What Explains the Intention to be Physically Active in Cancer Patients? - Different Determinants for Active and Insufficiently Active Patients

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PHYSICALLY ACTIVE VERSUS INACTIVE CANCER PATIENTS

What Explains the Intention to be Physically Active in Cancer Patients? – Different Determinants for Active and Insufficiently Active Patients

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Abstract

In a qualitative elicitation study with 61 cancer patients a broad range of attitudes toward physical activity could be obtained, especially negative attitudes among insufficiently active patients. Based on these results, a second quantitative study was conducted; 64 patients patients (40 men; 42\% insufficiently active (<150 minutes/week)) completed a Theory of Planned Behavior (TPB) questionnaire. Regression analyses revealed that different variables of the TPB are relevant for explaining the intention to exercise for physically active (subjective norm) and insufficiently active (attitudes) cancer patients. Health professionals should adapt their support to the special needs of insufficiently active and active cancer patients.

Keywords: Theory of Planned Behavior, physical activity, oncology, attitude, stage theory
Introduction

Based on recent findings (see e.g. the review by Speck, Courneya, Mâsse, Duval, & Schmitz, 2010), it is recommended for cancer patients to be regularly physically active. The official recommendation is to exercise 150 minutes a week with at least moderate intensity (Schmitz et al., 2010). This recommendation is based on studies showing that an active lifestyle helps, for example, to improve the quality of life, to increase physical functioning, to reduce fatigue, anxiety, depression and stress, and furthermore, to mitigate several side-effects of cancer treatment (compare for example Courneya & Friedenreich, 2011; Fitzpatrick & Farone, 2011; Jones & Alfano, 2012).

Nevertheless, most cancer survivors are not sufficiently physically active (Bellizzi, Rowland, Jeffery, & McNeel, 2005; Blanchard, Courneya, & Stein, 2008; Coups & Ostroff, 2005) and face different kind of barriers (Brawley, Culos-Reed, Angove, & Hoffman-Goetz, 2002). To explain and predict the reasons, why the majority of patients are physically inactive while others manage to be active the Theory of Planned Behavior (TPB) (Ajzen, 1991) has been widely applied (see Pinto & Ciccolo, 2011). The TPB states that attitude (positive or negative evaluation of performing a behavior; consisting of an instrumental and an affective component (Crites, Fabrigar, & Petty, 1994)), subjective norm (perceived influence whether important others believe one should perform a behavior), and perceived behavioral control (evaluation if they can control the behavior, similar to self-efficacy) predict behavioral intention. Intention captures the motivational factors and is seen as the most proximal determinant of actual behavior. Meta-analyses show that about 30 percent of behavior can be explained by intention (Armitage & Conner, 2001; Downs & Hausenblas, 2005b; Godin & Kok, 1996).
Looking at the results of previous studies using the TPB in cancer populations, it is remarkable that even insufficiently active patients stated very positive attitudes toward physical activity. Lowe, Watanabe, Baracos and Courneya (2012), Speed-Andrews et al. (2012) and Bélanger, Plotnikoff, Clark and Courneya (2012) observed average scores for instrumental attitudes of $M = 6.2 \ (SD = 0.6)$, $M = 5.9 \ (SD = 1.0)$ and $M = 6.1 \ (SD = 0.9)$ on a scale from 1 to 7 among insufficiently active patients (less than 60 or 150 minutes physical activity per week). Similarly, Peddle et al. (2009) reported high instrumental ($M = 6.5$, $SD = 0.4$) and affective ($M = 5.7$, $SD = 0.8$) attitudes for cancer patients with a low adherence to an exercise intervention.

Most TPB studies in the field of physical activity and cancer (e.g. Hunt-Shanks et al., 2006; Jones et al., 2007; Karvinen et al., 2007; Speed-Andrews et al., 2012) measured attitudes with the same five to seven point semantic differentials based on items used by Courneya and Friedenreich (1999). These items cover relevant potential positive and negative attitudes toward physical activity. Nevertheless, this type of assessment with a balanced list of positive / negative item-pairs, might lead to answers which are affected by social desirability tendencies or the tendency to give “balanced” responses. Zimmermann and Sieverding (2011) showed for another health-related behavior (alcohol consumption) that a semantic differential, which included a balanced list of positive and negative items, produced a tendency to the mean in the responses of young adults. In contrast, free associations regarding the same behavior appeared to be less prone to mean tendencies and therefore, might be more appropriate to reflect the full spectrum of attitudes, including negative ones.

