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# Effect of the exercise programme on the quality of life of prostate cancer survivors: A randomized controlled trial

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## Abstract

**Aim:** The aim of this study was to investigate the effect of the exercise programme on the quality of life of prostate cancer (PCa) survivors.

**Methods:** A randomized controlled, parallel trial was conducted from April 2017 to January 2018 on 80 PCa survivors. They were randomly assigned to intervention and control groups ($n$ = 40 in each group). The exercise programme was designed based on the self-management approach (SMA). The intervention group participated in a 12-week exercise programme consisting of one session of group exercise and three sessions of individual exercise per week using exercise facilities in the community. Data were collected using the quality of life questionnaires and the follow-up checklist.

**Results:** In the intervention group, statistically significant improvements in physical, role, emotional, social and sexual functions were reported. Also, the patients in this group reported reduced fatigue, insomnia, constipation, diarrhoea, urinary, bowel and hormonal treatment-related symptoms in comparison with before the exercise programme ($p < 0.05$).

**Conclusions:** Nurses are suggested to plan for improving the participation of PCa survivors in exercise programmes using exercise facilities in the community in order to reduce the complications of treatment and improve their quality of life.

KEYWORDS

community care, exercise programme, nursing, physical activity, prostate cancer, quality of life, self-management approach

## SUMMARY STATEMENT

What is already known about this topic?

- Prostate cancer (PCa) is one of the most common types of cancer in men across the globe.
- Given the increased survival rate of patients with PCa, interventions are required for improving their quality of life.
- There is a lack of knowledge about the effect of physical activity on the quality of life of PCa survivors.

What this paper adds?

- The exercise programme based on the self-management approach, use of exercise facilities in the community and group exercise can improve the quality of life of PCa survivors.
- Participation in the exercise programme can help with the reduction of physical and psychological complications of PCa.

The implications of this paper:

- Nurses should encourage PCa survivors to participate in the exercise programme for reducing treatment complications and improving their quality of life.
- Nurses can use exercise facilities in the community to improve the participation of PCa survivors in healthcare initiatives aiming at the improvement of their quality of life.
- The examination of the effect of exercise programmes on well-being and health-related quality of life of PCa survivors needs further research.

## 1 | INTRODUCTION

Prostate cancer (PCa) is the second most common cancer in men and accounts for 15% of new cases of cancers (Ferlay et al., 2015). It is the third most common type of cancer among Iranian men (Jalilpiran et al., 2018). Due to advances in the early diagnosis and treatment of cancer, about 90% of patients with PCa are diagnosed in the early stage and their relative 5-year survival rate is about 100% (DeSantis et al., 2014; Siegel & Ma, 2014).

The prolonged survival rate of PCa survivors predisposes them to age-related complications, side effects of the treatment process and inactivity (Harju et al., 2017; Haseen, Murray, Cardwell, O'Sullivan, & Cantwell, 2010). For instance, surgery, radiation therapy and androgen deprivation therapy (ADT) can cause urinary incontinence, fatigue, gastrointestinal disorders, osteoporosis, muscle atrophy, loss of strength and sexual dysfunction (Haseen et al., 2010; Pardo et al., 2010; Resnick et al., 2013). Also, the treatment process can lead to psychosocial issues including fatigue, depression and reduction of self-esteem (Sanda et al., 2008). Therefore, PCa survivors suffer from persistent physical and psychological disabilities affecting their quality of life (QoL) and need supportive care by healthcare professionals (Resnick et al., 2013; Spence, Heesch, & Brown, 2010).

### 1.1 | Exercise and QoL

Exercise is an appropriate strategy that can relieve patients' mental and physical issues and reduce the risk of cardiovascular diseases and secondary malignancies. It also helps with the amelioration of non-specific cancer-related symptoms and improvement of QoL (Ballard-Barbash et al., 2012; Mishra et al., 2012). A systematic review and meta-analysis by Vashistha, Singh, Kaur, Prokop and Kaushik (2016) concluded that exercise improved QoL and reduced fatigue in patients with PCa. However, exercise has not been incorporated into the rehabilitation programme and the healthcare process after the diagnosis of cancer (Lakoski, Eves, Douglas, & Jones, 2012). It has been reported that patients with PCa do not follow a regular exercise programme and do not reach the recommended level of physical activity (Chipperfield et al., 2013). Group exercise due to the encouraging effect of social interactions can promote patients' sustainable participation in physical activities (Beauchamp et al., 2018). Therefore, it can be an important method for maintaining and improving QoL and reducing the probable social disadvantages of old age (Dickens, Richards, Greaves, & Campbell, 2011; Rajotte et al., 2012).

