ORIGINAL RESEARCH

Determinants of Physical Activity in Palliative Cancer Patients: An Application of the Theory of Planned Behavior

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Abstract

BACKGROUND: Increasing evidence points to the theory of planned behavior as a useful framework to understand physical activity behavior in cancer patients.

OBJECTIVE: Our primary aim was to examine the demographic, medical, and social–cognitive correlates of physical activity in palliative cancer patients.

METHODS: A cross-sectional survey was administered to advanced cancer patients aged 18 years or older with a clinician-estimated life expectancy of less than 12 months and Palliative Performance Scale >30%, from outpatient palliative care, oncology clinics, and palliative home care.

RESULTS: Fifty participants were recruited. Correlates of total physical activity levels were affective attitude ($r = 0.36$, $P = 0.011$), self-efficacy ($r = 0.36$, $P = 0.010$), and intention ($r = 0.30$, $P = 0.034$). Participants who reported 60 minutes or more of total physical activity daily reported significantly higher affective attitude (M = 0.9, 95% confidence interval [CI] 0.26–1.6, $P = 0.008$) and self-efficacy (M = 0.8, 95% CI 0.0–1.5, $P = 0.046$). Participants <60 years of age (M = 343, 95% CI −7 to 693, $P = 0.054$) and who were normal or underweight (M = 333, 95% CI −14 to 680, $P = 0.059$) reported higher weekly minutes of total physical activity.

LIMITATIONS: Our small sample may not be representative of the total palliative cancer population.

CONCLUSIONS: Affective attitude, self-efficacy, and intention were the strongest correlates of total physical activity levels, and younger and normal/underweight participants did more physical activity.

Multiple systematic reviews have shown that physical activity interventions can result in positive effects on cancer-related fatigue, physical function, and overall quality of life in cancer patients.[1,2] In their Physical Activity and Cancer Control (PACC) framework, Courneya and Freidenreich[3] concluded that physical activity and physical functioning in cancer patients at the end of life are poorly understood. In our recent systematic review, there was preliminary evidence that at least some palliative cancer patients were willing and able to tolerate physical activity interventions, with some patients demonstrating improvement in select biopsychosocial outcomes.[4]

Following our systematic review, we conducted a pilot study to examine the association between physical activity and quality of life in cancer patients receiving palliative care.[5] Seventy-six percent of participants were deceased at the time of data analysis, with a median survival of 104 days from time of survey to time of death. The study showed a positive association between patient-reported physical activity and quality of life in our sample of advanced cancer patients, and the majority of participants felt willing and able to participate in a physical activity intervention.[6] The present article reports the medical,

Use your smartphone to read this QR code and link to Dr. Lowe's et al review that appeared in JSO. Also you can access and download that article at http://jso.imng.com/jso/journal/articles/0701027.pdf

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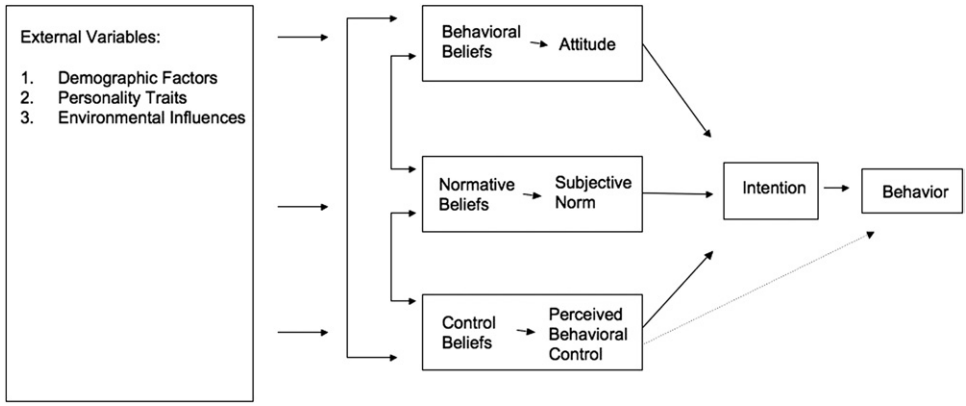

Figure 1 Theory of Planned Behavior.

demographic, and social–cognitive correlates of physical activity from that study.

