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Research Article

Obesity and Physical Education: Whose interests?

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Abstract

Introduction: The lack of physical activity in obese subjects, which is a major problem, can be explained by the presence of several brakes including non-medical. The objective of this study is to evaluate the impact of a physical activity education program during a week of hospitalization that was created at the University Hospital of Tours in the department of PRM in the context of the management of obese patients.

Material and Methods: This was a prospective, single-center, routine care study. Included were 30 adult obese patients, assessed 1 to 3 months prior to their admission to the clinic, where oral counseling was given (T0), day of hospitalization (T1) and 1 month of hospitalization (T2). The primary endpoint was the evaluation of kinesiophobia by TSK. The secondary judgment criteria were the assessment of beliefs in anxious avoidance by the FABQ, quality of life by the IWQOL-Lite questionnaire and physical activity practice with the IPAQ and the Dijon score. Our hypothesis was that variation in primary and secondary outcomes was greater after one week of physical activity education than after consultation with oral counsel.

Results: The change in the kinesiophobia score between T1 and T0 was -1.3 (p=0.1029), the change in this score between T2 and T1 was -4.4 (p=0.0001) with Δ2 (T2-T1) significantly greater than Δ1 (T1-T0), p=0.003448.

Conclusion: This work highlights that a week of physical activity education in hospitalization proposed to obese patients allows a significant improvement superior kinesiophobia compared to a medical consultation with oral counseling.

Introduction

Obesity has been recognized as a disease since 1997 by WHO, which declared it in 2000 as the "world's first noninfectious epidemic" [1].

It is defined by a Body Mass Index (BMI = Weight/Height²) greater than 30 kg/m² in adults. Prevalence, which is increasing, is estimated at 17.5% in adults in 2012 in France [2].

This disease, which is a cardiovascular risk factor, can be responsible for a significant increase in morbidity and mortality, as well as for the disabilities responsible for a decline in quality of life and significant direct and indirect economic costs health [3]. Severe obesity corresponds to a BMI>40kg/m² or >35kg/m² with disabling complications such as the existence of cardiovascular diseases including arterial hypertension, obstructive hypopnea apnea syndrome and other respiratory disorders Severe metabolic disorders, in particular type-2 diabetes, disabling osteoarticular diseases, non-alcoholic steatohepatitis and psychological disorders related to obesity [3].

Anyone who is overweight requires dietary education, physical activity counseling, a psychological approach and medical follow-up by their primary care physician. Daily physical activity must be presented as indispensable.

The definition of the most widespread physical activity is that proposed by Caspersen in 1985, namely all the body movements produced by the activation of the skeletal muscles and resulting in an increase in the expenditure energetic above the resting metabolism [4]. The intensity of a physical activity represents the importance of the effort provided which results in the energy cost, and often classified in three levels: light (<3 MET), moderate (between 3 and 6 MET) or high (>6 MET). Metabolic Equivalent (MET) is a multiple of resting metabolism and extrapolates energy expenditure [5].

According to the latest recommendations of the Haute Autorité de Santé concerning adults in the general population, it is advisable to perform a minimum of 150 minutes per week of moderate intensity physical activity per week or at least 75 minutes of high intensity activity. Weekly or combine these two types of intensity [6] with a minimum of 10 minutes per session. It is suggested to double this amount for additional health benefits such as weight loss [6]. In addition, it is advisable to alternate between aerobic activities at least at the first ventilatory threshold SV1 and muscle strengthening exercises [3].

This threshold SV1, determined during a stress test with measurement of VO2max, is a ventilatory adaptation threshold reflecting the transition between aerobic metabolism and a mixed anaerobic metabolism, thus making it possible to judge the intensity of a physical activity [3]. The SV2 threshold corresponds to the ventilatory incompatibility threshold [3].

Faced with the failure to implement hygiene and dietary measures for more than 6 months, the general practitioner must consider the help of a specialist health professional. In fact, in a subject aged between 18 and 65 years with severe obesity, specialized and multidisciplinary medical care is indicated as first-line, the indication for bariatric surgery is in the absence of sustained weight loss despite optimal follow-up [7].

Multidisciplinary monitoring makes it possible to rule out any contraindication to bariatric surgery, such as the inability to participate in prolonged medical monitoring evaluating motivation and willingness to join follow-up programs. There are other contraindications such as unstable psychotic disorders, alcohol abuse or drug dependence, or the existence of life-threatening conditions in the short term [7].