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1 The items were: useless–useful, harmful–beneficial, wise–foolish, bad–good (instrumental) and unenjoyable–enjoyable, boring–interesting, unpleasant–pleasant (affective).
Although there is evidence that TPB variables can explain around 25 to 70 percent of the variance in intentions to exercise regularly in different cancer populations (e.g. Jones et al., 2007; Karvinen et al., 2009; Keats, Culos-Reed, Courneya, & McBride, 2007; Stevinson et al., 2009), the different studies found different variables of the TPB to be important determinants of intention. Results regarding the role of attitudes toward physical activity were heterogeneous (Courneya, Blanchard, & Laing, 2001; Jones et al., 2007; Karvinen et al., 2009; Trinh, Plotnikoff, Rhodes, North, & Courneya, 2012). Similarly, the TPB construct of subjective norm emerged in some studies as a significant determinant of intention (e.g. Hunt-Shanks et al., 2006; Peddle et al., 2009), whereas in other studies, it did not have any importance (e.g. Karvinen et al., 2007; Stevinson et al., 2009).

One factor explaining these heterogeneous results may be that there are different determinants important for active patients who already meet the physical activity guidelines than for those who do not. This approach is based on stage theories (e.g. the Transtheoretical Model, Prochaska & DiClemente, 1983), which assume that for each stage, a different set of predictors is influential. Lippke, Nigg and Maddock (2007) tested this assumption empirically regarding the physical activity of healthy adults. They showed that different variables of the TPB are relevant in predicting intention at different stages of the Transtheoretical Model. Other studies in the field of physical activity and cancer have – to our knowledge - only examined the determinants of intention, independently of the level of physical activity. The distinction of subgroups (meeting the physical activity guidelines or not) is also relevant in practice as these two groups may require different kinds of support, either to maintain or to enhance a physically active lifestyle.
Our study compares physically active and insufficiently active cancer patients within the framework of the TPB first qualitatively (study 1) and second quantitatively (study 2).

**Study 1**

The goal of study 1 was to examine cancer patients’ attitudes toward the recommendation to be physically active using a qualitative approach. Concretely, we wanted to investigate what participants associate with the physical activity recommendation to exercise 150 minutes per week, when they express their thoughts freely. This study aimed to elicit the full range of modally salient beliefs (the antecedents of attitudes in the TPB framework) toward physical activity in cancer patients by using free associations. According to a prior study (Zimmermann & Sieverding, 2011), we assumed that this kind of open format assessment method would help, especially with insufficiently active patients, to also report their negative attitudes.

**Method**

The qualitative study 1 was conducted with 61 patients described in Table 1. Patients of any cancer entity and any out-patient therapy regime, who were above 18 years and where able to follow the study instructions were eligible to participate in the study. Any patients with inpatient treatment, mental retardation or severe physical restrictions that completely impeded physical activity (i.e. no ability to walk or stand) were excluded from the study.

This study followed the guidelines by Francis et al. (2004) to construct a questionnaire based on the TPB. Francis argues that a qualitative elicitation study is necessary before constructing a TPB questionnaire to assess the underlying modally salient beliefs. Study 1 followed the recommendations for the qualitative elicitation study with regard to wording of the questions, collecting and analyzing the data (see Francis page 25ff.).
The primary author of this manuscript administered a semi-structured 15-20 minute interview with each participant which consisted of five questions (assessing attitudes, barriers, barrier management, perceived benefits and perceived costs). In this paper, only the first question regarding attitudes is examined. At the start of the interview, the recommendation regarding physical activity for cancer patients (150 minutes of at least moderate physical activity per week, see Schmitz et al., 2010) was described to the patients, and they were then asked if they had fulfilled this recommendation during the past week. Then, patients were asked to imagine exercising 150 minutes per week and to give free associations how this is/would be for them. As the aim was to elicit the full spectrum of attitudes, especially negative ones, we wanted to examine if we reached our aim and established the following categories: “positive” (e.g. beneficial, enjoyable), “neutral” (e.g. normal, realistic) and “negative” (e.g. painful, time-consuming). Two raters classified the responses independently and the consensus-rate was high (87%). The 13%, which were rated inconsistently, were classified by a third rater and a consensus was achieved.