### 1.2 | Use of facilities in the community for patient care

Given the reduction of the length of hospital stays and increase of the healthcare cost for patients with PCa (Turini, Redaelli, Gramegna, & Radice, 2003), transitional care from hospital to patients own home and the use of community facilities during patients care have been emphasized (Choi, Chang, & Kong, 2015; Lundy & Janes, 2009). For instance, urban parks are good resources for behavioural changes and group physical activities (McCormack, Rock, Toohey, & Hignell, 2010) and have been shown effective for improving patients' mental and physical well-being (Sugiyama, Leslie, Giles-Corti, & Owen, 2008).

### 1.3 | Self-management approach

The self-management approach (SMA) has been defined as the learning of and practicing skills required for having an emotionally satisfying life and to face with a chronic illness (Mendelson, McCullough, & Chan, 2010). Provision of information, education and support, enhancement of patients' well-being and QoL are the advantages of healthcare interventions based on SMA (Cockle-Hearne & Faithfull, 2010; McCorkle et al., 2011). SMA offers a strategy to reduce the effects of PCa and its treatment through prioritizing men's healthcare needs and boosting their motivation for participation in healthcare (McCorkle et al., 2011). The effectiveness of the SMA-based cognitive and behavioural programme on lower urinary tract symptoms

in patients with PCa has been shown (Faithfull, Cockle-Hearne, & Khoo, 2011). Also, the SMA-based physical activity programme relieved symptoms among patients with lung cancer undergoing surgery (Granger et al., 2018) and in breast cancer survivors (Damush, Perkins, & Miller, 2006). Therefore, an exercise programme based on the SMA and the use of exercise facilities in the community was designed in this research to examine the effect of the exercise programme on the QoL of PCa survivors. The research hypothesis was as follows:

An exercise programme based on the SMA and the use of exercise facilities in the community improves the QoL of PCa survivors.

## 2 | METHODS

### 2.1 | Design

The study used a single-blind, parallel, two-armed, randomized controlled trial and was conducted on PCa survivors in a large referral teaching hospital in an urban area of Iran from April 2017 to January 2018.

### 2.2 | Participants and sampling

Eligibility criteria for participation in this study were being diagnosed with PCa, active participation in treatment sessions within the past 3–12 months, no metastasis to other parts of the body, no history of neurological, cardiovascular, respiratory disorders affecting patients' physical activity level, age at least 45 years and living in the urban area of the city. Exclusion criteria were unwillingness to take part in the study and presence of any health issue that hindered participation in the physical activity programme.

The sample size was estimated 35 patients in each group based on the study of Winters-Stone et al. (2015) and given 95% confidence interval, 80% power and assuming that the exercise programme increased QoL 10 scores in the functional dimension of the European Organization for Research and Treatment of Cancer. Quality of life Questionnaire-Core 30 Version 3 (EORTC QLQ-C30) tool. However, considering 10% possibility of samples' drop out, the final sample size was determined as 40 patients in each intervention and control group.

The medical files of patients with PCa who were admitted to the radiotherapy department of a large referral teaching hospital from April 2015 to February 2017 were reviewed to find eligible patients. Next, the patients were randomly selected using a randomized block design with the ration of 4:4 via the table of random numbers and were randomly assigned to the intervention group and control group (Figure 1). The random allocation sequence with 20 quadruple blocks was generated by the statistical adviser (SH) using https://www.sealedenvelope.com website. Also, numbered sealed opaque envelopes were used sequentially for concealment, which contained cards with letters A or B indicating the allocation sequence. The envelopes were opened to allocate each participant to the groups. Although blinding was impossible due to the nature of the intervention, data analyser (SH) was blind to the group assignment.

### 2.3 | Data collection

#### 2.3.1 | Social and demographic characteristics form

Data regarding PCa and the patients' socio-demographic characteristics were collected through interviewing the patients and reviewing their medical files (Table 1). The validity of this form was confirmed through face and content validity methods.

#### 2.3.2 | European Organization for Research and Treatment of Cancer. Quality of life Questionnaire-Core 30 Version 3

This questionnaire belongs to the European Cancer Research and Treatment Agency and is used to assess QoL in patients with cancer. It measures five functional domains and nine domains of symptoms, global health status and QoL. The functional domain includes physical, role, emotional, cognitive and social aspects. Symptoms include fatigue, nausea and vomiting, pain, dyspnoea, insomnia, appetite loss, constipation and diarrhoea. In addition, it asks about financial difficulties and a separate domain is for the global health status and QoL (Fayers et al., 2015).

