A Synthesis of the Effects of Occupational Therapy for Persons With Stroke, Part I: Restoration of Roles, Tasks, and Activities

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This article synthesizes research findings regarding the effects of occupational therapy on the restoration of role, task, and activity performance for persons who have had a stroke, with the purpose of guiding practice and research. It is the first of a two-part review of studies. Part II synthesizes research findings regarding the effects of occupational therapy on remediating impairments. Part I includes 15 studies involving 895 participants (mean age = 70.3 years). Of these studies, 11 (7 randomized controlled trials) found that role participation and instrumental and basic activities of daily living performance improved significantly more with training than with the control conditions. We conclude that occupational therapy effectively improves participation and activity after stroke and recommend that therapists use structured instruction in specific, client-identified activities, appropriate adaptations to enable performance, practice within a familiar context, and feedback to improve client performance. Empirical research to verify these findings and to characterize the key therapeutic mechanisms associated with desired outcomes is needed.

Stroke is a leading cause of serious, long-term disability in the United States (American Heart Association, 2001) and is the most common diagnostic category of clients treated by occupational therapists (Rijken & Dekker, 1998). Therefore, one might expect that research regarding effectiveness of occupational therapy with this population has been organized for use in evidence-based practice, which, however, is not the case. The goal of this article is to synthesize the research regarding the effectiveness of occupational therapy in the restoration of valued roles, tasks, and activities of persons who have had a stroke in order to guide practice and research.

Method

This review was initiated as part of the American Occupational Therapy Association's (AOTA's) Evidence-Based Literature Review Project. A group of two faculty members and three doctoral students at Boston University met regularly to discuss the approach, the definitions of levels of evidence, literature search strategies, and criteria for including or excluding studies. The group members were educated in meta-analysis, the method of synthesis used in this review. After establishing the general guidelines, the group divided into diagnosis-specific teams but continued to meet to discuss questions and problems that arose during the process of selecting studies, assigning grades of evidence, and categorizing particular assessments into the specific outcome categories. The two members of the stroke team reviewed, independently, the studies that met inclusion criteria, evaluated the validity of the studies, and verified the statistics to be noted. Disagreements were
resolved through discussion and further study of the research report.

**Literature Search**


**Inclusion–Exclusion Criteria for Studies**

To be included in this literature review, a study first had to be published in English. Second, it had to measure the effect of occupational therapy treatment applied to persons with stroke. In applying this criterion, treatment had to be designated as occupational therapy or administered by an occupational therapist, or the article had to be written by an occupational therapist. Third, the study had to be published in a peer-reviewed journal or be a thesis or dissertation completed between 1980 and 2000. Reports published before 1980 were not included because knowledge of motor behavior and recovery after central nervous system damage that affect therapeutic procedures as well as the philosophy of occupational therapy practice were different 20 years ago and may not be currently applicable.

Studies that were excluded from the review were

- those of treatment usually thought of as occupational therapy, such as cognitive-perceptual training, but not conceptualized as occupational therapy by the authors or applied to the participants by professionals other than occupational therapists;
- those that reported occupational therapists applying treatment not usually thought of as occupational therapy (e.g., fabrication and application of ankle-foot orthoses), with effects not reported in functional terms;
- those that evaluated outcomes of occupational therapy delivered in combination with other rehabilitation treatments because the specific effects of occupational therapy are unclear in such studies; and
- those that evaluated treatment effects of occupational therapy delivered to persons in other diagnostic categories together with stroke because the effects specific to persons with stroke could not be differentiated from the effects to persons with other diagnosed conditions.

These exclusion criteria have resulted in a conservative appraisal of the effects of occupational therapy for clients who have had a stroke because studies of some treatments used by occupational therapists (e.g., neurodevelopmental treatment, constraint-induced therapy) but not designated as occupational therapy in the literature or researched by occupational therapists were excluded.

