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Development of a questionnaire to assess the determinants of exercise among breast cancer survivors in Puerto Rico

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Abstract

The Theory of Planned Behavior (TPB) serves to understand determinants that predict the intention to exercise. According to this theory, attitudes, subjective norms, and perceptions of behavioral control determine intention. This is the first theory-based tool designed to measure the determinants of exercise among women in Puerto Rico who are breast cancer survivors. Understanding the determinants will assist in planning theory based interventions. The purpose of this study was to develop a TPB-based questionnaire to assess the determinants of exercise of breast cancer survivors in Puerto Rico and to evaluate its psychometric properties. Quantitative and qualitative methods were used for questionnaire development and psychometric testing. Three independent samples were recruited for the phases of item generation, pilot testing, and evaluation of psychometric properties. An initial 97-item questionnaire was constructed. Test-retest reliability was assessed for the indirect subscales; six items were found unreliable and removed. For the direct subscales, seven items with item-to-total correlations <0.30 were removed. The final version consisted of 84 items, with Cronbach's α ranging from 0.65 to 0.89. Construct validity was demonstrated by significant, fair-to-moderate correlations of all but one of the direct subscales and the multiplied scores of the indirect subscales of similar constructs.

INTRODUCTION

The benefits of exercising in breast cancer survivors are many: increased physical function (Demark-Wahnefried et al, 2006); decreased mortality risk (Demark-Wahnefried and Jones, 2008; Holmes et al, 2005); improved cardiopulmonary function (Hsieh et al, 2008); and increased quality of life (Cheema and Gaul, 2006). Exercise also has positive effects in reducing the incidence of lymphedema, a condition once thought to worsen by increasing upper body resistance exercise (Lane, Jespersen, and McKenzie, 2005; Schmitz et al, 2010). Current exercise guidelines for breast cancer survivors are to exercise at a moderate intensity at least 150 minutes per week, including strength training twice per week (Rock et al, 2012; Schmitz et al, 2010). Available evidence points toward the benefits of being physically active during and after cancer treatment, for patients in early cancer stage as well as in advanced stage (Rock et al, 2012; Schmitz et al, 2010). For breast cancer survivors who are at risk or have developed lymphedema, strength training is recommended under professional supervision (Rock et al, 2012).

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Since the benefits of exercise are dependent upon adherence to a prescribed exercise program, survivors may benefit from behavioral interventions to support changes in exercise behavior, such as professional supervision of an exercise program (Rock et al, 2012). As exercise specialists, physical therapists play an important role in facilitating, planning, and supervising exercise for women who are breast cancer survivors. Thus, the knowledge of exercise determinants (facilitators and barriers) is important to support these behavioral interventions.

The Theory of Planned Behavior (TPB) is useful in understanding exercise determinants across a variety of populations, including cancer survivors. According to the TPB, intention to perform a behavior is the main predictor to actual behavior performance (Ajzen, 1991, 2006; Doll and Ajzen, 1992). Intention is determined by attitudes, subjective norms, and perceived behavioral control. Attitude refers to the overall positive or negative evaluation of performing a behavior. Subjective norms refer to perceived social pressure to perform a target behavior. Perceived behavioral control refers to the extent a person feels capable and has control over performing a behavior. Intention to perform a behavior refers to the person's readiness to perform a behavior.

The constructs of attitudes, subjective norms, and perceived behavioral control can be measured either directly (i.e., by asking whether their attitude towards exercise is favorable or unfavorable) or indirectly (i.e., by asking specific beliefs about exercise to infer whether the attitude is favorable or unfavorable; Ajzen, 1991, 2002; Conner, Rodgers, and Murray, 2007; Francis et al, 2004a). Attitude can be measured directly by asking whether the behavior will achieve a positive or negative effect (instrumental attitude) and how it feels to perform the behavior (affective attitude). The indirect measures of attitudes are behavioral beliefs, referring to the consequences of a behavior, and outcome evaluation, referring to positive or negative judgments about each belief. The direct measures of subjective norms are injunctive norm, referring to pressure from important people to perform a behavior; and descriptive norm, referring to how significant people actually behave. The indirect measures of subjective norms include the beliefs about how significant others would like the person to behave, known as normative beliefs; and the positive or negative judgments about each belief, known as motivation to comply. The direct measures of perceived behavioral control include self-efficacy, referring to how difficult a person believes it is to perform a behavior; and controllability, referring to whether factors are within or beyond control. The indirect measures include control beliefs, which are influenced by the factors or circumstances that enable or make it difficult for a person to perform a behavior; and a person's confidence in his/her ability to perform the behavior, known as perceived power of control beliefs. The mapping of these constructs is illustrated in Figure 1.