Preoperative management is therefore essential in order to evaluate patients' ability to change behavior and to accompany patients in these changes.

It is described that despite these recommendations, lack of physical activity remains a major public health problem [5]. The identification of non-medical brakes in the practice of physical activity therefore seems essential.

Fear of movement, or kinesiophobia, seems to be higher in obese subjects, especially those who have had a chronic osteoarticular painful experience with, in particular, beliefs in anxiety avoidance [8,9].

The term kinesiophobia (Kinesis = Movement; Phobia = Fear) was introduced in 1980 by Kori et al. [10].

This concept was then developed by Vlaeyen et al in 1995 which defines kinesiophobia as "an irrational, excessive and disabling fear of movement and activity resulting from a feeling of vulnerability to painful injury or recurrence of this lesion" [11]. It is a persistent and intense fear caused by the simple thought of having to perform certain movements [12].

Kinesiophobia is measured using the TSK (Scale of Kinesiophobia) scale developed by Miller et al. 1991 and is present with a score greater than or equal to 40/68 points [13].

Fear is an emotional response to dangerous or painful experiences that can lead to survival mechanisms such as avoidance attitudes. It is linked to beliefs that are convictions of the veracity of propositions without their verification [14]. These are cognitions or mental processes that can influence perception and behavioral responses [14].

The fear of pain is increasingly recognized as a factor of disability and therefore of physical inactivity [15].

The existence of kinesiophobia or beliefs in anxious avoidance then appear as barriers to the practice of physical activity.

In addition, pre- and postoperative physical activity plays a key role in improving the outcome of bariatric surgery, particularly functional in terms of pain, disability and kinesiophobia [16,17].

A physical activity education program was created at the University Hospital of Tours in the Department of Physical Medicine and Rehabilitation (MPR) as part of the management of obese subjects before bariatric surgery or by the Network of Management overweight and obesity in the Central region. It has been set up to optimize the follow-up of obese patients by targeting the beliefs, representations and dietary and physical behaviors that are mainly related to obesity [18].

The main line of care is to make a lasting change in the lifestyle of obese patients regarding their physical activity and diet. This program takes place during a full hospitalization week at the Château-Renault hospital where individual and group interviews as well as physical activity workshops are conducted by a doctor from MPR, occupational therapists, sports educators and a dietician.

The main objective of this study is to evaluate the impact of a week of education on physical activity in obese adults on kinesiophobia.

The secondary objectives of this study are to evaluate the impact of a week of education on physical activity among obese adults on beliefs in anxiety avoidance, quality of life and physical activity.

Type of study

It was a prospective, monocentric study, performed in routine care in the Physical Medicine and Rehabilitation department of the University Hospital of Tours between September 2015 and June 2016.

Free and informed consent was obtained in each patient. All were informed of the data processing according to the recommendations of the CNIL (n° ID RCB 2015-A01375-44).

The Committee for the Protection of Persons has given its agreement n° 2015-S12.

The ANSM number obtained is n° 2016_013.

Population

All obese patients aged between 18 and 65 years were included, followed at the University Hospital of Tours as part of a bariatric surgery project or by the Network for the Management of Overweight and Obesity. Department of Indre and Loire (REPSO), and participating in the week of hospitalization in Château-Renault between September 2015 and September 2016.

There were no exclusion criteria.

Progress of the study

The protocol consisted of 3 steps

At T0: A first consultation during an individual interview conducted by a doctor of MPR 1 to 3 months before the week of hospitalization where were given standard oral advice concerning the practice of physical activity and where were collected the characteristics of the patients , the evaluation of the pain with the numerical scale out of 10, the weight, the size, the BMI and the following self-questionnaires: The evaluation of kinesiophobia with the Tampa Scale scale for kinesiophobia TSK, validated scale [19] in particular in French [20].

A score greater than or equal to 40/68 points is considered significant kinesiophobia [10].

The assessment of beliefs using the FABQ Fear Avoidance Beliefs Questionnaire whose original version was validated in 1993 by Waddell G et al. [21] and more recently in French [22]. This questionnaire allows the assessment of fears, beliefs and avoidance behavior in two areas: FABQ 1 concerns beliefs about work on 42 points and FABQ 2 evaluates beliefs about physical activities on 24 points. A high score corresponds to beliefs in anxiety avoidance [21].

