Purposeful Activity and Performance

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Fifteen male and 15 female subjects performed activities designated as purposeful and nonpurposeful that required the same muscle function. Subjects continued each activity to a predefined level of perceived exertion. The number of repetitions performed, the heart rate, and electromyogram (EMG) recordings were compared for the purposeful and nonpurposeful activities. Results showed a significantly greater number of repetitions performed on the purposeful activities \( p = .001 \) recorded at equal levels of exertion. The hypothesis that individuals will be motivated to perform longer when the activity is purposeful was supported empirically, thereby substantiating a basic premise of occupational therapy.

In formulating the first principles of occupational therapy in 1918, Dunton wrote that occupation must have some useful end to be an effective tool in the treatment of mental and physical disabilities. Today, purposeful activity remains a cornerstone of occupational therapy, and its importance to the field is cited throughout the professional literature. Numerous authors have taken a variety of approaches in attempting to advance an understanding of the concept of purposeful activity. King (1978) views it as part of an adaptive process that characterizes individual development and mastery of the environment. Fidler and Fidler (1978) speak of purposeful action, of "doing," as a means of self-actualization. DiJoseph (1982) identified purposeful activity in terms of a triad of mind, body, and the environment. These authors and others (Breines, 1984; Kleinman & Bulkey, 1982) articulate support for the view that purposeful activity is a legitimate tool in the evaluation and treatment of physical and mental dysfunction. However, despite apparent support for this view among occupational therapists, the concept and value of purposeful activity appears to have been accepted largely through a qualitative process with relatively little evidence of an empirical nature. With debate continuing over the definition and efficacy of purposeful activity (Breines, 1984; West, 1984), the need for controlled studies to measure its effectiveness or value is necessary since it is a basic premise in occupational therapy.

In identifying what sets purposeful activity apart from activity per se, one can begin by defining purposeful activity as "tasks or experiences in which the person actively participates" (Hinajosa, Sabari, & Rosenfeld, 1983, p. 805). By selecting activities in which the patient has an interest, the therapist assumes the patient will experience enough satisfaction to sustain performance (Fidler, 1981). According to King (1978), each successful effort elicited by the occupational therapist serves as an incentive for greater effort by the patient. In other words, purposeful activity is thought to provide an intrinsic motivation to act.

Trombly (1983) refers to motivation as the determination or persistence with which one pursues a goal. She reasoned that a patient provided with interest-sustaining activities is likely to pursue those activities longer than would be expected with less interesting activities or exercises. In a recent study, Kircher (1984) compared exertion, as perceived by the subject, during purposeful and nonpurposeful activity and found that, in normal subjects, heart rate at a predefined level of perceived exertion was significantly higher in the performance of a purposeful activity than in the performance of a nonpurposeful activity. The implication is that an individual may not perceive fatigue as readily when the focus of attention
is on the end product or purpose of the activity rather than on the act itself. However, Kircher's conclusions may have been somewhat compromised by her methodology.

Occupational therapists have long believed that purposeful activity would motivate the patient to perform longer. If this is true, then a greater number of repetitions or a longer duration of performance should be obtained during purposeful activity than during nonpurposeful activity before a point of fatigue is reached.

**Purpose of Study**

This study examined the hypothesis that the presence of a purpose or a goal would have an effect on the number of times an individual would repeat a desired motion before reaching a point of perceived exertion. For the scope of this study, purposeful activity was defined as an activity, task, or process in which the individual actively focuses on the achievement of a goal inherent in the activity. Nonpurposeful activity was defined as the absence of an inherent goal other than the specific muscle or extremity function.