In the exercise domain, behavioral beliefs stand for positive or negative feelings about participating in an exercise program (Courneya, Mackey, and McKenzie, 2002). Normative beliefs refer to what a person believes that significant or influential individuals or groups think about what she should do related to exercise. Normative beliefs also result in perceived social pressure to exercise or not, whereas control beliefs may facilitate or impede the performance of exercise. In other words, these will result in the person's perceived behavioral control. Attitudes toward exercise, subjective norms, and perceived behavioral control are proposed as predictors of the intention to exercise (Vallance et al, 2008). The more positive the attitude and subjective norm, and the greater control a person perceives to have over the behavior, the higher the probability that he/she will carry out the intention and demonstrate the behavior (Ajzen and Manstead, 2007).

The TPB presents a valid model to predict intention to exercise among breast cancer survivors. Courneya and Friedenreich (1999) reported that attitude and subjective norms

were the determinants of intention to exercise among breast cancer survivors; whereas intention and perceived behavioral control determined exercise behavior. Vallance, Courneya, Plotnikoff, and Mackey (2008) reported that for breast cancer survivors, behavioral and control beliefs mediated the effect of an exercise intervention on intention to exercise. In a recent trial of yoga for breast cancer survivors, adherence was predicted by positive instrumental attitudes and greater self-efficacy (Speed-Andrews et al, 2012). Variables of TPB have also been examined as predictors of adherence to supervised vs. unsupervised exercise among breast cancer survivors (Courneya et al, 2012). Research based upon this theory points out that provision of information by itself will not affect behavior, unless change has occurred in behavioral, normative and control beliefs about the behavior (Ajzen and Manstead, 2007). This theory is being used to enhance participation in exercise programs by designing focused interventions for breast cancer survivors (Courneya, Jones, Mackey, and Faurey, 2006).

Determinants of exercise, based on the TPB, among Puerto Rican breast cancer survivors have not been identified. The purposes of this study were to develop a TPB-based questionnaire to assess the determinants of exercise in breast cancer survivors in Puerto Rico and to evaluate the psychometric properties of such a questionnaire. Although Puerto Rico is a commonwealth of the United States, it has a distinctive culture from the mainland, as evidenced by the use of the Spanish language as mother tongue and Hispanic values such as the importance of the family over self when it comes to exercise (Im et al, 2010). Current health disparities exist regarding access to quality health services for Hispanics (Hallquist, García, and Keppel, 2010), contributing to a late diagnosis of breast cancer and poor engagement in health services needed for achieving optimal posttreatment outcomes. Compared with any other US state or territory, Puerto Rico has the lowest adherence to guidelines for physical activity (Loustalot et al, 2009). Instruments developed in the mainland to assess the determinants of exercise would not necessarily represent the exercise beliefs of Puerto Ricans; thus, there is a need for developing a culturally relevant questionnaire targeted to this population. The acknowledgment that variation in determinants of health behavior may be significant from one population to another is of utmost importance for the design of culturally relevant interventions for behavior change (Committee on Communication for Behavior Change, 2002). Having a questionnaire with good psychometric properties designed to assess the determinants of exercise, aimed at women in Puerto Rico, will assist in identifying beliefs about exercising that could aid in planning focused exercise interventions and facilitate adherence.

METHOD

Sample

Inclusion criteria consist of women with a first-time diagnosis of unilateral breast cancer and who had received surgical treatment for breast cancer within the past 12–36 months, with or without adjuvant therapy. Participants at all cancer stages were included. If adjuvant therapy had been received, treatment had to be completed at least 2 months prior to recruitment. Participants were residents of Puerto Rico. They were recruited through advertisements in newspapers, radio, television, magazines and institutional intranet, announcements on bulletin boards, through visits to physician's offices, and participation in breast cancer survivorship activities.

Questionnaire development and pilot testing

For the development of the questionnaire and testing of its psychometric properties, both qualitative and quantitative methods were used (Francis et al, 2004a). Three independent samples were recruited for the three phases of this study: 1) item generation to develop the

questionnaire; 2) pilot testing of the questionnaire for clarity and understanding; and 3) evaluation of psychometric properties of the questionnaire. Phases followed in the construction of the questionnaire are presented in Figure 2. This study received approval from the University of Puerto Rico Medical Sciences Campus Institutional Review Board (IRB) prior to data collection in all three phases and all study participants signed an informed consent form. This study commenced in 2004 and concluded in 2011.

