Materials-based occupation, imagery-based occupation, and rote exercise have been examined individually by several researchers. The present study compares all three approaches with one another (i.e., kicking a balloon, imagining kicking a balloon, and a control rote exercise) in nursing home residents. The dependent variable was the number of exercise repetitions. The subjects were 12 women and 3 men between 56 and 93 years of age residing in two nursing homes. All subjects experienced the three approaches in different orders. One-way analysis of variance for related measures indicated a significant difference among conditions ($p = .004$). The Tukey procedure (Stevens, 1986) determined that the materials-based occupation condition elicited significantly more repetitions than the other two conditions. The difference between the imagery-based occupation and rote exercise was not statistically significant. These findings support our profession's historical emphasis on the use of physical materials to enhance performance.

Occupation-eliciting purpose (sometimes called *purposeful activity*) is at the heart of occupational therapy. Baldwin (1919) stated that occupational therapy is based on the principle that “the best type of remedial exercise is that which requires a series of specific voluntary movements involved in the ordinary trades and occupations, physical training, *play*, or the daily routine activities of life” (p. 5). Occupational therapy is unique in its focus on self-initiated occupation to produce a reality-orienting influence on the client’s perception of himself or herself and the environment, so that he or she can function (Yerxa, 1967). According to West (1984), the basic philosophy of occupational therapy emphasizes the person as an active being employing occupation in his or her interaction with and manipulation of the environment.

Many different forms of occupation may contribute to the treatment of clients (Nelson, 1988). Various materials (i.e., aspects of the occupational form) are often used to elicit therapeutic exercise (occupational performance). Materials-based occupation involves everyday objects that can be analyzed both in physical and sociocultural terms. For example, automobile polish often elicits vigorous upper extremity exercise because of its physical nature (hard rubbing is required to turn a streaky film into a shine) and because of our society’s infatuation with the automobile. With the addition of such materials, the person has added purpose to exercise. In the context of a game, craft, work task, or self-care task, a person may get the needed exercise as a by-product of pursuing occupationally specific goals (Nelson & Peterson, 1989). For example, while buttoning a shirt, a client with impaired fine motor skills is performing important exercise that can improve dexterity while simultaneously accomplishing a
socially valued goal. Occupation allows for therapeutic exercise as well as the personal satisfaction gained from completion of a project.

Embedding exercise within materials-based occupation had received empirical support from numerous studies. Kircher (1984) compared materials-based occupation with rote exercise in a study involving a jumping activity. She found that increased heart rate upon indication of fatigue (indicated by a subject's cessation of jumping) was significantly higher for the group that jumped rope (materials-based occupation) than it was for the group that jumped in place (rote exercise). Steinbeck (1986) investigated the same principles using both upper and lower extremity exercises and found that a significantly greater number of repetitions were performed in two exercises during the materials-based occupation than during rote exercise. Miller and Nelson (1987) compared materials-based occupation with rote exercise in a study involving stirring. Though not quite statistically significant at the .05 level, the results indicated that subjects evaluated stirring for the purpose of making cookie dough more positively than stirring for exercise only. In a similar study, Yoder, Nelson, and Smith (1989) found that nursing home residents engaged in materials-based occupation (stirring for exercise and baking cookies) stirred longer and with more rotations than the subjects engaged in the rote exercise condition. Studies by Bakshi, Bhambhani, and Madill (1991); Mullins, Nelson, and Smith (1987); and Thibodeaux and Ludwig (1988) have also considered the effects of various materials on exercise.

Imagery has been suggested as another approach to enhance therapeutic exercise (Nelson & Peterson, 1989; Riccio, Nelson, & Bush, 1990). Nelson and Peterson defined imagery-based occupation as verbal or pictorial stimuli that elicit imagined or visualized activity even though little physical support (materials) may be present in the immediate environment. Examples of imagery-based occupation include moving one's arm up and down while one imagines painting a fence or moving one's arms while one imagines swimming across a pool. Sheehan (1972) stated that persons mature in the use of imagery skills can learn to perform at remarkable levels.

Imagery acts as a device for enhancing the memorability of kinesthetic information (Dennis, 1985). Hardy and Nelson (1988) listed imagery as one of four important skills having a beneficial effect on motor performance. In a research study, Riccio, Nelson, and Bush (1990) examined the effects of imagery on the performance of two different exercises by elderly women. Subjects were instructed to imagine picking apples versus simply reaching up and to imagine picking up coins versus simply reaching to the floor. The imagery condition elicited significantly more repetitions in the first exercise; the results in the second exercise were in the same direction but were difficult to interpret statistically.

Empirical research addressing these occupations in elderly persons is limited. The need for exercise does not diminish with age; however, according to Mobily (1982), barriers and frustrations with exercise may explain cessation of physical activity in later years. Elderly persons frequently do not seek levels of exercise sufficient to maintain or enhance health. Having subjects engage in occupations in which exercise is naturally embedded is a possible approach toward motivating those in need of such exercise.

