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The Effect of a Narrative Intervention Program for People Living with Dementia

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Multiple areas in the cerebral cortex are active during the listening of narrative material, and these activations in the brain produce significant changes in connectivity. In a pathological population living in nursing homes, patients who underwent daily narrative training showed some improvements in many psychological and cognitive aspects. Here we aim to investigate the effects of such training in many cognitive aspects. At the beginning and end of a 40-day narrative training, participants with cognitive decline were tested with the Repeatable Battery for the Assessment of Neuropsychological Status to quantify any improvements in individual performance. Results were compared with those of a control group of patients. Results show a significant increase in performances of the experimental group in domains such as immediate memory, language, attention, and delayed memory. Results replicate and expand previous findings, indicating that this type of training could increase cognitive performance and could be implemented as an effective nonpharmacological treatment for the cognitive wellness in both the pathological and nonpathological elderly.

Keywords: narrative, neuropsychology, dementia, cognitive training

Processing an element of storytelling by the human brain becomes something more complex than mere linguistic processing because many regions of the brain are involved in narrative understanding (Nyberg, McIntosh, Houle, Nilsson, & Tulving, 1996). Processing narrative material means understanding the intentions, goals, emotions, and other mental states of the characters, which is referred to as *mentalizing* (Ferstl, Neumann, Bogler, & von Cramon, 2008; Ferstl, Rinck, & von Cramon, 2005; Frith & Frith, 2003; Xu, Kemeny, Park, Frattali, & Braun, 2005; Zwaan & Radvansky, 1998), so that any network supporting language, memory, and perception is likely to play a key role (Mar, Oatley, Hirsh, dela Paz, & Peterson, 2006).

The understanding of a story needs a representation of the state of things described in the text (Zwaan & Radvansky, 1998) through a mental image. These representations of textual information are defined as *situation models* (Gernsbacher, 1990; Kintsch, 1999; Zwaan & Radvansky, 1998). A situation model consists of various dimensions, such as time, space, the main character, his or her intentions, and his or her emotional state (Ferstl et al., 2005, 2008; Zwaan & Radvansky, 1998).

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A review of the studies produced in the literature shows that the areas of the brain associated with reading are similar to those involved in the processes of mentalizing (Gallagher & Frith, 2003). Those cognitive processes show similar patterns of activity bilaterally in the medial ventrolateral prefrontal cortex, the precuneus, posterior cingulate, and in the retrosplenial cortex, into the medial-temporal and amygdala and the temporo-parietal junction, and along the superior temporal sulcus and the medium temporal gyrus at the temporal poles. During a task of understanding and/or produc-

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tion of narrative material, many bilateral prefrontal areas are active, and the same areas are active for recollecting and encoding episodic and autobiographical memories (Buckner & Carroll, 2007; Conway, Pleydell-Pearce, Whitecross, & Sharpe, 2002, 2003; Spreng, Mar, & Kim, 2009; Tulving, 2002; Wheeler, Stuss, & Tulving, 1997;). Areas involved in inferences and in people's intentions (paracingulate cortex, temporal parietal junction, temporal lobe, amygdala and hippocampus), those involved in attentional processes (orbitofrontal cortex) and motivation (anterior cingulate cortex), are also active while reading (Mar, 2004). Reading novels can even cause measurable changes in resting-state connectivity of the brain that decayed rapidly in the left angular/supramarginal gyri and right posterior temporal gyri. Regions that were previously associated with perspective taking and story comprehension swiftly decayed after the completion of the novel. Other long-term changes in connectivity persisted over several days after the reading, in the bilateral somatosensory cortex (Berns, Blaine, Prietula, & Pye, 2013). From a cognitive and behavioral point of view, reading and writing both stimulate the brain and help to preserve memory. One of the studies showed that the habit to engage in mentally stimulating activities throughout life strongly affects (about 15%) the preservation of cognitive abilities during the aging process (Wilson, 2013). The main mechanisms showing age-related declines in healthy adults are the speed of information processing (Verhaeghen & Cerella, 2008); working memory (Braver & West, 2008); the ability to learn and remember new information (Old & Naveh-Benjamin, 2008); and reasoning processes (efficiency and clarity; Old & Naveh-Benjamin, 2008). The only verbal skill—being an evaluation of the gained knowledge rather than a cognitive mechanism—is protected by differences in age (Park & Reuter-Lorenz, 2009). Nevertheless, some aspects of verbal skills may be effected in healthy aging, such as lexical retrieval (Facal-Mayo, Juncos-Rabadán, Alvarez, Pereiro-Rozas, & Díaz-Fernández, 2006; Nicholas, Obler, Albert, & Goodglass, 1985), verbal comprehension (Carvalho, Barreto, Guerra, & Gama, 2009), and even narrative and discourse processing (Saling, Laroo, & Saling, 2012; Wright, Capilouto, Srinivasan, & Fergadiotis, 2011).

