Factors Influencing Compliance With Home Exercise Programs Among Patients With Upper-Extremity Impairment

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Key Words: human activities and occupations • models, occupational therapy • therapeutic exercise • volition

Objective. Patient cooperation and satisfaction with home exercise programs are important for successful outcomes of intervention. This study investigated factors from three models to predict increased compliance and satisfaction with home exercise programs: the Model of Human Occupation (MOHO), including the volition subsystem (interests), habituation subsystem (roles), and performance subsystem (reported physical capacity); the Health Belief Model (HBM), including perceived barriers, benefits, self-efficacy, and severity; and the Health Locus of Control (HLOC).

Method. Sixty-two outpatients at an orthopedic upper-extremity rehabilitation facility completed a battery of questionnaires and self-report instruments, including a health belief survey to assess HBM factors, the Multidimensional Health Locus of Control Scale, the Modified Activity Profile to assess the performance subsystem of the MOHO, a demographic questionnaire (including roles), a report of home exercise, and a satisfaction scale of their therapist's treatment. Compliance was determined by comparing participants' report of exercises performed to exercises specified on their medical chart.

Results. Stepwise regression identified two predictors of compliance: perceived self-efficacy and internal HLOC, $R^2 = .16$.

Conclusion. Results supported the role of the MOHO's volition subsystem, but roles and physical capacity—representing the habituation and performance subsystems of the MOHO—did not contribute significantly to the prediction of compliance.


The extent to which a person follows medical or health recommendations, such as taking medications or altering lifestyle (Blackwell, 1992), has traditionally been termed compliance. Because following such recommendations is considered essential for good treatment outcomes (Codori, Nannis, & Pack, 1992; Jette, 1982), clinicians and researchers have investigated aspects of compliance and noncompliance, interventions to improve compliance, measures of compliance, and the relationship between compliance and treatment outcomes. Types of compliance that have been studied extensively include keeping clinic appointments for the management of a chronic condition (Mirozynski, Ginzler, Zagon, & Baptiste, 1998), taking medications and treatment regimes (Crane, 1996; Sackett & Snow, 1979), following regimens for diabetes (Bashoff & Beaser, 1995; Kavanaugh, Gooley, & Wilson, 1993; Pham, Fortin, Thibaudeau, 1996), controlling hypertension (Kjellgren, Ahlner, & Saljo, 1995; Rudd, 1995), managing arthritis symptoms (Feinberg,
Compliance with occupational therapy treatment regimens has not been the focus of many investigations, but compliance has been included as a variable in numerous studies. Patients who most closely follow their treatment recommendations have been observed to experience better treatment outcomes (Dovelle, Heeter, Fischer, & Chow, 1988; Groth, Wilder, & Young, 1994; Yuen, 1993). Although compliance with occupational therapy treatment recommendations is believed to be high (Codori et al., 1992, Feinberg, 1992), more research is needed to investigate a wide range of variables that may influence compliance and strategies that may facilitate compliance.

The term compliance has been criticized for its connotation that health care providers dictate what patients should do, and other terms have been suggested, such as adherence, patient cooperation, and maintenance. Groth and Wulf (1995) defined compliance in hand rehabilitation as, “an active engagement in the rehabilitation process” (p. 18). Their definition, which we have adopted here, denotes that the therapist, physician, and patient are active agents in the rehabilitation process and that cooperation with agreed-upon specific recommendations is crucial to optimal patient outcomes.

Because compliance may be influenced by multiple factors, we adopted a holistic frame of reference as a conceptual basis for our research: the Model of Human Occupation (MOHO; Kielhofner & Burke, 1980), the Health Belief Model (HBM; Rosenstock, 1966), and the construct of Health Locus of Control (HLOC; Wallston & Wallston, 1978). This study investigated how factors of the volition, habitation, and performance systems from the MOHO; perceived barriers, benefits, self-efficacy, and severity from the HBM; and the HLOC may influence compliance with home exercise programs for patients with upper-extremity impairment.