Materials-based occupation, imagery-based occupation, and rote exercise have been examined individually by researchers; however, the three conditions have not been compared in one study. Prior research shows that embedding exercise within occupation that uses materials can improve performance in a physical activity. Studies show that imagery-based occupation enhances performance as well. The present study compares materials-based occupation, imagery-based occupation, and rote exercise and seeks to answer the following question: Are there differences between these three occupational forms in terms of the number of repetitions performed by an elderly person during a physical activity? The following directional hypothesis was made and tested: Materials-based occupation elicits a greater number of repetitions during a physical activity in elderly persons than does rote exercise.

Method

Subjects

The Parachek Geriatric Rating Scale (Parachek, 1986) was administered as a screening device to potential subjects in two nursing homes. The Parachek scale determines one's overall functional level in three categories: (a) physical condition, (b) general self-care skills, and (c) social behaviors. The nursing staff was asked to answer questions regarding potential subjects from the above categories. Those persons who demonstrated sufficient physical and communication skills by obtaining a score of 25 points or more (out of a possible 50 points) on the Parachek scale were eligible for the study. Persons scoring 25 to 39 points demonstrate awareness of their surroundings, recognition of staff members, concern for their own care, and increased awareness and capability in group activities. Persons scoring 40 to 50 points are independent in self-care, are self-motivated, and benefit from involvement in various group activities (Parachek, 1986).

On the basis of this screening tool, 15 persons were selected for this study. The subjects' ages ranged from 56 to 93 years, with a mean age of 76.3 years (SD = 9.95). The mean score on the Parachek Geriatric Rating Scale obtained by the subjects was 38.87 points (SD = 6.41).

Procedure

The subjects were randomly assigned to three orders in accordance with a counterbalanced design. Each group
member was seen individually. Those in Group 1 (n = 5) received the materials-based occupation condition first, imagery-based occupation condition second, and rote exercise condition third. Group 2 (n = 5) received the imagery-based occupation first, the rote exercise second, and the materials-based occupation third. Group 3 (n = 5) received the rote exercise first, the materials-based occupation second, and the imagery-based occupation third. Three days passed between the presentation of each condition to prevent order effects.

All conditions were prefaced by the same instructions for preliminary exercises (breathing, rolling the shoulder, and raising arms). After preliminary exercises, the experimental condition was presented orally. Those performing the materials-based exercise were shown a balloon (approximately 18-in. in diameter) and were told the following:

I am going to throw this balloon in your direction. This gives you a chance to exercise and kick the balloon. Kick it with one foot; use that same foot each time you kick. Kick as many times as you can without becoming too tired. Stop when you feel too tired to continue. Ready? Kick the balloon.

When performing the imagery-based occupation condition, the subjects were given the following instructions:

Imagery there is a big red balloon coming toward your foot that you must kick. This activity gives you needed exercise and allows you to imagine you are kicking a balloon. Imagine or picture the balloon to be about this big [research assistant indicates the circumference by placing her arms in a position that one may use to hold the balloon between two arms]. Kick it with one foot; use the same foot each time you kick. Imagine this situation and kick as many times as you can without becoming tired. Stop when you feel too tired to continue. Ready? Imagine you are kicking the big red balloon.

When performing the rote exercise condition, subjects were given the following instructions:

Now, kick with your foot like this [demonstration of kicking motion]. Kick with only one foot; use the same foot each time you move. Do this as many times as you can without becoming tired. Stop when you feel too tired to continue. Ready? Kick with your foot.

The research assistant sat in a chair approximately 5 to 7 ft away and faced the subjects during the activity. If a subject asked when he or she could stop or how many exercises he or she should do, the instruction, “Stop when you feel too tired to continue,” was repeated. For all conditions, the procedure took place in the activity room, lounge, or dining area of the nursing home.

The researcher and a second research assistant independently measured the number of exercise repetitions. A repetition in all conditions was defined as any instance in which the subject extended the knee in an effort to kick the balloon, imagine kicking the balloon, or perform the rote exercise. The subjects in wheelchairs began the session with both feet on the foot plates of the wheelchair. Ambulatory subjects were seated in chairs with their knees at approximately 90° of flexion. Any observable movement toward extension was counted as a repetition.

The researcher and the second research assistant sat to the side of the assistant administering instructions and approximately 7 ft from the subject. The researcher and the research assistant kept their clipboards out of each other’s and the subject’s lines of vision. In the materials-based occupation condition, interrater reliability was 95.7%; in the imagery-based occupation condition, 97.0%; and in the rote exercise condition, 98.7%.

**Results**

Transformations of data were performed in accordance with Buchner and Findley (1990) and Stevens (1986). Both of these sources recommend taking the square root of data if the distribution is skewed to the right (positively), as was the case in this data set. After the square root transformations, all skewness levels were less than an absolute value of 1. There was no evidence of order effects. An analysis of variance for a within-subject design was performed, and a significant difference between the three conditions was found [F (2, 28) = 6.62, p = .004]. The post hoc test for related measures was used was the Tukey procedure (Stevens, 1986). The critical value for a two-tailed test at the .05 level given by the Tukey procedure was 1.75. The mean difference between the materials-based condition and the imagery-based condition was 1.81; the difference between the materials-based condition and the rote exercise condition was 2.46. Therefore, both were statistically significant. The mean difference between the imagery-based condition and rote exercise condition was .64; this difference was not statistically significant (see Table 1).

