Fitness; Clinical Applications Research

Successfully Improving Physical Activity Behavior After Rehabilitation

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Abstract

Purpose. *To determine the effects of the physical activity promotion programs Rehabilitation & Sports (R&S) and Active after Rehabilitation (AaR) on sport and daily physical activity 1 year after in- or outpatient rehabilitation.*

Design. *Subjects in intervention rehabilitation centers were randomized into a group receiving R&S only (n = 315) and a group receiving R&S and AaR (n = 284). Subjects in six control centers (n = 603) received usual care.*

Setting. *Ten Dutch rehabilitation centers.*

Subjects. *Subjects consisted of 1202 rehabilitation patients. Most frequent diagnoses were stroke, neurological disorders, and back disorders.*

Intervention. *Both the sport stimulation program (R&S) and the daily physical activity promotion program (AaR) consisted of personalized tailored counseling.*

Measures. *Two sport outcomes and two daily physical activity outcomes were assessed with questionnaires at baseline and 1 year after rehabilitation.*

Analysis. *Multilevel analyses comparing both intervention groups to the control group.*

Results. *The R&S program showed no significant effects. Intention-to-treat analyses in the R&S + AaR group showed borderline significant improvements in one sport (odds ratio [OR] = 1.66, p = .02) and both physical activity outcomes (OR = 1.68, p = .01 and regression coefficient = 10.78, p = .05). On-treatment analyses in the R&S + AaR group showed similar but stronger effects.*

Conclusions. *The combination of the R&S and AaR programs improved physical activity behavior and sport participation 1 year after in- or outpatient rehabilitation. The R&S program alone did not have any effects. (Am J Health Promot 2007;21[3]:153–159.)*

Key Words: People With Disabilities, Physical Exercise, Leisure Activities, Sports.

Manuscript format: research; Research purpose: intervention testing/program evaluation; Study design: quasi-experimental; Outcome measure: behavioral; Setting: clinical/health care; Health focus: fitness/physical activity; Strategy: skill building/behavior change; Target population: adults; Target population circumstances: geographic location (The Netherlands)

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INTRODUCTION

The health benefits of a physically active lifestyle are well known.[1–5] For people with physical disabilities, a physically active lifestyle could improve everyday functioning, reduce disability, and reduce the risk of secondary health problems.[6–11] However, such people are typically less physically active than the general population.[12,13] Consequently, a physically active lifestyle is probably even more important for people with disabilities than for the general population.

Rehabilitation is an excellent opportunity to start promoting a physically active lifestyle for two reasons. First, for many people rehabilitation is the start of learning to live with a disability. Second, rehabilitation treatment is focused on restoration of mobility yet often includes structured sport-related physical activities such as swimming and fitness exercises. Therefore, trying to integrate such activities into everyday life may be a good strategy to becoming physically active after rehabilitation. One of the problems with converting rehabilitation physical activities into daily life is the lack of sufficient care just after rehabilitation. Physical activity does not have a high priority after rehabilitation, and thus people easily become sedentary. This is why two physical activity promotion programs were developed that targeted people with disabilities just before and just after the end of rehabilitation. The first program is a personalized, tailored counseling sport stimulation program called Rehabilitation & Sports (R&S).

The second personalized tailored counseling program is Active after Rehabilitation (AaR) and promotes daily physical activity in general. These intervention programs are based on the conceptual "Physical Activity for people with a Disability model" (PAD model).[14] This model integrates the "Model of Functioning and Disability from the International Classification of Functioning, Disability and Health"[15] with the "Attitude, Social influence and self-Efficacy" model[16] and the stages-of-change concept of the "Transtheoretical model."[17] The PAD model conceptualizes the possible relationship among physical activity, its determinants, and functioning in people with disabilities, taking into account personal and environmental factors. The combination of the two intervention programs was shown to be effective in increasing sport participation and general physical activity behavior in people with disabilities 9 weeks after rehabilitation.[18] The longer-term effectiveness of these programs is probably even more important but still unknown. The objective of this study is to determine the effects of the R&S program and the effects of the R&S program combined with the AaR program on sports participation and daily physical activity behavior 1 year after the end of in- or outpatient rehabilitation.

