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Working Memory Training for Older Adults After Major Surgery: Benefits to Cognitive and Emotional Functioning

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ABSTRACT

Objectives: *Cognitive and mood changes can affect postoperative recovery in hospitalized older adults undergoing major surgical procedures, but few studies have considered postoperative cognitive interventions to sustain such patients' cognitive functioning and mood. The aim of this pilot study was to assess the efficacy of working memory training in improving cognitive functioning and mood, or emotional functioning, in older adults undergoing major surgery.* ***Methods:*** *Thirty-four older adults (from 64 to 75 years of age) hospitalized for partial or total arthroplasty of the knee were randomly assigned to either a trained group (N = 18) or an active control group (N = 16). The former received working memory training during the postoperative period, while the latter engaged in alternative activities. In addition to specific training gains in a working memory task similar to the one used in the training (criterion task), transfer effects to cognitive abilities (short- and long-term memory, and cognitive inhibition), and mood or emotional functioning (signs of depression or anxiety) were investigated.* ***Results:*** *Immediately after the training, results showed a main effect of group (in favor of the trained group) in the criterion task, in one of the short-term memory measures, and in cognitive inhibition. In addition, only the trained group showed a decrease in depression and anxiety scores.* ***Conclusion:*** *The results of this pilot study suggest that cognitive training targeting working memory administered in the postoperative period after major surgery can sustain older adults' cognitive and emotional functioning, and especially their mood.* (Am J Geriatr Psychiatry 2019; 27:1219−1227)

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INTRODUCTION

Cognitive changes can occur after major surgery, irrespective of the type of procedure and anesthesia,[1–3] and age is among the main risk factor.[4–6] Changes in mood or emotional functioning in the postoperative period may also exacerbate any other complications after surgery.[4] Although these changes are transient,[1] they can delay patients' recovery and affect their quality of life. Hence, the importance of efforts to prevent cognitive and mood or emotional changes in older adults after surgery.

To date, few studies have considered cognitive interventions in the postoperative period for patients undergoing noncardiac major surgical procedures as a way to sustain hospitalized older adult patients' cognitive functioning.[7,8] Kulason et al.[7] administered training in calculation and reading aloud to older patients in hospital after thoracic surgery, finding improvements in their motor programming, quality of life, and mood. Cheng et al.[8] applied a cognitive stimulation program to cognitively-impaired older patients who had undergone orthopedic surgery, and found an improvement in their global cognitive functioning.

The present pilot study further examined whether postoperative cognitive training could benefit both cognitive functioning and mood or the emotional domains in older patients after partial or total arthroplasty of the knee—a surgical procedure common in the aging population, and associated with postoperative cognitive changes.[9] Our training focused on working memory, that is the ability to simultaneously process and maintain information for use in complex cognitive tasks, because it is a mechanism crucially involved in higher-order cognitive abilities (reading comprehension, problem-solving, and reasoning),[10,11] and it is known to decline with aging.[12] The aim of working memory training for older adults is to sustain their cognitive functioning by improving their information processing system,[13] and thus enabling them to make more flexible use of their own resources. It can improve performance in the tasks used in the training (or similar tasks), but also in other types of task (transfer effects).[14] The working memory training procedure[15] adopted for the present study had produced positive results in older adults in a variety of studies,[16] and it was judged particularly suitable in hospitalized older adults because it is completed in just three sessions.

Training benefits in the cognitive domain were assessed using a working memory task (criterion task) similar to the one used in the training, as well as short- and long-term memory measures. Cognitive inhibition, that is, the ability to inhibit information that is no longer relevant,[17] was also considered. Any training benefits on patients' mood and the emotional functioning were identified with measures for scoring symptoms of depression and anxiety.

We expected to find training gains in the criterion task,[14,15] and transfer effects to the cognitive measures, as they tap the same broad ability (memory), but have different requirements from the task used in the training.[14,15] Benefits were also expected in the mood or emotional domain, in terms of fewer signs of depression and anxiety, in line with previous studies on working memory training that focused on complex mechanisms and processes.[18] Null effects could be expected too, due to the setting and possible postoperative physical complications.