The evaluation of the quality of life was carried out using the IWQOL-Lite score, the short form of the IWQOL score which is the first specific instrument developed to evaluate the quality of life at obese subjects [23]. This score, validated [24] in particular in French [25] has 31 items, with a total of 155 points. The items are grouped into five areas, mobility on 55 points, self-love on 35 points, sexual life on 20 points, social life on 25 points and work on 20 points. A high score indicates an impaired quality of life [23].

-the evaluation of physical activity was carried out using the self-questionnaire IPAQ International Physical Activity Questionnaire, validated in French [26]. This score allows in four questions to evaluate intense physical activity (8.0MET), moderate (4.0MET) and walking (3.3MET) in a subject over the last seven days, in MET.min / week. It classifies individuals into three levels of physical activity: a low level if no physical activity or activity that does not reach levels 2 or 3; a moderate level that corresponds to at least 3 days or more of intense activity more than 20 minutes per day or at least 5 days of moderate activity for at least 30 minutes or at least 5 days of activity reaching at least 600MET.min per week and a high level which corresponds to an intense activity at least 3 days a week reaching at least 1500MET. min per week or at least 7 days of activity reaching at least 3000MET. min per week [27].

-The physical activity score of DIJON validated in French for subjects over the age of 75 years was used to evaluate physical activity. It contains 9 questions, for a total of 30 points. Subjects with a score below 10 are considered sedentary, between 11 and 20 as moderately active and greater than or equal to 21 as active [28].

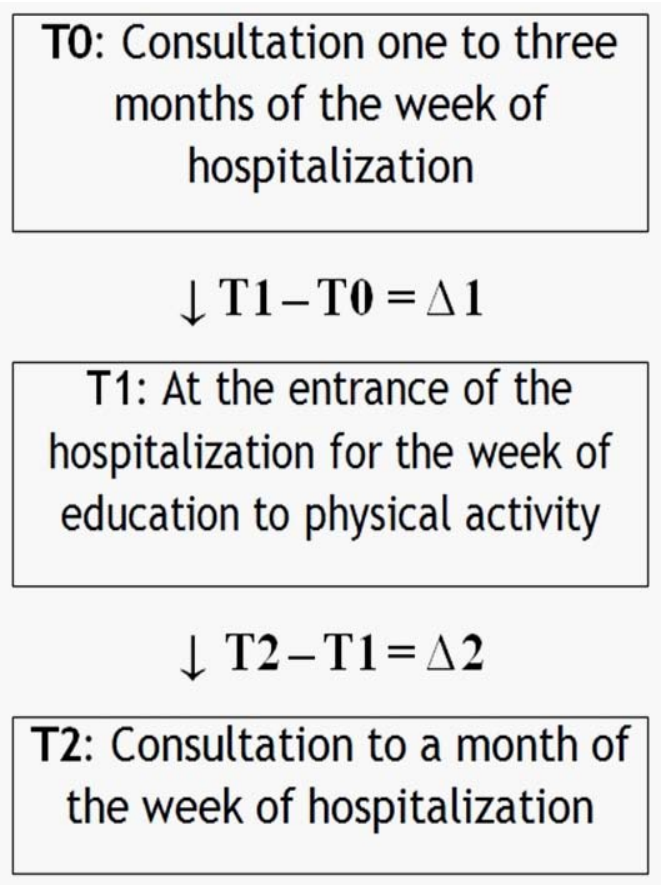
At T1: one to three months after the first consultation, patients were admitted to hospital in the PMR department for group management of 5 patients and hosted by a multidisciplinary team composed of GPs of doctors, nurses, caregivers, sports educators, occupational therapists and dieticians.

During this hospitalization were collected self-questionnaires, the assessment of pain with the numerical scale out of 10, weight, height and BMI. Hospitalization took place over 5 days. An individual medical assessment was performed by an MPR physician, combined with a stress test with VO2 max measurement and determination of SV1 and SV2 thresholds.

During the 5 days, physical activity workshops led by a sports instructor were conducted with two one-hour sessions on education and muscle building practice; two sessions of 30 minutes of aerobic activity type exercise bike, treadmill, rower, pedal bicycle, elliptical bike; two 45-minute balneotherapy sessions with muscle building and stretching in the water; and 30-minute dry stretch sessions at the end of half-days. An education in the use of a heart rate monitor was performed, as well as the practice of aerobic activity from the SV1 threshold. A 30-minute psychomotricity course and a 30-minute equilibrium course were conducted, supervised by a sports instructor. Two one-hour sessions supervised by an occupational therapist were carried out, with an assessment of the activities of daily and professional life and a scenario. Finally, two nutritional workshops supervised by a dietician as well as an individual interview were carried out.