Maximizing motivation and adherence are critical in designing and implementing a physical activity intervention in any population, and utilizing a theoretical framework can identify salient targets for facilitating behavior change.[7] Elucidating the factors which influence physical activity behavior in advanced cancer patients would be critical in promoting subsequent interventions, particularly in light of their limited prognosis. With respect to cancer populations, the social–cognitive theory,[8,9] the self-determination theory,[10,11] and the attribution theory[12] have been used to examine constructs related to physical activity motivation and behavior. Increasing evidence, however, supports the use of the theory of planned behavior (TPB) in understanding physical activity behavior in cancer populations.[13–16] To date, no research has investigated the social–cognitive correlates of physical activity in palliative cancer patients. Our objective was to examine the medical, demographic, and social–cognitive correlates of physical activity in a sample of palliative cancer patients. The hypothesis was that TPB variables would have medium to large correlations (i.e., $r = 0.3–0.5$) with patient-reported physical activity levels.

Theoretical Framework

The TPB is a validated social–cognitive model of human motivation to facilitate understanding of behavior (see Figure 1).[17] The principal determinant of behavior in the TPB is an individual's intention to perform or not perform a given behavior, which, in turn, is influenced by three independent concepts: attitude, perceived behavioral control (PBC), and subjective norm. *Attitude*, or the positive or negative appraisal of the behavior, is divided into (1) *affective attitude*, which refers to feelings elicited by the possibility of performing the behavior, and (2) *instrumental attitude*, which refers to the rational evaluation of potential advantages of performing the behavior. According to Ajzen,[17] attitudes are grounded in behavioral beliefs, which encompass perceived advantages and disadvantages of performing the behavior. *PBC*, or perceived confidence and control over performing the behavior, is comprised of (1) *perceived controllability*, which refers to the individual's control over performing the behavior, and (2) *perceived self-efficacy*, which refers to the ease or difficulty of performing the behavior. According to Ajzen,[17] PBC is grounded in control beliefs, which include the extent to which certain helpful or preventative factors could affect behavior. In combination with a favorable intention, PBC can directly impact behavior. *Subjective norm* refers to perceived social pressure to perform or not to perform the behavior in question. The more positive the attitude and subjective norm and the higher the PBC, the greater an individual's intention would be to perform the behavior in question.[18]

Methods

Complete details regarding the methods of the parent study have been presented elsewhere;[5] therefore, a summary of the main methods with supplemental information on TPB variable assessment is provided here. In brief, ethical approval was obtained to distribute a research participation document to all patients through the Department of Symptom Control and Palliative Care, Cross Cancer Institute, and the Capital Health Palliative Home Care program in Edmonton, Canada; of those patients who indicated interest on the research participation document, the study coordinator recruited potential participants via telephone. All participants were diagnosed with progressive, incurable, and locally recurrent or metastatic cancer. Eligibility criteria included (1) 18 years of age or older; (2) able to understand, provide written informed consent in, and speak English; (3) cognitive ability to participate (defined as a normal Folstein's Mini-Mental State Score for patient's age and education level); and (4) clinician-estimated life expectancy between 3 and 12 months. Participants were ineligible if they presented with (1) any absolute contraindications to physical activity or (2) Palliative Performance Scale level of 30% or less. The Health Research Ethics Board of the University of Alberta and the Research Ethics Committee of the Alberta Cancer Board provided ethical approval for the study.

DESIGN AND PROCEDURE

The study was a cross-sectional survey using an interviewer-administered questionnaire. The study coordinator conducted all of the interviews. Potential participants were recruited from a Department of Symptom Control and Palliative Care in a regional cancer center for ambulatory cancer patients or from the regional Palliative Home Care program from November 2006 to May 2007. We recruited from all sites with the assumption that there would be no differences in likelihood of interest in or ability to perform physical activity.

SURVEY MEASURES

For the purposes of this study, *physical activity* was defined as any bodily movement produced by skeletal muscles resulting in a substantial increase in energy expenditure over resting levels,[19] and this definition was explained to the participant before beginning the questionnaire. Physical activity was assessed by four questions modified from concepts and short items drawn from the Physical Activity Scale for the Elderly (PASE), which requires participants to recall their most common physical activities, including frequency, intensity, and duration, performed over the past week.[20] The frequency and duration in minutes of the three most common reported physical activities were used to calculate the total number of physical activity minutes over the past week.

TPB variable assessment was performed in keeping with Ajzen's established standardized guidelines.[21] The standardized items used have been shown to be reliable and valid from previous research in cancer populations[13–16] and were altered only to reflect the particular context. Each item was scored on a seven-point bipolar adjective scale, with 1 being a negative response and 7 being a positive response. Scores for each TPB construct were created through averages of the respective items.

