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Follow-up of a short motivational and volitional exercise-intervention trial with overweight and obese individuals

Abstract

This study examined the long-term efficacy of a short exercise-intervention trial (MoVo-LISA) with overweight and obese individuals. Mediators of physical activity, exercise, health, body weight, and body mass index (BMI) were used as outcome variables. A non-randomized trial was conducted including an experimental and a wait-list control group. Both groups were collapsed to analyse long-term effects after approximately 1 year. At the long-term follow-up, 34 participants returned their questionnaires (68%). MoVo-LISA accomplished its primary goal, which consisted in increasing exercise participation. Participants increased their exercise participation from 82 ± 119 min/wk at baseline to 109 ± 121 min/wk at follow-up. This might be attributable to the fact that participants reported more intrinsic motivation, increased action planning and reduced exercise barriers. Additionally, participants reported enhanced health. Initial weight losses and reductions in BMI, however, disappeared at the long-term follow-up. MoVo-LISA seems a useful approach in the therapy of obesity to increase energy expenditure and might produce the best effects if used within nutrition counselling.

Zusammenfassung

Diese Studie untersuchte die Langzeiteffekte einer kurzen Bewegungsintervention (MoVo-LISA) mit übergewichtigen und adipösen Individuen. Verschiedene Determinanten von körperlich-sportlicher Aktivität, die wöchentliche Sportaktivität, die Gesundheitswahrnehmung, das Körpergewicht und der Body Mass Index (BMI) wurden als Indikatoren verwendet. Im Herbst 2007 wurde mit einer Experimental- und einer Warteliste-Kontrollgruppe eine nicht randomisiertes Bewegungsintervention durchgeführt. Um die Langzeiteffekte der Intervention zu evaluieren, wurden die Follow-up-Werte der Experimental- und Warteliste-Kontrollgruppe zusammengefasst und ausgewertet. Beim Follow-up schickten insgesamt 34 Teilnehmende ihre Fragebögen zurück (68% Rücklauf). Die Studienteilnehmer erhöhten die körperlich-sportliche Aktivität von 82 ± 119 min/Woche bei t1 auf 109 ± 121 min/Woche beim Follow-up. Das Hauptziel von MoVo-LISA, eine Steigerung der körperlich-sportlichen Aktivität, konnte mit der Kurzintervention erreicht werden. Die Zunahme des Bewegungsumfangs kann mit einer gesteigerten intrinsischen Motivation, vermehrten Implementierungsintentionen und einer reduzierten Wahrnehmung von Barrieren erklärt werden. Die Teilnehmenden gaben zudem beim Follow-up ein verbessertes Gesundheitsbefinden an. Anfängliche Gewichtsverluste sowie die Verringerung des BMI konnten jedoch nicht aufrechterhalten werden. MoVo-LISA scheint ein brauchbarer Ansatz in der Therapie von Übergewicht und Adipositas zu sein, um den durch körperlich-sportliche Aktivität bedingten Energieverbrauch zu erhöhen. Es ist allerdings anzunehmen, dass das Programm kombiniert mit einer Ernährungsberatung die besten Effekte erzielt.

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Introduction

Most Western societies are currently facing an obesity epidemic, which is driven by environmental, biological, psychological and sociological factors (Parlesak & Krömker, 2008). However, in basic biological terms, excess body weight is a result of an imbalance between energy intake and energy expenditure (Jakicic & Otto, 2005). Accordingly, the primary treatment of obesity is caloric restriction to reduce energy intake and augmented physical activity and exercise to increase energy expenditure (Jakicic & Otto, 2005).

Obesity is a significant public health concern, linked with increased mortality (Adams et al., 2006) and a number of chronic diseases such as type 2 diabetes mellitus (Klein et al., 2004), cardiovascular disease (Poirier et al., 2006), and several cancers (Johnson & Lund, 2007). Furthermore, obese people are often exposed to labelling and discrimination, which might negatively affect quality of life, self-worth and body image (Fabricatore & Wadden, 2004; Jackson et al., 2000). As a consequence, obese people may avoid physical settings (including exercise and sport), where their body shape does not correspond to the prevailing norms (Li & Rukavina, 2009). Ultimately, low activity levels lead to a vicious cycle as reduced energy expenditure facilitates the occurrence of excess energy (Taheri, 2006).