At the end of the stay, the patients left with a program of adapted physical activity, established with the sports educator and the doctor of MPR.

At T2: Patients were seen in consultation at one month of hospitalization in a personal interview with an MPR physician who collected the self-questionnaires again, pain assessment using the 10-digit numerical scale , weight, height, and BMI.



Method

Main judgment criterion

Assessment of kinesiophobia: At T0, T1 and T2 kinesiophobia was assessed by the 68-point TSK self-questionnaire for a comparison of the score change between T0 and T1 (Δ1) and between T1 and T2 (Δ2).

Comparison of the number of kinesiophobia (TSK≥40) and non-kinesiophobia (TSK<40) patients with T0 and T2 was performed.

Secondary criteria for judgment

Evaluation of Beliefs: At T0, T1 and T2 using the FABQ auto questionnaire with the two scores: FABQ 1 for work on 42 points and FABQ 2 for physical activity on 24 points for a comparison of the score variation between T0 and T1 (Δ1) and between T1 and T2 (Δ2).

Quality of life assessment: At T0, T1 and T2 by the self-questionnaire IWQOL-Lite with a total of 155 points: mobility on 55 points, self-love on 35 points, sexual life on 20 points, social life on 25 points and the work on 20 points for a comparison of the score variation between T0 and T1 (Δ 1) and between T1 and T2 (Δ 2).

Evaluation of physical activity practice: At T0, T1 and T2 by the DIJON self-questionnaires out of a total of 30 points and by the IPAQ with a ranking of the patients in 3 levels of physical activity (low, moderate, high) for a comparison of the variation of the score between T0 and T1 (Δ1) and between T1 and T2 (Δ2).

Assessment of anthropometric parameters: At T0, T1 and T2 were evaluated weight P in kilograms (kg), height T in centimeters (cm), body mass index IMC in kg/m² and abdominal perimeter PA in cm for a comparison of variation scores between T0 and T1 (Δ1) and between T1 and T2 (Δ2).

Our hypothesis was that variation in primary and secondary outcomes was greater after one week of physical activity education than after consultation with oral counsel.

Other parameters collected: We believe that the following factors may influence our judgment criteria: age, sex, number of cardiovascular risk factors (Nb FDR CV), age of obesity in years, presence of antecedent obesity status, parity status, socio-educational level, professional status, presence of sporting history, the notion of sports exemption for more than 6 months during schooling, history of the musculoskeletal system, the existence of a negative cardiotrope treatment in progress, the duration of follow-up at the University Hospital for obesity, or the evaluation of pain by the numerical scale of the pain on 10 points.

The evaluation of eating disorders was carried out using the EAT40 eating attitude test score, which is a 40-question self-questionnaire developed in 1979 by Garnier and Garfinkel [29]. This score, validated in French [30] allows to detect the existence of eating disorders and to measure their intensity and severity. A high score especially greater than 20 points reflects a risk of existence of eating disorders.

The search for an underlying depressive state was performed using the Beck Depression Inventory as one of the most common self-reported depression scales [31]. A French validation exists [32]. There are 21 items, a score higher than 4 points translated of the existence of a depression which is light of 4 to 9 points, average of 10 to 19 points, moderate of 20 to 29 points and severe greater than 30 points [33].

The ability to change behavior was sought during the interrogation of the first medical consultation according to the score of Prochaska and Di Clemente during the consultation. This model described by James Prochaska in 1997 [34] highlights five stages assessing the motivation to change behavior: the pre-contemplative stage in which the subject does not realize that there is a problem to be solved, the contemplative stage where the subject plans to do something, the stage of preparation where it learns about the different ways to solve this problem, the stage of action where these means are implemented recently and the stage of maintenance where these means are implemented since more than 6 months. This model is applicable to the adoption of many health behaviors, especially in the management of obesity [35]. Face to low numbers, patients were classified into two groups: "action / preparation" and "contemplation / pre-contemplation".

For all these criteria, a subgroup analysis was performed comparing kinesiophobia and non-kinesiophobia patients to T2 (one month of the education week to physical activity).

