Added-Purpose Versus Rote Exercise in Female Nursing Home Residents

Rita M. Yoder, David L. Nelson, Doris A. Smith

Key Words: activity analysis • aged • purposeful activities • therapeutic exercise

Seven recent experimental and quasi-experimental studies have compared the exercise of subjects instructed to pursue some added goal (often termed purposeful activity) with the exercise of subjects instructed to exercise without the suggestion of an added goal (often termed nonpurposeful activity). This article suggests a new terminology for this type of independent variable and describes an experiment within this developing tradition. An occupational form designed, through materials and instructions, to elicit a rotary arm exercise with the added purpose of stirring cookie dough was compared with an occupational form designed to elicit the rotary arm exercise with no added purpose. The subjects were 30 elderly female nursing home residents randomly assigned to the occupational forms. Results indicated that the added-purpose, occupationally embedded exercise condition elicited significantly more exercise repetitions than did the rote exercise condition (one-tailed \( p = .012 \)). Exercise duration and exercise stoppages were also recorded. This study provides additional support for the traditional occupational therapy idea of embedding exercise within occupation. Suggestions are made for future research involving the experimental analysis of therapeutic occupation.

Rita M. Yoder, MS, OTR, is a staff therapist at the Institute of Physical Medicine and Rehabilitation, Peoria, 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.

Doris A. Smith, MEd, OTR, FAOTA, is Professor, Occupational Therapy Department, Western Michigan University, Kalamazoo, Michigan.

This article was accepted for publication February 17, 1989.

Seventh recent occupational therapy research studies have compared rote exercise to exercise that is embedded in goal-directed activity, or occupation. Kircher (1984) compared jumping rope to jumping in place without a rope in terms of female subjects' heart rates and exercise duration. Upon stopping at a prespecified level of perceived exertion, the subjects who jumped rope had a significantly higher heart rate than did the subjects who jumped in place. Exercise duration also tended to be somewhat greater in the subjects who jumped rope, but the difference was not statistically significant. Kircher concluded that exertion and fatigue were perceived to be less when jumping with a rope than in the other condition and argued that these results indicated enhanced motivation in the subjects who engaged in the jump rope activity.

In a replication and extension of Kircher's 1984 study, Bloch, Smith, and Nelson (1989) also found that female subjects' heart rates at a given level of perceived exertion were greater after jumping rope than after jumping in place. However, unlike Kircher, they found a tendency (approaching but not reaching statistical significance with \( p = .06 \)) for the subjects who jumped in place to exercise longer than the subjects who jumped rope. Bloch et al. suggested that the most likely explanation for this discrepancy was that a heart-rate target zone for safe maximum exertion was imposed on their subjects, whereas Kircher's subjects' heart rates were not monitored during their jumping. Both studies did show, however, that the actual exertion levels of the subjects who jumped rope (as measured by their heart rates) was greater than those of the subjects who jumped in place, even though both groups experienced the same level of perceived exertion.

Steinbeck (1986) investigated two different exercise contexts, one involving a bulb-squeezing exercise and the other involving a pedaling exercise. For the added-purpose condition, Steinbeck ensured that the bulb-squeezing exercise resulted in the suspension of a table-tennis ball and that the pedaling exercise resulted in the operation of a drill press. These conditions were compared to bulb squeezing without table-tennis ball suspension and to pedaling without drill-press operation. Steinbeck found that the frequency of repetitions in both of the added-purpose conditions exceeded those in the rote conditions. Although Steinbeck argued convincingly for the desirability of controlling for heart rate and other variables when comparing exercise conditions in terms of the frequency of exercise repetitions, his data indicated the difficulty of doing so (heart rates differed across conditions).

Thibodeaux and Ludwig (1988) compared the sanding of a cutting board that the subject could finish.
and keep with the sanding of the same type of board that would remain unfinished and that the subject could not keep. As in the three studies discussed above, the subjects were instructed to work to a prespecified level of exertion. No significant differences in exercise duration or heart rate were found between the two conditions, but the subjects in the added-purpose group reported more enjoyment than subjects in the other group, as measured by a questionnaire developed for the study.

