Studies of clinical reasoning are essential if we are to extend our knowledge of occupational therapy practice, better communicate our work to clients and colleagues, and reveal to our students the nuances of therapy that cannot be gained from texts. However, accessing therapists' clinical reasoning is not an easy task because these cognitive processes can be studied only indirectly. The aim of this article is to promote the study of clinical reasoning by reviewing a new approach to data collection in this field. To achieve this purpose, the article outlines current data collection methods, such as the think-aloud method, written notes, free recall, and audio-assisted and video-assisted recall. A novel method involving a head-mounted video camera is described, and details are provided on a modified approach to debriefing using video-assisted recall. Anecdotes from the author's experience of using this technology illustrate the text.

Several articles in the occupational therapy literature explore the concept of clinical reasoning (Burke & DePoy, 1991; Rogers, 1983; Schell & Cervero, 1993; Strong, Gilbert, Cassidy, & Bennett, 1995) and approaches to teaching clinical reasoning (Neistadt, 1996, 1998; Neistadt, Wight, & Mulligan, 1998; VanLeit, 1995). However, since Mattingly and Fleming's (1994) seminal research that organized the types of reasoning and developed a language to describe clinical reasoning in occupational therapy, relatively few research-based studies have examined this phenomenon.

Studying clinical reasoning in the complex "real-world" therapy environment presents many challenges to the researcher because of the range of problems clinicians work on with their clients, the large amounts of interrelated information used when solving problems, the number of appropriate therapy options the client and therapist can choose to pursue, the dynamic nature of the therapy process (i.e., choices made change the decision environment for subsequent choices), and the fact that the timing of a therapeutic action can be as important as the selection. The quantitative methods that traditionally have been used to study medical decision making have limited application in occupational therapy research because our profession is more interested in how therapists "think in action" rather than diagnose. Hence, the majority of occupational therapy researchers use qualitative approaches when studying clinical reasoning (Mattingly & Fleming, 1994; Roberts, 1996; Rogers & Masagatani, 1982).

Several occupational therapy researchers have used semistructured interviews to elicit clinicians' thoughts and
intentions related to therapy sessions (Crabtree & Lyons, 1997; Creighton, Dijkers, Bennett, & Brown, 1995). However, this approach is not suitable if the researcher wants to access directly what therapists are thinking as they work. The assumption is usually made that most competent practitioners in a number of professions “know more than they can say.” Additionally, when confronted with an account of their performances, these practitioners often reveal a capacity to articulate this tacit knowledge (Schön, 1983). Hence, audio-assisted recall (where the therapist listens to an audiotape of the therapy session and uses this to aid recall of his or her reasoning processes) and video-assisted recall (where video footage is used to prompt recall of reasoning processes) are popular methods of eliciting clinical reasoning data (Embrey, Guthrie, White, & Dietz, 1996; Greenwood & King, 1995; Mattingly & Fleming, 1994). Other methods to access therapists’ reasoning processes include asking therapists to write notes as they solve a problem; the “think-aloud” method, where the therapist provides a verbal commentary during a therapy session; and free recall, where the therapist presents his or her reasoning about a therapy session afterward from memory. These five data collection methods are generally described as either concurrent or retrospective reports.

This article presents an overview of these five data collection techniques (including merits, pitfalls, and research examples) as background information before describing a new approach to data capture using a head-mounted video camera and a modification to the video-assisted recall technique. These techniques provide a powerful new approach to studying clinicians’ reasoning processes.

Concurrent Reports

Written Notes Using Vignettes

Researchers using quantitative methods to investigate clinical decisions frequently use carefully constructed written case vignettes to present client information to therapists (Elstein, Shulman, & Sprafka, 1978; Fonteyn & Fisher, 1995; Unsworth, Thomas, & Greenwood, 1995). On the basis of clinician’s decision, cue (information) selection and weights (the importance of the cue) are analyzed. For example, when formulating housing recommendations to suggest to clients after stroke, health care teams consider such cues as the client’s self-care ability and social supports as more important than the client’s age or the length of time poststroke (Unsworth et al., 1995; Unsworth & Thomas, 1993). When using a qualitative approach to understanding clinical reasoning processes, researchers can ask therapists to write notes about what they are thinking as they review written case vignettes. For example, Roberts (1996) examined the reasoning processes of 38 occupational therapists by asking them to write their thoughts in response to a written referral for a new client. The validity of data collected using this method relies on the therapist’s ability to write about his or her thought processes. Writing one’s thoughts can be more difficult than verbalizing them, given the more laborious nature of creating a written record and the greater potential to censor what is documented in writing (Roberts, 1996). Additionally, therapist reasoning processes inspired by vignettes may lack ecological validity because written case studies do not reproduce the complex and dynamic environment in which real clinical reasoning occurs.