For the first phase of this study, beliefs elicitation for item generation, 43 female breast cancer survivors were interviewed. Their age ranged from 34 to 84 years, with a mean age of 53 years. Information was elicited on: behavioral beliefs (advantages of participating in exercise; disadvantages of doing so); normative beliefs (people who approve of participation; people who disapprove); and control beliefs (factors or circumstances that make it easy to exercise; and factors or circumstances that make it difficult). Exercise was defined as physical activity that is planned or structured, aimed to improve or maintain one of the components of physical fitness, such as endurance, strength, flexibility, and body composition (Center for Disease Control and Prevention, 2008). For the development of the questionnaire, the behavior of exercise was expected to occur three times per week for at least 30 minutes each time during the next month, based on existing guidelines at the beginning of the first phase of this study in 2004 (Courneya, Mackey, and McKenzie, 2002).

Information was collected to describe participants' beliefs related to exercising through one-to-one semi-structured, face interviews. Qualitative interviews to members of a given population are considered an appropriate method to elicit beliefs about target behaviors (Francis et al, 2004a). Nine open-ended questions were used to collect data on beliefs related to exercise intention that are relevant for female patients who are survivors of breast cancer. Interview questions were developed following the guidelines offered by Francis et al (2004a). Open-ended questions were followed by probes, such as why, how, and tell me more about it, to elicit additional information, explanation, or justification to the answers provided. Interviews were performed by the second author who has expertise in qualitative research and in the conduct of in-depth interviews; all interviews were tape-recorded. The interviews were conducted in Spanish, transcribed, and the transcriptions were used for content analysis. Responses to the open-ended questions were tabulated based on the selected constructs to measure the beliefs (i.e., behavioral beliefs, sources of social pressure, and control belief strength). Themes extracted were labeled and listed from the most-frequently mentioned to the least-frequently mentioned. Content analysis was independently performed by three persons; two of the researchers (first and second authors) and a research assistant, and consensus on results was achieved through discussion sessions among them. When needed, reference was made to the transcriptions of the interview during the discussion sessions for clarification to assist consensus. Frequencies of themes were recorded and ranked in descending order according to frequency. Responses to the open-ended questions provided the basis for item generation to construct a questionnaire in Spanish (Francis et al, 2004a). As a result of this phase, a first questionnaire was constructed consisting of 97 items, organized into 13 subscales, reflecting the constructs of attitude, subjective norms, perceived behavioral control (direct and indirect measures of each construct), and intention.

For the second phase of this study, the pilot testing of the questionnaire, a second, independent sample of 17 women who are breast cancer survivors in Puerto Rico (mean age of 56 years; years of survivorship ranged from 1 to 28) was recruited. As part of this phase, the participants completed the self-report questionnaire, followed by an interview with the researcher where each item was explored for clarity and understanding by asking participants if they had any difficulty answering the items. When the item was not clear, participants were asked for recommendations for improving the item with these changes

subsequently made to improve the questionnaire's clarity. Data saturation was achieved in the pilot testing, at the point where no new recommendations for item improvement were given.

Psychometric evaluation of the questionnaire

For the third phase of this study, psychometric evaluation, the questionnaire was administered face-to-face to a third, independent sample of 30 women who are breast cancer survivors in Puerto Rico. Their age ranged from 29 to 77 years, mean age of 58 years. Each participant completed the 97-item questionnaire developed in the previous phases of the study. Two weeks after the initial administration of the questionnaire, the same sample was re-tested with the same instrument.

The 97-item questionnaire version underwent initial psychometric testing for item reduction. To score the direct scales of attitude, subjective norm, and perceived behavioral control, as well as the intention scale, the average (mean) was obtained. For example, to score the direct scale of attitude, the average was obtained from the items in the instrumental attitude and affective attitude scales. Several item scores needed to be recoded before obtaining the average, so that the higher score of that particular item reflected a positive end point. For example, in a scale where 1 is good and 7 is bad, the scale was recoded where 1 will be bad and 7 will be good. For indirect scales, the score of each item in an indirect subscale was multiplied by the score relating to the relevant item in the other indirect subscale, to obtain a multiplied score; multiplied scores were then summed. For example, to obtain the score of the attitude indirect scale, the score of each behavioral belief was multiplied by the relevant item in the outcome evaluation scale; then the multiplied scores were summed for a total score of this indirect scale. For detailed information on scoring and examples, refer to Francis et al (2004a).