Two activities designated as purposeful were matched with two designated as nonpurposeful. An Oliver Rehabilitation Woodworking Machine requiring reciprocal pedaling to operate an integral drill press was chosen for the purposeful lower extremity activity (see Figure 1), and a Fitron Cycle Ergometer, adapted to duplicate the physical requirements of the drill press, was chosen for the nonpurposeful lower extremity activity (see Figure 2). In preparing the cycle ergometer to duplicate the motions of the drill press, the handlebars were removed and replaced with a platform of the same height which served as the drill press worktable. A spring-loaded lever was installed on the platform to reproduce the motion used in operating the drill press. The speedometer on the cycle was covered to eliminate that particular incentive.

A game requiring the rapid unilateral squeezing of a rubber bulb to produce a steady jet of air necessary to maintain a Ping-Pong ball at a particular level of suspension on an inclined track was developed and designated the purposeful hand activity (see Figure 3). The same rubber bulb, detached from the game, was designated for the nonpurposeful hand activity.

The activities designated as purposeful had goals inherent in their performance whereas the nonpurposeful activities did not. In operating the drill press, the subject's attention was focused on drilling holes to produce a solitaire strategy game. Keeping the Ping-Pong ball suspended on a specific color-coded section of the inclined track was the focus of the purposeful hand activity.
In addition to the number of repetitions performed for each activity, heart rate and electromyogram (EMG) measures were recorded to establish comparable levels of activity in the subjects.

**Method**

**Subjects**

Thirty undergraduate students not studying occupational therapy or physical therapy (15 males, 15 females) with a mean age of 19.0 years participated in the study. The selection was based on results of an eight-item assessment of activity and health factors. Volunteers were considered for selection if they reported performing fewer than 3 hours of aerobic activity per week, did not participate in regular weight training, and had no physical conditions that might have been aggravated by a performance of the activities required in the study.

**Apparatus**

Range of motion on the drill press and Fitron was set at 33 cm diameter, and the seats were set at equal positions. The Fitron was adjusted to require the same pedaling resistance as the drill press by recording EMG activity in the right rectus femoris muscle of a single control subject who performed both activities. The statistical analysis following this method of calibration indicated no significant difference between EMG readings taken on the two activities ($t = .12, P > .05$). Since EMG registers muscle action potentials evoked by the discharge of motor neurons which increases with the level of muscle contraction (Kimura, 1983), it could be reasonably assumed that the similar EMG readings generated by the control subject on the two activities were an indication that the physical demands of the activities were essentially the same.

Repetitions of the pedaling activities were recorded by mechanical revolution counters attached to the machines, and an observer took a back-up count. Repetitions of the hand activities were counted by an observer using a hand-held counter.

**Figure 3**

**Ping-Pong Ball Game for Purposeful Hand Activity**

<table>
<thead>
<tr>
<th>Borg Scale of Perceived Exertion</th>
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<tbody>
<tr>
<td>6</td>
</tr>
<tr>
<td>7 very, very light</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9 very light</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11 fairly light</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>13 somewhat hard</td>
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</tbody>
</table>

**Instrumentation**

A Cyborg Biolab was used to monitor and record surface EMG activity in the right forearm flexors and the right rectus femoris muscle of each subject during the respective performance of the upper and lower extremity activities.

Heart rate was monitored at 1-minute intervals with a Quinton 650 Heartrate Meter, which utilized a 3-lead chest pick-up to display an updated heart rate every 10 seconds. Accuracy is reported at ±4 beats per minute.

The Borg Scale of Ratings of Perceived Exertion (Borg, 1970) was used to establish levels of exertion at which the subjects would stop each activity (see Table 1). The validity ($r = .79$) and reliability ($r = .80$) of this instrument have been reported in the literature (Skinner, Hutsler, Bergsteinova, & Buskirk, 1973).

The subject's opinion of the activity in terms of interest and physical requirements was assessed with the aid of a three-item interest questionnaire. Scaled answers were assigned values ranging from 3 to 12 with a higher value indicating greater interest. After completing all four activities, the subjects ranked the activities in order of preference and were given an opportunity to make additional comments.

