

Anatomy of cognitive strategies: A therapist's primer for enabling occupational performance

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Abstract

Background. Promoting effective strategy use is an integral part of enabling occupational performance; however, there are variations in how strategies are defined, discussed, used, and applied in occupational therapy practice. **Purpose.** Focusing on cognitive strategies, in this paper, we define and describe strategies and their types and divide the concept of strategies into two dimensions: strategy attributes and strategy use. A comprehensive framework for each dimension (attribute and use) is proposed as a clinical reasoning guide as well as a foundation for future research. The frameworks are designed to reduce ambiguity, deepen understanding, and serve as clinical reasoning guides assisting therapists in specifying, describing, and observing cognitive strategies during occupational performance. **Key Issues.** We argue that there is a need for therapists to use consistent terminology and to be able to systematically select cognitive strategies and evaluate their use. **Implications.** The proposed strategy frameworks provide clinical guides for systematic analysis and selection of cognitive strategies as well as for observing components of strategy use during clients' occupational performance. We suggest the need for greater specification and description of strategies during intervention and highlight directions for future research.

Abrégé

Description. L'une des parties intégrantes de l'habilitation du rendement occupationnel est l'usage de stratégies efficaces; toutefois, dans la pratique de l'ergothérapie, on observe des variations dans la façon dont les stratégies sont définies, discutées, utilisées et appliquées. **But.** En mettant l'accent sur les stratégies cognitives, cet article définit et décrit différents types de stratégies et divise le concept des stratégies en deux dimensions : les attributs de la stratégie et l'usage de la stratégie. Les auteurs proposent un cadre complet et détaillé pour chaque dimension (attribut et usage) à titre de guide pour le raisonnement clinique et de fondement pour de futures recherches. Ces cadres sont conçus de manière à réduire l'ambiguïté, à favoriser la compréhension et à servir de guides pour le raisonnement clinique afin d'aider les ergothérapeutes à spécifier, décrire et observer des stratégies cognitives tout au long de l'habilitation du rendement occupationnel. **Questions clés.** Les auteurs argumentent que les ergothérapeutes doivent utiliser une terminologie uniforme et être aptes à choisir des stratégies cognitives et à évaluer leur usage de manière systématique. **Conséquences.** Les cadres proposés constituent des guides cliniques pour l'analyse systématique et la sélection de stratégies cognitives, et pour observer les composantes de l'usage des stratégies pendant l'habilitation du rendement occupationnel des clients. Les auteurs suggèrent l'importance de spécifier et de décrire davantage les stratégies pendant l'intervention et proposent des orientations pour de futures recherches.

Understanding effective performance requires understanding the psychology of strategies; promoting human effectiveness at a task requires understanding of the strategies that can accomplish the task and how to develop such strategies among learners. (Pressley & Harris, 2006, p. 265)

In the quotation above, Pressley and Harris, unwittingly, offer important insights into the enablement of occupational performance: promoting human effectiveness at a task requires understanding the strategies that can accomplish the task. One of our important roles as occupational therapists is to know how to support optimal strategy use among our clients to enable their occupational performance.

The focus of this paper is on cognitive strategies, specifically, what strategies are and how they can be used to facilitate skill acquisition and to enhance occu-

pational performance. The use of strategies as a means to enhance occupational performance has been emphasized in occupational therapy intervention approaches including Cognitive Orientation to daily Occupational Performance (CO-OP) (Polatajko & Mandich, 2004) and the Dynamic Model of Cognition (Toglia, 2011). Although strategies are highlighted in these models, there is a need to make the concept of strategies more accessible to clinicians and researchers by providing a structured method for describing and analyzing the characteristics of strategies. This paper dissects the concept of strategies and presents two comprehensive frameworks that classify and specify types of strategies and analyzes various aspects of strategy use so that strategies can be more clearly described and matched with the needs and abilities of an individual client. An underlying assumption of this paper is that all individuals use strategies to manage performance of occupations undertaken in daily life, whether they are aware of these strategies or not (i.e., they can be tacit). As such, strategy use is an inherent (albeit often unrecognized) part of everyone's daily occupational performance. While many individuals utilize strategies effectively, even when unaware of their use, not everyone uses strategies effectively or efficiently all the time. Many of the people we encounter clinically fall into the latter group. For example, inefficient strategy use (compared to typically developing controls) has been described in persons with autism (Steele, Meyer, & Tager-Flusberg, 2005), learning disabilities (Swanson, 1989), schizophrenia (Gsottschneider et al., 2010; Landgraf et al., 2011), substance abuse (Daig et al., 2010), developmental coordination disorder (Sangster, Beninger, Polatajko, & Mandich, 2005), and brain injuries (Strangman et al., 2009).

Individuals across the lifespan experiencing different occupational performance issues can benefit from effective strategy use to enhance their learning and performance. Occupational therapy interventions, such as the CO-OP approach (Polatajko & Mandich, 2004) and the Multicontext approach (Toglia, Johnston, Goverover, & Dain, 2010; Toglia, 2011) have demonstrated that occupational performance can be improved through strategy use. Evidence-based reviews and meta-analysis of research studies have consistently demonstrated that intervention approaches that include a focus on strategies produce the best outcomes across different groups, including persons with learning disability (Swanson & Deshler, 2003; Swanson & Sachse-Lee, 2000), brain injury (Cicerone et al., 2011), stroke (Geusgens et al., 2006; McEwen, Huijbregts, Ryan, & Polatajko, 2009), and schizophrenia (Wykes, Huddy, Cellard, McGurk, & Czobor, 2011).

