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ORIGINAL

EFFECTIVENESS OF A PROGRAM OF PHYSICAL ACTIVITY IN PEOPLE WITH SERIOUS MENTAL DISORDER

EFFECTIVIDAD DE UN PROGRAMA DE ACTIVIDAD FÍSICA EN PERSONAS CON TRASTORNO MENTAL GRAVE

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ABSTRACT

This study examined the effectiveness of a physical activity and sport program for 28 individuals with Severe Mental Disorders (SMD). An assessment was made before the start of the program and again after four months which

included the measurement of anthropometric variables, functional physical ability, balance and coordination as well as social functioning and capacity to engage in activities of daily living. The results showed statistically significant improvements in those who attended more than 50% of the sessions on all of the anthropometric variables, functional physical capacity and motor variables, as well as on the Scale of Personal and Social Functioning (SPSF). Moreover, attendance in the program was high, with 80% of the initial participants maintaining their involvement over the duration of the intervention. The importance of the results and the need to implement future such interventions in the SMD population is discussed.

KEYWORDS: Severe Mental Illness; Physical Exercise; Sports; Mental Health; Physical Health.

RESUMEN

En el presente estudio se analiza el impacto que ha tenido un Programa de actividad física y deporte en un grupo de 28 personas con Trastorno Mental Grave (TMG). Se realizó una evaluación antes del comienzo del Programa y otra a los cuatro meses, tomando medidas antropométricas, de capacidad física funcional, Balance y coordinación, así como del funcionamiento social y las actividades de la vida cotidiana. Los resultados mostraron mejorías estadísticamente significativas en aquellas personas que asistieron a más del 50% de las sesiones en todas las variables antropométricas, y de condición física funcional y cualidades motrices, así como en la Escala de Funcionamiento Personal y Social (PSP). Por otro lado, la asistencia al programa fue alta, manteniéndose en el mismo el 80% de las personas que lo iniciaron. Se discute la relevancia de los resultados y la necesidad de implantar este tipo de intervenciones en el SMD.

PALABRAS CLAVE: Trastorno Mental Grave; Ejercicio Físico; Deporte; Salud Mental; Salud Física.

INTRODUCTION

At the present time, a sedentary lifestyle is very common among individuals with serious mental disorders (subsequently referred to as SMD). Even when there are favorable treatment options available to individuals with these disorders, reduced physical activity and increased social isolation usually accompany mental illness. Low levels of physical activity combined with other factors, such as poor diet, tobacco consumption and the consumption of other toxic substances can have secondary effects when combined with psychotropic medications and can result in a variety of negative outcomes and reduce hope and quality of life in this population (Pack, 2009). Patients with schizophrenia present a comorbidity of “medical” problems that extends to over 50% of individuals given that the prevalence of “metabolic syndrome” is much greater in this population and is associated with a two to four-fold level increase in coronary and diabetes risk (Ohlsen and Gaughram, 2011; Sánchez-Araña, 2006). Consequently, as highlighted by the Consensus Statement on Physical

Health by the Spanish Societies of Psychiatry and Biological Psychiatry, there is a need for improvement in interventions that are directed toward modifiable behaviors, including physical activity interventions (Sáiz, Bobes, Vallejo, Giner and García-Portilla, 2008).

Nevertheless, the likelihood of increasing exercise behavior in this population is quite low relative to the population as a whole (Davison, Judd, Jolley, Hocking, Thomson and Hyland, 2001). In addition to the lack of physical activity, individuals with mental health issues typically demonstrate little confidence in their exercise capacity and receive limited social support for physical activity engagement (Ussher, Stanbury, Cheeseman and Faulkner, 2007). In this respect, a considerable number of younger individuals in the first weeks of treatment who take antipsychotic medications experience a notable increase in weight (Villegas, López, Martínez and Villegas, 2005) and reduce their involvement in sport and physical activity subsequent to initiating treatment (Villegas, López, Martínez, Luque and Villegas, 2004). Similarly, following hospitalization (where patients are in a state of total physical inactivity), it is typical that individuals experience a state of apathy and anhedonia that limits their subsequent social interaction and their desire to engage in physical activity (Lambert, Velakoulis and Pantelis, 2003).