Statistical analyzes

The comparison between T0 and T1 (Δ1), between T1 and T2 (Δ2) and between Δ1 and Δ2 (Δ2-Δ1) studied parameters were performed using the paired Student test.

- A Chi2 test was used to compare the qualitative variables.
- A Student's test was carried out for the subgroup analysis of the quantitative variables as the numbers were greater than 5.
- A difference was considered statistically significant if p was less than 0.05.
- An intent-to-treat analysis was performed to handle the missing data by imputing the last observed value.

As for the calculation of the number of subjects needed to be included to demonstrate a significant difference, we focused on the primary endpoint, the TSK score. In the literature, no variance in this score has been shown to be significant. We have therefore fixed a variation of 4 points of the value of the TSK as significant. Assuming a frequency of the event of 5% in the group "before education" and 50% in the group "after education", it is necessary to include 30 patients, for a power of 90% and an alpha risk of 5%.

Results

Population

There were 30 patients included, 3 patients did not show up for the consultation at one month of hospitalization. There were 7 men and 23 women. The average age was 38.8±10.8 years.

The TSK score was significantly lower in women with a score of 34.96±6.1 versus a score of 42.1±4.7 in men (Table 1).

Evaluation of the primary endpoint: Kinesiophobia

Only the change in the TSK score between T1 and T2 (after education) was statistically significant. We observe that Δ2 (T2-T1: after education) was significantly greater than Δ1 (T1-T0: before education) (Table 2).

The variation in the number of kinesiophobia patients between T0 and T1 (Δ1) is before education of and between T1 and T2 (Δ2) or after education was not statistically significant

Between T1 and T0, 10 patients (33%) have a variation of the TSK score ≥4 points. Between T2 and T1, 14 patients (47%) of patients had a change in TSK score ≥4 points. The difference was not significant (Table 3).

Table 1: Characteristics of the population.

	Male (n=7)	Female (n=23)	p	Total (n=30)
TSK	42,1±4,7	34,9±6,1	0,008*	36,60±6,5 (25-48)
Age	41,6±10,1	37,9±11,1	0,4368	38,8±10,8 (24-62)
Obesity duration	27,6±8,5	26±12	0,7061	26,3±11,2 (5-50)
EAT 40	18,9±2,2	19,8±7,8	0,5991	19,6±6,8 (9-45)
Beck	4,2±3,7	5,1±5,7	0,6738	4,9±5,3 (0-20)
Poids	140,1±29,2	118,7±26,9	0,1163	123,7±28,5 (70-186)
IMC	44,1±8,8	44±9,5	0,9653	43,9±9,0 (30-70,8)
PA	130,3±13,3	123,21±17,5	0,2747	124,9±16,7 (98-158)
EVA	1,0±1,9	1,3±2,4	0,6839	1,28±2,31 (0-8)
Nb FDR CV	0,6±0,8	0,4±0,6	0,6868	0,46±0,68 (0-2)

Table 2: Variation in score TSK.

	T0	T1	Δ1	T2	Δ2	Δ 2-Δ1
Score TSK	36,6±6,5	35,3±7,01	-1,30 p=0,1029	30,9±8	-4,4 p=0,0001	p=0,03448

Table 3: Variation of the TSK of more or less 4 points.

	Δ1	Δ2
Variation TSK ≥-4 pts	10 (33%)	14 (47%)
Variation TSK <-4 pts	20 (67%)	16 (53%)

P=0,2918

At T0, there were 11 kinesiophobia patients. At T2, there were 5 kinesiophobia patients. (Table 4). Only a non-kinesiophobia patient at T0 becomes T2 at a variation of TSK of more than 4 points.

Regarding the 5 kinesiophobia T2 patients, there were 2 men and 3 women. The average age was 41 ± 11.24 years old. Kinesiophobia T2 patients had an initial TSK significantly greater than that of non-kinesiophobia T2 patients (Tables 5 and 6).

Table 4: Variation in the number of kinesiophobia.

	T0 n(%)	T1 n(%)	Δ1	T2 n(%)	Δ2
Nb patients kinesiophobia	11 (36%)	9 (30%)	p=0,5838	5 (16%)	p=0,2221

Table 5: Analysis by sub-group of patient's kinesiophobia to T2. (Quantitative criteria).