**Literature Review**

**Compliance in the Occupational Therapy Literature**

In the occupational therapy literature, use of recommended items such as splints or other positioning devices, adaptive equipment, and wheelchairs are commonly considered as compliance behaviors (Bates, Spencer, Young, Rintala, 1993; Feinberg, 1992; Feinberg & Brandt, 1981; Furth, Holm, & James, 1994; Groth et al., 1994; Hannah & Cottrill, 1985; Krajnik & Bridle, 1992; Sharrott & Cooper-Fraps, 1986; Tyson & Strong, 1990), whereas failure to keep appointments or perform specific exercises are considered noncompliance behaviors (Codori et al., 1992; Dovelle et al., 1988; Ekes & Marvin, 1985; Groth et al., 1994; Sharrott & Cooper-Fraps, 1986; Turton & Fraser, 1990; Wynn & Eckel, 1986). With few exceptions (Kielhofner & Nelson, 1983; Rust, Barris, & Hooper, 1987), studies of relationships between compliance and occupational therapy treatment outcomes or of compliance promotion interventions (Turton & Fraser, 1990; Yuen, 1993) have been atheoretical.

**Models Pertaining to Compliance**

Several theories and explanatory models have been suggested to predict and explain compliance behaviors (Mullen, Hersey, & Iverson, 1987). The HBM, derived from Lewin’s aspiration theory (Rosenstock, 1966; Strecher & Rosenstock, 1997), was developed to explain preventive health behaviors (Hochbaum, 1958). Janz and Becker (1984) summarized the model as consisting of the following dimensions:

- **Perceived susceptibility**—subjective perception of risk of contracting a condition.
- **Perceived severity**—evaluations of medical/clinical consequences (e.g., death, disability, pain) and possible social consequences (e.g., effects of the conditions on work, family life, and social relations).
- **Perceived benefits**—a “sufficiently-threatened” individual would not be expected to accept the recommended health action’s effectiveness against perceptions that it may be expensive, dangerous (e.g., side effects, iatrogenic outcomes), unpleasant (e.g., painful, difficult, upsetting), inconvenient, time-consuming, and so forth. (p. 2)

The HBM has been studied extensively. Janz and Becker (1984) reviewed 46 studies and found perceived barriers to be the most powerful single predictor of health behavior across all studies, but the strength of predictors varied by type of behavior. Perceived risk (or susceptibility) was a stronger predictor of participation in preventive health behaviors, whereas perceived benefits was a stronger predictor of health actions recommended for persons who already had a medical condition (i.e., compliance with a treatment or rehabilitative regimen).

The HBM has been broadened to incorporate the role of self-efficacy in health-related behavior (Rosenstock, Strecher, & Becker, 1988). Self-efficacy beliefs concern one’s perceived capability in performing a given behavior to produce desired outcomes (Bandura, 1977). Perceived self-efficacy may affect not only expectations for success, but also choices about where to attempt a task and how long or hard one works on it (Strecher, DeVellis, Becker, & Rosenstock, 1986).

Few occupational therapy studies are based on the HBM. Kielhofner and Nelson (1983) attempted to apply its concepts to patient cooperation and participation with therapy, positing that the fit between patients’ expectation for recovery and the goals of the therapy (i.e., recovery vs. adaptation to disability) predicted how much the patient valued therapy, which, in turn, predicted cooperation and participation. Perhaps, in part, because HBM aspects encompassed by the fit between patients’ expectations and therapy goals were not clearly specified, these researchers found little support for the model. Groth and Wulf (1995) specified application of HBM concepts to hand rehabilitation. Perceived benefits would be “increased health and
function, return to work, and re-engagement in activities of daily living” (p. 19), for example, “if a patient believes that wearing a protective splint following a flexor tendon repair will not prevent tendon rupture, he or she will be less likely to do so” (p. 19). This delineation of application of the HBM to a rehabilitation program set the stage for investigations testing elements of the model in an occupational therapy context.