Heck (1988) compared a design-reproduction activity with an activity that required the use of a blunt stylus but did not involve the generation of a design. Unlike in the previous studies, however, Heck urged each subject to continue to a prespecified level of discomfort on a pain scale instead of to a prespecified level of exertion (each subject was administered a noxious electrical stimulus). Additionally, the electrical stimulation to the lower extremity had no inherent relationship to the fine-motor independent variable, whereas the subjects' exertion levels in the other studies were the naturalistic consequences of exercise. Heck found that the subjects in the design-reproduction group tolerated pain significantly longer than did the control subjects. No significant differences were found in terms of peripheral skin temperature or heart rate.

Mullins, Nelson, and Smith (1987) also used materials and oral instructions to compare added-purpose exercise with rote exercise. However, instead of studying heart rate, exercise duration, or frequency of repetitions, Mullins et al. compared the two types of exercise contexts in terms of each subject's choice of subsequent exercise. Additionally, they studied a population likely to receive occupational therapy intervention or consultative services (elderly male and female nursing home residents) instead of healthy young adults. Each subject performed a shoulder exercise within the context of stenciling and then the same type of exercise without the stenciling materials and instructions. Results were generally as hypothesized (twice as many women chose the stenciling condition as the rote-exercise condition), but were not statistically significant. Mullins et al. suggested that further research involve activities selected for suitability to male subjects as well as to female subjects.

Miller and Nelson (1987) compared a rotary arm exercise performed within the context of stirring cookie dough with the same type of exercise performed without the suggestion that cookie dough was being stirred. The subjects were healthy female college students. The subjects in the added-purpose group rated this condition significantly higher on the evaluation factor of the Osgood semantic differential than did the subjects in the control group. The results for exercise repetitions approached statistical significance (p = .052) in favor of the group that stirred cookie dough.

Conceptual Issues and Rationale

The seven articles reviewed above differ in terms of type of exercise used, dependent (criterion) variables, and populations; however, they all involved the same type of independent variable and identified the theoretical and historical importance of this independent variable to the profession of occupational therapy. This paper will add to the above-mentioned findings by discussing three conceptual and terminological issues in this developing research tradition.

The first issue involves the use of the terms *purposeful activity* and *nonpurposeful activity* by Kircher (1984), Steinbeck (1986), and Heck (1988). The problem with this terminology is that all simple exercise involves purpose. As Trombly (1982) pointed out, all nonreflexive exercise is goal-oriented, voluntary behavior. The exerciser has clear intentions—otherwise, the movement would not take place. Given this line of reasoning, the label *nonpurposeful activity* is inherently self-contradictory, and the label *purposeful activity* is overly exclusive.

Alternatively, Nelson and Peterson (1989) have proposed the terms *added purpose* and *rote*. The term added purpose implies that purposefulness is often multidimensional. In one exercise period, for example, a person may have several purposes, including (a) enhanced health; (b) pleasure in the sensory experience of movement; (c) a sense of mastery, autonomy, or independence; (d) the receipt of extrinsic motivators (e.g., praise from others); and (e) goals relating to the activity or occupation in which the exercise is embedded (e.g., the completion of a product or the successful adherence to a recognized format). The embedding of a therapeutic exercise within an occupation can thus be thought of as the therapist's attempt to add purpose to the exercise situation.

According to Nelson and Peterson (1989), the term rote implies a limited-purpose or single-purpose focus by the exerciser on the movement. As pointed out by Trombly (1982), the voluntary, intentional pursuit of pure exercise may well be satisfactory to certain persons under certain conditions. Rather than dismiss such human action as nonpurposeful, Nelson and Peterson recommended that rote exercise be conceptualized as a type of occupation in its own right, with socioculturally sanctioned and recognized processes, materials, and environmental contexts. An occupational analysis of rote exercise suggests that it involves (a) rhythmically steady repetitions; (b) a high degree of predictability in the environment; (c)
objects (e.g., barbells) which, if present, are rarely transformed; (d) a lack of products; (e) few environmental cues as to beginning, middle, or end, or as to the next step; and (f) self-administration of controlled sensory input with little stimulus change. A thorough understanding of occupation in all its richness and varieties demands an appreciation of the characteristics of rote exercise (single-purpose or limited-purpose occupation) as well as an appreciation of added-purpose, multidimensional occupation.