Think Aloud

Newell and Simon (1972) first described the think-aloud method to capture clinical reasoning data, which Ericsson and Simon (1993) presented in detail in the premiere text in this field. The think-aloud method also can be used to obtain retrospective reports. Thinking aloud is commonplace in our daily lives as we communicate our thoughts and ideas to others. However, whereas on some occasions we may talk as we think, on others we may process our thoughts before articulating them. Ericsson and Simon described three different levels at which persons may verbalize thought processes and their content. To obtain Level 1 verbalizations, the therapist (subject) undertakes a usual therapy session with the client but is instructed to verbalize the thoughts and intentions that are within his or her “current sphere.” In this approach, it is important that therapists are requested to focus on the therapy session as a whole while verbalizing rather than explaining verbally each part of the session. Hence, the therapist need expend no special effort to communicate his or her thoughts. Most researchers using the think-aloud method aim to attain Level 1 verbalizations from their subjects. If the therapist is required to translate information in the therapy session into language before “thinking out loud,” then such verbalizations are described as Level 2. Level 2 verbalizations do not bring new information to the therapist’s attention, but explicate information that is already held internally. For example, when describing the odor emanating from a splint that a client has worn for too long, the therapist has to process sensory input about the odor and then translate this into language. Finally, requests to verbalize specific information, such as explanations or reasons, are Level 3 verbalizations. For example, the therapist may be asked to explain why he or she chose a specific intervention. Such a question requires the therapist not only to articulate current ideas and hypotheses, but also to link these with stored thoughts and information. Ericsson and Simon argued that requesting Level 3 verbalizations can change the subject’s cognitive processes and thus alter his or her performance.

When using the think-aloud method, the researcher needs to be present to transcribe the therapist’s commentary, or a videotape or audiotape is made of the session and transcribed at a later point. Ericsson and Simon (1993) specified that it is the job of the researcher, not the thera-
Therapists are asked to recount the events of therapy together with their reasoning processes after the session ends (Carroll & Johnson, 1990). For example, Hagedorn (1996) used the free recall technique to elicit the decision-making processes of six experienced therapists when working with newly referred clients in physical rehabilitation settings. Researchers using free recall, like other retrospective reporting approaches, assume that most of the information from a therapy session is contained in the therapist’s short-term memory and can be accessed directly. When eliciting a retrospective report, the researcher may prompt, “Tell me what you were thinking at each moment during the therapy session you have just completed.” Free recall may also take the form of “thought listing,” where subjects are asked to recall a list of their thoughts. In thought listing, the subject’s thoughts are viewed as distinguishable elements. This approach is rarely used in clinical environments because therapists’ thought processes are generally interconnected.

Using a modified version of the free recall technique, Creighton et al. (1995) interviewed occupational therapists after completion of treatment sessions with clients with spinal cord injury. However, rather than asking therapists to recount the events and reasoning of the whole session, they used a semistructured interview technique to elicit the therapists’ reasoning specifically related to their selection and modification of activities (or Level 3 verbalizations [Ericsson & Simon, 1993]). Similarly, Barnitt and Partridge (1997) focused on the ethical reasoning of a sample of occupational therapists and physical therapists. Using a method drawn from hermeneutic phenomenology, the researchers asked therapists, “Can you tell me the story of an ethical dilemma you have experienced at work during the past 6 months?” The advantage of free recall is that no equipment is introduced into the treatment setting; however, the therapist must rely solely on memory to tell the therapy story and recount his or her reasoning. A discussion of the disadvantages common to all retrospective reporting methods, including reliance on memory, is presented at the conclusion of this section of the article.

Audio-Assisted Recall

In audio-assisted recall, the clinician listens to an audiotape of the therapy session immediately after its completion to prompt his or her recall of conversations and events and the associated reasoning (Carroll & Johnson, 1990; Meichenbaum & Butler, 1979). An advantage of this method is that an audiotape recorder is usually a relatively unobtrusive addition to the therapy environment. A limitation of this approach is that therapy is often visual, and it is through observing the client’s performance that the therapist is cued to recall his or her reasoning. Hence, videotape is believed to provide significantly more prompts than audiotape for therapists attempting to recall their thinking.
Video-Assisted Recall

The use of video to aid recall of mental events was first described by Kagan (1976) as a means of assisting counselors to improve their interpersonal skills. Similar to the audio-assisted recall method, two procedures are required: (a) data capture using video and (b) video-assisted recall that occurs during a debriefing session where the therapist watches the footage to facilitate recall of his or her thoughts, choices, and uncertainties at that time.