	Patients kinesiophobia (N=5)	Patients non kinesiophobia (N=25)	P IC
Age	41,00±11,24 (29-59)	38,36±10,8 (24-62)	0,6482 [-11,0; 16,3]
Obesity duration	19,40±10,69 (5-30)	27,7±10,9 (6-50)	0,1646 [-21,3; 4,6]
EAT 40	19,20±5,80 (12-28)	19,68±7,2 (9-45)	0,8761 [-7,5; 6,5]
Beck	7,00±7,81 (0-20)	4,48±1,8 (0-15)	0,5200 [-7,0; 12,1]
Weight	123,8±35,6 (97-186)	123,68±27,74 (70-177)	0,9945 [-43,2; 43,4]
IMC	43,79±15,12 (35,6-70,8)	44,03±7,7 (30-62,5)	0,9741 [-18,8; 18,3]
PA	122,6±22,6 (100-158)	125,32±16,1 (98-166)	0,8002 [-29,0; 23,6]
EVA	1,50±2,30 (0-5,5)	1,24±2,35 (0-8)	0,8320 [-2,6; 3,2]
Nb of FDR CV	0,80±0,83 (0-2)	0,40±0,6 (0-2)	0,3586 [-0,6; 1,4]
TSK to T0	44,60±4,15 (42-48)	35,04±5,96 (25-45)	0,002829 [4,4; 14,6]

Assessment of secondary endpoints

Beliefs in Anxiety Avoidance FABQ Physics and FABQ Work: The change in FABQ physical and FABQ work scores between T0 and T1 (Δ1) and between T1 and T2 (Δ 2) was not statistically significant. The difference between Δ1 and Δ2 is not significant (Table 7).

There was no significant difference between the 9 subjects with musculoskeletal conditions who had an average physical FABQ at 4.3±6.1 and an average FABQ work at 7.4±10.1 and the average 21 other subjects without antecedents (Table 8).

Quality of life IWQOL-Lite: Regarding total IWQOL-Lite scores, mobility, sex life, social life and work: only the variation between T1 and T2 was statistically significant. The difference between Δ1 and Δ2 is not significant (Table 7).

Concerning the IWQOL-Lite self-esteem score, the variation between T0 and T1 (Δ1) and between T1 and T2 (Δ2) was not statistically significant. The difference between Δ1 and Δ2 is not significant (Table 7).

Assessment of physical activity practice Dijon score and IPAQ score: Only the variation between T1 and T2 of the Dijon score was statistically significant. The difference between Δ1 and Δ2 is not significant (Table 7).

Regarding the variation in the number of active patients (Dijon score ≥21) between T0 and T1 (Δ1) and between T1 and T2 (Δ2), only weight between T1 and T2 was statistically significant. It is observed that Δ2 is significantly greater than Δ1 (Table 7).

The change in abdominal perimeter (PA) between T0 and T1 (Δ1) and between T1 and T2 (Δ2) was statistically significant. It is observed that Δ2 is significantly greater than Δ1 (Table 7).

Regarding the variation of BMI between T0 and T1 (Δ1) and between T1 and T2 (Δ2), no difference was statistically significant. The difference between Δ1 and Δ2 is not significant (Table 7).

Subgroup analysis

Kinesiophobia T2 patients had a significantly higher initial TSK score than non-kinesiophobia T2 patients (Tables 3).

Table 6: Analysis by sub-group of patients kinesiophobia to T2.
(Quantitative criteria).

	Kinesiophobic patients N=5 n (%)	Non-kinesiophobic patients N = 25 n (%)	p
Sex ratio: Number of men	2 (40%)	5 (20%)	0,3344
Professional activity	3 (60%)	12 (48%)	0,6242
Retirement	0 (0%)	2 (8%)	0,5126
Family history of obesity	5 (100%)	19 (76%)	0,2206
Sports antecedent	3 (60%)	11 (44%)	0,5126
Antecedent sports dispensation> 6 months	0 (0%)	3 (12%)	0,4142
History of affection or musculoskeletal surgery	1 (20%)	8 (32%)	0,5929
Socio educational level:			
Graduate studies	0 (0%)	4 (16%)	0,2430
high school	4 (80%)	10 (40%)	
College	1 (20%)	11 (44%)	
Duration of care at the CHRU			
<2 years	3 (60%)	20 (80%)	0,6012
>2 years	2 (40%)	5 (20%)	
Stadium of Prochaska and Di Clemente			0,2487
Action / Preparation	4 (80%)	13 (52%)	
Contemplation / pre-contemplation	1 (20%)	12 (48%)	

Table 7: Variation of criteria of secondary judgments.

