Review

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Review

Tailoring Semantic Interventions for the Elderly: Task-Focused vs Person-Centered Approaches

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Abstract: Cognitive interventions vary in their level of structure, encompassing standardized and unstandardized tasks, person-centered tasks. Addressing semantic knowledge/semantic memory/semantics is important, mainly because its efficiency impacts other cognitive domains. Semantic tasks are commonly included in preventive and rehabilitation programs, typically as standardized tasks with pre-defined semantic referents. In contrast, person-centered approaches have introduced personally relevant semantics, allowing for expressive language to share thoughts and experiences. Although these approaches offer benefits beyond cognitive improvement, their lack of structure may pose challenges. Our CQ program blends structured activities with personally relevant semantics, aiming to harness the advantages of both methods. Additionally, in this review we discuss future challenges and directions in the field of semantic interventions.

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1. Cognitive Interventions in Older Adults

When discussing cognitive programs, we refer to non-pharmacological, cognitive-based interventions designed to directly improve and maintain cognitive function. The literature presents a wide variety of terms for different subtypes of cognitive interventions for the elderly, including cognitive stimulation, activation, training, rehabilitation, remediation, and enrichment, among others [1–5]. The distinctions between these terms are not always clear, but some basic differences can be identified. One differentiator is the level of standardization in the activities: some approaches adhere to a script-based, controlled procedure (task-focused interventions), while others value the input provided by participants (person-centered interventions), as seen for example, e.g., in group discussions or reminiscence therapy [6,7]. In the current review, we focus on a specific cognitive domain that is important to address as a goal—linguistic semantics—and how it has been approached by task-focused versus person-centered interventions.

2. The Role of Semantics in Cognitive Interventions

The cognitive domains most frequently targeted in cognitive interventions are memory, attention, and executive functions [8–16]. Among the goals related to long-term memory, preserving the subsystem of semantic memory is essential for maintaing an individual's connection to the physical and social world [17,18]. Semantic memory, also referred to as conceptual or semantic knowledge, involves the general knowledge of objects, word meanings, facts and people, collectively known as semantic representations. Unlike episodic memory, semantic memory is not tied to specific times and places [19]. An efficient semantic memory system must not only allow for agile access to stored information (retrieval), but also optimize forms of storage methods, which can, in turn, facilitate retrieval. Retrieval abilities are demonstrated in tasks such as naming objects, defining words, or matching pictures with words. Category fluency, or the ability to name multiple elements

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within a given category (e.g., animals), is an example of a task related to storage [20]. Although it is possible to conceive of semantic memory tasks that do not involve language - for instance, matching one picture with another based on semantic similarity - most do involve language. Therefore, most semantic memory training is also linguistic-semantic, or, as it has become popularly known, lexical-semantic [21].

Severe semantic memory deficits are not a common consequence of healthy ageing [22–24], although they are characteristic of conditions such as mild cognitive impairment (MCI) [25,26], Alzheimer's disease (AD) [27], and semantic dementia (SD) [28]. Interventions based on linguistic semantic tasks have shown various positive effects in counteracting age-related cognitive decline [29]. On one hand, the use of linguistic-semantic strategies - such as chunking or hierarchical organization of information - is known to enhance the learning and retrieval of new information in healthy older adults and MCI patients [30–33]. On the other hand, various studies have shown that the cognitive benefits of linguistic-semantic training extend well beyond semantic memory, as we will show in the following section.

3. Outcomes of Linguistic Semantic Training

Semantic tasks are an integral part of cognitive linguistic therapies, which stem from the cognitive linguistic approach focused on addressing language deficits [34]. As such, semantic tasks include activities that target general knowledge, the extraction of meaning from oral or written language (comprehension), and the storage of meaning-related information through processes such as categorization or chunking. For example, the linguistic-semantic program BOX [35], originally developed to rehabilitate aphasic patients, has also demonstrated positive effects on episodic memory in early AD patients, as well as improvements in other cognitive domains. These domains include the Mini-Mental State Examination (MMSE), the Boston Naming Test (BNT), the Verbal Naming Test (VNT), the Brief Story Recall, the Stroop test and the RAVL delayed recall mean scores [36,37]. BOX incorporates various semantic decision tasks designed at enhance semantic processing. Each task features different types of exercises in which patients confirm or deny the semantic relationship between content words presented either in written or auditory form, either separately or within sentences or texts. The program emphasizes the interpretation of written words, sentences, and texts, with auditory presentations by a speech and language therapist when necessary. In designing the program, factors such as word choice (i.e., imageability, frequency, word length, and abstractness are considered), the number of distractors (i.e., the difficulty level generally increases by adding more distractors), semantic relatedness (easier levels contain mostly unrelated distractors, while the most difficult levels contain only related distractors), and ambiguity (difficult levels incorporate ambiguous words, requiring patients to interpret both meanings simultaneously), were carefully considered to create different levels of difficulty [35].

