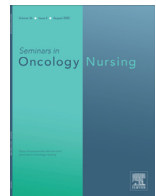




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## The Use of Theory to Develop Physical Activity Interventions in Urological Cancer Survivors: A Narrative Review

Elke Rammant, MSc<sup>a,\*</sup>, Renée Bultijnck, MSc<sup>a,b</sup>, Cristina M. Caperchione, PhD<sup>c</sup>,  
Linda Trinh, PhD<sup>d</sup>, on behalf of the research collaboration group of the cancer prevention and  
management Special Interest Group of ISBNPA

<sup>a</sup> Ghent University, Human Structure and Repair, Ghent, Belgium

<sup>b</sup> Research Foundation, Flanders (FWO), Brussels, Belgium

<sup>c</sup> Faculty of Health, Human Performance Research Centre, University of Technology Sydney, Sydney, New South Wales, Australia

<sup>d</sup> Faculty of Kinesiology and Physical Education, University of Toronto, Toronto, Canada

## ARTICLE INFO

## Keywords:

Urological cancer  
Behavior change  
Theory  
Physical activity  
Exercise  
Intervention mapping

## ABSTRACT

**Objectives:** To summarize the current available evidence on the use of behavior change theories to explain and change physical activity behavior in urological cancer survivors.

**Data Sources:** Five electronic databases including Medline, Web of Science, Embase, Cochrane, and Psych INFO and reference lists of key studies were searched between database inception and November 2020.

Peer-reviewed articles on the use of behavior change theories to understand or change physical activity in urological cancer survivors were included.

**Conclusion:** The theory of planned behavior and the social cognitive theory were the most used theories to explain and change physical activity behavior in urological cancers, respectively. However, the use of behavior change theories in physical activity interventions for urological cancers is still low across all urological tumor groups. Planning frameworks such as the intervention mapping approach should be used to enhance the systematic use of behavior change theories during every phase of intervention development. In addition, more research is needed to identify which behavior change techniques are most effective to change physical activity behavior in urological cancer survivors.

**Implications for Nursing Practice:** Nurses play a key role in the urological cancer patients' clinical pathway and should be able to motivate patients to engage in sufficient physical activity levels. Therefore, it is important that nurses understand the underlying reasons why patients (do not) engage in physical activity and which behavior change techniques are most effective in changing a patients' behavior.

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### Introduction

#### Burden of Urological Cancers

The incidence in the Western world of urological cancers is high with prostate, bladder, and kidney cancer being the most common.<sup>1</sup> In addition, survival rates for those living with urological cancers continues to increase due to advances in diagnosis and treatment.<sup>2</sup> Urological cancer survivors are generally diagnosed at an advanced age and have multiple comorbidities.<sup>3</sup>

One of the primary treatment options in this population is surgery, which is complex and associated with moderate to high complication

rates, depending on the type of surgery (ie, cystectomy 56%, nephrectomy 21%, prostatectomy 19%).<sup>4</sup> Other frequently experienced problems after surgery are fatigue, diminished physical function and treatment-related symptoms leading to a decrease in health-related quality of life (HRQoL).<sup>5</sup> Some of the most common treatment-related symptoms after surgery but also after radical radiotherapy are urinary, gastro-intestinal and/or sexual dysfunctions,<sup>6,7</sup> which may in turn increase the risk of mental health issues such as depression, anxiety and stress.<sup>8</sup> Mental health issues are also common in patients with urological cancer at diagnosis, which may independently worsen patient morbidity and mortality rates.<sup>9,10</sup>

In addition, almost half of patients with prostate cancer receive androgen deprivation therapy (ADT) at some point in their treatment. ADT leads to a variety of side effects with changes in body composition (ie, decrease in bone mineral density and muscle mass, increase in fat mass), fatigue, sexual dysfunction, and hot flushes as most common side effects.<sup>11</sup> These complications and side effects, combined

\* Address correspondence to: Elke Rammant, MSc. Department of Human Structure and Repair, Ghent University, Corneel Heymanslaan 10, B-9000 Ghent, Belgium. Phone: +32-9-33-21552.