The MOHO, which contains some of the same concepts as the HBM, may provide a more comprehensive framework for understanding compliance as a form of occupational behavior. The MOHO posits that three subsystems—volition, habituation, and performance—determine occupational behavior. These subsystems, and the elements that comprise them, correspond to HBM variables as well as other variables investigated in the compliance literature. For example, the MOHO's values and interests correspond to the HBM's perceived benefits. Findings from the few studies investigating the influence of interests on treatment compliance have been mixed. Fronczek (1985) reported that interests did not predict behavior change among patients in hand rehabilitation. Rust et al. (1987) likewise reported that an interests-specific and exercise-specific measure did not contribute significantly to explaining exercise behavior. It may be that interests were too closely related to other predictors (exercise-specific personal causation, exerciser role) to contribute independently. In contrast, Oldridge and Streiner (1990) reported that persons who dropped out of a cardiac rehabilitation program generally did not participate in leisure activities, suggesting a relationship between interests and compliance. Interests as a predictor of compliance requires further investigation.

In the MOHO's habituation subsystem, patients' roles are expected to influence their occupational behavior. Although research findings support this claim (Carpenter & Davis, 1976; Jones, Jones, & Katz, 1987; Kiley, Lam, & Pollak, 1993), it is unclear whether compliance with treatment fits the daily routines of particular roles or whether some other aspects of roles are important (i.e., whether compliance allows for continuation of a role, such as worker). The influence of roles on compliance behavior, particularly in the context of the MOHO, deserves investigation.

In the MOHO's performance subsystem, it is postulated that skills influence occupational behavior. How skills specifically affect compliance behavior, however, is unknown. Very little research has examined patients' compliance and perceived physical capacity. Feinberg and Brandt (1981) reported that compliant patients with rheumatoid arthritis were more symptomatic and had greater impairment. On the basis of this result, patients with better perceived physical capacity may be less compliant.

HLOC refers to people's perceptions that their health is controlled by themselves, chance, or powerful others (Rotter, 1971; Wallston & Wallston, 1978). HLOC may influence compliance behaviors (Fronczek, 1985). Patients with “internal” or “powerful others” HLOC have been found to be more likely to comply than patients believing that their health outcomes are controlled by chance (Fronczek, 1985; Kiley et al., 1993; Schlenk & Hart, 1984). Personal causation, another element of the MOHO's volition construct, is related to HLOC.

In the only study we found linking the MOHO to a behavior similar to compliance, Rust et al. (1987) investigated whether the model explained exercise behavior in women. Although exercise as a leisure form of occupational behavior differs from exercises prescribed in a rehabilitation program, both are types of occupational behavior and have longer-term health benefits than, for instance, activities such as cooking or doing laundry. Moreover, adherence to a prescribed exercise regimen for weight loss, diabetes control, or cardiac rehabilitation can be characterized as compliance with medical recommendations (Bashoff & Beaser, 1995; Kavanagh et al., 1993; Robertson & Keller, 1992). Rust et al. found that the following three variables explained 43% of the variability in exercise behavior: an exercise-specific measure of personal causation, the exerciser role, and values regarding leisure. Their findings provided strong support for consideration of the elements of the MOHO as determinants of compliance with rehabilitation programs.

In summary, we found support in the research literature that factors from MOHO's three subsystems can influence occupational behavior. In the volition subsystem, HLOC, health beliefs, and interests are factors that can influence occupational behavior as it pertains to compliance. In the habituation subsystem, roles (e.g., homemaker, worker, spouse) can favorably influence compliance with therapy. In the performance subsystem, skills can influence compliance.

The purpose of our study was to assess the factors that predicted increased compliance of patients with upper-extremity orthopedic conditions with their home exercise programs. Our study integrated the MOHO, HBM, and HLOC to predict patient compliance. Figure 1 represents how the MOHO predicts compliance and incorporates the HBM and HLOC. Using the framework in Figure 1, we hypothesized that the following would predict greater compliance with home exercise programs:

- Greater perceived benefits of rehabilitation, greater perceived severity of the disease or injury, greater self-efficacy, and lower perceived barriers to carrying out the home exercise program
- Internal HLOC
- Higher interest in the recommended home exercise program activities.

