Adding Purpose to the Repetitive Exercise of Elderly Women Through Imagery

Christine M. Riccio, David L. Nelson, Mary Ann Bush

Key Words: activity analysis • aged • human activities and occupations • mental process • visual perception

Many studies have documented the effectiveness of verbally elicited imagery in the enhancement of motor skills in young, nondisabled populations. The present study examined the effects of verbally elicited imagery in the encouragement of two exercises (i.e., reaching up to pick apples and reaching down to pick up coins) in elderly women. The subjects were 27 women between 62 and 96 years of age who were selected from a nursing home, a residential retirement home, and a foster care home. All of the subjects received imagery as well as control conditions, but in a counterbalanced fashion. The Wilcoxon matched-pairs signed rank tests indicated that the imagery condition elicited significantly more repetitions of the reaching-up exercise than did the control condition ($z = 2.25, p \text{ [one-tailed]} = .012$). The results in the reaching-down exercise were generally in the same direction but difficult to interpret statistically. The results are discussed in terms of other recent research investigating ways to add purpose to therapeutic exercise through occupation. Clinicians are urged to explore the advantages and disadvantages of imagery-based occupations in treatment.

Imagery is an internal psychological process involving the evocation of the physical characteristics of objects or events that are absent from the perceptual field (Denis, 1985). A person can form a mental image of an object, such as a flower, for example, even when no flower is physically present. Likewise, a person can form a mental image of an event, such as picking a flower, even though no movement is actually taking place. Paivio (1985, p. 265) stated that imagery depends either on “memory for a specific performance episode” or on “general knowledge of performance skills in appropriate situations.” It is important to recognize that a person can have an image of an event without actually having experienced or witnessed that specific event. One can imagine picking up a snake, for example, without ever having actually done so. In the construction of this image, general knowledge of snakes is integrated with general knowledge of the act of picking things up.

The relationship between imagery and human movement has been the topic of many studies in the disciplines of physical education, sports psychology, and movement. In these studies, imagery is elicited through protocols encouraging mental practice (i.e., symbolic rehearsal or introspective visualization) to enhance a motor skill or strength. A typical experimental design involves a comparison of three conditions: imagery-based mental practice, actual physical practice, and a control condition. Examples of motor skills that have been enhanced experimentally through mental practice include ring tossing (Twinning, 1949), basketball shots (Clark, 1960), gymnastic moves (Jones, 1965), dart throwing (Wichman & Lizotte, 1983), and golf putting (Woolfolk, Parrish, & Murphy, 1985). An example of a study that used imagery to test strength was performed by Tynes and McFatter (1987). A meta-analysis of 60 studies (Feltz & Landers, 1982) has indicated that the use of imagery is particularly efficacious in the promotion of skills requiring cognition but is also somewhat effective in promoting strength.

Physical therapists Fansler, Poff, and Shepard (1985) investigated mental practice by studying a basic component of normal movement: equilibrium. Elderly women in their study were assigned to three experimental conditions: mental practice involving vivid images, progressive relaxation, and a control condition involving nonsensical instructions requiring the subject’s attention. The results tended in the direction of improvement after mental practice, but the statistical comparison of the three conditions’ improvement scores was nonsignificant (perhaps because of high subject-to-subject variance). The authors urged the future study and use of mental practice in the rehabilitation of elderly persons and other populations.

Christine M. Riccio, MS, OTR, is a Staff Occupational Therapist, Olympia Fields Osteopathic Medical Center, Olympia Fields, Illinois. At the time of this study, she was a graduate student in the Occupational Therapy Department, Western Michigan University, Kalamazoo, Michigan.

David L. Nelson, PhD, OTR, FAOTA, is Associate Professor, Occupational Therapy Department, Western Michigan University, Kalamazoo, Michigan 49008-5051.

Mary Ann Bush, MA, OTR, is Associate Professor, Occupational Therapy Department, Western Michigan University, Kalamazoo, Michigan.

