Outcome Expectations, Expectancy Accessibility, and Exercise in Endometrial Cancer Survivors

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Studies have shown that expectations about exercise outcomes are associated with exercise behavior. Outcome expectations can be assessed by self-report questionnaires, but a new method—the expectancy accessibility task—may convey unique information about outcome expectations that is less subject to respondent biases. This method involves measuring the reaction time to endorse or reject an outcome. We examined the relationship of self-reported outcome expectations and expectancy accessibility tasks in a pilot study of sedentary endometrial cancer survivors (N = 20). After measuring outcome expectations and expectancy accessibility, participants were given an exercise program and asked to monitor exercise for 7 days using diaries and accelerometers. Analyses revealed no relationship between outcome expectation scores and exercise, but shorter response times to endorse positive exercise outcomes was related to more exercise in the next week (p = .02).

Keywords: exercise, health behavior, motivation, special needs populations

Exercise is increasingly encouraged as a strategy for cancer survivors to offset cancer-related side effects. Physically active cancer survivors demonstrate improved cardiovascular fitness, strength, physical functioning, and quality of life and decreased body fat and fatigue (Courneya, 2003; Courneya & Friedenreich, 2007; Cramp & Daniel, 2008; Segal & Evans, 2001). In addition, physical activity has been associated with survival and recurrence risk in breast and colon cancer survivors (Holmes, Chen, Feskanich, Kroenke, & Colditz, 2005; Meyerhardt et al., 2006). Despite the benefits, many cancer survivors are not physically active (Bellizzi, Roland, & Jeffery, 2005). Thus, examining factors that encourage the adoption and maintenance of exercise behavior is important in developing strategies to increase physical activity in this population.
Social cognitive theory (SCT) provides a framework to examine the adoption and maintenance of exercise. Social cognitive theory suggests that behavior is influenced by efficacy beliefs and outcome expectations (Bandura, 1997). Outcome expectations are the belief that performing a behavior results in positive or negative consequences (Bandura, 1997). Summative research concerning outcome expectations and physical activity indicates an association between positive outcome expectations and physical activity among overweight, sedentary adults, older adults, and older women (Williams, Anderson, & Winnett, 2005). Less research examines negative outcome expectations, but results indicate small correlations between negative outcome expectations and low physical activity levels (Williams et al., 2005).

The role of outcome expectations and physical activity among cancer survivors has been examined in only a few studies. In cross-sectional research, Rogers and colleagues (2005; Rogers, Courneya, Shah, Dunnington, & Hopkins-Price, 2007) have examined SCT constructs, including outcome expectations, among women undergoing breast cancer treatment. Specific positive psychological and physical outcomes, such as experiencing less depression and building muscle strength, as well as general positive expectations scores, were associated with physical activity (Rogers et al., 2005, 2007). Higher negative expectation scores were associated with less physical activity (Rogers et al., 2005). Further investigation of outcome expectations and physical activity among cancer survivors will improve our understanding of survivors’ expectations about exercise and is important in developing effective interventions to help them adopt a more active lifestyle.