In the nonhealthy aging population, the memory domains most effected are cognitive functions (although many other processes are progressively effected), and this produces serious difficulties, which influence the quality of life of patients. It undermines the sense of self, thus causing an impairment in the everyday functioning.

Tasks such as reading aloud have been found to activate dorsolateral prefrontal cortex (Miura et al., 2003; Price et al., 1996) and they can improve frontal functions. People living with dementia increase their performances in the Frontal Assessment Battery (Kawashima et al., 2005). Even listening to a story has been found to be effective for what concerns memory functions (Batini, Toti, & Bartolucci, 2016) and behavioral dimensions measured with the Neuropsychiatric Inventory Brief Questionnaire (Billington, Carroll, Davis, Healey, & Kinderman, 2013). Therefore, reading and narrative processing could represent a powerful tool for rehabilitation programs in people living with dementia. In this article, we aim to investigate how a narrative intervention could operate as a tool in the rehabilitation programs for people living with dementia within nursing homes.

Method

A total of 43 patients suffering from various forms of dementia (e.g., Alzheimer's, vascular dementia, general cognitive decline) took part in the trial. Individuals were recruited within the Casa Serena Sant'Eraclio Ex ONPI nursing home. Patients were diagnosed with different neurological diagnosis on the basis of careful medical history, physical examination, laboratory tests, as well as characteristic changes in thinking, daily functioning, and behavior associated with each type of dementia. Once inside the nursing home, clinicians used the Clinical Dementia Rating Scale to get a profile of each patient. All participants had mild to moderate dementia on the basis of the scores from the Clinical Dementia Rating Scale (CDR). They were provided by setting cut offs at total score CDR 1 (mild dementia rate) and total score CDR 2 (moderate dementia rate). No patients were reported to suffer from hearing loss. Their degree of education was 6.5 years, on average (SD = 1.52; for the experimental group, M = 6.2 years, SD = 1.63 years; for the control

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group, $M = 6.7$ years, $SD = 1.6$ years). One professional psychologist carried out all the testing in the morning between 9 a.m. and 12 a.m., over the course of 7 days.

The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) is a quick and complete test, which is individually administered in order to assess attention, language, visuospatial abilities, immediate, and delayed memory. It consists of two versions (Form A and Form B) at the same difficulty level, each one divided into 12 subtests that are administered in 20 min to 25 min. The administration duration of less than 30 min allows to maximize the cooperation of the patient and to minimize the effects of fatigue on performance. Its level of difficulty is appropriate for a range of performance that ranges from normal adults to patients with moderate dementia. The practicality of this neuropsychological test allows the administration, even in bed-ridden patients.

Patients were divided into two groups on the basis of RBANS outcomes (balancing them over the two groups) as well as on the willingness of the patients to undergo the training: A control group consisting of 21 individuals (9 men, 12 women; M age = 81.7 years, SD = 6.43 years) and an experimental group consisting of 22 individuals (9 men, 13 women; M age = 82.3 years, SD = 10.14).

T1 No differences (see Table 1) were found between the two groups on the baselines scores (immediate memory: $t = -.186$, $p = .853$; visuospatial: $t = .581$, $p = .564$; language: $t =$ /041, $p = .967$; attention: $t = -.832$, $p = .410$; delayed memory: $t = .458$, $p = .650$). Moreover, no patients were undergoing any specific pharmacotherapy that could interact with brain functions.

The training was carried out thanks to a group of students of the University of Perugia who carried out reading aloud to the experimental group over 40 sessions (up to 1 hour a day, 5 days a week, Monday through Friday). Before the training started, students were trained themselves on reading to a group of patients with cognitive impairment. They were trained in 3 days (3 hr per day) on group management, personal interactions, reading out loud (by a professional theater actor), and on how to integrate themselves inside the nursing home facility. Initially, we chose texts characterized not only by their overall brevity, but also by the story's period structure, which was articulated in short sentences so that the understanding was accessible even in situations of reduction in memory span and consequent impairment of working memory. Progressively, texts characterized by longer semantic units and greater total duration were inserted. We proceeded in a similar way for what concerns the linguistic difficulty level: In the last part of the training, we used texts that were not exhausted in a single day of reading, therefore requiring patients to recollect contents of the "previous episode." The training sessions, difficulty levels (structure of sentences and periods), and duration are summarized in Table 2. At the beginning and end of each session, patients were asked to share (if willing) their thoughts on the reading material, allowing them to relate their own personal memories. During the rest of the session, we asked them to try to maintain attention and listen. This training took place in the hours when the patients of the nursing home were supposed to stay in the common room watching TV. Thus, the control group just went on with the usual schedule (which was the same for the experimental group, apart from the reading sessions); when the experimental group was doing the reading activity, they were watching TV.