As enablers of occupation, we need to understand and recognize strategy use and explicitly identify it as such, both for the individual strategy user (the client) and for ourselves. Occupational therapists frequently discuss the use of strategies to support occupational performance; however, there are wide variations in our understanding of the meaning, types, and purposes of strategy use. Clarification and conceptualization of strategies are important in bringing coherence to this broad and complex topic.

We aim to provide therapists with a primer on strategies in enabling occupational performance. While strategies have been discussed broadly in the literature in areas such as com-

munication and interpersonal skills (Eisenberg, Fabes, Minore, & Mathy, 1994; Tarone, 1981), coping (Cederlund, Thoren-Jonsson, & Dahlin, 2010; Demers, Robichaud, Gelinias, Noreau, & Desrosiers, 2008), self-management (Murphy et al., 2008) or adaptation following an illness or disability (Bottari, Lamothe, Gosselin, Gelinias, & Ptitto, 2012; Hoogerdiijk, Runge, & Haugboelle, 2011; Lyons, Erickson, & Hegel, 2012), and emotional regulation or strategies to cope with psychotic or negative experiences (Tai & Turkington, 2009), we are limiting this paper to a discussion of cognitive strategies used to optimize learning, skill acquisition, and occupational performance.

We begin with a general discussion of strategies and their use and offer a working definition that is relevant to occupational therapy. Next, we provide a comprehensive description of the various types of cognitive strategies and propose that strategies can be subdivided into two dimensions: *strategy attributes* and *strategy use*. We discuss the various attributes of cognitive strategies and present a framework that can be used to describe, specify, and classify strategies. We also present a detailed overview of the characteristics of cognitive strategy use that can be used to assist occupational therapists in their clinical reasoning when working with clients to promote effective cognitive strategy use. Finally, we discuss directions for future research.

What Are Strategies?

There are many different definitions of strategies in the literature; however, most of them refer to the behaviours and thoughts that a learner actively uses while learning in an attempt to enhance his or her information processing and, in turn, his or her achievement or success in the activity. Strategies are basically tools or plans of action used for accomplishing a task or achieving a purpose; they are always goal directed (Beckman, 2002; Harvey & Goudvis, 2007).

Strategies have also been described as tactics, procedures, or methods a person may use either consciously or automatically to acquire new skills or cope with a challenging activity or problem (Abreu & Toglia, 1987; Toglia, 2005). Thus, strategy use includes the application of "how to" knowledge.

Within the rehabilitation context, the term strategy is often linked with compensation and is often viewed as the end product of intervention (Giles, 2011; Katz, Baum, & Maier, 2011; Koh, Hoffmann, Bennett, & McKenna, 2009). For example, compensatory strategies have been described as methods that are taught to clients to help them substitute for an impaired skill that cannot be re-established (Geusgens, Winkens, van Heugten, Jolles, & van den Heuvel, 2007). A strategy, however, can be more than the end goal of an intervention and can extend beyond compensatory methods. Strategies are a part of typical learning and performance (Harris, Alexander, & Graham, 2008). Pressley and his colleagues "conceived of effective strategy use as good information processing" (Harris et al., 2008, p. 86). Strategies help us take in and integrate information more deeply and increase efficient use and allocation of cognitive resources (Pressley & Harris, 2006). Normally a person orchestrates the use of multiple strategies to enhance his or her performance and learning (Reid & Lienemann, 2006). For both children and adults, strategies support skill acquisition or re-acquisition and help individuals regulate and manage chal-

lenges in learning or performance. Strategies, therefore, play a key role in the process of the learning and performance of tasks (Polatajko & Mandich, 2004; Walsh & Anderson, 2009).

What Is a Cognitive Strategy?

Cognitive strategies are a particular class of strategies. A number of definitions of cognitive strategies have been provided in the literature, including a cognitive tool put into place to help learn, memorize, and problem solve (Paris & Byrnes, 1989); a goal-directed, cognitive operation used to facilitate learning and task performance (Shaffer & Kipp, 2009); or a guide or heuristic that supports the learner in developing internal procedures that enable him or her to perform operations (Rosenshine, 1997). Cognitive strategies are involved in all activities that require thinking, planning, and decision making; using a cognitive strategy increases the probability of successful performance. Westwood (2004) describes effective cognitive strategy use as that which “enables learners to plan what they will do, and then monitor and modify their own thoughts and actions as they proceed” (p. 6). This description identifies several aspects of strategy use, including the learner’s strategy use, his or her metacognition, and self-regulation (which represents ways in which a learner changes his or her approach to a problem) as he or she tries to perform the activity.

The purpose of cognitive strategy use is to support learning or performance. Cognitive strategies are used to acquire new skills and to make task performance easier, quicker, or more efficient (Reid & Lienemann, 2006). Across a variety of different tasks and domains, strategies have been shown to increase efficiency and accuracy in performance (Walsh & Anderson, 2009). Strategies also help a person deal with challenges to his or her occupational performance. Although the majority of the literature focuses on the use of cognitive strategies within academic contexts and with children (Meltzer et al., 2006; Pressley & Harris, 2006; Reid & Lienemann, 2006; Swanson & Deshler, 2003), there is also considerable evidence that demonstrates that cognitive strategies are important in motor-skill acquisition and occupational performance in both children and adults (McEwen et al., 2009; Miller, Polatajko, Missiuna, Mandich, & Macnab, 2001; Polatajko, Mandich, Miller, & Macnab, 2001; Toglia, Goverover, Johnston, & Dain, 2011).

