Determinants of physical activity in a behavioural intervention study in persons with long-standing spinal cord injury

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Abstract

Study design: Cross-sectional study

Objectives: The HABITS-trial was undertaken to test the effectiveness of a behavioural intervention to enhance physical activity (PA) in persons with long-standing spinal cord injury (SCI). This intervention was based on the transtheoretical model of behavioural change (TTM) and the theory of planned behaviour (TPB). The aim of the present study was to examine the assumed underlying mechanisms of the behavioural intervention.

Methods: Utilising pre- and post-intervention HABITS-data, three types of associations were examined using (log)linear regression analyses: (1) between baseline determinants of the TTM and TPB models (i.e. attitude, self-efficacy, social support) and baseline PA and the stages of exercise change; (2) between baseline determinants and change in PA; and (3) between change in determinants and change in PA. Inclusion criteria were: age at injury ≥ 18 years, time since injury ≥ 10 years, able to use a handrim wheelchair and physically inactive. Exclusion criteria were no intention to change exercise behaviour.

Results: We included 66 participants in the first analysis and 33 in the second and third analyses. Overall, no associations between the determinants and PA were found. However, at baseline, a significant relationship was detected between self-efficacy and PA.

Conclusion: The determinants of the models we tested in this study did not facilitate behavioural change in persons with long-standing SCI. Moreover, no cross-sectional relationships were found, self-efficacy excepted. Our results do not support the usefulness of the TTM and TPB models in defining and evaluating interventions.

Introduction

Many people with spinal cord injury (SCI) lead an inactive and sedentary lifestyle.[1-3] This is problematic because both are associated with deconditioning and decreased health, e.g. in terms of cardiovascular function and other secondary health conditions.[4-7] Therefore, the availability of effective behavioural interventions aiming at behavioural change is necessary. Previous studies tended to show positive effects of behavioural interventions in people with SCI,[8-10] but these studies were performed in the acute phase or in person with a recent SCI.

To our knowledge, the only behavioural intervention study undertaken to promote physical activity in people with long-standing SCI was the HABITS randomised controlled trial (RCT). [2] This study compared an intensive 16-week theory-based self-management intervention including group meetings and individual counselling to a less intensive intervention consisting of one information meeting and an instructional booklet. Results showed that the self-management intervention was no more effective than the control intervention for all study outcomes. Additional analyses, however, showed large variability in intervention effects within the self-management group, indicating that some subjects benefitted more from the intervention than others.

We based the self-management intervention on two well-known behavioural change models: the theory of planned behaviour (TPB) and the transtheoretical model (TTM). TPB assumes that intentions to perform (new) behaviours are determined by personal attitudes (e.g. the perceived benefits or importance of the new behaviour), subjective norms (e.g. social support, attitudes expressed by other people), and perceived behavioural control (e.g. confidence in one's ability to perform the new behaviour). [11] The TTM assesses an individual's readiness to act on a new healthier behaviour,[12] such as a more active lifestyle. [13] In other words, readiness is measured as one's willingness to adopt a certain new behaviour within a certain time frame. In addition, we measured proactive coping as a determinant, which should facilitate the step from intention to action. In other words, proactive coping supports individuals to overcome barriers to become more physically active.

These behavioural change models gave substance and structure to our intervention in several ways. For example, the intervention was tailored towards the participant's needs and motivations, and the tools used in the interventions were focused on improving all factors included as determinants in these models and not only on the physical activity outcomes. All these determinants were measured as secondary outcomes of the RCT. Also, the inclusion of the participants was based on these models; participants had to

be motivated to perform a more active lifestyle. It can be expected that such an approach will be effective,[14] but this proved not to be the case. Nevertheless, the RCT data allow targeted examination of the assumed relationships between determinants and the primary physical activity outcomes. By examining these relationships, we will gain more insight into these presumed working mechanisms, which will give more direction to what works or does not work in persons with long-standing SCI.