In addition to programs like BOX [35], where all activities relate to semantic processing and are examples of cognitive linguistic therapy, several other programs integrate semantic processing tasks with activities targeting other cognitive functions, such as executive functions or visuo-spatial memory.

Prevention programs including tasks related to general knowledge-related, as well as oral and written language comprehension, have been shown to enhance cognitive functioning in healthy older adults, particularly in areas such as working memory, processing speed and learning potential [38,39]. Rehabilitation programs using semantic tasks have been studied across various neurological conditions, including aphasia, AD, MCI, and Parkinson's disease (PD). Semantic training programs have also demonstrated effectiveness in addressing dementia-related anomia. For instance, Savage, et al. [40] observed generalization effects in patients with mild impairments after repetitive training that involved pairing target item photos with labels, both in written form and via audio recordings of the spoken word. Furthermore, Stampacchia et al., [41] found that explicit pictorial feedback improved semantic cognition in patients with post-stroke semantic aphasia (SA), suggesting that semantic training can be beneficial for these patients and may show some degree of generalization to untrained situations. Lastly, combining semantic feature analysis (SFA) with transcranial direct

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current stimulation (tDCS) has been shown to counteract language deterioration in the semantic variant of primary progressive aphasia (svPPA), with lasting and generalized effects [41].

Rehabilitation programs incorporating verbal-learning exercises, picture recognition, word recall, reading aloud, sentence completion, and proverb explanation tasks have shown to enhance cognitive functioning in AD patients [43–45], namely on attention, working memory, language comprehension, and executive functions. These improvements were observed immediately after the intervention and persisted for six months, although they diminished after twelve months [44,45]. Additionally, research comparing rehabilitation programs for individuals with MCI and AD has demonstrated positive effects on cognitive functioning. Zaccareli et al., [46] used the Sociable platform, a computer-based cognitive training program (featuring semantic task games: "synonyms" and "antonyms" and reported notable improvements in memory and executive functions.

Moreover, integrative cognitive training programs, such as REHACOP, which include semantic exercises (e.g., synonyms/antonyms and verbal fluency, though not specified in the literature if the semantic part of verbal fluency is included), have shown significant benefits in processing speed, visual memory, theory of mind, and functional disability for older patients with PD [47–49]. These findings suggest the potential long-term benefits of such interventions for PD patients.

Most, if not all semantic tasks described here are standardized to a considerable extent, following a predefined sequence of steps (a script) for their implementation. Critically, the semantic references, such as stories and discussion topics, are often predefined as well. This can result in participants being unfamiliar with or uninterested in these topics, potentially reducing engagement and negatively affecting the outcomes. In contrast to this task-focused, standardized approach to semantic interventions, a person-centered approach allows participants to choose their own topics, thereby encouraging expressive language in less-structured activities.

4. Expressive Language and Person-Centered Semantic Intervention

Expressive language refers to the productive aspect of linguistic communication. In the context of semantic training, individuals use expressive language whenever they share their thoughts, memories, opinions, or feelings with others, through language whether in written or oral form. Communication-based programs, particularly those aimed at AD patients, use expressive language as a tool to enhance both cognitive, and psychosocial dimensions. Compared to interventions centered around standardized language comprehension tasks, expressive language training not only (1) increases the possibility of addressing semantic materials that are personally relevant to the participant, thereby engaging them with meaningful topics), as it (2) promotes social interaction through dyadic or group conversation. According to Bayles [50], (1) engaging with personally relevant semantic materials during conversations, particularly with older adults, including those with dementia, improves their ability to access their own knowledge as they repeatedly bring it to consciousness. Peplau in [51] further suggests that conversations may have a corrective effect on participants' thought patterns by providing feedback, such as requests for clarification. In summary, using relevant semantic materials in expressive language contexts allows participants to choose their topics of interest, potentially leading to better cognitive outcomes.