E-mail address: [elke.rammant@ugent.be](mailto:elke.rammant@ugent.be) (E. Rammant).

**TABLE 1**  
Overview of PA Patterns in Urological Cancer Patients/Survivors

First Author, year	Tumor group	No. of patients	Type of Measurement	Meeting PA guidelines
Galvao et al, 2015 <sup>29</sup>	PCa patients	463	GLTEQ	12.3% sufficient active 40.2% insufficiently active 47.5% inactive
Zopf et al, 2017 <sup>30</sup>	Advanced PCa patients with bone metastases	55	Modified GLTEQ	29% met aerobic exercise guidelines 71% insufficiently or completely inactive
Blanchard et al, 2008 <sup>31</sup>	Mixed group of patients with breast, prostate, colorectal, bladder, uterine and skin cancer	Total 9105, of which 2226 prostate and 586 bladder	GLTEQ	Prostate cancer patients; 43.2% meeting PA recommendations Bladder cancer patients; 36.0% meeting PA recommendations
Karvinen et al, 2007 <sup>32</sup>	BC survivors	525	GLTEQ	22.3% met PA guidelines 16% insufficiently active 61.7% sedentary
Gopalakrishna et al, 2017 <sup>33</sup>	BC patients	472	IPAQ	50% high PA levels 26% median PA level 24% low PA level
Trinh et al, 2018 <sup>34</sup>	Kidney cancer survivors	703	Modified GLTEQ	10.1% combined exercise guidelines 15.9% aerobic-only guideline 8.8% strength-only guideline 65.1% none of the exercise guidelines

Abbreviations: PA, physical activity; PCa, prostate cancer; BC, bladder cancer; GLTEQ, Godin Leisure Time Exercise Questionnaire; IPAQ, International Physical Activity Questionnaire.

with their advanced age, contribute to a decline in physical function and decrease in HRQoL.<sup>11</sup>

Therefore, holistic supportive care interventions are needed to reduce the chronic and late effects of cancer treatment. Physical activity (PA) has a positive affect on clinical outcomes such as improvement in HRQoL, cancer-specific mortality, and reducing treatment-related toxicities across many cancer survivor groups,<sup>12</sup> including urological cancer survivors.<sup>13</sup>

#### Effects of Exercise on Symptom Management

Engaging in sufficient levels of PA or structured exercise is a relatively inexpensive and safe strategy to mitigate treatment-related side effects or improve different aspects of HRQoL.<sup>14</sup> Further, some research has revealed contrasting evidence; however, this research mainly reported on breast cancer, was focused on multimodal treatments and included only a small number of studies.<sup>15</sup>

Several studies investigated the effects of exercise in men with prostate cancer and showed beneficial results in outcomes such as fatigue, physical fitness, body composition parameters, anxiety and depression, HRQoL, comorbidities, risk of recurrence, and cancer-specific survival.<sup>11,16,17</sup> Most evidence for these beneficial effects were found for supervised PA programs with moderate-intensity combined aerobic plus resistance training sessions performed two to three times per week or twice-weekly moderate-intensity resistance training for at least 12 weeks.<sup>18,19</sup>

Emerging evidence exists that describes positive effects of exercise on sexual desire and sexual activity in men with prostate cancer.<sup>20</sup> Patients with prostate cancer who engage in sufficient PA also showed lower prostate-specific antigen levels, delay in initiating ADT by 2 years, lower serum insulin and insulin-like growth factor (IGF-1), higher IGF binding protein (IGFBP-1), and a lower risk of high-grade disease (Gleason score 7 or greater) compared with less-active patients.<sup>13</sup>

Few PA studies have been conducted in bladder and kidney cancer survivors. However, a systematic review in patients with bladder cancer (including 3 exercise studies) showed that exercise training has the potential to improve muscle strength, activities of daily living, physical fitness, and some HRQoL domains.<sup>21</sup> For kidney cancer, positive associations were found between PA and HRQoL.<sup>22</sup> A recent systematic review also suggested beneficial effects of exercise on mortality in bladder and kidney cancer.<sup>17</sup>

In patients undergoing major cancer surgery with additional (neo) adjuvant treatments such as chemotherapy and/or radiotherapy, it has been demonstrated that PA can play an important role in the pre-operative setting (also known as “prehabilitation”). Research shows that prehabilitation interventions aimed at increasing PA, can improve the physical and mental functioning of the patient.<sup>21,23</sup> For instance, it can facilitate the return to the highest possible PA level and provide an opportunity to become immediately involved in their own care.