Therefore, the overall goal of this study was to explore the underlying mechanisms of a behavioural intervention based on two well-known behavioural change models (TTM and TPB). The primary research question is: are determinants of the models (self-efficacy, attitude, social support) and proactive coping related to physical activity and stages of exercise change (STOEC). These relationships were examined in three types of analysis: (1) between baseline determinants and baseline physical activity and STOEC; (2) between baseline determinants and change in physical activity; and (3) between change in determinants and change in physical activity. We hypothesise that the (changes in) determinants from the behavioural change models and proactive coping are related to (changes in) physical activity and STOEC.

Methods

This study is part of the HABITS-study, a multi-centre, randomised controlled trial (RCT).[2] In each rehabilitation centre, participants were randomly allocated to the self-management intervention group or the control group after the baseline measurements. The research assistants who performed the baseline measurements were not involved in the self-management intervention and were blinded to the group allocation. The researchers were also blinded to the group allocation until the initial data analyses of the primary and secondary outcomes were performed.

Participants

Adults with SCI were eligible for this study if they met the following criteria: age at injury was 18 years or above; time since injury was at least 10 years; current age between 28 and 65 years; able to use a hand-rim wheelchair; physically inactive, as defined by a Physical Activity Scale for Individuals with Physical Disabilities (PASIPD) score lower than the 75th percentile of a Dutch SCI population.[3, 15] Potential participants were excluded from the study if they had no intention to change their exercise behaviour in the next 6 months, a progressive disease or severe co-morbidities, psychiatric problems

that could interfere with the study, and insufficient knowledge of the Dutch language to understand the purpose of the study and the testing methods.

Recruitment

Physicians from the participating rehabilitation centres pre-selected former inpatients using information from medical charts. Potential participants were sent an invitation letter and two weeks thereafter they were contacted by the research assistant to check the inclusion and exclusion criteria and to provide further information. All participants signed a consent form after expressing their willingness to participate.

Multi-centre approval was granted by the Erasmus MC Medical Ethics Committee, Rotterdam, the Netherlands. Local approval was further granted by all participating centres.

Interventions

The theoretical framework (figure 1) used to design the interventions, with a focus on behavioural change, and to select outcome measures is described in detail elsewhere. [15] In this theoretical framework, we combined two well-known models of behavioural change.

Study participants received either the self-management interventions or were in the information group. Details of these intervention are described elsewhere [2, 15] and are described here only briefly.

The HABITS intervention specifically targeted two conditions for behavioural change: optimising intentions towards a healthier lifestyle and behaviour by (i) improving self-management skills (i.e. by changing perceived behavioural control) and (ii) fostering proactive coping skills. The HABITS intervention consisted of one home visit, 5 individual and 5 group sessions during a total of 16 weeks. It included: guidance from the HABITS counsellor; peer support and mastery experiences (experiencing task accomplishment strengthens self-efficacy) and discussions on various themes related to a healthy active lifestyle, e.g. discussing the benefits of social support and making plans on how the environment of the participants could support an active lifestyle, or by letting participants experience physical activities they can easily perform in their home setting, to stimulate a more positive attitude about exercising. Furthermore, the following tools were used: action & proactive coping planning, problem solving, activity monitoring, a self-help workbook and a booklet, "How to stay fit with SCI". [16]

The control group received information about an active lifestyle in SCI, which included attendance at one information group meeting in the first weeks of the study. During this meeting the same themes relating to a healthy active lifestyle as presented in the HABITS intervention were discussed. In addition, participants were instructed on how they could change their behaviour and what they would have to do to achieve these new behaviours. This group also received the self-health workbook; "How to stay fit with SCI". [16]

The HABITS intervention and the information group were provided with counsellors who were already working in one of the participating rehabilitation centres, were experienced in the treatment of persons with SCI, e.g. physical therapist, and were trained in motivational interviewing (MI). MI is a directive client-centred counselling style to elicit behavioural change by helping clients to explore and resolve their ambivalence towards behavioural change. [17]

Outcome measures

Measurements were recorded at baseline, T0 (week 0), directly after the intervention, T1 (week 16) and half a year after termination of the intervention (week 42). For the analyses in this study, we used data from T0 and T1 only.