From the above it can be seen that, in essence, a cognitive strategy is a mental plan of action that allows a person to approach a new task systematically (Westwood, 2006). Strategies, in effect, are mind tools for learning and adaptation because they help a person to adapt to external demands and support occupational acquisition or performance. For the purposes of this paper, we propose, as a working definition, that a cognitive strategy is a mental plan of action that helps a person to learn, problem solve, and perform and that the use of cognitive strategies can improve an individual’s learning, problem solving, and task performance in terms of efficiency, speed, accuracy, and consistency.

Types of Cognitive Strategies

There are numerous lists and descriptions of different types of cognitive strategies in the literature (Dole, Nokes, & Drits, 2009; Singer & Chen, 1994; Weinstein, Acce, & Jung, 2011).

This reflects a lack of consensus on how types of strategies can be grouped or described. For example, cognitive strategies have been described in terms of the depth of information processing (e.g., deep versus surface strategies [Vermunt & Vermetten, 2004]); whether they are external (overt or visible) or internal (covert or invisible mental processes) (Bouazzaoui et al., 2010; Toglia, 2011), and domain specific or general (Polatajko & Mandich, 2004). Cognitive strategies have also been divided into learning strategies (e.g., acquiring, selecting, organizing, or rehearsing material to be learned), and self-regulation or metacognitive strategies (e.g., checking, monitoring, planning, predicting, and gauging performance) (Brown, 1987; Dole et al., 2009). Learning strategies have been further subdivided according to cognitive domains (e.g., attention, memory, comprehension, or problem-solving strategies) and academic content areas (e.g., reading, math, or writing strategies) (Meltzer et al., 2006; Reid & Lienemann, 2006).

Classifying cognitive strategies is not a simple matter, hence, the evolution of different approaches to describing strategies. These variations have resulted in ambiguity regarding the concept of cognitive strategies. Thus, it is not always clear how strategies differ from one another or what aspects of strategies should be considered by therapists in choosing, selecting, or evaluating a strategy.

Table 1 offers one approach to the description of different types of commonly used cognitive strategies. The broad and diverse nature of cognitive strategies is illustrated in this table. While some strategies involve changing or adjusting task features, procedures, or sensory cues, others involve the person’s mental operations, inner speech, or use of mental imagery. We chose to create a descriptive typography, using three main types for the purposes of initial description: (1) modality specific strategies—various sensory cues or prompts that a person provides for him- or herself; (2) mental or self-verbalization strategies—techniques that involve mental operations, inner speech or imagery, or thinking/talking aloud; and (3) task specification or modification strategies—changing or adjusting the task or environment. The latter is differentiated from adaptive techniques where other people, such as caregivers, parents, teachers, or therapists, adjust and modify the task or environment for the person rather than the person planning and initiating the change to the task or environment him- or herself. These three types of strategies are not intended to be either mutually exclusive or all inclusive; rather, we present this description as a starting point for understanding the many varied strategies that appear in the literature.

Another approach to identifying strategies is to group strategies according to their primary purpose(s). A strategy matrix (see Table 2) illustrates how the same cognitive strategies can also be re-organized according to purposes such as performance, learning, or self-regulation or specific functions such as memory, problem solving, and motor-skill acquisition.

The classification of cognitive strategies presents challenges because often the same strategy can be applied and used differently depending on the problem, goal, client factors, activity demands, time, and context. For example, as indicated in Table 2, a strategy such as using mental imagery can be used in different contexts and activities to support motor-skill acquisition, reading comprehension, or self-regulation. We argue therefore, that

