The Effectiveness of Physical, Psychological, and Functional Interventions in Treating Clients With Multiple Sclerosis: A Meta-Analysis

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Key Words: occupational therapy (treatment) • role • task performance and analysis

This article provides a meta-analysis of the current best evidence for the use of occupational therapy with clients with multiple sclerosis (MS). A review of the literature identified 23 articles that examined the effectiveness of occupational therapy–related treatments on clients with MS. Meta-analytic analysis suggests that occupational therapy–related treatments were effective in treating the deficits associated with MS ($r = .52$), particularly for outcomes in the capacity and ability ($r = .52$; e.g., muscle strength, range of motion, mood) and task and activity ($r = .57$; e.g., dressing, bathing, ambulation) levels. A review of the research designs used to study MS suggests that more rigorous research is necessary to fully understand treatment effectiveness. Further, more research must be done to establish the effectiveness of occupational therapy treatment at the life role level.

Multiple Sclerosis: Definition and Implications
MS is a progressive disease that causes the demyelination of the central nervous system. According to the World of Multiple Sclerosis Web site (1999; www.ifmss.org.uk), MS affects more than 2.5 million people worldwide. Although the exact etiology of the disease is unknown, it is generally accepted that MS involves an abnormal immune response within the central nervous system (Coyle, Krupp, Doscher, Deng, & Milazzo, 1996). Research has suggested that MS has a viral component, although the exact nature of the virus has not yet been identified. A genetic propensity toward developing MS has also been suggested (Tipping, 1996). MS is usually diagnosed between the ages of 20 and 40 years (Pulaski, 1998) and is two times more prevalent in women than in men (World of Multiple Sclerosis, 2000). Symptoms vary in both type and intensity. Because impairment depends on the area of the central nervous system that is demyelinated, clients with MS can experience deficits in sensory processing, range of motion, muscle tone and strength; endurance; coordination; visual systems; bowel and bladder control; sexual function; cognition; and psychosocial skills, such as mood and judgment (Pulaski, 1998; Rumrill, Roessler, & Cook, 1998). The deficits can lead to severe limitations in daily life participation. The disease process is characterized by exacerbations and remissions. Clients' symptoms worsen during an acute exacerbation and then improve during remissions. Fatigue and sensitivity to heat are two notable features of MS (Bowcher & May, 1998; Coyle et al., 1996).

Method
A comprehensive literature search was conducted for published intervention effectiveness studies related to occupational therapy and MS. First, a computerized search of MEDLINE, PsychLIT®, and The Institute for Scientific Information of literature from 1980 to 1999 was conducted with the following key words: multiple sclerosis and activities of daily living, occupational therapy, therapy, and rehabilitation. A manual search of the following journals for the past 10 years was also conducted: The American Journal of Occupational Therapy®, Canadian Journal of Occupational Therapy, Physical Therapy, and The Journal of Neurologic Rehabilitation. For each article identified, its reference list was also examined for citations of additional relevant studies. Eighty-seven published studies were identified for possible relevance and inclusion in this meta-analysis. Of these studies, 32 were found to measure the effect of occupational therapy or occupational therapy-related interventions on clients with MS. Nine of these studies contained insufficient information to calculate effect sizes and were excluded from further analysis, leaving a total of 23 studies for the meta-analysis.

Inclusion Criteria
Articles published before 1980 were excluded from this study because their relevance to current practice was questionable. Each article selected had to address MS as the primary diagnosis of interest and had to describe some sort of intervention or treatment that was within the scope of an occupational therapy practitioner's abilities, although it did not have to be a typical occupational therapy treatment. Thus, the articles selected were those in which an occupational therapy practitioner would be capable of performing the treatment, even if occupational therapy personnel did not actually perform the treatment in the studies. Drug interventions were not included, nor were interventions in which the outcome measure was at the physiological level (e.g., articles that described the effect of treatment on specific brain sites or motor units). Articles that described associations between outcomes and interventions on clients with MS were excluded as well as articles that described prognostic factors. Each study had to provide sufficient detail of the quantitative analysis to allow for the calculation of effect size. The statistical information required to calculate effect sizes includes means and standard deviations, reported percentages as positive outcomes, or tests of significance (e.g., z test, t test, F test).

