Relationship Between Performance-Based and Self-Reported Assessment of Hand Function

Celina R. Rallon, Christine C. Chen

OBJECTIVE. To examine the relationships between self-reported and performance-based hand function.

METHOD. Thirty participants with hand function limitations completed the Manual Ability Measure (MAM–36) and the Upper Extremity Performance Test for the Elderly (TEMPA). Participants were categorized into two groups: (1) Dominant Hand Affected and (2) Nondominant Hand Affected. Correlations between the two assessments were examined. The speed of task execution and TEMPA scores were compared between the two groups.

RESULTS. A significant correlation was found between the MAM–36 and TEMPA Total Functional Rating ($r = 0.79$, $p < .05$). Significant differences were found in the speed of execution of unilateral tasks and the Unilateral Functional Ratings between the two groups.

CONCLUSION. The MAM–36 is a promising assessment tool for measuring a client’s perceived hand function. However, a performance-based assessment can supplement information about the quality and speed of hand-task performance.


In evaluating and treating clients with hand function problems, occupational therapists are faced with deciding which assessment tool to use. Among the currently available tools, one type is standardized, performance based, and administered by the therapist, whereas another is self-report. Performance-based assessments provide the therapist with objective and firsthand (or observed) information about the client’s hand function but are more time consuming. Questionnaires are filled out by clients to show their own rating of their hand use; they are usually quicker to administer but provide the occupational therapist with only subjective information about the client’s perception. Several studies demonstrate the importance of using either standardized assessments or questionnaires. However, only minimal study has been done to show the correlation between findings from a standardized test and a client’s self-report of hand function. The purpose of this exploratory research was to examine the extent to which a client’s self-report relates to or agrees with the occupational therapist’s evaluation of hand use.

Literature Review

Standardized Assessments

The use of standardized tests has been well recognized in evaluating clients with upper-extremity or hand impairments because standardized tests provide accurate and objective information that can be used for treatment planning and determining treatment effectiveness (Rudman & Hannah, 1998). In many clinical settings, for
example, dexterity tests are used to evaluate upper-extremity function (Desrosiers, Hebert, Bravo, & Dutil, 1995). Common standardized assessments include the Nine Hole Peg Test (Mathiowetz, Weber, Kashman, & Volland, 1985), the Box and Block Test (Mathiowetz, Volland, Kashman, & Weber, 1985), and the Purdue Pegboard (Tiffin, 1968). All of these assessments use speed of manipulation as the surrogate of hand function (O’Neill, 1995). The Nine Hole Peg Test has a high interrater reliability (intraclass correlation [ICC] = .98 to .99; Oxford Grice et al., 2003). The Box and Block Test has a high test–retest reliability (ICC = .89 to .97; Desrosiers, Bravo, Hebert, Dutil, & Mercier, 1994). The Purdue Pegboard also has a high test–retest reliability (ICC = .85 to .90; Gallus & Mathiowetz, 2003). These assessments, however, do not consider the following: (1) the function of the entire upper extremity, (2) how the measurement of components of hand function (i.e., speed) translates into use of the extremity in daily life, and (3) the effect of artificial setting in which the testing occurs.

Questionnaires

Questionnaires are a part of the evaluation of upper-extremity and hand conditions and allow us to better understand what clients experience (Schuind et al., 2003). Questionnaires are also easier to administer than physical testing: They require no special equipment, are less time consuming, and can be self-administered and therefore eliminate observer bias (Amadio, 2001). Amadio (2001), however, pointed out that questionnaires are not the best tool to measure anatomic or physiologic impairments. Even with an increase in the use of client self-report outcome measures by clinicians, some practitioners hesitate to use them as part of their practice (Michener & Leggin, 2001). According to Michener and Leggin (2001), there is a belief among practitioners that information gathered through self-report is subjective, less reliable, and less accurate than information obtained through standardized assessments. They concluded, however, that if a questionnaire is well designed and validated, the information collected from clients through this method is also reliable (Michener & Leggin, 2001).