MATERIALS AND METHODS

Participants

Participants were recruited from among the patients hospitalized for partial or total arthroplasty of the knee at a clinic in northern Italy. Our inclusion criteria were as follows: 1) age between 65 and 75 years; 2) Italian as mother tongue; 3) a score of 26 or more in the Mini-Mental State Examination;[19] 4) no physical or psychological conditions capable of causing cognitive deficits according to Crook et al.,[20] as established from a semistructured interview; and 5) hospital stay for physiotherapy after surgery.

Thirty-six eligible older adults agreed to take part in the study and were randomly assigned to the trained or active control groups. Two patients in the control group subsequently chose not to take part in the post-test session, however. The final sample thus included 34 participants, 18 in the trained group, and 16 in the active control group. Six participants in the trained group, and 9 in the control group underwent partial arthroplasty of the knee, while 12 trained

TABLE 1. Descriptive statistics (means and standard deviations) for the demographic characteristics and the measures of interest at pretest and post-test by group (trained vs active control) and results of ANOVAs at prestest between groups.

	Pretest								Post-test			
	Trained group N = 18 (11 females)		Control group N = 16 (7 females)		Trained vs Control group at pretest				Trained group N = 18 (11 females)		Control group N = 16 (7 females)	
	M	SD	M	SD	F	df	p	η^2_p	M	SD	M	SD
Age	69.50	3.20	69.69	4.01	<1	1,32	0.881	.001				
Education (years)	7.17	1.38	7.06	1.43	<1	1,32	0.831	.001				
Mini-Mental State Examination	26.81	1.00	26.44	0.98	1.18	1,32	0.285	.036				
Categorization Working Memory Span task	10.72	1.99	11.06	2.71	<1	1,32	0.678	.005	14.06	1.86	10.63	2.78
Forward Digit Span task	5.50	0.61	5.56	0.69	<1	1,32	0.772	.003	5.67	0.59	5.13	0.72
Backward Digit Span task	4.17	0.62	4.25	0.45	<1	1,32	0.659	.006	4.22	0.43	3.94	0.57
Rey's Verbal Learning Test - Immediate recall	35.39	6.79	34.62	5.89	<1	1,32	0.730	.004	40.72	9.11	41.67	7.36
Rey's Verbal Learning Test - Delayed recall	7.44	2.43	7.81	2.83	<1	1,32	0.686	.005	8.77	2.36	8.93	2.97
Intrusion errors in the Categorization Working Memory Span task	2.17	1.72	1.43	1.54	1.67	1,32	0.206	.050	1.22	1.11	2.75	1.98
Geriatric Depression Scale	1.94	1.39	3.00	2.23	2.58	1,32	0.118	.075	1.28	0.75	2.81	2.22
Hospital Anxiety and Depression Scale, Anxiety subscale	4.89	2.19	6.50	3.52	2.62	1,32	0.115	.076	3.83	1.79	6.50	2.96

participants and 7 controls had a total arthroplasty. The two groups did not differ in terms of age, years of education (see Table 1), gender ($\chi^2_{(1)} = 0.42$, p = 0.51), or type of surgery (partial versus total arthroplasty of the knee) ($\chi^2_{(1)} = 1.80$, p = 0.18).

The experimental procedure complied with the principles of the Declaration of Helsinki (2013). The study was approved by the local research ethics committee.

Materials

Training gains

Criterion task

The Categorization Working Memory Span task[21] consisted of 10 sets of word lists, each of which included 20 lists of words that were divided into groups containing from 2 to 6 lists. Participants listened to a set of word lists audio-recorded at a rate of 1 word per second, and they had to tap with their hand on the table whenever they heard the name of an animal (processing phase). The interval between word lists was 2 seconds. At the end of a set, participants recalled the last word on each list (maintenance phase), that is, they needed to remember from 2 to 6 words altogether, depending on the difficulty of the set. The total number of words recalled was used as the measure of working memory performance (maximum 20).

Transfer Effects

Cognitive measures

Short-term memory. In the Forward[1] and Backward Digit Span tasks,[22] participants had to repeat series of digits in the same (forward) or reverse (backward) order.[a] Each level (from 3 to 9 digits for the forward task, from 2 to 8 digits for the backward task) contained two series of digits. After two consecutive recall errors, the task was discontinued. One point was awarded for each correctly recalled series. The final score corresponded to the total number of series recalled correctly (maximum score of 14 for both tasks).