To include a variety of occupational therapy–related interventions, adequacy of the experimental design was not an inclusion criterion. Therefore, studies using randomized clinical trials, cohorts, pretest and posttest, and single-case methods were included if they met the previously described inclusion criteria. To evaluate the strength of the research, each research project was evaluated using criteria developed for this study (Trombly, Tickle-Degnen, Baker, Murphy, & Ma, 1999). These criteria expanded on Sackett's (1988) levels of evidence. Four areas were identified that were considered important for understanding the strength of the study: the research design, the sample size, internal validity, and external validity. Each study was graded using these four areas (see Table 1). Thus, a study graded IA1a would provide the strongest evidence to support the treatment; a IA1a study would be a randomized clinical trial with more than 20 participants per condition, high internal validity, and high external validity. A study graded IVB3c would provide weaker evidence to support the outcome of the study. In this case, the study would be a single-subject design with less than 20 participants and with low internal validity and low external validity.

Coding Procedure
The first author coded all study design variables, which included year of publication, type of research design, purpose of study, overall number of participants, number of participants in treatment and control group (if applicable), mean age of participants, and outcome measures. Each outcome measure was listed by instrument and then further defined using Trombly's (1995) conceptualization of occupational performance. In this taxonomy, occupational
performance is divided into progressively larger and more complex levels. Although Trombly described seven levels—cognitive–neuromuscular substrate, first-level capacities, developed capacities, abilities and habits, activities, tasks, and life roles—they were condensed into three basic categories for the purposes of this study. The first category, capacities and abilities, is a combination of the cognitive–neuromuscular substrate, first-level capacities, developed capacities, and abilities and habits. This category is used to refer to underlying biological abilities. The second category is a combination of the activities and tasks levels and is used to refer to both the skills and the behaviors required for occupational performance. The third category is life roles and constitutes the broadest level of occupational performance. We chose to divide the categories in this manner because distinguishing between smaller categories from the information provided within each study was often difficult.

Effect Size Calculation

A separate effect size was generated for each relevant outcome identified within a study. From these, a mean effect size for each study was calculated and used as the primary unit of analysis. In addition, the effect size by category (i.e., capacities and abilities, activities and tasks, life roles) was also obtained.

To obtain the most accurate effect sizes, the following decision tree was used. Exact t statistics or F statistics were used to directly calculate the effect size r in the studies that provided them. In studies in which an exact p value was provided, the p was converted to a Z statistic, a t statistic, or an F statistic, and then the effect size r was calculated. If no p value was available, means and standard deviations were used to calculate a d effect size, which was then converted to an r effect size. In studies with a treatment and control group, where possible, the difference score between the pretest and posttest for each group was used to calculate the d. If no difference score was available either listed in the results or calculable from the means and standard deviations provided, posttest scores were used. In studies with no control group, the d effect size was obtained by subtracting the pretest score from the posttest score (Rosenthal, 1994). Table 2 shows the formulas for these calculations. If none of this statistical information was available, the study was discarded as not having enough information to accurately calculate an effect size. If the author reported that one of several results was “nonsignificant” and did not report any usable values, that result was coded as a zero effect size.

Statistical Analysis

The raw effect size r for each outcome measure was translated into a Fisher’s zr. From these, the mean zr was calculated for each study. The mean zr for each study was then used to calculate the overall zr for all the studies. After completing calculations, zr was translated back into an effect size r. A standard practice in meta-analysis is to further explore the effect size r by weighting each study’s overall r. Because studies with larger samples will give a more accurate estimate of population parameters than studies with smaller samples, an overall sample size weighted effect size of rw was calculated using the conditional variance vr.

To assess the probability that the overall effect size r actually represented a treatment effect, the significance value p was calculated using Stouffer’s procedure for combining Z values (Becker, 1994). Where possible, exact p values were used to calculate the Z. Where not available, the values were derived from effect size values and sample size.