Correlation Between Objective and Subjective Assessments

Numerous studies demonstrate the importance of either standardized assessments (Desrosiers et al., 1995; Pap, Angst, Herren, Schwyzer, & Simmen, 2003; Richards, Stoker-Yates, Pohl, Wallace, & Duncan, 2001; Rudman & Hannah, 1998; Schuind et al., 2003) or client self-report assessments (Amadio, 2001; Barbier, Penta, & Thonnard, 2003; Chen, Granger, Peimer, Moy, & Wald, 2005; Michener & Leggin, 2001; Pap et al., 2003; Schuind et al., 2003). However, only one study correlated the findings between the two types of assessments: O’Connor and colleagues (1999) attempted to correlate the findings from two objective measures (Sollerman Hand Function Test [Sollerman & Ejeskär, 1995] and Sequential Occupational Dexterity Assessment [van Lankveld et al., 1996]) with two subjective measures (Visual Analog Scales for Pain and the Upper Limb Health Assessment Questionnaire [ULHAQ], both of which can be found as components of the Health Assessment Questionnaire [see Bruce & Fries, 2005]) for clients with rheumatoid arthritis. This study showed a strong relation between the scores; however, reliability and validity of the ULHAQ has not been studied, and this study involved clients with only one specific condition (rheumatoid arthritis). Therefore, the purpose of the current study is to examine the relation between a self-reported hand function measure and a performance-based standardized test.

Method

Description of Participants

The participants consisted of 30 adults who had hand functional limitations caused by current or past injuries or diseases such as fractures, carpal tunnel syndrome, previous hand surgeries, arthritis, and stroke. The participants were occupational therapy clients who responded to an advertisement posted at the outpatient Occupational Therapy Department of Staten Island University Hospital in Staten Island, New York.

Inclusion Criteria

To be included in the study, participants had to be more than 18 years old and pass a screening assessment that determined whether the participant had adequate cognitive ability to follow instructions.

Instruments

We used the Manual Ability Measure (MAM–36; Chen & Giustino, 2007; Chen, Kasven, Karpatkin, & Sylvester, 2007) and the Upper Extremity Performance Test for the Elderly (TEPA; Desrosiers, Hebert, Dutil, & Bravo, 1993) to assess hand function among the participants.

MAM–36. The MAM–36, a recently developed, psycho-metrically sound outcome measurement tool that is a task-orientated and client-centered questionnaire, measures perceived manual ability (Chen & Giustino, 2007; Chen et al., 2007). It consists of a list of 36 discrete hand tasks. A 4-point rating system is used for the client to indicate how easy or hard the task is for him or her to perform: 4 (easy), 3 (a little hard), 2 (very hard), and 1 (cannot do). Chen and colleagues...
have demonstrated evidence of the reliability and validity of
the MAM–36: Rasch person reliability ranged from 0.83 to
0.94, and the item reliability ranged from 0.85 to 0.98 (Chen
et al., 2007; Chen & Giustino, 2007). They also provided
preliminary evidence of criterion-related validity (Chen et
al., 2005). A copy of the MAM–36 can be found at Chen et
al. (2007).

Compared with the Disabilities of the Arm, Shoulder
and Hand assessment (Beaton et al., 2001), which measures
clients performing complex tasks including recreational
activities and heavy household chores, tasks in the MAM–36
are simpler and more specific to the construct of manual
ability (Chen et al., 2005). Unlike ABILHAND (Barbier et
al., 2003), a questionnaire developed to measure manual
ability that was administered to a sample of clients with
rheumatoid arthritis and chronic stroke only, the MAM–36
was administered to a sample of clients with a variety of
impairments, such as rheumatoid and osteoarthritis, multiple
sclerosis, cerebral vascular accident (CVA), carpal tunnel
syndrome, tenosynovitis, and traumatic injuries including
fractures and open wounds (Chen et al., 2005, 2007; Chen
& Giustino, 2007). The MAM–36, therefore, has been
shown to be a promising outcome measurement tool to
measure manual ability.