METHODS

Sample

All in- or outpatients older than 18 years from 10 Dutch rehabilitation centers were candidates for inclusion in the study if they had one of the following diagnoses: amputation, stroke, neurological disorders, orthopedic disorders, spinal cord injury, rheumatic-related disorders, back disorders, or whiplash. Subjects were excluded if one of the following criteria were met: insufficient cognitive abilities to participate, medical contraindications for participating, terminal or very progressive disease, insufficient understanding of the Dutch language, or no interest at all in sport participation. Potential participants were identified by health care professionals in the rehabilitation centers and were included by the research assistant at the center, who gave oral information and asked for written informed consent. The Medical Ethics Committee of Rehabilitation Center Het Roessingh in Enschede, The Netherlands, approved the study in January 2001.

Design

The study included four intervention rehabilitation centers in which the R&S intervention program already existed and six control rehabilitation centers. Subjects in the control centers received usual care. Subjects in the intervention centers were randomized into a group receiving R&S only and a group receiving both the R&S and AaR intervention programs. Randomization envelopes were made for each intervention center separately by an independent supervising researcher. A research assistant performed the baseline measurements and sent every subject to an intervention counselor with a sealed randomization envelope, where it was opened. Consequently, research assistants in direct contact with the subjects were blinded to which intervention group the subjects were allocated.

Interventions

The R&S program aimed at improving sport participation after rehabilitation. The program consisted of a 30-minute personalized tailored counseling session with a sport counselor 6 weeks before the end of rehabilitation and a 10-minute telephone checkup 6 weeks after rehabilitation. The first session identified sport history, wishes, possibilities, facilitators, and barriers and resulted in advice toward a tailored sport. Additionally, information on available and appropriate sports locations near the subject's home was provided. Recommended sports were usually noncompetitive and most commonly consisted of swimming activities, exercising at a fitness center, or exercising in a diagnosis-specific group. The second session identified sporting status, satisfaction with the given advice, and reasons for not participating in sports. If necessary, the sport counselor gave additional sport advice.