Outcome expectations are traditionally assessed using self-report questionnaires. One potential limitation of self-reported outcome expectations is that they primarily reveal the content of deliberative, conscious processing. Recent research has stressed the view that cognition involves two distinct processing systems, deliberative and automatic (Evans, 2003; Fazio & Towles-Schwen, 1999; Wilson, Lindsey, & Schooler, 2000), and that reaction time tasks are useful for assessing automatic (Waters & Sayette, 2005), or spontaneous (Fazio & Towles-Schwen, 1999), components of cognition. Examining these automatic cognitions may enhance our understanding of psychological constructs such as expectancies (Palfai, 2002) by providing measures that are less subject to biases that may be introduced by conscious deliberation. To assess automatic cognitive processing, it is necessary to minimize deliberative processing. This can be achieved by instructing participants to make rapid responses (Wilson et al., 2000) and measuring the time it takes them to respond to the task. For example, in the expectancy accessibility task, participants are required to make rapid and timed endorsement decisions about the expected outcomes (expectations) of behaviors. Two individuals may both endorse the same outcome expectancy (e.g., Exercise makes me . . . HEALTHY, True / False), but they may differ in the time taken to endorse such an outcome. Endorsement reaction times may contain information about the accessibility of cognitive representations (how readily expectations “come to mind”) that may add information to that captured by self-reported outcome expectations (e.g., Palfai, 2002). Waters et al. (2008) examined exercise behavior, outcome expectations, and accessibility in healthy populations comparing exercisers and sedentary individuals to investigate differences in positive and negative outcome expectations and expectancy accessibility. This study documented that self-reported outcome expectations and expectancy accessibility were both independently associated with exercise behavior.
The purpose of this study was to examine exercise-related outcome expectations in a sample of sedentary and low-active endometrial cancer survivors, using self-report questionnaires and the expectancy accessibility task. We hypothesized that both self-reported outcome expectations and expectancy accessibility would be related to exercise. For negative outcomes, we hypothesized a negative association between exercise and negative outcome expectations.

Methods

This paper analyzed data from a pilot test for a prospective longitudinal study of SCT and exercise among endometrial cancer survivors. The laboratory assessments and exercise testing procedures for this pilot test include psychological and physiological measures to be examined in the long-term study. For this analysis, we examined only the associations between participants’ outcome expectations, the accessibility of expectations and self-reported exercise for 7 days following the assessment.

Participants

After receiving institutional review board approval, we recruited sedentary and low-active endometrial cancer survivors during their follow-up appointments at the University of Texas M.D. Anderson Cancer Center’s Gynecologic Oncology Center and at a private gynecologic oncology practice. To be eligible for this study, candidates had to have received treatment for Stage I, II, or IIIa endometrial cancer in the past 5 years, and have completed treatment for at least 6 months. Because this study focused on sedentary or low-active survivors, we excluded candidates who had met or exceeded the current public health recommendations for physical activity for 6 months using the Godin and Shephard (1985) leisure-time physical activity questionnaire to assess activity level. Candidates who had any contraindications to exercise testing as defined by the American College of Sports Medicine’s (ACSM) guidelines (ACSM, 2006) were also excluded.

Of the 92 women identified as eligible, 27 were not contacted at the clinic appointment because they did not keep the appointment or were missed by the study investigators. Of the 65 contacted, 35 (54%) were interested in participating and 30 declined to participate because of lack of time or living too far away. Of the 35 who were interested, 4 were too physically active, thus leaving 31 eligible for the study, of whom only 26 provided informed consent and secured clearance to participate from their physicians. Of these, 5 dropped out before the baseline assessment and 1 was excluded because of a cardiac arrhythmia discovered before she took the exercise test. In the end, 20 survivors completed this pilot study.

Procedures

Participants attended an orientation and an assessment session, separated by approximately 1 week, although both sessions were combined for six participants because of time constraints. Outcome expectation measures were completed at the assessment session.
During this assessment visit, participants also completed several questionnaires concerning exercise, and various anthropometric and fitness assessments were conducted, including a submaximal cardiorespiratory fitness test on a cycle ergometer. Participants completed outcome expectation assessment questionnaires and the computer-based expectancy accessibility task before and after the fitness test.

After completing the assessments, we gave participants a personalized exercise prescription. Participants recorded their exercise in diaries for the next 7 days. On days they exercised, they recorded the time they started and stopped their exercise, and the intensity of each bout using the Borg scale (Borg, 1982). Participants were given prepaid mailers to return each day’s diary as it was completed. In addition, participants wore an accelerometer (model GT1M, ActiGraph, LLC, Pensacola, FL) on their waists during waking hours for seven consecutive days to provide an objective measure of activity.