TEMPA. The Upper Extremity Performance Test for the
Elderly (TEMPA; Desrosiers, Hebert, Dutil, & Bravo, 1993)
is a standardized assessment developed to assess upper-
 extremity function; it includes both quantitative and qualita-
tive information (Desrosiers et al., 1995). It has been
regarded as an assessment with adequate psychometric pro-
 perties and clinical utility (Rudman & Hannah, 1998). The
TEMPA requires a person to perform nine tasks related to
activities of daily living: five bilateral tasks (open a jar and
remove a spoonful of coffee, unlock a lock and open a pill
container, write on an envelope and stick a stamp on it,
shuffle and deal playing cards, and tie a scarf around the
neck) and four unilateral tasks (pick up and move a jar, pick
up a pitcher and pour water into a glass, handle coins, and
pick up and move small objects). Three parameters are mea-
sured for each task: (1) speed, (2) functional rating, and (3)
task analyses. The functional rating (FR) indicates the extent
of independent completion of the task, and there are four
scores: unilateral functional ratings (R–FR or L–FR) for
unilateral hand tasks, bilateral functional rating (B–FR) for
bilateral hand tasks, and the total or combined functional
rating. If the task is successfully completed without assistance
or modification, a score of 0 is given; if the task is completed
with some difficulty, a score of –1 is given; if the task could
only be partially completed or performed in its entirety with
major difficulty, a –2 is given; if more than 25% of the task
cannot be performed, a –3 is given.

The TEMPA has been shown to have excellent test–
retest reliability for its speed of execution and functional
rating components (Richards et al., 2001). According to
Richards et al. (2001), ICC was .89 for the unilateral tasks
of the TEMPA and > .97 for the functional rating com-
ponent of the test. Concurrent validity of the TEMPA has been
established (Desrosiers, Hebert, Dutil, Bravo, & Mercier,
1994). High correlations (.90 to .95) exist between the
TEMPA’s four functional ratings and task analysis total

Procedure
The Institutional Review Boards of New York University
and Staten Island University Hospital approved this research.
The researcher screened each possible participant to deter-
mine whether he or she was eligible as a candidate using the
screening assessment. The MAM–36 and TEMPA were
administered to each participant, and after each participant
completed the two hand function assessments, he or she was
asked to rate himself or herself on the ease or difficulty of the
TEMPA activities as well.

Data Analysis
Descriptive statistics were calculated to determine the char-
acteristics of the participants. Ordinal ratings of the MAM–
36 were first transformed into interval measures through Rasch Rating Scale Analysis (Wright & Masters, 1982). Next, Spearman correlations were conducted to examine the relationships between the MAM–36 and the functional
ratings of the TEMPA. The participants were categorized
into two groups: (1) Dominant Hand Affected (participants
whose dominant hand was also the affected or symptomatic
hand) and (2) Nondominant Hand Affected (participants
whose nondominant hand was the affected or symptomatic
hand). Four participants who had both hands affected were
assigned to a group depending on which hand was more
symptomatic. T tests were conducted to compare functional
ratings, task performance speed, and MAM–36 measures of
the two groups.

Results
Twenty women and 10 men (n = 30) participated in the
study. The participants’ ages ranged from 34 to 76 (M =
56.07, SD = 11.87). Most of the participants had a diagnosis
that fell under the orthopedic category involving the hand
(26.7%), such as wrist sprain, capsulotomy of the metacarpal
joints, wrist fracture, and tendon transfer or repair; another
13.3% had involvement of parts of the arm other than the
hand, such as shoulder adhesive capsulitis, lateral epicondy-
liitis, rotator cuff tear, and shoulder bursitis. An additional
23.3% had a diagnosis that fell under the “other” category, which included brachial plexopathy, Charcot Marie Tooth Disease, diabetic neuropathy, reflex sympathetic dystrophy, and hand infection. Twenty percent had a diagnosis of CVA. Last, 16.7% had a diagnosis of spinal cord injury, rheumatoid arthritis, or osteoarthritis. Twenty-four of the participants (80%) were right-hand dominant, whereas the other six were left-hand dominant. Eighteen participants (60%) had their left hand affected, eight (26.7%) had their right hand affected, and the remaining four (13.3%) had both hands affected.