Table 1
Criteria To Evaluate the Strength of a Research Study

<table>
<thead>
<tr>
<th>Grade</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Randomized clinical trials (RCT)</td>
</tr>
<tr>
<td>II</td>
<td>Includes repeated measures designs with randomization of sequence of treatments</td>
</tr>
<tr>
<td>III</td>
<td>Non-RCT–2 groups</td>
</tr>
<tr>
<td>IV</td>
<td>Two groups, treatment versus control, non–randomly assigned. Repeated design without randomization, but with two conditions.</td>
</tr>
<tr>
<td>NA</td>
<td>Single-subject designs</td>
</tr>
<tr>
<td></td>
<td>One group evaluated preintervention and postintervention</td>
</tr>
<tr>
<td></td>
<td>One person evaluated preintervention and postintervention</td>
</tr>
</tbody>
</table>

Sample size

- A: n ≥ 20 per group
- B: n ≤ 20 per group

Internal validity

- 1: High internal validity: no alternate explanation for outcome
- 2: Moderate internal validity: attempt to control for lack of randomization biases
- 3: Low internal validity: two or more serious alternative explanations for outcome

External validity

- a: High external validity: participants represent population, and treatments represent current practice
- b: Moderate external validity: between high and low
- c: Low external validity: heterogeneous sample without being able to understand whether effects were similar for all diagnoses or treatments do not represent current practice
As with \( z_r \), \( Z \) values were calculated for each outcome measure, and then the average \( Z \) was determined for each study. These values were summed and divided by the square root of the number of studies (23) to calculate the overall \( Z \) value of the study.

To evaluate whether the study effect sizes were drawn from the same population, a null test of homogeneity was done. This statistic \( (Q) \) is used as a diagnostic to determine whether a moderator analysis should be done. A significant \( Q \) suggests that there are systematic varying factors, such as age, gender, or treatment outcome, that differentiate the effect sizes either within or between studies. These factors should be studied separately to better understand the effect of these moderating factors. In this meta-analysis, the moderating factors were occupational performance levels. Therefore, weighted and unweighted effect sizes were calculated for each separate category (i.e., capacities and abilities, activities and tasks, life roles). \( Z \) values were also calculated for each category identified for occupational performance.

**Results**

Table 3 lists all mean effect sizes for each study as well as the overall effect size. Cohen (1988) suggested that in interpreting an effect size, an \( r \) of .10 can be considered a small effect size, an \( r \) of .30 can be considered a moderate effect size, and an \( r \) of .50 and above can be considered a large effect size. In these 23 studies, 26% had a small effect size, 26% had a moderate effect size, and 48% had a large effect size. The overall effect of treatment on outcome was large (.52). This effect of treatment on outcome was reduced after controlling for the variances due to studies with small sample sizes. The \( r_w \) suggested that the treatment effect was moderate \( (r_w = .39) \). The significance test, or \( p \) value, suggests that the overall mean effect size significantly exceeds zero \( (p < .0001) \). This significant \( p \) value suggests that the studies demonstrate a treatment effect that is not due to chance. The null test for homogeneity was significant \( (Q = 63.02, df = 22, p < .005) \), suggesting that the studies should be broken down by outcomes for further analysis.

Of the 23 studies, 83% had outcomes that were at the capacities and abilities level. The overall effect of occupational therapy–related treatment on the capacities and abilities level \( (r = .52) \) was the same as that obtained for all studies. The \( r_w \) was also similar to the weighted effect size obtained for all studies \( (r_w = .35) \). Forty-three percent of the studies had outcomes that were at the activities and tasks level. The effect size \( r \) was .57, somewhat larger than the mean effect size \( r \) obtained for all studies. In this case, the \( r_w \) was very similar to that obtained on the unweighted effect size \( (r_w = .54) \). On the other hand, only 17% of the studies had outcomes at the life roles level. The overall effect size obtained for life roles was moderate \( (r = .35; r_w = .38) \). As with the overall effect size, \( p \) for each of the studies was less than .0001. Figure 1 provides a graphic representation of effect sizes obtained in this meta-analysis, both overall and by outcomes. The effect sizes ranged from .08 to .98.

**Discussion**

The results of this meta-analysis suggest that occupational therapy–related treatments have a strong positive effect \( (r = .52) \) on the effects of MS. This strong effect was decreased to moderate when the effect size was weighted by sample size \( (r_w = .39) \). The influence of weighting on the \( r \), however, decreased when examining the different occupational performance levels as outcomes. When the overall weighted effect size for life roles was calculated, it was higher than the unweighted effect size.