Conversely, we hypothesized that perceived physical capability should be negatively related to compliance and contribute significantly to predicting the level of compliance.
The treating therapist selected patients who met the study criteria and invited them to visit with the researcher immediately after treatment. Eligibility criteria were more than 21 years of age, upper-extremity impairment, recommendation of a home exercise program by an occupational therapist or physical therapist at least 1 week before the study, and a willingness to participate in this study as indicated by written consent. All home exercise programs required active participation or mobilization by the patient. Exclusion criteria were cognitive deficits or language barriers preventing completion of the questionnaire, upper-extremity impairment secondary to upper motor neuron lesion, and no home exercise program involving the affected upper extremity. The consent form stated that the purpose of the research was to gain a better understanding of beliefs about health and treatment and to document how participants carried out their home exercise programs.

Instruments

Participants were invited to complete a 15-page battery of questionnaires and self-report instruments on site or at home and returned by mail. The following describes each questionnaire and instrument contained in the battery.

Demographic items. These items included age, gender, marital status, date of injury or recent surgery, diagnosis, job description, educational background, and employment status.

Health Belief Model. The HBM is a 19-item health belief survey designed to assess perceived severity (7 items), benefits (2 items), barriers (8 items), and self-efficacy (2 items). Each item is measured on a 6-point Likert scale (1 = strongly disagree, 5 = strongly agree). The score for each dimension was the sum of the values for the items of that dimension.

Health Locus of Control. The 18-item Multidimensional Health Locus of Control Scale (Form A) (Wallston & Wallston, 1978) measures perception of internal control (IHLC), the control of chance, or the control of powerful others. Each item is measured on a 6-point Likert scale (1= strongly disagree, 5 = strongly agree).

Interests and perceived physical capacity. The Modified Activity Profile, which is based on Baum’s (1995) Activity Card Sort, was constructed for the purpose of this study to determine the perceived capacities and extent of enjoyability in activities by persons with upper-extremity orthopedic conditions. The Activity Card Sort had been developed to measure older persons’ activities and determine activity patterns of persons with cognitive impairment. The Modified Activity Profile includes the original 78 activity items—home management (21 items), leisure activities (47 items), and social activities (10 items)—but was modified in two respects. Participants were asked to rate their performance level for each item from 1 (“gave up due to injury”) to 5 (“able to perform as prior to injury”) and to rate each item for interest from 1 (“do not enjoy it at all”) to 4 (“enjoy it very much”). We determined the self-reported physical capacity as the ratio of number of activities currently performed to those activities performed before injury. Interest in activities was computed as the sum of the interest ratings divided by the total number of activities reported, indicating generally low (1, 2) or high (3, 4) ratings of interest.

Compliance rates. A home exercises self-report was designed to document each exercise, the number of repetitions per session, and the number of sessions per day that were recommended by the participants’ therapists as well as which exercises, number of repetitions, and sessions per day were actually performed on a typical day during the previous week. To determine compliance, we compared the participant’s self-report of exercises performed to (a) his or her memory of therapist’s recommendation and (b) the therapist’s recommendation (determined from chart review). For both methods, a percentage of recommended exercises was calculated. For example, if the home exercise program involved three exercises performed four times each day for 10 repetitions each, the total possible would be 120. If par-
Participants performed 10 repetitions of all three exercises three times a day, their compliance would be 90/120 or 75%. In addition to the exact percentages, which were used in the correlation and regression analyses, participants were categorized as having low (0%-33%), moderate (34%-66%), or high (67%-100%) compliance.

Satisfaction. Participants rated their satisfaction with their therapist’s treatment on a 6-point Likert scale (1 = very dissatisfied, 5 = very satisfied).