Long-term memory. In Rey's Verbal Learning Test,[23] participants were presented with 15 words, one by one, in a fixed order on a computer screen, with a presentation time of 1 second and an interstimulus interval of 1 second, then they were asked to recall the words. The first trial was followed by four more trials in which the words were always presented in exactly the same order. After a delay of 20 minutes, and unexpectedly for the participants, they were asked to recall the words they had learned once more. Finally, a recognition trial was administered. The dependent

[a] In line with the results of the meta-analysis by Bopp and Verhaeghen [21], both the digit span tasks used here were considered as measures of short-term memory.

variables used in the present study were the total number of words correctly recalled over the five trials (Rey's Verbal Learning Test Immediate recall), and the number of words correctly recalled after the 20-minute delay (Rey's Verbal Learning Test Delayed recall).

Two versions were created for each task, and administered one at pretest and the other at post-test in a counterbalanced fashion across testing sessions.

Cognitive inhibition

Intrusion errors in the Categorization Working Memory Span task,[22] that is, the number of words recalled that were on a list, but were not the last words on a list, were considered. The dependent variable was the sum of the intrusion errors made.

Mood and emotional measures

Depressive symptoms

The Geriatric Depression Scale (GDS)[24] is a 30-item self-report measure of depressive symptoms for older adults. Participants were asked to rate with a yes/no answer how they had felt in the previous week. The dependent variable was the sum of the scores awarded for each item. Scores up to 7 indicated no signs of depression.

Anxiety symptoms

The Hospital Anxiety and Depression Scale, Anxiety subscale (HADS-A)[25] comprises 7 items that focus on symptoms of generalized anxiety disorder. Each item is scored on a Likert scale from 0 to 3. The dependent variable is the sum of the scores awarded for each item (maximum 21). Scores from 0 to 7 are within the normative values.

Procedure

All participants attended five individual sessions: the first (prior to surgery) and fifth sessions of about 90 minutes each were for the pretest and post-test assessments, respectively. The other three sessions (sessions 2-3-4), lasting about 30−40 minutes each, were completed within a 2-week time frame, with a fixed 2-day break between sessions. During these three sessions, the trained group completed the working memory training, and the control group was involved in alternative activities.

During the two assessment sessions (pre and post-test), participants completed the battery of tasks and questionnaires listed in Table 2.

The tasks were presented: 1) via computer (the Rey's Verbal Learning Test); 2) in a paper-and-pencil format (the Hospital Anxiety and Depression Scale, Anxiety subscale; the Geriatric Depression Scale); and 3) in an auditory modality (the Categorization Working Memory Span Task and both Forward and Backward Digit Span tasks), adjusted to the participant's hearing levels to limit the influence of sensory variables on the outcomes.

Working Memory Training and Control Group Activities

A verbal working memory training task was presented individually to participants in the trained group, which consisted of lists of words, audio-recorded, and organized in the same way as for the Categorization Working Memory Span task. Participants were asked to recall target words, and tap on the table with their hand when they heard the name of an animal. The maintenance demand of the training—the Categorization Working Memory Span task—was manipulated by only using an adaptive procedure in session 2 (i.e., the difficulty of the task increased if a participant was successful at a given level; if not, the lowest level was presented). The demands of the task also varied and, depending on the session, could involve having to recall words preceded by a beep (session 3) or the last or first word in each list (session 4). The processing demand (tapping on the table when the name of an animal was heard) was manipulated by varying the frequency of these animal words in the lists (session 3). This kind of training combines an adaptive procedure in session 2 with a standard procedure (from the easiest to the hardest trials; it is known as a "hybrid" procedure, and believed to promote transfer effects).[15] A detailed description of the three training sessions is provided in Table 2.

Participants in the active control group were asked to complete paper-and-pencil questionnaires: the Autobiographical Memory questionnaire[22] in session 2; the Memory Sensitivity questionnaire[22] in session

TABLE 2. Description of the Procedure and Activities for the Trained and Control Groups