The outcomes most often studied in the literature were in the capacities and abilities level, occurring in 19 of the 23 studies. Of these, 6 were randomized clinical trials (Coyle et al., 1996; Fuller & Wiles, 1996; Gordan, Lam, &
Although fewer studies looked at activities and tasks, the effects, overall, tended to be greater than those at the capacities and abilities level. The mean $r_{M}$ for the activities and tasks level was .54, which is larger than that for the mean capacities and abilities level. This large effect was seen in all but 3 of the 11 studies (DiFabio, Choi, Soderberg, & Hansen, 1997; Francobanderer, Holland, Wiesal-Levison, & Scheinberg, 1988; Fuller & Wiles, 1996). These three studies, however, tended to have the highest validity, suggesting that those studies with a more rigorous design did not demonstrate large effects. The exception is the well-designed study on influence of aerobic exercise on quality of life by Petajan et al. (1996), which had a very large effect size of .77.

Studies that examined the effect of occupational therapy–related treatment on outcomes at the life role level were scarcer. Four of the 23 studies looked at role outcomes (DiFabio et al., 1997; Freeman, Langdon, Hobart, & Winter, 1997; Jonsson, Korfitzen, Helterberg, Ravnborg, & Byskov-Ottoson, 1993; Petajan et al., 1996; Smeltzer, Lavietes, & Cook, 1996). The effect sizes for the capacities and abilities outcomes were generally large, particularly for the studies that examined a specific type of treatment, such as exercise (Gehlson, Grigsby, & Winant, 1984; Petajan et al., 1996; Smeltzer et al., 1996), fatigue management (Bowcher & May, 1998), cooling (Coyle et al., 1996; Smeltzer et al., 1996), and transcutaneous electrical nerve stimulator application (Mattison, 1993). A smaller effect size was seen for emotional and cognitive outcomes, such as stress management (Crawford & McIvor, 1987), skills training in socialization (Gordan et al., 1997), and attention training (Plohman et al., 1998).

For the activities and tasks level, a significant effect of occupational therapy–related treatment was also found. Eleven of the 23 studies examined these types of outcomes.