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According to wide-ranging literature reviewed by Bortz (1982), elderly persons have special needs for physical exercise because physical inactivity tends to result in the deterioration of several of the body's biological systems. Mobily (1982) showed that a lack of exercise among elderly persons also tends to be associated with psychosocial problems. Cantu (1980) is among those who have described specific exercises for the elderly that promote flexibility, coordination and agility, balance, muscular strength, and endurance. As Mobily pointed out, however, elderly people are frequently unmotivated to exercise.

Clinicians have often employed imagery to motivate repetitive exercise patterns in elderly patients. Caplow-Linder, Harpaz, and Samberg (1979) stated that many geriatric groups respond well to suggestions such as, “Stretch your arms up as if you’re touching the stars.” Ross and Burdick (1981) encouraged group members to act out images related to gardening (e.g., spading the ground, raking, pulling weeds) or winter actions (e.g., shoveling snow, throwing snowballs, ice skating) while exercising. Lewis (1987) elicited exercise by urging her elderly, immobile clients to “push the water away” or to pretend to be various animals with characteristic movements. The use of this type of imagery-based instruction in the absence of materials is also a common feature of exercise groups for well persons of various ages.

But how does this use of imagery relate to the theoretical constructs of the profession of occupational therapy? Nelson and Peterson (1989) suggested that occupation can be categorized as (a) naturalistic, (b) simulated, or (c) imagery based. Occupational therapists frequently employ simulated environments (e.g., hospital-based therapeutic kitchens) to enhance future performance in naturalistic environments (e.g., the patient’s home kitchen). The distinction between imagery-based occupation and simulated occupation is that verbal or pictorial cues referring to absent materials are used to elicit imagery-based occupation, whereas props are used in simulated occupation.

In imagery-based occupation, the occupational form is the verbalization or picture within the environmental context. The person finds meaning in the occupational form depending on memories of past occupations. Given meaning and the development of purpose, occupational performance occurs (see Figure 1).

In the present study, for example, one of the occupational forms was the verbalization, “Stretch your arms up one at a time as if you’re picking apples.” We predicted that this form would tend to be meaningful to the research subjects. Meaning, however, is an individual matter dependent on a particular person’s developmental structure. A person could conceivably come to this occupation with a loathing of apple picking on the basis of experience (i.e., negative adaptations due to past occupations). We predicted that, generally speaking, most research subjects would be favorably disposed to the apple-picking imagery. We further predicted that this verbalization would have the type of meaning that would add purpose to the subjects’ performance.

To test this prediction, we compared the subjects’ occupational performance (exercise repetitions) in the imagery-eliciting condition to their occupational performance in a suitable control condition. The control condition was called rote exercise, a term used by Nelson and Peterson (1989) to describe repetitive exercise done without any special added purpose. We reasoned that if statistically significant differences could be documented between these two conditions, then the apple-picking prompt probably had meaning and added purpose. We also predicted that exercise repetitions would be increased in a different, subsequent occupation, in which the subjects were instructed to reach down as if picking up dropped coins, compared with a rote exercise of reaching down.

Method

Subjects

The Parachek Geriatric Rating Scale (Parachek & King, 1976) was administered as a screening device to female volunteers residing in a nursing home, a residential retirement home, and a foster care home. The Parachek scale determines the overall functional level of potential subjects in three categories: (a) physical capabilities, (b) self-care skills, and (c) social interaction skills (Parachek & King, 1976). Those persons who demonstrated sufficient physical and communication skills by obtaining a score of 25 or more on the Parachek scale were eligible for the study. Persons scoring 25 to 39 points show awareness of their surroundings, recognition of staff members, some concern for their own care, and increased awareness and capability in group activities organized by an occupational therapist. Persons scoring 40 to 50 points are generally independent in self-care, are self-motivat-
ing, and benefit well from an occupational therapy program consisting of various activities.