More than 150 articles and abstracts were reviewed in the initial literature search. Of these, 36 were included in this review (i.e., Parts I and II). Forty-seven percent were published in the United States, 25% in the United Kingdom, 17% in Canada, and 11% in various other countries. Single-case designs were excluded because of limited generalizability. One exception was the study by Mudie and Matyas (2000) (see Part II) that replicated the experiment over several participants and reported individual scores, allowing meta-analytic synthesis of the results.

**Review Method**

The 36 studies included in the full analysis were evaluated for level of evidence, using a system developed for AOTA’s Evidence-Based Literature Review Project and subsequently improved by two members of the group (N. Baker & L. Tickle-Degnen, personal communication, March 1, 2001) (see Table 1).

The statistics for each study were examined. First, the $p$ values of differences between the treatment and control groups, between conditions, or between pre- and posttreatment within one group were noted. The $p$ values designate the probability of the difference being due to chance. Next, the reported effect sizes were noted. Effect size indicates the magnitude of the relationship between the independent variable (in this review, occupational therapy treatment) and the outcome (Rosenthal & Rosnow, 1991). A positive effect size indicates improvement after treatment, and a negative effect size indicates poorer performance after treatment. If significance levels ($p$ values) or effect sizes were not reported, they were calculated using the methods described by Rosenthal and Rosnow (1991), if enough information was provided. The product-moment correlation ($r$) was chosen as the estimate of effect size in this review because it is similar to the Pearson product-moment correlation with...
which occupational therapists are familiar and can be easily recast into a binomial effect size display (BESD) that reveals the practical significance of any given magnitude of effect in terms of whatever measure is appropriate (e.g., success rate, improvement rate) (Rosenthal & Rubin, 1979, 1982; Rosnow & Rosenthal, 1988). Where appropriate, the mean effect sizes of statistically homogeneous studies of similar treatments were combined, and an aggregate weighted effect size was determined through meta-analytic techniques described by Rosenthal (1984). The effect sizes were weighted by study sample size (N-3).

**Organization of the Review**

This review is organized by therapeutic goal: restoration of roles, tasks, and activities (Part I) and remediation of impaired bodily functions (Part II) (Ma & Trombly, 2002). Outcome (dependent) variables were classified into the International Classification of Functioning, Disability and Health (ICIDH-2) categories of participation (role), activity (instrumental activities of daily living [IADL] and basic activities of daily living [BADL]), and structural and functional integrity (mental and physical abilities and capacities) (World Health Organization, 2001).

**Characterization of the Studies and Participants**

Fifteen of the 36 studies reviewed addressed restoration of roles, tasks, or activities and are synthesized in this part of the review. Eight of these studies also measured remediation of impairments, and that aspect is reviewed in Part II (Ma & Trombly, 2002). Table 2 reports the details of each study, listed in the order of outcome category and strength of evidence. Of these, 3 were classified as randomized controlled trials (RCTs; Level I), with high internal validity (see Table 1). An RCT design allows assignation of causality because it controls for alternate explanations of the outcome (Cook & Campbell, 1979). Of the remaining 12 studies, 7 were designated as randomized controlled trials (Level I) with one or more threats to internal validity; 2 were designated as multiple group comparisons without randomization to treatment (Level II), and 3 were designated as one-group pretest–posttest designs (Level III). All the studies were conducted in a natural (home or clinic) setting, which contributes to their generalizability (external validity).

The 15 studies included an initial total of 984 participants, 895 (91%) of whom completed the studies. Of these, 411 were identified as having a left CVA, and 425 were identified as having a right CVA. Two studies did not report the location of the lesion. Across the 15 studies, mean age ranged from 63.1 years to 76.0 years (overall mean = 70.3 years). Participants of 4 studies were in the chronic stage (≥ 12 months poststroke) when little spontaneous recovery is expected (Gresham et al., 1995; Wade, 1992). Participants of 10 studies were in the acute stage (≤ 6 months poststroke) when spontaneous recovery is considered to be occurring. Participants of 1 study were of mixed chronicity.