### Table 3

**Summary Table of Studies and Their Effect Sizes**

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Study Purpose “The effect of...”</th>
<th>N</th>
<th>Rx n</th>
<th>Cont n</th>
<th>M Age</th>
<th>M r</th>
<th>M Capacity/Ability r</th>
<th>M Activity/Task r</th>
<th>M Role r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aisen et al. (1993)</td>
<td>IBB2a</td>
<td>tremor dampening on function</td>
<td>4</td>
<td>4</td>
<td>na</td>
<td>36.8</td>
<td>.88</td>
<td>.88</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Aisen et al. (1996)</td>
<td>IIA2a</td>
<td>an inpatient program on MS</td>
<td>37</td>
<td>37</td>
<td>na</td>
<td>46.9</td>
<td>.49</td>
<td>.46</td>
<td>.51</td>
<td>na</td>
</tr>
<tr>
<td>Bowcher &amp; May (1998)</td>
<td>I VB3a</td>
<td>a fatigue management program on reducing fatigue</td>
<td>1</td>
<td>1</td>
<td>na</td>
<td>48.0</td>
<td>.54</td>
<td>.37</td>
<td>.67</td>
<td>na</td>
</tr>
<tr>
<td>Coyle et al. (1996)</td>
<td>IB1a</td>
<td>cooling on objective clinical measurements</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>44.0</td>
<td>.87</td>
<td>.66</td>
<td>.93</td>
<td>na</td>
</tr>
<tr>
<td>Crawford &amp; McIvor (1987)</td>
<td>IIA3a</td>
<td>a stress management program on psychological adjustment</td>
<td>44</td>
<td>23</td>
<td>21</td>
<td>47.3</td>
<td>.34</td>
<td>.34</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>DiFabio et al. (1997)</td>
<td>IB3a</td>
<td>one year of outpatient rehabilitation on health status</td>
<td>31</td>
<td>12</td>
<td>19</td>
<td>46.9</td>
<td>.16</td>
<td>.18</td>
<td>.03</td>
<td>.16</td>
</tr>
<tr>
<td>Feigenson et al. (1981)</td>
<td>IIA3a</td>
<td>type of care (rehabilitation vs. acute) on cost</td>
<td>20</td>
<td>20</td>
<td>na</td>
<td>44.8</td>
<td>.64</td>
<td>.60</td>
<td>.65</td>
<td>na</td>
</tr>
<tr>
<td>Francobanderer et al. (1988)</td>
<td>IA2a</td>
<td>type of rehabilitation (inpatient vs. outpatient) on functional status</td>
<td>73</td>
<td>nr</td>
<td>nr</td>
<td>nr</td>
<td>.17</td>
<td>na</td>
<td>.17</td>
<td>na</td>
</tr>
<tr>
<td>Freeman et al. (1997)</td>
<td>IA1a</td>
<td>short-term inpatient rehabilitation on impairment, disability, and handicap</td>
<td>66</td>
<td>32</td>
<td>34</td>
<td>44.0</td>
<td>.16</td>
<td>na</td>
<td>na</td>
<td>.16</td>
</tr>
<tr>
<td>Fuller &amp; Wiles (1996)</td>
<td>IA2a</td>
<td>inpatient physical therapy on home ability</td>
<td>45</td>
<td>23</td>
<td>22</td>
<td>46.5</td>
<td>.17</td>
<td>.15</td>
<td>.16</td>
<td>na</td>
</tr>
<tr>
<td>Gehlson et al. (1984)</td>
<td>IIB3e</td>
<td>an aquatics program on strength and endurance</td>
<td>10</td>
<td>10</td>
<td>na</td>
<td>40.2</td>
<td>.61</td>
<td>.61</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Gordan et al. (1997)</td>
<td>IB3b</td>
<td>skills training on socialization skills</td>
<td>26</td>
<td>13</td>
<td>13</td>
<td>44.5</td>
<td>.20</td>
<td>.20</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Jones et al. (1996)</td>
<td>IB3a</td>
<td>rehabilitation in reducing impairment and disability</td>
<td>37</td>
<td>28</td>
<td>9</td>
<td>36.8</td>
<td>.58</td>
<td>na</td>
<td>.58</td>
<td>na</td>
</tr>
<tr>
<td>Jonsson et al. (1993)</td>
<td>IB3a</td>
<td>their psychological treatment on cognitive and behavioral measures</td>
<td>32</td>
<td>16</td>
<td>16</td>
<td>44.5</td>
<td>.13</td>
<td>.13</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Lord et al. (1998)</td>
<td>IIA1a</td>
<td>facilitated and task-oriented treatment on mobility and balance</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>53.1</td>
<td>.51</td>
<td>.65</td>
<td>.45</td>
<td>na</td>
</tr>
<tr>
<td>Mathiowetz &amp; Matsuska (1998)</td>
<td>IIA3a</td>
<td>an inpatient occupational therapy program on self-care</td>
<td>30</td>
<td>30</td>
<td>na</td>
<td>45.0</td>
<td>.65</td>
<td>na</td>
<td>.65</td>
<td>na</td>
</tr>
<tr>
<td>Mattison (1993)</td>
<td>IIB3a</td>
<td>an inpatient occupational therapy program on self-care</td>
<td>8</td>
<td>8</td>
<td>na</td>
<td>43.1</td>
<td>.98</td>
<td>.98</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Petajan et al. (1996)</td>
<td>I A3a</td>
<td>transcutaneous electrical nerve stimulator on pain reports and sleeping</td>
<td>46</td>
<td>21</td>
<td>25</td>
<td>40</td>
<td>.65</td>
<td>.61</td>
<td>.77</td>
<td>.63</td>
</tr>
<tr>
<td>Ploehman et al. (1998)</td>
<td>IB3b</td>
<td>aerobic exercise on quality of life</td>
<td>22</td>
<td>22</td>
<td>na</td>
<td>44.6</td>
<td>.32</td>
<td>.32</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Reding et al. (1987)</td>
<td>IB3a</td>
<td>type of care (acute vs. rehabilitation) on outcome</td>
<td>28</td>
<td>14</td>
<td>14</td>
<td>nr</td>
<td>.08</td>
<td>.08</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Rummill et al. (1998)</td>
<td>IIB3a</td>
<td>career reentry programs on unemployment status</td>
<td>37</td>
<td>37</td>
<td>na</td>
<td>43.0</td>
<td>.27</td>
<td>.00</td>
<td>.40</td>
<td>na</td>
</tr>
<tr>
<td>Smeltzer et al. (1996)</td>
<td>IB1a</td>
<td>expiratory training on expiratory muscle strength</td>
<td>15</td>
<td>10</td>
<td>5</td>
<td>nr</td>
<td>.71</td>
<td>.71</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Syndulko et al. (1995)</td>
<td>IIB3a</td>
<td>cooling on objective clinical measurements</td>
<td>20</td>
<td>20</td>
<td>na</td>
<td>nr</td>
<td>.29</td>
<td>.29</td>
<td>na</td>
<td>na</td>
</tr>
</tbody>
</table>