Data Analysis
Data management and analysis were performed with the Statistical Package for the Social Sciences (SPSS) for Windows 6.0 (Norusis, 1993). Spearman rank order correlation, t test, chi-square, and multiple linear regression analyses were performed. In the regression analysis, stepwise selection was used, combining backward and forward processes. SPSS first selects the independent variable that has the largest positive or negative association with the dependent variable. The correlation between independent and dependent variables must have a value of $p < .05$. Then, the selected variable is tested to see whether it should be removed on the basis of removal criteria ($p < .10$).

Results
Of the 102 persons who agreed to participate in this study, 75 (74%) returned the questionnaires and self-report instruments of which 13 were incomplete. Of the remaining 62 participants, 23 (37%) were men and 39 (63%) were women, ranging in age from 23 to 88 years ($M = 47.8$ years, $SD = 13.8$). Forty-one (66%) were married. Diagnoses included 24 (39%) nerve compression syndromes, 23 (37%) shoulder injuries, 9 (15%) fractures, and 6 (10%) other. Because there was no variation in satisfaction with treatment (61 participants rated themselves as satisfied or very satisfied), it was not examined in relation to compliance. Distribution of time since date of surgery or onset of injury is shown in Figure 2.

The two compliance measures compared participants’ documentation of their actual exercise performance to (a) self-report and (b) chart documentation of the recommended home exercise program. On the basis of what they remembered their therapists’ recommending, 74% were categorized as 100% compliant. In contrast, on the basis of chart documentation of the recommended regimen, 35% were 100% compliant (see Figure 3). The correlation coefficient of these two compliance rates, although significant ($p < .001$), was .51. (In general, participants did not understand or forgot to mention about 12% of the home exercise program recommendations documented in their charts.) We considered the rates from chart review as more accurate and, thus, used them in subsequent analyses.

$T$ tests examining differences in compliance on the basis of categorical, demographic variables yielded no sig-
significant differences by gender, marital status, or work status during rehabilitation. Participants who had child-care needs (76%) were more compliant than those without child-care needs (65%), but this difference did not achieve the criterion for significance of .05, t(60) = 11.64, p = .11.

Spearman rank order correlations among compliance, factors of the HBM and HLOC, and the demographic variables are shown in Table 1. Only perceived self-efficacy was significantly correlated with compliance. Participants with higher perceived self-efficacy about the home exercises were more compliant and reported lower perceived barriers and higher perceived benefits associated with treatment. In the stepwise regression (see Table 2), only perceived self-efficacy and IHLC significantly contributed to compliance behavior (p < .01).

Individual health belief items were examined to determine which were most salient. Table 3 shows the items with consistent agreement or disagreement. Items concerning spouse, significant others, and friends’ expectations that the participant do the home exercises elicited strong agreement or disagreement among participants (6 to 10 of the participants left these items blank). Consequently, for all 62 participants, these items were not the most important. Finally, we attempted to examine associations between individual health belief items and a categorical measure of compliance behavior (low, moderate, high) using chi-square analyses, but the number of cells with only 2, 1, or 0 participants rendered the analysis unworkable.

Discussion
This study partially supported our proposed conceptualization of how the MOHO, integrating aspects of the HBM and HLOC, explains compliance behavior with home exercise programs. Results particularly highlight the importance of self-efficacy—the belief that one can perform particular behaviors, in this case home exercises. The construct of self-efficacy is an important component of the volition subsystem of the MOHO; that is, personal causation includes one’s sense of efficacy in occupations. According to Kielhofner (1995), “Sense of efficacy is the perception of control over one’s own behavior … as well as a sense of control in achieving desired outcomes of behavior” (p. 43). Kielhofner and Burke (1985) stated that persons “possess an image of self-efficacy of skill, which is the belief that one’s abilities are useful and relevant in one’s life situation” (p. 16), and “this perceived match between one’s capacity and the demands and resources of the environment leads one to make positive choices for encountering the environment through occupational behavior” (p. 17). In our study, belief in ability to perform the exercises contributed to the participants’ choice of occupational behaviors, that is, the actual performance.

