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Low physical activity in patients diagnosed with head and neck cancer

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Abstract

Background: This pilot study aimed to describe physical activity (PA) and self-perceived function, health and quality of life (QoL) prior to oncological treatment in patients with head and neck cancer (HNC).

Methods: In a prospective study including 49 patients, self-perceived PA (Saltin-Grimby scale) and health-related QoL (European Organization for Research and Treatment of Cancer Quality of Life questionnaire Core 30 and EQ-5D) were assessed. Further, PA was also measured by an accelerometer attached to the thigh for eight consecutive days. The accelerometer PA was compared to the PA of a reference population assessed with the same method. Results presented are from data collected before start of oncological treatment.

Results: The patients (44-79 years, 65% males) spent most of their time in sedentary behavior: a median of 555 minutes/day in bed (39% of total) and 606 minutes/day sitting (41%). Only 129 minutes/day were spent moving/walking. Patients with higher education, reduced physical function and higher fatigue were less physically active ($P \leq .01$). Further, the different PA measures demonstrated a pattern of being less physically active compared to the reference population.

Conclusions: Patients diagnosed for HNC may have low PA level. Assessment of PA from accelerometer data may be an important component of oncological treatment to identify patients in need for PA intervention that may enhance treatment outcome.

KEYWORDS
accelerometer, head and neck cancer, physical activity

1 | INTRODUCTION

Patients with head and neck cancer (HNC) are most often males and over 65 years old. Smoking, alcohol consumption, and infection with

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human papillomavirus are common risk factors for developing the disease.[1,2] Globally, a total of 888 000 new cases are diagnosed annually, and HNC is now the seventh most common cancer overall.[2] In Sweden, the relative 5-year survival is approximately 65% to 67%.[1]

Physical activity (PA) as part of the treatment in patients with HNC has showed positive effects on, for example, fitness, lean body mass, quality of life, physical function, pain, and depressive symptoms.[3] Less is reported about the effect on survival rate in HNC patients.[3] In patients with other cancers, physical activity interventions reduce risk of recurrence and mortality.[4] Further, pretreatment healthy behaviors (including physical activity) are associated with mortality in HNC patients.[5] In addition, the effect of PA interventions on physical function, fatigue, muscle strength, and quality of life is greater in cancer patients with low pretreatment levels.[6] Therefore, it is important to identify those patients with the greatest need for PA intervention as part of oncological treatment. Pretreatment assessment of PA would be one method to identify these patients.

There are only a few studies that have assessed PA prior to oncological treatment and they have reported low level of PA.[7-9] In addition, lower PA was associated with lower functional wellbeing, higher fatigue, more comorbidity, and higher tumor stage.[7,8] Two of the studies used self-report methods,[8,9] which are prone to reporting bias. An objective method (accelerometer) was used in one of the studies.[7] Accelerometers have been shown to have less measurement error[10] and stronger association with measures of cardiovascular health[11] than self-report methods. Further, large disagreement between these methods occurs in HNC patients[12] as well as in the general population,[13,14] across the PA intensity range. Therefore, self-report and accelerometer methods may not be directly comparable and the use of accelerometers may improve identification of HNC patients with the greatest need of PA intervention. Still, even if self-report methods can provide a crude categorization of the PA level and prediction of health outcomes,[13] the ability depends on the specific method used and needs to be evaluated before implemented into clinical practice.

Assessment of PA using accelerometers can be performed placing the accelerometer at the hip, wrist or on the thigh.[15] The hip has been the traditional location for providing measures of PA intensity (eg, sedentary, light, moderate, vigorous), but the wrist and thigh are now used more frequently. The thigh placement provides more reliable measures of activity type (eg, sit, stand, walk, cycling, run) and is therefore more useful to partition sitting from standing and moving, which has been of more recent research interest in relation to health. This placement has recently been implemented in large population studies, such as the Copenhagen City Heart Study (CCHS) from which data has been presented and could be used as reference material,[16] and from the Trøndelag Health Study in Norway and the Swedish CArdioPulmonary bioImage Study (in addition to hip placement), from which data is about to emerge and could also be used as reference material in near future. Still, considerable measurement errors may also occur with accelerometers, if the sources to these errors are not apparent and resolved.[15]

The aim of the present pilot study was to present descriptive data on PA types and intensities using an accelerometer worn on the thigh, as well as self-reported PA, function, health, and QoL prior to oncological treatment in patients diagnosed with HNC.