On the other hand, it has been found that physical exercise affects not only indices of “physical” health but also the individual’s emotional state and well-being. For example, engaging in moderate exercise has been found to have a notable effect on the diminishment of depressive symptoms (Candel, Olmedilla and Blas, 2008; Dunn, Trivedi and O’Neal, 2001; Lawlor and Hopker, 2001) and anxiety levels (Akandere and Tekin, 2004; Herrera-Gutiérrez, Brocal-Pérez, Sánchez and Rodríguez, 2012). Exercise can be of further benefit and serve as an important means of protecting against stress (Holmes, 1993; Paluska and Schwenk, 2000). Martínez de Haro (1986) conducted a study with a sample of individuals with serious mental disorders and demonstrated impressive, favorable consequences in their socialization and social interaction with others as well as associated improvements in self-control, reduced need for medication and diminished anxiety and depression among other outcomes. As such, physical activity involvement can have a positive effect on clinical outcomes and can be an indicator of quality of life of participants (Martín-Sierra *et al.*, 2011).

Despite the important beneficial effects that are associated with physical activity and sport involvement, there are very few studies that have attempted to evaluate the effectiveness of interventions for individuals with severe mental disorders. In fact, one of the essential principles of the recent Declaration of Málaga concerning sport and mental health which was advanced by nine European Union countries, is that further research is essential to advance knowledge in this area of study (<http://www.faisem.es/index.php/es/actualidad/noticias/item/476-organizaciones-de-nueve-paises-suscriben-la-carta-europea-del-deporte/476-organizaciones-de-nueve-paises-suscriben-la-carta-europea-del-deporte>).

One common concern in this area of study pertains to the high number of individuals who fail to maintain their involvement in physical activity programs. This problem is very common in intervention studies with schizophrenics and also in those intervention programs designed to foster habitual sporting involvement. Consequently, it is necessary to implement interventions that will contribute to the maintenance of healthy habits in typical environments.

There were two primary objectives to the present study. The first goal was to evaluate the effects that a physical activity and sport program can have on both physical health and social outcomes in a population with serious mental disorders. The second purpose was to evaluate the effectiveness of a program that was designed to provide a great variety of activities and conducted with the collaboration of university students.

MATERIALS AND METHODS

Participants

The sample was comprised of a total of 28 persons with serious mental disorders who came from various Almerian regional centers of the Andalucian Public Foundation for the Social Integration of Persons with Mental Illness (heretofore referred to by Spanish language acronym: FAISEM), such as social clubs and group homes. Of these individuals, there were 21 males (75%) and 7 females (25%) who participated in the study. The participants ranged in age from 27 to 61 years ($M=46.64$; $SD=9.24$ years).

Instruments

To evaluate the effectiveness of the program, there were various types of assessments of physical capacity and other instruments were included to measure social functioning and functioning in daily life. These measures have all been widely used in previous studies addressing serious mental illness. An attendance record was also kept to assess regularity of involvement in the program. The following will discuss these instruments:

6 Minute Walking Test (Gutiérrez-Clavería, et al., 2008). This instrument is a test of functional cardiorespiratory capacity that assesses the maximal distance an individual can cover in 6 minutes. It is widely used to determine and assess the quality of life and change in physical performance capacity of patients with cardiorespiratory illness. The test is widely considered to be easy to use, well tolerated by patients and capable of providing a good assessment of capacity to carry out daily life activities.

AFISAL-INEFC Test Battery (Rodríguez, Gusi, Valenzuela, Nacher, Nogués and Marina, 1998). This battery of tests evaluates the physical health condition of individuals through the application of various tests carried out in the following order: General state of health questionnaire; body mass index (BMI); waist circumference; estimated body fat composition; maximal grip strength; vertical leap for lower body power; abdominal endurance test; static balance test on one

foot with eyes closed; submaximal test for the prediction of maximal oxygen capacity (2-minute step test).

Scale of Personal and Social Functioning, (SPSF: Morosini, Magliano, Brambilla, Ugolini and Pioli, 2000). This scale addresses the functioning of each patient in the following 4 areas: a) self-care; b) habitual social activities, including working and studying; c) personal and social relations; and d) disturbed and aggressive behaviors. Keeping this information in mind, the scale assesses the 4 areas according to established criteria using a Likert scale format with endpoints on the scale that award the highest score (6 points) for behaviors that most closely correspond and the lowest score (1 point) is given for behaviors that are weak or absent. The Spanish language version of the SPSF (García-Portilla, Saiz, Bousoño, Bascaran, Guzmán-Quilo and Bobes, 2011) has demonstrated good test-retest reliability with a value of .979 and a Cronbach's alpha value of .874 for internal reliability which supports the scale's validity and appropriateness for use in measuring the functional capacities of ambulatory patients with schizophrenia. In addition, the scale is brief which makes it appropriate for widespread administration in clinical practice as a means to quantify and monitor the daily functioning of patients.