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Table 1
Baseline Scores for the Two Groups

	RBANS subscale									
	Immediate memory		Visuospatial abilities		Language		Attention		Delayed memory	
Group	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
Experimental	13.5	2.48	12.59	2.65	13.23	1.39	8.27	1.26	13.82	2.07
Control	14.14	2.39	10.48	2.47	13.14	1.5	10.05	1.73	12.38	2.36

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Table 2
Summarixes the Training Sessions, Their Difficulty Levels (Structure of Sentences and Periods), and Duration

Date	Minutes of reading aloud	Narrative material	Difficulty level
January 25 to February 9	20	Stories from *Favole al telefono* by Gianni Rodari (1920–1980)	*Favole al Telefono* is a book of short stories that don't require recall of a "previous episode" and with a very simple narrative structure. The stories are humorous. It is a kind of narrative conceived for children.
February 10 to February 22	30	Stories from *Fiabe Italiane* by Italo Calvino (1923–1985)	*Le Fiabe Italiane* is a collection of fairy tales from the Italian tradition transcribed in the Italian language from the various dialects by Italo Calvino. In this case, the narrative structure is slightly more complex, with recurrent motifs (magical objects that you want to achieve, combined with creatures and monsters, rescuing people turned into beasts, etc.). At the end, there is a generally happy ending. In the fairy tales, in the words of Calvino himself, a battle is fought against time and against obstacles that prevent or delay the fulfillment of a desire, or the re-establishment of a lost love is realized mostly through a magical element. The transcribed fairy tales by Calvino are longer and longer than the ones by Rodari and have a more complex narrative structure, more complex characters, and a mixed language between orality and writing.
February 23 to February 25	40		
February 26 to March 8	40	*Un Treno per la Luna* by Cinzia Giuntoli (1963–alive)	This epistolary novel was chosen for its geographic location (Tuscany) and historical context (WWI). The choice of a novel implies an important step for the memory function because one has to remember what happened before (the previous letter). The novel can easily connect to the memories of the elderly, which involve historical accuracy, and retraces the events of those years and subsequent years through the letters that the young couple, separated by war, exchange.
March 9 to March 18	45		

The assumption underlying the construction of this type of training is that the narrative acts as brain training in working memory domains with progressive scales of quantity and difficulty. The change in the final part of the entire training—where the effort required is no longer limited to a single meeting, but transverse to more meetings—is suggested by the assumption that the benefits gained by working memory during the first part of the training would be generalized to domains of long-term memory. In addition, most of the texts used were chosen in connection with an alleged familiarity of the patients with authors and content.

At the end of the training, all individuals of both the experimental and the control groups were again tested with RBANS (those who did the A version in the first testing session were then administered the B version, and vice versa; the version administered first was randomly assigned) to quantify any differences from the initial detections. The person who conducted

the testing was a professional neuropsychologist (a person other than the one who performed the training) who did not know whether the patients were from the experimental or control group. To calculate the statistical significance effect of the training (Nieuwenhuis et al., 2011), we analyzed the effect on difference of scores (T1–T0) T0 is time zero (before intervention) while T1 is Time 1 (after intervention) by using a 2 × 2 repeated-measures analysis of variance (ANOVA; Time × Group). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Results

The analysis of the scores at T0 and T1 in the two groups (the experimental and the control one) taken into account shows that the reading training effects lead to a positive trend in the experimental group in all five macrodimensions of the RBANS (see Figure 1).

To calculate statistical significance effect of the training (Nieuwenhuis et al., 2011), we analyzed the effect on difference of scores (T1–T0) by using a 2 × 2 ANOVA (Time × Group). Differences between groups (interactions: Time × Group) reached statistical significance in the domains of immediate memory, $F(1, 42) = 12.994$, $p < .001$, language, $F(1, 42) = 7.601$, $p < .01$, attention, $F(1, 42) = 4.484$, $p < .05$, and delayed memory, $F(1, 42) = 4.894$, $p < .05$, but not in the visuospatial abilities domain (see Figure 2).