Table 1
A Descriptive Typography of Cognitive Strategies

Strategies	Description
Modality-specific Strategies	Visual, tactile, auditory, or kinesthetic cues. For example, use of pictures, signs, tones, vibrating beeper, light touch, deep pressure, movement to attract attention, provide guidance in task steps, or prompt memory or actions.
Mental or Self-verbalization Strategies	A broad category of techniques that involve mental operations, inner speech or imagery, or thinking and talking aloud.
Rehearsal	Repeating information mentally or verbally such as key words, rules, procedures, action steps, or facts to enhance retention of information or procedures. Includes imagined, mental practice of procedures or performance of a task as opposed to actual practice.
Mnemonic technique (across modalities)	Forming associations between words, sets of words, pictures, or images to cue actions or recall.
Rote scripts	Repeating information that has been coded or abbreviated to guide a sequence of actions or enhance recall of information.
Association	Linking similar information together based on previous experiences, knowledge of categories, or physical similarities.
Elaboration (mental, verbal)	Expands or adds to new information (adding new words, sentences, images, symbols or actions) and relates it to previous information.
Imagery	Mental images involve transforming physical objects, events, actions, or experiences into images, symbols, or representations. Mental imagery is not just visual as it can involve imaging smells, textures, sounds, or the feel of movements.
Reconstruction (mental verbal)	Thinking back involves replaying, imagining, or verbalizing a previous activity, experience, or context to assist in guiding performance in a new a situation.
Anticipation (mental verbal)	Imagining or verbalizing potential challenges or obstacles, possible scenarios, or outcomes to assist in preparing for a task (e.g., before going shopping, thinking about self-dealing with crowds, noise, and lights without difficulty).
Translation	Translation of information such as written instructions, procedures, or actions into images, phrases, or more manageable chunks of information.
Self-guidance	Provide oneself instructions, self-cues, or reminders to prepare or guide oneself through a task (self-instruction, self-talk, talk aloud).
Self-coaching	Positive self-talk, thinking, and encouragement to increase persistence or to help regulate and control emotions (e.g., you can do this, stay calm).
Self-questioning	Imagining or asking oneself key questions related to the task or performance.
Knowledge	Identifying, verbalizing, or thinking about what one knows about a task before beginning.
Task Specification/Modification	Strategies that involves specifying, changing, or adjusting the task stimuli or arrangement
Stimuli reduction	Decreasing the amount of information or number of items presented at any one time, covering or removing part of task stimuli.
Organization	Reorganizing task materials or steps so that similar items or steps are together (association, categorization).
Task simplification	Breaking apart steps or reducing steps or activity into more manageable parts.
Lists	Creating or using a written, pictorial, or audiotaped list of steps to guide performance or cue actions.
Pacing strategies	Actions that assist with the timing of activities, e.g., taking breaks, spreading activities throughout the day, completing partial tasks, etc. Humming a tone, singing a song or rhythm, or counting to oneself or out loud, tapping one's foot to a rhythm to assist with the timing of actions.
Task specification	Identify specific relevant features or components of a task prior to an activity that requires careful consideration, planning, or attention.
Attention to doing	Identifying key cues or features to pay attention to during performance.
Finger pointing	Pointing to relevant task stimuli to enhance attention to details or to pace timing within a task.

Note. Examples of cognitive strategies are based on Polatajko and Mandich (2004) and Toglia (2011).

Table 2
Types of Cognitive Strategies According to Purpose

Strategies	Performance	Learning Strategies	Self-regulation	Problem Solving	Memory Strategies	Motor-skill Acquisition or Reacquisition
Modality-specific strategies	X		X			X
Rehearsal	X	X			X	X
Mnemonics		X			X	
Rote scripts	X	X			X	X
Association		X			X	
Imagery	X	X	X	X	X	X
Elaboration (mental,verbal)		X			X	
Reconstruction (mental verbal)	X			X		
Anticipation (mental verbal)	X		X	X		X
Translation		X		X	X	
Self-guidance	X		X	X		X
Self-coaching	X		X			X
Self-questioning	X	X	X	X		X
Knowledge	X					X
Stimuli reduction	X	X		X		
Organization	X			X		
Task simplification	X			X		
Lists	X			X		
Pacing strategies	X	X	X			X
Task specification	X			X		X
Attention to doing	X					X
Finger pointing	X					

although there are a variety of methods for grouping or categorizing strategies, including those illustrated in Tables 1 and 2, they are inadequate for conveying the full scope of cognitive strategy characteristics. A framework is needed to take into account the multiple ways that strategies can be applied and used.

The Dimensions of Cognitive Strategies

Cognitive strategies have different dimensions (attributes and uses) that need to be clearly articulated, specified, and analyzed so that therapists can use them more effectively during intervention. This need was recognized by Singer and Chen (1994), who proposed an initial strategy classification scheme in the psychomotor literature that incorporated four attributes: (1) source (externally or internally imposed); (2) orientation (person or task); (3) purpose (learning or performance); and (4) scope (task specificity or generality). Here, we propose two frameworks for occupational therapy that incorporate these concepts and further expand upon the analysis of cognitive strategies within the context of the person, task, and environment.

We propose that cognitive strategies can be divided into two distinct dimensions. The first dimension involves the attributes of strategy while the second has to do with the use of the strategy. Each of these global dimensions is described as a separate framework that can be further unpacked as described below.

Cognitive Strategy Attributes

We propose a framework that identifies seven general attributes that can be used to describe and organize cognitive strategies.

These attributes are (1) strategy outcome; (2) strategy purpose; (3) range of application; (4) visibility; (5) permanence; (6) performance phase; and (7) strategy target (see Figure 1). Each of these attributes includes a range of behaviours that are further described below.

Table 3 provides examples of how these multiple attributes can be used simultaneously within the clinical context so that strategies that are used in intervention are more precisely described. The purpose of this framework is to guide clinicians' reasoning with respect to describing, analysing, and selecting a potential strategy for a particular client's unique performance problem. The framework is also designed to help clarify the differences between strategies and to illustrate the range of strategy applications so that they can be better used in intervention.

We propose that when therapists are reasoning about cognitive strategy use with a client that the first consideration is to clearly identify the desired outcome and purpose the strategy will serve in supporting that outcome. Desired strategy outcomes include the acquisition or reacquisition of skills, enhanced ability to cope with cognitive challenges, and optimal performance. Strategy purposes can be broadly grouped into strategies that are directed towards skills and performance, learning, or self-regulation. Performance strategies support the accuracy, quality, or proficiency of performance during an activity, and learning strategies help the individual to optimize his or her attention, comprehension, retention, and integration of information during learning. Further, self-regulation strategies help a person monitor his or her emotions or arousal (self-regulate), detect errors, and evaluate ongoing performance in relationship to the desired outcome. Self-regulation strategies can co-occur with performance or learning strategies.