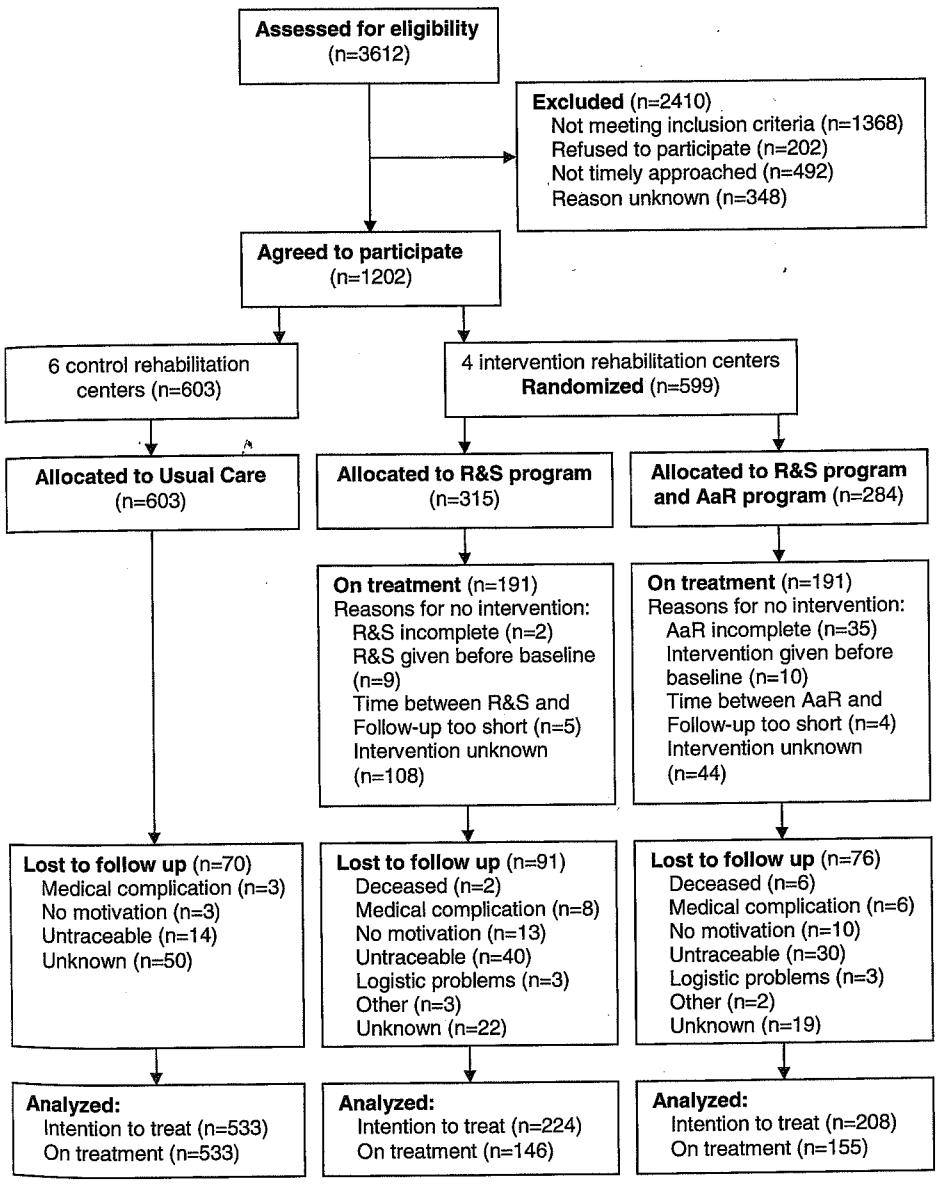
The AaR program aimed at improving daily physical activity in general after rehabilitation and was based on the stages-of-change concept of the Transtheoretical model.[17] This concept categorizes subjects into the precontemplation, contemplation, preparation, action, and maintenance stages of physical activity behavior change.[17] Subjects received a 40-minute personalized tailored counseling session from a physical activity counselor 6 weeks before the end of rehabilitation and three 15- to 20-minute counseling sessions by telephone at 2, 5, and 8 weeks after the end of rehabilitation. The sessions were supported by folder material specific to stage of physical activity change according to materials from Health Partners & Io Solutions, Ltd (Minneapolis, Minnesota). The program focused on identifying physical activity possibilities; integrating facilitators; overcoming barriers; and using strategies to become more physically active, such as goal setting and rewarding.

Measures

Data collection took place from March 2001 until December 2004. Questionnaires were administered under the supervision of a research assistant at the rehabilitation center 7 weeks before the end of rehabilitation (baseline) and at home 1 year after rehabilitation (follow-up). Personal characteristics were assessed with questionnaires. Body mass index was calculated from self-reported body height and body weight. Duration of treatment and hours of sport-related physical activities during treatment were obtained from a computerized registration system of each rehabilitation center.

Two sport participation and two daily physical activity outcomes were assessed at baseline and at 1 year follow-up with questionnaires. The two sport participation outcomes were whether or not subjects participated in a sport at that moment ("yes" or "no") and a total sport score, which incorporated intensity and average duration of participation per week for each sport.[18] For both sport participation outcomes, recall of sport participation during the average week in the year before rehabilitation was recorded at baseline. The first daily physical activity outcome was whether or not the participants met the public healt

Figure 1
Flow of Participants Through the Study



recommendation of being moderately physically active at least 5 days a week for 30 minutes per day, either continuously or intermittently with bouts of at least 5 minutes.[3,18] The second outcome was the 7-day recall Physical Activity Scale for Individuals with Physical Disabilities (PASIPD), which identifies leisure time and household and work-related physical activities.[19] If only 1 of the 12 items of the PASIPD was missing for a subject, imputation was performed by using the most conservative value (least physically active option) of the missing item to calculate a total physical activity score (baseline: n = 30; 1 year follow-up: n = 42).

Analysis

Data analysis was performed in January and February 2005 according to a pre-established analysis plan. For all sport and physical activity outcomes measured at 1 year follow-up, a multilevel analysis comparing both intervention groups with the control group was conducted.[20,21] Multilevel analyses were performed with the MLwiN (version 1.1, Institute of Education, London, UK, 2001) statistical computer program. To correct for differences at baseline between the groups, in all analyses a correction was used for the value of the particular outcome variable at baseline.