	T0	T1	Δ1	T2	Δ2	Δ2-Δ1
FABQ physique	4,5±5,4	3,97±5,7	-0,73 p=0,4675	2,93±4,5	-1,07 p=0,2933	p=0,7640
FABQ travail	10,4±11,3	7,0±10,4	p=0,1079	4,5±7,4	-2,03 p=0,0514	p=0,7259
IWQOL-Lite total	77,8±17,5	74,5±25	-1,23 p=0,2273	66,2±23,8	-3,96 p=0,0004	p=0,2215
IWQOL-Lite mobilité	30,8±11,2	29±10,3	-1,32 p=0,1965	25,8±10	-3,60 p=0,0012	p=0,438
IWQOL-Lite amour propre	19,2±7,7	17,8±7,8	-1,32 p=0,1964	16,4±7,5	-1,55 p=0,1308	p=0,9686
IWQOL-Lite vie sexuelle	7,6±4,1	7,5±4,2	-0,07 p=0,9438	6,4±3,7	-2,42 p=0,0216	p=0,1871
IWQOL-Lite vie sociale	11,3±6	11±5,4	-0,37 p=0,7098	10±5,3	-2,57 p=0,0277	p=0,3238
IWQOL-Lite travail	8,6±4,5	8,3±4,1	-0,64 p=0,5241	7,2±3,7	-2,57 p=0,0154	p=0,2946
Dijon score	18,1±4,9	18,5±5,2	0,60 p=0,5468	20,7±3,9	2,71 p=0,0111	p=0,173
IPAQ score	1636,5±141 6,5	1866,3±148 3,4	0,69 p=0,4906	2361±1436	1,57 p=0,1256	p=0,655
Poids	123,7±28,5	123,6±27,3	-0,10 p=0,9172	120,9±27,5	-5,22 p=0,0001	p=0,0292
IMC	43,99±9,01	44,3±8,5	1,02 p=0,3161	43,6±9,3	-1,95 p=0,0607	p=0,060
PA	124,9±16,7	132,4±16,5	4,30 p=0,0002	129,2±18,9	-2,52 p=0,0173	p=0,0002

Table 8: Variation in the number of patient with IPAQ high and Dijon active.

	T0	T1	Δ1	T2	Δ2
Nb patient High IPAQ	5 (17%)	10 (33%)	p=0,1360	18 (60%)	p=0,03843
Nb patient active Dijon	9 (30%)	10 (33%)	p=0,4167	18 (60%)	p=0,03843

It is observed that in these 5 patients, 4 patients (80%) belong to the active stage according to the Dijon score and 3 patients (60%) to the stage of high physical activity according to the IPAQ score.

Discussion

Our study reveals that the physical activity education week offered to obese patients allowed a significantly greater improvement

in kinesiophobia in patients compared with oral advice given in medical consultation.

There is a significant improvement after the week of education of quality of life and physical activity. There was no significant difference regarding beliefs in anxiety avoidance.

Our study is the first, to our knowledge, to have investigated the influence of physical activity education on kinesiophobia in obese subjects. The improvement of kinesiophobia is certainly due to the multidisciplinary care of patients, with both access to appropriate information and the application of physical activity advice during the week of education.

In our study the average kinesiophobia score is 36.6±6.5. A study published in 2011 by Vincent HK et al describes a population of 192 obese subjects followed outpatient in a hospital with a kinesiophobia score observed at 26.2±7.5 [36]. Our population seems more kinesiophobia than the latter. However, obese subjects represent a very heterogeneous population with regard to age, sex, level of physical activity or the mode of recruitment, so it is difficult to have a totally representative sample of this population.

Regarding beliefs in anxiety avoidance, in our study the physical FABQ score in patients with musculoskeletal conditions is 4.3±6.1 and the FABQ score of 7.4±10.1 without significant difference with those without locomotor disorders. A randomized prospective study published by Vincent HK et al in 2014 on 49 obese low back pain subjects selected for rehabilitation treatment without exercises of muscle strengthening or with exercises found a physical FABQ score of 13±7.8 in the group without exercises, 14.4±4.6 in the group with overall muscle strengthening exercises and 11±5.9 in the group with muscle strengthening exercises of the spinal extensors. The FABQ work score was 14.5±11.6 in the control group and 11.7±11.4 in the other group [37]. Our population seems to have fewer beliefs in anxiety avoidance, probably in relation to the information given more frequently during specialized consultations during their hospital care. In addition, our obese patients are not very painful and therefore less likely to have anxious avoidance beliefs, with an average VAS of 1.28±2.31 whereas in this study the average VAS is 4.3±1.8 in the control group, 5.0±1.7 in the group with spinal extensor strengthening exercises and 5.2±2.3 in the group with overall muscle strengthening exercises.