Previous research has demonstrated that regular physical activity prevents the development of obesity, facilitates weight loss and contributes to the stabilisation of body weight (Jakicic & Otto, 2005; Nyholm et al., 2008). Reductions in energy intake generally have a greater impact on body weight than changes in energy expenditure via exercise. The best results, however, occur if dieting and exercise are combined (Jakicic & Otto, 2005; Sharma, 2007; Shaw et al., 2008). Despite this, Ross et al. (2000) found that an energy deficit of 700 kcal/day induced by a reduction in energy intake or an increase in energy expenditure had comparable effects on weight loss. However, individuals had to engage in amounts of exercise that would be difficult to achieve in normal lifestyle (Jakicic & Otto, 2005).

It has been suggested that increasing daily physical activity in the therapy of overweight may be more easily adopted through integration into daily routines and, therefore, produce more sustainable effects beyond program completion (Andersen et al., 1999). Importantly, research strongly supports that sufficient levels of physical activity and exercise produce health-enhancing effects even if obese people are unable to accomplish weight loss (Shaw et al., 2008).

Despite the fact that epidemiological studies have repeatedly demonstrated the positive impact of physical activity on both physical and mental health (Biddle & Mutrie, 2006), and that many people are aware of the potential health effects associated with a physically active lifestyle (Gibney, 1999), people often have problems to translate their exercise intentions into action. Correspondingly, studies drawing on the theory of planned behaviour have been successful in explaining behavioural intentions, but, fail to explain substantial performance variance (Hagger et al., 2002; Hausenblas et al., 1997). Sonnentag and Jelden (2009) try to explain this result with the argument that exercise represents an effortful activity, demanding more self-regulatory capacities than most sedentary leisure activities. They found that after a stressful day, people had less self-regulatory resources and were less likely to engage in exercise activities after work, whereas the amount of time spent in low-effort activities (e.g. watching TV, doing nothing) was increased.

Given that many factors may hinder the enactment of a previously formed intention, Göhner and Fuchs (2007) emphasised the importance of volitional capacities as they benefit intention enactment and increase the likelihood of health-enhancing behaviour to occur. However, Göhner and Fuchs (2007) also suggest that most exercise intervention programmes still do not explicitly address volitional skills. Formulating implementation intentions (also know as action planning; Gollwitzer, 1999) and anticipating strategies to overcome performance barriers (coping planning; Sniehotta et al., 2005) have been useful in prior studies to bridge the gap between intention and behaviour (Brickell et al., 2006; Milne et al., 2002; Prestwich et al., 2003; Scholz et al., 2008). Milne et al. (2002) found that, of the 248 subjects who had formulated implementation intentions 100% exercised at the places, 97% at the time and 88% as previously planned. Moreover, Simkin and Gross (1994) showed that previously sedentary women who planned to take up a self-instructed training programme relapsed less often if they had made plans how to cope with 10 common and difficult high-risk situations for exercise relapse.

To address the lack of volitional capacities in exercise programmes, Göhner and Fuchs (2007) developed a short exercise-intervention program (MoVo-LISA), consisting of one individual session and two group sessions. The goals and contents of each session are described in a standardised didactical manual, which facilitates training of program instructors. MoVo-LISA draws on social-cognitive theories which Fuchs (2007) condensed in his MoVo process model *(Figure 1)*. Briefly, this model (a) suggests that outcome expectancies and self-efficacy beliefs function as most proximal predictors of the strength and self-concordance of goal intentions, and (b) highlights the importance of volitional capacities in the promotion of behaviour change above and beyond the role of goal intentions. Specifically, the MoVo process model suggests that formulating implementation intentions to shift behaviour control from deliberate decision-making to situational cues, developing coping strategies to overcome performance obstacles and anticipating how to deal with setbacks and relapses are key factors to achieve

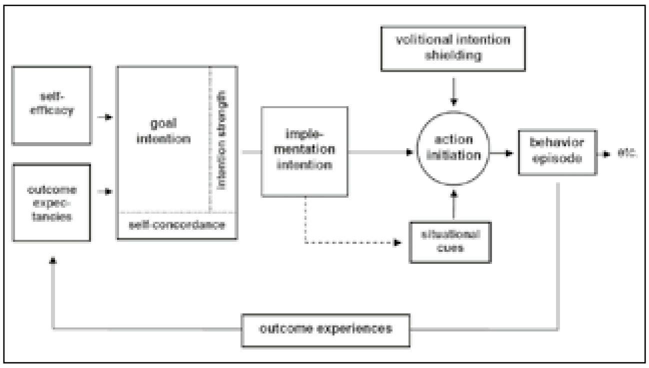

Figure 1: Process model including motivational and volitional antecedents of exercise (Fuchs, 2007).