#### Patterns of Physical Activity in Urological Cancers

Studies showed that cancer survivors are interested in receiving PA advice from their health care team.<sup>24</sup> However, only a small minority (on average 18.3%<sup>25</sup>) of survivors are receiving a referral to an exercise program.<sup>25–28</sup>

The updated guidelines of 2019 for cancer survivors recommend thrice-weekly aerobic activity for 30 minutes and twice-weekly resistance exercise (1 exercise per major muscle group, 8–15 repetitions per set, 2 sets per exercise), progressing with small increments.<sup>18</sup> However, a majority of urological patients are not meeting these PA guidelines. **Table 1** shows an overview of the PA patterns in urological patients.

The beneficial effects of PA and exercise for urological cancer survivors are clear, however, only the minority of the survivors are reaching sufficient PA levels. To achieve PA behavior change, psychological theories of motivation and behavior change should be used to address the barriers and facilitators of PA experienced by the patients.<sup>35</sup> A variety of theories exist that explain the mechanisms (ie, cognitive, affective, and behavioral) through which behavior can be targeted.<sup>35</sup> Theoretical approaches are also needed to identify key motivational outcomes to facilitate the adoption and maintenance of PA.<sup>36</sup>

The aim of this study is to summarize the current available evidence on the use of behavior change theories to explain and change PA behavior in urological cancer survivors.

#### Methods

A narrative review was conducted of peer-reviewed English language literature published from inception until November 2020. Our population-of-interest was urological cancer survivors. Only prostate, bladder, and kidney cancer were included as these are the three most common urological cancers. Both randomized controlled trials and

non-randomized studies (ie, cohort studies, case-control studies, longitudinal studies, and cross-sectional studies) were considered for inclusion. Furthermore, also systematic reviews were considered. Studies that explained or changed physical activity using behavior change theories were considered relevant. Following search teams were used; "physical activity/exercise", "prostate, bladder and/or kidney cancer", and keywords that are associated with behavior change theories (behavior change, behavior change techniques, form of delivery, motivation, theories, facilitators and barriers, planning frameworks).

Data sources used for this review were electronic databases including Medline, Web of Science, Embase, Cochrane, and Psych INFO and reference lists of key studies.

## Results

Growing evidence shows that theory-based behavior change interventions are more likely to succeed and to sustain, than non-theoretical interventions.<sup>37,38</sup> This trend has also been conveyed in cancer-specific PA research.<sup>39</sup> Theories can help identify the behavioral constructs that should be targeted, the mechanisms underpinning the "active ingredients" (BCTs) used to change behavior, and how those constructs are interconnected.<sup>40,41</sup> Theory-based behavior change interventions are also able to provide information on how or why an intervention works, which increases the utility of the results of an intervention.<sup>37</sup> Behavior change interventions, guided by theory, provide a framework to systematically develop and evaluate interventions, and should include three broad components: (1) theories to explain behavior, (2) BCTs to change behavior, and (3) form of delivery.<sup>40,41</sup>

### *Explaining Physical Activity Behavior in Patients With Urological Cancer*

Meeting PA guidelines can be challenging for patients undergoing urological cancer treatments and underlying reasons or determinants for this can be multifactorial. Research showed that disease, treatment-related factors and a numerous of demographic factors, such as age or socioeconomic background, are related to the likelihood of a patient being physically active.<sup>42</sup> Although we cannot change these factors, they do help explain why an intervention is (not) working. We can however have an effect on the modifiable factors at an individual or environmental level, to influence patient's PA behavior.