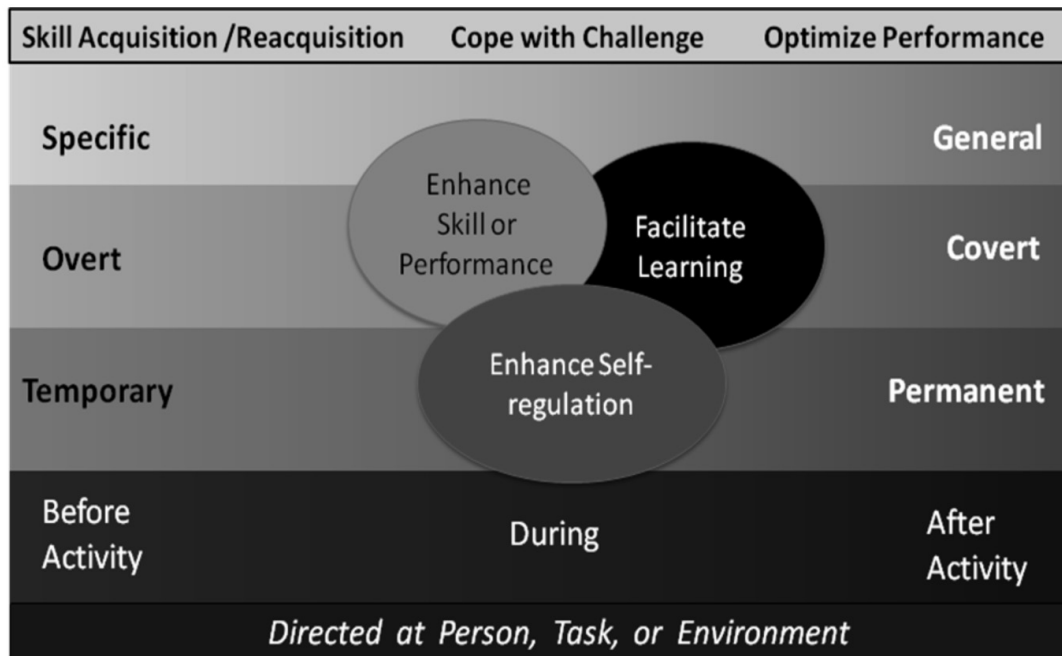


Figure 1. Attributes of cognitive strategies.

Generally, individuals switch between self-regulation, learning, or performance strategies and adjust these as needed depending on the demands of the activity and context. In some situations, there may be greater use of performance strategies, while in other situations, learning strategies may be primarily used, illustrating that use of strategies is typically flexible.

An important consideration in cognitive strategy selection is the range of strategy applications or the degree to which the strategy is applicable across activities, contexts, and situations. Strategies can be restricted to specific activities and contexts or can be used widely across many different situations. For example, the strategy of mentally visualizing oneself keeping both feet together while jumping rope is specific to the task of jumping rope; however, the broad strategy of mental imagery can also be applied across different tasks. Although the strategy may be the same, the intended range and scope of use may be very different; this has important implications for intervention. Intervention with the goal of improvement in a specific task (such as safely crossing the road) is very different than an intervention that is focused on the goal of strategy use across tasks (such as assisting a child with motor problems to use one hand to stabilize tasks while the other hand is actively doing, such as writing, using scissors, stirring in a bowl, holding a ruler to rule a margin).

Cognitive strategies can be directed at the task or environment or they can be oriented toward the person. Environment- or task-oriented strategies involve analyzing or modifying external demands or adjusting one's attention to specific task or environmental features. Person-oriented strategies include methods that enhance the person's retention, comprehension, and general abilities to attend, monitor, and regulate performance (Singer & Chen, 1994). Once again, the same strategy can be directed towards the person, the task, or environment. For example, self-talk or self-guidance can be used to attend to features of a task such as "foot on the pedals" when learning to ride a bicycle. Self-guidance can also be used as a general

reminder to "slow down" and help control the person's impulsive actions, which may be useful across multiple tasks.

Additional considerations include the visibility, permanence, and performance phase of strategies. For example, strategies may be overt, or easily visible, and observable by others (e.g., a person checks off a task on his or her list before moving on), or they may be covert, internalized, or hidden (e.g., a mental image that assists performance). Typically, people use a combination of overt and covert strategies in everyday life. Strategies that are overt may gradually become internalized or covert, particularly when the person becomes more proficient in their use. For example, studies of strategy development show a trend from overt to covert strategy use in children aged 7 to 11 (Winsler & Naglieri, 2003) and a trend from covert to overt or external strategy use during normal aging (Bouazzaoui et al., 2010). Bouazzaoui and colleagues (2010) hypothesized that covert strategies place greater demand on cognitive resources than overt strategies.

With respect to permanence, cognitive strategies may be used in the initial phases of acquisition or re-acquisition of skills and then gradually fade as performance becomes automatic. For example, in learning to play tennis, a person may initially use mental self-instructions or reminders during a swing, such as "keep elbow slightly bent" or "eye on ball." As proficiency is attained, these mental self-cues are no longer needed. Strategies, however, may also be used permanently to support performance (e.g., a timer is always used to remember to take a cake out of the oven). In addition, strategies can be activated whenever needed. For example, strategy use may be activated during automatic or routine task performance when confronted with obstacles, unexpected situations, or additional challenges (Taylor & Ivry, 2011) (e.g., individuals often switch off the radio when driving in new environments or when the rain becomes heavy).