**Participation in life roles.** Enabling clients to engage in satisfying life roles is a major goal of occupational therapy. Three studies addressed role (Corr & Bayer, 1995; Drummond & Walker, 1995; Jongbloed & Morgan, 1991). Two measured participation or satisfaction with self-enhancement roles (i.e., roles that add to a person’s sense of accomplishment and enjoyment, such as leisure pursuits as a hobbyist or sportsperson [Trombly, 1993, 1995]), and 1 measured perceived quality of life related to self-maintenance roles (i.e., roles associated with development and maintenance of self, including family and home, such as independent person, homemaker, and parent [Trombly, 1993, 1995]). No study addressed self-advancement roles (i.e., roles that involve productive activity within the community and add to the person’s skills, possessions, or other betterment [Trombly, 1993, 1995]).
<table>
<thead>
<tr>
<th>Study</th>
<th>Level of Evidence</th>
<th>Sample Description</th>
<th>Treatment</th>
<th>Dosage</th>
<th>Outcome</th>
<th>Effect Size</th>
<th>Threats to Internal Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jongbloed and Morgan (1991)</td>
<td>IB1a</td>
<td>N = 40 chronic</td>
<td><strong>Experimental group:</strong> Facilitate resumption of old or development of new self-identified leisure activities; adapt activities; set up and accompany on first attempt</td>
<td>Five 1-hr visits over 5 consecutive weeks</td>
<td>Between groups participation—Katz Adjustment Index (amount and satisfaction with activity involvement) NS</td>
<td>NA</td>
<td>Possible sampling bias (experimental group was younger)</td>
</tr>
<tr>
<td>Drummond and Walker (1995)</td>
<td>IB2a</td>
<td>N = 65 acute</td>
<td><strong>Experimental group:</strong> Leisure occupational therapy: Practice skills and use of equipment to improve participation in self-identified hobbies and interests at home</td>
<td>30 min once/week for 12 weeks after discharge and 30 min every 2 weeks for next 12 weeks</td>
<td>Participation—Nottingham Leisure Questionnaire</td>
<td>$M = .64$</td>
<td>Lacks placebo control group (attention differed between groups)</td>
</tr>
<tr>
<td>Corr and Bayer (1995)</td>
<td>IA2a</td>
<td>N = 110 chronic</td>
<td><strong>Experimental group:</strong> Follow-up services plus treatment at home based on Model of Human Occupation, applied as needed. Included teaching ADL skills, facilitating return of function, enabling use of equipment supplied by other agencies, and providing information and referrals</td>
<td>Four visits: 2nd, 8th, 16th, and 24th week after discharge from hospital</td>
<td>Between groups participation—Pearlman’s Six-Point Quality of Life Scale (NS)</td>
<td>.02</td>
<td></td>
</tr>
<tr>
<td>Drummond and Walker (1996)</td>
<td>IB2a</td>
<td>Same as Drummond and Walker (1995)</td>
<td><strong>Experimental group:</strong> Routine follow-up services plus occupational therapy in home to achieve patient-identified ADL or IADL goals (domestic or leisure activities)</td>
<td>30–45 min/visit for 10 visits over 6 weeks</td>
<td>Activity–IADL—Nottingham EADL Total score (NS)</td>
<td>NA</td>
<td>Possible sampling bias (experimental group was younger)</td>
</tr>
<tr>
<td>Gilbertson et al. (2000)</td>
<td>IA2b</td>
<td>N = 138 acute; only those expected to be discharged home</td>
<td><strong>Experimental group:</strong> Routine follow-up services plus occupational therapy in home to achieve patient-identified ADL or IADL goals (domestic or leisure activities)</td>
<td>8-week 8-month 6-month $M = .15$ $M = .03$ $M = .03$</td>
<td>Between groups activity—BADL At 8 weeks: Nottingham EADL ($p = .02$); At 6 months (by postal questionnaire): Nottingham EADL (NS) Activity—BADL At 8 weeks: Barthel Index ($p = .06$); At 6 months: Barthel Index (NS)</td>
<td>$M = .15$ $M = .03$ $M = .03$</td>
<td>Lacks placebo control group (attention differed between groups)</td>
</tr>
</tbody>
</table>
Table 2. Evidence Table for Studies of Occupational Therapy for Restoration of Role, Tasks, and Activities Poststroke 1980–2000 (Continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Level of Evidence</th>
<th>Sample</th>
<th>Treatment</th>
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<th>Outcome</th>
<th>Effect Size</th>
<th>Threats to Internal Validity</th>
</tr>
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<tbody>
<tr>
<td>Walker et al. (1999)</td>
<td>IA2b</td>
<td>N = 185 acute (but not hospitalized) LCVA: 80 RCVA: 85 Other: 20 M age: 74.3 Attrition = 12%</td>
<td>Experimental group: Occupational therapy in home to increase ADL and IADL (community reentry, driving, household tasks); patient practiced between visits of occupational therapist; leisure activities encouraged</td>
<td>24–90 min visit (M = 52 min) for 1–15 visits (M = 5.8) for 5 months</td>
<td>Between groups Activity–IADL Nottingham EADL (p = .009) Activity–BADL Barthel Index (p = .002)</td>
<td>φ = .18</td>
<td>Lacks placebo control group (attention differed between groups)</td>
</tr>
<tr>
<td>Logan et al. (1997)</td>
<td>IA2b</td>
<td>N = 111 acute LCVA: 50 RCVA: 61 M age: 72.5 Attrition = 22%</td>
<td>Experimental group: Enhanced community occupational therapy (undefined therapy plus provision and checkout of adapted equipment): Mean days to start: 3 less Mean number of visits: 4 more Mean minutes of occupational therapy: 155 more Mean days case open: 72 more</td>
<td></td>
<td>Between groups Activity–IADL Nottingham EADL (p &lt; .01)</td>
<td>NA</td>
<td>Instrumentation (questionable reliability of self-report)</td>
</tr>
<tr>
<td>Jongbloed et al. (1989)</td>
<td>IB2b</td>
<td>N = 90 acute requiring 8 weeks of treatment minimum LCVA: 44 RCVA: 46 M age: 71.3</td>
<td>Group 1—functional approach: teaching ADL and IADL tasks in hospital Group 2—sensorimotor integrative approach: Treating sensorimotor deficits using neurodevelopmental interventions in hospital</td>
<td>40 min/day, 5 days/week for 8 weeks</td>
<td>Activity–IADL and BADL Between groups Test of Meal Preparation (NS) Barthel Index (NS) Within groups All measures improved: (p &lt; .05)</td>
<td>NA</td>
<td>Between groups: Cointervention that may have equalized treatment across groups Within groups: Spontaneous recovery</td>
</tr>
<tr>
<td>Young et al. (1983)</td>
<td>IIC2b</td>
<td>N = 27 acute LCVA: 0 RCVA: 27 M age: 64.0</td>
<td>Experimental group: Cancellation, visual scanning, and block design training in clinic Control group 1: Routine occupational therapy (teaching ADL and perceptual tasks in clinic) Control group 2: Routine occupational therapy plus cancellation and visual scanning training in clinic</td>
<td>1 hr/day for 20 successive days</td>
<td>Between groups Activity–IADL Wide Range Achievement Test, Reading subtest E &gt; Cl1 (p &lt; .01) E &gt; Cl2 (p &lt; .01) Copying an address E &gt; Cl1 (p &lt; .025) E &gt; Cl2 (NS)</td>
<td>M = .54</td>
<td>Possible selection bias because of nonrandom assignment</td>
</tr>
<tr>
<td>Klapora et al. (1995)</td>
<td>IIC3c</td>
<td>N = 10 chronic LCVA: 4 RCVA: 4 NA: 2 M age: 63.1</td>
<td>Dynavision training for those who failed behind-the-wheel driving test because of visual and attentional deficits. Laboratory treatment.</td>
<td>45 min/ session (20 min on task), 3 times/week for 6 weeks</td>
<td>Activity–IADL Behind-the-wheel driving test (p &lt; .05)</td>
<td>φ = .67</td>
<td>Design does not control for threats</td>
</tr>
<tr>
<td>Walker et al. (1996)</td>
<td>IC1b</td>
<td>N = 30 chronic LCVA: 16 RCVA: 14 M age: 68.0</td>
<td>Experimental group: Teach adapted dressing techniques and energy conservation at patient’s home. Practice between therapist’s visits. Control group: No treatment</td>
<td>Mean of 6 visits over 3- month period, depending on patient need</td>
<td>Activity–BADL Between conditions Nottingham Stroke Dressing Assessment (p = .002) Rivermead ADL Scale, Self-Care subtest (p = .008)</td>
<td>M = .48</td>
<td>(Continued)</td>
</tr>
</tbody>
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Table 2. Evidence Table for Studies of Occupational Therapy for Restoration of Role, Tasks, and Activities Poststroke 1980–2000 (Continued)