The *Theory of Planned Behavior* (TPB)<sup>43</sup> has been the most tested theory to date in patients with cancer to explain PA behavior.<sup>44</sup> The TPB states that intention to perform a particular behavior is the primary determinant of behavior. Intention, in turn, is determined by three other constructs: subjective norm, attitude, and perceived behavior control. Each of these constructs is considered a higher-order structure composed of two lower-order components. The lower-order components of subjective norm are descriptive (perception that important others exercise) and injunctive (perception that important others approve of exercise) components. Attitude consists of affective (enjoyment of exercise) and instrumental (perceived benefits of exercise) components, and perceived behavior control includes self-efficacy (confidence in ability to exercise) and perceived control (perceived control over exercise).<sup>43</sup>

A study in patients with prostate cancer found that perceived behavioral control was the only determinant of exercise intention in these survivors, explaining 36% of the variance in exercise behavior. In bladder cancer survivors, exercise behavior was predicted by perceived behavior control whereas exercise intention was predicted by affective attitude, instrumental attitude, descriptive norm, and perceived behavior control. In kidney cancer survivors, all constructs of the TPB, except for injunctive norm and affective attitude, explained exercise intention with perceived behavior control as most important construct.<sup>45</sup>

In addition to the TPB, other common behavior change theories have been used to help explain PA behavior of urological cancer survivors. In a study by Courneya et al<sup>46</sup> stages of change (as described in *The Transtheoretical Model* [TTM]) was found to be a strong predictor of exercise adherence in patients with prostate cancer.<sup>46</sup> The TTM states that an individual goes through different stages of readiness to make behavioral changes and therefore require interventions tailored to the patient individual stage. The five stages of change are as follows: precontemplation (ie, no intention of becoming physically active in the next 6 months), contemplation (ie, intending to become physically active within the next 6 months), preparation (ie, making small changes in behavior but still not meeting a criterion for PA), action (ie, meeting a criterion of PA for <6months), and maintenance (ie, meeting a criterion for PA for ≥6months). In addition, the TTM identified 10 processes of change along with decisional balance, self-efficacy, and temptations as important constructs for behavior change. In the earlier stages of change emphasizing experiential or cognitive processes of change are recommended (eg, understanding the risks of low levels of PA), whereas in later stages of change promoting behavioral processes of change are more indicated (eg, rewarding one-self).<sup>47,48</sup>

A study in bladder cancer survivors used a qualitative approach to examine factors related to PA behavior.<sup>49</sup> This study identified demographic, disease, treatment, and psychological factors, as well as social, health system, and environmental factors, to explain PA behavior in bladder cancer survivors.<sup>49</sup> The results indicated that PA behavior should also be explained by using *social ecological models* in addition to individual factors including social (eg, social support), policy (eg, reimbursements, rehabilitation programs) and environmental factors (eg, weather, distance to exercise facilities). However, no quantitative study to date has tested social ecological models in bladder cancer survivors. In kidney cancer, one study examined which social ecological factors are related to PA and found that only perceived proximity of retail shops was a significant predictor of meeting PA guidelines.<sup>50</sup>

### *Changing Behavior in Patients With Urological Cancer*

A recent systematic review in prostate cancer evaluated PA-based behavior change interventions and identified six prostate cancer and six mixed cancer studies of which only three prostate cancer and five mixed cancer studies incorporated theories in their interventions. In the prostate cancer only studies, one study used *Social Cognitive Theory* (SCT), one study the TPB, and another study was grounded in multiple theories, including the SCT and the TTM. All of the mixed cancer studies incorporated multiple theories including the SCT, the TTM, the TPB, the social ecological model and the chronic disease self-management framework.<sup>51</sup>

*Bandura's SCT* is a theory that is often used for both explaining and changing behavior. The determinants described by the SCT are outcome expectations, self-efficacy, behavioral capability, perceived behavior of others, and environment. The SCT integrates its determinants of behavior with specific BCTs such as active learning, reinforcement, enactive mastery experiences, modeling, guided practice, verbal persuasion, improving physical and emotional states, and facilitation.<sup>52,53</sup>