Self-reported physical activity

Self-reported physical activity was assessed with the PASIPD instrument. [18] The Dutch adaptation [3] of the PASIPD consists of 11 items concerning sports, hobbies, household- and work-related activities. The questionnaire includes items on the number of days per week and the hours per day a certain activity was performed during the past 7 days. The total score of the PASIPD was computed by multiplying the average hours per day for each item by a Metabolic Equivalent value (MET) associated with the intensity of the activity, MET*hour/week. PASIPD scores range between 0 (no activity) and a maximum of 182. We chose this measure instead of the accelerometer data from the HABITS trial because the latter has too many missing values. [2]

Stage of exercise change (STOEC)

The University of Rhode Island continuous measure (URICA-E2) [19] assesses readiness to change in regards to regular exercise. The URICA-E2 consists of 24 statements reflecting intentions towards exercise change. The responses are given on a Likert 1–5 scale, from 'strongly disagree' to 'strongly agree'. There are six outcome stages: pre-contemplation non-believer, pre-contemplation believer, contemplation, preparation, action and maintenance. The internal consistency of this questionnaire was

determined to be 0.80-0.93. [20] In our analyses here, we dichotomised the STOEC score into intention (including pre-contemplation until preparation) and action (action and maintenance).

Determinants

Self-efficacy

The SCI exercise self-efficacy scale [21] measures self-reported self-efficacy for various types of physical exercise in individuals with SCI. This scale includes 10 items, each with a 4-point scale (1: not at all true, up to 4: exactly true). The range for the total score is 10-40. Internal consistency was determined to be 0.93. This questionnaire was translated into Dutch and validated in a sample of individuals with SCI. [22]

Proactive coping

Proactive coping was measured with the Utrecht Proactive Coping Competence scale,[23, 24] which assesses self-reported competency with regard to proactive coping, meaning anticipating on and dealing with possible future situations. This self-report scale includes 21 items, each with a 4-point response scale (1: not capable, up to 4: very capable). The total score is the mean of the item scores; therefore, the range is also 1-4. Internal consistency was measured as 0.83 and 0.95, and the test-retest reliability was between 0.45 and 0.82. [23, 24]

Attitude to change behaviour

Attitude was measured using the Exercise Decisional Balance. [25] This questionnaire reflects the individual's relative weighing of the pros and cons of changing exercise behaviour. The questionnaire consists of 10 statements (5 cons, 5 pros), all rated on a 5-point scale ranging from 1 (not at all) to 5 (extremely important). A positive ratio of pros versus cons means that the respondent is positive about changing his/her exercise behaviour. The mean internal consistency of this measure was 0.80 for the pro subscale and 0.70 for the con subscale. The test–retest reliability values of the pros and cons scales were 0.84 and 0.74, respectively. [25]

Social support

Social support (Social Support for Exercise Behaviour Scale): the level of support individuals experienced in making their health-behavioural changes (exercise). The questionnaire consists of 23 statements subdivided into three categories (family support, rewards/punishments and friend support). The frequency of each item is rated on a 5-point Likert scale ranging from 1 (none) to 5 (very often). [26]

Statistical analyses

Analyses that focused on the baseline relationships were performed with all participants (N=64). The analyses which included change data (the second and third types of analysis) were performed with participants of the HABITS intervention group only (N=33), because they received the intervention aimed at exercise behavioural change whereas no significant behavioural change was expected in the control group. Further, the change analyses did not include the STOEC variable because of the high number of missing values in the post-intervention data.

Analysis began with descriptive statistics of the demographic variables, lesion characteristics and the main outcomes. As the physical activity score was positively skewed, it was log-transformed before the analyses to satisfy the assumption of normality. The change score (T1 minus T0) of physical activity showed a normal distribution and was therefore not log-transformed. For descriptive purposes, a frequency table was developed to show the change in the stages of exercise change at an individual level and showed in which intervention the participants participated. In addition, a cross table was developed to show the types and number of transitions between the STOEC during the intervention. Differences in PASIPD score between the STOEC intention and action group were tested with a t-test.