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<tr>
<th>Study</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Edmans et al. (2000)</td>
<td>IB1a</td>
<td>N = 80 with perceptual problems; acute LCVA: 45 RCVA: 35 M age: 68.8</td>
<td>Group 1: General occupational therapy (undefined) plus transfer of training approach (practice a particular perceptual task to improve performance on other tasks)</td>
<td>2.5 hr/week for 6 weeks for experimental treatment</td>
<td>Activity–BADL Between groups</td>
<td>NA</td>
<td>Within groups: Spontaneous recovery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Attraction = 1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Gibson and Schkade</td>
<td>IIB3a</td>
<td>N = 50 acute LCVA: 26 RCVA: 24 M age: 74.0</td>
<td>Experimental cohort: Occupational Adaptation</td>
<td>Daily for 2–3 weeks</td>
<td>Activity–BADL Between groups</td>
<td>φ = .36</td>
<td>History; experimenter expectation</td>
</tr>
<tr>
<td>(1997)</td>
<td></td>
<td></td>
<td>Historical control cohort: Standard occupational treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>van Heugten et al.</td>
<td>IIB3b</td>
<td>N = 43 acute LCVA: 43 RCVA: 0 M age: 70.1 Attraction = 23%</td>
<td>Teach compensatory strategies based on information processing model to improve functioning (instruction, physical assistance, feedback) in spite of apraxia</td>
<td>30 min/session, 3–5 times/week for 12 weeks (2 weeks/goal)</td>
<td>Activity–BADL Between groups</td>
<td>φ = .27</td>
<td>Design does not control for threats; spontaneous recovery</td>
</tr>
<tr>
<td>(1998)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thomas et al. (1994)</td>
<td>IIC3c</td>
<td>N = 5 convenience sample of mixed chronicity LCVA: NA RCVA: NA M age: 76.0</td>
<td>Cognitive retraining group therapy: Reality orientation, cognitive activities (e.g., step-by-step sequences of tasks, categorizing objects, physical games), dressing practice after demonstration of motor patterns needed in dressing skills</td>
<td>45 min/session, 4 times/week for 2 weeks</td>
<td>Activity–BADL Between groups</td>
<td>NA</td>
<td>Design does not control for threats; selection bias due to dropouts</td>
</tr>
</tbody>
</table>

