

APPLICATION OF THE THEORY OF PLANNED BEHAVIOR TO UNDERSTAND INTENTIONS TO ENGAGE IN PHYSICAL AND PSYCHOSOCIAL HEALTH BEHAVIORS AFTER CANCER DIAGNOSIS

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SUMMARY

A cancer diagnosis can trigger change in both lifestyle behaviors and mental health outcomes such as ‘growth’ and ‘benefit-finding’. Assuming changes in mental health outcomes are based upon changes in specific behaviors, the Theory of Planned Behavior (TPB) may facilitate understanding of post-diagnosis change in physical and psychosocial ‘health’ behaviors. Adults ($n = 130$) ≤ 2 years post-cancer diagnosis completed an internet survey. Current performance and future behavior intentions for two physical (e.g. eating a healthy diet) and four psychosocial (e.g. spending quality time with family/friends; engaging in spiritual or religious activities) health behaviors were assessed. TPB constructs (subjective norm, behavior attitudes, perceived behavioral control) for each of the six behaviors were also assessed. Multiple regression analyses indicated the set of TPB constructs accounted for an increment of 25–53% of variance in behavioral intentions beyond that accounted for by clinical and demographic variables. Among individual TPB constructs, behavioral attitude was most consistently associated with behavioral intentions while subjective norm was least consistently associated with behavioral intentions. The TPB could serve as a comprehensive model for understanding change in both physical and psychosocial health behaviors after cancer diagnosis and could suggest innovative approaches to developing interventions to enhance post-diagnosis ‘growth’ and ‘benefit finding’. Copyright © 2005 John Wiley & Sons, Ltd.

KEY WORDS: cancer; health behaviors; Internet research; Theory of Planned Behavior; psychosocial adjustment; survivors

INTRODUCTION

Evidence has accumulated that cancer diagnosis and treatment can serve as a catalyst for change in a variety of health behaviors. Certainly, the stresses associated with cancer diagnosis and treat-

ment might trigger increases in unhealthy behaviors, such as tobacco or alcohol consumption, in some individuals. However, research aimed at understanding the impact of cancer diagnosis and treatment has generally focused upon its role in triggering increases in behaviors linked to positive physical health outcomes (Pinto *et al.*, 2000). Research has shown cancer patients and survivors often evidence a strong interest in adopting healthier lifestyle behaviors (Blanchard *et al.*, 2003; Demark-Wahnefried *et al.*, 2000). Even more importantly, cancer patients and

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survivors often report actual changes in the direction of adopting healthier lifestyle behaviors including reduced tobacco use, increased physical activity and exercise, and consumption of a healthier diet following cancer diagnosis and treatment (Gritz *et al.*, 1993; Maskarinec *et al.*, 2001; Maunsell *et al.*, 2002; Patterson *et al.*, 2003; Pinto *et al.*, 2000; Reardon and Aydin, 1993; Satia *et al.*, 2004). The specific motivations underlying these health behavior changes vary. Some adopt healthier lifestyle behaviors to improve their general health status and consequently their future risk for other diseases, while others do so in order to (hopefully) enhance their response to cancer treatment or reduce the risk for cancer recurrence (Pinto *et al.*, 2000). Often, changes in physical health behaviors occur spontaneously, in the absence of participation in any formal behavior change program. This spontaneous willingness to adopt more healthy lifestyle behaviors evidenced by many cancer patients and survivors has led to the suggestion that a cancer diagnosis constitutes a 'teachable moment' (McBride *et al.*, 2000). As a result, some research has examined the utility of formalized efforts to enhance the adoption and maintenance of healthier physical lifestyle behaviors targeted toward cancer patients and survivors (Chlebowski *et al.*, 1993; Griebel *et al.*, 1998; Pierce *et al.*, 1997; Segal *et al.*, 2001).

The willingness of cancer patients and survivors to adopt healthier patterns of behavior is not limited to behaviors linked to enhanced physical health outcomes. Research has emerged within the past decade establishing that many cancer patients and survivors report changes in behaviors linked to enhanced mental health outcomes. More specifically, research has examined the frequency and extent of reports of what has been variously labeled 'positive psychological adjustment' (Andrykowski *et al.*, 1993), 'positive sequelae' (Fromm *et al.*, 1996), 'growth' (Andrykowski *et al.*, 2005), and/or 'benefit-finding' (Sears *et al.*, 2003) following cancer diagnosis and treatment. Despite differences in nomenclature, this research has established the experience of cancer diagnosis and treatment often is accompanied by spontaneous positive changes in social and interpersonal relationships, a reordering of life priorities, increased spiritual and religious activities and enhanced spiritual faith and experience, and greater empathy and involvement in altruistic activities (for a review see Stanton *et al.*, in press).

In short, this research has established cancer patients and survivors are likely to evidence changes from pre-diagnosis status in a variety of psychosocial behaviors leading to positive mental health outcomes. Based upon the view of cancer diagnosis as a 'teachable moment' or 'psychosocial transition' (Parkes, 1971), recent research has attempted to capitalize on the apparently enhanced potential for positive psychosocial behavior change in cancer patients and survivors by developing and implementing interventions to enhance 'growth' and 'benefit-finding' (Antoni *et al.*, 2001; Kissane *et al.*, 2003; Stanton *et al.*, 2002).