On the basis of this screening tool, 30 female subjects were selected; 2 subjects, however, did not participate in both conditions of the study because of conflicting appointments, and another subject refused to participate in both conditions. These 3 were excluded from the study, leaving 27 subjects. The subjects' ages ranged from 62 to 96 years, with a mean age of 80.9 years (SD = 9.2). The mean Parachek scale score of the sample was 44.70 points (SD = 4.85).

Procedure

The subjects were randomly assigned to different orders in accordance with a counterbalanced design. In Order 1 (n = 12), the subjects received the control condition first and the imaging condition second. These conditions were reversed for the subjects in Order 2 (n = 15).

In the rote exercise condition, the subjects were told that the researcher (the first author) was interested in the kinds of exercises women over 62 years of age like to do and that they would be asked to do two exercises. They were then given the following instructions for the reaching-up exercise:

Today we are going to exercise our arms. Listen to all of the directions first. I will demonstrate the exercise and give you a chance to try a few. First, stretch your arms up one at a time. Reach all the way up with your right arm, then place it in your lap. When your right arm touches your lap, repeat with your left arm. Watch me. Now you try a few. When I tell you to begin, do as many as you can without becoming too tired. Stop when you are too tired. Ready? Begin.

When the subjects stopped, they were told to rest for a few minutes and to take some deep breaths. Then the researcher continued:

Now we are going to do another exercise. Reach all the way down with both of your hands as if you are picking up some coins you have dropped. Bring both hands back up and put the coins in your lap. Watch me. Now you try a few. When I tell you to begin, pick up as many coins as you can without becoming too tired. Stop when you are too tired. Ready? Begin.

The researcher remained in a chair approximately 1.7 m away from and facing the subjects throughout the proceedings. If a subject asked when she could stop or how many exercises she should do, the instruction of “Stop when you are tired” was repeated. For both conditions, the procedure took place in the dayroom of the premises or in residents’ rooms (each subject’s setting was the same for both conditions).

The researcher measured the frequency and duration of exercise repetitions. A repetition in the reaching-up exercise was defined as the raising of a hand over the top of the head and the placing of that hand in the lap. A repetition in the reaching-down exercise was defined as the movement of both hands to ankle length or lower and the placing of both hands in the lap. Interobserver reliability was confirmed by an independent observer, who observed 11 subjects. The independent observer sat to the side of the researcher and approximately 1.7 m from the subject. The researcher and the independent observer kept their stopwatches out of each other’s sight, and the operation of the stopwatches was inaudible. The silent count of repetitions (frequency) was necessarily independent. We determined reliability by dividing the smaller number by the larger number for each subject, by multiplying the result by 100, and by taking the mean across the 11 subjects dually observed. In the reaching-up exercise, interobserver reliability was 98.5% (frequency) and 97.3% (duration). In the reaching-down exercise, interobserver reliability was 99.4% (frequency) and 97.6% (duration).

Results

As is often the case when the dependent variable involves a frequency count (Neter, Wasserman, & Kutner, 1985), the data were positively skewed. Therefore, nonparametric statistics were used. Additionally, as expected, within each type of exercise, frequency was highly correlated with duration. Because frequency and duration cannot be assumed to be independent, only frequency was analyzed through inferential statistics (see Table 1).
Table 1
Differences in Frequency and Duration Between the Imaging and Control Conditions for Two Exercises (N = 27)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Outcome Measures</th>
<th>Imaging</th>
<th>Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency (no. of repetitions)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>38.44</td>
<td>20.67</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>42.94</td>
<td>38.85</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>19.00</td>
<td>17.00</td>
</tr>
<tr>
<td></td>
<td>Mean rank</td>
<td>14.90</td>
<td>11.90</td>
</tr>
<tr>
<td></td>
<td>(z = 2.25, p = .012)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Duration (sec)</td>
<td>84.78</td>
<td>60.93</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>88.46</td>
<td>84.96</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>59.00</td>
<td>35.00</td>
</tr>
</tbody>
</table>

