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Pilot Evaluation of Physical and Psychological Impacts of a Physical Trek Program including a Dog Sledding Expedition in Children and Adolescents with Cancer.

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Short Title: Physical training program in children with cancer

Key words: children, oncology, self-esteem, physical fitness, general physical preparation, health.

Abbreviations: PAP: Physical Activity Program; APA: Adapted Physical Activity; HR: Heart Rate; BMI: Body Mass Index; 6MWT: Six-Minute Walk Test; PSI: Physical Self Inventory; ALL: Acute Lymphoblastic Leukemia.

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1 Abstract

Aim of the study: To evaluate the feasibility and to measure the effects of a six-week-long adapted physical activity programme (APAP), including 5 days of intense dog sledding, on the physical and psychological health of children and adolescents treated for cancer.

Methods: Eleven children and teenagers (4 girls, 7 boys; mean age 14.3 ± 2.9 years) participated in this monocentric pilot programme of adapted physical activities from February 2013 to March 2013. Seven were still on treatment. The programme lasted 6 weeks. A series of physical tests and psychological questionnaires were carried out before and after the programme.

Results: All children and teenagers completed the full programme. An improvement in all physical and psychological parameters was observed. Statistically significant differences were observed for global self-esteem (6.2 ± 2.1 to 7.7 ± 1.8 ; $p = 0.02$), perceived sport competence (5.3 ± 3.2 to 7.4 ± 2 ; $p = 0.02$) and perceived physical strength (5.6 ± 2.5 to 7.1 ± 1.8 ; $p = 0.001$). Regarding physical tests, the physical training led to statistically significant improvement for sit-ups (13.8 ± 2.6 to 21.75 ± 5.4 ; $p = 0.01$), muscle tone (76 ± 23.7 to 100 ± 22.9 ; $p = 0.01$), and resting heart rate (96.1 ± 3.2 to 91.6 ± 4.5 ; $p = 0.03$).

Conclusion: This programme is feasible in children and adolescents even during their oncologic treatment. During the 6-week programme, children and adolescents improved their physical and psychological health, and the putative benefits of the APAP are discussed. A larger randomised trial started in 2014.

Keywords: *children, oncology, solid tumour, leukaemia, self-esteem, physical fitness, general physical preparation, health, sport*

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2 Introduction

Cancer in children represents less than 1% of all cancers but is a real public health issue because it remains one of the main causes of mortality in younger in developed countries. Each year, 160 000 new cases are diagnosed with 90 000 deaths worldwide, among these new cases 15 000 are diagnosed in Europe (1).

Children and adolescents faced with cancer are immersed in a painful experience with an uncertain outcome and social life, relational, familial and scholar ruptures. Current therapeutic advances (new drugs and novel therapeutic strategies, new surgical techniques and new radiation modalities) lead to the cure of about 80% of children and adolescents with cancer. However, side effects and long-term sequel, whether related to the disease or treatments, can lead to mild to severe handicaps affecting the health and daily life of children and adolescents during and after completion of the treatment (2-5). Two-thirds of [adult](#) survivors will experience a late effect, with a quarter of survivors experiencing one that is severe or life-threatening (6).

Continuous decline in physical abilities, and fatigue (7) related to both long stays in bed in hospital (8) and cytotoxic drugs, is an important issue. Indeed, studies have demonstrated that cancer and related treatments have negative impact on both physical and psychological health in children (9-11), including a decrease in physical capacity, self-esteem and an increase in anxiety state (12-13). On the one hand, in adults, several studies have shown that exercise during or after treatment could lead to an improved physical condition and social life. Precisely, aerobic exercise is now strongly recognized as beneficial for individuals with cancer-related fatigue during and post-cancer therapy, specifically those with solid tumors (14). On the other hand there is only a quite limited literature on this topic for children (15-18). Nevertheless, some studies have observed an increase in quality of life and a trend towards an improvement in fitness in children who perform physical exercise during or after treatment (19-21) and decrease in fatigue (7).

The present study aimed at evaluating the feasibility of an adapted physical activity program and the beneficial effects on the physical and psychological performance of children and adolescents suffering from cancer. Since the mid-1970' the term "adapted physical activity" (APA) referred to physical activity interventions aiming to enable and to enhance performance and participation in people with