Results

About half of the patients \(N = 34, 56\%\) responded that they fulfilled the exercise recommendation during the last week. Patients spontaneously named between 1 and 7 associations (on average: 3.3 associations); overall, the patients named a total of 203 associations. Generally, the interviewed patients had positive attitudes toward physical activity. 51% of the 203 associations were classified as positive, 23% as neutral and the remaining 26% as negative. Comparing active patients who already met the guidelines with insufficiently active patients using Chi-squared tests revealed significant differences: Active people mentioned 68%
positive associations and only 10% negative ones, whereas insufficiently active patients came up with only 33% positive and 43% negative attitudes ($\chi^2(2) = 32.76, p < .001$), see Figure 1.

Evaluating the positive responses of the whole sample, 34% of the patients stated that exercising 150 minutes per week would be beneficial for them, 21% said it would be useful, and 15% said they would really enjoy it. Further positive associations were “you can achieve an aim, feeling competent”, “it is just necessary, I could not live without it”, “it is distractive”. For example, a woman said “When I exercise I always feel unburdened and free. My mind gets fresh and clear and I don’t think of my disease all the time”.

Regarding the negative associations, 23% reported exercising makes them tired and is exhausting, 16% said it would not be feasible, for 12% it is too much, 8% stated it would be painful and for 5%, it would be very time-consuming. For example, one woman said “150 minutes a week? That is way too much. That is not feasible for me, I am happy when I can get out of my bed” (all translated from German language).

As study 1 also served as an elicitation study for the TPB questionnaire in study 2, the 17 most frequently mentioned (at least 3 times) associations were collected. Of these, 6 were negative (exhausting, not feasible, too much, painful, time-consuming, laborious), 2 were neutral (normal, realistic), and 9 were positive (good, beneficial, enjoyable, useful, great, desirable, healthy, helpful, pleasant).

**Discussion**

The main goal of study 1 was to elicit the full range of attitudes toward physical activity in cancer patients by using free associations. Using the open format in study 1 did indeed elicit
negative attitudes toward physical activity in addition to the positive ones; this was true especially for insufficiently active cancer patients.

In most other studies (e.g. Hunt-Shanks et al., 2006; Jones et al., 2007; Karvinen et al., 2007; Speed-Andrews et al., 2012), attitudes were measured with the same five to seven semantic differentials based on items used by Courneya & Friedenreich (1999). Our elicitation study elaborated 17 behavioral beliefs. Five of these 17 behavioral beliefs replicate the five to seven “standard” items by Courneya and Friedenreich (1999): good, beneficial, enjoyable, useful, and pleasant. Beyond that, more negative modally salient beliefs were collected and were included in study 2. Thus, through this elicitation study, 17 attitude items were obtained for study 2, of which almost two thirds are non-standard behavioral beliefs which enrich the spectrum of attitudes.

Study 2

Study 2 compared active and insufficiently active cancer patients regarding the variables of the TPB toward the recommendation to exercise 150 minutes per week. So far, three studies have categorized cancer patients regarding their physical activity level (e.g. meeting the guidelines or not) and found higher mean levels in TPB variables for active patients (Bélanger et al., 2012; Lowe et al., 2012; Speed-Andrews et al., 2012). To our knowledge, to date, no study has investigated if the determinants of intention differ in their strength for reportedly active and insufficiently active patients. It was hypothesized that physically active patients would score higher on all variables of the TPB than insufficiently active cancer patients when comparing the means. Beyond that it was expected that different variables of the TPB would be relevant to explain the intention to exercise in the two groups, as assumed in stage theories.
Method

The cross-sectional survey was conducted at XXX. Cancer patients of different entities and different outpatient therapy regimes were recruited. Inclusion and exclusion criteria were the same as in study 1. Sixty-four persons participated in this study and are described in Table 1. The primary author of this manuscript systematically approached patients in the waiting areas or while receiving treatment (e.g. chemotherapy). The participation was voluntary, but about 90% of the patients who were contacted took part. Participants were informed about the study, gave their informed consent and were asked to complete a two-page questionnaire assessing the variables of the TPB relating to the recommendation to exercise 150 minutes per week. The study personnel gave oral instructions about the questionnaire at the beginning and were available for questions throughout.