long-term increases in physical activity and exercise. A quasi-experimental study with previously inactive orthopaedic rehabilitation patients supports the practical usefulness and efficacy of the MoVo-LISA intervention. At the 12-month follow-up, patients who had been assigned to the experimental group reported about 30 min more weekly physical activity, less pain, and better scores on most psychosocial mediator variables than patients who did not receive the MoVo-LISA intervention (Göhner et al., 2009).

The purpose of the present study was to examine the long-term effects of MoVo-LISA with a sample of overweight and obese individuals who received the intervention program approximately 1 year earlier. Previous analyses showed that cognitive mediator variables associated with exercise considerably increased in the experimental (EG) as well as in the wait-list control (WLCG) group 4 to 5 months after baseline (Gerber et al., 2010). Furthermore, significant and strong increases in energy expenditure and significant decreases in body weight and BMI were found independent of group assignment. Thus, the goal of this present study was to determine whether the short-term programme effects were maintained over a longer period.

Materials and methods

Overall study design. The original study was designed as a non-randomized intervention trial including EG and WLCG. Baseline measurements (T1) were collected by postal questionnaire during October 2007. Following baseline data collection, 21 EG participants completed the intervention sessions. In mid-January 2008, participants completed the questionnaire for the second time (T2). Thereafter, 29 WLCG participants received the exercise intervention. To assess short-term effects, the questionnaire was administered to all participants at the end of March 2008 for the third time (T3). Finally, to determine long-term changes of social-cognitive exercise determinants, self-reported exercise behaviour and perceived health of individuals taking part in the intervention, the questionnaire was distributed to all 50 participants in November 2008 (T4). Given the lack of previous studies, no statistical methods (e.g. power analysis) were applied to determine sample size. Given the exploratory character of this study, the decision was made by the authors to limit the study to about 50 to 60 participants. The study has been performed in accordance with the ethical standards laid down in the Declaration of Helsinki.

Participants and screening procedure. All 50 participants returned questionnaires at T1, T2 and T3. The intention-to-treat principle was applied (Des Jarlais et al., 2004). However, even though an incentive (a voucher worth of 20 Swiss Francs) was offered to all participants at T4, only 34 questionnaires were returned at T4 (return rate: 68%).

Participants were mostly recruited from hospitals, nutrition counseling centres, via general practitioners and an advertisement in the local newspaper. Participants were eligible if they were between 16 and 75 years and had a body mass index (BMI) between 25.0 and 38.0 kg/m^2. Participants were not eligible if they were currently receiving treatment for depression or reported medical/ orthopaedic contra-indications that might preclude an increase of physical activity and exercise (assessed with the Par-Q physical activity readiness questionnaire; Thomas et al., 1992). The mean age of the sample at T1 was 48.2 ± 10.5 years (SD). 70% of the participants were women.

Intervention procedure and materials. MoVo-LISA is a short exercise-intervention programme, which consists of two group sessions (provided in an interactive style) and a one-to-one counselling with each participant. Maximum group size was 10 participants per group. The two group sessions (75 min each) were provided within a 2-week period. The face-to-face counselling took place after the first group meeting and was aimed at discussing individual health goals, exercise goals, action plans and coping strategies. All participants received a personal exercise booklet, in which they could write down personal health goals, possible exercise activities, individual action plans, etc. (Göhner & Fuchs, 2007).

Demographics and background characteristics: Information was acquired about participants' age, gender, weight, height, life situation, work status, and highest level of education.