Measures

Outcome Expectations. Outcome expectations were assessed using a scale adapted from the Active for Life Project for breast cancer survivors (Basen-Engquist et al., 2006) that included 15 positive and 5 negative outcomes of exercise. The internal consistency for positive outcome expectations was .96, at pre- and postexercise test assessments. For negative outcome expectations, internal consistency was lower (.44 and .55 for pre- and postexercise tests). Outcome expectations assessed with this scale have been associated with exercise behavior in a study of healthy adults (Waters et al., 2008).

The expectancy accessibility task was based on that used by Waters and colleagues (2008). It was programmed using E-prime (Version 1.1; Schneider, Eschman, & Zuccolotto, 2002) and was administered on a desktop computer. Instructions were presented on the computer, and responses were recorded by the computer. The instructions indicated that participants should (1) respond to each statement as quickly as possible, (2) that there were no right or wrong answers, and (3) respond with the answer that fits best for them. Each participant completed two test blocks. On the first, participants made speeded responses about talking on the telephone (the control activity), and on the second they responded about exercise. Participants also completed a practice block consisting of positive and negative outcomes related to driving.

On each trial, a “prime” (e.g., Exercise makes me . . . , or Talking on the telephone makes me . . .) was presented for 1.5 s. Subsequently, a one-word “target” was presented in capitals (e.g., RELAXED) below the prime (which remained on the screen). Participants endorsed/rejected these statements by pressing the letter T (for true) or F (for false) button on the keyboard. There was a 1-s intertrial interval. Order of presentation of stimuli was randomized within each block. Within each test block, five nonexpectancy filler trials were included (e.g., Exercise makes me . . KNOWLEDGEABLE). Data from filler trials were not analyzed. Further details of the procedures are available in Waters et al. (2008).

Reaction times were aggregated from T responses (endorsements) and F responses (rejections). Endorsement rates are typically high for exercise positive outcomes and low for exercise negative outcomes (Waters et al., 2008).
current study, we computed mean reaction times from endorsements of positive outcomes, and mean response times from rejections of negative outcomes. These two reaction time measures have been shown to be robustly associated with exercise behavior (Waters et al., 2008). To reduce the influence of extreme outliers on the data, response times > 3 SD above the overall mean were eliminated (Waters et al., 2008). We applied a natural logarithm transformation to reduce the skew of reaction time data.

Minutes of Exercise

The women recorded their exercise in diaries. The information recorded included start and stop times for activity, and intensity ratings using the Borg scale. Minutes of weekly moderate or vigorous exercise was calculated based on these parameters. Accelerometers recorded physical activity counts as the sum of accelerations measured during 1-min intervals. The accelerometer data were exported into an Excel file, where bouts of activity were analyzed. A bout was defined as continuous moderate or vigorous activity lasting at least 10 min. Activity counts were categorized into light, moderate, and vigorous intensity based on algorithms established for adults (Freedson, Melanson, & Sirard, 1998).

Analysis

Descriptive statistics were calculated for reported exercise, outcome expectation scores, and expectancy accessibility task endorsement rates (proportion of outcomes on which the subject selects “true”) and reaction times. We used Pearson’s correlation coefficients to examine the associations between outcome expectation scores, expectancy accessibility endorsement rate, reaction times, and reported exercise in the following week. We used linear regression to examine the independent associations of outcome expectation scores and expectancy accessibility data with subsequent exercise. Outcome expectation scores from the self-report questionnaire, exercise outcome endorsement rate, and exercise outcome reaction times were entered concurrently as predictor variables (control endorsement rate and control response times were included as covariates to control for individual differences in general reaction speed). To facilitate interpretation of parameter estimates, variables were standardized ($M = 0$, $SD = 1$) before entry into linear regression analyses. Analyses were conducted on data from before and after sessions. For all analyses, alpha was set to .05, and two-tailed tests were used.