In all analyses, the following possible confounding effects were evaluated: age, gender, baseline body mass index, marital status, having children living at home, education, monthly income, time between baseline and end of rehabilitation, time between end of rehabilitation and 1 year follow-up, time since start of complaints, duration of treatment, treatment form (inpatient, outpatient, or both), hours of sport-related physical activities during treatment, diagnosis, medical complications at 1 year follow-up, sport participation and sport score in the year before rehabilitation, and the season of measurement. Variables that changed the intervention regression coefficients by at least 10% were identified as confounders and were corrected for in the final analysis. Interaction terms between age or gender and the two intervention variables were also added to investigate possible effect modification ($p < .05$).

Besides intention-to-treat analyses, on-treatment analyses were performed in which only the subjects who actually received their intervention were compared with the control group. The R&S on-treatment group and the R&S + AaR on-treatment group contained all subjects who received at least the first two sessions between baseline and 1 year follow-up. For both on-treatment intervention groups, the time between the last session and 1 year follow-up had to be longer than 120 days (because only long-term effects were studied). In all analyses, p values $< .05$ were considered statistically significant.

RESULTS

Figure 1 shows the flow of participants throughout the study. In one intervention center, the last 18 subjects were not randomized but had to be allocated to the R&S group because an AaR counselor was no longer available in that center. This accounts for the lower number of subjects in the R&S + AaR group (n = 284) compared with the R&S group (n = 315).

Table 1

Personal Characteristics of the Subjects in All 3 Groups*

Characteristic	Control (n = 533)	R&S (n = 224)	R&S + AaR (n = 208)
Male, n (%)	270 (51)	120 (54)	107 (51)
Mean age ± SD, y	46 ± 14	46 ± 14	47 ± 12
Mean body mass index ± SD, $kg \cdot m^{-2}$	25.9 ± 5.0	25.2 ± 4.4	25.1 ± 4.1
Treatment form, n (%)			
Inpatient	14 (3)	54 (25)	44 (21)
Outpatient, first inpatient	130 (24)	71 (32)	53 (26)
Outpatient	385 (73)	95 (43)	108 (53)
Mean duration of treatment ± SD, h	89 ± 129	167 ± 167	172 ± 207
Mean total time of sport-related activities during treatment ± SD, h	19 ± 24	40 ± 58	44 ± 71
Mean time between baseline and end of rehabilitation ± SD, d	72 ± 71	102 ± 116	116 ± 124
Education, n (%)			
Primary school	57 (10)	11 (5)	16 (8)
Secondary school low	217 (41)	99 (44)	69 (33)
Secondary school high/college low	153 (29)	68 (30)	75 (36)
College high/university	106 (20)	46 (21)	47 (23)
Diagnosis group, n (%)			
Amputation	23 (4)	19 (8)	18 (9)
Stroke	154 (29)	56 (25)	45 (22)
Neurological disorders	93 (18)	34 (15)	23 (11)
Orthopedic disorders	54 (10)	15 (7)	19 (9)
Spinal cord injury	18 (3)	22 (10)	17 (8)
Rheumatic-related disorders	41 (8)	18 (8)	28 (14)
Back disorders	88 (17)	26 (12)	19 (9)
Chronic pain/whiplash	58 (11)	33 (15)	37 (18)

* R&S indicates Rehabilitation & Sports program; AaR, Active after Rehabilitation program; and SD, standard deviation.

Compliance with the different sessions of the interventions was as follows. Ninety-four subjects in the analyzed R&S on-treatment group (64%) received the checkup telephone call. Of the analyzed subjects in the R&S + AaR on-treatment group, 122 (79%) received the first R&S session. Furthermore, of the analyzed subjects in the R&S + AaR on-treatment group, 141 (91%) received all four AaR sessions. Of the remaining subjects, 4 (3%) received two AaR sessions and 10 (6%) received three AaR sessions.