Mediators of physical activity and exercise: In summary, 8 cognitive mediators of exercise were assessed: 1) Outcome expectancies were assessed with 9 positive (pros) and 7 negative formulated items (cons). The items were anchored on a 4-point Likert-type scale from 1 (not true) to 4 (completely true). Satisfactory psychometric properties of these items have been demonstrated (Fuchs, 1997). Items were combined into 2 composite scores (positive and negative) by the arithmetic mean of each. *Table 1* provides an exemplary item for each scale and the Cronbach's Alpha values at T1, T3 and T4. 2) Self-efficacy beliefs were measured with 3 items referring to beginning, maintaining and restarting exercise after a relapse. This scale proved to be a psychometric sound measure in a previous study (Fuchs, personal communication). The scale ranged from 0 (not at all confident) to 5 (100% confident in myself). The 3 items were added to obtain a single score. 3) Goal intentions were assessed with 1 item asking participants about the strength of their intention to exercise regularly during the next few weeks and months (0=no intention to 5=very strong intention). Seelig and Fuchs (2006) showed that this measure has acceptable validity. 4) To collect information about participants' level of action planning, 5 validated items were administered, which assessed the degree to which individuals have pre-planned their exercise participation. Thus, participants were asked if they already knew when, where, how, how often and with whom they would exercise after completion of the intervention (0=no, 1=yes). The items scores were summed. 5) Perceived exercise barriers were measured using a 19-item scale that listed various obstacles to regular exercise participation. This instrument had satisfactory psychometric properties in a previous study (Fuchs, personal communication). Participants indicated on a 4-point Likert scale from 1 (almost never) to 4 (almost always) how often they perceived these barriers. The mean was computed to obtain a single score. 6) Insight into coping planning was obtained using a 15-item index, in which participants were asked whether or not they use specific self-regulation strategies to overcome potential exercise barriers and could answer 0 (I don't use this strategy) or 1 (I use this strategy). The item scores were summed up to obtain a composite index (Fuchs, personal communication). 7) Relapse management was assessed with 3 items, which were validated previously (Fuchs, personal communication). Participants indicated how they would react if they failed in overcoming exercise barriers. Possible answers ranged from 1 (not true) to 4 (true). High scores reflected a low resignation tendency after momentary relapses into a sedentary lifestyle, which was considered a desirable characteristic. 8) Social support from relevant others was measured with 7 items which were rated on a 4-point Likert-type scale ranging from 1 (almost never) to 4 (almost always). This scale proved to be a psychometric sound measure in a previous study (Fuchs, 1997).

Physical activity and exercise. Participants self-reported on how many days per week and how long they usually engaged in 10 physical activities (e.g. walking, cycling to work, gardening, strenuous household activities, etc.). Based on these answers, a weekly score was derived. The validity of this scale has been established earlier (Fuchs, personal communication). In addition, participants indicated whether or not they normally engaged in exercise activities (including gymnastics, exercise and sports). If yes, participants were asked to indicate activities that they practised during their leisure time. For each activity, respondents reported the frequency (per month) and the duration (per episode). This instrument has proved to have acceptable validity in a previous study (Seelig & Fuchs, 2006). Non-exercise activities (i.e. gardening) and relaxation techniques (i.e. yoga) were not counted as exercise. Skiing was excluded since this was the only activity that participants were performing on a irregular basis. For every item, a weekly score was calculated by multiplying frequency and duration. A total score was obtained by summing up the activities.

Health perception. Participants answered 3 items to rate their general health status. Specifically, they were asked how they perceive their physical, mental and general health. Possible answers ranged from 1 (very poor) to 5 (excellent). Satisfactory psychometric properties of these items have been demonstrated. Additionally, a list of 21 common somatic (e.g. backache, headache, stomach ache) and psychological complaints (e.g. feeling irritated, low, anxious) was administered to assess subjective health complaints (Fuchs, personal communication). All items were rated on a 5-point Likert-type scale ranging from 1 (never) to 5 (very often). A mean score was obtained by adding the scores of all items and taking an average. The internal consistency of the index was satisfactory (T1–T4: α = .81–.84).

