REGULAR ARTICLE

Increasing the Motivation for Physical Activity in Obese Patients

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ABSTRACT

Objective: In this randomized controlled study, a standardized motivation intervention was compared with a relaxation intervention with regard to its effectiveness in decreasing dropout rates and increasing physical activity in a sample of obese patients.

Method: Thirty-eight obese participants were randomly assigned to a one-session motivation or relaxation intervention. Thereafter, both groups participated in an 8-week aerobic program. Adherence, physical activity, motivational stage of change, and body mass index (BMI) were assessed during intervention and at 3- and 6-month follow-ups.

Results: During the aerobic program, the motivation group showed significantly fewer dropouts but comparable adherence if only completers were considered. Moreover, their weekly minutes of physical activity increased over time before leveling off, whereas steady decreases were observed in the relaxation group. For motivational stage of change and BMI, no significant group differences were observed.

Discussion: The importance and efficacy of motivational interventions in enhancing the high dropout rates in obesity treatment is underlined. © 2008 by Wiley Periodicals, Inc.

Keywords: obesity; physical activity; exercise; motivational stage of change; weight loss; dropout

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Introduction

Overweight and obesity represent a rapidly growing threat to the health of adults and children in an increasing number of countries worldwide.[1] Roughly 20–30% of the U.S. population and about 10–20% of the European population are affected by obesity.[2–7] Obesity is associated with a number of health risk factors as well as psychological and social impairment[4,8–11] and is therefore a major contributor to the global burden of disease.[1] The direct costs of obesity relative to total health care costs are now estimated to be around 7% in the United States[12] and between 1 and 6% in Europe,[13] respectively. Thus, there is urgent need to prevent a further spreading of the global obesity epidemic.

Nowadays, an imbalance between energy intake and energy expenditure due to an increased availability of energy-dense high-fat food and decreased physical activity is seen as the major cause of overweight and obesity.[1,14,15] Recent research findings show that increased physical activity results in a number of health benefits associated with significantly lower mortality rates independent of weight loss.[16] Physical activity further enhances weight loss[17] and seems to be the best predictor of long-term maintenance of weight loss.[18] These findings support the guidelines for weight loss programs that suggest establishing balanced nutrition combined with increasing physical activity in obese patients.[19]

There is evidence that not only in the obese but also in the general population in the United States and Europe, rates of physical activity are decreasing.[20–23] Several factors have been found to impede physical activity of obese and normal weight individuals, such as low motivational status, self-efficacy, negative learning history with exercising, lack of coping skills, and aversive environmental characteristics such as reduced access to physical activity facilities, high costs of training programs, low social and cultural support, and time barriers.[24–26] Another major problem when treating obese patients are the high dropout rates of 20–80% and the poor adherence rates that are usually observed in physical activity and behavioral weight loss studies.[18,27–30]

Previous research in inactive, normal-weight individuals indicates that motivational techniques both improve motivational stage of change for

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physical activity according to Prochaska and DiClemente[31] and lead to increased physical activity level over a 12-month follow-up period.[32,33] Moreover, recent studies show that by use of short-term motivational interviewing approaches, attrition rates of obese patients in behavioral weight loss studies can be diminished.[34,35] Yet, despite the need to develop efficacious tools to both reduce attrition to weight loss treatment protocols and enhance physical activity in obese patients, to our knowledge, there is no research about the efficacy of a motivational intervention in obese patients focusing on enhancing their physical activity behavior.

The present randomized controlled study aims first at evaluating whether a standardized motivation intervention when compared with a nonspecific control intervention would reduce dropout rates to an 8-week physical activity program and increase physical activity in everyday life among obese individuals at post-treatment and at 3- and 6-month follow-ups. Second, we explored the interventions' efficacy with respect to the course of participants' motivational stage of change according to Prochaska and DiClemente[31] and their BMI.