In summary, the results indicated that when engaged in materials-based occupation, subjects kicked significantly more often (M = 53.80) than when engaged in

| Table 1 |
|-----------------|-----------------|-----------------|
| Kicking Repetitions of Nursing Home Residents Across the Three Conditions of the Independent Variable (N = 15) | Conditions of the Independent Variable | |
| | Materials-based Occupation | Imagery-based Occupation | Rote Exercise |
| **Outcome Measures** | **Median** | **Median** | **Median** |
| **Repetitions (raw score)** | 53.80 | 26.20 | 18.53 |
| Median | 33.00 | 22.00 | 28.00 |
| **SD** | 54.12 | 20.72 | 9.65 |
| **Dependent variable (after square root transformations of repetitions)** | | | |
| **Median** | 6.60 | 4.79* | 4.15* |
| Median | 5.75 | 4.69 | 4.24 |
| **SD** | 3.31 | 1.87 | 1.20 |
| *Significantly less than the materials-based occupation condition, p < .05. | | | |

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imagery-based occupation \((M = 26.20)\) or rote exercise \((M = 18.53)\). Although the mean number of repetitions for imagery was somewhat greater than that for rote exercise, the difference was not statistically significant.

Discussion

The results in favor of the materials-based occupation are clear and lend support to the idea that materials-based occupation will elicit a greater number of repetitions in exercise in the elderly than rote exercise. The results also indicated that the materials-based condition elicited a greater number of repetitions than the imagery-based condition. A directional hypothesis was not indicated in the proposal, yet a statistically significant difference between the two conditions is apparent.

The subjects' spontaneous verbalizations during the exercises were generally consistent with the findings. They responded to the materials-based occupation condition with statements such as, "I'm getting tired but I want to keep going," "I like using the balloon the best," and "I'm going to kick a field goal!" The subjects, in general, smiled and laughed more often during this condition and appeared more talkative after the activity, compared with the other conditions. During the rote exercise condition, the subjects replied with comments such as, "That's all I can do," and "I'm too tired."

These results have implications for occupational therapy theory. Historically, occupational therapy has had a strong belief in the benefits of purposeful occupation. The results of this study contribute empirical evidence to support the concept that materials-based occupation enhances a person's performance in a given activity. As Baldwin (1919) explained more than 70 years ago, therapeutic exercise is especially beneficial when performed within the context of recognizable occupations. The use of occupation lends purposefulness to one's behavior and gives life order (West, 1984).

Several research studies (Kircher, 1984; Miller & Nelson, 1987; Steinbeck, 1986; Yoder, Nelson, & Smith, 1989) have investigated the use of materials-based occupation and its effect on performance in comparison to rote exercise. The results of the present study are similar to these projects in that a materials-based occupation enhanced exercise as compared with rote exercise. The study differs from others in that materials-based occupation was compared with imagery and imagery was compared with rote exercise. The subjects performed twice as well, in terms of number of repetitions, when presented with the materials-based occupation than in either of the other two situations. The results of this study support the historical emphasis that occupational therapy has placed on materials as a method toward therapeutic adaptation.

Several factors may account for the lack of a statistically significant difference between the imagery-based occupation and rote exercise conditions. The subjects may have required a more vivid image in order to perform more repetitions. The instructions to imagine kicking a balloon were presented one time; this may not have been adequate for the subjects to maintain interest or concentration. In this project, the use of materials was practical; however, if other movement patterns were necessary, imagery might have proven beneficial. For example, if one needed to perform movements found in apple-picking, it may not be possible for that client to participate in the actual occupation. Imaging, therefore, would be the next best alternative. Physical materials are not always necessary to create an occupational form eliciting added purpose (Riccio, Nelson, & Bush, 1990).

This study also has implications for occupational therapy practice in many settings. While several research projects have investigated the use of the upper extremity, few have focused on the use of the lower extremity. This study supports the role of the occupational therapist as one who considers the whole body in therapeutic occupations; an occupational therapist need not focus on the upper extremity alone (West, 1984).

Further research in materials-based occupations and imagery-based occupations is needed. The current study should be replicated to help make the results of this study more generalizable. Other studies might examine the same concepts with different populations such as the well elderly, developmentally disabled children, or rehabilitation patients in need of therapeutic exercise. A larger sample might show improved results for subtle effects, such as in the imagery-based occupation. A variety of occupations, movement patterns, and movement qualities using the upper or lower extremity may be examined (e.g., pedaling a bicycle, kicking balls of different sizes and shapes, swimming). In addition to measuring repetitions, other dependent variables of potential interest might include physiological parameters (e.g., heart rate, blood pressure), duration, affect, attitude, socialization, and number of verbalizations.

Conclusion

This study demonstrates that materials-based occupation, when presented to a sample of nursing home residents, brought about better performance in number of repetitions, as compared with imagery-based occupation and rote exercise. The empirical support for materials-based occupation in one setting has theoretical, research, and clinical implications for occupational therapy. The findings support our profession's historical emphasis on using materials to enhance human performance.

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