**REACHING-DOWN EXERCISE**

<table>
<thead>
<tr>
<th>Frequency (no. of repetitions)</th>
<th>M</th>
<th>SD</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>66.15</td>
<td>53.35</td>
<td>48.00</td>
</tr>
</tbody>
</table>

**REACHING-UP EXERCISE**

<table>
<thead>
<tr>
<th>Frequency (no. of repetitions)</th>
<th>M</th>
<th>SD</th>
<th>Median</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>20.11</td>
<td>15.89</td>
<td>16.11</td>
</tr>
<tr>
<td></td>
<td>17.16</td>
<td>10.00</td>
<td>12.70</td>
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<tr>
<td>(z = 1.60, p = .055)</td>
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Note. The nonparametric Wilcoxon matched-pairs signed rank test was used to compute one-tailed z scores.

**Discussion**

The results for the reaching-up exercise are clear and support the study's hypothesis. The results for the reaching-down exercise are not so clear due to (a) differences between randomly assigned order groups and (b) the difficulty in interpreting a probability level that closely approaches but does not pierce the traditional .05 level. As shown in Table 1, however, the mean levels of performance tended to be in the direction of favoring the imaging condition in both the reaching-down and reaching-up exercises. Future research that replicates the reaching-down design, independent of the reaching-up design, would be desirable.

The subjects' spontaneous verbalizations after the exercise were generally consistent with the statistical findings. They responded to the imaging conditions with statements such as "My apple tree is plentiful," "I will have to go to another tree when I finish here," and "I used to pick apples" for the reaching-up exercise and "I have enough coins to go to Detroit now" and "I will be rich pretty soon" for the reaching-down exercise. In the control condition, the subjects replied with comments such as "This is silly" or "I'm not tired, but I want to stop."

The unambiguous results for the reaching-up exercise and, to a lesser extent, the results for the reaching-down exercise suggest important implications for occupational therapy theory. First, this study documents another approach by which the therapist can add purpose to needed exercise. The use of occupation to encourage therapeutic exercise is one of the oldest traditions within the profession of occupational therapy. For example, Baldwin (1919) postulated that therapeutic exercise is especially beneficial when done within the context of everyday occupations and described this idea as a basic principle of occupational therapy. Fidler and Fidler (1978) provided a theoretical link between imagery and purpose. They wrote how action leading to achievement can be thought of as "the product of a mental image that sets an objective" (p. 307). In other words, mental imagery adds purpose to occupation.

Eight recent research articles (Bloch, Smith, & Nelson, 1989; Heck, 1988; Kircher, 1984; Miller & Nelson, 1987; Mullins, Nelson, & Smith, 1987; Steinbeck, 1986; Thibodeaux & Ludwig, 1988; Yoder, Nelson, & Smith, 1989) have investigated how purpose can be added to encourage movement. The present study is similar to these projects in that an occupational form is used to add purpose to therapeutic exercise; it differs, however, in that, whereas the occupational forms in the previous studies relied on materials as well as verbal instruction to simulate an occupational situation, the present study relied on verbal instruction only. We showed in the present study that physical materials (e.g., the apples described in the instructions) are not always necessary in order to create an occupational form eliciting added purpose. As Paivio (1985) stated, language is an efficient and accurate way of eliciting imagery, which, in turn, can guide human movement.
To what extent is imagery involved even when materials are physically present in the occupational form? To explore this question, let us consider the hypothetical example of an occupational form consisting of some modeling clay, and let us further assume that this occupational form elicited occupational performance resulting in a sculpture in the shape of a cat. Here we have no verbal instructions, but almost certainly the person who encountered the clay experienced mental images of cats or remembered pictures of cats before completing the sculpture. We can thus theorize that imagery may well have been involved in all eight of the studies cited above. The occupations examined in these studies were rope jumping (Bloch et al., 1989; Kircher, 1984), a table tennis game and the drilling of holes to make a game board (Steinbeck, 1986), the sanding of a cutting board (Thibodeaux & Ludwig, 1988), the drawn reproduction of a design (Heck, 1988), the stenciling of a design (Mullins et al., 1987), and the stirring of cookie dough (Miller & Nelson, 1987; Yoder et al., 1989). Mental images on the part of the research subjects may have been involved in all of these studies. Although all occupation does not necessarily involve imagery, we believe that imagery is involved in much developmentally advanced, complex occupation, particularly occupation that depends on subjects' memories of occupations.