Note: ADL = activities of daily living (I = instrumental, B = basic, E = extended [similar to IADL]); CVA = cerebrovascular accident (L = left, R = right); NA = not available; NS = not significant. TLA = total leisure activity score; TOTL = overall leisure score.

*Effect size r unless stated otherwise. Interpreted similarly to a correlation coefficient. In behavioral studies, a small effect = .10; a medium effect = .30; and a large effect = .50 (Cohen, 1988). * Dependent variables categorized according to the ICDH-2 (World Health Organization, 2001). “>” reads as “scored higher” or “improved more.” φ is equivalent to r (Rosenthal, 1984). * Cook and Campbell (1979, pp. 99–103).
The particular effect of occupational therapy on restoration of role performance in these studies appears to depend on dosage and goal-specificity. The 2 studies that offered infrequent and less-structured treatment (Corr & Bayer, 1995; Jongbloed & Morgan, 1991) found no improvement in role performance or satisfaction compared with the control, whereas 1 study (Drummond & Walker, 1995) found that 9 hours of treatment that emphasized practice of skills needed to do preferred leisure activities was successful. The effect size was large \( r = .64 \), indicating that the number of activities and frequency of engagement in leisure activities were strongly affected by the specific practice versus treatment focused on ADL or no treatment. Three studies are inadequate to allow confident evidence-based clinical judgments regarding restoration of role performance. One reason that research is lacking in this area may be that restoration of role performance involves the whole rehabilitation team. Those studies were excluded because occupational therapy’s specific effect could not be differentiated from that of the other rehabilitation professions. To differentiate occupational therapy’s contribution to role resumption after stroke, use of a design that tested the effect of the team with and without occupational therapy participating (an ethnically troublesome situation) or a method that allows measurement of goals related to role performance that are specifically the focus of occupational therapy are necessary.