The validity and reliability of this questionnaire have been confirmed by Yusoff, Low and Yip (2014). Safaee, Dehkordi Moghimi and Tabatabaie (2007) reported that the third Farsi version of this questionnaire was reliable and valid for patients with cancer. The Cronbach's alpha coefficients of the questionnaire's domains were higher than 0.7 indicating its appropriate reliability. Also, convergence validity scores varied from 41% to 79% in the physical function to 99% in the general health status.

#### 2.3.3 | European Organization for Research and Treatment of Cancer. Quality of Life Questionnaire—Prostate Cancer Module

This questionnaire is used as a supplement to the EORTC QLQ-C30 questionnaire in order to assess QoL in patients with urinary tract cancer. It contains 25 questions in six domains of sexual activity, sexual function, urinary, bowel and hormonal treatment-related symptoms, and the use of incontinence aid (van Andel et al., 2008). van Andel et al. (2008) reported that Cronbach's alpha coefficients and convergent validity scores were higher than 0.7 and 0.4, respectively, for most domains. This questionnaire was translated to Farsi and was filled out by 20 PCa survivors. Its internal consistency through the calculation of Cronbach's alpha coefficients for the whole instrument and its domains were 0.63 and 0.85, respectively. Also, the test–retest coefficient within a 2-week interval was 0.895.

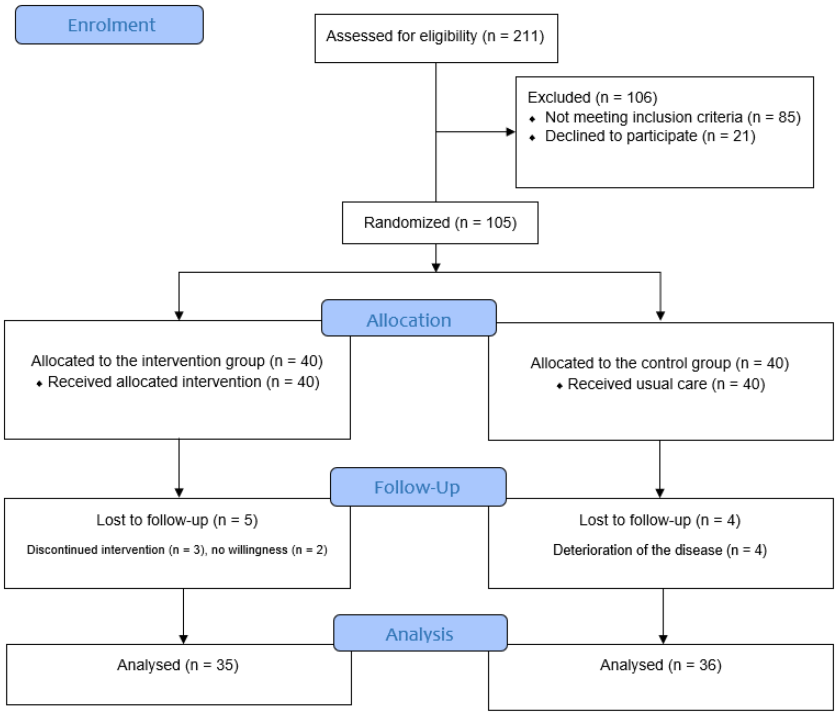


**FIGURE 1** The process of the study according to the CONSORT flow diagram (2010). The participants (*n* = 80) were randomly assigned to the groups using a block design method with the ration of 4:4 (*n* = 40 in each group)

The Likert scale was used for both questionnaires, and the score for each domain was calculated and reported separately, then it was converted to 0–100. In the functional domains, a higher score indicated the patient's better condition, but in the symptom domains, a higher score meant more severity (Fayers et al., 2015).

### 2.3.4 | Follow-up checklist

A researcher-made checklist was developed to assess adherence to the exercise programme in the intervention group. It included week days and type of exercise such as aerobic, resistance and flexibility. Exercise should be performed on the specific days of the week and should be marked on the checklist after each exercise session. It was placed at the end of the exercise programme booklet to be filled out by the intervention group and was controlled by the researcher (A. M.) every week through making phone calls.

## 2.4 | Procedure

A 12-week exercise programme was designed, and a booklet was compiled by the research team after preforming a review of international literature (Hayes, Spence, Galvão, & Newton, 2009; Schmitz et al., 2010) based on exercise guidelines for cancer survivors developed by the American College of Sports Medicine (Schmitz et al., 2010) and Exercise and Sport Science of Australia (Hayes et al., 2009). The booklet's compilation was guided by the social cognitive theory (Bandura, 1986) and the SMA (Mendelson et al., 2010). The validity of the exercise booklet was assessed and confirmed by two physical education specialists, two sport technicians and one urologist.