Session	Activities for the Trained Group	Activities for the Control Group
1 (Pretest)	Tasks and questionnaires were presented in the following order: semi-structured interview; Mini-Mental State Examination; Categorization Working Memory Span task; Rey's Verbal Learning Test, Immediate recall; Hospital Anxiety and Depression Scale, Anxiety subscale; Geriatric Depression Scale; Forward Digit Span task; Backward Digit Span task; Rey's Verbal Learning Test, Delayed recall.	
2 (Training)	Working memory training: in each of the three phases, participants listened to sets of 2, 3, 4 or 5 word lists (each list containing 5 words), and were asked to remember target words (the first or last word on each list, in serial order) and to tap their hand on the table whenever they heard an animal noun. The procedure was adaptive: participants were presented with three sets of word lists for each level of difficulty (which depended on the number of lists in a set). If they recalled the words correctly for two of the three sets, the task's difficulty was increased (up to sets of 5 word lists). When they were unable to do so, they moved on to the next phase of the task, which started from the easiest level (sets of 2 word lists). The three phases of the task differed in that participants had to recall the last word on each list during the first phase, the first word on each list during the second, and the last word again during the third.	Autobiographic Memory Questionnaire[22]
3 (Training)	Working memory training: participants listened to sets of 2, 3, 4 or 5 word lists (each list containing 5 words), and were asked to remember target words (those followed by a sound, which could be anywhere on the list, in serial order) and to tap their hand on the table whenever they heard an animal noun. They were presented with four sets of word lists for each level of difficulty (which depended on the number of lists in a set). Sets of 2 word lists could contain from 2 to 8 animal nouns, sets of 3 lists could contain from 4 to 9 animal nouns, sets of 4 lists could contain from 6 to 11 animal nouns, and sets of 5 lists could contain from 8 to 17 animal nouns. In this case, participants were required to complete the whole task, from the easiest to the hardest level of difficulty, regardless of their performance.	Memory Sensitivity Questionnaire[22]
4 (Training)	Working memory training: participants listened to sets of 2, 3, 4 or 5 word lists (each list containing 5 words), and were asked to remember target words (the first or last word on each list, in serial order) and to tap their hand on the table whenever they heard an animal noun. They were presented with four sets of word lists for each level of difficulty (which depended on the number of lists in a set), and they had to recall: 1) the last word on each list in the first set; 2) the first word on each list in the second set; 3) the last word on each list in the third set; and 4) the first word on each list in the fourth set. In this case, participants were required to complete the whole task, from the easiest to the hardest level of difficulty, regardless of their performance.	BEN-SSC Questionnaire - Questionario sul Benessere Psicologico (Psychological Well-being Questionnaire)[22]
5 (Post-test)	Tasks and questionnaires were presented in the following order: Categorization Working Memory Span task; Rey's Verbal Learning Test, Immediate recall; Hospital Anxiety and Depression Scale, Anxiety subscale; Geriatric Depression Scale; Forward Digit Span task; Backward Digit Span task; Rey's Verbal Learning Test, Delayed recall.	

3; and a psychological well-being questionnaire[22] in session 4 (see Table 2). Here again, the sessions were individual (see Table 2).

The duration of the sessions and the amount of interaction with the experimenter were approximately the same for both groups.

RESULTS

The groups' baseline performance was compared by means of separate analyses of variance on their pretest performance in all tasks, with group (trained and active control) as the between-subjects factor. The results of the preliminary analyses of variance (see Table 1) showed that the groups did not differ in any measures at the pretest session (before surgery).

To examine specific training gains and transfer effects, univariate analyses of covariance were run using the post-test scores as dependent variables, the pre-test scores as a covariate, and group as a between-subjects factor[2]. The results of the analyses of covariance (summarized in Table 3) showed a main effect of the covariate for all tasks except the Backward Digit Span and intrusion errors.

Concerning specific training gains, the main effect of group for the criterion task was significant: the trained group performed better than the control group in the Categorization Working Memory Span task at post-test. As for transfer effects (see Table 3), there was a significant main effect of group, with the trained participants performing better than the controls in the Forward Digit Span task, and making fewer intrusion errors (see Table 3). The effect of group was not