Body weight and BMI. Participants reported their body weight and height. BMI was used as primary obesity indicator. Following

Subscale	Exemplary item	α (T1)	α (T3)	α (T4)
Positive expectancies	I can improve my physical appearance if I regularly exercise.	.74	.79.	.80
Negative expectancies	If I regularly exercise I end up in situations where I feel embarrassed.	.65	.68	.78
Self-efficacy beliefs	I feel confident to start with a new exercise activity.	.86	.82	.76
Intention to exercise	How strong is your intention to exercise regularly in the next few weeks and months?	---	---	---
Action planning	I know already when I will do this particular exercise activity.	.95	.87	.92
Perceived barriers	I have too much work to do.	.84	.76	.81
Coping planning	I tell my friends about my exercise plans so that I don't miss my planned exercise.	.76	.64	.55
Relapse management	I consider it as an exception if I miss my planned exercise on one day.	.72	.60	.78
Social support	Close family or friends help me plan my exercise.	.87	.86	.89
General health	How would you rate your general health status?	---	---	---
Health complaints	Backache, feeling irritated	.81	.84	.84

Table 1: Exemplary items and internal consistency (Cronbach's Alpha) at T1, T3 and T4.

the WHO (2000), a BMI < 20 kg/m^2 represents underweight, a BMI between 20 and 24.99 kg/m^2 healthy weight, a BMI between 25 and 29.99 kg/m^2 overweight and a BMI ≥ 30 kg/m^2 obesity.

Statistical Analyses. A series of α^2-tests and univariate analyses of variance (ANOVA) were performed to test whether participants who responded at T4 differed from those who did not. Moreover, ANOVAs were used to find out whether among the 34 long-term follow-up participants, those 15 who were initially in the EG, differed in any of the outcome variables from the 19 participants who took part in WLCG at T1 and T3. To examine whether initial improvements from T1 to T3 were maintained over time (from T1 to T4), repeated measure ANOVAs were performed with the cognitive antecedents of exercise, physical activity, exercise, health, body weight and BMI as dependent variables. Three stages were included in the repeated measure ANOVAs: T1 (baseline), T3 (after both groups had completed the intervention) and T4 (10- to 12-month follow-up). All statistical analyses were carried out using SPSS 16 (SPSS, Chicago, IL, USA).

Drop-out analyses. Univariate ANOVAs and α^2-tests showed that few significant differences existed between the 34 participants who returned the questionnaire 4 times and the 16 who dropped out after T3. The only significant difference was found in T3 exercise indicating that dropouts were considerably more involved in exercise activities than individuals who stayed in the sample *(Table 2)*. Additionally, a significant difference was found at T1 pointing out that dropouts initially perceived less coping planning, but improved more on this variable from T1 to T3 than the long-term follow-up participants.

Group differences between the initial EG and WLCG at T1 and T3. No significant differences were observed between the 15 follow-up participants who were initially in EG compared to the 19 who participated in WLCG in any of the outcome variables at T1 or at T3. Since previous analyses have demonstrated that most variables improved from T1 to T3 both in the EG and the WLCG (Gerber et al., 2010), group data were collapsed in the present study for further analyses.

Results

Long-term changes in cognitive antecedents of physical activity and exercise. Table 3 shows that individuals who participated in MoVo-LISA reported increases from T1 to T3 in self-efficacy, intention to exercise, action planning, coping planning, relapse management, and social support. Decreases occurred in perceived exercise barriers. No significant changes were observed for positive and negative outcome expectancies.

Many of the significant changes in cognitive exercise antecedents observed from T1 to T3 were not maintained at T4. This was the case for self-efficacy beliefs, intention to exercise, action planning and relapse management. A decrease from T3 to T4 was also found for positive outcome expectancies. Despite the fact that coping planning and social support did not significantly decrease from T3 to T4, the changes from the first to the last measurements were no longer statistically significant. In turn, action planning was still significantly increased at T4, while perceived exercise barriers were significantly decreased.

Long-term changes regarding physical activity and exercise. Table 4 reveals that exercise significantly increased from T1 to T3. The increase in daily physical activity was not significant, but amounted to about 160 min/wk. The increase of approximately 48 min/wk of exercise observed from T1 to T3 remained elevated at T4. This is an important finding since the primary goal of MoVo-LISA was exercise promotion. Compared with baseline (82 min/wk), participants' exercise involvement has totally increased by about 26 min/wk (T4-follow-up: 108 min/wk).

Long-term changes regarding health, body weight and BMI. As *Table 4* shows, subjective health complaints significantly decreased from T1 to T3 and then stabilised on a lower level. In contrast, the intervention did not produce changes in participants' general health perception. With regard to body weight, the analyses showed that participants achieved significant weight losses from T1 to T3. However, they regained weight in the months following after until the follow-up assessment at T4. Similar patterns were observed for BMI changes.