Item to total correlation was conducted for the direct measure subscales of attitude, subjective norms, and perceived behavioral control to eliminate specific items that were not related to the same construct, using the cut-off value <0.30 for item removal (Ferketich, 1991). Following item removal, reliability analysis using Cronbach's coefficient α was conducted to assess internal consistency. An acceptable level of α was set at >0.60 (Francis et al, 2004a).

As indirect measures of constructs include both positive and negative beliefs, internal consistency is not an adequate measure of reliability (Francis et al, 2004b). Thus, reliability of indirect measures focused on testing short-term temporal stability, or consistency at two time points, using test-retest assessment within a 2-week interval. Temporal stability was tested using the Wilcoxon matched pairs signed-ranks test. Items with a p value <0.05 were considered significant for change between the two time points, therefore, not consistent, and were removed from the subscale.

Convergent and divergent validity, as indicators of construct validity, was assessed for the final version of the questionnaire, consisting of 84 items after item reduction (Portney and Watkins, 2008). Pearson's r correlation (two-tailed test) was calculated between the summary scores of each direct subscale and the multiplied score of the indirect measures of the same construct, using the first time values of the questionnaire administered, that is, the pretest (Francis et al, 2004b). The guideline proposed by Portney and Watkins (2008) to assess correlation was used: r values of 0.00–0.25 indicate little or no relationship; 0.25–0.50 fair relationship; 0.50–0.75 moderate-to-good relationship; and above 0.75 good-to-excellent relationship. Descriptive statistics (mean and standard deviation) of the subscales of the final version were calculated. Data were analyzed using SPSS, version 13.0 (SPSS, Inc., Chicago, IL, USA).

RESULTS

Questionnaire development and pilot testing

Beliefs for each of the three constructs of the TPB used for questionnaire construction are presented in Table 1. Wordings used by participants were preserved for item generation. Seventy-five percent of the behavioral beliefs, normative beliefs, and control beliefs were converted into items to guarantee content validity (Francis et al, 2004a). Weight control and well-being were the most frequently mentioned benefits of participating in an exercise program (attitudes). Children and husband or partner were believed to influence most in performing exercises (subjective norms). Time management and sickness were the more frequent reasons for not performing an exercise program (perceived behavioral control). A first version of the questionnaire resulted in 97 items developed for the direct and indirect subscales representing the constructs of the TPB.

Psychometric evaluation

Item analysis for item reduction was conducted for both the direct and indirect measure subscales. For the direct measure of attitude, one item had an item-to-total correlation of -0.11 and was removed from the questionnaire. The direct measure of subjective norms had five items in the item to total correlation with values <0.30 : 0.01 , 0.03 , and 0.18 for the injunctive norm; and 0.04 and 0.20 for the descriptive norm. In this subscale, to preserve at least one item in each of the constructs of injunctive norm and descriptive norm, an exception to the cutoff of <0.30 was made for the injunctive norm and the item with the highest value of 0.18 was preserved.

Two items in the subscale of direct measure of perceived behavioral control had item to total correlation values of 0.08 and 0.23 , and were removed from the questionnaire. Removal of these two items in this subscale resulted in an α coefficient of 0.65 . All of the items under the subscale of intention had values >0.30 for the item to total correlation. α coefficient for these direct measures subscale after item removal was >0.60 (Table 2). For the direct scales of attitude, the mean was 3.94 ($SD = 1.06$); for the direct scales of subjective norms, the mean was 6.13 ($SD = 1.43$); for the direct scales of perceived behavioral control direct, the mean was 5.76 ($SD = 1.38$); for the intention scale, the mean was 6.56 ($SD = 2.00$).

A Wilcoxon matched pairs signed-ranks test was carried out to ascertain whether there was any significant difference between the test–retest items of the indirect measures. Four items in the indirect measures of attitude and two items in the indirect perceived behavioral control were found to be significantly different. These items were not considered temporally stable and were removed. The final questionnaire contained 84 items.

Convergent construct validity of the final version of the questionnaire was assessed by the Pearson correlation test between the direct and the multiplied score of the indirect subscales. A fair, significant correlation was found between the direct subscale of instrumental attitude and the indirect multiplied score of attitude ($r = 0.47$). The correlation between the direct subscale of affective attitude and the indirect multiplied score of attitude was found to be fair but not significant ($r = 0.32$). Significant correlation was found between the direct subscales of subjective norms (injunctive and descriptive norm) and the indirect multiplied scores subjective norms. Significant correlations were also found between the direct subscales of perceived behavioral control (self-efficacy and controllability) and the indirect multiplied score of perceived behavioral control (r values ranged from 0.39 to 0.56 ; Table 3).