Note: Rx n = number of participants in treatment group; Cont n = number of participants in control group; na = not applicable; nr = not reported.
The overall effect size for the life role level was moderate (r = .38). As with the capacities and abilities studies, the effect was greater for those studies that examined specific types of treatment, such as aerobic exercise (Petajan et al., 1996) and job acquisition (Rumrill et al., 1998), than for those that examined the results of an overall rehabilitation program (DiFabio et al., 1997; Freeman et al., 1997).

No studies examined occupational therapy specifically and separately from other rehabilitation therapies, such as physical therapy, nursing, and speech therapy. Studies that examined occupational therapy treatment included it as part of a multidisciplinary team. Examining occupational therapy interventions as part of a comprehensive treatment is appropriate because, generally, occupational therapy practitioners work with clients with MS as part of a larger team. The 10 studies examining the effect of general rehabilitation therapy on clients with MS varied in their effect sizes (Aisen, Sevilla, & Fox, 1996; DiFabio et al., 1997; Feigenson et al., 1981; Francobandera et al., 1988; Freeman et al., 1997; Fuller & Wiles, 1996; Jones, Lewis, Harrison, & Wiles, 1996; Lord, Wade, & Halligan, 1998; Mathiowetz & Matsuska, 1998; Reding, LaRocca, & Madonna, 1987). Of these 10 studies, 3 were randomized controlled trials. These generally reported that rehabilitation had a small effect on MS outcomes. However, these results may be misleading. One study did not compare therapy versus no therapy but compared two different types of treatment of which both were about equally effective (Francobandera et al., 1988). Another study examined the effect of inpatient therapy on the ability to perform the same tasks at home (Fuller & Wiles, 1996). The small effect size may reflect the choice of outcome measures. Finally, Freeman et al.’s (1997) study examined only a short-term inpatient program. It is possible that clients with MS may require longer term therapy to demonstrate favorable outcomes.

As with most meta-analyses, this meta-analysis has the potential for a publication bias. This bias is often called the “file drawer problem” (Rosenthal & Rosnow, 1991) and refers to the difficulty in finding studies that have non-significant outcomes. Most studies that have primarily non-significant results are either never submitted for publication or not accepted. Rosenthal and Rosnow (1991) developed a calculation to help understand the effect of publication bias on the results of a meta-analysis. Although there is some controversy about the accuracy of this method (Begg, 1994), it remains one of the best ways to determine the effect of publication bias on any given meta-analysis. Using Rosenthal and Rosnow’s (1991, pp. 508–509) formula, we calculated that it would take in excess of 400 nonsignificant studies to bring the results of this meta-analysis down below the cut-off level of significance. This calculation suggests that the effect sizes reported in this study provide accurate and stable information on the effectiveness of occupational therapy–related treatment on clients with MS.

### Implications for Occupational Therapy Practice

Overall, the studies reviewed in this meta-analysis suggest that occupational therapy interventions or interventions that include methods used by occupational therapists are moderately effective in improving the lives of persons with MS. Studies of specific interventions (Bowcher & May, 1998; Coyle et al., 1996; Gehlson et al., 1984; Mattison, 1993; Petajan et al., 1996; Smeltzer et al., 1996; Syndulko et al., 1995) had larger effect sizes than studies of multidisciplinary therapy possibly because of the greater precision or control in the administration and measurement of these interventions. One of the largest limitations of the research in this area is the lack of control groups who received a placebo intervention. In general, studies either did not have control groups or the control groups consisted of individuals on a waiting list. Thus, it is unclear whether intervention effectiveness findings are due to treatment techniques or the high degree of attention the intervention participants received relative to control participants.

