The Effects of Task Preference on Performance During Purposeful and Nonpurposeful Activities

Rita Bakshi, Yagesh Bhammbhani, Helen Madill

Key Words: purposeful activities

This study examined the number of repetitions, increase in heart rate, increase in blood pressure, and rating of perceived exertion of subjects performing the most-preferred and least-preferred tasks from a predetermined list under purposeful and nonpurposeful conditions. Twenty healthy women completed the four experimental tests in random order for a period of 10 min each. The results indicated that there was no significant interaction (p > .05) between task choice and condition, thus implying that the subjects' performance was not influenced by task preference regardless of whether the activity was purposeful or nonpurposeful. Comparisons between the purposeful and nonpurposeful conditions revealed that the increase in heart rate and rating of perceived exertion were significantly higher (p < .05) during nonpurposeful activity for both the most-preferred and the least-preferred tasks. On the basis of these results, it is recommended that therapists use purposeful, or goal-directed, activities in their practice, even if they are unable to provide their patients with a choice of therapeutic tasks.

As early as 1918, in describing the term occupational therapy, Dunton reported that "occupation or activity must have some useful end to be an effective tool in the treatment of mental and physical disabilities" (p. 317). At that time, no scientific evidence was available to support his statement. During the next six decades, several researchers (Fidler & Fidler, 1978; Reilly, 1960; Rogers, 1983; Taber, Baron, & Blackwell, 1953; Yerxa, 1967) seemed to have supported Dunton's initial theory, but scientific evidence to substantiate their claims was still lacking.

During the last decade, however, several researchers (Bloch, Smith, & Nelson, 1989; Heck, 1988; Kircher, 1984; Mullins, Nelson, & Smith, 1987; Steinbeck, 1986; Thibodeaux & Ludwig, 1988; Yoder, Nelson, & Smith, 1989) have studied this long-standing theory in a number of ways, and the evidence seems to be equivocal. In one of the first studies in this area, Kircher examined the activity duration and increase in heart rate when female subjects performed a purposeful activity (i.e., jumping with a rope) and a nonpurposeful activity (i.e., jumping without a rope) that were classified as very hard on the rating of perceived exertion scale (the Borg Scale) established by Borg (1977). The results of her study suggested that a nondysfunctional subject may not perceive fatigue as readily when involved in a goal-directed, purposeful activity as when involved in a nonpurposeful activity, despite the fact that cardiovascular stress, as measured by an increase in heart rate, was significantly higher during the purposeful activity. In a subsequent study, Steinbeck compared the number of repetitions performed, heart rate, and electromyographic activity during purposeful and nonpurposeful activities. He found that a greater number of repetitions could be performed at a similar rating of perceived exertion when the activity performed was purposeful. These observations indirectly supported Kircher's initial finding that fatigue is delayed when the activity performed is purposeful. Conversely, Steinbeck reported that heart rate during purposeful activity performed with the lower extremities was significantly lower than during nonpurposeful activity. The reverse trend was observed in this study when the purposeful and nonpurposeful activities were performed with the hand.

Bloch et al. (1989), in a study design similar to that of Kircher (1984), supported Kircher's finding that the increase in heart rate was significantly higher during purposeful activity than during nonpurposeful activity, but the trend observed for the exercise duration was quite different. Although both studies showed no significant difference between the two activities for this variable, Kircher's data indicated that exercise duration was approximately 22% longer during purposeful activity, whereas Bloch et al. reported that exercise duration was approximately 25% longer during nonpurposeful activity. In contrast to these observations, Thibodeaux and Ludwig (1988) reported no significant difference in heart rate
increase or in the time that it took the subjects to assign a rating of perceived exertion of 15 (i.e., working “hard” on the Borg Scale) when engaged in either product-oriented or non-product-oriented activities.