Significant correlations were noted between the MAM–36 measures and the functional ratings on the TEMPA (Table 1). The Dominant Hand Affected group consisted of 12 participants, and the Nondominant Hand Affected group had 18 participants. Eight participants (67%) in the Dominant Hand Affected group were right-hand dominant, whereas 16 participants (89%) were right-hand dominant in the Nondominant Hand Affected group. The t-test analyses revealed a significant difference between the two groups for the TEMPA functional ratings for the right- and left-handed unilateral tasks (Table 2). The Dominant Hand Affected group had a lower group mean (–3.25) for the functional rating for the right than the Nondominant Hand Affected group (–1.28). Conversely, the Dominant Hand Affected group had a higher group mean for the functional rating for the left than the Nondominant Hand Affected group. No significant difference was noted for the bilateral and combined functional ratings of the TEMPA, the MAM–36 measures, and task performance speed for all five bilateral tasks of the TEMPA between the two groups. Although the MAM–36 measures did not show a significant difference between the two groups, it should be noted that the group mean was 0.92 logits for the Dominant Hand Affected group and 1.09 logits for the Nondominant Hand Affected group, indicating that the manual ability was greater in those who had their nondominant hand impaired. A significant difference was noted in the task-performance speed for the following unilateral tasks of the TEMPA: (1) picking up a jar with the right or the left, (2) pouring with a pitcher with the right, (3) handling coins with the left, and (4) picking up small objects with the left.

### Conclusion

The findings of this study showed a moderate correlation between a client’s self-report (MAM–36) and standardized assessment (TEMPA) of hand function. Moreover, the speed of execution and the proficiency of performance were significantly compromised when clients performed unilateral hand tasks with their affected hand. Last, the fact that no between-group difference was found in the MAM–36 or the TEMPA bilateral or combined functional ratings suggests that the MAM–36 measured the bilateral or overall manual ability of the clients.

The MAM–36 is a promising assessment tool that occupational therapists can use as a valid measure to quickly and adequately evaluate a client’s hand function. This tool may be helpful to many clinicians to better manage the time spent with their clients. Self-report questionnaires need to be short enough for easy completion and review and must contain items that will evaluate a client’s functional limitations (Michener & Leggin, 2001). When additional information

### Table 1. Correlations Between MAM–36 and Functional Ratings of the Upper Extremity Performance Test for the Elderly

<table>
<thead>
<tr>
<th></th>
<th>MAM</th>
<th>FR–R</th>
<th>FR–L</th>
<th>FR–bilateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR–R</td>
<td>0.38*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FR–L</td>
<td>0.38*</td>
<td>–0.35</td>
<td></td>
<td></td>
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<tr>
<td>FR–bilateral</td>
<td>0.68**</td>
<td>0.47**</td>
<td>0.23</td>
<td></td>
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<tr>
<td>FR–combined</td>
<td>0.79**</td>
<td>0.54**</td>
<td>0.47**</td>
<td>0.87**</td>
</tr>
</tbody>
</table>

*Note. MAM = Manual Ability Measure; FR–R = functional rating of the right hand; FR–L = functional rating of the left hand.

*p < .05. **p < .01.