The significant contribution of perceived self-efficacy supports findings of other studies (Becker, Drachman, & Kirscht, 1972; Strecher et al., 1986). Confidence in making successful change has been associated with cardiac rehabilitation and alcoholism treatment compliance (Oldridge...
patients with lower IHLC, following recommendations from health providers with the encouragement of friends or family members would be consistent with their orientation and would lead to compliance (Schlenk & Hart, 1984). Therefore, this finding may not contradict the contribution of perceived self-efficacy or the MOHO but may suggest that encouragement from the therapist, combined with a sense of self-efficacy with regard to performing the home exercise program (which can be enhanced by actual performance in the clinic), can significantly increase compliance with treatment.

The importance of perceived benefits from and barriers to therapeutic recommendations is consistent with findings from other studies and supports the MOHO (Becker, 1974; Becker et al., 1972; Newell, Price, Roberts, & Baumann, 1986; Yuen, 1993). Perceived barriers are connected to the habituation subsystem. If the home exercise program does not fit into the patient’s routines, it is less likely to be performed. Therefore, therapists can help patients understand benefits that will result from compliance and structure the home exercise program and the environment to make compliance as convenient as possible.

Although only the volition subsystem of the MOHO contributed significantly to explaining compliance with home exercise programs, the habituation and performance subsystems still deserve attention. Our findings suggest that roles, a component of the habituation subsystem, influence compliance behavior. For example, participants with child-care needs were more compliant, and support from a significant other or spouse, family members, and friends for performing the exercises was important. The importance of social support for following therapeutic recommendations confirms findings reported in previous research (Kirsch, Kirsch, & Rosenstock, 1981; Oakes, Ward, Gray, Klauber, & Moody, 1970; Rees, 1985; Schlenk & Hart, 1984). Therapists may find that helping family members and friends express confidence in the

Table 1
Spearman Rank Order Correlation Analysis Among Compliance, Factors of the Health Belief Model and Health Locus of Control, and Demographic Variables

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Note. Barriers = perceived barriers; benefits = perceived benefits; self-efficacy = perceived self-efficacy; severity = perceived severity; IHLC = internal health locus of control; CHLC = chance health locus of control; PHLC = powerful others health locus of control; interest = interest in activities; weeks = weeks since onset.

*p < .05. **p < .01. ***p < .001.

Table 2
Summary of Stepwise Regression Analysis for Variables Predicting Compliance With Home Exercise Programs

<table>
<thead>
<tr>
<th>Variable</th>
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<tr>
<td>Step 1. Perceived self-efficacy</td>
<td>7.05 (2.60)</td>
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<td>Step 2. Internal health locus of control</td>
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Note. R² = .08 for Step 1; ΔR² = .08 for Step 2 (p < .05).
patient’s ability to make improvement by doing the exercises may be an especially effective strategy for enhancing compliance and, thus, promoting recovery. An important strategy therapists may use to enhance recovery would be to link patients and family members with relevant community resources, such as support groups for pain management or reflex sympathetic dystrophy or disability advocacy organizations.

With regard to the performance subsystem of the MOHO, our study did not support Feinberg and Brandt's (1981) finding that patients with higher physical capacity were less compliant. Greater perceived physical capacity was positively associated with perceived benefits and inversely related to perceived barriers and severity. Perhaps patients with greater skill find it easier or more possible to perform their home exercise program and, thus, are more compliant. Whether this finding is generalizable beyond home exercise program regimens is still to be determined.

An examination of the items that showed consistent responses from the entire group of participants shows high confidence in the therapist and indicates that the exercises themselves are not a problem. However, the differences between perceived and actual compliance are noteworthy. The finding that about three quarters of participants thought that they were fully compliant but only one third actually were (as indicated by chart review) is consistent with Kortman's (1992) finding that patients recalled only 63% of 11 instructional statements for splint wearing and may partially explain why we found so few associations between health beliefs and compliance. Compliance may depend as much on correct understanding as on volition. Because most participants were not clear about what constituted the home exercise program, therapists may need to provide written instructions and periodically review their prescriptions with patients to identify and correct misunderstanding.