Associations between each baseline determinant and baseline PASIPD and dichotomous STOEC were first examined by univariate linear regression analyses (PASIPD) or univariate log regression analysis (STOEC), followed by multivariable regression analyses to investigate possible confounding for age, sex, time since injury, level of SCI, rehabilitation centre and baseline body mass index (BMI). Associations between each separate baseline determinant and change in physical activity during the intervention were examined by univariate regression analysis. Since we had a limited number of participants in the study, only univariate analyses were performed. In a similar way, the associations between change in each separate determinant and change in physical activity during the intervention were examined. Alpha was set at 0.05.

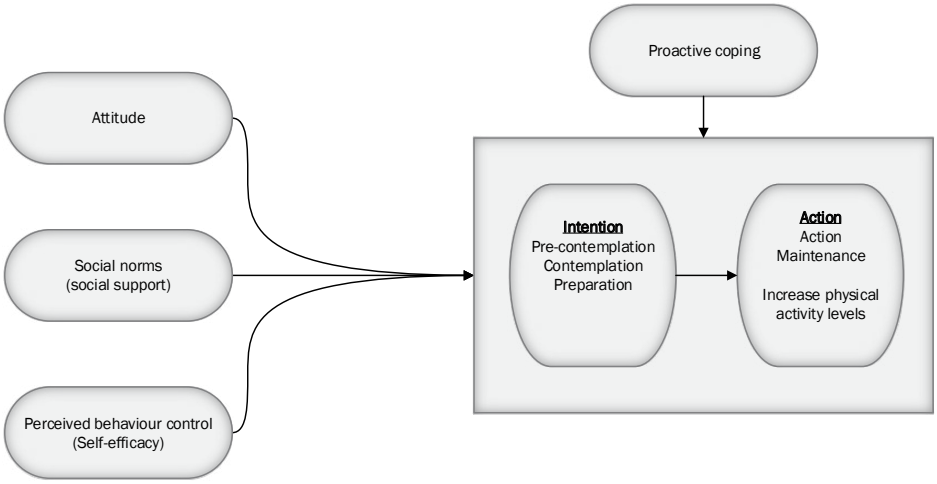

Figure 1 HABITS theoretical model

Results

Descriptive findings

Between January 2012 and October 2014, 64 persons were included in the HABITS RCT. Table 1 shows the characteristics of all participants and those in the HABITS intervention group. The descriptive data of physical activity, STOEC and the determinants are shown in table 2. Table 3 shows the number of patients in the HABITS group for each STOEC at baseline, and their stage at T1.

Table 1 Characteristics of participants

	Intervention group (HABITS-group) N=33	**Total group N=64**
Age in years, mean (±SD)	48 (10)	49 (10)
Sex, n (%) male	21 (64)	45 (67)
Lesion level, n (%) tetraplegia	11 (33)	21 (38.2)
Completeness, n (%) motor complete	24 (73)	50 (87.1)
Years since injury, mean (±SD)	21 (8)	22 (9)
BMI, mean (±SD)	25.0 (5.1)	24.0(5.7)