Profile of Daily Abilities Scale (PDAS: Rosen, Hadzi-Pavlovic and Parker, 1989) in the Spanish language adaptation (Bulbena, Fernández and Domínguez, 1992). This scale is intended to be used as a self-report scale for individuals with chronic mental illness. The scale is completed only when the patient is not in a state of crisis. The PDAS is composed of five subscales: self-care, social and interpersonal behavior; communication and social contact; non-personal social contact and autonomous living. Each item corresponds to a Likert-type scale with high level functioning (4 points) and lower level functioning (1 point) representing the two endpoints. A high overall score across the PDAS would indicate a high level of overall functioning.

Attendance record: This record was designed for the present investigation to determine the presence or absence of each participant at each of the sessions.

Procedure

Initial contact was made with the Provincial Delegation of FAISEM in Almeria to schedule a meeting to determine whether the centers might be willing to host a program of physical activity and sport. Once this interest was communicated and interest was expressed, contact was made with the participants who would potentially participate in the study and the first (pretest) assessments were conducted with the instruments previously identified. The second evaluation (posttest) was conducted four months later at the conclusion of the intervention.

The program Physical Activity and Mental Health (PAMH) was conducted three days per week with each session lasting one and a half hours. The fundamental premise that shaped the design of the intervention was that it was structured to provide as many varied stimulating activities as possible so that each individual had a multitude of alternative activities to select from in order to

attract the greatest percentage of the population possible. The program was conducted in such a way as to group the activities into three major blocks:

1. Adapted Gymnasium Activities: These activities included aerobic, fitness and group cooperative activities.
2. Games and cooperative activities that were designed to enhance group cohesion, such as those suggested in Gómez-Calvache (2012).
3. Sport activities: These included the utilization of both individual and team sports: Track and Field, Hockey, Badminton, Soccer, Basketball, Team Handball, Rugby, Baseball and Kin-Ball. All of these sports were adapted to this population.

The different sessions were structured in the following manner: The first phase always involved a warmup period (comprised of static/dynamic activities and general/specific activities) that lasted for 20 to 25 minutes (which included a 10 minute warmup and 10-15 minutes of games). The second part of this initial warmup period was conducted using traditional and popular games which were dynamic and fun and which were designed to foster group cohesion and unity. This second principal part of the session had a duration of 30-35 minutes and was of moderate intensity. During this portion of the workout a variety of different activities were included (such as adapted gymnastics, individual and team sports, etc.) Finally, the third phase consisted of a "return to a relaxed state" and consisted of stretching and light relaxation exercises (10 minutes) and a discussion and debate of 5 minutes which allowed for feedback on the activity. Each session concluded in the same way with the participants saying their goodbyes while we held hands and shouted out a particular theme. In this case, the goal was to provide the most entertaining and inclusive closure possible.

Throughout the development and implementation of the program eight students from the School of Psychology at the Universidad de Almería assisted with the delivery of the program objectives.

Data Analysis

The descriptive statistics will be presented first in the form of the mean scores corresponding to each subject on the physical tests from the test battery, AFISAL-INEFC test and the 6 minute walking test (6MWT). At the second level of analysis the pretest and posttest means are compared for the high-attendance (> 50% attendance at class sessions) and low-attendance (< 50% attendance at class sessions) groups through the Wilcoxon paired sampled test. The median score and interquartile scores corresponding with each physical and psychological test are provided through this analysis. The effect size has been computed to establish the magnitude of influence of the intervention. As such, the effect size has been calculated as a means of knowing the level of dependence among the variables (this has been calculated with the fixed

statistic for this non-parametric test: r for Wilcoxon). All analyses were conducted with SPSS version 22.0.

RESULTS

Of the 28 individuals who completed the pretest evaluation at the start of the program, 5 individuals voluntarily discontinued their participation at some point over the course of the study. Two additional individuals were dropped from the analysis, one as a consequence of a poor reaction to their prescription medicine (ischemic cardiopathy was detected in the initial evaluation) and the other for a circulatory complication.

First, Table 1 provides a summary of the pretest data to provide a baseline level for the study variables at the beginning of the intervention. If we recognize that a BMI (body mass index) ≥ 25 is considered to indicate that an individual is overweight then 22 of the 28 individuals were classified as overweight (of which 11 fit the “preobese” category with BMIs between 25.00 and 25.99; 6 were categorized with “light obesity” with BMIs between 30.00 and 34.99; and 5 were categorized with “moderate obesity” but approached morbid obesity levels with BMI values between 35.00 and 39.99. The actual BMI values of these individuals were 36.3 and 39.2, respectively).