While it is apparent that cancer diagnosis and treatment can trigger positive change in both physical and psychosocial behaviors, research has not adopted an integrated approach to studying this phenomenon. In large part, this is because specific research studies have generally focused upon documenting the frequency and correlates of either positive change in physical health behaviors or positive change in psychosocial behaviors. Rarely, if ever, have both types of post-diagnosis behavior change been examined within the same study. Furthermore, attempts to understand inter-individual differences in the nature and extent of post-diagnosis behavior change have invoked a variety of theoretical models as explanatory mechanisms. On the one hand, positive post-diagnosis psychosocial behavior change is often characterized as 'post-traumatic growth' (e.g. Cordova and Andrykowski, 2003; Cordova *et al.*, 2001; Manne *et al.*, 2004), suggesting the utility of viewing such changes within the context of a trauma adaptation framework (Tedeschi and Calhoun, 1995; Tedeschi *et al.*, 1998). On the other hand, positive post-diagnosis physical behavior change has been examined from the standpoint of several well-known models of health behavior, including the Health Belief (Maiman and Becker, 1974; Rosenstock, 1990) and Trans-theoretical Models (Prochaska *et al.*, 1991).

We propose an integrated approach to understanding the nature and extent of post-diagnosis change in both physical and psychosocial behaviors might be useful. More specifically, we posit cancer diagnosis and treatment represents a 'teachable moment', characterized by a propensity to critically examine many facets of one's life and a heightened motivation to change both physical and psychosocial behaviors in order to enhance both physical and mental health. While a spectrum

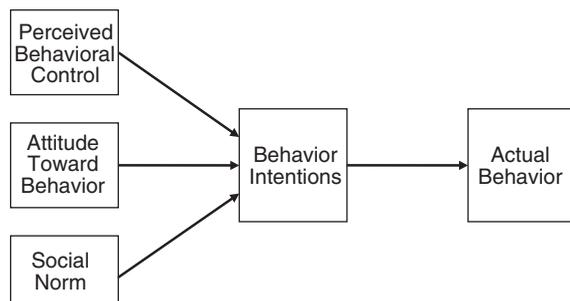


Figure 1. Schematic representation of the Theory of Planned Behavior (TPB).

of physical and psychosocial behaviors are potential candidates for change after a cancer diagnosis, they all share a fundamental characteristic: they are all behaviors. Consequently, attempts to understand the positive changes in behaviors related to spirituality or interpersonal relationships often observed after a cancer diagnosis could benefit from application of the same, existing health behavior models used to understand the often observed post-diagnosis positive changes in diet or exercise behaviors.

The Theory of Planned Behavior (TPB), an extension of the earlier Theory of Reasoned Action (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975), has been used to understand the initiation and continued performance of a variety of health behaviors under volitional control (Ajzen, 1985, 1991; Armitage and Conner, 2001). As shown in Figure 1, the TPB posits that the intention to engage in a specific behavior is a strong proximal indicator of the subsequent, actual performance of that behavior. This fundamental assumption has been supported across a broad range of studies of health behavior. For example, a review of the application of the TPB to health-related behaviors found the correlation between measures of intention and subsequent health behavior in 18 different studies ranged from 0.25 to 0.72 with a mean of 0.47 (Godin and Kok, 1996). Furthermore, the TPB posits that the intention to engage in a behavior is itself determined by several cognitive variables including *attitudes* regarding that behavior, the *subjective norm* regarding the performance of that behavior, and *perceived behavioral control*. The latter refers to beliefs in one's ability to effectively engage in that behavior. The TPB has proven to be a useful framework for

understanding initiation and maintenance of a variety of behaviors related to physical health, such as consumption of a healthy diet and participation in an exercise regimen (for reviews see Armitage and Conner, 2001; Conner and Sparks, 1996; Godin and Kok, 1996). Advanced as a general model of behavior, there appears to be no reason why the TPB cannot be also used to understand performance of psychosocial behaviors related to mental health commonly altered by the cancer experience (e.g. engaging in religious or spiritual activities, engaging in volunteer or charitable activities, spending more quality time with friends and family, etc.). Intentions to engage in these psychosocial behaviors should be proximally linked to the actual performance of these behaviors, with both intentions and performance linked to the TPB constructs of attitude, subjective norm, and perceived behavioral control associated with these behaviors. Demonstration that the TPB provides a useful framework for understanding post-diagnosis change in psychosocial health behaviors would have distinct, clinical implications. Attitudes, norms, and perceived behavioral control are all characteristics of human behavior that are modifiable. Thus, similar to the use of the TPB for guiding the development and implementation of interventions to facilitate change in physical health behaviors (e.g. diet, exercise), the TPB could provide at least a partial blueprint for the development and implementation of interventions to facilitate post-diagnosis change in psychosocial behaviors related to enhanced mental health (e.g. 'growth'). Specifically, the TPB would suggest interventions to enhance positive psychosocial behaviors be targeted toward identification of attitudes and perceptions of norms and perceived behavioral control relevant to these psychosocial behaviors, followed by efforts to modify these cognitions, as necessary.