The findings of this meta-analysis can be used in evidence-based practice. One use for the meta-analysis is to communicate with clients about intervention effectiveness so that they can make informed decisions about whether to participate in occupational therapy. The binomial effect size display (BESD; Rosenthal & Rubin, 1982) translates the effect size r into success rates: quantified information that may be easier to communicate about than r. Using the BESD formula, the average unweighted effect size r of .52 found in this study translates into success rates of 24% for the control group as opposed to 76% for the intervention group. A practitioner could translate the meta-analytic evidence to a client as follows (see Tickle-Degnen, 1998, for more details on this method of translation):

You asked me whether it is worth it to become involved in occupational therapy. Your concern is understandable, given the cost of ther-

<table>
<thead>
<tr>
<th>Mean r</th>
<th>Mean Capacity/ Ability r</th>
<th>Mean Activity/ Task r</th>
<th>Mean Role r</th>
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**Figure 1. Stem and leaf plot of each study’s mean effect size, both by overall studies and by occupational performance levels.** This plot provides a visual guide to the distribution of effect sizes in this meta-analysis. The “stem” is created by organizing the effect sizes by the first number after the decimal point (all effect sizes beginning .0 are placed at the beginning of the stem, all those with .1 are next, etc.). The effect sizes are then categorized from 0 to 9 by the second digit after the decimal point as the “leaf” on the stem. Thus, .1*36677 in the mean r stem and leaf plot indicates that there are five effect sizes that were .1 (.13, .16, .16, .17, .17).

Thompson, 1997; Petajan et al., 1996; Rumrill et al., 1998). The overall effect size for the life role level was moderate (r = .38). As with the capacities and abilities studies, the effect was greater for those studies that examined specific types of treatment, such as aerobic exercise (Petajan et al., 1996) and job acquisition (Rumrill et al., 1998), than for those that examined the results of an overall rehabilitation program (DiFabio et al., 1997; Freeman et al., 1997).

No studies examined occupational therapy specifically and separately from other rehabilitation therapies, such as physical therapy, nursing, and speech therapy. Studies that examined occupational therapy treatment included it as part of a multidisciplinary team. Examining occupational therapy interventions as part of a comprehensive treatment is appropriate because, generally, occupational therapy practitioners work with clients with MS as part of a larger team. The 10 studies examining the effect of general rehabilitation therapy on clients with MS varied in their effect sizes (Aisen, Sevilla, & Fox, 1996; DiFabio et al., 1997; Feigenson et al., 1981; Francobandera et al., 1988; Freeman et al., 1997; Fuller & Wiles, 1996; Jones, Lewis, Harrison, & Wiles, 1996; Lord, Wade, & Halligan, 1998; Mathiowetz & Matsuska, 1998; Reding, LaRocca, & Madonna, 1987). Of these 10 studies, 3 were randomized controlled trials. These generally reported that rehabilitation had a small effect on MS outcomes. However, these results may be misleading.

One study did not compare therapy versus no therapy but compared two different types of treatment of which both were about equally effective (Francobandera et al., 1988). Another study examined the effect of inpatient therapy on the ability to perform the same tasks at home (Fuller & Wiles, 1996). The small effect size may reflect the choice of outcome measures. Finally, Freeman et al.’s (1997) study examined only a short-term inpatient program. It is possible that clients with MS may require longer term therapy to demonstrate favorable outcomes.

As with most meta-analyses, this meta-analysis has the potential for a publication bias. This bias is often called the “file drawer problem” (Rosenthal & Rosnow, 1991) and refers to the difficulty in finding studies that have non-significant outcomes. Most studies that have primarily non-significant results are either never submitted for publication or not accepted. Rosenthal and Rosnow (1991) developed a calculation to help understand the effect of publication bias on the results of a meta-analysis. Although there is some controversy about the accuracy of this method (Begg, 1994), it remains one of the best ways to determine the effect of publication bias on any given meta-analysis. Using Rosenthal and Rosnow’s (1991, pp. 508–509) formula, we calculated that it would take in excess of 400 nonsignificant studies to bring the results of this meta-analysis down below the cut-off level of significance. This calculation suggests that the effect sizes reported in this study provide accurate and stable information on the effectiveness of occupational therapy–related treatment on clients with MS.