Method

Participants

Forty-one overweight participants were recruited through newspaper advertisements and were offered free intervention to enhance physical activity at the Department of Psychology and Psychotherapy of the University of Basel (Switzerland). Respondents were included if they had a body mass index (BMI: weight in kilograms divided by height in square meters) between 27 and 40, were between 18 and 70 years old, and were screened for their health status by a physician who attested that they could participate in the physical activity program. Exclusion criteria were severe mental disorders warranting immediate treatment (e.g., psychotic symptoms, severe major depression, substance dependence or abuse), cognitive impairment or severe medical conditions with clearly limited life expectancy (e.g., heart disease, kidney disease, HIV), and hypertension neither controlled nor treated. The local Ethical Committee Board approved the protocol, and all participants signed written informed consent before participating. For a diagram of the participant flow see Figure 1.

Procedure

After the completion of the clinical interview and the questionnaires, individuals were randomly assigned to either a one-session motivation intervention or a one-session relaxation intervention (control group) according to a randomized permuted block design.[36] Both interventions were conducted in group settings and lasted for about 90 min. Groups were led by a clinical psychologist (E.B.) and a student co-therapist who followed standardized intervention manuals. Subsequently, participants took part in an aerobic program consisting of eight weekly lessons lasting for about 50 min. Participants of both intervention groups were divided into two groups for the aerobic program, so four groups of 9–10 participants were formed. Follow-up measurements were assessed 3 and 6 months after completion of this aerobic exercise program.

Motivation Intervention

The intervention aimed at enhancing motivation to be physically active by providing information about obesity and energy balance, physical activity and its initiation and maintenance, and the aerobic program (see Table 1). The aim of the motivation intervention was to establish solid knowledge about possible barriers to increasing physical activity and to prepare the participants to deal with these difficulties instead of giving up on efforts to maintain increased physical activity prematurely (unpublished manual, available from the authors). We conceptualized our training according to Fiedler,[37] offering a tailored individualized treatment approach in groups and used well-known cognitive-behavioral strategies such as guided discovery and the socratic dialog.[38] We chose the group setting to administer the motivational intervention to ensure cost effectiveness and availability of our approach to a broad population.