A majority of the studies in the systematic review by Finlay et al<sup>51</sup> used a combination of BCTs with goal setting, encouragement to self-monitor, provision of information about the consequences of the behavior, and barrier identification as the most common. Social support, through supervised programs with social group interactions and demonstration of behavior, was more common in prostate cancer only studies compared with mixed cancer studies.<sup>51</sup>

Another framework identified during the search is the *Multi-Process Action Control* framework (M-PAC), which was recently used in a physical activity pilot study in prostate cancer.<sup>54</sup> The M-PAC

framework aims to reduce the intention–behavior gap and focuses on translating intentions into actions, developing PA habits (ie, cue-based reminders) and forming an exercise identity.<sup>55</sup> The study by Trinh et al<sup>54</sup> showed the utility of the M-PAC to guide and understand behavior change in prostate cancer survivors.

A recent systematic review in patients with prostate cancer also identified and evaluated BCTs in the included studies.<sup>56</sup> The most common BCTs identified were behavioral practice/rehearsal, instruction on how to perform the behavior, self-monitoring of behavior, adding objects to the environment, social support (unspecified), and generalization of target behavior. However, evaluation of the BCTs did not show any difference in efficacy between the number and types of BCTs. Some evidence suggested that BCTs that were well taught and explained to the cancer survivors were more effective than BCTs that were less well explained to the patients.<sup>56</sup>

For bladder cancer, only one PA intervention is presented in the literature that is developed based on a behavior change theory.<sup>57</sup> Another study in patients with bladder cancer described the use of BCTs in their intervention, although not referring to the term “BCT”.<sup>58</sup> The strategies used in the study by Jensen et al<sup>58</sup> are “set graded tasks” and “prompt self-monitoring of behavior”. For kidney cancer, one behavior change intervention based its counseling strategies on the TPB. This study showed preliminary evidence that adding behavioral counseling (based on the TPB) improved PA, physical functioning, and short-term motivation, and self-regulatory outcomes in kidney cancer survivors.<sup>59,60</sup>

#### *Form of Delivery of Behavior Change Interventions*

Although less commonly discussed in the literature, form of delivery is next to theory and BCTs an important ingredient for behavior change interventions. The form of delivery describes the ways in which an intervention is delivered. The form of delivery of an intervention includes different components such as the provider, format, materials, setting, intensity, tailoring, and style.<sup>40,41</sup> Form of delivery is important for several reasons such as operationalizing theories into concrete intervention components, enhancing or undermining BCT effectiveness, influencing intervention engagement, adherence, and fidelity, determining how users understand intervention content, influencing effectiveness beyond the BCT, and for implementation and sustainability.<sup>40</sup>

## **Discussion**

### *Framework for Developing Theory- and Evidence-Based Behavior Change Interventions*

The use of theory to develop PA interventions is still scarce. Furthermore, adequate descriptions of the theories that were used in the interventions are needed to identify the “active components” of successful interventions and to expand and test the evidence across settings and facilitate evidence synthesis. Next to the use of theory, also other resources (eg, literature review, collection of new data, involvement of stakeholders) are required to develop behavior change interventions. Hence, this might be challenging and frameworks to guide this development process are needed. Therefore, planning frameworks exist that guide the systematic development of theory- and evidence-based behavior change interventions.

An example of a planning framework is the *intervention mapping* (IM) protocol.<sup>61</sup> This is a detailed protocol for the planning and development of theory- and evidence-based health promotion interventions (in this case increasing PA levels). The IM approach is characterized by three perspectives applied during the program planning process; (1) it takes an ecological and systemic approach to understand health problems and consequently intervene at multiple levels to address them (ie, individual, interpersonal, organizational

and community), (2) it is grounded in community-based participatory research methods to ensure that the interventions match the specific priorities of the needs and context of the population, and (3) the eclectic use of theory. The IM protocol exists of a systematic development process of intervention planning in six steps: (1) conduct a needs assessment, (2) create matrices of change objectives, (3) select theory-based intervention methods and practical applications, (4) organize methods and applications into an intervention program, (5) plan for adoption, implementation and sustainability of the program, and (6) generate an evaluation plan.<sup>62</sup>