Table 2 Observed data

		T0 Total group		T0 HABITS intervention group		T1 HABITS intervention group	
	min/max	**N**	**Median IQR [Q1 - Q3]**	**N**	**Median IQR [Q1 - Q3]**	**N**	**Median IQR [Q1 - Q3]**
Physical activity	0/168	64	10.2 [18]		13.0 [22]		12.0 [16]
	min/max	**N**	**%**	**N**	**%**	**N**	**%**
Stages of exercise change (categorical)	1/6	43		23		23	
Pre-contemplation (non-believer)		2	3.1	1	4.3	1	4.3
Pre-contemplation (believer)		3	4.7	3	13.0	2	8.7
Contemplation		14	21.9	9	39.1	4	17.4
Preparation		2	3.1	1	4.3	1	4.3
Action		6	9.4	2	8.7	1	4.3
Maintenance		16	25.0	7	30.4	14	61.0
Dichotomous stages of exercise change intention phase		21	23.8	13	56.3	9	34.7
	min/max	**N**	**Mean (SD)**	**N**	**Mean (SD)**	**N**	**Mean (SD)**
Self-efficacy	0/40	64	31.5 (1.4)	25	29.7 (7.9)	24	30.3 (7.2)
Attitude	1/5	64	1.3 (0.2)	26	1.3 (0.8)	23	1.4 (1.1)
Proactive coping	1/4	64	3.1 (0.1)	26	3.1 (0.6)	23	3.1 (0.5)
Social support	0/30	64		26		25	
Family support	0/23		17.7 (1.3)		16.0 (6.6)		17.1 (7.4)
Rewards and punishment	0/19		4.6 (0.4)		4.3 (1.2)		4.6 (1.9)
Friend support	0/23		4.8 (0.3)		6.9 (2.8)		7.5 (4.1)

Table 3 Cross table of the stages of exercise change at T0 and T1 in the HABITS group, for the subjects with data for both time points

	Number of participants who moved from T0 STOEC to T1à								
Number of participants at STOEC at T0	T1 Pre-contemplation non-believer	T1 Pre-contemplation believer	T1 Contemplation	T1 Preparation	T1 Action	T1 Maintenance	T1 Missing	T1 Total valid	T0 Missing
Pre-contemplation non-believer (n=1)						1	0	1	0
Pre-contemplation believer (n= 3)	1	1				1	0	3	0
Contemplation (9)			3	1		2	3	6	3
Preparation (1)						1	0	1	0
Action (2)						2	0	2	0
Maintenance (7)		1				5	1	6	1
T1 total valid									
Missing T1 (10)			1		1	2	6	4	6

Associations between STOEC and physical activity (Met score) (sub-question two)

We found a significant difference between the median PASIPD score of the intention group (6.3 METs-h/d [IQR[13]]) and the action group (14.9 METs-h/d, [IQR[7]]) of the dichotomised STOEC mean difference 7.6 [95% CI 1.5 to 13.9], p=0.02.

Baseline determinants vs. baseline STOEC and PASPID

Table 4 shows the associations between the baseline determinants and the baseline log-transformed PASIPD score. We found a significant association between self-efficacy and physical activity (B=1.04, 95%CI:1.00 to 1.08).

Table 4 Separate associations between baseline determinants and baseline physical activity (N=64)

		Univariate			Multivariable		
	N	**B**	**95%CI**	**P**	**B**	**95%CI**	**P**
Self-efficacy	64	1.22	0.99-1.05	0.25	1.04	1.00-1.08	0.03
Attitude	64	1.05	-0.78-1.42	0.72	1.02	1.34-1.37	0.91
Proactive coping	64	1.70	1.06-2.64	0.03	1.43	-0.83-2.51	0.19
Social support	64						
Family support		1.02	0.98-1.06	0.26	1.16	0.98-1.05	0.41
Rewards and punishment		1.01	0.83-1.23	0.90	0.82	0.78-1.23	0.86
Friend support		1.03	0.67-1.12	0.40	0.05	-0.97-0.01	0.23

Linear regression analysis per determinant, dependent variable log-transformed PASIPD score. Multivariable results corrected for age, sex, time since injury, level of SCI, rehabilitation centre and baseline BMI.

Table 5 shows the associations between the baseline determinants and the baseline dichotomous STOEC. Similar to the PASIPD data, we found a significant relationship with self-efficacy (B=1.23, 95% CI: 1.05 to1.45).