In light of the above, the present study is an initial test of the utility of the TPB for understanding intentions to engage in a variety of positive physical and psychosocial health behaviors following cancer diagnosis. Several specific hypotheses are advanced. In particular, it is hypothesized that stronger intentions to engage in a specific physical or psychosocial health behavior will be positively associated with a more positive attitude regarding that behavior, a more positive subjective norm regarding that behavior, and a stronger belief in one's ability to engage in

that specific behavior (i.e. perceived behavioral control).

METHOD

Participants and procedures

To be eligible for study, participants had to: (a) be ≥ 18 years; (b) have a history of cancer diagnosis and treatment; and (c) be able to read and write in English. Participants were recruited primarily from nine existing on-line cancer information and support groups between August 2002 and April 2003. The coordinator of each on-line group was contacted for permission to contact group members. If permission was granted, all group members were sent an e-mail message containing a brief description of the study, an invitation to participate, and a link to a web-site containing the study survey. (While our recruitment efforts were targeted toward members of these nine specific cancer information and support groups, only 62% of respondents indicated they heard about the study through an information or support group. The remaining participants heard about the study from a link to another web page (27%), a friend (2%), a search engine (1%) or some other source (8%).) The study web-site contained an introductory page which provided information about the study and an explanation of study procedures. The introductory page was followed by a set of questionnaires and a concluding page, which thanked participants. Participants were assured of the confidentiality of their responses and were advised their participation was voluntary and they had the right to end study participation at any time simply by closing their browser window. An electronic mail link was available to enable respondents to contact the investigator if they had questions or concerns about their study participation.

Questionnaires

Demographic information. Specific questions solicited information regarding a participant's age, gender, years of education, marital status, and race.

Clinical information. Participants were asked their specific cancer diagnosis, time since cancer

diagnosis, and stage of disease at diagnosis (local, regional, distant).

Current performance of physical and psychosocial health behaviors. Information regarding performance of two physical health behaviors (eating a healthy diet, engaging in physical exercise) and four psychosocial health behaviors (reflecting on priorities in life, spending quality time with friends and loved ones, engaging in charitable or volunteer activities, spending time in religious or spiritual activities) was obtained using a similar set of questions. For each of these six behaviors, whether a respondent currently engaged in that behavior on a regular basis was assessed. For example, study participants responded with either a 'yes' or a 'no' to the statement 'I currently *regularly* spend time reflecting on the priorities in my life'. Similarly, current participation in physical exercise was indexed by responses to the statement 'I currently *regularly* engage in physical exercise such as walking, bicycling, swimming or jogging'. Again, response options were 'yes' or 'no'. For each of the six health behaviors, a follow-up question was asked only if a respondent indicated they were currently engaging in that behavior. Specifically, they indicated whether they had been regularly engaged in that specific behavior for 'less than 6 months' or '6 months or more'.

Behavior intentions. Based upon general recommendations by TPB developers (Ajzen, 2002), a set of similar items was used to assess intentions to regularly engage in each of the six health behaviors examined. For example, intentions to regularly devote time to reflecting on priorities in life were assessed by two items 'During the next 30 days, I intend to regularly spend time reflecting on the priorities in my life' and 'During the next 6 months, I intend to regularly spend time reflecting on the priorities in my life'. Responses were recorded on 5 point Likert scales with endpoints labeled 'strongly disagree' and 'strongly agree'. Behavioral intentions for each of the remaining five health behaviors were assessed using similar procedures.

Behavior attitude. Based upon general recommendations by TPB developers (Ajzen, 2002), attitude regarding regularly engaging in physical exercise was assessed by the item 'For me, regularly engaging in physical exercise would

be....' Responses were recorded on two, 5-point Likert scales. One scale was anchored by the endpoints 'positive' at one end and 'negative' at the other. The other scale was anchored by the endpoints, 'unpleasant' at one end and 'pleasant' at the other. Attitudes regarding each of the remaining five health behaviors were assessed using similar procedures.

Perceived behavioral control. Based upon general recommendations by TPB developers (Ajzen, 2002), perceived behavioral control regarding the ability to regularly eat a healthy diet was assessed by the item 'If I wanted, I could regularly eat a healthy diet'. Responses were recorded on a 5-point Likert scale with one endpoint labeled 'Strongly Disagree' and the other endpoint labeled 'Strongly Agree'. A second item assessing perceived behavioral control regarding eating a healthy diet was 'For me, regularly eating a healthy diet would be....' with responses recorded on a 5-point Likert scale with one endpoint labeled 'Very Difficult' and the other endpoint labeled 'Very Easy'. Perceived behavioral control for each of the remaining five health behaviors was assessed using similar procedures.