2 | MATERIALS AND METHODS

2.1 | Participants

Subjects diagnosed with HNC are discussed at the weekly multidisciplinary tumor board meeting at Sahlgrenska University Hospital in Gothenburg, Sweden, where diagnosis and treatment are determined. Criteria for study inclusion were that the patients were adults (>18 years) and receiving treatment of curative intent for HNC (ie, surgery ± radiotherapy ± chemotherapy). Exclusion criteria included the inability to independently fill out questionnaires, or existence of tumor of the nose, sinus, naso/rhinopharynx or the parotid gland. Patients with recurrent disease or having more than one tumor diagnosis were excluded. Patients who fulfilled the inclusion/exclusion criteria were asked to participate in this prospective study. They gave informed consent prior to participation. Results presented herein are based on data collected before the start of oncological treatment. The study was reviewed and approved by the Regional Ethical Board in Gothenburg (Dnr 101-16 and T1009-18).

2.2 | Patient characteristics

Smoking and alcohol habits, educational level, occupation, and living status were assessed through questionnaires. Body height and weight were reported by the patient and body mass index (BMI) was calculated (body weight (kg)/height (m^2)) and classified as underweight (BMI below 18.5), normal weight (BMI between 18.5 and 25), overweight (BMI above 25), and obese (BMI above 30). Alcohol consumption levels were derived from Alcohol Use Disorders Identification Test Consumption (AUDIT-C),[17] where higher scores define higher levels of alcohol consumption. Calculated scores of ≥4 and ≥3 indicate high alcohol consumption levels for men and women, respectively. Educational levels were divided into primary school (up to 9 years), upper secondary school (12 years) and higher education. Educational level was dichotomized into low level (up to upper secondary school) and higher education. Living status was dichotomized into living alone or living with someone. In addition, comorbidity was evaluated using the Adult Comorbidity Evaluation scale (ACE-27).[17]

2.3 | Health status

The EQ-5D is a short, generic health-related QoL instrument that consists of assessments in five dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression) divided into three levels of severity (no complaints, some complaints, and severe complaints).[18,19] Only the dimensions pain/discomfort and anxiety/depression were hypothesized to be associated with PA and were therefore included in the analyses of this study.

2.4 | Quality of life

The European Organization for Research and Treatment of Cancer Quality of Life Questionnaires Core-30 (EORTC QLQ-C30) is a generic instrument developed for assessment of health-related QoL in cancer patients.[20,21] It consists of 30 items divided into 6 functional domains (global QoL, physical function, role function, emotional function, cognitive function, and social function), 3 symptom domains (fatigue, nausea/vomiting, and pain) and 6 single-items (dyspnea, insomnia, appetite loss, constipation, diarrhea, and financial difficulties). All items are responded to in a 4-point scale ranging from "not at all" to "very much," except the global QoL domain, which has a 7-point response format. All domain scores are transformed to a scale from 0 to 100. For functional and global domains, a high score indicates a high, that is, good, function. For symptom and single-item domains, a high score indicates a high, that is, bad, level of symptom burden. When tested in large, cross-cultural samples of patients with cancer, the core questionnaire has demonstrated satisfactory to excellent reliability and validity.[20] In this study, the following domains were expected to be associated with PA and were therefore selected and used in comparison to accelerometer data: Physical function, role function, pain, fatigue, and insomnia.

2.5 | Self-reported PA

Patients were asked to report their self-perceived PA according to the Saltin-Grimby PA level scale.[22] The patients rated their PA during leisure time over the past week according to the following response categories: (a) Physically inactive: being almost completely inactive, reading, watching television, watching movies, using computers, or doing other sedentary activities; (b) some light PA: being physically active for at least 4 hours/week such as riding a bicycle or walking to work, walking with the family, gardening, fishing, table tennis, bowling, and so forth; (c) regular PA and training: spending time on heavy gardening, running, swimming, playing tennis, badminton, calisthenics, and similar activities, for at least 2 to 3 hours/week; (d) regular hard physical training for competition sports: spending time in running, orienteering, skiing, swimming, soccer, European handball, and so forth, several times per week. The Saltin-Grimby PA level scale has been used extensively in >600 000 patients, has demonstrated high validity and reliability and predicts long-term morbidity and mortality.[22-28]