Activity—IADL or extended activities of daily living (EADL). Eight studies involving 736 participants measured outcomes in terms of IADL or EADL. Six of these (Corr & Bayer, 1995; Drummond & Walker, 1996; Gilbertson, Langhorne, Walker, Allen, & Murray, 2000; Jongbloed, Stacey, & Brighton, 1989; Logan, Ahern, Gladman, & Lincoln, 1997; Walker, Gladman, Lincoln, Siemonsma, & Whiteley, 1999) were randomized trials, all except 1 having threats to internal validity. One was a nonrandomized multiple-group comparison (Young, Collins, & Hren, 1983), and 1 was a pretest–posttest one-group study (Klavora et al., 1995).

Four of the Level I studies (Corr & Bayer, 1995; Drummond & Walker, 1996; Gilbertson et al., 2000; Walker et al., 1999) tested the effects of various intensities of in-home or community-based therapy focused on task-specific practice to improve IADL. Logan et al. (1997) also tested therapy in the home, although whether it was task-specific practice is not known because the description was vague. The studies by Logan et al. (1997), Gilbertson et al. (2000), and Walker et al. (1999) found significant improvements in total score of IADL by the experimental group compared with the control group. Logan et al. did not provide enough information to calculate an effect size, but Gilbertson et al. and Walker et al. did. The mean weighted effect size \( r = .16 \) was a small effect (Cohen, 1988). The practical significance of this effect size can be appreciated when it is presented graphically in the BESD (Rosenthal & Rosnow, 1991; Rosnow & Rosenthal, 1988) shown in Table 3. A BESD is a 2 × 2 contingency table that displays an effect size as a dichotomous (binomial) outcome. The two rows of the table correspond to the independent variable (experimental treatment, control), and the two columns correspond to the dependent variable (e.g., improved, not improved) (Rosenthal, 1984). The percentage of cases improved in the treatment condition is calculated with the following formula: \( .50 + r/2 \times 100 \). For example, \( .50 + .16/2 \times 100 = 58\% \). Percentage of cases improved in the control condition is calculated with the formula \( .50 - r/2 \times 100 \), or \( .50 - .16/2 \times 100 = 42\% \). Because all rows and all columns must add to 100\%, the other cells can be calculated easily. The difference between these two values, 58\% and 42\%, is equivalent to a 16\% increase in success rate due to in-home or community-based task-specific practice. Therefore, the effect size gives a direct estimate of the distribution of cases improved by the treatment or the difference in success rate between the experimental and control conditions (Rosenthal, 1984; Rosnow & Rosenthal, 1988). In this case, 16\% more cases improved after task-specific practice in a familiar context than under the control condition, and conversely, 16\% fewer cases did not improve under the treatment condition than under the control condition.

Corr and Bayer (1995) and Drummond and Walker (1996) found improvements in only certain subtests. Whether Corr and Bayer’s treatment focused on these areas exclusively is not known. Drummond and Walker (1996) actually reexamined the data from Drummond and Walker (1995) to determine whether occupational therapy directed toward regaining leisure skills generalized to EADL; therefore, it is not surprising that the leisure and mobility subtests showed significant improvement over training that was focused on BADL or no treatment. In other words, those skills practiced improved.