For divergent construct validity, no correlation was found between the direct measures of attitude and subjective norms and perceived behavioral control indirect multiplied scores.

No correlation was found between the direct measures of descriptive norm (subjective norms) and the multiplied score of indirect perceived behavioral control. A fair, significant correlation was found between the direct injunctive norm subscale and the multiplied score of indirect perceived behavioral control ($r = 0.36, p < 0.05$). No correlation was found between the direct measure of self-efficacy (perceived behavioral control) and the multiplied scores of indirect attitude and subjective norm. A fair, significant correlation was found between the direct measure of controllability and the multiplied score for indirect subjective norm ($r = 0.37, p < 0.05$). A sample of items for each subscale is presented in Table 4. The number of items removed for each construct is presented in this table.

DISCUSSION

Questionnaire development

There seems to be congruency between the determinants identified in this study and those reported in the literature using a variety of theoretical backgrounds and data collection methods. These theoretical backgrounds share common constructs, such as barriers and facilitators; thus, allowing for comparisons. Similarity of beliefs supports Fishbein and Cappella's (2006) assumption that variables such as socioeconomic background, culture, gender, age, and health status play an indirect role as determinants of health beliefs as compared with proximal determinants (i.e., attitudes, perceived norms, and self efficacy). Although similar behavioral, normative and control beliefs among populations of breast cancer survivors are being reported, in order to gather relevant information from the perspective of the targeted population, specific population characteristics, such as culture and gender must be reflected in belief statements. Interventions based upon behavioral construct theories have been under scrutiny due to their emphasis on individual behavioral constructs and limited consideration to cultural context (Kreuter et al, 2005). Guidelines for developing theory-based interventions stress the importance of knowing the specific salient beliefs and their strength (most frequently reported beliefs) in a given population in order to address the efforts to improve behaviors (Fishbein and Yzer, 2003).

In our study, family members were considered among the most relevant persons to approve engagement in an exercise program. A similar finding was reported by Owens, Jackson, and Berndt (2009) who conducted in-depth interviews on the factors that impeded or facilitated adhering to an exercise program in a sample of Hispanic women in the United States, reporting that husband and family members were important sources of support. These results support the previous findings on the relevance of extended family on health issues among Hispanics (Almeida, Molnar, Kawachi, and Subramanian, 2009). At the same time, family members were found to be a barrier in exercise performance, as taking care of them seemed to hinder breast cancer survivors' participation in exercise programs. This is consistent with Im et al (2010) findings where Hispanic women reported that making time for exercise comes after fulfilling family responsibility.

Other barriers to exercise intention included difficulty in managing time for exercise and feeling sick. The results of a recent study using focus groups to explore barriers to exercise in a sample of 16 breast cancer survivors in Puerto Rico support our findings (Treviño et al, 2012). Owens, Jackson, and Berndt (2009) participants reported that taking care of children, family responsibilities, and limited time made difficult their adherence to the exercise program. In an aerobic and resistance training trial, Courneya et al (2008) interviewed Canadian women receiving adjuvant cancer therapy on their exercise barriers. The barriers reported were feeling sick, fatigued, and loss of interest. In a pilot study report using structured interviews, Rogers et al (2007) reported that the most frequent barriers to exercise were not considering exercise as a priority, lack of self-discipline, procrastination, fatigue,

lack of interest, and lack of time to exercise. Family responsibilities were also reported as a barrier to exercise but it was not among the leading barriers.

Environmental factors such as: transportation to exercise facilities; location of exercise facilities; weather conditions while exercising (e.g., rain and heat); and costs related to exercise (e.g., gym fees and exercise gear), could inhibit exercise participation. Similar environmental factors such as cost and lack of exercise facilities were reported by Blaney et al (2010) in a sample of cancer survivors in United Kingdom. Owens, Jackson, and Berndt (2009) also reported lack of transportation and time limitations as factors that hindered exercise participation in breast cancer survivors. Courneya, Jones, Mackey, and Fairey (2006), using a TPB-based questionnaire, reported that bad weather, followed by time limitations, were the most common barriers to exercise among breast cancer survivors in Canada.