2.6 | Accelerometer PA

Daily movement patterns were measured by small and lightweight (23 × 32.5 × 7.6 mm, 11 g) accelerometers (Axivity AX3, Axivity Ltd., Newcastle upon Tyne, United Kingdom) fixed to the center anterior right thigh on patients using medical grade adhesive film. Participants were instructed to wear the accelerometer for eight consecutive days. Additionally, participants completed an activity diary for time in bed and non-wear time. All information in the diary was manually checked and estimated by visual inspection of the raw accelerometer data. The accelerometer sample rate was set to 50 Hz, but was resampled to 30 Hz upon data extraction. Non-wear time was defined as at least 60 consecutive minutes of processed accelerometer output of zeros, with allowance of up to 2 minutes of output up to the sedentary (SED) cut point.[29] Non-wear time was excluded from analysis. A valid day included at least 10 hours of wear time.[29] A valid measurement consisted of at least four valid days.[29]

Two different classes of PA measures were generated in this study. Due to different algorithms, the measures from the two classes are not directly comparable. *PA intensity* measures have traditionally been used in research but not specifically with data obtained from thigh accelerometer placement.[15] Therefore, the subgroup analyses were based on this class of measures. Raw tri-axial accelerometer data was processed using the 10 Hz frequency extended method with a 3 second epoch length.[30] Cut points developed for thigh accelerometer use were applied to the processed data to identify time spent sedentary (SED), light physical activity (LPA) and moderate to vigorous PA (MVPA), corresponding to <1.5, 1.5 to ≤3.0 and >3.0 metabolic equivalents respectively.[31]

Activity type is a more recent class of PA measures. Activity type was identified by a decision tree using variables of movement intensity and inclination of the accelerometer according to a previously developed algorithm.[32] Diary data supported the assessment of time in bed. For the purpose of setting PA data of Swedish HNC patients into perspective, we aimed to compare them to a reference population (non-patients) in a similar age span and with comparable measurement methodology. A Danish study by Johansson et al, which was recently performed and analyzes PA in adult Copenhageners as part of the CCHS,[16] provided reference data with comparable methodology and age groups.

2.7 | Statistical analyses

Measures of patient characteristics, lifestyle behaviors, health, and QoL domain were dichotomized before being analyzed in relation to the accelerometer variables. Age was dichotomized into the categories <65 years and ≥65 years, which facilitated comparison with the reference population data.[16] The dichotomization of the scores of each QoL domain was performed to differ between patients reporting no difficulties and patients reporting some degree of difficulty. The four response categories in the Saltin-Grimby PA scale were used in the analysis. Separate Mann-Whitney *U* tests were applied to test differences between the dichotomized groups regarding time spent at different accelerometer PA intensity levels. The Kruskal-Wallis test was used to evaluate differences in time spent at different accelerometer PA intensity levels between the

TABLE 1 Descriptive characteristics of the patients included in the analysis. Continuous variables presented as mean, SD, median and range, categorical data as number and percentage

Age (years)	Mean (SD) n = 49 64.2 (8.8) n (%)[a]
BMI	
Underweight	1 (2)
Normal weight	16 (33)
Overweight	21 (43)
Obese	11 (22)
Sex	
Male	32 (65)
Female	17 (35)
Tumor localization	
Oral	15 (31)
Oropharyngeal	26 (53)
Larynx	7 (14)
Unknown primary	1 (2)
Stage	
Early (I-II)	28 (57)
Advanced (III-IV)	21 (43)
Comorbidity according to ACE-27	
None	25 (51)
Comorbidities present (mild-severe)	24 (49)
Living alone	15 (31)
Smoking habits	
Never smoked	17 (35)
Quit smoking >12 months ago	22 (45)
Current smoker	8 (16)
Missing	2 (4)
Alcohol consumption	
Modest alcohol	16 (33)
Much alcohol	27 (55)
Missing	6 (12)
Occupation	
Working	12 (25)
On sick leave	5 (10)
Pensioner	30 (61)
Missing	2 (4)
Education	
Primary school	13 (27)
Upper secondary school	18 (37)
College/university	16 (33)
Missing	2 (4)

Abbreviations: ACE-27, Adult Comorbidity Evaluation; BMI, body mass index.
[a]Percentages rounded, therefore do not sum up to 100%.