Subjective norm. Based upon general recommendations by TPB developers (Ajzen, 2002), subjective norm regarding regularly spending quality time with family/friends was assessed by the item 'Most of the people who are important to me would recommend that I regularly spend 'quality time' with friends and loved ones'. Responses were recorded on a 5-point Likert scale with one endpoint labeled 'strongly disagree' and the other endpoint labeled 'strongly agree'. Subjective norms for each of the remaining five health behaviors were assessed using similar items.

Data preparation and analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences, Release 11.5. The criterion for statistical significance for all analyses was set at $p \leq 0.05$ unless otherwise indicated.

Similar to prior research (e.g. Conner *et al.*, 2002; Sheeran *et al.*, 2001), a composite behavior intention score was created for each of the six health behaviors by calculating the mean of the two behavior intention items for each health behavior (range 1–5). An identical approach was

used to create separate composite behavior attitude and perceived behavioral control scores for each health behavior. Higher composite scores reflect stronger intentions to engage in a health behavior in the future, more positive attitudes toward a health behavior, and stronger perceptions of behavioral control regarding a health behavior, respectively. Coefficient alphas for each of the three composite indices for each of the six health behaviors examined are shown in Table 3. All coefficient alphas exceeded 0.67.

To test our hypotheses regarding the ability of the TPB to account for intentions to engage in physical and psychosocial health behaviors following cancer diagnosis, a set of six hierarchical multiple regression analyses were performed. A separate regression analysis was conducted for each of the six health behaviors. The dependent variable in the regression analysis was the composite behavior intention score for that specific health behavior. In all six regression analyses, an identical set of 10 predictor variables was used. A set of 7 demographic and clinical variables was first entered into each regression analysis. Demographic variables included age, gender, years of education, minority status (caucasian vs non-caucasian), and marital status (current partner vs no current partner). Clinical variables included disease stage at cancer diagnosis (local, regional, distant) and time since diagnosis. At the second step in the regression analysis, the three TPB variables for that health behavior were entered (subjective norm, composite perceived behavioral control, composite behavior attitude). Respondents included in the regression analysis for each of the six health behaviors consisted only of those respondents who indicated they were *not* currently regularly engaging in that specific health behavior as well as those who acknowledged that they were currently regularly engaging in that health behavior, but had only begun doing so within the past 6 months. Thus the sample size for the six regression analyses ranged from 28 (spending quality time with friends/family) to 90 participants (engaging in charitable activities) (see Table 2). Prior research indicates mean R^2 values for predicting behavior intentions from the TPB constructs of attitude, perceived norm and perceived behavioral control are in the 0.40 to 0.50 range (Sutton, 1998). This translates into a 'large' effect size using Cohen's (1992) criteria. Using a large effect size (i.e. $f^2 = 0.35$) in Green's (1991) formula for determining an adequate sample size

Table 1. Comparison of completers and non-completers of the entire survey with regard to demographic and clinical variables

Variable	Completers (<i>n</i> = 307)			Non-completers (<i>n</i> = 169)			<i>p</i> -value ^a
	Mean	S.D.	%	Mean	S.D.	%	
Age (years)	50.4	12.4	—	50.9	14.0	—	0.68
Education (years)	15.6	3.3	—	15.1	3.6	—	0.49
Time since Dx (years)	4.3	5.2	—	4.7	5.2	—	0.12
% Female	—	—	84	—	—	83	0.79
% Caucasian	—	—	93	—	—	92	0.85
% Married/partnered	—	—	74	—	—	66	0.07
Disease stage at Dx							<0.001
% Local	—	—	40	—	—	36	
% Regional	—	—	49	—	—	24	
% Distant	—	—	11	—	—	40	

^a*p*-value for *t*-test of difference between independent means for continuous variables; *p*-value for chi-square test for categorical variables.

Table 2. Current and recent performance of physical and psychosocial health behaviors

Behavior	Current, regular performance?		Duration of performance <6 months? ^a		No current performance or performance <6 months	
	# Yes (%) ^b	# No	# Yes (%) ^c	# No	#	(%) ^b
Eating a healthy diet	80 (62)	49	9 (11)	71	58	(45)
Physical exercise	66 (63)	63	19 (29)	47	82	(64)
Reflecting on life priorities	113 (87)	17	23 (20)	90	40	(31)
Quality time W/family and friends	108 (83)	22	6 (6)	102	28	(22)
Charitable or volunteer activities	46 (35)	84	6 (13)	40	90	(69)
Religious or spiritual activities	73 (57)	56	4 (6)	69	60	(47)

^aQuestion asked only of respondents acknowledging current, regular performance of that health behavior.

^bPercentage of total number of respondents for that question (i.e. either 129 or 130).

^cPercentage of those answering 'yes' to current, regular performance of that behavior.

for multiple regression analysis with 10 independent variables, a sample size ≥ 32 is considered adequate. Because of significant negative skew in the four TPB-related variables (behavior intention and attitude, perceived norm and behavioral control), these variables underwent a square root transformation prior to use in the regression analyses.