The personal characteristics of the subjects (n = 965) are presented in Table 1. Table 1 shows that there were some differences among the groups in treatment form, duration of treatment, total time of sport-related activities during treatment, time between baseline and end of rehabilitation, education, and diagnosis. Table 2 shows the values of the two sport and the two physical activity outcomes in the year before rehabilitation, at baseline, and 1 year after rehabilitation. The results of the intention-to-treat and on-treatment multilevel analyses for all four outcomes are presented in Table 3. All analyses needed correction for baseline value of the outcome, time between baseline and end of rehabilitation, hours of sport-related physical activities during treatment, diagnosis, rehabilitation form, and education. The R&S intervention did not result in significant improvements. Intention-to-treat analyses in the R&S + AaR group showed significant improvements in one sport ($p = .02$) and one physical activity outcome ($p = .01$) and a marginally significant improvement in the other physical activity outcome ($p = .05$). The on-treatment analyses in the R&S + AaR group showed stronger improvements in the same sport ($p = .01$) and physical activity outcome ($p < .01$) and a marginally significant improvement in the other physical activity outcome ($p = .05$). Significant interactions between age and the R&S + AaR intervention revealed that the intervention was more effective in improving sport participation and both physical activity outcomes for older adults than for younger adults.

DISCUSSION

The results of the current study suggest that the combination of the R&S and AaR programs was able to increase physical activity behavior and sport participation 1 year after the end of rehabilitation. The R&S program alone did not have an effect on any of the outcomes. These long-term findings are quite similar to the results of this trial 9 weeks after rehabilitation, which showed no effect of the R&S program alone but significant improvements in both sport and one daily physical activity outcome in the R&S + AaR group.[18] A difference with the results at 9 weeks was the significant interaction between age and the R&S + AaR intervention. In the longer term, it seems that R&S + AaR was more effective in older subjects.

Table 2

Outcome Variables in the Year Before Rehabilitation, at Baseline, and 1 Year After Rehabilitation*

Outcome Variable at Different Times	Group Control (n = 533)	R&S (n = 224)	R&S + AaR (n = 208)
Year before rehabilitation			
Sport participation, n (%)	315 (60)	132 (59)	126 (61)
Mean sport score ± SD, KJ/kg/d	10.2 ± 15.0	9.5 ± 14.4	10.0 ± 13.3
Baseline			
Sport participation, n (%)	214 (41)	122 (55)	117 (58)
Mean sport score ± SD, KJ/kg/d	3.6 ± 6.9	4.2 ± 6.1	5.0 ± 7.3
Meeting physical activity recommendation, n (%)	257 (49)	123 (56)	127 (61)
Mean PASIPD ± SD, KJ/kg/d	68.2 ± 57.9	60.2 ± 50.8	65.4 ± 51.6
One year after rehabilitation			
Sport participation, n (%)	280 (53)	125 (56)	141 (68)
Mean sport score ± SD, KJ/kg/d	6.3 ± 10.5	5.9 ± 9.1	7.8 ± 10.6
Meeting physical activity recommendation, n (%)	290 (55)	130 (59)	135 (67)
Mean PASIPD ± SD, KJ/kg/d	63.7 ± 53.1	63.9 ± 54.7	71.3 ± 64.2

* R&S indicates Rehabilitation & Sports program; AaR, Active after Rehabilitation program; SD, standard deviation; and PASIPD, Physical Activity Scale for Individuals with Physical Disabilities.

When comparing the results in the R&S + AaR group at 9 weeks and at 1 year after rehabilitation, it seems that physical activity behavior improved more during follow-up, whereas sport participation decreased slightly over time. The lack of an effect on the sport score at 1 year could mean that subjects still reported that they participated in a sport but spent less time on the sport than they did at 9 weeks. However, subjects appeared to have spent more time on daily physical activities at 1 year, which probably has a lower participation threshold than sports and probably was easier to integrate into daily life. This could also be one of the reasons why the R&S program alone was not effective. Both programs consisted of personalized tailored counseling, but the R&S program, especially its second session, was more standardized than the AaR program and left less room for tailoring. The use of the stages of physical activity change concept in the AaR program probably also made AaR a better-tailored program than R&S.