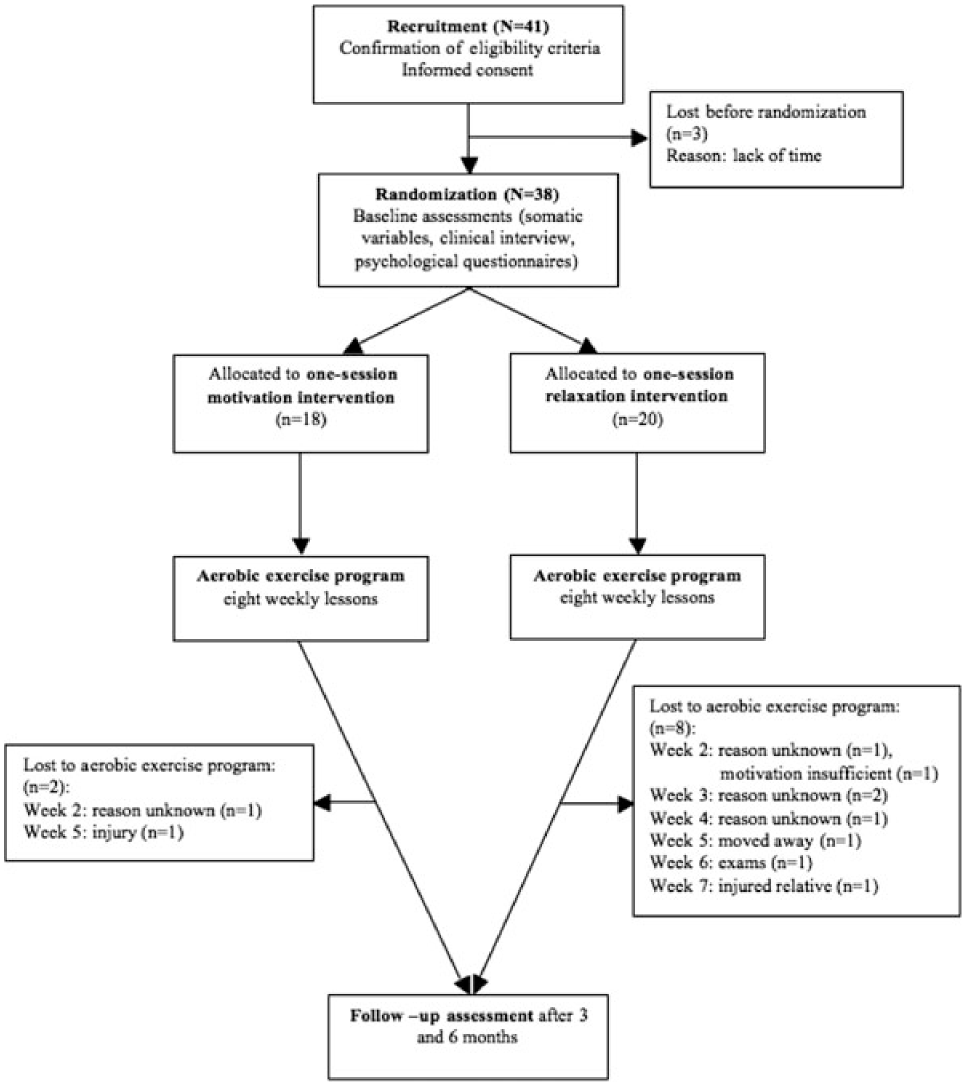
Relaxation Intervention

In this control condition, the progressive muscle relaxation technique (PMR), short-version by Jacobson,[39] was introduced and put into practice. This well-known and well-evaluated method is used both in clinical and preventive contexts.[40] The basic principle of PMR consists of a change between tension and relaxation of individual muscle groups. After initially flexing individual muscles, the tension is kept for about 5 s and then released by breathing out. In doing so, concentration has to be focused on the feeling of relaxation in the concerned muscle groups, which should grow deeper with each breath.

Aerobic Exercise Program

The aerobic exercise program was especially tailored to the needs of inactive obese people and consisted of eight weekly, standardized 50-min sessions. It was administered equally to all participants. An instructor from Aerobics and Fitness Association of America (AFAA) ran the sessions. The elements and duration of the aero-

FIGURE 1. Participant flow.



bic exercise program were based on the guidelines of the AFAA.[41] Components and structure of the aerobic sessions are shown in Table 2. The training intensity increased over the 8-week program but always remained on a moderate intensity level and was adjusted to each individual's capabilities.

Measures

At baseline, diagnosis of current and lifetime mental disorders was assessed using the Mini-Dips, the German short version of the Structured Clinical Interview for DSM-IV and ICD-10.[42]

Adherence was assessed by summarizing the number of exercise sessions participants attended during the 8-week aerobic exercise program. The extent of physical activity in daily life was assessed by self-report using weekly exercise diaries participants filled out during the aerobic exercise program and at 3- and 6-month follow-ups. Motivational stage of change was measured by a one-item algorithm of the stage of change construct with five distinct, mutually exclusive response choices.[43] According to the transtheoretical model,[31] motivation for behavior change is conceptualized as a five-stage process or continuum related to a person's readiness to change his or her behavior. The five stages of change are precontemplation, contemplation, preparation, action, and maintenance. Participants were asked to select the response that best fit their current level of physical activity, according to which their current motivational stage of change was classified. This staging approach reflects an increasing degree of intention to engage in exercise and in duration of the target behavior.[43] Motivational stage of change was assessed before and after motivation or

TABLE 1. Content of the motivation intervention

Goals	Techniques and Interventions
Understanding etiology of obesity and effects of physical activity	Information about the role of physical activity in weight regulation: • Etiology of obesity and the role of energy expenditure. • Beneficial effects of physical activity on resting metabolic rate and fat burning. • Beneficial effects of physical activity on mental and physical health. • Beneficial effects of physical activity on maintenance of weight loss.
Increasing knowledge about initiation of physical activity	Information about the principles of how to increase physical activity: • Information about increasing everyday activity vs. regular planned activities. • Information about stages of motivation and their implication for initiating and maintaining physical activity.
Clarifying motivation	Increasing motivation: • Discussion of individual pros and cons for participation. • Provision of strategies for coping with barriers.
Increasing knowledge and self-efficacy	Introduction to the aerobic exercise program: • Structure and topics. • Realistic expectations. • Appropriate equipment. • Risks and negative effects such as injuries and muscle aches.