RESULTS

The study website received 1184 visits during the 241 days the study was available on-line. Of these visitors, 478 completed all (*n* = 309) or some portion (*n* = 169) of the survey. (While no reasons for the failure to complete the entire survey were solicited from participants, the pattern of incomplete surveys suggested some participants com-

pleted the first few questionnaires and then simply stopped and left the study web site.) As local Institutional Review Board (IRB) approval limited study participation to adults, two respondents who had completed the survey but were <18 years of age were excluded from all analyses per IRB mandate. No differences were found between the remaining study participants with complete (*n* = 307) versus incomplete (*n* = 169) survey responses on demographic or clinical variables except stage of diagnosis (see Table 1). Respondents with local and regional disease were more likely to complete the entire survey than respondents with distant disease ($\chi^2 = 57.2$, $p < 0.001$).

Of the 307 adult respondents with complete survey data, the 130 respondents <2 years post-cancer diagnosis were included in the final study sample. This was done to produce a final study

sample comprising individuals for whom the experience of cancer diagnosis and treatment was relatively recent. Thus, consistent with the view of cancer diagnosis as a 'teachable moment,' their cancer diagnosis was more likely to be a relatively salient factor affecting their recent and current attitudes, intentions, and behavior. The final study sample ($n = 130$) was primarily female (81%), married or partnered (76%), and Caucasian (93%). Participants reported a mean age of 48.4 years (S.D. = 11.8; range = 20–85) and a mean of 15.4 years of education (S.D. = 3.1; range = 6–26).

A range of primary diagnoses was reported including lung (31% of final sample), breast (24%), thyroid (12%), colorectal (7%), lymphoma (6%), ovarian (5%), prostate (3%), melanoma (3%), and 9% a variety of other diagnoses (e.g. uterine, stomach, bladder). Most patients had been diagnosed with local (40%) or regional (48%) disease. Mean time since diagnosis was 1.1 years (S.D. = 0.5; range = 1 month–2 years). Seventy-seven percent had undergone surgery for treatment of their cancer, 16% percent had received RT, 29% had received CT, and 35% had received both RT and CT.

Current performance of physical and psychosocial health behaviors

The proportion of respondents currently, regularly engaging in each of the six health behaviors ranged from 35% (engaging in charitable or volunteer activities) to 87% (reflecting upon life priorities) of the entire sample (see Table 2). The proportion of respondents in the final study sample *not* reporting current, regular performance of a behavior *or* engaging in that behavior for less than 6 months ranged from 22% (spending quality time with family/friends) to 69% (engaging in charitable or volunteer activities). Table 3 displays means and standard deviations (S.D.) for the four TPB-related constructs (behavior intention and attitude, perceived norm and behavioral control) for the six health behaviors for those respondents not currently performing a specific behavior or reporting performance of that behavior for less than 6 months.

Factors associated with intentions to engage in physical and psychosocial health behaviors

For each of the six health behaviors examined, the amount of variance in behavioral intentions

Table 3. Mean, standard deviation, and range for behavioral intention and TPB variables

Variable	Mean	S.D.	alpha
Eating a healthy diet ($n = 58$)			
Subjective norm	4.3	1.0	—
Perceived behavioral control	3.5	1.0	0.67
Attitude	4.0	1.0	0.73
Intention	3.7	1.1	0.98
Engaging in physical exercise ($n = 82$)			
Subjective norm	4.1	1.1	—
Perceived behavioral control	3.3	1.2	0.82
Attitude	3.9	1.0	0.83
Intention	3.6	1.3	0.92
Reflecting on life priorities ($n = 40$)			
Subjective norm	3.8	1.1	—
Perceived behavioral control	4.0	0.9	0.83
Attitude	4.0	1.0	0.90
Intention	3.8	1.0	0.98
Spending quality time W/family, friends ($n = 28$)			
Subjective norm	4.2	1.1	—
Perceived behavioral control	3.1	1.0	0.75
Attitude	3.9	1.1	0.83
Intention	3.3	1.1	0.97
Engaging in charity and volunteer activities ($n = 90$)			
Subjective norm	2.9	1.2	—
Perceived behavioral control	3.1	1.2	0.89
Attitude	3.8	1.1	0.94
Intention	2.5	1.3	0.96
Engaging in religious and spiritual activities ($n = 60$)			
Subjective Norm	2.8	1.3	—
Perceived behavioral control	3.1	1.1	0.86
Attitude	3.1	1.3	0.97
Intention	2.5	1.3	0.99

Note: All values based on subgroup of respondents reporting they do not currently engage in a specific health behavior or, if currently engaged, have only been doing so for <6 months.

accounted for by the set of seven demographic and clinical variables ranged from 14.4% (eating a healthy diet) to 39.8% (spending quality time with family/friends) (see Tables 4 and 5). Across the six health behaviors, the mean proportion of variance in behavioral intentions accounted for by this set of clinical and demographic variables was 22.9%. The proportion of variance in behavioral intentions accounted for by the set of clinical and demographic variables was statistically significant (i.e. $p \leq 0.05$) for only two of the six health behaviors (physical exercise, charity and volunteer activities). Few specific demographic and clinical variables emerged as significant individual

