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Intervention

Experiential or behavioral processes: Which one is prominent in physical activity? Examining the processes of change 1 year after an intervention of therapeutic education among adults with obesity☆

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ABSTRACT

Objective: Although physical activity (PA) is essential, most obese people will not engage in its practice. The transtheoretical model (TTM) and its processes of change (POC) contribute to the understanding of behavior change regarding PA. The present study aimed to test how POC are associated with a progression through the stages of change (SOC) and whether they predict BMI change.
Methods: Interventional study. A total of 134 subjects participated in an education program, were called at 1 year and 62 of them provided follow-up data. Participants completed the SOC and POC questionnaires at baseline, at 1 year and were classified according to their SOC progression.
Results: Participants who progressed through SOC lost more weight ($p < 0.001$). Significant interactions were found for three out of five POC ($p < 0.05$). Progression through SOC was associated with an increased use of POC. Weight loss was predicted by two behavioral POC.
Conclusion: Results support the previous cross-sectional studies showing that physically active people use more frequently POC.
Practice implications: The present findings support the development of TTM-grounded behavioral interventions targeted to obese patients. Identifying methods to promote POC use to improve adherence to weight guidelines may lead to improved clinical outcomes and quality of life.
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1. Introduction

Obesity is recognized as a growing epidemic with the worldwide body mass index (BMI) increasing by 0.5 kg/m^2 per decade since 1980 [1]. It is associated with increased total mortality and increased risks of disease or death from diabetes, ischemic heart disease and ischemic stroke, cancers, chronic kidney disease, and osteoarthritis [2]. Beneficial effects of physical activity (PA) on body weight and global health have now been clearly proven and besides diet and behavior therapy, PA is considered as a cornerstone of weight management for overweight/obese adults [3–5]. One of the major issues with PA in obese individuals is to motivate them to engage in regular PA and to keep them involved, which requires understanding of the mechanisms involved in behavior change.

One of the most commonly used theoretical frameworks to understand health behavior change is the transtheoretical model (TTM) [6]. This integrative model of health behavior has different components including self-efficacy (confidence to achieve a specific outcome), decisional balance (pros and cons of a behavior), stages of change (SOC; where people are in their motivation) and processes of change (POC; strategies to modify behavior). SOC indicate where people are in their intention to change and assume that people move through five different stages i.e. precontemplation (no intention to change within the next 6 months), contemplation (intention to change within the next 6 months), preparation (intention to change within the next 30 days), action (people started to change their behavior less than 6 months ago),

☆ I confirm all patient/personal identifiers have been removed or disguised so the patient/person(s) described are not identifiable and cannot be identified through the details of the story.

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Table 1
Processes of change, description and strategies for activation.

Processes of change	Description	Examples of strategies
Consciousness raising	Efforts by the individual to look for information to better understand the problematic behavior	Provide information about physical activity and its benefits and risks related to inactivity
Dramatic relief	Affective aspects of behavior change	Feedback about the consequences; playing role;
Self reevaluation	Cognitive or emotional appraisal of the impact of the behavior on the individual	Clarification of values regarding the individual and the problematic behavior
Environmental reevaluation	Impact of the (negative or positive) behavior on the individual's social and physical environment	Encourage thoughts about how the behavior can affect the individual's life and how it can be further modified
Social liberation	Recognition that actual social norms encourage individual to move toward healthier life	Make the individual realizes the different public health campaign. Show alternatives and opportunities to the problematic behavior.
Self liberation	Make a commitment to change and believe in this commitment	Strategies of goal fixation, Create plan about physical activity
Helping relationships	Using the support of caring others (family, friends, doctor) to modify the behavior	Ask individuals to enlist persons that can encourage and support the practice of physical activity
Counterconditioning	Substitution of the behavior for another healthier behavior	Identify the situation that lead to sedentarity and the different scenario that can be established to include physical activity
Reinforcement management	Use of reinforcement and reward to continually reinforce the positive behavior	Establish a reward list with each attained goal of physical activity
Stimulus control	Modify the environment to encourage the positive behavior	Hang some pictures or message that can encourage practicing physical activity.

and maintenance (behavior maintained for more than 6 months). Although the TTM assumes the transition between stages, it does not assume that this change is linear, several studies showing that each stage has different properties [7,8]. The last components of the TTM are the POC, which are postulated to explain whether people influence their experiences and environment to further modify their behavior. There were originally 10 POC divided into two factors representing experiential and behavioral processes (Table 1). The experiential POC are consciousness-raising (awareness about a behavior), dramatic relief (affective aspect of a behavior), environmental reevaluation (how the problem affects the environment), self-reevaluation (emotional and cognitive appraisal of the impact of the behavior on the individual regarding its value) and social liberation (awareness about social opportunity and alternatives). The behavioral POC are counter-conditioning (substitute the problematic behavior), helping relationships (social support), reinforcement management (self-reward for change), self-liberation (commitment to change) and stimulus control (remove cues for unhealthy habits).

In recent years, a growing body of literature focused on POC and their relationships with SOC [9,10] and demonstrated that, contrary to tobacco cessation, both experiential and behavioral, types of POC predict the progression or regression through SOC [11–13]. Even though both types of POC are involved in behavior change, only behavioral POC were found to be mediators of PA [14]. However, while models specific to behavior adoption (e.g. PA) have been developed, none of these studies tested the POC from the five-factor model related to behavior adoption [15] among obese individuals. The evidence about the ability of this model to predict PA is therefore weakly documented.

The TTM demonstrated its interest in PA [16] and in obesity management [17,18] with improvements in weight change, depression and healthy eating, but sometimes with mitigated results [19]. Furthermore, to our knowledge, one study showed an association between weight loss and behavioral processes [20] and no study analyzed whether POC predicted the transition through SOC. Thus, the present study aimed to analyze over a 1-year period following an education program whether (1) participants who progressed through SOC lost more weight than those who did not; (2) individual who progressed through SOC had a better activation of POC as evidenced by higher scores and (3) BMI change was predicted by POC.

2. Methods

2.1. Inclusion criteria

We included inpatients with overweight or obesity (BMI > 25 kg/m^2) hospitalized in the Nutrition-Diabetes department of Montpellier University Hospital, France, for weight comorbidites (e.g. type 2 diabetes, blood pressure, pain, psychological stress) that could affect their health or to investigate reasons for weight gain. Patients had to be covered by the national health insurance and be able to read and understand the questionnaires. Exclusion criteria consisted in refusal of the initial evaluation, contraindications to PA (e.g. acute cardiac events, unstable fasting glucose, unstable blood pressure at rest, or injuries), comorbidities related to major psychiatric disorders, pregnancy, application for bariatric surgery, participation in a weight-control program in the last six months. Participants were referred to the hospitalization after a consultation with one of the physicians of the department. No advertisement was done for the recruitment.

All participants were enrolled in a therapy education program (TEP). The entire protocol was administered under routine care in our department at the University Hospital of Montpellier. This study was performed between June 2010 and September 2013.

2.2. Sociodemographic information

Participants were asked for their gender, date of birth, tobacco status (smoker, non-smoker, former smoker) and socioprofessional status, the latter being classified according to the categories defined by the National Institute of Statistics and Economic Studies (1: manual worker; 2: intellectual professionals; 3: employees; 4: retirees; and 5: unemployed). To this classification, we also added students and others.

2.3. Transtheoretical model questionnaires

2.3.1. Stages of PA/exercise behavior change

The algorithm was the PA staging questionnaire that has previously been used with obese individuals [21]. Briefly, participants were given a definition of regular PA and exercise (at least 30 min per session, at least 4 days a week) followed by four

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