Table 5 Separate associations between baseline determinants and baseline dichotomous stages of exercise change (N=64)

	N	**Univariate**			**Multivariable**		
		B	**95%BI**	**P**	**B**	**95%BI**	**P**
Self-efficacy	64	1.21	1.06-1.38	0.01	1.23	1.05- 1.45	0.01
Attitude	64	1.23	0.65-2.36	0.53	1.51	0.28- 3.92	0.40
Proactive coping	64	3.00	0.91-9.81	0.07	4.45	0.72-27.61	0.11
Social support	64						
Family support		1.06	0.97-1.15	0.19	1.06	0.95- 1.17	0.30
Rewards and punishment		1.26	0.82-1.94	0.30	1.21	0.63- 2.23	0.59
Friend support		1.15	0.96-1.38	0.13	1.25	0.97- 1.60	0.08

Logistic regression analysis, dependent variable dichotomous stages of exercise change. Intention phase = 0, action-phase = 1.

Baseline determinants vs. change in PASIPD

Table 6 shows the associations between the baseline determinants and the change in PASIPD in the HABITS group during the intervention. One association was significant, i.e. the negative relationship between proactive coping and PASIPD (B=-8.50, 95%CI:

-14.83 to -0.83), which means that higher proactive coping skills were associated with lower PASIPD scores.

Table 6 Separate associations between the baseline determinants and change in physical activity in the HABITS group

	N	Univariate		
		B	**95%CI**	**P**
Self-efficacy	25	0.10	-0.36- 0.56	0.66
Attitude	23	2.02	-1.97- 6.02	0.31
Proactive coping	24	-8.50	-14.83- -0.83	0.01
Social support	25			
Family support		0.03	-0.49- 0.60	0.90
Rewards and punishment		0.55	-2.24- 3.33	0.69
Friend support		-0.57	-1.56- 0.43	0.26

Linear regression analysis, dependent variable delta PASIPD (physical activity) score T1 minus T0

Change determinants vs. change in PASIPD

Table 7 shows the associations between the change in determinants and change in PASIPD in the HABITS intervention group. No significant relationships were found.

Table 7 Separate associations between the change in determinants and change in physical activity in the HABITS group

Determinant (N)		**Univariate**		
	N	**B**	**95%CI**	**P**
Self-efficacy	25	0.17	-0.24- 0.57	0.41
Attitude	23	-1.52	-4.82- 1.78	0.36
Proactive coping	24	4.8	-6.16-15.73	0.38
Social support	25			
Family support		0.40	-0.32- 1.11	0.27
Rewards and punishment		0.30	-2.07- 2.67	0.80
Friend support		0.20	-0.11- 1.45	0.30

Linear regression analysis, dependent variable delta PASIPD (physical activity) score T1 minus T0. Independent variables are the delta scores of the determinants (T1 minus T0).

Discussion

We performed an RCT of a behavioural intervention in patients with chronic SCI. This intervention was based on two well-known behavioural change models: the trans-theoretical model (TTM) and the theory of planned behaviour (TPB). Although the results of the RCT were negative, the study also allowed us to analyse the determinants from those models. Therefore, the overall aim of this study was to explore the working mechanisms of a behavioural intervention on physical activity and its changes, based on the TTM and TPB and the primary outcomes. Overall, we did not find a relationship between the determinants of the two models and physical activity. A significant relationship was found between self-efficacy and physical activity, but only at baseline.

The TBP model includes three determinants of behaviour: attitude, social norms and self-efficacy. From these determinants, only self-efficacy was associated with our two behavioural outcomes, i.e. STOEC and physical activity, and only at baseline. This cross-sectional relationship is in line with another cross-sectional study in another sample in which we explored the relationship between self-efficacy and physical activity. [2] In that study, we showed that exercise-self efficacy is a weak but independent predictor of the level of physical activity amongst persons with long-standing SCI. In other cross-sectional studies, similar relationships were found, e.g. that self-efficacy was related to leisure physical activity in both persons with non-acute SCI [27] and persons with acute SCI. [10]