The exercise programme included aerobic, resistant, flexible and pelvic floor muscle exercises. The severity of aerobic walking was from light to moderate based on the patient tolerance and initially was started for 60 min/week in the first 2 weeks. Next, 20 min was added to the duration of exercise every 2 weeks and finally reached 150 min/week in the last 4 weeks. Resistance exercises for improving muscle strength consisted of 11 exercises for large muscles including biceps curls, shoulder shrugs, side lateral raise, one arm row, overhead press, chest press, leg extension, heel raises, hamstrings curl, gluteal extension and body weight squat. Each exercise was started for eight times in one set per each session in the first 2 weeks and was gradually reached 12 times in two sets in the last 2 weeks. The intensity of weight tolerance exercise was from low to moderate and without any need for auxiliary device. The exercises were performed twice a week, one in the group and one individually.

Flexibility exercises for the elongation of main muscles and tendons consisted of 10 exercises including triceps stretch, chest stretch, straight arm chest stretch, shoulder stretch, neck stretch, hip rotator stretch, calf stretch, hamstrings stretch, lower back stretch, and wrist flexion and interlaced fingers stretch. Each exercise was started for one time, held 5 s, in each session and was gradually reached two times, held 15 s, in the last 2 weeks. Similarly, these exercises also were performed twice a week, one in the group and one individually. In addition, the patients were taught to perform pelvic floor exercise in a daily manner.

The intensity of aerobic and resistance exercises was measured using the Borg pressure scale with 6 as 'no pressure' to 20 as 'the maximum pressure' (Krause, 2010). The amount of pressure perception

**TABLE 1** Demographic and social characteristics of the patients in the groups

| Variable | Intervention ($n$ = 35) | Control ($n$ = 36) | Variable | Intervention ($n$ = 35) | Control ($n$ = 36) |
|---|---|---|---|---|---|
| Mean age, y (*SD*) | 69.40 (5.77) | 70.39 (5.45) | **Time passed from cancer diagnosis *n* (%)** | | |
| BMI, kg/m$^2$ (*SD*) | 24.40 (2.77) | 24.64 (2.43) | Less than 1 year | 1 (2.9) | 6 (16.7) |
| Marital status *n* (%) | | | 1–3 years | 20 (57.1) | 16 (44.4) |
| Married | 25 (71.4) | 24 (66.7) | | | |
| Single | 10 (28.6) | 12 (33.3) | | | |
| Education level *n* (%) | | | More than 3 years | 14 (40) | 14 (38.9) |
| Under diploma | 25 (71.4) | 28 (77.8) | **Treatment type *n* (%)** | | |
| Diploma and higher | 10 (28.6) | 8 (22.2) | Surgery | 11 (31.4) | 13 (36.1) |
| Occupation *n* (%) | | | Radiotherapy | 35 (100) | 36 (100) |
| Employed | 10 (28.6) | 8 (22.2) | Hormone therapy | 28 (80) | 23 (63.9) |
| Retired | 21 (60) | 20 (55.6) | **Background diseases *n* (%)** | | |
| Unemployed | 4 (11.4) | 8 (22.2) | Hypertension | 14 (40) | 17 (47.2) |
| Economic status (self-report) *n* (%) | | | Diabetes | 3 (8.6) | 8 (22.2) |
| Sufficient | 8 (22.9) | 6 (16.7) | **History of performing exercise *n* (%)** | 11(31.4) | 7 (19.4) |
| Relatively sufficient | 20 (57.1) | 17 (47.2) | **Smoking** | | |
| | | | Yes | 10 (28.6) | 16 (44.4) |
| | | | No | 25 (71.4) | 20 (55.6) |
| Not sufficient | 7 (20) | 13 (36.1) | **History of sexual problem before cancer** | | |
| Need to help for daily activities *n* (%) | | | Yes | 4 (11.4) | 3 (8.3) |
| | | | No | 31 (88.6) | 33 (91.7) |
| Yes | 20 (57.1) | 24 (66.7) | | | |
| No | 15 (42.9) | 12 (33.3) | | | |

*Note*: There were no statistically significant differences between the groups at baseline ($p > 0.05$ for all variables).
Abbreviations: BMI, body mass index; *N*, number; *SD*, standard deviation; Y, year.

for aerobic and resistance movements was described from light to moderate, which corresponded to 11 as 'relatively modest' and 13 as 'somewhat rigid' (Krause, 2010). The patients were taught about how to use this scale during preforming the exercise programme.

Before randomization, the data collection tools were filled out by the groups. Next, the intervention group was assigned to five groups consisting of eight patients in each group based on the closeness of their living place and convenience of access to exercise facilities in the urban park.