Yoder et al. (1989), like Steinbeck (1986), found a significant increase in the number of repetitions during added-purpose, occupationally embedded exercise, as opposed to the number of repetitions during rote exercise, but this increase was due to greater duration in the subjects’ performance of the added-purpose exercise. Thus, scientific support for the use of purposeful activity could still be questioned. Although some of these controversies could be due to differences in experimental design among the studies conducted, they could also be due to the fact that the activity duration was not controlled in any of the studies conducted to date. The evidence provided by the studies that have advocated the use of purposeful activity for occupational therapy practice needs to be interpreted cautiously, due to the following limitations.

First, in none of these studies were the subjects given a choice of preferred tasks to be performed as a purposeful activity. It has been suggested (Florey, 1969; King, 1978; Shontz, 1959) that motivation is an essential part of therapeutic activity, and performance could be enhanced if clients select activities based on their interests (Florey, 1969; King, 1978; Shontz, 1959). Thus, failure to provide such a choice could influence overall performance, thereby affecting the results of the study. Second, in Thibodeaux and Ludwig’s (1988) study, the subject pool consisted primarily of occupational therapy students who could have been aware of the importance of purposeful activities in occupational therapy practice and thereby confounded the study results.

The present study was undertaken to further examine the role of purposeful and nonpurposeful activities in a controlled laboratory setting and to overcome some of the limitations of the previous research in this area. Specifically, we wanted to compare the number of repetitions, heart rate, blood pressure, and rating of perceived exertion during purposeful and nonpurposeful activities in healthy female subjects who were allowed to choose the most-preferred and least-preferred tasks from a selected number of tasks used commonly in occupational therapy practice.

Method

Subjects

The subjects were 20 healthy female students from the University of Alberta (age range = 18 to 30 years, \( M = 22.5 \) years \( \pm 3.6 \) years) who were unfamiliar with the study objectives. Students registered in the occupational therapy program were excluded from participation, as were those with known cardiovascular, respiratory, neurologic, arthritic, or musculoskeletal disorders.

Procedure

Orientation. Initially, eight tasks commonly used by occupational therapists as therapeutic modalities were presented: (a) block printing (end product: wrapping paper), (b) nail and thread art (end product: wall hanging), (c) drill press (end product: Chinese checker board), (d) rug hooking (end product: cushion cover), (e) leather work (end product: bookmark), (f) weaving (end product: place mat), (g) macramé (end product: plant hanger), and (h) painting (end product: wrapping paper). Each of these eight tasks could be performed under two conditions: purposeful and nonpurposeful. For example, when weaving was considered to be a purposeful activity, the subject used a continuous thread in the shuttle with the goal of making a place mat. When weaving was considered to be a nonpurposeful activity, the subject performed the same repetitive movement pattern, but there was no thread on the shuttle and therefore no end product. After watching a demonstration of each of the purposeful activities, the subjects were asked to select their most-preferred and least-preferred activity. Once the subjects made this choice, they were allowed 2 min to practice the selected purposeful activities. Thereafter, the test administrator demonstrated the nonpurposeful component of the two activities selected by the subject.

Testing. After this orientation procedure, the subjects were fitted with a wireless chest monitor (Sport Tester Model PE 3000\(^1\)) for a recording of heart rate. The subjects were then asked to stand quietly until a steady resting heart rate was attained. Resting blood pressure was recorded manually by the auscultation technique with a stethoscope and a blood pressure cuff. Each subject then performed the four tests—most-preferred purposeful, least-preferred purposeful, most-preferred nonpurposeful, and least-preferred nonpurposeful—in random order to control for possible order effects. Each activity was performed for 10 min at a self-selected pace. To avoid the effects of postural changes on the physiological parameters being measured, all of the activities were performed with the subject in a standing position. The number of repetitions completed during the 10 min of testing was recorded with a manual counter. At the end of the test, the subject was asked to indicate her overall rating of perceived exertion on the Borg Scale. This ordinal scale uses numbers from 6 to 20, with the odd numbers being qualified by descriptive words in the following manner: very, very light (7); very light (9); fairly light (11); somewhat hard (13); very hard (17); and very, very hard (19). The ratings on this scale are considered to be subjective estimates of the degree of physical effort experienced by the subject. The final heart rate was record-

\(^{1}\)Manufactured by Polar Electro Key, Munkakaante 18, SF-90440, Kempele, Finland.