Weight control was reported as the most common benefit or advantage of engaging in an exercise program. Behavioral beliefs of a sample of breast cancer survivors in Canada did not include weight control (Courneya, Jones, Mackey, and Fairey, 2006). However, the results of Blaney et al (2010) and Rogers et al (2007) support our findings.

Participants felt that having a health specialist by their side, who had expertise in exercise for cancer survivors, helped them be accountable for participating in an exercise program. This health specialist was seen as important in providing supervision during the exercise routine and promoting exercise participation. A similar result was found by Blaney et al (2010), through focus groups who reported that the delivery of exercise programs by specialized health professionals in a controlled, supervised setting, including the use of commitment exercise contracts, was a facilitator for cancer survivors. Owens, Jackson, and Berndt (2009) also reported that having a nurse to provide exercise information would facilitate adherence to an exercise program. Rogers et al (2009), through a program evaluation after completing an exercise trial, found that exercise behavior change in women who are breast cancer survivors was impacted most by interactions with exercise specialists. Fatigue has been reported as a side effect of cancer treatment, even after 5 years of treatment completion (Bower et al, 2006). In this study, participants reported that feeling tired was a factor that inhibited them from exercising; while at the same time they believed that exercising would increase their energy and decrease feelings of tiredness. Participants were therefore aware of the role of exercise in counterbalancing fatigue. The results reported by Blaney et al (2010) support our findings where fatigue was identified as a barrier to exercise, and at the same time overcoming fatigue was a motivator for exercising.

Psychometric evaluation of questionnaire

Psychometric findings provided evidence of internal consistency, temporal stability, and construct validity of the questionnaire. Internal reliability for the direct subscales yielded values above the expected Cronbach's α of 0.60. Similar findings on internal consistency were reported by Courneya, Jones, Mackey, and Fairey (2006) and Vallance, Courneya, Plotnikoff, and Mackey (2008) in their TPB questionnaires.

One item in the injunctive norm was preserved despite not meeting the cut-off value >0.30 for item-to-total correlation. This was done in order to retain the ability to measure injunctive norm of the subjective norm construct, based on the recommendation of Rattray and Jones (2007). Temporal stability (test-retest) for the indirect subscales was supported; only six items were found to be unreliable and were removed. The findings also supported construct validity by significant fair-to-moderate convergent correlations (r range from 0.39 to 0.60) between all but one of the direct and indirect subscales of the same construct of the

TPB. There was little to fair correlation (r range from 0.08 to 0.37) between most of dissimilar constructs (Portney and Watkins, 2008).

During the elicitation of beliefs through interviews, the use of multiple researchers in data analysis and the discussion among them in data interpretation increased credibility of findings (Hesse-Biber and Leavy, 2010). The use of open-ended questions facilitated the collection of rich information on the perceived advantages, approval, and barriers concerning participation in exercise programs. Our questionnaire includes both direct and indirect measures of the constructs of the TPB. Thus, the number of items used for comprehensively measuring all the constructs of the TPB resulted in a long questionnaire that might decrease attention and motivation from the participants (Portney and Watkins, 2008). Comparison of the psychometric properties with similar questionnaires is limited as most questionnaires use direct scales (Ajzen, 2002). Future research to evaluate predictive validity of the questionnaire should be performed.

Limitations of this study include the small sample sizes for each phase and the recruitment of convenience samples. Future studies with a larger sample size would allow for subgroup analyses, such as cancer stage, age, treatment types, and comorbidities. A potential limitation may be on the focus of exercise at the gym, as this focus may exclude individuals who do not have access to gym or prefer non-gym-based exercise. The exercise guidelines used for this study were revised (Schmitz et al, 2010) after the second phase of this study was completed. However, evidence indicates that 90 minutes of exercise per week might be beneficial (Wen et al, 2011). Another limitation may be the one-item scale due to the scales limited ability to fully capture the construct; although the use of one-item scales has been validated in previous studies (Jones, Courneya, Fairey, and Mackey, 2005). Finally, in conducting our interviews and analysis based on the TPB, constructs may have limited the emergence and identification of beliefs not contemplated in this theory. Research that integrates behavior change theories, such as the TPB, and stronger culturally relevant approaches are needed to strengthen the design of interventions geared to targeted populations.