Besides the differences in content between both interventions, the number, timing, and duration of the counseling sessions was also different. Subjects in the R&S + AaR group received more counseling. The multiple AaR counseling sessions after the rehabilitation period may have especially been effective. During this period, subjects had to resume their everyday lives without help from health professionals and without the structured sport-related activities that were part of the rehabilitation program. Counseling during this period is likely to have provided the necessary stimulus and may have helped start or maintain sport and daily physical activities.

A final explanation for the relative ineffectiveness of the R&S program could be the sport advice that the subjects reported to have received from health care professionals. In the control group, 65% of the subjects stated to have received such advice, usually from a rehabilitation physician or a physical therapist. This was similar to what subjects in the intervention group received, besides their R&S sessions. Thus, usual care appears to be similar in the control and intervention centers regarding sport advice from health professionals. It could be that the R&S program alone did not add enough to this usual care to have an effect on sport and physical activity.

Literature Perspective

Some studies using individualized counseling in a different setting and in populations with different diagnoses have been reported in the literature. In a randomized controlled trial among 70 people with type 2 diabetes, the intervention group received an exercise counseling program and improved physical activity level 6 months after baseline and maintained this level after 12 months.[22] The exercise counseling program consisted of two stage-of-change tailored 30-minute exercise counseling sessions at baseline and 6 months after baseline and four follow-up support phone calls at 1, 3, 7, and 9 months after baseline. A similar randomized controlled trial among 340 people with type 2 diabetes also used an individual behavioral counseling intervention that increased self-reported voluntary physical activity.[23] This 2-year physician-based program consisted of an initial counseling session, which was followed 1 month later and then every 3 months by a telephone session. Another randomized controlled trial showed that one exercise consultation during phase intravenous cardiac rehabilitation improved self-reported leisure physical activity among 31 subjects 4 weeks after the intervention.[24]

The present study and the discussed studies suggest that physical activity promotion interventions with individualized tailored counseling in populations of people with chronic diseases or with physical disabilities can be effective in improving physical activity behavior. The stages-of-physical-activity-change

Table 3

Multilevel Analysis Comparing Both Intervention Groups With the Control Group on Physical Activity and Sport Outcomes*

Outcome	n	Group					
		R&S			R&S + AaR		
Sport participation†		OR	(95% CI)	*p*	OR	(95% CI)	*P*
Intention to treat	901	0.99	(0.67–1.47)	0.98	1.66	(1.09–2.51)	0.02
On treatment	785	1.08	(0.68–1.72)	0.75	1.98	(1.22–3.20)	0.01
Physical activity recommendation†							
Intention to treat	898	1.30	(0.90–1.88)	0.16	1.68	(1.13–2.48)	0.01
On treatment	784	1.31	(0.86–2.00)	0.22	1.96	(1.26–3.04)	<0.01
Sport score†		RC	(95% CI)	*p*	RC	(95% CI)	*P*
Intention to treat	873	−0.60	(−2.26–1.05)	0.48	0.65	(−1.08–2.38)	0.46
On treatment	758	−0.77	(−2.68–1.14)	0.43	1.41	(−0.53–3.34)	0.15
PASIPD†							
Intention to treat	876	4.06	(−6.43–14.55)	0.45	10.78	(−0.06–21.62)	0.05
On treatment	761	2.69	(−8.78–14.15)	0.65	11.36	(−0.07–22.79)	0.05

* R&S indicates Rehabilitation and Sports program; AaR, Active after Rehabilitation program; OR, odds ratio; CI, confidence interval; RC, regression coefficient; PASIPD, Physical Activity Scale for Individuals with Physical Disabilities.

† Data corrected for baseline value, time between baseline and end of rehabilitation, hours of sport participation during treatment, diagnosis, rehabilitation form, and education.

concept can be helpful in such interventions. However, excluding the results from the current study, not much is known about the effectiveness of such interventions more than 3 months after the last intervention session.

Limitations

Loss to follow-up was 29% in the R&S group, 27% in the R&S +AaR group, and 12% in the control group (Figure 1). Compliance with the interventions was 61% in the R&S and 67% in the R&S + AaR group. Because compliance was not high, on-treatment analyses were added to the intention-to-treat analyses to allow better evaluation of the interventions. Logistic and personnel problems, especially in one of the four intervention centers, had a negative effect on compliance and loss to follow-up and led to the relatively high number of subjects in the unknown categories in the intervention groups.