The American Journal of Occupational Therapy
ed during the last 30 sec of the test, and the final blood pressure was recorded immediately at the end of the test. Differences between the initial and final values for heart rate and blood pressure were calculated and used for statistical analysis. A 10-min rest interval was allowed between each of these tests to avoid the effects of fatigue.

Data Analysis

For each of the variables monitored, the data were analyzed with a two-way analysis of variance (Conditions × Preference) with repeated measures on both factors. The significant F ratios were subjected to a post hoc Scheffé multiple comparison test to locate the differences between the conditions and preference variables. All of the results were considered to be significant at the .05 level of confidence.

Results

The number of subjects who selected each task as the most and least preferred was as follows: (a) block printing, most preferred by 5 subjects, least preferred by 2 subjects; (b) nait and thread art, most preferred, 1, least preferred, 3; (c) drill press, most preferred, 3, least preferred, 8; (d) rug hooking, most preferred, 1, least preferred, 2; (e) leather work, most preferred, 6, least preferred, 2; (f) weaving, most preferred, 2, least preferred, 1; (g) macramé, most preferred, 1, least preferred, 2; and (h) painting, most preferred, 1, least preferred, 1. From the limited choice of eight tasks, the most preferred was leather work, which was selected by 30% of the subjects, and the least preferred was working on the drill press, which was selected by 40% of the subjects.

The summaries of the analyses of variance for the four variables examined in this study are presented in Table 1. No significant interaction between conditions and preference of tasks was observed for any of these variables. A similar trend was observed for the purposeful and nonpurposeful conditions when the subjects were allowed to select a task of their choice.

The means and standard deviations of the number of repetitions, increase in heart rate, increase in blood pressure, and rating of perceived exertion during the four experimental procedures are summarized in Table 2. The results of the main effects of the two factors included in the analysis of variance and of the post hoc Scheffé multiple comparison test, where applicable, are interpreted below.

Number of repetitions. For both the most-preferred and least-preferred tasks, the number of repetitions was approximately 25% lower during the purposeful condition than during the nonpurposeful condition. These values were not statistically significant, however, probably because of the large standard deviations associated with these measurements. There was also no significant difference between the most-preferred and least-preferred tasks for the number of repetitions during either the purposeful or nonpurposeful condition.

Heart rate. The increase in heart rate was significantly different between the purposeful and nonpurposeful conditions for each task choice as well as between the most-preferred and least-preferred tasks for each activity condition in each case (p < .001). The increase in heart rate was higher during the nonpurposeful condition when compared with the purposeful condition by 14.3% and 12.5% for the most-preferred and least-preferred choices, respectively. When the two task choices were compared for the purposeful and nonpurposeful conditions, the increase in heart rate was higher during the least-preferred task by the same amount, 14.3% and 12.5%, respectively.

Blood pressure. The increases in blood pressure measured while the subjects were performing the tasks were minimal, probably because of the low intensities at which the activities were performed and the small muscle

| Table 1 | Summaries of the Analyses of Variance for the Four Study Variables |
|-----------------|-----------------|-----------------|-----------------|
| Variable/Source | Sum of Squares | M Square | F | p |
| Number of repetitions | Conditions | 0.100 | 0.000 | 0.100 | 0.73 |
| | Preference | 4.800 | 4.800 | 1.700 | 0.21 |
| | Conditions × Preference | 0.100 | 0.100 | 0.200 | 0.21 |
| Increase in heart rate | Conditions | 231.200 | 231.200 | 16.900 | 0.00 |
| | Preference | 186.000 | 186.000 | 8.000 | 0.01 |
| | Conditions × Preference | 1.800 | 1.800 | 0.100 | 0.67 |
| Increase in blood pressure | Conditions | 1.200 | 1.200 | 0.900 | 0.35 |
| | Preference | 0.100 | 0.100 | 0.100 | 0.75 |
| | Conditions × Preference | 0.100 | 0.100 | 0.100 | 0.76 |
| Rating of perceived exertion | Conditions | 0.009 | 0.009 | 0.002 | 0.98 |
| | Preference | 78.000 | 78.000 | 17.500 | 0.00 |
| | Conditions × Preference | 0.100 | 0.100 | 0.000 | 0.91 |