According to the SMA, the patients could individually manage and perform the exercise programme after receiving some information and using the booklet along with an indirect supervision by the main researcher (A. M.). Education regarding the exercises programme was provided to each group separately in two sessions lasting for 2 h. The booklet containing pictorial information on how to perform the exercise programme during 12 weeks and how to replicate exercises was given to them.

The intervention group performed the exercise programme during 12 weeks consisting of one session of group exercise per week in the assigned group in the urban park with the presence of the first researcher (A. M.) and three sessions of individual exercise per week. Individual exercise sessions were managed by the participants themselves and only indirect supervisions were provided using telephone follow-ups in a weekly manner.

The control group received routine healthcare for the treatment of PCa and were instructed to maintain their customary physical activities and dietary patterns. The researcher only contacted them to ensure their participation in this study. After the intervention, the groups were visited in their place of residence and were asked to fill out the data collection tools.

## 2.5 | Ethical considerations

The research proposal was approved by the Medical Ethics Committee affiliated with Tehran University of Medical Sciences (decree code: IR.TUMS.FNM.REC.1396.2209). The research protocol was registered on the IRCT website under the code of IRCT20180113038347N1.

The permission to enter the research zone was obtained from hospitals' authorities. The patients were informed of the study aim and method. They were also ensured of the confidentiality of data collection. They could leave the study at any time without any effect on their care. The informed consent form was signed by those patients who were willing to participate in the study.

### 2.6 | Data analysis

Descriptive and inferential statistics were used to analyse data via SPSS Version 22. The homogeneity of the groups was assessed using the independent *t* test, Fisher's exact and $\chi^2$ tests. To compare QoL scores before and after the intervention between the groups, the independent *t* test, paired *t* test, Wilcoxon test and covariance analysis were used. The rate of adherence to the exercise programme in the intervention group in the first and the second 6 weeks was assessed using the Wilcoxon test. $p < 0.05$ was considered statistically significant.

## 3 | RESULTS

Out of 211 patients who were assessed for eligibility criteria, 80 patients were randomly allocated to intervention ($n = 40$) and control ($n = 40$) groups. Four patients in the control group were hospitalized and excluded. Two patients experienced cancer deterioration and three patients left the programme from the intervention group. Therefore, data collected from 36 patients in the control group and 35 patients in the intervention group were used for analysis.

### 3.1 | Demographic characteristics

The patients' mean age in the intervention and control groups was 69.40 and 70.39 years, respectively. The intervention group (57.1%) and the control group (44.4%) were diagnosed with cancer in the last 3 years. All patients had a history of radiotherapy, and the most common types of treatment in both groups were hormone therapy and surgery (Table 1). No statistically significant differences between the groups were observed in terms of socio-demographic and PCa-related characteristic ($p > 0.05$).

### 3.2 | QoL

Before the programme, the groups had no statistically significant differences in all functional domains of the questionnaires, global health status and QoL (Questions 29 and 30 of the EORTC QLQ-C30 questionnaire) ($p > 0.05$) except in the cognitive function ($p = 0.04$).

In the symptoms domain, no statistically significant differences between the groups in all symptoms ($p > 0.05$) were found except pain ($p = 0.002$) and diarrhoea ($p = 0.002$).

Comparison of QoL between the groups after the programme showed that in the domains of physical function ($p < 0.001$), role function ($p = 0.002$), fatigue ($p = 0.001$) and sexual activity ($p = 0.001$), the intervention group had a better status than the control group (Tables 2–4).

Regarding the within-groups comparisons of QoL before and after the exercise programme, in the functional domains, except for cognitive function ($p = 0.07$) and sexual activity ($p = 0.16$), functions scores significantly increased after the programme in the intervention group ($p < 0.05$). However, no statistically significant increase in the global health status and QoL was reported ($p > 0.05$). In the control group, none of the functions improved compared with before the programme. In the symptoms domains, the post-intervention scores decreased significantly in fatigue, insomnia, constipation and diarrhoea, urinary symptoms, bowel and hormonal treatment-related symptoms compared with scores before the programme ($p < 0.05$).

Within groups' comparisons showed no statistically significant differences in the QoL domains in the control group before and after the programme ($p > 0.05$) (Tables 2–4).

### 3.3 | Adherence to the exercise programme

The rate of adherence to the exercise programme was reported 80.09% in the intervention group. Although it did not show statistically significant differences between the first 6 and the second 6 weeks, an improvement in the second 6 weeks was observed ($p > 0.05$) (Table 5).

## 4 | DISCUSSION

The effect of the exercise programme based on the SMA on the QoL of PCa survivors was investigated in this research.