A second conceptual issue deals with the exact nature of the independent variable in each of the seven studies reviewed above. Technically, the conditions of the independent variable do not and cannot include assured purposes. Rather, each condition of the independent variable consists of the researcher’s attempt to elicit a certain pattern of purposefulness in subjects. For example, in Figure 1, occupation is conceptualized as a relationship between occupational form and occupational performance. Occupational form is external to the person and has a physical as well as a sociocultural structure. Occupational performance consists of the person’s actions taken in response to, or elicited by, the occupational form. The occupational performance elicited by an occupational form depends on the meanings assigned to the form and the purposes established by the person’s developmental structure. This model is relevant to the independent variables of all seven studies reviewed above because it shows that the subject’s purposes are not controlled directly by the researcher. The subject’s purposes cannot be operationalized into a condition of an independent variable. The researcher can only synthesize an occupational form designed to elicit a certain pattern of purposes. For example, Steinbeck (1986) did not directly control or operationalize the purposes of his subjects when they engaged in the bulb-squeezing exercise. It was impossible for Steinbeck to ensure that each subject would find meaning and purpose in the table-tennis ball game. Whether or not each subject actually adopted Steinbeck’s intended purpose depended, in part, on each subject’s developmental structure at that particular time.

The same principle holds true for the independent variables in the six other studies reviewed above. In each study, the researcher presented an occupational form (external to the individual) that was hypothesized to elicit added purposes or limited purposes, as in rote exercise. In each study, the researchers assumed that results indicating differences between the experimental conditions would mean that the actual purposes of the subjects generally matched the researcher’s intentions. For example, if the subjects in the table-tennis ball group engaged in significantly more objectively observable exercise repetitions than did the subjects in the control group, one could deduce that the table-tennis ball condition elicited more purpose. The logic is that, given control over extraneous variables, enhanced performance implies enhanced purpose.

A third and final note on terminology relates to the terms activity and occupation. We prefer the term occupation and recommend its increased use in the occupational therapy literature. A profession labeled “occupational” therapy should become increasingly comfortable with the term occupation as well as with the terms occupational analysis, occupational form, occupational performance, and occupationally embedded exercise. We recognize, however, that the profession is changing, and therefore, the use of the term activity is occasionally desirable because of its frequent use in the literature and in other professional contexts.

Despite changes in terminology, our study was conceptualized as being within the tradition of the seven studies reviewed above. We examined the same type of occupation and the same type of movement pattern as was used in Miller and Nelson’s (1987) study. As in Miller and Nelson’s study, the independent variable consisted of two occupational forms that were contrasted: one designed to elicit a rotary arm exercise with the added purpose of stirring cookie dough, and the other designed to elicit rotary arm exercise with no added purpose. The two occupational forms required the identical type of movement and work load. As in the Miller and Nelson study, we measured the frequency and duration of arm rotations under both conditions of the independent variable. However, our study differed from Miller and Nelson’s study in the following ways:

1. Elderly female nursing home residents were studied instead of female college students. As pointed out by Johnson (1983) and Nelson and Peterson (1989), occupational therapy for the elderly patient often involves goal-directed activity, or occupation. The present study hypothesized that the subjects would consider food preparation to be purposeful.

Figure 1. Occupation as the relationship between occupational form and occupational performance. From “Occupational Form and Performance” by D. L. Nelson, 1988, American Journal of Occupational Therapy, 42, p. 637.
2. The oral instructions and the materials were somewhat different in order to adjust to the subjects' developmental structures (e.g., cookie making was made more believable by allowing the subjects to view the contents of the mixture and by encouraging them to add an ingredient to the dough).

3. A system of oral prompts was developed in response to brief stoppages in movement (these discontinuities were also measured).

4. Affective meanings were not measured because subjects were unable to engage in this type of self-reporting.

We hypothesized that the subjects engaged in the added-purpose, occupationally embedded exercise would engage in more exercise repetitions than the subjects engaged in the rote exercise. It was also expected that the subjects in the added-pur· pose group would exercise for a longer duration and would stop less frequently than would the subjects in the rote condition group.

Method

Subjects

Thirty female residents of two nursing homes were studied. The subjects' ages ranged from 70 to 92 years with a mean age of 81.5 years ($SD = 7.2$ years).

The Parachek Geriatric Rating Scale (Parachek & King, 1976) was used as a screening device to determine the overall functional level of the potential subjects in three categories: (a) physical capabilities, (b) self-care skills, and (c) social interaction skills. Parachek scores range from 10 to 50; the scale's authors recommend that scores from 10 to 24 be categorized as Group 1; scores from 25 to 39 as Group 2; and scores from 40 to 50 as Group 3. A selection criterion for this study was a minimal score of 25 (see Table 1), because Group 1 subjects often show a lack of awareness of the environment, an inability to understand instructions, and deficits in understanding simple activities.