Note. df = 1.

| Table 2 | Comparison of Mean Responses During Purposeful and Nonpurposeful Activities When Subjects Were Allowed to Select a Task of Their Choice |
|-----------------|-----------------|-----------------|-----------------|
| Variable | Preference | Purposeful | Nonpurposeful |
| No. of repetitions | Most | 63.3 ± 33.7 | 82.9 ± 39.1 |
| | Least | 63.1 ± 54.9 | 84.2 ± 43.6 |
| Increase in heart rate | Most | 18.0 ± 4.8 | 21.0 ± 6.8 |
| | Least | 21.0 ± 6.8 | 24.0 ± 6.5 |
| Increase in blood pressure | Most | 0.5 ± 0.9 | 0.8 ± 1.2 |
| | Least | 0.6 ± 2.1 | 0.7 ± 1.3 |
| Rating of perceived exertion | Most | 8.2 ± 1.8 | 8.1 ± 2.1 |
| | Least | 10.1 ± 2.9 | 10.2 ± 2.6 |

*Difference between the mean values was significant at p = .05.
mass used in their execution (Astrand & Rodahl, 1986). No significant differences were observed for the increase in blood pressure between the purposeful and nonpurposeful conditions for each task choice and between the most-preferred and least-preferred tasks for each activity condition.

Perceived exertion rating. There was no significant difference in the rating of perceived exertion between the purposeful and nonpurposeful conditions for both the most-preferred and least-preferred tasks. However, when comparisons between task choices were made for the two conditions, the rating of perceived exertion during the most-preferred task was significantly lower in each case ($p < .001$).

Discussion

Effects of Task Preference on Performance During Purposeful and Nonpurposeful Activities

This study was designed to examine whether allowing subjects the choice of tasks would influence their performance when these tasks were performed under purposeful and nonpurposeful conditions for a fixed duration. Because no significant interaction was observed between task choice and activity condition for the four variables monitored during these experimental procedures, the results suggest that allowing the subjects the choice of a task does not seem to significantly influence their performance when the activities are performed for a given period of time. Many of the subjects did indicate, however, that if they had the option, they would have terminated the least-preferred nonpurposeful activity well before the required 10-min test duration. If the subjects were allowed this option, significant differences would probably have been observed between the task choices for some of the variables monitored in this study. This hypothesis, however, needs to be scientifically tested before any firm conclusions for occupational therapy practice can be drawn.

Comparison of Performance Between Purposeful and Nonpurposeful Activities During the Most-Preferred and Least-Preferred Tasks

The results of this study indicated no significant differences between purposeful and nonpurposeful activities for the number of repetitions and increase in blood pressure, whereas the increase in heart rate and rating of perceived exertion were significantly higher during nonpurposeful activity than during purposeful activity. These observations were consistent regardless of whether the subjects were allowed the choice of an activity or not.