**Procedure**

Subjects were not informed about the primary purpose of the experiment, they were told that the purpose was to study the effect of various activities on heart rate. After giving informed consent, subjects were randomly assigned to one of eight possible sequences of activities that controlled for order effects as well as for the effects of fatigue by alternating upper and lower extremity activities. Once a sequence had been established and resting heart rate taken, the subject was given an explanation of the Borg Scale. Subjects were told to stop performance of each activity when they felt they were working somewhat hard, which is at midpoint on the scale. With heart rate and EMG monitors in place, subjects were given a demonstration of the activity, heart rate was recorded, and they were told to begin. A pendulum metronome, placed outside the subject's view, was used to regulate the rate of pedaling in the lower extremity activities. The purposeful lower extremity activity involved drilling a series of 32 holes in a 13.5
Table 2
Means and Standard Deviations for Dependent Variable of Repetitions

<table>
<thead>
<tr>
<th>Purposeful Activity</th>
<th>Nonpurposeful Activity</th>
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<tbody>
<tr>
<td><strong>Repetitions</strong></td>
<td><strong>Mean</strong></td>
</tr>
<tr>
<td>Lower extremity</td>
<td>677.80</td>
</tr>
<tr>
<td>Hand</td>
<td>105.67</td>
</tr>
</tbody>
</table>

cm square pine board to construct the game, which the subjects were told they could keep upon completion. No limit was placed on the number of games each subject could produce. On the nonpurposeful lower extremity activity, subjects pedaled at the same rate while depressing the nonpurposeful lever at a rate of approximately once every 10 seconds.

Subjects performed the hand activities in a seated position with the arm in slight abduction, elbow flexed to 90 degrees, and forearm in the neutral position. The proper grasp was demonstrated, and the subjects were instructed to squeeze the bulb all the way at a rate sufficient to keep the Ping-Pong ball suspended on the color-coded section of the track. Subjects who performed the nonpurposeful hand activity before the purposeful hand activity were instructed to squeeze at a demonstrated rate of approximately twice per second.

Immediately following each activity, the interest questionnaire was administered. Subjects then rested for a minimum of 5 minutes to allow their heart rate to return to its resting level before they resumed activity (Lunsford, 1978).

Results

Table 2 shows means and standard deviations for the dependent variable of repetitions. Dependent t tests indicated that the mean number of repetitions for the purposeful lower extremity activity was significantly greater than for the nonpurposeful lower extremity activity (p < .001), and purposeful hand activity repetitions were significantly greater than nonpurposeful hand activity repetitions (p = .05).

Table 3 shows the means and standard deviations for the control variables of heart rate and EMG. For heart rate, significantly higher levels were recorded on ending heart rates for the nonpurposeful lower extremity activity (p < .001) and the hand (p < .001). No significant differences were found between male and female responses on the questionnaire; however, males preferred the purposeful activities over the nonpurposeful ones, whereas females indicated no significant preference.

Discussion

The hypothesis that purposeful activity will have a positive effect on performance, as measured by the number of repetitions, was supported empirically. For the field of occupational therapy, this clearly supports a basic premise of the profession. If one views purposeful activity as a process engaged in by patients rather than as the tools of the profession (Breines, 1984) the value of this study becomes apparent. The results substantiate the philosophy of occupational therapy—the therapeutic value of the process of purposeful activity—and the modalities utilized in that process. When therapists choose a purposeful activity for a patient, that decision is based on the assumption that the patient will find sufficient satisfaction in the activity to sustain performance. This satisfaction is a key property of intrinsic motivation leading to the performance of an activity that can lay the foundation upon which competent behavior can be built (Florey, 1969). Results of this study strongly support the intrinsic motivational qualities of purposeful activities. Comments from subjects also endorse this view. One wrote, "Certainly physical activity seems easier when

Table 3
Means and Standard Deviations for Control Variables of Heart Rate and EMG