Attitude. Six items were used to assess affective (e.g., enjoyable/unenjoyable, pleasurable/painful, fun/boring) and instrumental (e.g., useful/useless, beneficial/harmful, important/unimportant) attitudes. The scales were preceded by the statement "I think that for me to perform regular physical activity over the next month would be . . . ." Seven-point scales were used with the descriptors of extremely (1 and 7), quite (2 and 6), and slightly (3 and 5; 4 was not labeled). Internal consistency for affective and instrumental attitudes, as measured by Cronbach α, were 0.82 and 0.72, respectively.

Subjective norm. Three items were used to assess injunctive norm (approving/disapproving, encouraging/discouraging, supportive/unsupportive). The scales were preceded by the statement "I think that if I engaged in regular physical activity over the next month, most people who are important to me would be . . . ." Two items were used to assess descriptive norm (active/inactive, agree/disagree that important others will be physically active regularly). The scales were preceded by the statements "I think that over the next month, most people who are important to me will themselves be . . . ." Seven-point scales were used with the descriptors of extremely/strongly (1 and 7), quite/moderately (2 and 6), and slightly (3 and 5; 4 was not labeled). Internal consistency for injunctive and descriptive norms, as measured by Cronbach α, were 0.85 and 0.86, respectively.

PBC and self-efficacy. Two items were used to assess PBC and perceived self-efficacy: "If you were really motivated . . . ." followed by (1) how controllable would it be for you to do regular physical activity over the next month? (1 [extremely uncontrollable] to 7 [extremely controllable]) and (2) how confident would you be that you could do regular physical activity over the next month? (1 [extremely unconfident] to 7 [extremely confident]). The first item was used to measure PBC, and the second item was used to measure self-efficacy.

Intention. Three items were used to assess intention: (1) how motivated are you to perform regular physical activity over the next month? (1 [extremely unmotivated] to 7 [extremely motivated]), (2) how committed are you to doing regular physical activity over the next month? (1 [extremely uncommitted] to 7 [extremely committed]), and (3) I intend to do regular physical activity over the next month (1 [strongly disagree] to 7 [strongly agree]). Internal consistency for intention, as measured by Cronbach α, was 0.90.

The study coordinator collected all of the medical and demographic information using self-report measures (age, gender, marital status, education, income, employment status, ethnicity) and via medical chart review (months since diagnosis, primary tumor type, site of metastases, type and duration of adjuvant treatment, current medications, smoking and alcohol status, medical comorbidities, current Palliative Performance Scale level, and date of death).

STATISTICAL ANALYSIS

Data were analyzed using SPSS version 15.0 software (SPSS, Inc., Evanston, IL). There are no established physical activity level recommendations for advanced cancer patients[22]; therefore, participants were divided into two categories based on a roughly median split on their self-reported total physical activity over the past week (<60 vs. ≥ 60 minutes of physical activity per day). Descriptive statistics for TPB variables, medical and demographic characteristics, and physical activity levels are presented as means. Pearson correlations were used to examine associations between total physical activity levels and TPB constructs. The intercorrelations between TPB variables were also analyzed. Medium to large correlations were defined as $r = 0.3–0.5$ according to Cohen.[23] Independent samples *t*-tests were conducted to compare differences in total physical activity levels based on medical and demographic factors (i.e., male vs. female, age <60 vs. ≥ 60 years, body mass index [BMI] of <25 vs. ≥ 25, Palliative Performance Scale level of $<60\%$ or $\geq 60\%$). Differences in TPB variables based on the cut-point of 60 minutes per day of total physical activity were analyzed with independent *t*-tests. All statistical tests were two-sided ($\alpha = 0.05$). Because of the pilot nature of the study and small sample size, associations were interpreted based on effects sizes in addition to *P* values. Meaningful associations were consid-

Table 1

Total Physical Activity Minutes per Week and Theory of Planned Behavior Variables: Descriptive Statistics and Bivariate Correlations

VARIABLE	1	2	3	4	5	6	7	MEAN	SD
1. Total Physical Activity Minutes per week								740	625
2. Instrumental Attitude	0.14							6.3	0.6
3. Affective Attitude	0.36*	0.42**						5.1	1.2
4. Injunctive Norm	−0.16	0.32*	0.28*					6.6	0.8
5. Descriptive Norm	0.07	0.21	0.19	0.18				6.0	0.9
6. Perceived Behavioral Control	0.14	0.45**	0.14	0.06	0.23			5.9	1.0
7. Self-Efficacy	0.36*	0.43**	0.31*	0.09	0.20	0.47**		5.8	1.3
8. Intention	0.30*	0.34*	0.22	−0.02	0.25	0.46**	0.61**	5.8	1.0

* $P < 0.05$ (two-tailed), ** $P < 0.01$ (two-tailed).