Measures. The two-page questionnaire was prepared in German. Variables of the TPB were assessed in accordance with guidelines by Ajzen (2002) and Francis et al. (2004).

Behavioral intention was measured by two items (see Sieverding, Matterne, & Ciccarello, 2010): “Think of the next 4 weeks, please. Do you intend to exercise regularly for 150 minutes a week?” (7-point-Likert scale with the endpoints “no, under no circumstances and “yes, at any rate”) and “How likely is it (in percent from 0 to 100%) that you will exercise regularly for 150 minutes per week within the next 4 weeks?”. We calculated a composite score (possible values from 1 to 7) by using the following formula: [(item 1-1)+(item 2*6/100)/2]+1. The internal consistency for these items was good (Cronbach’s $\alpha = .81$).

Attitude was assessed by responses to the stem, “To be regularly physically active for 150 minutes a week would be…” on 17 semantic differentials (7-point scales) (e.g. beneficial – not
beneficial, unrealistic – realistic) which were elicited in study 1. In line with the approach by Francis et al. (2004) the modally salient behavioral beliefs revealed in the elicitation study are included in the TPB questionnaire of study 2. Five of these 17 items are similar to the “standard” items used in most other studies applying the TPB in the field of physical activity and cancer (Courneya & Friedenreich, 1999), the other 12 associations are “new” attitudes derived through our elicitation study (see results section of study 1). As a factor analysis (extraction method: principal component, rotation: varimax) did not result in the theoretically assumed distinction between affective and instrumental attitudes, this distinction could not be used in further analyses. Instead, this factor analysis revealed two factors explaining a total of 69.40% of the variance, in which the first factor describes positive attitudes and the second, negative attitudes (similar to the rating of attitudes in study 1). We built two sum scores of all attitude items which were consistently categorized through the factor analysis and the rating of study 1 (as the factor analysis revealed only two factors – the third factor had an eigenvalue below 1 - all items rated as neutral in study 1 were not included). The positive attitude score included the 9 items good, beneficial, enjoyable, useful, great, desirable, healthy, helpful, pleasant (Cronbach’s α = .93) and all items were recoded so that ‘7’ was the positive end-point; the negative attitude score included the 5 items exhausting, not feasible, too much, time-consuming, laborious (Cronbach’s α = .84) and all items were recoded so that 7 was the negative end-point.

Subjective norm was measured by 5 items (Cronbach’s α = .89): “My … (1) partner / (2) family / (3) friends and acquaintances / (4) attending physician / (5) most people I consider important … think(s), I should be regularly physically active for 150 minutes per week.”. A 7-point Likert-scale was used (complete disagreement to complete agreement).
Self-efficacy was assessed with two items (e.g. “It is difficult for me, to be regularly 150 minutes per week physically active” - negatively converted). The items were assessed on 7-point Likert-scales with the endpoints ‘completely disagree’ and ‘completely agree’ (Cronbach’s α = .62).

To measure physical activity, patients were first given a detailed description of the recommendation to exercise 150 minutes per week with at least moderate intensity. Examples were provided (e.g. Nordic Walking for 30 minutes/day on five days a week so that they feel at least “a little bit exhausted”). Afterwards, patients were asked to estimate how many minutes per week they are currently physically active.

The following sociodemographic and illness-related variables were assessed: Age in years, sex, cancer entity, surgery (yes/no, when “yes” when was your last surgery), chemotherapy [chemotherapy completed (when completed); currently undergoing chemotherapy (when did it start); never had any chemotherapy], radiotherapy [radiotherapy completed (when completed); currently undergoing radiotherapy (when did it start); never had any radiotherapy].

**Statistical Analyses.** First descriptive analyses were conducted. T-tests for continuous variables and chi-squared tests for discrete variables were used to detect differences between physically active and insufficiently physically active patients in sociodemographic or illness-related factors.

To test the hypotheses, first a one-way multivariate analysis of variance (MANOVA) with five variables of the TPB (intention, self-efficacy, positive attitudes, negative attitudes and subjective norm) as dependent variables, and the factor “physical activity status” (active versus insufficiently active) as the independent variable was used. Given a significant overall effect,
five one-way analyses of variance (ANOVAs) were conducted to examine univariate main effects. Partial eta squared was used as effect size measure.