Table 4. Hierarchal regression analyses of behavior intentions for physical health behaviors

	Physical exercise (<i>n</i> = 82)			Eating a health diet (<i>n</i> = 58)		
	ΔR^2	β^a	sr ^{2b}	ΔR^2	β^a	sr ^{2b}
Block 1	0.220*			0.144		
Age		0.03	0.001		0.11	0.008
Years of education		-0.28***	0.064		-0.10	0.008
Gender ^c		-0.03	0.001		-0.01	0.000
Race ^d		-0.04	0.001		-0.09	0.007
Partner status ^e		-0.03	0.001		-0.12	0.010
Disease stage at Dx ^f		-0.06	0.004		-0.21	0.036
Time since Dx (years)		0.04	0.002		0.09	0.007
Block 2	0.421***			0.241***		
Subjective norm		0.16*	0.021		0.14	0.011
Attitude		0.54***	0.198		0.45**	0.108
Behavior control		0.19*	0.021		0.06	0.002
Full model statistics						
Multiple <i>R</i>	0.801			0.621		
Multiple <i>R</i> ²	0.641			0.385		
<i>F</i>	11.44***g			2.70* ^h		

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

^aStandardized regression coefficients in full model.

^bSquared semi-partial correlation coefficient.

^cCoded as female (0), male (1).

^dCoded as caucasian (0), non-caucasian (1).

^eCoded as non-partnered (0), partnered (1).

^fCoded as local (1), regional (2), distant (3).

^gdf = 10, 71.

^hdf = 10, 47.

predictors of behavioral intentions. Less education was significantly associated with greater intentions to engage in physical exercise ($p < 0.001$), while greater intentions to engage in charitable and volunteer activities were associated with older age ($p < 0.05$) and caucasian race ($p < 0.01$).

In contrast, for each of the six health behaviors examined, the set of three TPB-related variables accounted for a significant increment in variance accounted for in behavioral intentions (all p 's < 0.01). The increment in variance accounted for ranged from 24.1% (eating a healthy diet) to 44.1% (reflecting on life priorities). Across the six health behaviors, the mean increment in the proportion of variance in behavioral intentions accounted for by the set of TPB-related variables was 36.9%. With regard to specific TPB-related variables, a more positive subjective norm was associated with stronger intentions to engage in physical exercise ($\beta = 0.16$; $p < 0.05$) and charitable and volunteer activities ($\beta = 0.38$; $p < 0.001$). Similarly, more positive behavior attitudes were associated with stronger intentions to engage in

physical exercise ($\beta = 0.54$; $p < 0.001$), eat a healthy diet ($\beta = 0.45$; $p < 0.001$), reflect on life priorities ($\beta = 0.60$; $p < 0.05$), spend quality time with family and friends ($\beta = 0.59$; $p < 0.01$) and engage in spiritual and religious activities ($\beta = 0.31$; $p < 0.05$). Finally, stronger perceptions of behavioral control were associated with stronger intentions to engage in physical exercise ($\beta = 0.19$; $p < 0.05$) and charitable and volunteer activities ($\beta = 0.32$; $p < 0.01$), and spend time in spiritual and religious activities ($\beta = 0.46$; $p < 0.01$). Additionally, there was a trend ($\beta = 0.33$; $p < 0.10$) for stronger perceptions of behavioral control to be associated with stronger intentions to spend time reflecting on life priorities.

DISCUSSION

Results provided strong support for our general thesis that the TPB-related constructs of behavior attitude, perceived social norm and perceived

Table 5. Hierarchical regression analyses of behavior intentions for psychosocial health behaviors

	Reflecting on life priorities (<i>n</i> = 40)			Charitable and volunteer activities (<i>n</i> = 90)			Spending quality time W/family and friends (<i>n</i> = 28)			Religious or spiritual activities (<i>n</i> = 60)		
	ΔR^2	β^a	sr ^{2b}	ΔR^2	β^a	sr ^{2b}	ΔR^2	β^a	sr ^{2b}	ΔR^2	β^a	sr ^{2b}
Block 1	0.170			0.201*			0.398			0.245 [†]		
Age		-0.03	0.001		0.22*	0.040		0.07	0.002		0.04	0.001
Years of education		-0.09	0.004		-0.04	0.001		0.09	0.002		0.13	0.013
Gender ^c		0.12	0.009		0.11	0.011		-0.14	0.014		0.03	0.001
Race ^d		-0.17	0.018		-0.29**	0.069		-0.15	0.008		-0.19 [†]	0.026
Partner status ^e		0.10	0.006		-0.03	0.001		0.26	0.027		-0.06	0.003
Disease stage at Dx ^f		-0.12	0.011		-0.03	0.001		-0.18	0.016		-0.01	0.000
Time since Dx (years)		0.11	0.011		-0.03	0.001		0.26	0.050		-0.05	0.002
Block 2	0.441***			0.364***			0.362**			0.389***		
Subjective norm		-0.11	0.007		0.38**	0.070		-0.05	0.001		-0.01	0.000
Attitude		0.60*	0.113		0.07	0.002		0.33 [†]	0.060		0.46**	0.088
Behavioral control		0.23	0.020		0.32**	0.072						
Full model statistics												
Multiple <i>R</i>	0.781			0.752			0.872			0.796		
Multiple <i>R</i> ²	0.610			0.565			0.760			0.633		
<i>F</i>	3.91**g			7.79***h			4.43**i			7.25***j		

^aStandardized regression coefficients in full model.