### Table 2. t-test Analyses Comparing the TEMPA Functional Ratings and MAM–36 Measures of the Dominant Hand Affected and Nondominant Hand Affected Groups

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>T test</th>
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<tbody>
<tr>
<td>Unilateral functional rating</td>
<td></td>
<td></td>
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<tr>
<td>for tasks performed with the</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>right hand</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Dominant hand affected</td>
<td>–3.25</td>
<td>2.45</td>
<td></td>
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<tr>
<td>Nondominant hand affected</td>
<td>–1.28</td>
<td>2.24</td>
<td>0.03*</td>
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<tr>
<td>(Range = 12–0)</td>
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<tr>
<td>Unilateral functional rating</td>
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<tr>
<td>for tasks performed with the</td>
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<tr>
<td>left hand</td>
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<tr>
<td>Dominant hand affected</td>
<td>–1.67</td>
<td>3.05</td>
<td></td>
</tr>
<tr>
<td>Nondominant hand affected</td>
<td>–3.83</td>
<td>2.40</td>
<td>0.03*</td>
</tr>
<tr>
<td>(Range = 12–0)</td>
<td></td>
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<tr>
<td>Bilateral functional rating</td>
<td></td>
<td></td>
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<tr>
<td>Dominant hand affected</td>
<td>–5.17</td>
<td>2.12</td>
<td></td>
</tr>
<tr>
<td>Nondominant hand affected</td>
<td>–4.56</td>
<td>1.75</td>
<td>0.40</td>
</tr>
<tr>
<td>(Range = 15–0)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Total/combined functional rating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dominant hand affected</td>
<td>–10.08</td>
<td>4.75</td>
<td></td>
</tr>
<tr>
<td>Nondominant hand affected</td>
<td>–9.67</td>
<td>4.89</td>
<td>0.03*</td>
</tr>
<tr>
<td>(Range = 39–0)</td>
<td></td>
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<tr>
<td>Total MAM raw score</td>
<td></td>
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<tr>
<td>Dominant hand affected</td>
<td>102.33</td>
<td>18.86</td>
<td></td>
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<tr>
<td>Nondominant hand affected</td>
<td>105.44</td>
<td>21.84</td>
<td>0.69</td>
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<tr>
<td>(Range = 39–0)</td>
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<td></td>
<td></td>
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<tr>
<td>MAM measure (logits)</td>
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<tr>
<td>Dominant hand affected</td>
<td>0.92</td>
<td>1.28</td>
<td></td>
</tr>
<tr>
<td>Nondominant hand affected</td>
<td>1.09</td>
<td>1.49</td>
<td>0.75</td>
</tr>
</tbody>
</table>

*p < .05.
is needed about a client’s quality of performance on a given task (i.e., how fast or coordinated a task is done), however, a performance-based assessment such as the TEMPA may be needed. These findings are similar to the findings of O’Connor et al. (1999), which showed the need for using a more sensitive assessment tool to determine the severity of hand function limitation than a self-report measure alone.

The current sample included participants with hand impairments and functional limitations. Many of them have had the condition for some time and have learned to adapt. A limitation of the current study is that the severity of the participants’ hand impairment was not categorized. The participants were also not categorized according to their diagnosis. Additional data from a larger sample size is needed to clarify whether a stronger correlation exists between the two hand function assessments and whether clearer differences may be found between people with injuries to their dominant hand and those whose symptomatic hand is their nondominant hand.

The information gained from the MAM–36 and TEMPA is valuable. Both measures offer information on a client’s ability to function and complete tasks. At the same time, the two assessments offer important as well as different additional information about the client. The MAM–36 provides insight into the client’s perception of his or her ability to function, whereas the TEMPA provides information on the speed and proficiency of performance. The MAM–36 requires the client to rate the difficulty of the tasks regardless of which hand is used to perform the tasks, whereas the TEMPA can compare the performance of the affected hand to that of the nonaffected hand, especially with unilateral tasks. Therefore, the use of a performance-based assessment complements that of a self-report, and both may be necessary for a thorough occupational therapy evaluation and treatment planning.

Acknowlegments

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