Regarding (2) research has also emphasized the value of interpersonal contexts, particularly in group settings. Sharing thoughts and experiences within a group can enhance the outcomes of cognitive training [52–54] and may also contribute to increased self-esteem and confidence [55], therefore also acting on affective dimensions. The power of verbal expression to enhance affective and psychosocial dimensions has been further emphasized in studies of reminiscence therapy [e.g., 56]. This intervention modality combines conversation with personally relevant semantics, focusing mainly on the individual's past. It may assume different levels of complexity, ranging from simple recall and sharing of memories to more complex attempts to integrate past, present and future experiences. Increased life satisfaction and quality of life have been reported as positive outcomes of this approach [56].

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4.1. Effects on Language Quality

In typical AD patients, a progressive decline in expressive language quality is common. These deficits often manifest as empty speech, reduced informational content, lexical retrieval difficulties accompanied by circumlocutions and paraphasias, use of pronouns without clear antecedents, ideational perseveration, decreased coherence, frequent topic shifting, excessive verbosity, and poor comprehension of abstract language [57]. Early studies focused on the benefits of expressive language stimulation for language performance in AD patients, highlighting the advantages of structured versus unstructured conversation. For instance, Arkin and Mahendra [57] engaged an experimental group in activities that included picture description, associations with evocative words, proverb completion and interpretation, category fluency exercises, and advice and opinion questions, while the control group participated in unstructured conversation. Language outcome measures included a picture description task, a comprehensive discourse battery, and proverb interpretation. The control group showed significant declines in the picture description tasks, while the experimental group maintained their baseline performance on these measures. Further, Mahendra & Arkin [58] used the same structured program, coupled with other meaningful activities such as supervised volunteer work, and found that AD patients could maintain and even improve their language performance. Similarly, Tappen, et al., [59] implemented one-on-one structured conversation sessions centered on patients' memories and analyzed the effects of adding a second layer of activity (walking and talking) to the primary activity (talking). They found smaller expressive-language-related declines among patients who only engaged in conversation, suggesting that focusing entirely on self-expression may be key to preserving communication skills.

4.2. Effects on Cognitive, Mood, Emotional, and Functional Dimensions

Other studies have shown that fostering expressive language in AD patients may have broader impacts beyond language itself, extending to general cognition and affect. Bottino [60] implemented a cognitive rehabilitation program for AD patients, comparing the cognitive effects of medication alone with those of medication combined with cognitive rehabilitation. The cognitive rehabilitation program, structured in group sessions, included activities such as talking about one's life, sharing past or recent experiences, discussing themes of common interest, or simulating daily life communication scenarios like having a conversation with a doctor. The group that participated in the cognitive rehabilitation sessions outperformed the control group in outcome measures, namely in MMSE scores and backward digit span scores (working memory). Similarly, Olazarán, et al., [61] implemented a similar cognitive program, combined with social- and psychomotor-oriented activities. In addition to cognitive outcomes, the authors assessed the affective status of medicated AD patients before and after the intervention. The maintenance (as opposed to decline) of cognitive function was more prevalent in the experimental group, where more participants also maintained or improved their affective status after one year of training. Chapman, et al., [62] analyzed the verbal, functional and emotional impact of a program entirely based on conversational interaction. Again, a control group of medicated AD patients was compared with an experimental group that received both medication and cognitive-communication (conversational) training program. Activities included participant-led discussions, interactive sessions about AD, and discussions centered on salient life stories. The experimental group exhibited a smaller decline in verbal and functional abilities compared to controls, as well as a decrease in negative emotional symptoms.

4.3. Focusing on Opinions, not Facts

In contrast to the aforementioned cases of success, Onder et al., [62] found no impact of expressive language training within a group- and reality-based communication program for AD patients. The main feature of this approach is the emphasis on maintaining a connection with reality, including personal, temporal and spatial orientation, as well as discussing news or topics of general interest. Although, to our knowledge, no direct comparisons are available between this program and

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other, less reality-focused programs, such as those based on reminiscence, are available, a possible explanation for this lack of effectiveness may be that external facts do not appeal to AD patients.