In relation to the other values such as the WC (waist circumference), and recognizing that research indicates that a relationship between waist circumference and hip width greater than 1.0 in males and 0.9 in females is associated with an increased probability of various illnesses (diabetes mellitus, coronary illnesses, elevated arterial blood pressure among other illness) it was determined that 14 of the 28 participants presented with a waist circumference that exceeded the standard of 1.0 for males and .90 for females. It is also important to mention the estimates of percentage of fat tissue relative to age and gender and in these estimates 10 individuals were considered to have an excessive percentage of body fat in this assessment.

On the balance test, 18 participants obtained a score of 0 which indicated that they could not maintain their balance for one minute on any of their maximum of 15 attempts.

With regard to the rest of the measures it should be mentioned that 7 individuals demonstrated very poor levels of flexibility. Similarly, lower body explosive strength was extremely low for 5 individuals.

Table 1. Values obtained on the AFISAL-INEFC test battery (values above normal are highlighted).

ID	AGE	WEIGHT	HEIGHT	BMI	WC	SKINFOLDS	% BODY FAT	BIMANUAL GRIP	BALANCE TRIES 1 MINUTE	TRUNK FLEXIBILITY	LOWER BODY EXPLOSIVE POWER
1	43	81.00	1.77	25.9	.89	63.9	23.37	78.5	0	-5	37.2

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2	34	70.70	1.53	30.1	.85	90.0	42.14	34.5	0	-4	21.3
3	40	78.00	1.60	30.5	.99	64.2	23.13	75.0	0	-2	32.7
4	31	118.0	1.83	35.2	.93	73.0	25.37	63.5	5	3.5	29.1
5	49	54.20	1.70	18.8	.89	15.4	6.61	58.0	0	3	15.1
6	48	67.50	1.77	21.5	.99	25.7	10.1	71.5	0	4	26.9
7	60	65.50	1.68	23.21	.06	33.8	14.31	79.0	0	-26	13.7
8	49	95.50	1.56	39.2	.98	76.7	36.79	37.5	0	-5	21.0
9	55	85.00	1.53	36.31	.00	84.4	40.87	36.5	0	-16	14.1
10	27	57.00	1.64	21.2	.76	36.0	16.91	49.0	0	3	30.5
11	53	79.00	1.63	29.7	.96	95.0	45.88	46.0	0	-3	20.4
12	39	75.40	1.80	23.3	.93	36.1	12.78	94.5	0	-1	23.2
13	37	77.00	1.58	30.8	.06	77.0	27.59	72.5	6	-1	43.7
14	48	73.90	1.64	27.5	.84	84.3	40.34	45.0	0	-2	17.1
15	52	74.50	1.63	28.01	.07	57.0	21.85	75.0	11	-4	31.9
16	61	95.00	1.75	31.01	.08	68.4	27.18	65.0	0	-12	19.2
17	53	97.50	1.67	35.01	.06	57.0	21.97	72.0	8	-7	31.7
18	62	72.00	1.68	25.51	.05	67.0	26.77	68.0	0	-19	21.2
19	34	87.50	1.71	29.91	.00	74.0	26.1	58.0	10	-13	35.6
20	55	81.00	1.79	25.3	.96	62.0	24.06	65.0	6	-7	28.1
21	42	73.00	1.68	25.9	.76	54.6	26.11	48.0	0	-11	21.2
22	46	111.0	1.76	35.81	.27	56.4	20.94	101.5	0	-1	47.3
23	49	93.30	1.79	29.1	.98	44.0	16.75	52.5	0	-9	33.4
24	46	93.80	1.84	27.71	.12	67.1	24.92	80.5	2	2	34.4
25	50	66.00	1.64	24.5	.98	41.6	15.99	97.0	10	3	36.1
26	43	98.00	1.76	31.61	.20	45.2	16.5	68.5	0	2	39.3
27	61	85.5	1.60	33.41	.06	56.2	22.6	39.5	1	-11	26.5
28	50	73.9	1.72	25.0	.95	62.4	23.63	77.5	7	2	43.1

Table 2 presents the results for the 6 minute walking test. 14 of the 27 individuals who participated on this test covered a distance that was less than the normal mean for healthy people (approximately 580 meters for men and 500 meters for women). In addition it should be mentioned that 11 individuals had very low values on this test. It should also be noted that 11 individuals presented a low estimated cardiorespiratory capacity value, 3 individuals demonstrated problems with low basal functional capacity (BFC) and 1 person had serious problems with arterial pressure.