We then analyzed the same effect on the single subtests of the battery. Figure 3 shows the results for those subtests in which differences between groups of effect size reach statistical significance: list learning, $F(1, 42) = 18.626$, $p < .001$; story memory, $F(1, 42) = 4.969$, $p < .05$, subtest of the immediate memory dimension; semantic fluency, $F(1, 42) = 5.821$; $p < .05$, subtest of the language dimension; coding, $F(1, 42) = 5.290$, $p < .05$, subtest of the attention dimension; and list learning recognition, $F(1, 42) = 4.838$, $p < .05$, subtest of the delayed memory cognitive dimension.

To check whether different types of dementia differently influence the results, we analyzed differences from T0 and T1 in the dimensions that reached statistical significance for the experimental group. Results shown in Figure 4

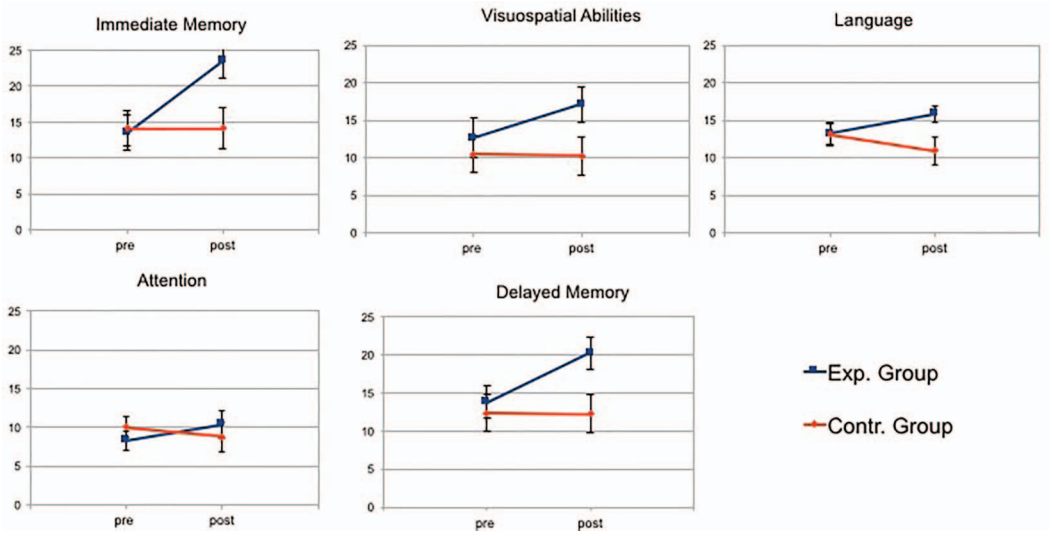

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Figure 1. Means of raw scores for the two groups at the pretraining and posttraining time points for each of the macro dimensions of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). See the online article for the color version of this figure.

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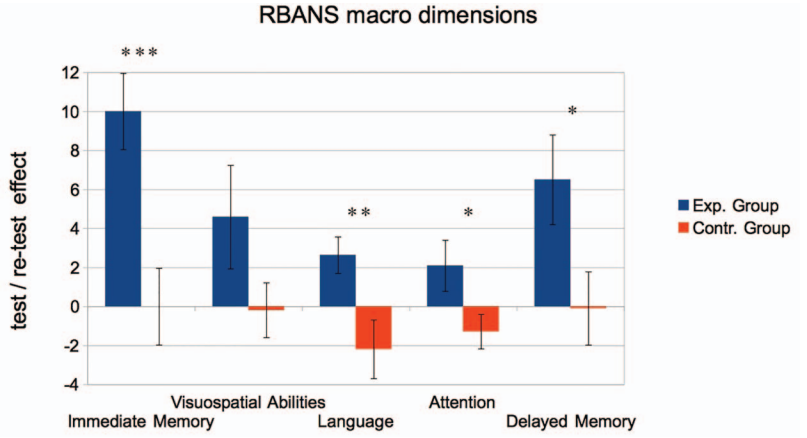

Figure 2. Means of test–retest differences (effect size) for the two groups in each dimension of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). The asterisk indicates statistical significance for differences of the means of the two groups. See the online article for the color version of this figure.