The study findings showed improvements in various aspects of QoL and adherence to the exercise programme. Similarly, Skolarus et al. (2019) showed that self-management using printed materials improved urinary, bowel, sexual and general conditions in PCa survivors. Faithfull et al. (2011) reported that self-management cognitive and behavioural programmes relieved lower urinary tract symptoms in patients with PCa. Furthermore, the efficacy and feasibility of self-management exercise programmes have been shown in patients with lung cancer (Damush et al., 2006) and in breast cancer survivors (Granger et al., 2018).

The physical function of the PCa survivors was improved, and their fatigue was reduced using daily exercises without the use of advanced sports equipment. Similarly, Galvão et al. (2014) and Winters-Stone et al. (2015) reported that education of exercise to patients with PCa undergoing hormone therapy, radiotherapy and ADT improved their physical performance. Galvão et al. (2018) found that exercise preserved and improved physical function in patients with PCa with bone metastases. Also, two systematic reviews supported the effectiveness of physical activity in the reduction of

**TABLE 2** Effect of the exercise programme on functional domains and overall quality of life- QLQ-C30 Questionnaire

| Variable | Group | Baseline mean (*SD*) | After the intervention mean (*SD*) | $p^{a,*}$ | $p^{b,**}$ | $p^{c,***}$ |
|---|---|---|---|---|---|---|
| Physical function | Intervention | 60.19 (13.95) | 72.57 (11.63) | 0.18 | <0.001 | <0.001[a] |
| | Control | 55.74 (14.17) | 60.19 (11.87) | — | 0.14 | — |
| Role function | Intervention | 58.57 (13.01) | 70.95 (10.95) | 0.72 | <0.001 | 0.002[a] |
| | Control | 59.72 (14.01) | 61.57 (13.10) | — | 0.08 | — |
| Emotional function | Intervention | 53.57 (12.00) | 64.52 (11.32) | 0.42 | <0.001 | 0.35[a] |
| | Control | 55.78 (11.05) | 62.04 (11.35) | — | 0.28 | — |
| Cognitive function | Intervention | 73.80 (19.08) | 78.57 (14.33) | 0.04 | 0.07 | 0.94[c] |
| | Control | 81.94 (14.57) | 82.87 (12.90) | — | 0.53 | — |
| Social function | Intervention | 40.47 (19.92) | 58.1 (14.22) | 0.87 | <0.001 | 0.13[a] |
| | Control | 47.68 (14.40) | 53.24 (12.48) | — | 0.39 | — |
| Global health status and quality of life | Intervention | 34.04 (13.31) | 33.33 (9.26) | 0.39 | 0.79 | 0.41[a] |
| | Control | 36.57 (11.31) | 35.18 (9.78) | — | 0.58 | — |

Abbreviation: *SD*, standard deviation.
[a]Independent *t* test.
[b]Paired *t* test.
[c]Covariance analysis test.
[*]Comparison of the groups at baseline.
[**]Comparison of each group at baseline and after the programme.
[***]Comparison of the groups after the programme.

**TABLE 3** Effect of the exercise programme on symptom domains of the QLQ-C30 questionnaire

| Variable | Group | Baseline mean (*SD*) | After the intervention mean (*SD*) | $p^{a,*}$ | $p^{**}$ | $p^{***}$ |
|---|---|---|---|---|---|---|
| Fatigue | Intervention | 52.38 (13.63) | 33.97 (10.06) | 0.35 | <0.001[b] | 0.001[a] |
| | Control | 49.38 (13.40) | 42.59 (11.42) | — | 0.07[b] | — |
| Nausea and vomiting | Intervention | 8.10 (10.97) | 5.71 (8.99) | 0.93 | 0.23[b] | 0.19[a] |
| | Control | 7.87 (13.50) | 8.80 (10.90) | — | 0.67[b] | — |
| Pain | Intervention | 41.90 (16.85) | 40.47 (16.31) | 0.002 | 0.36[c] | 0.36[d] |
| | Control | 29.17 (17.08) | 28.24 (15.84) | — | 0.52[c] | — |
| Dyspnoea | Intervention | 25.71 (24.37) | 20 (21.69) | 0.24 | 0.08[c] | 0.76[a] |
| | Control | 19.44 (20.12) | 18.52 (20.23) | — | 0.31[c] | — |
| Insomnia | Intervention | 48.57 (21.91) | 32.38 (18.94) | 0.36 | <0.001[c] | 0.26[a] |
| | Control | 43.53 (24.97) | 37.04 (15.49) | — | 0.06[c] | — |
| Appetite loss | Intervention | 23.81 (26.29) | 22.86 (17.66) | 0.52 | 0.79[c] | 0.58[a] |
| | Control | 27.78 (25.82) | 20.37 (19.96) | — | 0.059[c] | — |
| Constipation | Intervention | 36.19 (26.04) | 27.62 (18.94) | 0.35 | 0.03[c] | 0.96[a] |
| | Control | 30.56 (24.40) | 27.78 (14.91) | — | 0.46[c] | — |
| Diarrhoea | Intervention | 22.86 (19.42) | 12.38 (18.23) | 0.002 | 0.005[c] | 0.37[d] |
| | Control | 9.26 (15.14) | 11.11 (15.93) | — | 0.56[c] | — |
| Financial difficulties | Intervention | 61.90 (33.47) | 63.81 (34.65) | 0.26 | 0.15[c] | 0.46[a] |
| | Control | 70.37 (29.58) | 69.44 (29.14) | — | 0.31[c] | — |