Table 2. Values obtained for participants during the 6-minute walking test (6MWT)

ID	DISTANCE M/MI	EST RQ	VO2 0.1	VO2 1.15	RESTING HR	ENDING HR	% FCMT	INITIAL SpO2%	FINAL SpO2	BORG BREATHING	BORG PERCEPTION	BASAL ARTER PRESS	ENDING ARTER PRESSE	BP5MIN POST
1	687	102.2	15.0	20.7	74	147	82.6	97	98	1	6.5	110/70	160/60	110/65
2	531	84.1	12.4	16.8	74	137	73.3	98	99	1	2	120/80	125/60	110/60
3	624	110.6	15.0	20.7	64	88	48.6	96	98	3	2	115/70	140/60	110/60

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4	606	100.0	13.6	18.7	92	152	80.4	96	96	0	1	140/90	120/90	135/80
5	588	92.4	13.3	18.2	80	112	65.5	96	92	0	0	90/60	90/60	90/60
6	-	-	-	-	79	-	0.0	99	-	-	-	90/60	-	-
7	600	115.3	13.5	18.5	55	81	50.3	99	95	8	0	90/60	120/60	100/60
8	504	101.7	11.9	16.1	68	128	74.9	96	97	2	0	110/70	130/65	110/60
9	486	104.0	11.6	15.7	71	127	77.0	96	98	0	0	120/65	120/60	120/60
10	645	88.8	14.3	19.6	71	156	80.8	97	99	0	0	80/50	110/50	100/60
11	543	103.7	12.6	17.1	96	143	85.1	96	98	0	1	120/85	140/75	120/70
12	642	88.4	14.2	19.6	83	172	94.5	100	97	2	2	100/65	110/60	100/60
13	615	108.3	13.8	18.9	116	153	83.6	94	96	0	1.5	120/80	170/70	120/65
14	531	93.7	12.4	16.8	101	129	58.6	98	98	1	1	110/70	150/60	120/60
15	577	106.8	13.1	17.9	87	116	52.7	97	97	0	0	100/60	120/60	110/60
16	567	104.5	13.0	17.7	97	140	63.6	96	97	0	0	125/90	180/80	140/75
17	516	107.9	12.1	16.4	91	135	61.4	99	100	1	1	125/80	140/60	110/60
18	579	109.1	13.2	18.0	97	147	66.8	94	100	3	2	100/75	130/60	120/60
19	522	99.5	12.2	16.6	95	141	64.1	96	96	1	0	110/70	125/65	110/60
20	515	82.1	12.1	16.4	94	125	56.8	96	95	0	0	110/60	120/65	110/60
21	480	78.3	11.5	15.5	83	139	63.2	99	98	0	6	110/70	110/70	110/70
22	639	106.4	14.2	19.5	91	137	62.3	98	98	8	1	160/100	210/80	180/110
23	531	82.8	12.4	16.8	46	70	31.8	96	99	8	0	100/70	110/70	120/65
24	633	92.0	14.1	19.3	104	155	70.5	98	98	8	0	100/65	120/60	110/65
25	654	115.7	14.4	19.9	109	133	60.5	96	99	0	0	110/70	120/65	120/60
26	636	100.2	14.1	19.4	78	139	63.2	95	97	0	7	110/70	120/55	120/75
27	510	84.2	12	5	84	107	48.6	95	83	2	0	110/70	120/70	110/60
28	612	100.5	13.7	18.8	77	131	59.55	95	98	0	1	100/65	140/80	110/70

To further evaluate the effectiveness of the program, we split the sample into groups that customarily attended the training session (more than 50% of the sessions) and those who attended less frequently (less than 50% of the time) given that the effectiveness of physical activity and sport programs depends upon the continuous and habitual nature of participation (Table 3 provides these results).

In terms of weight loss, it was found that both groups lost weight during the intervention although significant changes ($p=.036$) were only found for those individuals who attended more than 50% of the sessions with a moderate to strong effect size in relation to weight loss differences between groups.

Statistically significant improvements were also found in balance favoring the more physical active group ($p= .033$) which required fewer attempts to succeed on the one minute balance test. The effect size was also moderate to strong for the balance test.

Both groups demonstrated an increase in walking distance from pretest to posttest but the only significant group difference occurred in the group that attended more than 50% of the sessions ($p=.017$) with a correspondingly strong effect size.