Table 2

Difference in Theory of Planned Behavior According to Total Physical Activity Minutes Per Day over the Past Week

	PHYSICAL ACTIVITY<60 MIN/ DAY (N = 25)		PHYSICAL ACTIVITY≥60 MIN/ DAY (N = 25)						
VARIABLE	MEAN	SD	MEAN	SD	MEAN DIFFERENCE	95% CI	*t*	EFECT SIZE (D)	*P*
Instrumental Attitude	6.2	0.6	6.4	0.6	0.2	−0.1 to 0.5	1.2	0.32	0.243
Affective Attitude	4.7	1.4	5.6	0.9	0.9	0.2–1.6	2.8	0.78	0.008
Injunctive Norm	6.8	0.5	6.4	1.1	−0.3	−0.8 to 0.1	−1.5	0.42	0.146
Descriptive Norm	5.9	0.9	6.1	0.8	0.2	−0.2 to 0.7	1.0	0.28	0.325
Perceived Behavioral Control	5.8	1.0	6.0	1.0	0.2	−0.4 to 0.7	0.6	0.18	0.524
Self- Efficacy	5.4	1.6	6.2	0.9	0.8	0.0–1.5	2.1	0.58	0.046
Intention	5.6	1.1	6.1	0.8	0.5	−0.1 to 1.1	1.8	0.51	0.076

ered to be those with at least a medium effect size of $d = 0.5$ for between-group comparisons and $r = 0.3$ for correlations.

Results

Complete details regarding sample medical and demographic characteristics have been presented elsewhere.[5] Briefly, 50 participants were recruited from the regional cancer center Department of Symptom Control and Palliative Care service (n = 24) and the regional Palliative Home Care Program (n = 26). Seventy-six percent (38 of 50) of the participants were deceased at the time of data analysis, with a median survival of 104 days from time of survey to death.

THEORY OF PLANNED BEHAVIOR VARIABLES

Participants demonstrated high levels of all TPB constructs, with means ranging 5.1–6.3 on the seven-point scales. Intercorrelations between TPB constructs were generally medium (Table 1). Overall, affective attitude ($r = 0.36$, $P = 0.011$) and self-efficacy ($r = 0.36$, $P = 0.010$) showed the strongest association with total physical activity minutes per week. An association was also found with intention ($r = 0.30$, $P = 0.034$).

Table 2 presents differences in TPB constructs between participants with <60 vs. ≥60 minutes of total physical activity minutes per day. Participants who reported 60 minutes or more of total physical activity daily reported significantly higher affective attitude (M = 0.9, 95% confidence interval [CI] 0.2–1.6, $P = 0.008$) and self-efficacy (M = 0.8, 95% CI 0.0–1.5, $P = 0.046$). Differences for intention (M = 0.5, 95% CI −0.1 to 1.1, $P = 0.076$) were not statistically significant but were potentially meaningful (i.e., d values >0.5).

Table 3 displays differences in total physical activity minutes per day over the past week based on medical and demographic factors. Participants who were <60 years of age (M = 343, 95% CI −7 to 693, $P = 0.054$) and who were normal or underweight (M = 333, 95% CI −14 to 680, $P = 0.059$) reported greater minutes of total physical activity per day over the past week. There were no other significant or meaningful associations found between total physical activity minutes per day over the past week and gender, time to death, number of metastatic sites, cancer diagnosis, comorbidities, income, education, or marital status.

Table 3

Differences in Total Physical Activity Minutes per Week Based on Demographic and Medical Variables

VARIABLE	R(P)	MEAN	SD	MEAN DIFFERENCE	95% CI	*t*	EFECT SIZE (D)	*P*
Age (years)	−0.24 (0.097)			343	−7 to 693	2.0	0.55	0.054
<60 (n = 21)		939	683					
≥60 (n = 29)		596	548					
BMI	−0.14 (0.342)			333	−14 to 680	1.9	0.55	0.059
Normal/underweight (n = 25)		907	707					
Overweight/obese (n = 25)		574	490					
Palliative Performance status	0.12 (0.405)			−86	−449 to 277	−0.5	0.13	0.634
<60% (n = 29)		704	558					
≥60% (n = 21)		790	719					
Gender	0.16 (0.280)			−197	−559 to 165	−1.1	0.32	0.280
Male (n = 20)		622	597					
Female (n = 30)		819	641					

Discussion

The purpose of this study was to examine the demographic, medical, and social–cognitive correlates of physical activity in palliative cancer patients. Overall, self-efficacy, affective attitude, and intention were the strongest correlates of total physical activity levels. Older age and higher BMI were associated with lower levels of physical activity. These findings provide impetus for the development of a physical activity program tailored to palliative cancer patients as a potential supportive care intervention.