Finally, it is important to recognize that cognitive strategies can be identified within phases of performance, not just

Table 3
Clinical Application of Cognitive Strategy Attributes

Performance Problem	Desired Outcome	Strategy and Example	Strategy Purpose	Range	Visibility	Permanence	Performance Phase	Strategy Target
During jumping rope, child jumps in wrong spot and often misses	Accurately and efficiently jump rope <i>Skill acquisition</i>	Sensory (Visual) cue – Child looks for tape on the floor when jumping rope (task modification)	Optimize skill performance	Specific	Covert	Temporary	During activity	Environ.
Client misses items on the left side	Locate information on both sides of environment during activities <i>Skill reacquisition</i>	Sensory (Visual) cue – Client places a brightly colored object on the left side before beginning activities such as eating, grooming, or writing	Optimize performance	General	Overt then covert	Temporary or permanent	Before and during activities	Environ.
Child does not initiate or follow morning routine through to completion	Completion of morning routine <i>Skill acquisition</i>	Task Modification: List: Child refers to a written list of steps of a morning routine and places star on a wall chart when each step is completed.	Learn a specific daily routine	Specific	Overt	Temporary (until routine is learned)	During task	Task
Client's performance is disorganized and haphazard	Enhance performance in multistep tasks <i>Cope with challenge</i>	Task Modification: List: Client taught to make a list of steps prior to every activity to help planning and reduce tendency to jump into a task haphazardly.	Enhance planning and efficiency	General	Overt	Permanent	Before	Person and task
Client shows lack of attention to detail	Independence in paying bills <i>Skill reacquisition</i>	Task Modification - Client uses list of key steps to check performance. For example, — Located balance due on bill — Wrote check for \$122.40	Enhance self-monitoring	Specific	Overt	Temporary or permanent	After task	Task
Client becomes easily sidetracked, and leaves out steps	Increase ability to carry out multiple-step activities <i>Cope with challenge</i>	Mental Rehearsal - Prior to multiple step activities, client mentally imagines, rehearses, and pictures oneself doing each step.	Optimize performance	General	Covert	Temporary or permanent	Before	Person and task
During jump rope, child's feet are not together	Increase accuracy in jumping rope <i>Skill acquisition</i>	Mental Rehearsal – Child pictures movement in head, imagines or feels the jump with both feet together	Optimize performance	Specific	Covert	Temporary	Before and during	Task
Client easily becomes frustrated with challenging tasks	Increase frustration tolerance in challenging activities <i>Cope with challenge</i>	Mental Rehearsal – Client mentally imagines a calm ocean whenever he or she begins to feel angry or upset.	Enhance self-regulation	General	Covert	Temporary or permanent	During	Person

Table 3. Clinical Application of Cognitive Strategy Attributes. Continued ...

Performance Problem	Desired Outcome	Strategy and Example	Strategy Purpose	Range	Visibility	Permanence	Performance Phase	Strategy Target
Poor spacing of letters when child is writing name	Write name legibly <i>Skill acquisition</i>	Self-verbalization: Self-guidance – Child uses self-cues aloud when writing (e.g., “S takes the full space, u takes up a half space”).	Optimize performance	Specific	During	Overt then covert	Temporary	Task
Client only recalls last step of 2- or 3-step directions	Accurate recall of new 3-step directions <i>Learning or acquisition</i>	Self-verbalization: Verbal Rehearsal – Client repeats and rehearses each step of instructions silently to self	Optimize learning	General	During	Covert	Temporary or permanent	Person
Client often misses steps; leaves out key ingredients	Independence in cooking tasks <i>Skill reacquisition</i>	Self-verbalization: Self Questioning – Client double checks and asks self-questions such as - Did I complete every step? Did I do everything I needed to do?	Cope with challenge	Across all cooking tasks	After task	Overt then covert	Temporary or permanent	Person
During jump rope, child jumps too early or late (poor timing)	Accurately jump rope <i>Skill acquisition</i>	Self-verbalization: Verbal script – Child repeats script to self “Jump before rope touches ground”	Skill acquisition, performance, & learning	Specific	During	Covert	Temporary	Task

Note: Environ. = Environment

used during an activity. Important strategies may be used prior to beginning an activity or immediately after an activity. Strategies used before an activity may help a person to plan ahead, anticipate challenges, and guide and organize performance. For example, the strategy of mental rehearsal or picturing oneself giving a speech at a graduation can help one organize one’s thoughts and increase confidence prior to the actual event. Strategies used immediately after an activity can help a person to self-evaluate his or her performance or learning and compare the outcome to the intended goal.

Table 3 illustrates how the proposed cognitive strategy attribute framework can be used clinically to analyze, describe, and compare strategies to address different clinical problems and desired outcomes across different age groups. It also illustrates how the same type of strategies can be applied in different ways depending on the purpose and strategy attributes. For example, strategies such as visual cues, lists, mental rehearsal, and self-verbalization can have varying attributes and be used to address different clinical problems and goals. This framework also serves as a guide to enhance clinical reasoning in selecting a strategy by providing a structure to specify and consider the type of strategy and how it will be used in intervention. For example, we recommend that clinicians first identify the presenting issue or problem that the client is experiencing with the client’s use of a strategy, the desired outcome, and the purpose of the strategy. This information guides the clinician in considering additional questions, such as:

1. Will the strategy be used in specific tasks or contexts or will the strategy be used across a wide variety of situations (i.e., across a range of applications)?
2. Will the strategy be observable (overt) and then gradually faded or internalized (covert), or will it remain overt (visibility)?
3. Will the strategy be faded as treatment progresses, or is it expected to be used permanently to support performance (permanence)?
4. Will the strategy be used before, during, after, or throughout an activity (performance phase)?
5. Is the strategy best directed towards the task or environment or towards the person?