These theoretical ideas have substantial implications for future occupational therapy research. Self-reports of imagery could serve as dependent variables in studies of occupation. As Fidler and Fidler (1978) asserted, imagery not only adds purpose to action but also is the result of action. The characteristics of self-reported imagery could be studied in relation to the characteristics of motor performance. Furthermore, it seems reasonable to expect differences across populations and individuals in terms of imagery. Other suggestions for future research related to the present study are (a) a comparison of verbally elicited imagery to materials-elicited imagery to a control condition of rote exercise in terms of exercise repetitions and (b) a study of the effects of imagery on additional dependent variables, such as the development or regaining of motor skills or other qualities of movement. Future research might also attempt to overcome a limitation in the present study, namely, that the first author of the study also served as the administrator of the independent variable.

The literature on imagery also has implications for occupational therapy practice. Descriptive phrases that begin with "Try it as if . . . " or "Imagine that . . . " could be used to guide movement and enhance performance. When using therapeutic exercise to improve a client's coordination, for example, the therapist could introduce rhythmic images, such as a seesaw, rocking horse, or cross-country skier. Additionally, the therapist could use such images as the swinging of a golf club or the imitating of the sun's pattern across the sky to promote full range of motion. Imagery could also be used in sensory integrative therapy to help children or psychiatric patients explore different movement qualities. By encouraging patients to imagine or act out stories, vocations, the functions of inanimate objects, or the behavioral patterns of animals, the therapist can elicit varied qualities of speed, shape, direction, or range of movement and promote relaxation, postural flexibility, and coordination. The therapist may also employ imagery for the development and practice of self-care, work, or leisure skills. Imagining actual occupations such as shaving may facilitate strength and endurance as well as the learning of this specific movement pattern.

Vivid images of well-remembered events are considered the best for eliciting skilled movement, according to Paivio (1985). The use of imagery has several advantages in clinical use. First, the therapist is not restricted by materials that are difficult to obtain. Second, verbally elicited imagery may be more gradable (e.g., in terms of range) than physical materials when the therapist tries to elicit specific movements. Third, imagery may be used in combination with standard equipment associated with rote exercise (e.g., the rowing machine). Finally, imagery has the power to communicate complex events. The therapist's saying "Imagine picking up a robin's egg" is a more efficient communication than an attempt to describe the complex finger and hand movements involved in performing that action.

The use of imagery outside of the context of physical materials, however, can have disadvantages in certain situations. The patient's image, memory, or both, on which imagery is based, may be incorrect. Even if the image is correct, the movement might still be faulty because of an inability to match intention to performance. For example, the person might believe that a particular movement would be effective in holding an egg, whereas a real egg would be crushed or dropped. In other words, imagery does not provide knowledge of results, one of the frequent advantages of naturalistic, malleable occupational forms. Additionally, some populations might have special difficulties in experiencing mental images. Future research will help clinicians choose between the use of physical materials, imagined materials, and rote exercise.

Conclusion

This study presents a beginning step in the consideration of the potential uses of imagery in occupational therapy. We have introduced a way to enhance pur-
posefulness and occupational performance without the use of physical materials. The verbal and nonverbal forms that elicit imagery have important theoretical, research, and clinical implications, specifically regarding therapeutic exercise. ▲

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