Regarding the practice of physical activity, the average IPAQ score in our population is 1636.5±1416.5 which reflects a moderate level of physical activity. A study published in 2005 by Tehard B et al concerning 256 women and 179 obese men, followed as an outpatient in a hospital center as part of their overweight, revealed IPAQ scores of 2465±2234.5 in women and 2831.2±2717.2 in men [39]. It therefore appears that the subjects in our study have less physical activity than this large sample of obese subjects, which justifies all the more our support.

For the practice of physical activity evaluated by the Dijon score, in our population the average was 18.1±4.9 with a mean age of 38.80±10.80. A study published by Labrunée M et al in 2012 on 23 obese patients with type-2 diabetes reveals scores of 14.8±5.8 to 14.7±6.3 with a mean age of 52.8 ± 8.5 and a BMI at 40.1±7.3 [40]. Our population therefore seems more active than the latter, however our patients being younger and having an average cardiovascular risk factor number of 0.46±0.68 it does not allow us to compare these two samples. This score is probably not very adapted to our population.

Many authors have studied the impact of rehabilitation programs lasting several weeks on kinesiophobia in chronic pain patients, particularly those with low back pain, who seem to be beneficial [9,14,41,42]. It has also been shown that kinesiophobia subjects belong to overweight populations [43].

Other authors have examined the effect of education, particularly on physical activity, in obese subjects, with or without a bariatric surgery project, which would lead to better results in the practice of physical activity and weight loss [18,44-49]. These programs, carried out in complete hospitalization over several weeks [49], day hospitalization over several weeks [44] or ambulatory with the help of a program of promotion of physical activity over several weeks [45] aim to make the patient actor of his illness with the acquisition of information and skills [50].

There is no consensus on an ideal program in terms of speaker, duration, type of session or devaluation. However, multidisciplinary long-term management combined with dietary education and physical activity were the main thrusts of an educational program [51].

Our study has the advantage of being prospective where the patients are their own witness which improves their power. However, it has some limitations. Indeed this is a short-term study with few patients included.

This study is of level C evidence, weak according to the classification of HAS because longitudinal, descriptive mono-centric non-randomized.

The calculation of the number of necessary subjects was carried out with the assumption of a variation of 4 points of the TSK score at a frequency of 5% in the "before education" group and 50% in the "after education" group. Our study found a frequency of 47% in the "after education" group. So we probably did not include enough patients.

The loss of view of the three patients after T1 was reestablished with intention-to-treat analysis to control attrition bias. However, this exposes a measurement bias.

The evaluation of patients by self-questionnaire represents a risk of bias of desirability or of declaration with a risk of overestimation of the practice of physical activity.

In addition, there was no objective measure of physical abilities such as performing a 6-minute walk test or measuring the VO2 max at each consultation.

The cognitive-behavioral approach, which is one of the axes of management of obese subjects described in the literature [52-55], and in the management of kinesiophobia [56,57]. This approach is not part of our education program.

To our knowledge there is no study measuring the impact of cognitive and behavioral therapy on kinesiophobia in obese subjects.

A future study would be interesting to realize in order to better take care of patients at risk of remaining kinesiophobia even after our education protocol.

The candidates to be prioritized for this program would be those with significant initial kinesiophobia. There were no other influencing factors highlighted in our subgroup analysis, probably because of the small numbers.

This study would involve more patients, with randomization and longer-term evaluation to judge the effectiveness of our program.

A cognitive-behavioral approach could be included in our protocol, especially to support patients' behavior change, by adapting to each person's needs, while knowing their beliefs and representations about obesity. We could thus judge the impact of this approach on patients' kinesiophobia.

Conclusion

This work highlights that a week of in-patient physical activity education offered to obese patients allows a significantly greater improvement in kinesiophobia compared to a medical consultation with oral advice.

A later study would allow us to observe the evolution of the patients who remain kinesiophobia even after this protocol of education to the physical activity.

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