TABLE 3. Results of One-Way ANCOVAs and Short-term Net Effect Sizes

		F	df	p	η^2_p	Pretest vs Post-test	Short-term net effect sizes
Specific effect							
Categorization Working Memory Span task	Covariate	25.50	1,31	<0.001	.451		
	Group	36.43	1,31	<0.001	.540	Controls < Trained	1.91
Transfer effects							
Cognitive measures							
Forward Digit Span task	Covariate	7.84	1,31	0.009	.202		
	Group	7.78	1,31	0.009	.201	Controls < Trained	0.87
Backward Digit Span task	Covariate	1.05	1,31	0.313	.033		
	Group	2.99	1,31	0.094	.088	Controls = Trained	0.53
Rey's Verbal Learning Test - Immediate recall	Covariate	14.26	1,31	0.001	.315		
	Group	<1	1,31	0.537	.012	Controls = Trained	0.23
Rey's Verbal Learning Test - Delayed recall	Covariate	44.86	1,31	<0.001	.591		
	Group	<1	1,31	0.832	.001	Controls = Trained	0.11
Intrusion errors in the Categorization Working Memory Span task	Covariate	<1	1,31	0.890	.001		
	Group	7.44	1,31	0.010	.194	Controls < Trained	0.96[a]
Mood and emotional measures							
Geriatric Depression Scale	Covariate	68.59	1,31	<0.001	.689		
	Group	5.83	1,31	0.022	.158	Controls < Trained	0.43[a]
Hospital Anxiety and Depression Scale, Anxiety subscale	Covariate	44.63	1,31	<0.001	.590		
	Group	8.47	1,31	0.007	.215	Controls < Trained	0.54[a]

Note. The covariate used was the pre-test (baseline) score for the measure examined.
[a] All net effect sizes were coded so that positive values denote a better performance, i.e., fewer intrusion errors (for the Intrusion errors measure), milder signs of depression and anxiety (for the Geriatric Depression Scale and the Anxiety subscale of the Hospital Anxiety and Depression Scale).

significant for Rey's Verbal Learning Test, in either immediate or delayed recall, nor was it significant for the Backward Digit Span task (see Table 3).

As regards the mood or emotional measures, the main effect of group indicated that the trained participants experienced a decrease in their scores on the Geriatric Depression Scale and the Anxiety subscale of the Hospital Anxiety and Depression scale after the training.

Effect Sizes

To ascertain the dimension of the gains for the training group, statistical net effect sizes, which adjust the gains made by the trained group in relation to the gains made by the control group, were computed using the following formula: {(Post-test for the trained group − Pretest for the trained group) − (Post-test for the control group − Pretest for the control group)}/(Pooled SD of the [adjusted] difference)[26] (see Table 3). For the cognitive measures, a large effect size was found for the trained group in the criterion task. As concerns transfer effects, the effect sizes for the trained group were large for intrusion errors and the Forward Digit Span, medium for the Backward Digit Span, and small for Rey's Verbal Learning Test (immediate and delayed recall) (see Table 3). In the mood and emotional measures, medium effect sizes were found for the trained group's scores in both the Geriatric Depression Scale and the Anxiety subscale of the Hospital Anxiety and Depression Scale (see Table 3).

DISCUSSION

Postoperative cognitive changes are among the potential negative outcomes after a major surgical procedure.[1] Though transient, such cognitive changes can particularly affect older adults, who are also more likely to need surgery due to age-related physiological impairments, and whose cognitive abilities decline with aging.[12] In fact, age is considered the main predictor of cognitive changes in older adults, even after noncardiac surgery. Changes in mood or emotional functioning can also occur after surgery, possibly exacerbating negative outcomes during the postoperative period.[4] It is therefore important to identify methods and solutions to sustain hospitalized older adult patients' cognitive functioning and mood, even after such a common surgical procedure as arthroplasty of the knee.

Hence the present study aimed at assessing the benefits of an intervention targeting a core mechanism of cognition, working memory, in sustaining the cognitive functioning and mood (or emotional functioning) of older adults undergoing partial or total arthroplasty of the knee. It is worth noting that this is the first study, to our knowledge at least, to investigate the benefits of a postoperative cognitive training that targeted working memory in hospitalized older adults.

In line with our expectations, the findings of this pilot study confirmed the efficacy of the verbal working memory training administered: compared with the active controls, the trained group showed an improvement in a task similar to the one used in the training (the criterion task).[14–16] They also revealed transfer effects to untrained tasks, and particularly to one of the short-term memory measures (the Forward Digit Span), and the measure assessing cognitive inhibition (intrusion errors). This pattern of results was confirmed by the net effect sizes, which were large for the Categorization Working Memory Span task (criterion task), the Forward Digit Span task, and the intrusion errors. These findings suggest that the working memory training administered enabled participants to make better use of their cognitive resources, in terms of encoding processes, and to resist no longer relevant information. The adaptive regimen of the training also ensured that the tasks were always challenging, cognitively demanding, and novel, consequently promoting participants' adherence to the training program. Our results also confirm the persistence of a cognitive flexibility in older adults,[14–16] even in such a frail condition as when they are hospitalized after orthopedic surgery.