### Implications for Occupational Therapy Practice

Overall, the studies reviewed in this meta-analysis suggest that occupational therapy interventions or interventions that include methods used by occupational therapists are moderately effective in improving the lives of persons with MS. Studies of specific interventions (Bowcher & May, 1998; Coyle et al., 1996; Gehlson et al., 1984; Mattison, 1993; Petajan et al., 1996; Smeltzer et al., 1996; Syndulko et al., 1995) had larger effect sizes than studies of multidisciplinary therapy possibly because of the greater precision or control in the administration and measurement of these interventions. One of the largest limitations of the research in this area is the lack of control groups who received a placebo intervention. In general, studies either did not have control groups or the control groups consisted of individuals on a waiting list. Thus, it is unclear whether intervention effectiveness findings are due to treatment techniques or the high degree of attention the intervention participants received relative to control participants.

The findings of this meta-analysis can be used in evidence-based practice. One use for the meta-analysis is to communicate with clients about intervention effectiveness so that they can make informed decisions about whether to participate in occupational therapy. The binomial effect size display (BESD; Rosenthal & Rubin, 1982) translates the effect size r into success rates: quantified information that may be easier to communicate about than r. Using the BESD formula, the average unweighted effect size r of .52 found in this study translates into success rates of 24% for the control group as opposed to 76% for the intervention group. A practitioner could translate the meta-analytic evidence to a client as follows (see Tickle-Degnen, 1998, for more details on this method of translation):

You asked me whether it is worth it to become involved in occupational therapy. Your concern is understandable, given the cost of ther-
apy and the effort required for you to participate in therapy. A recent review of the research on the effectiveness of occupational therapy and other relevant rehabilitation interventions with clients with MS reported that 24% of clients had positive results without therapy, but 76% had positive results with therapy. This finding suggests that intervention had a large and positive effect on outcomes, particularly with respect to improving basic abilities and daily living activities. We must be somewhat cautious in applying these findings to you, however. For one thing, some of the research studies had some flaws in their design. More importantly, you are unique, and the findings may or may not apply to you. You may or may not benefit from occupational therapy. Let’s talk more about the benefits and costs of your participating in occupational therapy.

This article supports the use of occupational therapy for clients with MS. Occupational therapy practitioners can use this meta-analysis to justify the use of occupational therapy treatment as part of an overall rehabilitation strategy for clients with MS. Many of the studies suggested that occupational therapy, along with other rehabilitation treatments, was effective in improving the occupational performance of clients who had at least moderate levels of impairment (Aisen, Arnold, Baiges, Maxwell, & Rosen, 1993; DiFabio et al., 1997; Francobandera et al., 1988; Jones et al., 1996). Several suggested that short, intensive inpatient treatment could be effective in improving performance (Freeman et al., 1997; Fuller & Wiles, 1996; Jones et al., 1996). The studies also demonstrated support for specific types of treatment, such as exercise, tremor damping, and training in specific impairment areas.

One trend of importance highlighted by this study is the indication that although occupational therapy–related treatment is effective at the capacities and abilities and activities and tasks levels, it is less effective at the life roles level. This finding may be partially due to the scarcity of studies that measure outcomes at the life roles level. With the increasing interest in using the World Health Organization’s (2000) terms for ability (i.e., the ICF—bodily structure and function, activity, and participation—it will be increasingly important for occupational therapy practitioners to demonstrate that occupational therapy can influence the participation level of their clients. Further research on occupational therapy and MS will need to focus on measuring outcomes at the life roles level (e.g., how occupational therapy influences participation in work, leisure, family, and community). Finding methods to measure the results of client-centered practice will help to focus research in this area.

Although more research is needed that includes (a) a control group that controls for the attention received by participants in a rehabilitation program and (b) measurement of outcomes at the life roles level, our meta-analytic findings suggest that interventions involving physical, psychological, and functional training have a positive effect in the lives of persons with MS.

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**References**