TABLE 2. Content of sessions of the aerobic exercise program (based on guidelines of the Aerobics and Fitness Association of America, 1996)

Exercise Components	Content
Warm-up (7–10 min)	Low-intensity, simple movements aimed at preventing injuries and slowly activating circulation
Heart and circulation training (20 min)	Repetition of sequences of coordinatively simple, low-impact aerobic steps, training in the anaerobic area
Strengthening (15 min)	Strengthening of the main muscle groups: arms, abdomen, legs, back, bottom, and chest
Stretching (7–10 min)	Stretching of exercised muscle groups to counteract muscle aches and increase general well-being and relaxation

relaxation intervention, in the middle and at the end of the aerobic exercise program, and at 3- and 6-month follow-ups. Height and weight were measured to the nearest 0.1 cm and 0.1 kg using a stadiometer and a Seca electronic balance (Seca, Vogel and Halke, Germany). BMI was calculated as weight in kilograms divided by the square of height in meters. Assessment points were at the start, in the middle, and at the end of the aerobic exercise program.

Statistical Analyses

For the analysis of differences between treatment groups concerning adherence to the aerobic exercise program, the Mann-Whitney *U*-Test was used, as assumptions for the independent sample *t*-test were violated. Group differences in numbers of dropouts and completers were analyzed by means of the χ^2 tests.

Group differences in the time course of weekly physical activity, motivational stage of change, and BMI were analyzed using linear mixed models. These have been shown to lead to more precise and less biased results compared with complete case analyses or analyses in which missing values have been imputed prior to the analysis using the last observation carried forward (LOCF) method,[44–46] as long as the pattern of "missingness" only depends on observed and not on unobserved measurements (a so-called missing at random or MAR pattern, see Ref. 47).

Our model allowed us to test for the effect of temporal changes averaged across two treatments, for the difference between the two treatments averaged across all assessment points, and, most importantly, for temporal changes between the two treatments (time × treatment interaction). The factor time consists of a linear and a quadratic component. The linear component tests for a positive or negative linear trend over time, whereas the quadratic component tests for a curvilinear trend over time, such as a temporal decline followed by no changes or an increase. Note that in the presence of a quadratic component, the linear component is not constant but represents the instantaneous rate of change at a particular time point (here: end of treatment). This is particularly important if the quadratic component is high, pointing to a time trajectory that strongly deviates from linearity.

The number of assessment points analyzed depends on the outcome variable. The linear mixed model that we used allowed the intercepts and slopes to vary randomly among the individuals, leading to an implicit covariance structure. Parameter estimates were obtained using the restricted maximum likelihood method. Mixed models were computed separately for the following four dependent variables: number of physical activity sessions, minutes spent with physical activity, motivational stage of change, and BMI. For each of these models, we also ran a second model with the baseline value of the dependent variable as covariate to increase the precision of the estimated parameters. Effect sizes were calculated using Cohen's *d*.[48] To meet model assumptions, data were transformed if necessary and outliers removed. All data were analyzed using the software package SPSS, version 13.[49]

TABLE 3. Sample characteristics at baseline

	Sample (N = 38)	Motivation Intervention (n = 18)	Relaxation Intervention (n = 20)
Age (years)	48.4 (10.0)	51.9 (7.2)	45.2 (11.2)
Females, no. (%)	28 (74)	12 (67)	16 (80)
Number of school years	10.9 (2.1)	11.3 (2.0)	10.5 (2.2)
Married, no. (%)	20 (53)	11 (61)	9 (45)
BMI	32.6 (3.2)	32.8 (3.1)	32.4 (3.5)
Number of years of overweight	14.6 (9.1)	15.5 (10.3)	13.7 (7.9)
Physical activity, no. (%)			
None	17 (44.7)	9 (50)	8 (40)
1–3 times/month	1 (2.6)	1 (5.6)	—
1–2 times/week	9 (23.7)	3 (16.8)	6 (30)
No answer	11 (29)	5 (27.6)	6 (30)
Diagnoses axis I, no. (%)			
None	33 (87)	16 (89)	17 (85)
Panic disorder with agoraphobia	1 (2.6)	—	1 (5.0)
Specific phobia	1 (2.6)	—	1 (5.0)
Dysthymia	1 (2.6)	1 (5.6)	—
Binge eating disorder	2 (5.3)	1 (5.6)	1 (5.0)

Note: Numbers indicate means and standard deviations (in parentheses) unless otherwise specified.