Implications

Although this study reports on findings of women who are breast cancer survivors in Puerto Rico, the determinants of exercise identified are supported by similar findings in Canada, United States, and United Kingdom. Addressing the barriers of perceived behavioral control is of particular importance for the patient to move from the intention to exercise to the actual behavior (Ajzen and Manstead, 2007). In Puerto Rico, the standard of care for breast cancer survivors does not include exercise recommendations or a referral for exercise prescription as part of breast cancer medical intervention. A questionnaire, such as the one developed in this study, could be used to identify factors that breast cancer survivors believe will inhibit or facilitate their exercise participation. This questionnaire would assist in identifying relevant beliefs of a larger sample of breast cancer survivors in Puerto Rico and in the development of targeted interventions that might result in enhanced adherence in exercise programs (Vallance, Courneya, Plotnikoff, and Mackey, 2008).

Physical therapists are in a privileged position to serve as qualified exercise experts in hospitals and other healthcare centers to provide exercise recommendations and intervention. The diagnosis of breast cancer might represent a teachable moment for survivors, a period where they are receptive to health information and behavioral changes (Demark-Wahnefried, Aziz, Rowland, and Pinto, 2005). It has been found that exercise behavior is increased in newly diagnosed breast cancer survivors following a one-time, brief 30-sec recommendation from their oncologist to exercise (Jones, Courneya, Fairey, and Mackey, 2004). This increase in exercise behavior was mediated by perceived behavioral

control, as survivors might consider themselves capable and confident of exercising if their oncologist was recommending it (Jones, Courneya, Fairey, and Mackey, 2005). Physical therapists can intervene early as part of a multidisciplinary healthcare team to assess the function of the cardiovascular and respiratory systems, as these systems relate to fatigue and to provide exercise interventions with the goal of preventing or reducing cancer-related fatigue (Gilchrist et al, 2009).

Although the TPB is a useful theory in understanding and predicting determinants of exercise, it is not a theory of implementation that would provide guidance on how to develop effective messages for behavior change (Fishbein, von Haeften, and Appleyard, 2001). However, other approaches are emerging that could provide this guidance (Fishbein, von Haeften, and Appleyard, 2001; Fishbein and Yzer, 2003; Kreuter et al, 2005). For interventions to be effective, a specific behavior must be targeted, considering elements such as setting, time, duration, and frequency; with attention to determinants relevant to the culture, environment, and demographics. Applying these guidelines along with the TPB constructs, Vallance, Courneya, Plotnikoff, and Mackey (2008) validated a self-paced guidebook to target an exercise intervention for breast cancer survivors, where survivors are presented with activities geared to self-exploration of beliefs as mediators to facilitate exercise behavior and overcome barriers to exercise. Physical therapists could use this guidebook to promote exercise adherence. Also, evidence-based guidelines have been delineated to assist physical therapists in planning and supervising exercise programs for this population (Schmitz et al, 2010).

CONCLUSION

The questionnaire developed in this study is theoretically based and has good psychometric properties. It can be used to measure attitudes, subjective norms, and perceived behavioral control which influence the intention to exercise among women who are breast cancer survivors in Puerto Rico. This information can be used by physical therapists to tailor interventions that promote exercise participation and adherence.

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FIGURE 1.
Constructs of the theory of planned behavior.

FIGURE 2.
Phases in the construction of the questionnaire.

TABLE 1

Behavioral beliefs, normative beliefs, and control beliefs on participation in an exercise program of breast cancer survivors in Puerto Rico (represent 75% of the beliefs elicited through interviews; $n = 43$).

Beliefs	<i>n</i>
Behavioral beliefs: Beliefs about the benefits of participating in an exercise program	
Decrease weight	42
Improve health and wellness	34
Decrease tiredness; increase energy; feeling more awake	26
Decrease stress; improves mood	22
Improves heart and circulatory system	22
Improves physical agility; increases flexibility	19
Help in doing chores in a more efficient manner	14
Improves upper extremity function	11
Increases muscle strength; improves body tone	9
Improves physical appearance	6
Decreases the probability of cancer recurrence	6
Keep bones strong	4
Improve lung function	4
Eliminate toxins from the body and the noxious effects of cancer treatment	4
Control diabetes	4
Helps to sleep better	3
Decreases discomfort at the site of the surgery	2
Able to feel the whole body and have my being back	2
Be an example to my children or grandchildren about the importance of physical activity	2
Decrease in pain	2
Increase sweating	2
Normative beliefs: Individuals or groups reported to have social pressure to perform an exercise program	
Children	20
Husband or partner	14
Physician	11
Parents	11
Other family members, such as uncles, aunts, in-laws	10
Friends	8
Siblings	7
Support groups (both formal and informal groups, such as church, cancer survivor support groups, colleagues at work, and neighbors)	7
Control beliefs: Situations and internal factors that would inhibit or facilitate the performance of an exercise program	
Time management	25
Sickness	21
Taking care of others	15
Follow-up given by personnel in charge of the exercise program; have professional supervision	12
Availability of transportation	12
Tiredness	12

Beliefs	<i>n</i>
Learn how to monitor the exercise; to establish a routine or structure	8
Getting injured	8
Close physical location	8
Pain	5
Household chores	5
Economical constraints such as the payment of the gym fees	3
Weather	3

TABLE 2

Internal consistency of the direct subscales of the questionnaire.