^bSquared semi-partial correlation coefficient.

^cCoded as female (0), male (1).

^dCoded as caucasian (0), non-caucasian (1).

^eCoded as non-partnered (0), partnered (1).

^fCoded as local (1), regional (2), distant (3).

^gdf = 10, 29.

^hdf = 10, 79.

ⁱdf = 10, 17.

^jdf = 10, 49.

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$; [†] $p \leq 0.10$.

behavioral control would be positively associated with intentions to engage in a variety of physical and psychosocial behaviors generally associated with positive physical and mental health outcomes. For each of the six health behaviors examined, the increment in variance in behavioral intentions accounted for by the set of three TPB variables was both statistically significant and substantial, ranging from 24% to 44% (see Tables 4 and 5). For five of the six behaviors examined (spending quality time with family/friends the lone exception) the increment in variance in behavioral intentions accounted for exceeded, often consider-

ably, the variance accounted for by the set of seven demographic and clinical variables.

Results of this study also provided support for our specific hypotheses regarding the relationship between specific TPB variables and intentions to engage in the six physical and psychosocial health behaviors examined. Behavior attitude was a significant predictor of intentions to engage in five of the six behaviors examined. The corresponding squared semi-partial correlation coefficient for these five behaviors, an index of the proportion of variance in behavior intentions uniquely associated with the behavior attitude variable, ranged

from 3.4% (engaging in religious or spiritual activities) to 19.8% (physical exercise) with a mean of 12.5%. Perceived behavioral control was a significant predictor of intentions to engage in three of the six behaviors examined. The proportion of variance in behavioral intentions uniquely accounted for by behavioral control beliefs for these three behaviors ranged from 2.1% (physical exercise) to 8.8% (engaging in religious or spiritual activities) with a mean of 6.0%. Finally, subjective norm was a significant predictor of intentions to engage in two of the six behaviors examined. The proportion of variance in behavioral intentions uniquely accounted for by subjective norm was 2.1% for physical exercise and 7.0% for engaging in charitable and volunteer activities (mean of 4.6%).

These findings are remarkably consistent with prior research using the TPB. In a recent meta-analysis, Armitage and Conner (2001) concluded the three TPB variables used here accounted for about 39% of the variance in behavioral intentions across a variety of health behaviors. The amount of variance in behavioral intentions accounted for by our set of TPB-related constructs ranged from 24% to 44% across our six health behaviors, with a mean of 37%. Thus, the explanatory power of the TPB variables in this study is in the same range as that found in most TPB research. Furthermore, of the three individual TPB variables examined, subjective social norm appeared to be least associated with behavioral intentions. This is also consistent with the conclusion drawn in the Armitage and Conner (2001) meta-analysis.

In general, our data confirm the utility of the TPB for understanding intentions to engage in 'classic' health behaviors, here specifically, eating a healthy diet and engaging in regular physical exercise, linked to physical health status (Blue, 1995; Connors and Sparks, 1996; Godin and Kok, 1996). Additionally, and perhaps more importantly, the data extend prior research by suggesting the utility of the TPB for understanding intentions to engage in a variety of positive psychosocial health behaviors potentially linked to positive mental health outcomes in cancer patients and survivors. While we focused on intentions to engage in four specific positive psychosocial behaviors often reported after cancer diagnosis and treatment (Stanton *et al.*, in press), we see no reason to expect our results would not generalize reasonably well to other positive psychosocial behaviors that might be triggered by a cancer diagnosis. Obviously, however, that is an empirical

question that remains to be addressed by future research.

While the TPB appears to have potential as a useful framework for understanding behavioral responses to cancer diagnosis and treatment, it must be recognized that behavior attitudes, perceived social norms, and perceived behavioral control are not the sole determinants of cancer patients' and survivors' intentions (and presumably subsequent performance) regarding the set of health behaviors examined here. Clearly other psychological (e.g. dispositional optimism) or social (e.g. social support) variables exert an impact and should be considered for inclusion in building a broader, more comprehensive model for understanding initiation and maintenance of positive health behaviors in cancer patients and survivors. It must also be recognized that attitudes, norms, and perceived behavioral control are likely not equal contributors to intentions and performance associated with health behaviors in cancer patients and survivors. One of the central tenets of the TPB is that the relative influence of these three variables varies across behaviors and situations (Ajzen, 1991). Consequently, research examining the cognitive, behavioral, and affective mechanisms underlying positive behavior change, benefit-finding, and growth after cancer diagnosis should consider viewing these outcomes as fundamentally grounded in specific behaviors. In doing so, the ability of well-known models of behavior change and maintenance, such as the TPB, to expand understanding of the forces that instigate and maintain these positive outcomes may become apparent.