Results

Baseline sample characteristics are shown in **Table 3**. At baseline, participants exercised for 1.03 h per week on average (SD = 1.48). Regarding motivational stage of change, one participant (2.9%) was at the precontemplation stage, 10 participants (28.6%) were at contemplation, 9 (25.7%) at preparation, 6 (17.1%) at action, and 9 (25.7%) at the maintenance stage. A majority of 23 (61%) participants preferred doing sports in groups rather than alone.

Of the 38 participants included for randomization and treatment, all completed either the motivation or the relaxation intervention. During the following 8-week aerobic exercise program, 10 participants (26%) dropped out, 2 at the precontemplation stage, 4 at contemplation, 1 at preparation, and 3 at the action stage of motivation. At baseline, dropouts smoked significantly more often (χ^2_1 = 9.0, p = .008, N = 38) and were less physically active (χ^2_2 = 6.7, p = .034, N = 27) when compared with completers. A Mann-Whitney U-test showed that motivational stage of change before motivation or relaxation intervention was significantly lower in dropouts than in completers (U = 50.5, p = .009).

Effectiveness of the Motivation Intervention

Analysis of dropouts showed that groups differed significantly regarding number of dropouts during the aerobic exercise program with only 2 (11% of n = 18) dropouts in the motivation intervention group but 8 (40% of n = 20) in the relaxation intervention group (χ^2_1 = 4.1, p = .04, N = 38). Referring to adherence rates, there was no significant group difference when comparing the number of aerobic exercise sessions attended by completers of the motivation intervention group (M = 6.44, SD = 0.96) to those attended by completers of the relaxation intervention group (M = 6.00, SD = 0.95, U = 71.5; p = .23).

The number of self-assessed weekly physical activity sessions did not differ between the two treatments over the course of the study (nonsignificant interactions for treatment × linear time trend and treatment × quadratic time trend, see **Table 4**), though values for the motivation group were always higher than those in the relaxation group. No significant group difference was observed at the end of treatment (t = 1.13, p = .26), but at the end of the 6-month follow-up the motivation intervention group reported significantly more weekly physical activity sessions (M = 5.44; SE = 1.05) than the control group (M = 2.17, SE = 1.20; t = 2.11, p = .044; Cohen's d = 0.81). There was neither a linear nor a quadratic time trend when combining both treatments, suggesting no temporal trend. All these results did not change when accounting for baseline group differences in physical activity.

Results for self-reported weekly minutes spent on physical activity revealed a significant treatment × linear (p = .002) and a significant treatment × quadratic time trend interaction (p = .018). Thus, in the motivation intervention group the minutes spent on physical activity first increased over time and then leveled off, whereas steady decreases were observed in the relaxation group (see **Fig. 2**). When the model accounted for physical activity at baseline, both the treatment × linear (p = .002) and treatment × quadratic time trend interactions

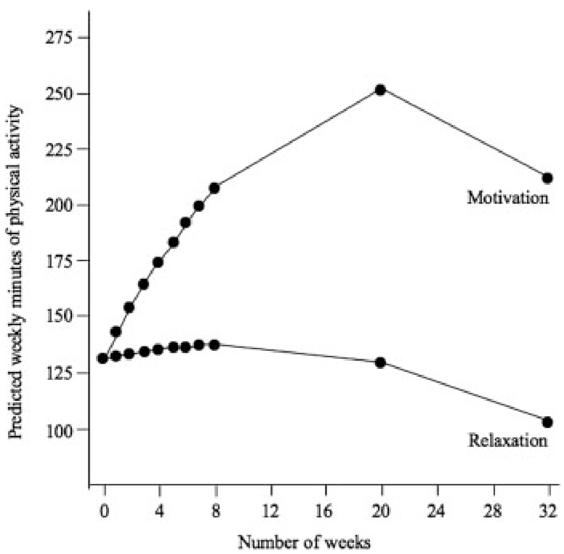
TABLE 4. Effectiveness of the motivation intervention relative to a relaxation intervention between baseline and 6-months follow-up