One of the key principles of the Cognitive Stimulation Therapy (CST) approach, proposed by Spector, et al., [64] and Spector et al., [65] in their program named "Making a Difference", is the prioritization of opinions over facts. Other key principles include encouraging new ideas, thoughts and associations, as well as stimulating language skills. Sessions include debates on topics of general interest, but primarily encourage participants to share their opinions and personal experiences. They also incorporate structured cognitive challenges like word association, categorization and number exercises, as well as physical activities. Positive effects on general cognition, language memory, orientation and praxis have been reported [66]. Some studies also highlight additional benefits to mood, quality of life [67], emotional functioning and behavior [68] in dementia patients. In summary, person-centered programs that value participants' expressive language and personally relevant semantics have shown a positive impact not only on cognitive domains, including language, but also on social, affective, and functional areas.

5. Structured Expressive Language: The CQ Example

Expressive language offers benefits beyond cognition, but it can also present disadvantages due to a lack of structure, e.g., when working on language itself, structure tends to have a more positive impact (see above). Moreover, conversation requires structured input for new learning to occur [50]. Finally, pure expression alone might not be sufficiently challenging for more ambitious cognitive goals, such as maintaining cognitive function in MCI or healthy older adults, or even enhancing cognitive function in the latter. Some programs combine structured and unstructured tasks, but the question remains: can this be achieved within a single task?

We have recently developed an online platform called CQ, where participants are invited to create their own multiple-choice quizzes using any of the eight activity formats included in the lexical semantic stimulation program BOX (I Semantic Categories; II Syntagmatic and Paradigmatic Relationship; III Semantic Gradiation; IVAdjectives and Exclamations; V Part-Whole Relationship; VI Anomalous Sentences; VII Semantic Definition; VIII Semantic Context) [35,69]. Participants may first try the activities as players, but the main focus is on creation. To facilitate this, participants are guided through a thorough step-by-step procedure, always beginning by choosing a semantic referent – be it an object, person, living being important to them, a past experience, an opinion, etc. Several activity-dependent steps follow, leading participants to complete the quiz they authored. The platform incorporates participants' input throughout the process, making the entire quiz dependent on it. For instance, in a categorization activity named "Find the intruder", participants are first asked to choose an object, place, or person, important or familiar to them. If a participant chooses "dog", the next question is, "What kind of thing is a dog?", to which they respond "animal" (category name). Then follows a request to name other animals (other exemplars from the same category) and, finally, they are asked to name something that is not an animal (the intruder). Therefore, the task of quiz creation begins by eliciting personally relevant semantics and follows a highly structured procedure continually fed by participants' input.

Depending on the mode of implementation – single user, facilitator and participant, or facilitator and group - opportunities for social interaction and self-expression can emerge to varying degrees easily. Group administration allows participants to share their experiences and knowledge with others when suggesting their personally relevant topics. The importance of this expressive component can be modulated according to participants' needs, and components can be even distributed unequally among the group members: those with more severe impairments may be invited to share experiences or feelings, while those with better cognitive skills can work on that input to create the quiz. This approach favors the inclusion of various types of participants, extending the use of expressive language well beyond its most frequent application, for example in dementia, going beyond self-expression, CQ aims to empower participants by turning them into content creators and, ultimately, service providers.

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6. Future Directions

The future directions in the field of semantic intervention are numerous and hold potential for yielding interesting, applicable, and beneficial results for both research and clinical practice. While targeting semantics appears to have a widespread positive impact, most programs—except perhaps for BOX—often include a variety of activities, both semantic and non-semantic, making it difficult to discern the specific impact of semantic tasks. In such cases, it would be useful to validate existing programs based on individual tasks (e.g., semantic vs. other tasks, and different types of semantic tasks) rather than evaluating entire packages. Although the idea of combining task-focused approaches with person-centered strategies in semantic interventions seems promising, there is little to no direct comparison between these methods. Research should prioritize direct comparisons between task-focused, person-centered, and hybrid approaches to semantics across different populations and objectives, particularly in the context of prevention and healthy aging. Furthermore, while expressive language interventions show great promise, their efficacy largely depends on the individual's conversational skills. We need to optimize the benefits of expressive language, particularly by training pragmatic skills to enable effective communication that ensures the speaker is both heard and understood, without exhausting the listener. Additionally, there is a need to develop corrective approaches that better structure communication and explore the most effective ways to share information.

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