These questions allow specification of the strategy attributes and provide clear and consistent reasoning for identifying what is required during intervention and how strategies can and will be used in intervention.

Cognitive Strategy Use

The second major dimension of cognitive strategies addresses the use of a strategy. Whereas the previous section described attributes that are inherent within the strategy itself, strategy use also closely aligns with the characteristics of the person.

Table 4 outlines a framework that summarizes different aspects of strategy use that can be used to guide the therapist’s reasoning about client readiness as well as successful strategy use. Strategy use can be subdivided into those aspects that are relevant prior to a task (e.g., prerequisites to strategy use) and those that may be observed during or immediately after a task (e.g., strategy execution, quality, monitoring and evaluation, and effect on learning or performance).

Prerequisites for effective cognitive strategy use include the person’s general knowledge, repertoire, and beliefs about

the value of strategies. A person needs to know about different strategies, what they are, when and why they should be used, and how they can help. For example, a child who is unable to tie his shoelaces may be able to do so when instructed to mentally picture “bunny ears.” Performance that reflects limited strategy knowledge often improves once a new strategy is taught. A key prerequisite is ensuring that a person knows a wide range of strategies; however, knowledge of a strategy alone is insufficient for effectively using the strategy. Knowing a strategy, does not mean that a person recognizes when it is needed or believes the strategy will help performance (Harris et al., 2008).

Within the context of a specific activity, a person also needs to be able to accurately “size up” a task in relationship to his or her abilities. For example, a person with an acquired brain injury may not initiate use of strategies to recall information, even though he or she is able to identify strategies that could help with remembering. Although knowledge of strategies may be intact, the person may not use them because he or she does not recognize the need for strategies within the context of the situation or may not believe that anything will help. Independent strategy use involves anticipating potential

obstacles, recognizing when strategies can help, and selecting or generating a strategy that is appropriate for the task. Beliefs about strategies are also important. If a person does not think that there is anything he or she can do to improve or change his or her performance, generation and use of strategies are likely to be limited.

Cognitive strategies can be provided by others or can be internally generated or discovered by the people themselves. Independent strategy use involves self-generation of strategies; thus, even when others initially provide strategies, the goal is for the person to self-generate the strategy him- or herself (Singer & Chen, 1994).

The preceding discussion implies that it is not enough to know that a person can carry out a strategy when it is provided or prompted by others. The full range of prerequisites for cognitive strategy use needs to be considered carefully and analyzed as clients may be able to execute a strategy that is provided but be unable to generate or spontaneously use strategies in everyday life. Similarly, a person may have all the necessary prerequisites for using a strategy but may have difficulty executing it completely, accurately, or efficiently and monitoring

Table 4

A Framework for Analysis of Cognitive Strategy Use: A Clinical Reasoning Tool

A. Prerequisites to Effective Strategy Use	Therapist Observations and Comments
1. Strategy knowledge <i>Does client know what a strategy is, how a strategy operates, and when and why it should be applied?</i> 2. Strategy repertoire <i>Is the client's range or repertoire of strategies adequate?</i> 3. Strategy beliefs <i>What are the client's beliefs about strategies (e.g., strategy use will influence outcome or strategies will not help performance)?</i> 4. Anticipation and recognition of need <i>Does the client anticipate and recognize task challenges? Does the client identify the need to use a strategy within an activity context?</i> 5. Strategy generation and selection <i>Does the client self-generate, state, or self-select strategies for activities or are strategies selected and provided by others?</i>	
B. Strategy Execution 1. Initiation <i>Is strategy spontaneously initiated by the client?</i> 2. Implementation <i>Are strategies carried out completely and accurately</i> 3. Number of strategies <i>Can the client use and coordinate multiple strategies simultaneously? Single strategies only?</i>	
C. Quality of Strategy Use 1. Degree of effort <i>What is the degree of effort or resources needed to use strategies (e.g., does degree of effort negatively affect performance or speed)?</i> 2. Temporal pattern <i>What are the timing and frequency of strategy use (e.g., are strategies used too late, over-used, fading too soon, or fluctuating)?</i> 3. Flexibility of strategy use <i>Does client adjust or switch strategies when needed?</i> 4. Monitoring and evaluating strategy use <i>Does client know when strategies have not been efficient or effective? Are performance errors recognized?</i>	
D. Effectiveness of Strategy Use <i>Are positive changes in learning, problem solving, or performance outcomes observed with strategy use?</i>	

or evaluating the effectiveness of strategy use.

Execution of cognitive strategies requires consideration of the number of strategies the person is using simultaneously, initiation and complete execution of the strategy(ies), as well as the quality of strategy use. For example, use of a checklist may involve several strategies, including referring to and checking off each step as it is completed as well as underlining, circling, or highlighting key details on the list. Incomplete strategy use is observed if the strategy is carried out only partially (e.g., person refers to list but does not check off steps completed). Poor quality of strategy use is observed if the person checks off the item before completing it or uses the list too late, after completing several steps. The quality of strategy use includes efficient timing as well as the ability to adjust or switch strategies when needed without a great deal of effort.