TABLE 2 Descriptive values of the questionnaire data of the patients included in the analysis

Saltin-Grimby Physical Activity Level Scale		n (%)
Mostly physically inactive		7 (15)
Some light physical activity (at least 4 hours/week)		33 (72)
Regular physical activity and training (at least 2-3 hours/week)		6 (13)
Regular hard physical training for competitive sports		0 (0)
Selected domains of the EORTC QLQ-C30	**Mean (SD)**	**Median (range)**
Physical function[a]	88.7 (17.5)	100 (26.7-100)
Role function[a]	80.5 (30.0)	100 (0-100)
Pain[b]	19.1 (26.2)	16.7 (0-83.3)
Fatigue[b]	31.2 (27.3)	22.2 (0-88.9)
Insomnia[b]	34.0 (37.1)	33.3 (0-100)
Selected domains of the EQ-5D		**n (%)**
Pain	No pain or discomfort	18 (39)
	Moderate pain or discomfort	26 (57)
	Extreme pain or discomfort	2 (4)
Anxiety/depression	Not anxious or depressed	15 (33)
	Moderately anxious or depressed	27 (59)
	Extremely anxious or depressed	4 (9)

Note: Two participants did not respond to the EORTC QLQ-C30 therefore, the total number is 47. Three participants did not respond to the Saltin-Grimby and EQ5D, therefore the total number is 46.
Abbreviations: EQ5D, EuroQol 5 dimensions; EORTC QLQ-C30, European Organization for Research and Treatment of Cancer Quality of Life Questionnaires Core-30.
[a]A high value corresponds to best possible health.
[b]A low value corresponds to best possible health.

categories in the Saltin-Grimby PA scale. A significance level of <.05 was applied in the analyses. Statistics and accelerometer data processing was performed in MATLAB R2020a (MathWorks, Massachusetts).

3 | RESULTS

3.1 | Patient characteristics

A total of 64 patients fulfilled the inclusion/exclusion criteria and accepted to wear the accelerometer. Twelve patients were excluded from analyses because no valid accelerometer data were retrieved and another three patients due to insufficient number of valid days. A final sample of 49 patients was included in the analyses and had a median age of 65 (range 44-79) years and a sex distribution of 32 (65%) males and 17 (35%) females (Table 1). The excluded patients had a median age of 66 years (range 36-80) with 10 (67%) males and 5 (33%) females. No statistically significant differences were found between the included and excluded patients regarding any of the variables listed in Table 1.

3.2 | Patient reported outcomes

Descriptive statistics in the selected domains in the different questionnaires used in the study are shown in Table 2. The results showed that a majority (72%) of the patients described themselves as performing some light PA according to the Saltin-Grimby scale. The patients experienced good physical functioning and low levels of pain according to the EORTC QLQ-C30. The worse group scores were observed in the fatigue, insomnia and role function domains (mean values of 80.5, 31.2, and 34.0, respectively). A majority of the patients experienced some level of pain (61%) or anxiousness/depression (68%) according to the EQ-5D results.

3.3 | Distribution of PA type

The patients spent almost half of their time awake in activities consisting of a minimal amount of movement, which was partitioned into a median of 42.1% (606 minutes) sitting and 9.0% (122 minutes) standing (Figure 1, Table 3). The rest of the time was allocated into a median of 5.6% (76 minutes) walking and 3.9% (53 minutes) moving, but with only minimal time engaged in cycling and no running. The patients spent more than 9 hours in bed (555 minutes). When dividing the patients into the two age-groups (<65 years and ≥65), the older group spent more time in bed but was also more physically active during the day with less sitting and more moving, walking and cycling (median values, Table 3).