Steinbeck (1986) and Yoder et al. (1989) compared the number of repetitions during purposeful and nonpurposeful activity for both upper-extremity and lower-extremity tasks. The subjects were asked to exercise until they reached a specific rating of perceived exertion without any time constraints. They reported that the number of repetitions was significantly higher during purposeful activity than during nonpurposeful activity for both task modes. The primary reason for the increased number of repetitions in these studies was the longer duration for which the purposeful activities were performed, which suggests that the subjects were more motivated under these conditions. Steinbeck did not report the duration for which the purposeful and nonpurposeful activities were performed. However, further analysis of the data of Yoder et al. revealed that when the number of repetitions was expressed per unit of time (i.e., number of repetitions per min), there seemed to be no significant difference between the purposeful and nonpurposeful activities (31.1 vs. 30.1 repetitions per min, respectively). This observation supports the results of the present study. As reviewed earlier, the heart rate response during purposeful and nonpurposeful activity is controversial. Bloch et al. (1989) and Kircher (1984) reported significantly greater heart rate increases during purposeful activity, whereas Steinbeck indicated significantly greater heart rate increases during nonpurposeful activity when performed with the lower extremities. In each of these studies, the subjects were asked to continue the activity until they reached a specific level on the rating of perceived exertion scale. In the studies by Bloch et al. and Kircher, the activity duration was quite short (approximately 3 min), which suggests that heart rate measurements were not taken under physiological steady-state measurements (Astrand & Rodahl, 1986). If such was the case, then even small differences in exercise time could have accounted for the differences in heart rate observed between the purposeful and nonpurposeful activities. The present study was designed to overcome this limitation by controlling for exercise time, and when the steady-state heart rate was monitored during the 10th minute of activity for each of the four experimental procedures, a significantly higher heart rate was observed during nonpurposeful activity than during purposeful activity, regardless of activity choice. One should note, however, that the subjects were allowed to perform these tasks at a self-selected pace for each of the experimental conditions; if this pace had been regulated, the heart rate response could have been quite different.

The Borg Scale, which measures rating of perceived exertion, was originally validated against heart rate measurements during exercise in healthy young subjects. The numerical values on the scale were selected to roughly correspond to approximately 10% of the exercise heart rate. Hence, as values on the rating of perceived exertion scale increase, so does the absolute value of the heart rate. In the present study, although significant differences in increased heart rate were observed between purposeful and nonpurposeful activities, regardless of activity.
choice, concomitant changes in the rating of perceived exertion were observed only for choice of activity and not for purposefulness. This was despite the fact that the magnitude of the increase in heart rate between purposefulness and choice was the same (i.e., approximately 3 beats per min). These findings suggest that factors other than heart rate may account for the differences in perceptual responses between purposefulness and choice of activity. In this context, it should be noted that Thibodeaux and Ludwig (1988) reported that the duration for which purposeful and nonpurposeful activity were performed until a specific rating of perceived exertion was attained seemed to be related to the degree to which the subjects liked the activity, but the heart rate did not seem to have a systematic relationship with the degree of preference of an activity.

Study Limitations
The current evidence needs to be interpreted with caution because of the following limitations. First, the present study, like many of the previous studies in this area (Bloch et al., 1989; Heck, 1988; Kircher, 1984; Miller & Nelson, 1987; Steinbeck, 1986; Thibodeaux & Ludwig, 1988), was conducted on nondysfunctional, healthy females. Steinbeck reported that women indicated no significant preference between purposeful and nonpurposeful activities, whereas men seemed to prefer the former. Second, the subjects were allowed to choose the most-preferred and least-preferred tasks from a limited choice of eight tasks commonly used by occupational therapists in clinical practice. Third, the performance was evaluated during light activities, which provided only a mild stimulus to the cardiovascular system. Hence, any application of these findings to occupational therapy practice must be examined within these limitations.

Summary
The results of this study suggest that when healthy women perform their most-preferred and least-preferred tasks under purposeful and nonpurposeful conditions for a fixed duration, the choice of tasks does not seem to influence the number of repetitions, increase in heart rate, increase in blood pressure, and rating of perceived exertion under either of these conditions. For both of the choices, however, the increase in heart rate and the rating of perceived exertion seem to be significantly higher during nonpurposeful activity than during purposeful activity, thus suggesting that physiological and perceived stress is elevated during nonpurposeful activity. We therefore recommend that therapists use purposeful, or goal-directed, activities in their practice, even if they are unable to provide their patients with a choice of therapeutic tasks.

References