Self-efficacy is believed to be one of the most important and modifiable behavioural change determinants [12, 28] of the TPB model. However, the results of the present study showed no relationship between change in physical activity and change in self-efficacy, nor between baseline self-efficacy and change in physical activity. Longitudinal studies regarding the relationship between self-efficacy and change in physical activity in comparable populations are scarce. One study showed that, amongst other variables, self-efficacy had a weak mediating effect on physical activity in persons with acute SCI after a behavioural intervention. [29] Another longitudinal study in a population with young healthy adults showed that self-efficacy had a significant but weak direct relationship with change in physical activity. [30] A review showed that after a behavioural intervention (e.g. self-regulation, motivation interviewing), change in self-efficacy can lead to change in physical activity in older community-dwelling people. [31] The same relationships were found in persons with chronic obstructive pulmonary disease (COPD). [32] However, our RCT study showed no effects on self-efficacy in both study groups,[2] and we found no relationship between change in physical activity and change in self-

efficacy. An explanation might be that most of the participants had already started with a high self-efficacy score, so there was little room left for improvement.

In our study we included two behavioural outcomes: STOEC and physical activity. Although there is not a one-to-one relationship between these outcomes, it is assumed that higher STOEC levels mean higher levels of physical activity. [13, 33] This assumption was confirmed in the present study. The longitudinal study of Rozekranz, published in 2005, in which the number of objectively measured steps was used as a measure of physical activity, produced similar results. [34] These results imply a longitudinal relationship between the STOEC and physical activity.

Although not part of the TTM and TPB model, we also included proactive coping as a determinant of behaviour and behavioural change, because the medical literature shows that proactive coping facilitates the step from intention to action. Thus, a relationship could be expected between coping at baseline and change in behaviour, and between change in proactive coping and change in behaviour. We did find a significant relationship between baseline proactive coping and delta PASIPD score, but this was a negative relationship, i.e. persons with higher proactive coping skills at baseline decline in physical activity level after an intervention. This is a remarkable finding which we cannot explain, and might simply be due to chance.

This study focused on the relationships between determinants of behaviour derived from two models: TTM and TPB. The aim of our study was to use, and not to validate, these models; however, our results do not support the validity of these models. Especially at baseline, substantial relationships could have been expected, but only self-efficacy was found to be a significant determinant. The interpretation of the lack of associations between longitudinal (change) score is more complex. Possibly our intervention was not sufficiently strong to result in changes of the determinants and behavioural outcomes. However, it might also be the case that some of the determinants are difficult to change, regardless of the content of the intervention. Reviews focusing on behavioural change techniques showed that it is difficult to identify effective determinants of behaviour change. For instance, two review studies on this topic also failed to provide conclusive evidence for which determinants are changeable. Furthermore, relationships reported between physical activity self-efficacy, attitude and social norm are rather weak. [14, 35]

Limitations

This study has some limitations. First, the statistical power of the study might be considered low, because of the relatively small number of participants, some with missing data. For example, we had to limit ourselves to univariate or simple equations.

Secondly, certain characteristics of our group might have influenced the results. A considerable number of the participants were found to be in the contemplation phases, and may have had no or minimal intention to change their behaviour. A few participants were even in the pre-contemplation phase and therefore should not have been in this study, according to our inclusion criteria. [2] It is unclear how this happened, because all participants were asked prior to their inclusion whether they had the intention to change their exercise behaviour in the following six months. Conversely, it is also remarkable that several participants were already in the action and maintenance phases, thus making it difficult for them to become even more physically active. Possibly they already considered themselves to be physically active but had an interest in further enhancing their physical activity. This is more in line with the median activity levels of the included participants, which were low compared to a group of people with SCI for only five years. [3] We are unable to provide a satisfactory explanation for the inclusion of these anomalous participants.

Conclusion

The determinants proactive coping and attitude, social support, self-efficacy from the models TTM and TPB that we used in this study did not facilitate behavioural changes in terms of increasing the level of physical activity in persons with long-standing SCI. In addition, no cross-sectional relationships were found, except for self-efficacy. Our results do not support the usefulness of the models in defining and evaluating interventions.

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