Jongbloed et al. (1989) found no significant difference on IADL between task-specific practice and sensorimotor treatment; participants improved significantly after both treatments. Spontaneous recovery is a plausible explanation for the outcome because the participants were less than 12

<table>
<thead>
<tr>
<th>Group</th>
<th>Improved</th>
<th>Not Improved</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task-specific practice in familiar context</td>
<td>58%</td>
<td>42%</td>
<td>100%</td>
</tr>
<tr>
<td>Control</td>
<td>42%</td>
<td>58%</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Binomial Effect Size Display for Effects of Home-Based, Task-Specific Training on Instrumental Activities of Daily Living
weeks poststroke and an untreated control group was not used. Another explanation for the outcome could be the cointervention: All participants received physical therapy and performed self-care routines established by an occupational therapist morning and night concurrently with the experimental treatment. This adjunctive routine practice of ADL skills morning and evening, rather than experimental treatments, could have accounted for the improvement seen in both groups.

It appears from the better controlled studies that task-specific training offered in the home results in improved IADL performance. Two other studies, although categorized as offering less strong evidence, found improved performance of specific IADL tasks after treatment to improve the abilities thought to underlie the functional performance. Young et al. (1983) tested various treatments to improve reading the newspaper and copying an address by participants with left neglect or visual scanning deficits. The experimental treatment (block design training) improved both reading and copying significantly more than ADL practice, perceptual tasks, or visual scanning training. The failure to randomly assign participants to groups threatens internal validity, although some control was achieved by ascertaining that there were no significant differences on possible confounding variables among the groups at the start of the study and by calculating and using effectiveness indices for analysis of each dependent variable to control for intersubject variability. Klavora et al. (1995) used a special apparatus to train abilities believed to underlie driving. A significant number of participants passed the driving test after this treatment. These two studies leave open the question of whether treatment should focus on task-specific training or training of underlying skills and abilities. None of the studies is definitive enough to guide practice, although task-specific therapy studied in the randomized trials seems worthy of continued implementation in practice. Further study of task-specific training and of the effectiveness of the approach that treats underlying abilities needs to be carried out.

Activity—BADL. Nine studies included in this review examined occupational therapy outcome in terms of BADL on 731 participants. Four have already been noted (Corr & Bayer, 1995; Gilbertson et al., 2000; Jongbloed et al., 1989; Walker et al., 1999). Of these, only Gilbertson et al. (2000) and Walker et al. (1999) found a significant improvement in BADL (Barthel Index) in the treatment group compared with the control group. Of the remaining 5 studies, 2 (Edmans, Webster, & Lincoln, 2000; Walker, Drummond, & Lincoln, 1996) were RCTs. Like Gilbertson et al. (2000) and Walker et al. (1999), Walker et al. (1996) found, using a two-group, randomized, crossover (repeated measures with alternating sequence) design in which participants acted as their own controls, that task-specific practice of client-identified activities in the client's home resulted in better performance of dressing and other self-care activities than no treatment. On the other hand, Edmans et al. (2000) found no significant difference between transfer of training or functional treatment outcomes. Both groups improved, which could be explained by spontaneous recovery because they used participants in the acute stage poststroke and did not have a no-treatment group to control for this possibility. In explaining their findings, the authors alluded to the possibility of the threat of equivalency of therapy by noting that similar basic strategies were used for both groups, namely similar instructional cues or prompts; progression from simple to complex activity; use of demonstration, imitation, gesture, repetition, reinforcement, mental stimulation, and a systematic method; and break down of each activity into components. They hypothesized that teaching these strategies may have more effect than teaching any particular activity.

The remaining 3 studies offer less strong evidence than the others previously cited. One (Gibson & Schkade, 1997) used a historical cohort design to test effects of Occupational Adaptation therapy on ADL performance. The essential difference between this therapy and control therapy seems to be the emphasis on client-defined goals and meaningfulness of therapeutic activities chosen as Occupational Adaptation therapy intervention. Although the researchers found significantly better ADL performance and discharge to a less restrictive environment for the experimental group, causality cannot be unequivocally attributed to Occupational Adaptation therapy because possible differences in context and history between the two groups hospitalized at different times are plausible alternate explanations for outcome. Van Heugten et al. (1998) and Thomas, Hicks, and Johnson (1994) used pretest–posttest research designs that did not control for threats to internal validity. One found a significant improvement in BADL after instructional therapy, whereas the other found no difference as a result of cognitive retraining group therapy. Lack of random assignment, however, allows the differences in histories and recovery of participants or training and approach of therapists to be raised as plausible alternate explanations for both outcomes.

