatment programme, and how to translate that motivation into action and behaviour. Many of the participants had been continuing with their exercise programme for some time prior to commencing the study. The results demonstrate that intention to exercise, irrespective of the time since initial lymphoedema diagnosis and treatment, can be influenced by two significant predictors, i.e. anticipated regret and perceived behavioural control.

Limitations and future research

A major limitation of the present study is that this is a self-reported measure. Future studies might incorporate additional objective indicators of sustained adherence, such as an improvement in range of movement, muscle strength or functional activity.

The measure of exercise adherence as described in this study was not associated with the validated measure of total exercise per week using IPAQ. Arguably, this lack of association illustrates the difference between recommended daily lymphoedema exercises (as measured in this study) and general weekly exercise (as measured by IPAQ), and reinforces the need for further research to examine

specific factors relating to adherence to specialised prescriptive exercise in clinical populations.

The low return rate of questionnaires represents a further limitation, as those who agreed to participate are likely to be highly motivated and are prepared to adhere to exercise recommendations. It is also important to develop research strategies that recruit a higher number of service users, including those who are not as highly motivated to adhere to clinical recommendations. In addition, the sample size was small and rate of recruitment relatively slow. This may have influenced results in relation to the main interaction between implementation intention manipulation and time that was not found to be significant. Despite the modest size of this study, the formation of implementation intentions still demonstrated a significant increase in exercise adherence over time, and was shown to increase the difference in adherence between groups from non-significance at baseline, to a high level of significance at one- and two-month follow-up.

Conclusion

The present research is the only study to explore lymphoedema patients' attitudes and beliefs surrounding lymphoedema exercise adherence using a theoretical framework, and has suggested that anticipated regret and perceived behavioural control are important variables to target in order to improve lymphoedema exercise adherence. The study also supports and extends the findings of other studies suggesting that forming implementation intentions is an effective strategy for translating motivation into sustained action within a clinical population. **JL**

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Key Points

- ▶▶ Slow and rhythmical exercises are perceived to be an important part of a lymphoedema treatment programme.
- ▶▶ No previous studies have explored why people adhere to lymphoedema exercise recommendations, or examined interventions to increase exercise adherence.
- ▶▶ Educational initiatives to promote perceived behavioural control and anticipated affect are likely to increase behavioural intentions to perform daily lymphoedema exercises.
- ▶▶ The formation of specific plans as to where and when lymphoedema exercises will be conducted, should also be considered as a strategy to increase performance.