Results

Participants were primarily college educated (70%), white, non-Hispanic (90%) survivors of stage I (70%) endometrial cancer. The women were overweight as defined by body mass index (BMI; $M = 30.9$, $SD = 7.8$) and demonstrated low predicted cardiorespiratory capacity ($VO_{\text{2max}}$; $M = 18.8$, $SD = 4.6$). Of the 20 endometrial cancer survivors participating in the pilot study, 19 completed and returned exercise diaries and accelerometers. Participants completed 96% of possible entries of exercise diaries. According to the diaries, the women completed a mean of 149.2 min ($SD = 89.26$, range = 35–330) of exercise for the week following the labora-
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tory assessment. This amount of activity is consistent with current public health recommendations of 150 min of moderate exercise per week (USDHHS, 1996). The majority of exercise reported by participants was consistent with objective measures of exercise. Survivors reported a total of 91 bouts of exercise; the duration of activity matched accelerometer data for 83.5% of these bouts. For 6.6% of the bouts, the accelerometer data did not match, and for 9.9% there was no accelerometer data.

Descriptive statistics for self-reported outcome expectations and expectancy accessibility task and correlations with exercise are shown in Table 1. Outcome expectations scores and endorsement rates from the expectancy accessibility task were not significantly correlated with reported minutes of exercise. Reaction times to endorse positive exercise outcomes (postsession) and reaction times to reject negative outcomes, but not reaction time control items, were significantly associated with reported minutes of exercise. For positive outcomes, linear regression analysis revealed that exercise outcome reaction times at the postsession significantly predicted reported minutes of exercise (Parameter Estimate = –72.1, SE = 29.7, p < .05) when controlling for postsession control reaction times, outcome expectation scores, exercise endorsement rate, and control endorsement rate. For negative outcomes, exercise reaction times (rejections) did not continue to predict reported minutes of exercise when controlling for control reaction times (rejections), outcome expectation scores, exercise outcome endorsement rate, and control endorsement rate (ps = .11, .26 for pre- post-session respectively).

Discussion

We examined outcome expectations about exercise and the cognitive accessibility of these outcome expectations in a sample of sedentary and low active endometrial cancer survivors to determine their associations with subsequent exercise. There were no significant associations between self-reported outcome expectations and subsequent exercise (Table 1). In contrast, reaction time measures on the expectancy accessibility task were significantly associated with subsequent exercise (Table 1). Faster endorsements of positive outcomes and faster rejections of negative outcomes were associated with greater reported exercise. Post—exercise reaction times on positive outcomes continued to predict subsequent exercise when controlling for reported outcome expectations and endorsement rates.

This result differs from the body of literature reporting positive associations among self-reported outcome expectation scores and physical activity. Although Rogers et al. (2005, 2007) found significant positive associations between positive outcome expectations and exercise among breast cancer survivors, our results yielded no significant associations, which may be due to sample size or study design. Most previous studies have been cross-sectional, and thus examined current outcome expectations and their relationship to past or usual exercise behavior. In contrast, we examined how outcome expectations were related to subsequent exercise, allowing stronger conclusions about the direction of associations.

Although no significant correlations were found between outcome expectations and exercise, shorter response times for expectancy accessibility tasks were significantly correlated with exercise. This is consistent with other research on outcome expectations and expectancy accessibility in both sedentary and active adults in the
Table 1 Descriptive Statistics for Self-Reported Outcome Expectation and Expectancy Accessibility Task, and Correlation With Minutes of Exercise (N = 20)