Discussion

The main aim of this study was to determine the long-term changes of a short non-randomized exercise-intervention trial focusing on the promotion of motivational and volitional skills and consisting of one individual session and two group sessions. To restate the main findings, initial weight losses and reductions in BMI, disappeared at the long-term follow-up after about 1 year. Also, some initial increases in cognitive exercise antecedents vanished from the short-term to the long-term follow-up. In turn, MoVo-Lisa accomplished its primary goal, which consisted in increasing participants' exercise levels. This might be attributable to the fact that participants significantly increased action planning skills and reduced perception of exercise barriers from T1 to T4. The observed increase in exercise amounted to almost 30 min/wk more exercise activities. As a positive side-effect, participants reported reduced psychosomatic complaints at the T4 follow-up.

While MoVo-LISA was able to increase exercise participation, no significant improvements were found for daily physical activity. After a non-significant change from T1 to T3, lifestyle physical activity decreased considerably until T4. Presumably, the programme did not focus enough on this form of physical activity. Accordingly, strategies to integrate more physical activity into daily routines could improve MoVo-LISA's effectiveness, if they were addressed more explicitly. Possibly, the lack of effects regarding daily physical activity might have contributed to the reason that participants could not maintain their initial weight loss over time. As demonstrated by Andersen and colleagues (1999), increasing daily physical activity is important to maintain weight loss over a longer period as exercise participation is subject to more fluctuation.

The weight loss achieved at T3 was not sustained at T4, despite the time spent exercising at follow-up being significantly above T1 levels. This may support the belief that relatively high exercise involvement (weekly time spent for exercise training) is necessary to initiate and maintain weight loss (Jakicic & Otto, 2005; Ross et al., 2000). Westerterp (2001) argues that increasing high-intensity exercise may not necessarily result in higher total energy expenditure because such high-intensity exercise is often compensated by extra rest or energy intake, which may have occurred in this study. The return of participants' body weight to T1 levels may also be attributed to seasonal effects as the baseline and long-term follow-up took place in October and November, while the T3 questionnaire was administered in late March (spring time dieting). Another explanation might be that the scope of the MoVo-LISA (e.g., exercise-promotion only) was simply not wide-reaching enough to allow long-term weight losses.

It is suggested that, to enable long-term weight loss, programme content should address dieting-related issues as well as exercise promotion. This idea is in line with previous research showing that multifaceted intervention programmes are more efficient than those focusing on dieting or exercise alone (Sharma, 2007). Moreover, as poor sleep has proved to be associated with both obesity, unhealthy dietary behaviour and physical inactivity (Taheri, 2006; Youngstedt & Freelove-Charton, 2005), participants might profit from additional information on how to accelerate recovery after exercise, for example, through enhanced sleep. Furthermore, more monitoring might help participants to maintain initial weight losses.

Finally, the present study shows that participants still reported less health complaints 10 to 12 months after the exercise intervention was finished. This corroborates prior studies in which positive health effects were found among obese exercisers even if no weight losses could be realised (Shaw et al., 2008).

The significant increase of exercise may be attributed to the fact that some relevant mediators were modified after participants took part in the MoVo-LISA intervention. However, the limited sample