Similarly, an increase in estimated respiratory quotient was present for both groups as well as an increase in estimated aerobic capacity in the posttest for both groups with the effect sizes being moderate and quite strong, depending on the group. Scores on the Borg scale of perceived exertion indicated a moderate to high effect size for improvement. There was also a reduction in arterial blood pressure across all the measures for both groups with changes being barely significant in the low attendance group and strong in the high attendance group. Finally, a reduction in post-exercise recovery time was found for both groups.

Table 3. Values for participants on the AFISAL-INEFC test comparing high attendance (> 50% of sessions) and low attendance (<50% of sessions) groups

- de 50%		N	Median (IQR)	p	r	+ de 50%		N	Median (IQR)	p	r
Weight	Pre	9	78.40 (71.10;84.65)	.484	.165	Weight	Pre	11	81.00 (71.00; 93.40)	.036	.445
	Pos	9	78.00 (69.70; 83.00)				Pos	11	77.00 (70.70; 95.00)		
BMI	Pre	9	29.17 (25.37; 33.94)	.515	.153	BMI	Pre	11	29.48 (25.00; 31.05)	.230	.257
	Pos	9	28.04 (24.53; 33.39)				Pos	11	29.92 (23.27; 31.02)		
WC	Pre	9	0.96 (0.89; 1.00)	.048	.467	WC	Pre	11	0.93 (0.90; 1.04)	.085	.369
	Pos	9	0.98 (0.89; 1.03)				Pos	11	0.99 (0.93; 1.06)		
Skinfolds	Pre	9	72.20 (55.20; 81.80)	.767	.068	Skinfolds	Pre	11	64.40 (46.50; 73.70)	.182	.286
	Pos	9	64.20 (45.40; 84.35)				Pos	11	67.00 (36.10; 74.00)		
Body Fat %	Pre	9	27.55 (20.60; 39.36)	.767	.068	Body Fat %	Pre	11	25.59 (20.01; 27.26)	.182	.286
	Pos	9	23.37 (18.08; 40.60)				Pos	11	25.37 (16.91; 27.18)		
Bimanual grip strength	Pre	9	55.00 (39.25; 78.00)	.400	.197	Bimanual grip strength	Pre	11	62.80 (54.00; 73.00)	.212	.266
	Pos	9	58.00 (41.25; 76.75)				Pos	11	65.00 (58.00; 72.00)		
Balance	Pre	9	13.00 (1.00; 16.50)	.045	0.471	Balance	Pre	11	14.00 (1.00; 16.00)	0.033	0.456
	Pos	9	1.00 (1.00; 1.00)				Pos	11	1.00 (1.00; 6.00)		
Flexibility	Pre	9	-4.00 (-12.25; 0.00)	.553	0.139	Flexibility	Pre	11	-6.00 (-14.00; -2.00)	0.090	0.362
	Pos	9	-4.00 (-10.50; -2.00)				Pos	11	-4.00 (-12.0; 3.00)		
Explosive Force	Pre	9	20.00 (18.10; 31.00)	.314	0.238	Explosive Force	Pre	11	30.10 (23.30; 32.00)	0.533	0.132
	Pos	9	20.40 (14.60; 32.30)				Pos	11	28.10 (21.30; 31.70)		
Distance Walked	Pre	9	525.0 (480.0; 585.5)	.017	0.577	Distance Walked	Pre	11	585.0 (516.0; 609.0)	0.138	0.323
	Pos	8	582.5 (534.0; 618.0)				Pos	10	573.0 (520.50; 621.75)		
Estimated RQ	Pre	9	97.60(88.90;101.35)	.025	0.543	Estimated RQ	Pre	11	86.90 (83.30; 101.10)	0.028	0.480
	Pos	8	102.9 (95.7;109.6)				Pos	10	99.75 (87.32; 108.0)		
VO2.0.1	Pre	9	12.30 (11.55; 13.25)	.017	0.577	VO2.0.1	Pre	11	13.30 (12.10; 13.70)	0.136	0.325
	Pos	8	13.20 (12.45; 14.62)				Pos	10	13.10 (12.17; 13.90)		
VO2. 0.15	Pre	9	16.60 (15.50; 18.15)	.021	0.560	VO2. 0.15	Pre	11	18.10 (16.40; 18.70)	0.092	0.366
	Pos	8	18.05 (16.87; 20.15)				Pos	10	17.85 (16.55; 19.07)		
BFC	Pre	9	73.00 (60.00; 91.00)	.778	0.065	BFC	Pre	11	92.00 (72.00; 112.00)	0.894	0.028
	Pos	9	77.00 (66.00; 91.50)				Pos	11	92.00 (79.00; 97.00)		
Final FC	Pre	9	116.0 (99.50; 130.0)	.362	0.220	Final FC	Pre	11	151.0 (132.0; 165.0)	0.610	0.111
	Pos	8	122.0 (94.0; 139.5)				Pos	10	144.0 (136.50; 153.75)		
	Pre	9	61.30 (51.80; 76.55)	.401	0.203		Pre	11	75.00 (61.80; 87.80)	0.575	0.121