show that both vascular and Alzheimer's dementia had an increase in performances in the domains of memory (immediate and delayed), but this increment was present in the language and attention scales only for vascular dementia. Other diagnosis (general cognitive decline, strokes, etc.) showed an increment in all scales. Those results are in line with previous findings

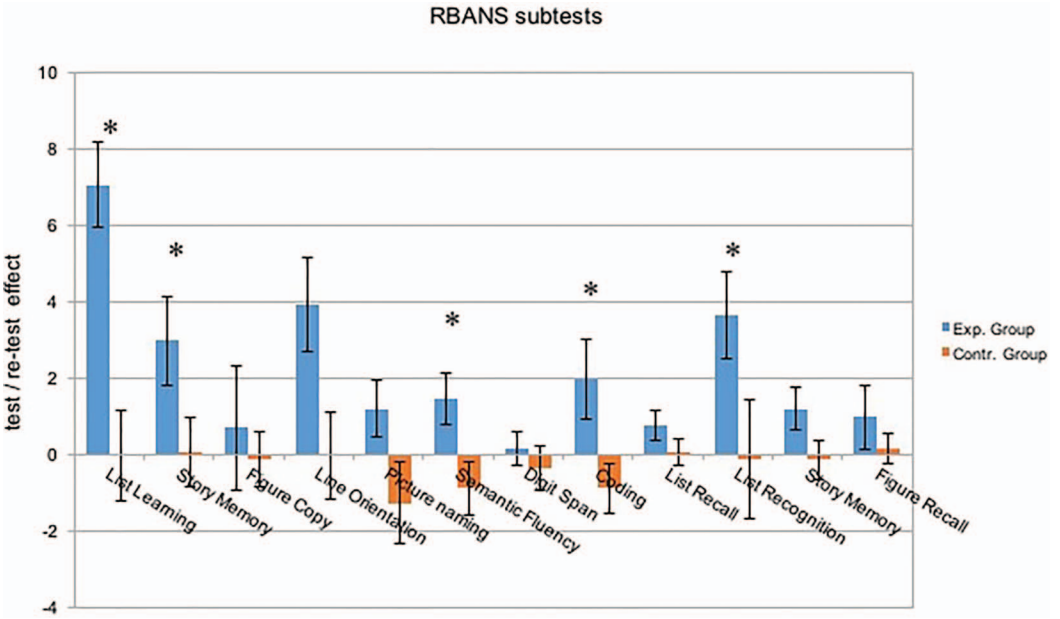

Figure 3. Means of test–retest differences (effect size) for the two groups for each subtest of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). The asterisk indicates statistical significance for differences of the means of the two groups. See the online article for the color version of this figure.

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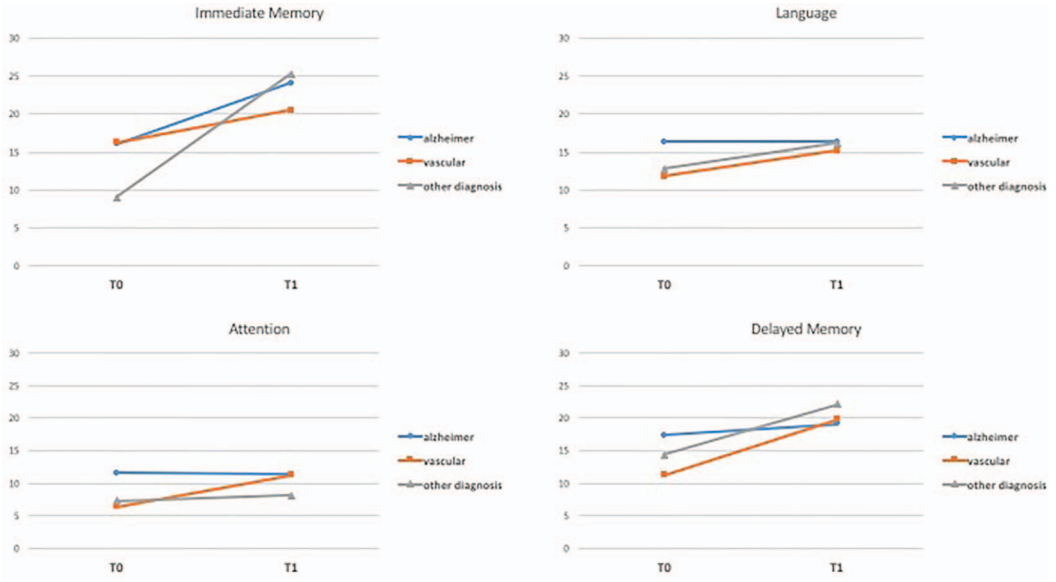

Figure 4. Means of raw scores for the different types of diagnosis of the experimental group at the pretraining and posttraining time points for each of the macro dimensions of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). See the online article for the color version of this figure.