	T1 measurements			T3 measurements		
	Dropouts	T4 sample		Dropouts	T4 sample	
	M ± SD	M ± SD	F	M ± SD	M ± SD	F
Positive expectancies	3.4 ± 0.5	3.2 ± 0.5	2.4	3.4 ± 0.5	3.2 ± 0.5	1.0
Negative expectancies	1.9 ± 0.2	1.9 ± 0.5	0.3	1.7 ± 0.3	1.8 ± 0.5	1.2
Self-efficacy beliefs	3.6 ± 1.2	3.3 ± 1.2	0.6	3.9 ± 0.9	4.0 ± 1.1	0.1
Intention to exercise	3.0 ± 2.0	3.4 ± 1.1	0.8	4.0 ± 1.3	4.2 ± 0.9	0.3
Action planning	1.8 ± 2.4	1.9 ± 2.2	0.0	4.1 ± 1.9	4.3 ± 1.3	0.2
Perceived barriers	1.7 ± 0.3	1.9 ± 0.5	3.1	1.6 ± 0.3	1.6 ± 0.3	0.2
Coping planning	5.8 ± 2.8	8.2 ± 3.3	6.1*	8.8 ± 2.8	9.5 ± 2.8	0.7
Relapse management	3.2 ± 0.8	3.1 ± 0.8	0.3	3.6 ± 0.5	3.6 ± 0.9	0.1
Social support	2.5 ± 0.9	2.2 ± 0.8	3.3	2.7 ± 1.0	2.5 ± 0.8	1.0
Physical activity (min/wk)	360 ± 225	452 ± 517	0.5	459 ± 284	613 ± 588	1.0
Exercise (min/wk)	140 ± 139	82 ± 119	2.4	238 ± 173	131 ± 106	7.3**
General health	3.3 ± 0.6	3.3 ± 0.9	0.6	3.6 ± 0.8	3.8 ± 0.7	0.8
Health complaints	2.2 ± 0.4	2.4 ± 0.5	3.7	2.0 ± 0.5	2.2 ± 0.5	0.7
Body weight (kg)	85.6 ± 10.7	85.2 ± 11.2	0.0	83.6 ± 11.4	84.1 ± 12.0	0.0
Body mass index (kg/m2)	29.6 ± 3.4	29.7 ± 3.6	0.0	28.9 ± 3.6	29.1 ± 4.1	0.0

*p < .05, **p<.01

Table 2: Dropouts versus participants who returned the questionnaire 4 times (T4 sample). The degree of freedom is 1.49 for all F-tests except for BMI.

	T1	T3	T4	Time (T1–T3)	Time (T3–T4)	Time (T1–T4)
	M SD	M SD	M SD	F	F	F
Positive expectancies	3.1 ± 0.4	3.2 ± 0.5	3.0 ± 0.5	1.1	5.8*	1.8
Negative expectancies	2.0 ± 0.5	1.9 ± 0.5	1.8 ± 0.5	3.6	0.0	2.9
Self-efficacy beliefs	3.4 ± 1.2	4.0 ± 1.1	3.3 ± 1.3	8.7**	5.3*	0.0
Intention to exercise	3.4 ± 1.1	4.2 ± 0.9	3.2 ± 1.6	22.4***	10.7**	0.5
Action planning	1.9 ± 2.2	4.3 ± 1.3	2.9 ± 2.2	30.0***	9.9**	5.8*
Perceived barriers	1.9 ± 0.5	1.6 ± 0.3	1.7 ± 0.4	23.8***	1.2	8.3**
Coping planning	8.2 ± 3.4	9.5 ± 2. 8	8.7 ± 2.7	8.8**	2.8	1.1
Relapse management	3.1 ± 0.8	3.6 ± 0.5	3.3 ± 0.8	14.8**	4.6*	1.7
Social support	2.2 ± 0.8	2.5 ± 0.8	2.4 ± 0.8	4.4*	1.3	1.7

*p<.05, **p<.01, ***p<.001

Table 3: Long-term effects regarding mediating variables of physical activity. The degree of freedom is 1.33 for all F-tests.

	T1	T3	T4	Time (T1–T3)	Time (T3–T4)	Time (T1–T4)
	M SD	M SD	M SD	F	F	F
Physical activity (min/wk)	452 ± 517	613 ± 588	490 ± 531	3.6	2.1	0.2
Exercise (min/wk)	82 ± 119	131 ± 106	109 ± 121	6.7*	1.2	4.3*
General health perception	3.7 ± 0.7	3.8 ± 0.7	3.7 ± 0.6	1.1	0.9	0.1
Psychosomatic complaints	2.4 ± 0.5	2.2 ± 0.5	2.2 ± 0.5	13.5**	0.1	11.9**
Body weight (kg)	85.4 ± 11.4	84.4 ± 12.3	85.1 ± 12.2	4.5*	1.1	0.3
BMI (kg/m2)	29.6 ± 3.7	29.2 ± 4.2	29.6 ± 4.4	6.4*	3.5	0.0

*p<.05, **p<.01

Table 4: Long-term effects regarding physical activity, exercise, health, weight and Body mass index (BMI). The degree of freedom is 1.33 for all F-tests.

size did not allow to perform real analyses of mediator effects. Moreover, there are still few instruments to measure volitional competencies associated with exercise participation. Accordingly, Fuchs (personal communication) developed specific instruments to evaluate the effectiveness of the MoVo-LISA concept, which were used in this study. Together, most of these instruments had satisfactory psychometric properties although negative outcome expectancies, coping planning and relapse management had not sufficiently high internal consistency (Cronbach's Alpha ≥ .70) throughout all measurements.