Effectiveness of a physical activity program for people with serious mental disorders

Estimated Max FC	Pos	8	62.05 (50.90; 80.67)			Estimated Max FC	Pos	10	70.05 (63.05; 81.50)		
Initial Oximetry	Pre	9	96.00 (95.00; 97.50)	.236	0.280	Initial Oximetry	Pre	11	97.00 (96.00; 98.00)	0.719	0.076
	Pos	9	96.00 (96.00; 97.50)				Pos	11	96.00 (96.00; 99.00)		
Final Oximetry	Pre	9	98.00 (95.50; 98.50)	.865	0.041	Final Oximetry	Pre	11	98.00 (98.00; 99.00)	0.720	0.078
	Pos	8	97.50 (95.50; 98.00)				Pos	10	97.00 (96.00; 99.25)		
Borg Level Breathing	Pre	9	1.00 (0.00; 2.00)	.593	0.128	Borg Level Breathing	Pre	11	0.00 (0.00; 0.00)	1.00	0.000
	Pos	8	1.00 (0.00; 2.75)				Pos	10	0.50 (0.00; 1.25)		
Borg Fatigue Scale	Pre	9	1.00 (0.00; 2.00)	.077	0.429	Borg Fatigue Scale	Pre	11	2.00 (0.00; 5.00)	0.075	0.388
	Pos	8	0.50 (0.00; 1.75)				Pos	10	1.00 (0.00; 2.00)		
Tensión AB 1	Pre	9	115.0 (105.0;120.0)	.131	0.356	Tensión AB 1	Pre	11	110.0 (110.0; 120.0)	0.478	0.151
	Pos	9	110.0 (95.0; 117.5)				Pos	11	110.0 (100.0; 125.0)		
Tensión AB 2	Pre	9	75.00 (70.00; 77.50)	.12	0.363	Tensión AB 2	Pre	11	70.00 (65.00; 80.00)	0.832	0.044
	Pos	9	70.00 (60.00; 77.50)				Pos	11	75.00 (60.00; 80.00)		
Tensión AF 1	Pre	9	130.0 (115.0;155.0)	.395	0.206	Tensión AF 1	Pre	11	130.0 (120.0; 140.0)	0.610	0.111
	Pos	8	135.0 (120.0;147.5)				Pos	10	125.0 (117.5; 147.5)		
Tensión AF 2	Pre	9	70.00 (65.00; 75.00)	.039	0.500	Tensión AF 2	Pre	11	70.00 (60.00; 75.00)	0.254	0.249
	Pos	8	60.00 (60.00; 77.50)				Pos	10	62.50 (60.00; 72.50)		
5 Minutes Recovery 1.	Pre	9	120.0 (110.0; 120.0)	.160	0.342	Recuperación 5min. 1.	Pre	11	120.0 (110.0; 130.0)	0.426	0.174
	Pos	8	110.0 (102.0;117.5)				Pos	10	110.0 (107.5; 123.75)		
5 Minute Recovery. 2.	Pre	9	65.00 (60.00; 72.50)	.102	0.395	Recuperación 5min. 2.	Pre	11	70.00 (60.00; 70.00)	0.050	0.426
	Pos	8	60.0 (60.0;63.75)				Pos	10	60.00 (60.00; 67.50)		

(IQR): Inter Quartile Range

In Table 4 the results are shown for the various social variables such as the Profile of Daily Abilities Scale (PDAS) and the Scale of Personal and Social Functioning (SPSF).

With attention to the results obtained in relation to personal and social functioning it is apparent that the individuals who attended less than 50% of the sessions experienced a decline in these functional capacities whereas the persons who attended more than 50% of the sessions demonstrated a significant improvement ($p = .05$) with a correspondingly strong effect size for the intervention in relation to personal and social functioning.