To summarize, 5 of the 9 studies reported significant improvement in BADL between the experimental and control groups, conditions, or times (Gibson & Schkade, 1997; Gilbertson et al., 2000; van Heugten et al., 1998; Walker et al., 1996; Walker et al., 1999). The actual scores were not reported in these studies; therefore, we do not know the magnitude of improvement. Effect size indicates a relative
magnitude of improvement; however, an overall effect size could not be calculated validly among these 5 studies because of statistical heterogeneity, \(X^2(4) = 22.906, p < .001\). The effect size for van Heugten et al. (1998) was .78, much larger than the other 4 studies that used control groups. This difference in effect size between pretest–posttest and control group designs was found in a similar review (Park & Ingles, 2001). After eliminating the van Heugten et al. study (Level III) from the analysis, the aggregate weighted effect size for the remaining 4 studies that were homogenous, \(X^2(3) = 5.805, p > .10\), was \(r = .30\), a medium effect that indicates that providing task-specific practice on client-chosen activities resulted in a 30% greater success rate for those participants in the experimental groups (or conditions) compared with those in the control groups (or conditions). The BESD in Table 4 presents the practical significance of this 30% greater success rate more clearly.

Well-controlled, large-sample replication studies with a clearly defined therapeutic approach (e.g., goal specificity, client-chosen goals, structured instruction, task-specific practice, particular practice schedules, role of feedback) and a more comprehensive measure of BADL than the Barthel Index (Mahoney & Barthel, 1965) are needed to verify and expand this finding. In the meantime, providing task-specific practice on activities clients identify as important to them may be accepted cautiously as “best practice.” The 4 studies that found no significant improvement of BADL after experimental occupational therapy treatment offered too few treatments (Corr & Bayer, 1995), manipulated the independent variable too indistinctively (Edmans et al., 2000; Jongbloed et al., 1989), and used a sample too small to detect statistical significance (Thomas et al., 1994). Future studies should control for these faults. Additionally, Edmans et al.’s (2000) suggestion that strategy training may be effective regardless of activity used in treatment warrants careful research.

### Recommendations for Practice and Research

Beyond the limitations imposed by the inclusion and exclusion criteria, another limitation of this review is the paucity of research on particular treatments and lack of information regarding the actual therapeutic procedures used in the studies. Nonetheless, it appears that occupational therapy effectively improves performance of BADL and IADL and role participation of some persons who have had a stroke. The best evidence available in the occupational therapy literature, synthesized here, supports provision of opportunities for practice of client-chosen activities, preferably in a familiar context, and provision of necessary adaptations and training in the use of the adaptations. Each study operationalized the interventions differently, so we do not know which elements are key to the improved performance. Some elements that may be key are ecological and contextual familiarity, client-designation of goal activities, meaningfulness of activity to the client, structured and goal-specific teaching of activity skills, and practice. Each possible key mechanism requires more study. We do not know yet which intervention or combination of interventions is effective for clients with particular characteristics. Perhaps strategy training is more effective than task-specific training for some clients, or treatments of underlying abilities required for functional performance may be most appropriate. Two studies in this review found the latter approach successful, and therefore, it warrants further study.

Research also is needed regarding the relative effectiveness of environment-focused therapy. Although therapy to improve activity performance can be directed toward the client, the context (environment), or both, no studies that manipulated context as therapeutic intervention were retrieved. All studies of this review reported on therapy directed to the client. Research about habits and routines so intimately connected with role participation and activity performance is needed. Although occupational therapy historically has been the profession that seeks to help people sustain adaptive habits, let go of habits that are no longer adaptive, and develop new habits given their changed abilities and capacities, no studies were retrieved that addressed habit formation or dissolution by occupational therapists. ▲

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