Abbreviation: *SD*, standard deviation.
[a]Independent *t* test.
[b]Paired *t* test.
[c]Wilcoxon test.
[d]Covariance analysis test.
[*]Comparison of the groups at baseline.
[**]Comparison of each group at baseline and after the programme.
[***]Comparison of groups after the programme.

**TABLE 4** Effect of the exercise programme on functional domains and symptoms domain of the QLQ-PR25 questionnaire

| Variable | Group | Baseline mean (*SD*) | After the intervention mean (*SD*) | $p^{c*}$ | $p^{**}$ | $p^{c***}$ |
|---|---|---|---|---|---|---|
| *Functional domain* | | | | | | |
| Sexual activity | Intervention | 28.33 (11.70) | 31.25 (13.22) | 0.10 | 0.16[d] | 0.001 |
| | Control | 23.61 (8.39) | 21.84 (7.85) | — | 0.42[d] | — |
| Sexual function | Intervention | 50.00 (6.80) | 51.04 (15.71) | 0.28 | 0.01[d] | 0.67 |
| | Control | 55.56 (4.81) | 58.33 | — | — | — |
| *Symptoms domain* | | | | | | |
| Urinary symptoms | Intervention | 36.31 (15.51) | 24.64 (12.35) | 0.22 | <0.001[d] | 0.07 |
| | Control | 32.06 (13.87) | 30.90 (12.84) | — | 0.057[d] | — |
| Bowel symptoms | Intervention | 15.24 (7.95) | 9.52 (6.44) | 0.31 | <0.001[d] | 0.29 |
| | Control | 13.43 (6.98) | 11.11 (6.30) | — | 0.08[d] | — |
| Incontinence aid[b] | Intervention | 85.19 (17.57) | 80.00 (17.21) | 0.56 | 0.31[e] | 0.32 |
| | Control | 79.17 (24.80) | 70.38 (21.36) | — | 0.15[e] | — |
| Hormonal treatment-related symptoms | Intervention | 18.41 (7.59) | 14.60 (6.19) | 0.051 | 0.001[d] | 0.77 |
| | Control | 15.12 (6.31) | 14.20 (5.70) | — | 0.16[d] | — |

Abbreviation: *SD*, standard deviation.
[a]This section was related to Questions 25–22, and only those patients who had sexual activities in the past 4 weeks responded to these questions. In the intervention group, before and after the programme, four and eight participants and in the control group, three and one participants responded to the questions, respectively. The analysis was performed on their responses.
[b]This section was related to the difficulty of using the incontinence aid, and the participants answered this question only if they wore an incontinence aid. In the intervention group, before and after the programme, 9 and 10 participants, and in the control group, 8 participants responded to this question, respectively. The analysis was performed on their responses.
[c]Independent *t* test.
[d]Paired *t* test.
[e]Wilcoxon test.
[*]Comparison of the groups at baseline.
[**]Comparison of each group at baseline and after the programme.
[***]Comparison of the groups after the programme.

**TABLE 5** Adherence to the exercise programme by the intervention group

| Exercise programme % (*SD*) | The first 6 weeks | The second 6 weeks | Total 12 weeks | $p^{a,*}$ |
|---|---|---|---|---|
| Group exercise | 83.33 (04.16) | 83.84 (08.82) | 83.59 (04.87) | 0.76 |
| Aerobic exercise (walking) | 78.11 (07.20) | 81.48 (06.46) | 79.80 (04.87) | 0.053 |
| Resistant exercises | 79.80 (09.08) | 80.81 (11.11) | 80.30 (06.52) | 0.72 |
| Flexibility exercises | 76.77 (10.15) | 77.78 (12.95) | 77.27 (07.29) | 0.83 |
| Total | 79.04 (04.50) | 81.14 (03.85) | 80.09 (02.93) | 0.052 |

Abbreviation: *SD*, standard deviation.
[a]Wilcoxon test.
[*]Comparison between the first and the second 6 weeks.

fatigue among patients with cancer (Kessels, Husson, & Van der Feltz-Cornelis, 2018; Vashistha et al., 2016).

