Effects of Action Observation Therapy in Patients Recovering From Total Hip Arthroplasty Arthroplasty: A Prospective Clinical Trial

Jorge Hugo Villafañe, PhD, MSc,[a] Caterina Pirali, MD,[a] Maria Isgrò, MD,[a] Carla Vanti, MSc, PT,[b] Riccardo Buraschi, PT,[a] and Stefano Negrini, MD[c]

Abstract

Objective: The purpose of this study was to investigate the effectiveness of action observation therapy (AOT) compared with written information in patients submitted to a physical therapy program after primary total hip arthroplasty (THA).

Methods: We conducted a prospective clinical trial. Twenty-four patients with THA, 62.5% female (aged 69.0 ± 8.5 years), received AOT in addition to conventional physical therapy (experimental group) or written information in addition to conventional physical therapy (exercise and information group) for 10 sessions. Outcomes used were visual analog scale, hip active and passive range of motion, Barthel Index, Short Form 36 (SF-36) Health Survey, Tinetti Scale, and Lequesne Index measurements. All measures were collected at baseline and at the end of the intervention. Repeated measures analysis of variance was used to examine the interventions effects within groups and between groups.

Results: No relevant baseline differences were observed between groups. Both treatments produced statistically significant improvements on visual analog scale, active and passive range of motion, Barthel Index, SF-36, Tinetti Scale, and Lequesne Index immediately after the intervention (all, $P < .001$). SF-36 (physical functioning subscale) revealed a statistically significant intergroups difference ($P = .02$) after treatment.

Conclusions: Both treatments were effective at improving pain, functional status, quality of life, and gait features in patients with primary THA. In addition to conventional physical therapy, AOT improved perceived physical function more than written information.

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Key Indexing Terms: *Arthroplasty; Hip Replacement; Rehabilitation*

Introduction

The mirror neuron system, initially discovered in macaque prefrontal cortex, has been well documented and studied in humans in neuroimaging and noninvasive neurophysiological investigations.[1] Subliminal mirror system activation has been identified in humans observing an action performed by another human,[2] and studies on healthy humans indicate that action observation facilitates the observer's motor system.[3]

Action observation therapy (AOT) has been proposed as a feasible alternative method of stimulating the motor system, even when the severity of impairment does not permit efficient activation of the peripheral motor system effectors. According to this idea, a growing number of AOT-based interventions have been adopted for the rehabilitation of patients with stroke[4-7] or Parkinson disease[8] and for use in impaired elderly people.[9] Robert et al[10] highlighted that new information and communication technologies (ICT)—such as video and audio analysis techniques, computerized testing, and actigraphy—may represent promising new tools to improve functional and cognitive assessments of patients.

Action observation therapy, a top-down approach that can influence peripheral motor skills, is hypothesized to improve motor recovery in patients undergoing orthopedic surgery, but few studies have been conducted in this field. Park et al[11] observed that AOT may reduce pain and stiffness

[a] IRCCS Don Gnocchi Foundation, Milan, Italy.
[b] OMT School of Physical Therapy, Alma Mater Studiorum, University of Bologna, Italy.
[c] University of Brescia, IRCCS Don Gnocchi Foundation, Milan, Italy.
Corresponding author: Jorge Hugo Villafañe, PhD, MSc, Regione Generala 11/16, Piossasco 10045, Italy. Tel.: +39 011 9065495; fax: +39 011 9065495. (e-mail: *mail@villafane.it*).
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and improve function in patients undergoing total knee arthroplasty. Bellelli et al[12] reported positive results in improving functional independence and balance in patients who had undergone lower limb joint arthroplasty; these patients observed video clips of others performing daily actions and imitated these actions afterward. In this study, patients who were asked to observe video clips with no motor content and then to execute the same actions performed by patients in the experimental group had inferior results compared with the experimental group. However, the conclusions of this study are difficult to discuss because the authors considered and statistically analyzed patients with hip and knee arthroplasty as 1 group.

To our knowledge, no study on AOT has been conducted on a selected sample of patients undergoing primary total hip arthroplasty (THA). This orthopedic surgical procedure is among the most frequently performed, and rates are estimated to increase by 174% in the United States, [13] with a similar trend in European countries.

We hypothesized that ICT through AOT in addition to conventional treatment would improve motor recovery in patients undergoing primary arthroplasty. The purpose of this study was to investigate the effectiveness of AOT, compared with written information, in patients submitted to a physical therapy program after THA.

Methods

Study Design

We conducted a prospective clinical trial. Informed consent was obtained from all patients, and procedures were conducted according to the Declaration of Helsinki. The protocol was approved by the Local Ethical Committee of Istituto di Ricovero e Cura a Carattere Scientifico (IRCCS), Regione Lombardia, Italy, on May 14, 2014 (NCT02861638).

Participants

From May 2014 to October 2014, 30 patients, aged 50 to 80 years, were assigned consecutively to an experimental group or an exercise and information group. Patients admitted for elective primary THA who gave written informed consent were eligible for inclusion in this study. Each patient underwent subjective and physical examination performed by a physician experienced in orthopedic rehabilitation; this physician applied inclusion and exclusion criteria. Exclusion criteria were scheduled bilateral arthroplasty or previous THA, severe hearing or visual impairment, cognitive deficits (Mini Mental State Examination score ≤ 21 [14]), and severe comorbidities (based on Cumulative Illness Rating Scale scores [15]). We also excluded patients who did not sign the informed consent.

Protocol

Patients in both groups were treated by a physical therapist with postgraduate orthopedic training and more than 10 years of clinical experience in musculoskeletal rehabilitation. The physical therapist was blinded to all data collected for this study.

Assignment to the experimental group or exercise and information group were assigned to one group until it reached capacity, and subsequent patients were assigned to the other group. All patients received 10 individual treatment sessions scheduled twice a day, at the same time of day, 5 days per week, for 2 weeks. All outcome measures were collected by an external assessor (physical therapist) blinded to the group allocation. Outcome measures were collected at baseline and after the intervention.

Experimental Group Intervention

Patients in the experimental group received a treatment intervention consisting of 15 minutes of conventional treatment and 15 minutes of AOT.

Conventional Treatment. Conventional treatment included passive mobilization, exercises, and transfer practice. The exercises initially were performed in the supine position and included ankle dorsiflexion and plantar flexion, quadriceps and gluteal contractions, hip and knee flexion, and hip abduction. [16,17]

Action Observation Treatment. Patients observed a video clip showing functional exercises and reinforcement of the lower limb and then were invited to imitate the actions they observed. [18] The video clip included some simple exercises (active mobilization of the lower limb in lying, sitting, and standing positions) and some daily living activities such as the transfer from lying to sitting and from sitting to standing, and vice versa.

Exercise and Information Group Intervention

Patients in the exercise and information group received a treatment intervention consisting of written information and 15 minutes of conventional treatment.

Conventional Treatment. Patients in the exercise and information group received same number, type, and duration of passive mobilization, exercises, and transfer practice as those in the experimental group.

Written Information. Patients received written information about exercises, reassurance about recovery, and instructions on self-treatment and daily living activities after THA.

Outcome Measures

An assessor who was blinded to patients' group assignment collected pretreatment measurements, which included patients' pain rating, functional status, quality of life, and gait features. Outcome measures used the visual analog scale, [19] the flexion and abduction active range of motion and passive range of motion, [20] the Barthel Index, [21] the Cumulative Illness Rating Scale, [15] the Short Form (SF-36) Health Survey, [22] the Tinetti scale, [23] and the Lequesne Index. [24] Outcome measures were collected in the same order.