Subscales	α Coefficient
Attitude	0.71
Subjective norm	0.89
Perceived behavioral control	0.65
Intention	0.77

TABLE 3

Intercorrelations of direct and indirect measures of constructs (convergent validity in bold).

Subscales	Indirect attitude: behavioral beliefs × outcome evaluation [*]	Indirect subjective norm: normative beliefs × motivation to comply [*]	Indirect perceived behavioral control: control beliefs × perceived power of control beliefs to influence behavior [*]
Direct: instrumental attitude	0.47^a	0.29	0.30
Direct: affective attitude	0.32	0.19	0.08
Direct: injunctive norm	0.34	0.43^b	0.36 ^b
Direct: descriptive norm	0.18	0.44^b	0.19
Direct: self efficacy	0.33	0.35	0.59^a
Direct: controllability	0.33	0.37 ^b	0.39^b

^{*} Multiplied subscale scores.

^a $p < 0.01$.

^b $p < 0.05$.

TABLE 4

Example items developed for each subscale of the final 84-item questionnaire.

Construct	Subscales	Sample item	End points	No. of items initial version ($\Sigma = 97$)	No. of items final version ($\Sigma = 84$)
Attitude	Direct: instrumental attitude (whether exercising achieve something)	"As breast cancer survivors, I think that participating in an exercise program is..."	Harmful/beneficial	2	1
	Direct: affective attitude (how it feels to exercise)	Same item as above	Good-bad, pleasant/painful	2	2
	Indirect: behavioral belief	Behavioral beliefs statements based on interviews presented in Table 1 are converted into items, for example "I will lose weight if I exercise regularly."	Unlikely/likely	22	20
	Indirect: outcome evaluation	Behavioral belief statements from Table 1 were converted into the form of incomplete sentences, which the participant complete by expressing a positive or negative evaluation of the belief statements, for example "I believe losing weight is..."	Undesirable/extremely desirable	22	20
Subjective norm	Direct: injunctive norm (what important people think a person should do)	"People who are important to me think that I..."	Should not exercise regularly/should exercise regularly	3	1
Subjective norm	Direct: descriptive norm (what important people actually do)	"Other breast cancer survivors who I relate with..."	Do not exercise regularly themselves/exercise regularly themselves	3	1
	Indirect: normative belief	Normative beliefs statements based on interviews presented in Table 1 are converted into items, for example "The opinion of close family members is important to me"	Strongly disagree/strongly agree	4	4
	Indirect: motivation to comply	Normative belief statements from Table 1 were converted into the form of incomplete sentence, which the participant complete by expressing a positive or negative evaluation of the belief statements, for example "My close family is...by my exercising"	Bothered/happy	4	4

Construct	Subscales	Sample item	End points	No. of items initial version ($\Sigma = 97$)	No. of items final version ($\Sigma = 84$)
Perceived behavioral control	Direct: self-efficacy (how difficult is to exercise and how confident they are that they could exercise)	"I trust I can exercise regularly..."	Strongly disagree/ strongly agree	2	1
	Direct: controllability (whether exercising is up to them and whether factors beyond their control determine exercise)	"Participating in an exercise program is totally dependent on me"	Strongly disagree/ strongly agree	2	1
	Indirect: control beliefs	Control beliefs statements based on interviews presented in Table 1 are converted into items, for example "I need to reorganize my time in order to be able to exercise"	Strongly disagree/ strongly agree	13	12
	Indirect: perceived power of control beliefs to influence behavior	Control belief statements from Table 1 were converted into the form of an incomplete statement about whether it would make more or less likely that the person will exercise, for example "If I organize my time, it is...that I exercise"	Much less likely/ much more likely	13	12
Intention	Direct: intention to exercise	If one person exercise three times per week at the gym, it is possible to exercise 12 times per month. How many times do you plan to exercise at the gym over the next month?	0 1 2 3 4 5 6 7 8 9 10 11 12	5	5