(Batini et al., 2016). Experimental and control groups had a similar distribution of forms of dementia (experimental group: nine individuals with Alzheimer's, seven with vascular dementia, and six with other type of diagnoses; control group: eight subjects with Alzheimer's, six with vascular dementia, and seven with other type of diagnoses). All the patients, although having different diagnoses at entrance in the Residenza Sanitaria Assistita (RSA), were then evaluate suffering from mild to moderate cognitive decline.

Discussion

Many studies have shown that the processing of narrative material activates a large cortical network that includes many areas responsible for different cognitive tasks, in particular those deputed to the recovery of autobiographical material and, more in general, of memory. Mar (2004) showed that the understanding of stories activates areas of the medial and dorsolateral prefrontal cortex: These areas are also active in recovery of episodic material tasks and narrative material production (Nyberg et al., 1996). Moreover, any network that supports language, memory, and perception is active during narrative material processing (Mar et al., 2006), indicating that all those cognitive processes are active and essentials to understand and actively follow the plot of a story. The results presented here extend and integrate, with appropriate control measures, the data obtained earlier with the cited pilot studies. The learning effect hypothesis, which could explain the increase in performance, is not plausible both because the individuals who participated had no familiarity with the tests and because the RBANS is composed of two versions (Form A and Form B) of equal difficulty. The individuals who were administered the Form A in the ex ante stage, were administered the Form B in the ex post stage, and vice versa. Unlike previous results, although a positive trend was found in each of the investigated domain, the achieved results here described reach statistical significance even in the two dimensions of language and attention. Memory seems to be the domain that receives a greater benefit, as there was an increase in the performance on both unorganized (list learning task) and organized material (story memory task). Albeit the results seem to be clear for episodic memory, the benefit obtained in a test

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like list learning task is more counterintuitive. To understand the story (or single parts of it), we must put the verbal memory trace in contact with our experience and knowledge, our semantic categories, our images that we have in memory, and our situation schemes in a continuous dynamic interaction between what we hear and what we already have in memory.

This interaction on several levels would strengthen the weight of the memory trace of verbal material, and the narrative listening produces a workout in the literal sense, activating many processes in parallel and thus affecting multiple levels and cognitive domains. Therefore, the overt workout for the memory domains could extend to other cognitive levels. Benefits related to those of the memory are those of language, specifically in the ability to retrieve verbal material rapidly and accurately. The results for the subtests of semantic fluency suggest that where there is a rise in memory performances, benefits can also extend to the ability to retrieve linguistic material semantically connected. In addition, to follow the story and to structure a coherent interpretation over time, a sustained and selective attention plays an important role. Benefits of this area are evident especially in the subtest of coding, which evaluates sustained, selective, and divided attention capabilities other than working memory. In conclusion, all the data from this study point to the effectiveness of the daily narrative training in delaying cognitive decline and, possibly, in improving the overall quality of life and self-perception of the individuals. Listening to and understanding stories activates a number of areas delegated to different cognitive functions, such as the ones delegated to language, perception, attentional areas, motor areas, and even visual areas (Nyberg et al., 1996). Studies in literature have highlighted cognitive benefits under normal (Nouchi et al., 2012) and pathological aging (Billington et al., 2013). Data collected here suggest that this kind of training can generalize its benefits to different cognitive domains, and it could be implemented as an effective nonpharmacological treatment for the cognitive wellness in pathological elder.

Conclusions and Future Directions

All the data from this study confirm the effectiveness of the daily narrative training in delaying cognitive decline and maybe in improving the overall quality of life and self-perception of individuals who suffer from mild to moderate cognitive decline. The idea that it might be possible to slow down cognitive decline by recovery and promotion of relearning effects of cognitive performance in the pathological elderly population opens scenarios about the important contribution of narrative listening as a prevention tool. One major limitation of the study is sample size: Future research should use bigger samples of patients to analyze more in depth how different forms of dementia might be affected by the training. In fact, future directions of study should be developed to check, in a longitudinal way, not only how those effects behave in time in the population considered here, but also how it could work as a prevention tool in normal aging population as well as in the borderline condition of mild cognitive impairment.

Ethical Approval

This study was approved by the ethical committee of the RSA of Foligno. Written informed consent was obtained from all participants and their families. AQ: 17

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