Data capture using video. When capturing a therapy session on video, researchers generally use a stand-alone video camera (Embrey et al., 1996; Mattingly & Fleming, 1994). However, this approach to video data collection is limited in several ways. First, the camera operator needs to be present to move the camera to wherever the action occurs and to keep the subjects in center view. Having this person present is likely to be intrusive or disruptive to the natural progress of the therapy session. Second, because the camera is often held at a distance to capture the whole scene, recording the detail of an activity (e.g., a tabletop game) may be difficult. Finally, the camera's perspective is different from that of the therapist. This difference is believed to impair the therapist's capacity to recall his or her reasoning (Omodei & McLennan, 1994).

To overcome these limitations, a new approach to data capture has been developed using a head-mounted video camera. The author has conducted some preliminary studies using this new technology and is currently analyzing data from a 3-year study with 13 experienced and 2 novice occupational therapists in physical rehabilitation settings. The purpose of these studies is to examine the ways experienced therapists use procedural, interactive, and conditional reasoning in three therapy phases (evaluation, intervention, discharge planning) and the differences between expert and novice reasoning. In addition, a student working toward a master's degree is currently using this technology to examine the reasoning of therapists who ensure that clients' home environments are accessible. Case examples from these studies are used to illustrate the descriptions of the technology provided in the current article. Although studies also are under way to investigate the use of this technology to elicit the reasoning that supports emergency care nursing, the author is not aware of any other research using a head-mounted video camera to elicit recall of clinical reasoning in occupational therapy.

Recent advances in technology have meant that lightweight video cameras are readily available and affordable. Rather than using a standard camera lens, a lightweight lens modified from those commonly used in security systems can be attached to an elastic band and placed on the therapist's head, similar to the headband used to secure a hands-free light. Researchers and technical officers at La Trobe University and Swinburne University of Technology in Australia have been developing this equipment for use in supporting and health research since 1995. Initially, the camera was built into a firefighter's helmet. However, given the unsuitability of this apparatus in the clinic, the author worked with the technical team through several revisions to develop the current camera system. In addition to wearing the small camera, the therapist wears a slim waistpack to hold the video recorder. The microphone is built into the recorder and is powerful enough to record all sound. The video system built at La Trobe University is illustrated in Figure 1, and its use during a therapy session is depicted in Figure 2. With this approach to recording, the therapist and client are completely mobile, and an accurate record is kept of what the therapist saw at each moment during the therapy session. Therapy sessions recorded using a head-mounted video camera can be conducted without the researcher's presence.

A disadvantage of this approach to capturing video data is that the presence of a camera on the therapist's head may be distracting to the client. For example, during a group pediatric therapy session, the children were too distracted to proceed until they were also wearing simulated cameras and video recorders. Additionally, this form of data capture may cause distress when used with clients who have psychiatric problems. One therapist recently reported difficulty in "getting close" to the client because the camera was in the way. In general, however, therapists and clients seem to "forget" about the camera after the first few moments and continue on as usual with therapy.

Figure 1. The therapist wearing a head-mounted video camera and recorder located in a waistpack.
A therapist wears a head-mounted video camera and recorder during an activities of daily living session with a client.

Debriefing using video-assisted recall. After a therapy session has been video recorded using either a stand-alone or a head-mounted camera system, the following strategies are generally used to facilitate therapist recall of reasoning. The therapist and researcher view the video footage on a television monitor in a quiet room, and the researcher guides the therapist to comment on events and his or her reasoning during the session, using nondirective probes such as, “Say some more about what you are considering doing now” or “What else is going on in your mind here?” (Kagan, 1976). When using any of the retrospective reporting methods, it is important that the therapist “recalls” rather than “evaluates” his or her reasoning. In other words, the therapist might comment, “At this point, I realized that he seemed more talkative when I asked about his son, so I thought I would get more information about his leisure occupations by asking what activities they had enjoyed together.” Therapists should be discouraged from making the following kinds of evaluative comments, “I shouldn’t have asked so much about his son because I got more information about his leisure occupations than my client’s. Next session I’ll be more directive to get this information from him.” This kind of evaluative analysis might form part of a future analysis of the data but is not the primary focus in a clinical reasoning study. Ericsson and Simon (1993) referred to reports requiring higher-level thinking as Level 3 verbalization.

During data collection, the author has found that many therapists find it difficult to refrain from critically analyzing their performance. However, a therapist may become less self-conscious and critical if the researcher assures that he or she is not being critical of the therapist’s performance. This assurance can be reinforced practically if the researcher and therapist review demonstration tapes before data collection and the researcher talks with the therapist about describing clinical reasoning and not analyzing it.