<table>
<thead>
<tr>
<th>Control Variables</th>
<th>Purposeful Activity</th>
<th>Nonpurposeful Activity</th>
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<tbody>
<tr>
<td></td>
<td><strong>Mean</strong></td>
<td><strong>SD</strong></td>
</tr>
<tr>
<td>Heart rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower extremity</td>
<td>141.27</td>
<td>23.68</td>
</tr>
<tr>
<td>Hand</td>
<td>101.50</td>
<td>17.44</td>
</tr>
<tr>
<td>EMG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower extremity</td>
<td>42.86</td>
<td>13.16</td>
</tr>
<tr>
<td>Hand</td>
<td>81.36</td>
<td>9.95</td>
</tr>
</tbody>
</table>

Note. EMG = Electromyogram
The recording instrument. Therefore, one can consider

In this study, the differences in heart rate were due to purposefulness. Kircher found that mean heart rate for the purposeful activity of jumping rope was 11.15 BPM greater than for the nonpurposeful activity of jumping in place without a rope. It has been established elsewhere that heart rate can be used effectively to classify exercise in terms of relative intensity with a higher heart rate indicating a greater work load (McArdle, Katch, & Katch, 1981; Astrand & Rodal, 1977). Consequently, the heart rates recorded in Kircher’s study indicate that her subjects performed two dissimilar activities in terms of work load and, therefore, her conclusion that the differences in performance were due to purposefulness is compromised by her procedure.

In this study, the differences in heart rate were in both directions. Heart rate was higher in the nonpurposeful lower extremity activity (p = .05) and in the purposeful hand activity (p = .05). In contrast to the 11.15 BPM difference found in Kircher’s (1984) study, the differences recorded in this study were less than the ±4 BPM margin of error reported for the recording instrument. Therefore, one can consider these differences to be of statistical rather than of clinical significance. The similarity in heart rates between the two activities is, in fact, a strong indication that work loads were essentially the same for the matched activities. Therefore, one can conclude that the differences in performance, in this case, can be attributed directly to the purposefulness of the activities.

Future research in this area might examine physiologic factors and levels of perceived exertion in subjects following performance of matching purposeful and nonpurposeful activities of controlled duration rather than exertion levels.

Finally, in considering results of the EMG readings, the absence of a significant difference between the purposeful lower extremity activity and nonpurposeful lower extremity activity indicates that the differences in repetitions were recorded at equal levels of activity. In the performance of the hand activities, however, the force exerted for each activity could not be regulated and this may have contributed to significantly higher readings on the purposeful hand activity. Despite this limitation, the results demonstrate that the subjects worked longer and harder at the purposeful hand activity than at the nonpurposeful hand activity, which ultimately supports the original hypothesis.

Because of the uniformity of the work loads between the purposeful and nonpurposeful activities, as measured by heart rate and EMG, one must examine the cognitive and emotional aspects of the activity to account for the differences in performance. Difjoseph (1982) collectively labeled these emotive and cognitive processes the “mind” and emphasized the therapeutic importance of considering these processes as intimately linked to the other dimensions of body and environment. Results of this study support that contention and demonstrate that purposeful activity involves the mind as well as the body in a process that can lead to greater performance. The facilitation of that process, through the utilization of appropriate modalities, is the fundamental challenge to be met by occupational therapists in all areas of practice.

Summary

In examining the effect of purpose on performance, it was found that, when working to a given level of perceived exertion, 15 male and 15 female subjects performed a significantly greater number of repetitions during a purposeful pedaling activity than during a nonpurposeful activity. Similar results were obtained for purposeful and nonpurposeful hand function activities. An assessment of the subjects’ interest in the activities showed a significantly greater interest in the purposeful activities. These results support occupational therapy’s basic premise that purposeful activity is a motivating factor in performance. Impli-
cations were discussed in general terms for the practice of occupational therapy and the process of purposeful activity.

Acknowledgments
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References