Apparatus

Two metal, manual popcorn poppers were adapted for the experiment, and all visible evidence of their customary use as popcorn poppers was concealed. Each apparatus was a 3-L cylindrical pan, 10 cm high and 22 cm in diameter. A 20-cm long wooden stirring handle was attached to a metal shaft which, in turn, was attached to a metal mixing paddle in the middle of the mixing chamber. The contents in the chamber were mixed by rotation of the wooden stirring handle. Each popper's lid was secured with two metal clips.  

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Ages and Parachek Scale Scores of Subjects in the Rote-Exercise and Added-Purpose Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Variable</td>
<td>Rote-Exercise Group ($n = 15$)</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Age in years</td>
<td>$M$ 81.3</td>
</tr>
<tr>
<td></td>
<td>$SD$ 7.5</td>
</tr>
<tr>
<td>Parachek score</td>
<td>$M$ 39.2</td>
</tr>
<tr>
<td></td>
<td>$SD$ 6.6</td>
</tr>
</tbody>
</table>

Note. Control variables were nonsignificant per t-test results.

Measurements

As in Miller and Nelson's (1987) study, the following variables were measured: (a) the frequency of rotations the subject made with the stirring handle and (b) the duration (recorded in seconds) of the task. In addition, the frequency of hesitations (discontinuities) that lasted at least 3 sec was recorded.

Two observers sat approximately 3 m (10 ft) from the subject and counted the total revolutions the subject made with the stirring handle during the activity. Additionally, the observers used a stopwatch to measure the total time the subject was engaged in the activity. Discontinuities were also counted.

Interrater reliability (measured for the scores of 16 subjects) of the independent observers for the frequency-of-rotations, duration, and discontinuity variables was 97.93%, 97.81%, and 100.00%, respectively.

Procedure

The first 30 subjects who scored more than 25 points on the Parachek scale were divided randomly into two groups: rote exercise (Group A) and added-purpose exercise (Group B). The cookie dough to be used by both groups contained 85 ml of water and 500 ml of cookie mix. However, Group B's dough contained an additional 15 ml of vanilla, whereas Group A's dough contained an additional 15 ml of water.

The occupational form for the subjects in Group A involved no added environmental stimuli other than an explanation of the study's purpose. Similar to Miller and Nelson's (1987) study, subjects were told the following:

All of us need to exercise. I am trying to determine the length of time and how hard a person will stir something for exercise. When I say begin, please stir as long as you can without becoming too uncomfortable. Stop when you are too uncomfortable. Don't let [observer's name] and me bother you. We will be keeping track of how long you stir. Remember, stir as long as you can without feeling too uncomfortable. Stop when you are too uncomfortable. Ready? Begin.

The occupational form of the subjects in Group B involved materials and verbalizations synthesized to
create an atmosphere of baking cookies. A plate of homemade cookies was placed in view of each subject (each subject was invited to eat a cookie after the activity). A toaster oven with a pan of cookies that was ready to be baked was also on the table as were a spatula, a hot pad, and a measuring spoon. The researcher and the subjects spoke briefly about making cookies. The subjects were allowed to view the dough in the mixing apparatus and assist in adding the remaining ingredient, 15 ml of vanilla, to the dough. Before beginning, the subjects in Group B were told the following:

All of us need to exercise. Sometimes we can combine our exercise with some other activity we enjoy, like baking cookies. I am trying to determine the length of time and how hard a person will stir something for exercise and baking cookies. These cookies taste best when stirred for a long time. When I say begin, please stir the cookie batter as long as you can without feeling too uncomfortable. Stop when you are too uncomfortable. Don’t let [observer’s name] and me bother you. We will be keeping track of how long you stir. Remember, these cookies taste best when stirred for a long time. Please stir as long as you can without feeling too uncomfortable. Stop when you are too uncomfortable. Ready? Begin.

After the instructions were given, the researcher arose and sat in a chair approximately 3 m (10 ft) away. The researcher initiated no interactions except planned prompts. Prompting was given whenever a hesitation lasted 3 sec (a discontinuity). When subjects in Group A ceased stirring for 3 sec, the researcher asked, “Can you stir more without feeling too uncomfortable? Stop when you are too uncomfortable.” When subjects in Group B ceased stirring for 3 sec, the researcher stated, “These cookies taste best when stirred for a long time. Can you stir more without feeling too uncomfortable? Stop when you are too uncomfortable.” No further prompts were given when a subject said that she wanted to stop or failed to resume stirring after a prompt.