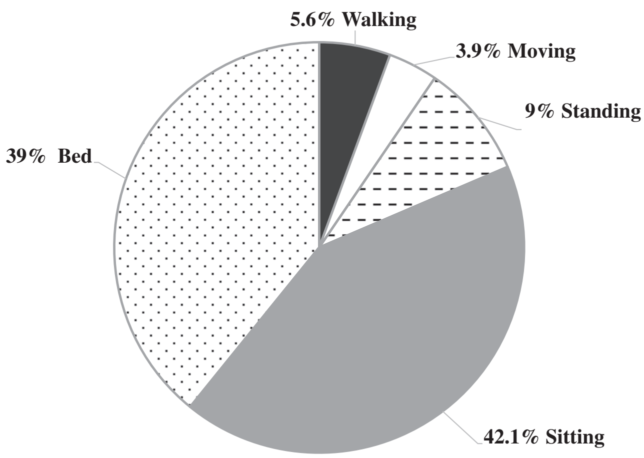

FIGURE 1 Distribution of type of physical activity in the whole sample population

3.4 | Comparison to a reference population

Comparing adult individuals from the CCHS[16] with our analyzed Swedish HNC patient group (Table 3), the younger group (age < 65 years) of the Swedish HNC patients had a median of 54 minutes (11%) more time in bed, 39 minutes (7%) more sitting/SED time but 64 minutes (−34%) less standing time per day. The older group (age ≥ 65 years) showed a median of 95 minutes (20%) more time in bed, 9 minutes (−7%) less sitting time and 64 minutes (−34%) less standing time per day compared to the reference group.

Regarding activities like moving, walking, running or cycling (Table 3), our results showed that the younger Swedish HNC patient group (age < 65 years) had daily medians of 24 minutes (−33%) less moving time, 22 minutes (−24%) less walking time, 0.15 minutes (−100%) less running time and 2.33 minutes (−95%) less cycling time. The older Swedish patient group (age ≥ 65 years) showed 13 minutes (−19%) less moving time, 6 minutes (8%) more walking time, 0.07 minutes (−100%) less running time and 0.34 minutes (100%) more cycling time per day (median values).

3.5 | Distribution of PA intensity by subgroup

Regarding the distribution of daily time spent in the different PA intensities, statistically significant differences were found in four of the considered subgroups (Table 4). Patients with higher educational level were less physically active, with statistically significant less time in LPA (89 vs 100 minutes/day) and MVPA (58 vs 74 minutes/day). Furthermore, patients with reduced physical function (47 vs

TABLE 3 Median time per day spent on different activity types for all participants, age subgroups, and in comparison with age subgroups of a Danish population study[19]

Activity type	All (n = 49)	<65 (years) (n = 27)	≥65 (years) (n = 22)	Danish population study 50 to <65 (years) (n = 522)	Danish population study 65 to <75 (years) (n = 431)
In Bed	555	526	580	472	485
Sitting	606	614	579	575	588
Standing	122	122	120	186	176
Moving	53	48	57	72	70
Walking	76	68	86	90	80
Running	0	0	0	0.15	0.07
Cycling	0.2	0.1	0.3	2.45	0

Note: Median time per day (minutes/day).

TABLE 4 Median time per day (minutes/day) spent in different physical activity intensity levels.

Subgroup specification		N	SED	LPA	MVPA
Overall		49	714	92	70
Sex (N = 49)	Male	32	714	94	71
	Female	17	699	81	54
	p value		*0.71*	*0.20*	*0.26*
Age (N = 49)	<65 years	27	720	90	54
	≥65 years	22	707	94	73
	p value		*0.51*	*0.28*	*0.34*
ACE-27 (N = 49)	None	25	699	94	73
	Mild-severe	24	724	90	59
	p value		*0.70*	*0.23*	*0.23*
Education (N = 47)	No college/university	31	701	**100**	**74**
	College/university	16	708	**89****	**58****
	p value		*0.69*	***0.014***	***0.0095***
Stage (N = 49)	Early (I-II)	28	708	89	58
	Advanced (III-IV)	21	714	94	73
	p value		*0.98*	*0.41*	*0.45*
Saltin-Grimby (N = 46)	Inactive	7	767	83	42
	Light PA	33	**714****	**93****	**70****
	Regular PA	6	**623****	**130****	**97****
	p value		***<0.001***	***<0.001***	***<0.001***
Living alone (N = 47)	No	32	714	91	69
	Yes	15	693	94	73
	p value		*0.86*	*0.88*	*0.53*
Physical function (N = 47)	Reduced ability	21	727	84	**47**
	Full function	26	700	95	**77****
	p value		*0.23*	*0.16*	***<0.001***
Role function (N = 47)	Reduced ability	17	683	83	58
	Full function	30	721	94	73
	p value		*0.59*	*0.11*	*0.12*
Pain (N = 47)	None	23	683	88	73
	Mild-severe	24	734	94	60
	p value		*0.17*	*0.86*	*0.20*
Fatigue (N = 47)	None	9	648	120	**99**
	Mild-severe	38	714	90	**59****
	p value		*0.38*	*0.08*	***0.012***
Insomnia (N = 47)	None	20	680	96	74
	Mild-severe	27	721	89	61
	p value		*0.32*	*0.26*	*0.15*
Pain & discomfort (N = 46)	None	18	721	93	84
	Mild-severe	28	700	92	64
	p value		*0.58*	*0.81*	*0.10*
Worry & depression (N = 46)	None	15	693	92	70
	Mild-severe	31	715	94	70
	p value		*1.00*	*1.00*	*0.93*