It is important to recognize that task demands need to be matched with the person's abilities to promote efficient and high quality use of strategies. If too much effort is required or if too many strategies are attempted at once, limitations in cognitive resources could compromise performance and learning. The resources required to use the strategy could compete with the resources needed for task performance. Strategies that consume too many cognitive resources are likely to be ineffective in enhancing performance. In these situations, the cognitive demands of the task may need to be lowered for effective strategy generation and use. Strategy use generally increases with greater task demands or cognitive challenges (Bray, Huffman, & Fletcher, 1999) in typically developing individuals; however, if the task is too difficult, strategies can be ineffective (Waters & Kunnmann, 2010). Finally, effective cognitive strategy use requires recognition of performance errors and knowing when a strategy is not working. The ability to step back and self-evaluate the effectiveness of strategy use and performance by reviewing, checking, and comparing outcomes with goals allows one to make corrections, revisions, and generate new strategies for the future.

In summary, strategy execution and quality of strategy use include several subcomponents, such as spontaneous initiation, complete implementation, flexible use of multiple strategies, minimal effort to execute, and activation when needed. Ongoing monitoring and evaluation of strategy effectiveness are critical aspects of successful use of strategies. Effective strategy use increases the confidence with which a person approaches a task as well as increasing accuracy, speed, or efficiency of learning and performance.

Cognitive strategies have sometimes been viewed as quick-fix solutions because once a person demonstrates skill in carrying out a strategy, it is assumed that he or she will use it (Singer & Chen, 1994). This is not always the case. Table 4 illustrates that there are many different reasons for a person's having difficulty applying and using strategies in everyday life. This has implications for occupational therapy assessment and intervention. Both the prerequisites to strategy use and the components of strategy execution and quality should be carefully observed during activity performance and probed during pre- and post-activity interviews. It is not enough to demonstrate or instruct a person in strategy use. Interventions need to go beyond "showing and doing"; they must incorporate methods to help a person discover, understand, anticipate, or recognize the need for the strategy and know when it needs to be used, modified, or adjusted within the context of an activity.

In other words, awareness of performance or what it takes to obtain a successful result in a specific activity or learning situation needs to be emphasized during intervention.

Discussion

The preceding discussion highlights the complexity of successful strategy use and provides a deeper look at the concept of "cognitive strategy" as it relates to occupational therapy. It supports existing occupational therapy approaches and models (Polatajko, Mandich, & McEwen, 2011; Polatajko & Mandich, 2004; Toglia, 2011) that emphasize strategy use by expanding methods for describing and analyzing cognitive strategies. The concept of "cognitive strategy" was divided into two dimensions (attributes and use) and a framework for each dimension has been proposed. One of the strengths of the frameworks is that they can be used to assist therapists' clinical reasoning and to help with reflection on everyday practice as well as a foundation for research.

For example, the proposed framework for cognitive strategy attributes provides a consistent method for describing strategy characteristics. This specification provides a way of reasoning about the selection and choice of strategies as well as allowing clinicians and researchers to more clearly articulate, specify, and compare what is involved in strategy interventions. For example, use of a list for multiple-step activities is often described within occupational therapy interventions. Table 3 challenges therapists to think carefully about how strategies such as a list are being used and how the same strategy might have different attributes or characteristics when used with different clients. Research studies could use this framework as a guide to investigate and describe the attributes of strategies most often selected by therapists for different types of clients or interventions. In addition, consistent methods of describing strategies are necessary to compare interventions that use strategies.

The proposed framework for cognitive strategy use identifies the components involved in effective use of strategies. For example, Table 4 provides an outline for observing, reasoning about, and analyzing the components of strategy use so that the reasons for a person's difficulty in effectively using strategies can be identified and understood. This guide could be further developed, refined, and tested by examining therapist interrater agreement and internal consistency of items. In addition, potential research questions for future investigation include the following: What are the most common reasons for difficulties in effectively using strategies during occupational performance? Are there particular types of clients that have difficulties with certain aspects of strategy use (e.g., prerequisites, execution, or quality; see Table 4).

Another strength of the proposed frameworks is their applicability to all stages of the lifespan and to diverse areas of practice, including working with children with developmental and learning issues or acquired injuries; adult mental health; as well as adult rehabilitation contexts such as neurology, stroke, and acquired brain injury. Although the applications are broad, the frameworks are drawn from literature focused on learning as well as the authors' clinical and research experience in using and studying strategy use with children and adults. Strategy research in areas such as coping, adaptation, self-management, health promotion, stress or time management, interpersonal skills, and

managing negative thoughts or emotions were not included. While this may be viewed as a limitation, our primary focus and purpose was to propose an initial conceptual framework of cognitive strategies situated within learning and performance.

Conclusion

The frameworks proposed in this paper further unpack the term “cognitive strategy” so that interventions that use strategies for the purposes of enhancing learning and performance can be better described, analyzed, and compared. There is a need to examine and test the proposed frameworks empirically as well as to continue to refine them. If we are to use strategies effectively with our clients, we need first to be able to describe and understand them, and, through developing a common language and framework, we are likely to be better able to research their use with the clients whose occupational performance we aim to enhance.

Key Messages

- Strategies are not just compensatory. They support skill acquisition or reacquisition and help individuals regulate and manage challenges in learning and performing occupations.
- Enabling occupational performance requires skilled use of strategies requiring careful consideration of the attributes of strategies as well as analysis and observation of effective strategy use.
- The proposed strategy frameworks can be used to specify and select strategies for enabling occupational performance.

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