When reading the clinical reasoning literature, therapists should be aware of another approach to debriefing when using video-assisted recall. Yinger (1986) suggested that subjects should focus on their immediate thoughts when providing an account of a session rather than trying to remember their thoughts at the time of the actual event. Yinger argued that subjects can gain new cues from viewing the video that were not used during the event. Hence, studies following this protocol provide the following instruction to subjects: “Verbalize what you are thinking at this point in time, not what you may have been thinking during the treatment session” (Embrey et al., 1996, p. 24).

Video-assisted recall using data captured from a head-mounted camera (also referred to as own-point-of-view video-assisted recall) has many advantages. When viewing footage from a head-mounted video camera, the therapist “sees” exactly what he or she saw as therapy unfolded (i.e., has the same visual and cognitive perspective), which is believed to enhance reasoning recall significantly (Omodei & McLennan, 1994). Omodei and McLennan (1994) argued that having the camera focus on the environment rather than the subject (therapist), minimizes self-consciousness and enhances psychological immersion in the original events. Kipper (1986) also demonstrated that video footage from a camera that moves through the environment as though it were a human visual system is much more informative for the viewer than traditional video footage. Own-point-of-view video-assisted recall provides an accurate record of the therapist’s perspective of the client and the therapeutic activity. For example, the client’s facial expressions are more clearly perceived, and observations of facial cues may enhance the therapist’s recall of his or her interactive reasoning. However, the therapist’s facial expressions are not captured, and two therapists involved in the author’s research have reported that they find viewing their own expressions useful to prompt their recall of reasoning.

As the therapist watches a video recording of the therapy session, the researcher usually captures the therapist’s reasoning by taking notes or audio recording the therapist’s commentary (Alnervik & Sviden, 1996; Mattingly & Fleming, 1994). Using the video system developed at La Trobe University, a modified approach to collecting these data has been developed. The original video footage is copied onto a new videotape together with a superimposed “clinical reasoning soundtrack,” which is the therapist’s narration of the session. The original soundtrack of the therapy session is softened so that the clinical reasoning soundtrack can be heard clearly. From the author’s experience, this approach to capturing “data” (i.e., own-point-of-view video footage with clinical reasoning soundtrack) enhances analysis because the soundtrack is supported by rich visual images, and the context for the clinicians’ comments is preserved. The researcher, therapist, or a team of raters then can study the data, depending on the mode of analysis to be used. The circuitry required to capture data in this form is illustrated in Figure 3.
Video-assisted recall using footage from a head-mounted camera is an excellent method of eliciting reasoning because the therapist has a clear picture of the session from his or her own point of view. Omodei and McLennan (1994) reported that subjects involved in competitive orienteering (a sport where participants find their way in unfamiliar countryside using a map and compass) recollected and described between two and four times the amount of detail when using own-point-of-view video-assisted recall compared with free recall. A disadvantage of own-point-of-view video-assisted recall is that some therapists find the speed and movement of the videotape difficult to watch. If the therapist has moved his or her head rapidly during the therapy session, which may occur when scanning the room, he or she may feel slight nausea, like motion sickness, when reviewing the tape. However, as Omodei and McLennan noted, people generally report rapid perceptual adaptation to this movement.

Limitations Common to All Retrospective Reports

When using a concurrent think-aloud method, subjects are required to tell what they are thinking at that moment. Because subjects do not deliberately provide their reasoning or draw on their memory of events, little opportunity exists for them to make incorrect or misleading statements or inferences about their own thought processes. In contrast, the main disadvantage with all retrospective reporting methods is the reliance on subjects' memories of their thoughts. As Martin (1992) reported, the length and complexity of any task means that large gaps and distortions of events are often noted when a memory-dependent approach is used to elicit subjects' reasoning. Other difficulties with retrospective reporting include subjects reconstructing their reasoning based on what they were supposed to do rather than what they actually did or rationalizing their thoughts to create a logical story. As Newell and Simon (1972) pointed out, retrospective accounts allow therapists to mix current knowledge with past knowledge, thereby providing opportunity for therapists to be involved in evaluating their thinking in addition to presenting their thinking. Researchers who are true to this method do not want therapists to evaluate their reasoning. Hence, the researcher must guide the therapist to recount what he or she was thinking at the time the event was happening rather than evaluating what should have happened through hindsight.

Summary

The occupational therapy literature contains a limited number of research-based articles examining therapists' clinical reasoning. Further research is required to expand and refine the language established to assist clinicians to articulate their thinking, to increase our understanding of the complex reasoning processes therapists use in their remarkably varied work, and to determine differences in the thinking processes of novice and expert therapists so that we can assist student and beginner therapists on their journey to expert therapist status. To promote clinical reasoning research, this article provided an overview of current methods used and introduced a novel head-mounted video camera approach to elicit and capture data in this field. ▲

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Figure 3. Diagram of circuitry required for the researcher-therapist debriefing.

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