Abbreviations: ACE-27, Adult Comorbidity Evaluation; LPA, light physical activity; MVPA, moderate and vigorous physical activity; PA, physical activity; SED, sedentary.

**$p \le 0.01$.

77 minutes/day) and with higher degree of fatigue (59 vs 99 minutes/day) spent statistically significant less time doing MVPA. The Saltin-Grimby PA scale was statistically significantly associated with the accelerometer measures, as for each increasing category with more PA, the time in SED decreased, and the time in LPA and MVPA increased. Table 4 shows the stepwise decrease in daily SED of 53 minutes (−5%; inactive vs light PA) and 91 minutes (−8%; light vs regular PA), showing an overall decrease in SED of 144 minutes (−13%) from an inactive to regularly active state (median values). Regarding LPA and in contrast to SED, the data showed a median daily stepwise increase of 10 minutes (1%; light PA vs inactive) and 37 minutes (5%; regular vs light PA), similar to MVPA with a median daily increase of 28 minutes (3%; light PA vs inactive) and 27 minutes (3%; regular vs light PA). In all other specified subgroups, no statistically significant differences between the corresponding intensities were identified.

4 | DISCUSSION

The aim of the present pilot study was to present descriptive data on different types and various intensities of PA and self-perceived QoL prior to oncological treatment in Swedish patients diagnosed with HNC. The main findings were that the patients were inactive and spent a lot of time in sedentary behavior, spending a large time in bed and with sitting dominating their daytime activities. Compared to a Danish reference population, time in bed, sitting, and standing were distinctly larger in the Swedish HNC patient group, while time moving or walking and other activities were overall lower than the reference group. In addition, patients with higher education, reduced physical function, as well as higher degrees of fatigue were less physically active in light to vigorous intensities than their comparators.

Overall, a large part of the day for HNC patients appears to be spent lying down. The time awake for patients in this study was characterized by a low level of activity, with a median of more than half of the day spent sitting, standing, and a low amount of walking, for the patient group. It is of note that the older patient group (≥ 65 years) was more active during the day, showing almost 30 minutes longer walking and moving times together compared to their younger counterparts (median values, Table 3).

The Swedish HNC patients compared to adult healthy Copenhageners of the same age span, were clearly less physically active with approximately 100 minutes/day spent in bed or sitting (~22%; Table 3). Consequently, the amount of moving, walking, running, or cycling was far lower compared to the Danish reference study with a median of 38% less overall walking to cycling activity (Table 3).

These comparisons emphasize that the reduction in PA in HNC patients compared to a non-patient population of a similar age span merits attention. Previous results of PA intervention studies for HNC patients suggest the benefit of specified PA programs, both during and following treatment.[3] A 7-to-14-weeks resistance exercise and walking program prevented decline as well supported improvement in physical performance, mobility, PA, diet, and QoL compared to usual medical care.[9] Also, a study investigating the feasibility and effects of a progressive resistance-training intervention program during and after radiotherapy reported that some improvements were observed in fitness, quality of life and nutrition status following intervention.[33] In addition, other studies state that especially walking programs and light resistance training activities provide encouraging effects on life quality and aid the challenges throughout the HNC experience, improve prognosis and survival.[34,35] In all, considering the physical inactivity of HNC patients, there is clearly a clinical potential for the use of exercise programs for these patients.