It is worth noting that—contrary to our expectations and the findings of previous studies using the same procedure[15]—no gains emerged after the training in the other short-term memory measure (the Backward Digit Span), or in the long-term memory task (Rey's Verbal Learning Test, Immediate and Delayed recall). This pattern of results was confirmed by the medium-to-small effect sizes obtained by the trained group *vis-à-vis* the active control group in these measures. Concerning the short-term memory tasks, which transfer effects were only seen for the Forward Digit Span may be attributable to the different types of process required in the forward and backward versions of the Digit Span task (the latter demands more active memory processes).[16,27] The long-term memory task (Rey's Verbal Learning Test) also requires a deeper type of encoding process than the Forward Digit Span task. In other words, their characteristics and complexity (in terms of the demands on memory) may make the Backward Digit Span task and Rey's Verbal Learning Test more sensitive to the hospital environment. Hospital stays usually entail changes in daily rhythms, disrupted and poor-quality sleep, with a consequent decrease in the efficient use of mental resources, as well as in mood or emotional functioning. These changes have been shown to have a greater impact on the elderly than on younger individuals.[28] Future studies should make an effort to replicate the present results, taking into account the characteristics of the tasks used to assess the training's efficacy (in terms of the demands of the task and the processing resources required).

It seems intriguing that our working memory training led to an improvement in the two moods or emotional measures considered, for which medium effect sizes were found. Only the trained group's depression and anxiety scores (on the Geriatric Depression Scale and the Anxiety subscale of the Hospital Anxiety and Depression Scale) improved at post-test. Since both groups had normal scores on these measures at pretest, the benefits seen in the trained group at post-test seem to indicate that the training served to distract the patients from their worries and negative feelings more effectively than the control group's activities, prompting a significant improvement in the trained group's mood or emotions, whose participants scored very low for both anxiety and depression. Challenging and engaging cognitive activities can modulate psychological and physiological emotional processes, and there have been other reports of negative emotion and depression reducing after working memory training in older adults.[18]

Despite these promising results, ours was only a pilot study with a small sample size. It also had several limitations, the first of which relates to the types of task involved. Using a broader range of tasks would have enabled us to ascertain the impact of the training in relation to the complexity of the task. On the other hand, given the setting, it seemed wise to limit the number of transfer tasks to avoid tiring the participants. Nonetheless, in future studies the training could be administered once patients have been discharged and returned home, and this might allow for the use of a more complete battery of tasks to assess the training's efficacy.

Another limitation concerns the absence of an assessment after the surgical procedure, but before the training (to identify any cognitive changes occurring after the surgery, and their severity), and of a follow-up assessment some months later to reveal any maintenance effects of the working memory training. These assessments would have also shed more light on the impact of anesthesia and surgery on cognitive functioning and mood or emotional changes in older adults, as well as on the benefits of the working memory training.

Further studies could also examine the efficacy of working memory training after surgery in older patients with mild cognitive impairments, who might benefit even more because of their baseline deficit. With our longer life expectancy, the number of older patients undergoing major surgery is bound to increase, and will include individuals with overt or subclinical dementia. Although there is still no clear evidence of a causal link between anesthesia, surgery and cognitive impairment, it is well worth continuing to explore the underlying mechanisms with a view to developing anesthetic and surgical strategies that minimize their cognitive impact.[1] In this vein, cognitive training, and working memory training in particular, can contribute to building a scaffold in response to age-related changes. It can create the right conditions for new learning to compensate for age-related decline,[29] as well as serving as an effective way to manage surgery-related cognitive and mood or emotional changes. It would therefore be worth including cognitive interventions as part of the daily care for hospitalized older adult patients, favoring an interdisciplinary and proactive cooperation with physicians, and particularly with nurses, who are in a key position to detect and manage cognitive and mood changes during the postoperative period.

Our overall conclusion, based on this first pilot study on a working memory training administered to elderly patients undergoing arthroplasty of the knee, is that such a training procedure can be used to help elderly patients cope with postoperative changes in their cognitive functioning, and especially in their mood or emotional functioning.

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