In the present study, no statistically significant differences between the groups were reported in terms of the global health status and QoL. Similarly, Culos-Reed et al. (2010) and Nilsen et al. (2015) showed that physical activity did not influence on overall QoL in patients with PCa undergoing ADT. On the other hand, Segal et al. (2003) demonstrated that the education of resistance exercise in PCa survivors undergoing radiotherapy significantly improve their QoL after 12 weeks. As a reason for differences in results, in the study by Segal et al. (2003), the Functional Assessment of Cancer Therapy-Prostate (FACT-P) tool was used, which might have more sensitivity for the measurement of the short-term QoL than the two questions of the QLQ-C30 (Culos-Reed et al., 2010).

Sexual relationship increased by 11% compared with before the programme in the intervention group, but it reduced by about 5% compared with its initial value in the control group. Similarly, Cormie et al. (2015) found that regular exercise at the onset of ADT improved sexual function in patients with PCa. Sexual dysfunction including reduced sexuality, erectile dysfunction and lack of orgasm are the most common sexual issues among PCa survivors (Galvão et al., 2014, 2015; Harju et al., 2017).

In our study, group exercise improved social function in the intervention group. Regular exercises have physical and psychological benefits for patients with PCa. They can improve self-sufficiency, sense of independence and feeling of power leading to an improvement of social performance (Hamilton, Chambers, Legg, Oliffe, & Cormie, 2015).

Also, urinary symptoms reduced in intervention group that could be attributed to performing pelvic floor muscles exercise besides aerobic, resistance and flexibility exercises. Consistent with our results, long-term pelvic floor exercises have been shown to create a positive effect on urinary incontinence after prostatectomy (Mei-Li-Yang Wu, Wang, & Chao-Hua Peng, 2019).

The reduction of bowel problems after the exercise programme in the intervention group was observed. PCa survivors undergoing radiotherapy often have gastrointestinal and rectal problems, which may not be improved even after 2–5 years of diagnosis (Resnick et al., 2013). Thomas et al. (2013) found that patients undergoing radiotherapy that were more physically active had lower rectal and bowel symptoms, because exercise increased blood supply to pelvic muscles, and improved mucosal cover and pelvic muscle strength (Thomas et al., 2013).

The reduction of complications related to hormonal treatments compared with before the programme was reported in the intervention group. Similarly, Galvão et al.'s (2014) study on resistance and aerobic exercise in men with PCa undergoing ADT showed the same positive effects of exercise on these complications.

Our study participants achieved lower scores in the QoL domains and higher scores in the severity of symptoms, because they received various treatments including radiotherapy, hormone therapy and radical prostatectomy. The similar level of QoL in patients with PCa after diagnosis in the study of Smith et al. (2009) was attributed to undergoing various treatments in a 3-year cohort study.

The study participants showed high adherence to the exercise programme. The group exercise increased their adherence to exercise in the second six weeks and promoted their sustainable participation in the exercise programme. Adherence to the healthcare intervention protocol is one part of the assessment of its effectiveness (Winger et al., 2014). Nilsen et al. (2015) reported an acceptable adherence rate to lower limbs and upper limbs exercises in patients with PCa undergoing ADT. Converse to our study procedure, their exercise programme was conducted under the direct supervision of the researcher.

### 4.1 | Limitations of the study

Blinding was impossible due to practical reasons. Also, the duration of the exercise programme was 12 weeks. Therefore, further studies with the duration of exercise over 12 weeks are needed to investigate long-term changes in all aspects of QoL.

## 5 | CONCLUSIONS

Our findings have implications to improve adherence to self-care and well-being activities in patients with PCa. Nurses are suggested to plan for improving the participation of PCa survivors in exercise programmes in order to reduce the complications of treatment and improve their QoL. Nurses should also be taught about SMA and the use of exercise facilities in the community during degree education and in-service training to incorporate them into rehabilitation programmes for PCa survivors.

### DISCLAIMERS

The views expressed in the submitted article are his/her own and not an official position of the institution or funder.

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### CONFLICT OF INTEREST

The authors declare that they have no conflict of interests.

### AUTHORSHIP STATEMENT

AM, MV and SPR conceptualized and designed the study and conducted the intervention. AM and SH analysed the data. RM helped with drafting the exercise programme. AM and MV wrote the first draft of the article. All authors revised the manuscript for important intellectual content and approved the final submitted version to be published.

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