Results

As is often the case when the dependent variable involves a frequency count (Neter, Wasserman, & Kutner, 1985), the data were not distributed normally. Therefore, nonparametric statistics were used. The correlation between the frequency of rotations and the duration was calculated. As expected, these two variables were highly correlated (Spearman r (28) = .88, p < .001). Because these two variables cannot be assumed to be independent, only one (frequency of rotations) was analyzed through inferential statistics (see Table 2).

Frequency of rotations. For this dependent variable, a Mann Whitney U test was used (U = 58.5, p < .05). The mean and median for the rote-exercise group were 75.27 rotations and 55.00 rotations, respectively. The mean and median for the added-purpose group were 190.87 and 133.00, respectively. Overall, stirring rotations ranged from 8 to 512.

Duration. Seconds of duration were converted to minutes. The mean and median for the rote-exercise group were 2.49 min and 1.60 min, respectively. The mean and median for the added-purpose group were 6.06 min and 4.68 min, respectively. Overall, minutes stirred ranged from 0.83 to 14.48.

Discontinuities. There was a slight tendency for the subjects in the rote-exercise group to stop more often than the subjects in the added-purpose group. However, most of the subjects had no discontinuities, and the range of distribution in the variable was so small (0–3) that statistical analysis was unnecessary.

Other considerations. There were no significant differences between the subjects at the two nursing homes. There were also no significant differences between the rote-exercise and the added-purpose groups in terms of age or Parachek scale scores.

Discussion

In this study, the added-purpose, occupationally embedded exercise elicited significantly more repetitions than did the rote exercise. This finding provides additional support for the traditional occupational therapy idea of embedding exercise within occupation.

Occupational therapy clinicians should be aware that this study, like the seven studies reviewed earlier in this paper, is theoretical. Unlike efficacy research, theoretical research does not tell clinicians, consumers, or service providers that occupational therapy works. Theoretical research does, however, tell us something about the underlying principles of our profession. We urge occupational therapy clinicians to consider the theoretical basis for the addition of some activity other than exercise to everyday tasks that are often repetitive.
to reconsider the routine techniques used to elicit therapeutic exercise in view of the power of added-purpose occupation. Is it possible that commonly used techniques focus so much on the motor outcome that little attention is given to the context eliciting the motor performance? How many people, particularly disabled people, are actually motivated by rote exercise? Can added-purpose occupation provide additional benefits, such as an enhanced sense of autonomy, due to a sense that the self is capable? Are we as occupational therapists fully capitalizing on our profession's heritage of adding purpose to therapeutic situations through occupation?

We have identified three levels of research that need to be further explored. The first level involves studies that are closely related to the present study. In addition to replication, we must identify and test occupational forms oriented to elderly men as well as other occupational forms oriented to elderly women. The populations under study could also be narrowed to specific diagnostic categories (e.g., subjects with Alzheimer disease).

A second level of recommended research would involve the measurement of other types of dependent variables, such as range of motion, force exerted, or rhythmicity of movement. The dependent variables could also be operationalized by the impact of the occupational performance on the environment and on subsequent occupational forms (see Figure 1). For example, one could measure the extent to which the stirring causes physical changes in the cookie dough. In addition, the subject's adaptations (and subsequent observable performances in future occupations) could serve as dependent variables. Furthermore, the meanings and purposes of the individual could be assessed via self-report measures.

A third level of future research recognizes that the type of independent variable investigated in this study (involving an occupationally embedded exercise format) is only one part of an expanding body of knowledge: the experimental analysis of therapeutic occupation. Other principles of historical and theoretical significance to occupational therapy need to be investigated, such as occupational choice and the occupational impact of others, including the therapist. For example, the present study was designed to prevent physical closeness between the subjects.

The experimental analysis of therapeutic occupation demands the careful investigation of details. Just as this study involved revisions of the occupational synthesis described by Miller and Nelson (1987), future research should involve analogous revisions. Experimentation is a scientific method that requires many related studies. Each of these studies may appear weak and trivial if taken alone, but, when taken together, they can strengthen and support a theory.

Acknowledgments

We thank Phyllis Wall, Betsy Shafer, and Ruth Richards, OTR, for their assistance with subject recruitment, and research assistants Kirsten Knuth, OTR, and Theresa Fremgen, OTR, for their assistance with data collection.

References