This study has a number of limitations that may have affected the amount of variance explained by the predictors: a small sample size, large selection and response bias, instrumentation limitations, and much variation of time since injury. Selection bias was the major problem in this study. Convenience sampling may have resulted in therapists referring the most compliant patients on their case-load. In addition, validity and reliability of the HBM and the Modified Activity Profile are unknown. The 15-page battery of questionnaires and self-report instruments may have been too long for most participants to complete, or they may have rushed to finish it without careful thinking (Rust et al., 1987). Finally, several methods of measuring compliance over a longer period would have yielded more accurate estimates of compliance than the one-time, one-method measure used in this study.

To address these limitations, future research should use a larger sample size, including randomly selected participants with similar medical conditions (e.g., all with carpal tunnel syndrome) and have a similar range of time since injury (e.g., acute, subacute, chronic). Variance may also be reduced if participants are examined on the basis of their time since the beginning of treatment instead of time since the onset of the orthopedic condition. Recommendations to enhance reliability and validity of the instruments include designing a shorter survey and including an observation assessment of the client’s understanding of the home exercise program. Communicating more effectively with recruiting therapists to reduce selection bias is also important. Finally, a more accurate measure of the participants’ active engagement in the rehabilitation process would be a periodic assessment instead of using only a one-time measure.

Conclusion
These findings partially supported the MOHO as a framework for predicting compliance behavior with occupational therapy and physical therapy treatment. The volition subsystem made a greater contribution than the habituation and performance subsystems, perhaps because persons are motivated by their beliefs and perceptions. Our findings that self-efficacy and IHLC are significant predictors of compliance with home exercise programs have implications for practice. An enhanced IHLC with greater compliance or patient engagement might occur if therapists encouraged greater participation from patients in treatment planning, problem solving, and goal setting. Patients' sense of control may also be enhanced if therapists attempt to decrease the possible barriers to compliance, such as patient fears from lack of knowledge or the family mem-

Table 3
Items From the Health Belief Survey That Have the Highest Percentage of Agreement or Disagreement

<table>
<thead>
<tr>
<th>Item</th>
<th>% (Agree, Disagree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am not sure my therapist knows how to help me.</td>
<td>95 (Disagree)</td>
</tr>
<tr>
<td>I am afraid my home exercises will make my symptoms worse.</td>
<td>92 (Disagree)</td>
</tr>
<tr>
<td>I feel confident I can successfully do my home exercises.</td>
<td>89 (Agree)</td>
</tr>
<tr>
<td>I think my exercises take too much time.</td>
<td>82 (Disagree)</td>
</tr>
<tr>
<td>My other family members expect or think I should do my exercises.</td>
<td>81 (Agree)</td>
</tr>
<tr>
<td>My hand/arm injury/disease negatively affects my overall daily life.</td>
<td>81 (Agree)</td>
</tr>
<tr>
<td>If I do my home exercises, my overall daily life will improve.</td>
<td>77 (Agree)</td>
</tr>
</tbody>
</table>

Note: Agree = strongly agree + agree; disagree = strongly disagree + disagree.
bers' lack of understanding for the importance of their support. Strategies to improve patient self-efficacy for management of a home exercise program may also further treatment outcomes, such as encouraging peer sharing for role modeling among patients in the rehabilitation experience and teaching patients to set realistic weekly goals to ensure success. In addition, therapists may encourage more accurate and consistent follow-through by giving patients the opportunity for further feedback and encouragement when requesting them to periodically demonstrate their home exercise programs. Home programs and recommendations are important in achieving therapy outcomes, and occupational therapists and physical therapists would benefit from further investigation of the factors that influence patients' engagement in their treatment. ▲

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References