Afterwards, regression analyses were conducted separately for active and insufficiently active cancer patients with intention as dependent variable and all variables of the TPB (positive and negative attitude, self-efficacy and subjective norm) as determinants.

As only 2.9% of data was missing for variables of the TPB, we did not use any imputation technique, but calculated the scale means of TPB variables with all existing data. In all analyses, \( p \)-values < .05 were considered statistically significant. IBM SPSS Statistics 20 was used to conduct all analyses.

**Results**

Twenty-seven patients (42%) of the sample were classified as insufficiently physically active (<150 minutes/week, \( M = 78.59 \) minutes/week; range: 0-130 minutes/week; \( SD = 36.78 \)), 36 as physically active (\( M = 287.22 \) minutes/week; range: 150-990 minutes/week; \( SD = 198.25 \)) and one could not be classified because of missing data. Physically active and insufficiently physically active patients did not significantly differ in any of the sociodemographic or illness-related factors (sex, age, cancer entity, time since surgery, chemotherapy-status, radiotherapy-status).

**Mean comparisons for TPB variables.** A significant multivariate main effect for physical activity status (active versus insufficiently active), Pillais’ Trace = .492, \( F (5, 55) = 10.64, p < .001 \), \( \mu^2 = .492 \) was found. Subsequently, all one-way ANOVAS showed a significant main effect for physical activity status, meaning that active cancer patients scored higher on all variables of the TPB: intention to exercise 150 minutes per week in the next four weeks (\( M_{\text{insufficiently active}} = \)
4.70 (SD = 1.82), $M_{\text{active}} = 6.56$ (SD = 0.73), $F(1,59) = 29.33, p < .001, \mu^2 = .332$), self-efficacy ($M_{\text{insufficiently active}} = 3.94$ (SD = 1.53), $M_{\text{active}} = 5.88$ (SD = 1.14), $F(1,59) = 32.00, p < .001, \mu^2 = .352$), positive attitudes toward the exercise recommendation ($M_{\text{insufficiently active}} = 5.50$ (SD = 1.28) , $M_{\text{active}} = 6.15$ (SD = 1.01) , $F(1,59) = 4.93, p = .030, \mu^2 = .077$), negative attitudes toward the exercise recommendation ($M_{\text{insufficiently active}} = 3.96$ (SD = 1.53) , $M_{\text{active}} = 2.39$ (SD = 1.25), $F(1,59) = 19.65, p < .001, \mu^2 = .250$) and subjective norm ($M_{\text{insufficiently active}} = 4.48$ (SD = 1.82) , $M_{\text{active}} = 5.93$ (SD = 1.50), $F(1,59) = 11.65, p = .001, \mu^2 = .165$).

**Determinants of the intention to be physically active in the next four weeks.** Results of the regression analyses are presented in Table 2. As none of the sociodemographic (age, sex) and illness-related variables (chemotherapy, time since surgery) significantly correlated with the dependent variable, and as those variables could only explain little variance of intention ($R^2_{\text{active}} = .01$ and $R^2_{\text{insufficiently active}} = .09$), they were not included in the regression analyses. For active patients, TPB variables explained 32% of the variance of intention, while the explained variance for insufficiently active patients was 58%.

Although the variables of the TPB were important determinants in the analyses for active and insufficiently active cancer patients, the influence of the single constructs of the TPB was very different in the two groups. Regarding physically active patients, their intention to exercise 150 minutes a week regularly could only be significantly explained by their subjective norm ($p = .018$); positive and negative attitudes and self-efficacy were not significant determinants. In contrast, for insufficiently active patients, the only significant determinant for their intention were their positive ($p = .048$) and negative attitudes ($p = .026$), whereas subjective norm and self-efficacy had no significant influence.
Additional Analysis. We wanted to investigate whether the attitudes we obtained in our qualitative study 1 and which were used for the semantic differential in study 2 really mirror a broader spectrum of attitudes. Therefore we compared the attitudes elicited in our study 1 to the standard attitudes in the semantic differential used in most studies (e.g. Courneya & Friedenreich, 1999). All items by Courneya and Friedenreich (1999) that were replicated in our study 1 (good, beneficial, enjoyable, useful, pleasant) were summed into one score (“standard attitudes”) and compared to the other attitudes (“new attitudes”: exhausting, not feasible, too much, painful, time-consuming, laborious, normal, realistic, great, desirable, healthy, helpful). As expected, the new attitudes scored more negatively (had a lower mean) especially among insufficiently active patients ($M_{\text{new}} = 4.79$, $SD = 1.22$, $M_{\text{standard}} = 5.49$, $SD = 1.39$, $t(26) = 4.47$, $p < .001$, $d = .535$). Therefore, while the standard items had a ceiling effect toward the positive end point ($M = 5.49$ on a scale from 1-7), the new attitude items were more equally distributed in the middle of the scale. This result of study 2 together with the results of study 1 support our assumption that the open format in study 1 enabled the detection of additional negative attitudes toward physical activity among insufficiently active cancer patients and thus broadened the spectrum.