The timing of the baseline measurement was one of the difficulties in this study. Performing the baseline measurement at the start of rehabilitation was not an option because duration of treatment differed greatly among subjects. However, the chosen time of 7 weeks before the end of rehabilitation resulted in two problems. First, determining the last day of rehabilitation approximately 2 months in advance was difficult and led to variations in the actual time between baseline and end of rehabilitation. Consequently, all analyses had to be corrected for the time between baseline and end of rehabilitation. Second, at baseline some subjects already had been participating in some rehabilitation-center–facilitated sport activities. The higher baseline values for sport participation and sport score in the intervention groups compared with the control group suggest this might have happened more frequently in the intervention centers, especially because the number of subjects who participated in sports in the year before rehabilitation was equal in all groups. This could have led to an underestimation of the effect of the interventions on sport participation and sport score.

For practical and ethical reasons, the study was quasi-experimental instead of a randomized controlled trial. As a result, the intervention and control populations differed in rehabilitation form; duration of treatment; total time of sport-related activities during treatment; time between baseline measurement and end of rehabilitation; and, to a lesser extent, diagnoses and education. Correction for these variables in all analyses was necessary except for duration of treatment, which was probably sufficiently incorporated in the other correcting variables.

Clinical and Research Implications and Generalizability

The use of personalized tailored counseling made the interventions applicable to a wide range of different individuals in this heterogeneous study population, which included differences in diagnoses, age, severity of disability, and stage of physical activity change. However, the effectiveness of the R&S + AaR intervention probably differs among subgroups. For example, the results showed that the R&S + AaR intervention was more effective in older subjects. However, it was not possible to determine for which age groups the intervention was effective and for which it was not. Besides possible differences in effectiveness, the R&S + AaR intervention might be generalized to all other rehabilitation patients who would meet the inclusion and exclusion criteria of this study. The effects of the R&S + AaR intervention on people who would not meet these criteria remains unclear. On the one hand, given the heterogeneous population of the current study and the use of personalized tailored

counseling, the R&S + AaR intervention might be beneficial for a wider population of patients in rehabilitation, including, for example, people with other diagnoses. On the other hand, the effectiveness of the R&S + AaR intervention is doubtful for people who have no intention at all to become more physically active.

Another unanswered question is whether the R&S and AaR programs were supplemental to each other or if the AaR program on its own would have had the same effect. From a theoretical point of view, it seems wise to integrate both interventions. The combination of sport and daily physical activity leaves the patients with a wider range of physical activity options. To accomplish this, the first session of both programs could be integrated into one longer session, and the focus during three telephone sessions could be on both sport and daily physical activity. In conclusion, future research has to determine the effectiveness of the R&S + AaR intervention in different populations and subpopulations as well as the dose-response relationship.

CONCLUSIONS

The results of the current study suggest that the combination of the R&S and AaR programs was able to increase physical activity behavior and sport participation 1 year after in- or outpatient rehabilitation. The R&S program alone did not have any significant effects. These results were quite similar to those reported at 9 weeks after rehabilitation.[18] In conclusion, it is possible to obtain a long-lasting increase in physical activity behavior by using physical activity promotion programs consisting of several personalized tailored counseling sessions during and after rehabilitation.

SO WHAT? Implications for Health Promotion Practitioners and Researchers. The recent increase in the number of physically inactive people in the industrial world is a serious public health concern. Individuals with disabilities or chronic diseases are even more sedentary than the general population; for these people, a physically active lifestyle could reduce the risk of secondary health problems and improve overall functioning. Studies reported in the literature suggest that physical activity promotion interventions using individualized tailored counseling in populations of people with chronic diseases or physical disabilities can be effective in improving physical activity behavior in the short-term. The current study suggests that a long-lasting (1 year) improvement in physical activity behavior can be achieved by using rehabilitation-based physical activity promotion programs consisting of several personalized tailored counseling sessions for people with physical disabilities.

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