	Linear Time Trend: Coefficient (SE)			Quadratic Time Trend: Coefficient (SE)			Effect of Covariate
	Motivation Intervention	Control Group	*p*-Value	Motivation Intervention	Control Group	*p*-Value	*p*-Value
Weekly number of physical activity sessions	.079 (.058)	.019 (.070)	.508	−.001 (.002)	−.002 (.003)	.754	
Adjusted for baseline physical activity covariate	.077 (.058)	.020 (.070)	.535	−.0009 (.002)	−.002 (.003)	.720	.034
Weekly minutes spent on physical activity	11.8 (3.03)	−3.36 (3.70)	.002	−15.200 (4.78)	.085 (.146)	.018	
Adjusted for baseline physical activity covariate	11.8 (3.03)	−3.03 (3.67)	.002	−.372 (.121)	.069 (.145)	.021	≤.001
Motivational stage of change	.022 (.024)	−.006 (.028)	.454	−.0005 (.0009)	.0005 (.001)	.679	
Adjusted for baseline motivational stage covariate	.019 (.025)	−.020 (.029)	.304	−.0002 (.0009)	.0006 (.001)	.551	≤.001
BMI	−.057 (.033)	−.006 (.031)	.275	—[a]	—[a]	—[a]	
Adjusted for baseline BMI covariate	−.056 (.033)	−.009 (.031)	.318	—[a]	—[a]	—[a]	≤.001

Note: Because a quadratic polynomial was fitted, the linear trajectory here denotes the instantaneous rate of change in the middle of treatment (i.e., at 4 weeks from baseline).

[a] Not tested as there were only two data points available.

FIGURE 2. Temporal course of weekly minutes spent on physical activity, including baseline physical activity as covariate.



(p = .021) remained significant. Effect sizes for group differences were large at the end of treatment (M = 218.37; SE = 19.77 for motivation intervention, and M = 131.77; SE = 22.55 for relaxation intervention; t = 2.89, p = .005; Cohen's d = 0.75) but smaller at 6-month follow-up (M = 215.89; SE = 33.83 for motivation intervention, and M = 111.45; SE = 37.67 for relaxation intervention; t = 2.06, p = .040; Cohen's d = 0.28).

For both motivational stage of change and BMI, no significant results for any of the tested terms were found. Including the corresponding baseline values as covariates did not alter these results (see **Table 4**).

Discussion

In our randomized controlled trial, we analyzed whether a one-session motivation intervention is more efficacious than a nonspecific control intervention with respect to reducing dropout rates in an 8-week aerobic exercise program and improving participants' level of physical activity. We additionally analyzed the time course of individuals' motivational stage of change according to Prochaska and DiClemente's[31] transtheoretical model and their BMI.

We observed that the one-session motivation intervention positively affected dropout rate at the 6-month follow-up when compared with the relaxation control intervention (11 and 40%, respectively). However, adherence to the 8-week aerobic exercise program was comparable between the two groups when looking at completers only. This result could indicate that the motivation intervention influenced the participants' general decision whether or not to further participate in the aerobic exercise program, but did not affect the motivational process involved in the immediate decision to attend one specific aerobic exercise session. If this result was replicated in larger trials, the one-session motivation intervention might offer a very short and cost-effective possibility to cope with the high dropout rates of about 20–80% usually observed in physical activity and weight loss programs.[18,27–30] Future studies should also investigate whether the implementation of follow-up motivation sessions could enhance adherence to physical activity.

Regarding the time course of participants' weekly level of physical activity, our results show that the motivation intervention group, independent of their baseline physical activity level, spent significantly more time being physically active and maintained the increased physical activity level during the 6-month follow-up relative to the controls. Our findings underline previous results of Marcus et al.[33] and Bock et al.,[32] who also demonstrated superiority of a motivation intervention to a standard self-help intervention with respect to minutes of physical activity per week and maintenance of the increased activity level in a group of normal-weight, sedentary adults. Our results further show that the motivation intervention succeeded in encouraging participants to increase their weekly minutes spent with physical activity but did not succeed in motivating them to also enlarge their number of weekly physical activity sessions. This finding might be explained by the several barriers impeding the establishment of more physical activity sessions per week,[24,25] which is why it might be easier to simply extend the duration of already established activity sessions.