General discussion

The main goal of this study was to identify the full range of attitudes toward physical activity among cancer patients including negative ones, and to discover if different determinants explain the intention to be physically active in active and insufficiently active cancer patients. A qualitative study was conducted first (study 1), then physically active and insufficiently active cancer patients were compared quantitatively, regarding variables of the TPB in study 2.
In study 1, patients expressed their free associations toward the recommendation to exercise 150 minutes/week. Through this open format of assessment, a broader spectrum of patients’ attitudes toward physical activity could be gained. As hypothesized, insufficiently active patients mentioned more negative (43%) than positive (33%) associations toward the exercise recommendation, while active patients reported more positive associations (68% positive and 10% negative). This is in contrast to other studies reporting very positive attitudes (mostly with a mean above $M = 5$ or $M = 6$ on a scale from 1 to 7) even for insufficiently active cancer patients (e.g. Lowe et al., 2012; Peddle et al., 2009; Trinh et al., 2012). A study by Zimmermann & Sieverding (2011) compared qualitative and quantitative assessment methods regarding prototypes of alcohol consumption. They reported that open answers have fewer tendencies to the mean than the semantic differential with a balanced list of positive and negative items. Open format answers might be more appropriate to reflect the full range of attitudes, including negative ones, than a semantic differential.

To date, only a few other studies in the field of physical activity and cancer have used elicitation studies to assess the behavioral beliefs which predict attitudes in the TPB framework (Bélanger et al., 2012; Courneya & Friedenreich, 1999; Karvinen et al., 2007; Keats et al., 2007; Peddle et al., 2009; Trinh et al., 2012; Vallance, Lavallee, Culos-Reed, & Trudeau, 2012). This is a good approach, but one needs to be careful that the behavioral beliefs are not biased in a positive direction. For example, Karvinen et al. (2007), Trinh et al. (2012), Bélanger et al. (2012) and Keats et al. (2007) only asked for benefits and advantages (not for disadvantages) of physical activity to assess behavioral beliefs.
Results of study 2 revealed that variables of the TPB differentiated very well between active and insufficiently active cancer patients: active patients scored higher on all variables of the TPB. Analyses revealed a very high overall effects size of $\mu^2 = .49$, with self-efficacy having the largest univariate effect ($\mu^2 = .35$). This result is in accordance with the study of Speed-Andrews et al. (2012), which also found differences in all TPB variables for colorectal cancer patients of four activity levels. The fact that self-efficacy reaches the highest effect size confirms the results of other studies showing the importance of this TPB construct (e.g. Karvinen et al., 2007; Keats et al., 2007; Trinh et al., 2012). It is also worth mentioning that negative attitudes had a much higher effect size ($\mu^2 = .25$) than positive attitudes ($\mu^2 = .08$). Thus, negative attitudes discriminate much better between active and insufficiently active cancer patients than do positive ones. This strengthens the aim of study 1 to elicit the full range of attitudes and to especially include the negative ones.

Furthermore, study 2 compared active and insufficiently active patients in regards to the strength of TPB determinants in explaining intention. As hypothesized, there were different determinants relevant for active and insufficiently active patients in explaining their intention to be physically active. For insufficiently active patients, attitudes might be very important to develop an intention to exercise regularly, with negative attitudes having a stronger effect ($\beta = -.482$, $p = .026$) than positive ones ($\beta = .399$, $p = .048$). On the other hand, only subjective norm played a statistically significant role for active patients to explain their intention ($\beta = .41$). This result is consistent with the theoretical framework of stage theories assuming that different sets of determinants are relevant for different stages.
The different determinants of intention for active and insufficiently active patients have important practical implications. Health professionals can have the possibility to advise their patients regarding physical activity. According to the results of our study, it is the best to screen patients regarding their physical activity: do they already meet the 150 minutes/week guidelines or not? Depending on the results of this screening, different advice is necessary.