For the profile of daily abilities the group with an attendance less than 50% suffered a decline in the performance of daily abilities whereas the group with an attendance level exceeding 50% maintained their pretest levels on these functional abilities.

Table 4. Values for the Personal and Social Functioning (SPSF) and Profile of Daily Abilities (PDAS) Scales comparing high attendance (>50%) and low attendance (<50%) groups

- de 50%		<i>N</i>	Median (IQR)	<i>p</i>	<i>r</i>	de 50%	<i>N</i>	Median (IQR)	<i>p</i>	<i>r</i>	
SPSF	Pretest	5	72.0 (70.0; 91.0)	.109	.506	SPSF	Pretest	9	66.00 (50.75; 75.75)	.050	.473
	Postest	4	65.0 (55.0; 76.0)				Postest	8	70.00 (61.00; 80.00)		
PDAS	Pretest	5	140.0 (128.0; 142.0)	.144	.462	PDAS	Pre test	9	127.0 (107.75; 140.25)	.833	.051
	Postest	4	129.0 (102.0; 140.5)				Postest	8	129.0 (118.0; 143.0)		

(IQR): Inter Quartile Range

DISCUSSION

After the completion of the four month program some significant improvements were found in the desired direction, particularly in the group that attended more than 50% of the sessions and on those outcome variables related to a reduction in fatigue, post-exercise recovery time, body weight and balance capacity. Similar positive effects took place for social competencies where those in the group that attended more than half of the sessions demonstrated significant and positive changes. With regard to the capacities for daily living, those in the high attendance group demonstrated these positive changes but these same benefits were not obtained in the group with attendance of less than 50% of the sessions (in fact these individuals decreased in these abilities as reflected in Tables 1 and 2). In this sense, and in a manner that is consistent with previously reported research relative to the regular practice of physical exercise, the greater benefits were experienced by the more regular exercisers (those who attended more than 50% of the sessions) (Hahn, Teutsch, Rothenberg and Marks, 1990; Nieman, 1998; Paffenbarger, Blair and Lee, 2001).

Program acceptance by the participants was also high in that only 5 of the participants who constituted the initial sample did not voluntarily maintain their participation in the study with the recognition that two individuals had to leave the study involuntarily due to issues with a prescription medication or due to another complication. These findings are highly relevant if we consider that the posttest evaluation revealed that the population was quite heterogeneous in terms of age and physical and motor capacity with the overwhelming majority being overweight and possessing numerous physical limitations (such as poor balance, excessive waist circumference, etc.). Few of these individuals had been involved in any form of sport for a long period of time and it is characteristic for individuals with severe mental disorders to drop out of structured activities (Ussher *et al*, 2007). The positive outcomes could be the result of the variety of activities provided in the program and the fact that the intervention program introduced novel activities (such as Kin-ball), and used the collaboration of a substantial number of university students for the implementation of the program. These aspects should be considered in the evaluation of future studies to determine the specific contribution of each component to the resultant changes.

To summarize, the PAMH program was found to have a favorable effect on the outcome variables of interest. Nonetheless, due to the tremendous value that physical activity provides to this population and the frequent obstacles that are encountered in access to physical activity for these individuals it would be beneficial to continue to investigate the benefits of intervention programs of this type to this population in order to strengthen this line of research. On the other hand, it would be interesting to include instruments that monitor the physical activity levels of participants in their daily lives (and not only throughout the duration of the intervention program) as a means of advancing generalizations relative to the efficacy of the intervention over time. At the same time it would be very beneficial to increase the size of the sample to include participants from regions other than Almería to test the validity and generalizability of these findings.

CONCLUSIONS

From these results we can extract different conclusions. The first conclusion is that the development of a program of physical activity for individuals with severe mental illness is important not only for their physical health but also has favorable consequences at the social level. In this way, it seems important to promote these types of regular programs for the social rehabilitation of the individuals involved.

On the other hand, despite the differences at the physical health level that were apparent in this sample, important improvements were nonetheless obtained after four months of involvement in the program (particularly for those individuals who attended at least half of the sessions) and revealed the benefits of an intervention program of short to moderate duration.

Finally, the results were supportive of a program of physical activity with considerable variety in the activities presented in which there was also extensive involvement and collaboration on behalf of younger individuals, most notably university students. The result was that the large majority of individuals with severe mental disorder maintained their involvement in the intervention program and for this reason it is important to continue investigating these aspects to determine the specific elements that lead to maintaining physical activity program participation in a population that is strongly characterized by low continuation levels in intervention program.

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