Consistent with our hypothesis, TPB variables showed medium to large correlations with total physical activity levels. Self-efficacy was one of the most significant correlates of total physical activity levels, and participants who reported ≥60 minutes of total physical activity per day also reported higher self-efficacy than those who reported <60 minutes of total physical activity per day. Self-efficacy is a key component of PBC, and previous studies in cancer patients have shown that PBC is an independent correlate of exercise behavior and adherence.[13,15] These findings suggest that developing strategies to improve the participant's confidence may, in turn, significantly influence their intention and subsequent behavior.

The strong correlation between self-efficacy and total physical activity levels in this sample of palliative cancer patients may have interesting implications within this population. PBC has been shown to predict the initiation and maintenance of exercise behavior over a relatively short period of time.[24] Given the median survival of 104 days in our sample of palliative cancer patients, promoting initiatives which enhance patients' confidence in their ability to perform the behavior may impact adherence and outcomes for a program duration that is likely limited by short life expectancy. Larger prospective studies are warranted to further investigate and confirm these findings.

Affective attitude was one of the most significant correlates to total physical activity levels in our sample of palliative cancer patients. Moreover, those participants who reported higher levels of physical activity also reported significantly higher affective attitude than those who reported lower activity. These findings correspond to previous research which showed that affective attitude is an independent predictor of exercise intentions in non-Hodgkin's lymphoma patients,[25] brain cancer patients,[16] and ovarian cancer patients.[14] Emphasizing the enjoyable elements of a physical activity program may be one practical means of improving affective attitude and, hence, influencing behavior. This would appear to be intuitive in a palliative cancer population, wherein the activity itself should be enjoyable, rather than something endured for potentially transient benefit.

Ajzen[17] postulated that intention is the proximal determinant of behavior. In our study, intention was a moderate, but not the strongest, correlate of total physical activity levels. Similarly, there was a potentially meaningful, but not statistically significant, difference in intention between participant-reported levels of total physical activity. The overall sample mean for intention was high at 5.8 out of a seven-point scale; given that the participants who were more interested in physical activity were probably more likely to participate in the study, one may postulate that in the presence of uniformly favorable intention, PBC could exert direct influence on behavior. Notwithstanding the small sample size, the correlation between intention and total physical activity levels may portend to the unique motivations of advanced cancer patients.

In the current study, participants who were <60 years of age reported greater levels of total physical activity than those who were ≥60 years of age. This finding corresponds to previous research in bladder cancer patients.[26] Given their perceptions of frailty and disability, older adults may not attribute the same value to, or feel as much control over, their ability to participate in physical activity.[27] Developing physical activity initiatives for older palliative patients would ideally incorporate those determinants which are specific to their subgroup. Larger prospective studies are warranted to

further elucidate potential associations between age and specific physical activity determinants in this palliative cancer population.

Finally, participants with a normal or lower BMI reported greater levels of total physical activity than those who were overweight or obese. A normal BMI in a palliative cancer patient does not preclude prediagnosis obesity, given the severe weight loss and anorexia–cachexia syndrome which manifests in the end stages of cancer.[28] Sarcopenia in an overweight or obese palliative cancer patient can herald poor prognosis and may not be accurately reflected in the BMI.[29] Nevertheless, overweight and obese adults may not perceive physical activity to be enjoyable and may feel less confident in their ability to perform physical activity, particularly if the program is prescribed rather than self-initiated.[30] These findings are similar to previous research in endometrial[15] and colorectal cancer[31] patients.

A number of limitations should be considered when interpreting our findings. First, this study was cross-sectional, and the sample size was small. Second, this may be a biased sample given that participants who are interested in physical activity may be more likely to participate in our study. Third, self-reported measures are prone to recall bias, and objective assessment may have more accurately reflected the participants' total physical activity levels. Finally, our survey items did not identify the perceived barriers to undertaking physical activity, which would have significant implications in the implementation of any physical activity program in this population. Advanced cancer patient beliefs with respect to physical activity would likewise warrant future evaluation.

Conclusions

Despite these limitations, however, these findings indicate that affective attitude, self-efficacy, and intention were the strongest correlates of total physical activity levels in this sample of palliative cancer patients. Older age and higher BMI were associated with lower levels of physical activity, and thus, these subgroups may be targeted in future interventions. By enabling strong intentions for physical activity through encouraging positive affective attitude and higher perceptions of confidence, this information could inform future research trials of physical activity in palliative cancer patients. In keeping with the recommendations of the PACC framework,[3] pilot testing is needed to further define the potential delivery models of physical activity in this understudied patient population.

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