Interestingly, the patients with college or university degree spent a median of 11 and 16 minutes per day less for LPA and MVPA, respectively. The Dutch study on HNC patients found opposite results regarding educational level and age, with significantly less time in PA in lower educational levels but also in patients with more comorbidity and higher tumor stage.[7] They also observed a lower cardiorespiratory fitness levels for older patients, females and patients with a higher tumor stage among other fitness parameters.[7] In addition, they identified different values for PA in the HNC patient group with 229 minutes/day vs 129 minutes (walking/moving) in comparison to the current study. One possible reason for these contradictory results in our study compared to the Dutch study[7] may be the different methodology for measuring PA. Accelerometers were fixed at the hip in contrast to mounting the sensors at the thigh in our study, although it seems unlikely that this explains the full range of discrepancy between the two studies. In addition, in the present study, a larger proportion of patients were overweight (43% vs 37%) and obese (22% vs 15%), compared to the Dutch study.[7]

We found a significant association between self-reported and accelerometer PA, indicating that the Saltin-Grimby PA level scale may be a useful and low-cost alternative to accelerometers to discriminate the PA level between HNC patients. Still, even if the outcome measures of the two methods were associated, the result does not provide evidence of their agreement and that they can be used interchangeably. The Saltin-Grimby PA level scale has previously been shown to have low concurrent validity with accelerometer measures when evaluated in HNC patients.[13]

In the subgroups of physical function and fatigue levels only, MVPA differences were evident between levels (Table 4). Patients with full physical function demonstrated 3% (30 minutes/day) more MVPA compared to patients with reduced ability, whereas patients with no reported fatigue were 5% (40 minutes/day) more active in MVPA compared to those with mild to severe fatigue. No differences in PA were found for tumor stage, pain level or worry and depression (Table 4). Although, the Dutch study did observe an association between PA and tumor stage,[7] another study in HNC patients found an association between PA and fatigue but not with depression.[12] QoL has generally been associated with PA in HNC, but the different aspects of QoL are more or less associated.[36] Differences in patient characteristics, sample size, study design, and methods would explain these variations in outcomes. Future research into HNC patients is needed to address these issues, to clarify the multiple effect of PA on HNC and associated aspects of QoL.

Overall, based on the results of the current and other studies,[7-9] it is of importance that the widely observed low PA levels prior to the start of HNC treatment requires deeper attention and further research, especially due to the fact that these levels are expected to decrease more during treatment.[8] However, even if our study showed that the HNC patient were less physically active compared to a reference population, it does not provide any scientific basis to support decisions on whether the PA level is sufficiently low in individual patients to warrant PA intervention as part of the oncological treatment. Current PA recommendations are not useful for this purpose, as they are too general and are based on self-report methods. Future research needs to develop more individual-adapted PA recommendations based on objective methods for PA assessment to be useful in clinical practice. In addition, more research is needed on the long-term association between the PA level before oncological treatment and outcomes such as quality of life, physical function, fatigue, as well as cancer recurrence and survival.

4.1 | Strength and limitations

One strength of the current study is the quality and validity of the objective measurements in the assessment of PA including self-reporting in diaries combined with the use of accelerometers. This set up also follows the urgent recommendations and future perspectives.[15] A limitation of the study is the relatively small sample size with some clinical heterogeneity, which precludes us from drawing general conclusions about the PA level and the associations with health-related QoL in patients with HNC, or conclusions for specific sub-groups. Further, no matched control group was included for direct comparison. To evaluate the PA level of the included patients, we compared our results to data generated from a large Danish population study using the same method for the assessment of PA. Our pilot study needs to be followed-up by a larger study including matched controls to confirm our results and to further investigate the influence of different sub-group characteristics.

4.2 | Conclusions and implications

Findings of the current pilot study showed that patients diagnosed with HNC were physically inactive and spent a lot of time in sedentary behavior. PA is related to physical function and fatigue. The implication of these findings may be that pretreatment assessment of PA is a useful method to identify patients with the greatest need for PA intervention as part of the oncological treatment, to improve treatment outcome. Still, individually adapted PA recommendations based on objective PA methods need to be developed to support decisions on individual patients. Whether a self-report instrument is sufficient for this purpose or to predict treatment outcome, or an objective method is required needs to be determined. Our results need to be followed-up by studies including larger samples and with matched controls, to confirm the PA level of patients diagnosed with HNC and the influence of different patient characteristics. More research is needed to evaluate the benefits of different PA interventions in patients with HNC before, during, and after treatment, including long-term effects.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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