Extension and application of the TPB to understanding both physical and psychosocial health behavior following cancer diagnosis and treatment has more than just potential theoretical significance. The TPB has been used to inform the development and implementation of interventions to increase performance of appropriate physical health behaviors in both cancer and non-cancer settings (Hardeman *et al.*, 2002). At first glance, there appears to be little reason to believe the TPB might not also be profitably used in the oncology setting to guide the development and implementation of interventions to increase performance of psychosocial health behaviors associated with enhanced mental health outcomes. While the potential for benefit-finding and growth following cancer diagnosis and treatment has been recognized for some time, the question of whether and

how such outcomes might be intentionally facilitated has proven elusive to answer. Recognition and acceptance of the basic premise that often nebulous and vaguely described positive mental health outcomes such as 'benefit-finding' and 'growth' are fundamentally the result of specific changes in behavior could play a key role in developing answers to this important clinical question. Acceptance of this basic premise would suggest several clearly defined and innovative avenues for clinical intervention using the TPB. Specifically, the TPB would suggest that one route to enhancing 'growth' in cancer patients and survivors would entail focusing upon specific positive psychosocial behaviors and strengthening potentially modifiable attitudes, subjective norms, and perceptions of behavioral control associated with these psychosocial behaviors.

While we believe our results are innovative and, hopefully, provocative, several study weaknesses should be acknowledged. First, while the ultimate goal of our research is to enhance understanding of factors that might account for the initiation and maintenance of a set of positive physical and psychosocial health behaviors after a cancer diagnosis, we never measured the subsequent performance of these behaviors. Rather, our primary study endpoints were intentions to engage in a particular set of behaviors. While prior research with the TPB has demonstrated that intentions are typically fairly strong proximal indicators of subsequent health behavior (Godin and Kok, 1996), intentions are not perfect indicators of subsequent behavior. Clearly, future research should prospectively examine the utility of the TPB for understanding both behavior intentions and subsequent behavior performance in cancer patients and survivors. Second, the generalizability of our findings to the universe of cancer patients and survivors might be questioned. Our use of an internet-based platform for recruitment of study participants raises questions regarding the representativeness of our sample (Duffy, 2002). As internet access is not uniformly distributed across the general population, it is not likely to be uniformly distributed across the entire population of cancer patients and survivors. Consequently our sample is not 'population-based'. Furthermore, our sample was primarily female and Caucasian, limiting our ability to generalize our findings to males and minority individuals. Replication of our findings in more traditionally recruited, broader-based samples of cancer

patients and survivors would be wise. Third, our analyses were based on a sample of patients and survivors heterogeneous with regard to cancer diagnosis. Due to the relatively small size of our study sample we were unable to analyze our data for specific diagnostic subgroups. While the prevalence of positive physical and psychosocial behavior change might vary across specific cancer diagnoses, we see no reason to believe the relevance of the TPB for understanding the behavior change that does occur would vary substantially as a function of cancer diagnosis. However, future research should examine the robustness of our findings in groups of patients and survivors sharing a specific cancer diagnosis. Finally, the number of study participants included in our primary regression analyses varied from a minimum of 28 to a maximum of 90. This was due to the need to include in the analyses for a specific health behavior only participants who were not already engaged in that behavior on a consistent basis (i.e. those not already engaging in that behavior, or had only recently initiated that behavior). Consequently, the sample size for some of our regression analyses were near the lower bound for acceptability given the anticipated effect size for the TPB variables and the number of independent variables included in the regression analyses (Green, 1991). As a result, we recommend the results of our analyses be viewed with some caution and, in general, our analyses merit replication in a larger sample.

In conclusion, acceptance of the basic premise that positive mental health outcomes reported by cancer patients and survivors, such as 'benefit-finding' and 'growth', are fundamentally based upon changes in specific psychosocial behaviors suggests several new paths for future research. Specifically, acceptance of this premise would suggest application of existing models of health behavior maintenance and change could lead to theoretical and clinical advances in understanding and enhancing these positive mental health outcomes in cancer patients and survivors. The present study examined the utility of one of these models, the TPB, for understanding intentions to engage in a set of physical and psychosocial health behaviors following cancer diagnosis. While our results are promising, our intent is not to suggest that the TPB is the best theoretical model for understanding positive physical and psychosocial health behaviors in cancer patients and survivors. Rather, our intention was to demonstrate for the

first time that an existing, well-known theoretical model used primarily to understand performance of physical health behaviors has the potential to understand intentions and performance associated with psychosocial health behaviors as well. Having established the potential value of the TPB here, future research should similarly examine the relative utility of other well-known models of health behavior, such as the Health Belief (Maiman and Becker, 1974; Rosenstock, 1990) or Transtheoretical Models (Prochaska *et al.*, 1998), for understanding and ultimately increasing positive physical and psychosocial health behaviors in cancer patients and survivors.

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