It might be argued that the observed positive effect of the motivation intervention regarding dropouts and time spent with physical activity may have been nonspecific, in which case it would be observed for any intervention that is relevant to the exercise program that followed, e.g., an educational program that merely provides relevant information without motivational work. However, our motivation intervention was conceptualized according to previous findings regarding motivational processes and physical activity promotion.[25,33,35,50] These studies observed that a motivational intervention (psychoeducation and motivation training) was more effective than a standard intervention with psychoeducation only. This evidence provides support for the specific effect of motivational interventions that goes beyond the effect of simple educational programs. On the other hand, provision of educational information about obesity and physical activity can also be seen as a process of change according to Prochaska and DiClemente,[31] who state that raising of consciousness (e.g., seeking new information, gaining understanding and feedback about problem behavior) helps individuals to move from one motivational stage to another.

We further explored whether our motivation intervention influenced participants' motivational stage according to Prochaska and DiClemente,[31] but found no additional benefit. Our results contradict previous findings of Marcus et al.,[51] as 30–60% of participants in their study progressed from one stage to another during a 6-week motivation intervention period. It might be argued that a certain ceiling effect has to be taken into account as 15 of our participants already engaged in exercise for 1 h or more per week and thus had already accomplished the criterion of regular physical activity needed to reach the action and maintenance motivational stages of change. Furthermore, there are contradictory findings regarding the psychometric properties of the one-item stage of change algorithm.[52–56]

The analysis of participants' BMI course during the active treatment phase revealed that the motivation intervention did not induce an additional weight loss when compared with the control group. To draw definite conclusions about the impact of the motivation intervention on weight course, future studies should assess BMI during long-term follow-ups.

There are several limitations that have to be considered when interpreting our results. First, our sample size was rather small and the population itself selective. It can be hypothesized that participants answering to the recruitment efforts already are at the contemplation motivational stage of change. This argument is underlined by the small number of participants of our study being in the precontemplation stage before intervention (2.9%). The generalizability of our findings is therefore limited. Second, the number of sessions and time spent on physical activity per week were assessed by self-report diaries and thus might be biased due to the well-known trend of obese patients to overestimate their physical activity level.[57] However, as our study included randomized allocation of individuals, this bias is expected to apply to both groups equally and should therefore not affect our results. Third, the follow-up period of 6 months was rather short. Because it is important that overweight individuals maintain their increased physical activity level, future studies should re-evaluate our findings using a longer follow-up period. Fourth, the pretreatment interventions were of necessity nonblind so that therapist bias or participants' expectations and subsequent behavior may also have influenced outcome. However, as the aerobic instructor leading the 8-week aerobic exercise program did not know which participants received the motivation or relaxation intervention, therapist bias and expectation may have had no influence, so that neither dropout rates nor adherence to the aerobic program nor weekly minutes of physical activity were substantially influenced by any bias. Moreover, when giving informed consent, participants were not told which intervention was expected to be more effective and initial participation rate for the aerobic program was equal for both groups. The difference in dropout rates then occurred during the 8-week aerobic exercise program. It is a major concern that we did not assess any credibility or suitability ratings here, this has to be done in future studies. Despite this, it is remarkable, that participants who stayed in the study had equal adherence rates regardless of pretreatment intervention but differed in their weekly physical activity rate.

Taking these limitations into account, this randomized, controlled intervention study extends previous findings of the effectiveness of motivational interventions in inactive, normal-weight participants[32,33] and offers an opportunity to deal with the high dropout rates usually observed in physical activity and weight loss programs.[18,27–30] Our one-session motivation intervention strongly decreased obese individuals' dropout rates in an 8-week aerobic exercise program and also increased their minutes spent on daily physical activity when compared with a one-session relaxation control intervention. It thus offers a quick, efficacious, and for a majority of obese patients readily available opportunity to enhance their level of physical activity. Further research should re-evaluate these findings in an enlarged sample during long-term follow-up. Further efforts should be made to specially tailor interventions to obese individuals being at the precontemplation stage of change.

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