Differences between our results and those of other studies must be addressed. Former TPB studies in the field of physical activity among cancer survivors showed heterogeneous results regarding the role of attitudes. Reasons why some studies showed no or weaker associations between attitudes and intention (e.g. Courneya et al., 2001; Peddle et al., 2009) might be that they did not regard insufficiently active patients separately or did not assess the full spectrum of attitudes. Most other studies (e.g. Hunt-Shanks et al., 2006; Jones et al., 2007; Karvinen et al., 2007; Speed-Andrews et al., 2012) consistently used the same standard semantic-differential items to assess attitudes (Courneya & Friedenreich, 1999). Results of study 2 confirmed that these standard items were rated more positively than the additional ones elicited in study 1. It might be that the negative adjectives of the standard items are too strongly worded. For example, participants might hesitate to evaluate physical activity as “bad”, “harmful” or “useless”. Weaker adjectives that were detected in study 1 like “laborious”, “too much” or “exhausting” might be more acceptable and might thus reduce ceiling effects. Nevertheless, cultural differences might also explain the discrepancy between the results of our study and other literature. This was the first study about the TPB in the field of physical activity in a German cancer population. There might be differences in the promotion of physical activity in different countries which might be reflected in different attitudes.
To our knowledge, only two studies among cancer survivors have used more than the standard items and assessed attitudes with 14 adjectives for the semantic differential (Culos-Reed, Shields, & Brawley, 2005; Keats et al., 2007). Unfortunately, the adjectives are not mentioned in these articles and there is no information provided regarding how these items were derived. Notably, both of these other studies confirmed our result that attitude was the only significant predictor of intention.

The result that subjective norm is the most important determinant of intention for active patients is not in line with the results of Lippke et al. (2007). In a sample of healthy adults, they found that subjective norm is only important in the precontemplation and contemplation (thus inactive) stages of the Transtheoretical Model. For cancer patients this pattern might be different. As there is usually a decline in physical activity during cancer therapy (Huy, Schmidt, Vrieling, Chang-Claude, & Steindorf, 2012), the social environment might be especially important in maintaining the level of physical activity. Aside from the many other factors in the social environment, positive social relationships were found to be important for cancer patients to be physically active: in a recent systematic review, Barber (2012) revealed a positive relationship between social support and cancer patients’ physical activity in about 50% of the included 22 studies.

Our study has some limitations. First, all data is based on self-reports which can lead to response biases. Whereas self-reports are the standard for assessing the variables of the TPB, the assessment of physical activity used in this study needs improvement. Physical activity was measured by one item accompanied by a detailed description and examples of the exercise guidelines. A validated and reliable questionnaire or even an objective measure to assess physical activity would be more precise.
physical activity should be used in future research. Furthermore there might be a social desirability effect in the responses, because the exercise guidelines were presented prior to the questions. Nevertheless, we think it was necessary to define physical activity first and make everybody have the same background information about the exercise recommendation before answering the questions. Second, this study only tested if variables of the TPB explain the intention to exercise, but not the actual behavior. Third, there are some limitations about the sampling and recruitment strategy. Both studies are based on relatively small and non-representative samples, as we used convenience samples. The low number of participants might have led to a low power of the statistical tests. Thus, there might be some “true” relations which we did not detect. Furthermore, the sample of study 2 is unbalanced regarding the sexes (24 women, 40 men). Lastly, all disadvantages of a cross-sectional survey should be regarded when interpreting the results of this study.

In spite of these limitations, our study has broadened the existing TPB literature in the field of physical activity and cancer in two directions: First, in study 1, a new qualitative assessment method for attitudes (free associations) was used to achieve the full range of attitudes including negative ones. Second, in study 2, active and insufficiently active patients were compared regarding variables of the TPB. According to the assumptions by stage theories, we found that different TPB variables are important for these two subgroups in explaining physical activity intention – subjective norm for active and attitudes for insufficiently active patients.

Conclusions can be drawn for research and practice. Future research should be aware that negative aspects of attitudes are also assessed, for example, by using an open format of assessment. Longitudinal and experimental studies are necessary to detect if the influences of
TPB variables – especially attitudes and subjective norm - on intention, change over time. Thereby it would be interesting to include the assumptions of stage models and see if the progression in stages moderates the relationship between the TPB variables and intention.