Interestingly, participants reported significantly higher ratings of action planning at follow-up, which is a powerful performance predictor (Brickell et al., 2006; Milne et al., 2002; Prestwich et al., 2003; Scholz et al., 2008). However, a decrease occurred from T3 to T4, which may indicate that the capacity to formulate implementation intentions must be refreshed from time to time. Equally, increases in coping planning skills were not maintained over time. Sniehotta et al. (2005) note that it is necessary to adapt coping plans to changing life circumstances. Therefore, it might be helpful to provide continuous support to participants and examine on a more regular basis whether or not coping strategies previously identified still suit their needs.

Participants reported significantly fewer exercise barriers at follow-up. This is a positive finding as perceived obstacles are a negative behaviour correlate (Biddle & Mutrie, 2006). However, combined with the finding that participants were not able to maintain high levels of self-efficacy beliefs this result may suggest that, while participants regarded exercise activities as accessible, they did not perceive exercise participation as being under self-regulatory control. Possibly, feeling unable of being the architect of one's own fortune, may put obese individuals at risk to allocate blame on themselves and attribute failure internally. As Lippke et al. (2009) showed, high self-efficacy levels facilitate the enactment of exercise intentions via action planning. Again, this finding suggests that accompanying participants longer and to support them more intensively in their endeavour to increase exercise and to lose weight might be a helpful strategy.

Moreover, the fact that weight losses disappeared at follow-up might have a negative repercussion regarding exercise behaviour. As could be shown in the present study, outcome expectancies significantly decreased at follow-up. Presumably, the disappearance of the observed weight loss played an important part in the decline of positive outcome expectancies. As outlined in the MoVo process model (Fuchs, 2007), positive outcome expectancies and self-efficacy beliefs are seen as the most proximal predictors of exercise intention and self-determination. Teaching participants how to self-evaluate fitness and skill improvements might contribute to render positive outcome expectancies less reliant on accomplished weight losses.

Perceptions of social support remained unchanged from T1 to T4. This was not a surprise as MoVo-LISA pursued an individual intervention approach. However, enhancing social support may be critical as engaging in physical activity and exercise demands high self-regulatory capacities (Oaten & Cheng, 2006; Sonnentag & Jelden, 2009).

Some limitations of the study must be addressed. First, all participants volunteered to take part in the counselling. Second, dropout analyses showed that participants who did not respond at T4 were more engaged in exercise activities. One might speculate that these individuals were satisfied with their exercise involvement and, therefore, saw no more need to fill in the questionnaire. On the other hand, the dropout analyses pointed out that few other significant differences existed regarding the remaining variables (at T1 and T3). Third, no written reminder was sent to the participants and the check-up phone call was omitted as it is foreseen in the original version of the MoVo-LISA programme. This means that the implementation of these additional measures seems strongly advisable in order to stabilise the accomplished changes. Fourth, due to the small sample size no gender-sensitive analyses were feasible although previous research showed that women may be less influenced by short intervention programs, as females may wish more intense than brief contacts (Bolognesi et al., 2006). Moreover, EG and WLCG were combined to analyse long-term follow-up changes. Accordingly, the follow-up period varied between 10 and 12 months. Finally, as for all study variables, the assessment of obesity was based on participants' self-reports.

Perspective. This study addresses a fundamental shortcoming of most previous research examining the effectiveness of exercise interventions in the therapy of obesity: the lack of follow-up evaluations (Sharma, 2007; Taheri, 2006). Additionally, the intervention programme is theory-based, puts an emphasis on the promotion of volitional skills, takes place in a group setting and is tailored towards the individual needs of the participants. Finally, all cognitive exercise antecedents specified in the MoVo process model were assessed repeatedly over a relatively long period of time.

In summary, the present study presented a mixed picture of MoVo-LISA's potential to contribute to the therapy of overweight and obesity. Overall, the main goal of the programme (exercise promotion) was met. However, the results indicate that weight loss is difficult to achieve through exercise alone. MoVo-LISA seems a promising approach to promote exercise participation among overweight and obese people, but might produce the best effects if used as a complementary measure integrated into nutrition counselling.

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