<table>
<thead>
<tr>
<th></th>
<th>Preexercise Test</th>
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<th>Postexercise Test</th>
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<tbody>
<tr>
<td></td>
<td>Positive outcomes</td>
<td>Negative outcomes</td>
<td>Correlation</td>
<td>Positive outcomes</td>
<td>Negative outcomes</td>
<td>Correlation</td>
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<tr>
<td></td>
<td>M (SD)</td>
<td>r</td>
<td>M (SD)</td>
<td>r</td>
<td>M (SD)</td>
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<tr>
<td>Outcome Expectations Questionnaire</td>
<td></td>
<td></td>
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<tr>
<td>Outcome expectation ratings (1–5)</td>
<td>3.88 (0.85)</td>
<td>.15</td>
<td>1.55 (0.44)</td>
<td>-.22</td>
<td>3.93 (0.83)</td>
<td>.16</td>
</tr>
<tr>
<td>Expectancy Accessibility Task</td>
<td></td>
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<tr>
<td>Exercise items</td>
<td>84.5 (24.4)</td>
<td>.36</td>
<td>22.7 (19.6)</td>
<td>-.07</td>
<td>91.0 (31.5)</td>
<td>.33</td>
</tr>
<tr>
<td>Control items</td>
<td>81.5 (18.8)</td>
<td>.41</td>
<td>29.2 (33.5)</td>
<td>-.23</td>
<td>81.4 (22.1)</td>
<td>.32</td>
</tr>
<tr>
<td>Reaction times (ms)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Reaction Times—Exercise items</td>
<td>1672 (966)</td>
<td>-.28</td>
<td>2040 (786)</td>
<td>-.49*</td>
<td>1156 (361)</td>
<td>-.59**</td>
</tr>
<tr>
<td>Reaction Times—Control items</td>
<td>1801 (677)</td>
<td>-.21</td>
<td>1972 (788)</td>
<td>-.32</td>
<td>1338 (401)</td>
<td>-.32</td>
</tr>
</tbody>
</table>

Note. Data are means (SD), pre- and post-exercise, for positive and negative outcomes, and Pearson correlations (r) for outcome expectations, expectancy accessibility, and minutes of exercise. Reaction times on positive outcomes reflect endorsements (“True” responses); reaction times on negative outcomes reflect rejections (“False” responses). Extreme reaction times were excluded (>3 SD above the overall mean), and reaction time data were log-transformed before analysis.

*p < .05, **p < .01.
general population (Waters et al., 2008). The data underscore the potential utility of reaction times for assessing automatic cognitive processes. When completing self-report measures, participants may spend time considering how to respond, and factors such as social desirability, or other deliberative cognitive processes, may influence their responses (Greenwald et al., 2002). The results of this study indicate that expectancy accessibility may exert an influence on exercise independent of self-reported outcome expectations in cancer survivors, but more research with a larger sample is needed to confirm these results and determine how responses from expectancy accessibility tasks differ from self-reported measures.

The results of this study must be considered within the framework of its limitations. Small sample size may account for the null relationship between self-reported outcome expectations and exercise. In addition, the mean scores ($M = 3.88, 3.93$) for positive outcome expectations was on the higher end of a scale (range: 1–5), thus raising the possibility of ceiling effects for positive outcome expectation scores. Survivors who were willing to participate in the study may have had more positive outcome expectations than those who refused; thus, if we had been able to recruit a larger proportion of the women approached, we might have had increased variation in outcome expectations and found significant associations with exercise. In addition, the low endorsement rate on negative outcomes (Table 1) made it difficult to examine accessibility of negative outcomes. However, rejection times on negative outcomes revealed important information relevant to exercise behavior (Table 1), and further research should examine this possibility.

In summary, the findings from this pilot study—an initial investigation of exercise-related outcome expectations and expectancy accessibility among cancer survivors—indicate that reaction time measures assessing automatic processing may explain variance in exercise behavior not explained by outcome expectation scores. Implicit tasks like expectancy accessibility merit examination in a larger, more diverse sample of survivors and for a longer study period. These measures could prove useful in the evaluation of interventions, by providing outcome measures that are less subject to respondent bias. Increasing our understanding of outcome expectations important to cancer survivors may also be valuable for developing interventions to help this population become more physically active. For example, increased understanding of participant expectations for exercise may help in tailoring intervention activities. Using these innovative tools will provide more information about the cognitive processes involved in exercise adoption and will thus help in designing effective physical activity interventions for cancer survivors.

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**References**


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