Furthermore, the results of this study can be translated into practice. Health professionals should adapt the advice they give cancer patients regarding their physical activity according to the physical activity status of the patient. Insufficiently active patients would benefit the most if health professionals try to modify their negative attitudes toward physical activity. Additionally, it would help already active patients most to maintain an appropriate level of physical activity if health professionals address their social environment.

Acknowledgement

The authors are thankful to Michael Paskow for careful editing of the manuscript.
References


Table 1

Demographic and medical characteristics of participants in study 1 and study 2.

<table>
<thead>
<tr>
<th>Demographic or medical variable</th>
<th>Study 1, (N = 61)</th>
<th>Study 2, (N = 64)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>30 (49.2%)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>31 (50.8%)</td>
<td></td>
</tr>
<tr>
<td><strong>Age in years</strong></td>
<td>62.19 (10.30)</td>
<td></td>
</tr>
<tr>
<td><strong>Chemotherapy at present</strong></td>
<td>24 (39.3%)</td>
<td></td>
</tr>
<tr>
<td><strong>Radiotherapy at present</strong></td>
<td>1 (1.6%)</td>
<td></td>
</tr>
<tr>
<td><strong>Radiotherapy completed</strong></td>
<td>24 (39.3%)</td>
<td></td>
</tr>
<tr>
<td><strong>Cancer entity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast</td>
<td>14 (23.0%)</td>
<td></td>
</tr>
<tr>
<td>Colorectal</td>
<td>11 (18.0%)</td>
<td></td>
</tr>
<tr>
<td>Skin</td>
<td>11 (18.0%)</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>25 (41.0%)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>40 (62.5%)</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>24 (37.5%)</td>
<td></td>
</tr>
<tr>
<td>Age in years</td>
<td>59.77 (10.79)</td>
<td></td>
</tr>
<tr>
<td>Chemotherapy at present</td>
<td>31 (48.4%)</td>
<td></td>
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<tr>
<td>Radiotherapy at present</td>
<td>3 (4.7%)</td>
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<tr>
<td>Radiotherapy completed</td>
<td>24 (37.5%)</td>
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</tr>
<tr>
<td>Cancer entity</td>
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<td></td>
</tr>
<tr>
<td>Breast</td>
<td>12 (18.8%)</td>
<td></td>
</tr>
<tr>
<td>Colorectal</td>
<td>9 (14.1%)</td>
<td></td>
</tr>
<tr>
<td>Lung</td>
<td>6 (9.5%)</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>37 (57.8%)</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* All data is from self-report.
Table 2

Regression analyses explaining intention to exercise for active and insufficiently active cancer patients with variables of the Theory of Planned Behavior

<table>
<thead>
<tr>
<th>Determinant</th>
<th>$\beta$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active cancer patients, $N = 34$</td>
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<tr>
<td>Self-efficacy</td>
<td>.042</td>
<td>.869</td>
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<tr>
<td>Positive attitude</td>
<td>-.347</td>
<td>.097</td>
</tr>
<tr>
<td>Negative attitude</td>
<td>-.329</td>
<td>.205</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>.406</td>
<td>.018</td>
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<tr>
<td>$R^2$ for Model</td>
<td>.322</td>
<td></td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>.228</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Determinant</th>
<th>$\beta$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficiently active cancer patients, $N = 27$</td>
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<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>-.200</td>
<td>.322</td>
</tr>
<tr>
<td>Positive attitude</td>
<td>.399</td>
<td>.048</td>
</tr>
<tr>
<td>Negative attitude</td>
<td>-.482</td>
<td>.026</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>.199</td>
<td>.201</td>
</tr>
<tr>
<td>$R^2$ for Model</td>
<td>.582</td>
<td></td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>.506</td>
<td></td>
</tr>
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</table>
Note. a insufficiently active means “less than 150 minutes of moderate physical activity a week”; all variables of the Theory of Planned Behavior scored from 1 to 7.

Figure 1. Free associations regarding the recommendation to exercise 150 minutes per week among active (≥ 150 minutes physical activity per week) and insufficiently active cancer patients.
insufficiently active patients (N=27)

- 33% positive
- 24% neutral
- 43% negative