Another planning framework is the *Medical Research Council* framework, published in 2000 and updated in 2008.<sup>63</sup> The goal is to assist researchers to recognize and adopt appropriate methods in the process of developing and evaluating complex interventions. The framework follows several phases, not necessarily in a linear sequence. The key elements are: developing an intervention (ie, identifying the evidence base, identifying or developing theory, and modeling process and outcomes), piloting and feasibility (ie, testing procedures, estimating recruitment and retention, and determining sample size), evaluating the intervention (ie, assessing effectiveness, understanding change process, and assessing cost effectiveness), and implementation (ie, dissemination, surveillance and monitoring, and long-term follow-up).

These planning frameworks and others have been used across various disciplines, but the use of it in urological PA cancer research is rare. Only a few studies in urological cancers are using a planning framework to develop and test their PA behavior change intervention. For example, OncoActive in prostate cancer,<sup>64</sup> ExerciseGuide in metastatic prostate cancer,<sup>65</sup> and The POPEYE trial in bladder cancer.<sup>66</sup> Although these planning frameworks are not the only way to develop behavior change interventions, it might help researchers to develop and evaluate their intervention with a systematic approach.

### *Implications for Nursing Practice*

For future intervention development, we would strongly recommend using a planning framework, although we acknowledge that this is a time-consuming event. Furthermore, we recommend considering the use of a combination of theories for both explaining and changing PA behavior rather than trying to fit everything in one specific theory, to allow synergistic effects and enhance intervention effectiveness.<sup>67</sup>

To increase evidence synthesis and identification of the effective ingredients within interventions, it is also crucial to thoroughly report the used theories and BCTs. Often studies report results without adding detailed information about the development of the intervention. It is important to state that also interventions that did not follow an in-depth planning framework approach should report the BCTs used and, if possible, include additional details regarding the dose, frequency, and quality of implementation of the BCTs. To increase consistency in reporting BCTs, we advise to use a classification model such as, the Coventry, Aberdeen, and London–Refined (CALO-RE) taxonomy of behavior change techniques. Furthermore, this method will enable in the search for psychological mediators that reveal why interventions (do not) work.<sup>68</sup> Specific attention is also indicated in the specification of the type of BCT per tumor group/disease stage and treatment, to further tailor interventions within the cancer survivorship population.

Another reporting gap is that primarily short-term data are published. Therefore, future studies should implement longer-term follow-up for physical activity maintenance, which is particularly important for long-term outcomes in urological cancer survivors.

Finally, physical activity interventions should focus on understanding mediating mechanisms to uncover “what worked” and “what did not work” in a behavior change intervention.<sup>69</sup> Mediators are intervening causal variables that are needed to complete a

cause—effect pathway between an intervention and physical activity.<sup>70</sup> Knowledge of mediators will assist with effective design of interventions and targeting key constructs that are needed for behavior change.<sup>71</sup> Physical activity theories suggest that specific constructs are critical antecedents of engaging in physical activity. These constructs are hypothesized as components of a causal chain where if the mediators are changed, a change in physical activity should follow.<sup>72</sup> However, few behavior change interventions examine the mechanisms of change, and therefore pilot studies that demonstrate change in the proposed mediators are needed before larger-scale randomized controlled trials.

## Conclusion

The use of behavior change theories in physical activity interventions for urological cancers is limited across all urological tumor groups. For optimal long-term health benefits, cancer survivors need to be continually active throughout the cancer care continuum. Nurses play a key role in the urological patients' clinical pathway and should be able to motivate patients to engage in sufficient physical activity levels. Therefore, it is important that nurses understand the underlying reasons why patients (do not) engage in physical activity, and which behavior change techniques are most effective in changing a patient's behavior.

Planning frameworks such as the intervention mapping approach should be used to enhance the systematic use of behavior change theories during every phase of intervention development. In addition, future research is needed to identify which behavior change techniques are most effective to change physical activity behavior in urological cancer survivors.

## Disclosures

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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