disability. Entering as a specialty in the curriculum of French university studies in Faculties of Sport Sciences and Physical Education, APA is now recognized as a professional field of study and intervention with a strong crossdisciplinary knowledge base. In the team of "Sourire à la Vie", CV and FS are certified professional of APA under the direction and supervision of whom the adapted physical activities were conducted. Thus our APA program was proposed to children and adolescents during treatment or within 1 year after the end of treatment. Unlike a few previous studies (for review 35 : Baumann et al., 2013) investigating the putative benefits of intrahospital conditioning programs on young cancer patients, one of the major novelties of our program relies on its "ecological approach". Indeed, children and adolescents were engaged in activities outside of the hospital setting, over several weeks including the period of treatment (chemotherapy, surgery, radiotherapy) aiming to prepare their participation to an expedition with sled dogs in Canada organized by *Sourire à la Vie*. Founded in 2006 by FS and LG, *Sourire à la Vie* is a non-profit organization Law 1901 (so-called in France association culturelle; <http://www.sourirealavie.fr/>) that takes care for young people with cancer by promoting and organizing adapted (soft) physical activities outside the hospital. These activities, performed throughout the year under the supervision of certified professionals in APA, include dance, cruising sailboarding, trekking, snow activities such as adaptive skiing, snowshoeing, dog sledding... Hence, the present study might be viewed as an opportunity to quantify (in the field) with scientific tools the putative health benefits and wellbeing commonly observed in young patients after a stay at *Sourire à la Vie* by the healthcare workers (nurses, oncologists, psychologists) of the department of hematology and oncology of La Timone Children Hospital. In contrast, due to the heavily constrained context, investigations routinely performed in the field of physical activity sciences (e.g. VO₂ measurements to

quantify exercise intensities) simply could not be done here, thus limiting the extrapolation of the present results to other groups of patients.

3 Patients & Methods

3.1 Patients

All children and adolescents were treated in the department of pediatric hematology and oncology of La Timone Children Hospital (AP-HM, France). Moreover, there were active members of *Sourire à la Vie*. Young patients were selected after validation by the hospital medical staff. The selected patients needed to fulfill two criteria: medical capability to participate (according to the timing of treatment, fitness) and willingness to participate to the program (i.e. both the sojourn in Canada and the physical and psychological preparation and testing associated with this study). Young patients and legal guardians gave written consent for participating. The study is in accordance with the 1964 Declaration of Helsinki and has been approved by the local ethics committee (CPP n°).

Materials and Methods

The adapted physical activity program, developed by the Association *Sourire à la Vie*, lasted 6 weeks and is described in Figure 1. Participants joined for two weekends of two days of preparation, outside of the hospital before of the joining the expedition. Physical and psychological health of children and adolescents was evaluated on the first and on the last day of the program (Figure 1). The program began with physical and psychological tests presented below and assessed by an investigator/observer (CV and/or FS) at the association just followed by an physically active session. The children and adolescents were further evaluated 12 days after the completion of the expedition to limit as possible the putative effects of the jet lag and were asked to give a feedback on their fitness. For the physical evaluations, we selected very simple tests so that the children and adolescents required only a few minutes or tries for familiarization with the equipment and testing procedures. Moreover, this limits the possibility of a learning effect between the initial and the final sessions of testing.

We evaluated the aerobic fitness with the six-minute walking test (6MWT). The test involves walking on a flat surface of at least 20 meters and a round-trip. The objective was to walk the greatest possible distance in 6 minutes. This is one of the most widely used sub-maximal test to assess cardiovascular endurance in several healthy or weakened populations. This test is well tolerated by children and is very suitable for evaluation of the functional status of persons for whom a maximal test is contraindicated or impractical (22-25). For this test, heart rate was evaluated in children and adolescents with a heart rate monitor (FT1 Polar©, Finland) at rest (resting HR), during exercise (HR max effort) and during

recovery. These cardiac frequencies allowed calculating a recovery factor (i.e. à compléter en le définissant).

All the tests used for this study are part of the validated EUROFIT battery (26). This European battery of cardiovascular and motor tests was first designed for assessing school-aged children's physical development. Its easiness of use makes it accessible while respecting the requirements of validity, accuracy and objectivity (27). Moreover, the Eurofit test battery offers a wide range of reference data across ages, countries and diseases (28).

The battery of physical fitness tests included the assessment of the following physical fitness measures:

- Abdominal muscle endurance and strength was measured by the number of correctly completed sit-ups in 30s. Sit-ups were performed with the hands placed at the side of the head, knees bent at 90 degrees, and the feet secured by the investigator. A full sit-up is defined as touching the knees with the elbows and returning the shoulders to the ground.
- Functional postural muscle structure was measured by a test of "muscle tone", a maximum time held in the following position: elongated front support position on forearms with right angles and the tips of the toes, horizontal trunk (closed and parallel legs)
- Evaluation of strength of the upper limb was done by measuring the distance at which a medicine ball (Decathlon, France) was thrown. The weight of the ball depended on children's weight (donner la relation x kg de poids corporel = y kg de medicine ball).
- Evaluation of strength of the lower limbs was performed using a Myotest Sport© measurement tool (Switzerland). We evaluated the standing vertical jump during a counter-movement jump: the young patient started from an upright standing position, made a downward movement by flexing at the knees and hips, then immediately extended the knees and hips again to jump vertically up off the ground; he repeated the stroke 5 times (measurement of flight height (centimeters), power (watts per kilogram), strength (newton per kilogram) and jump speed (centimeters per second).

Psychological health, specifically self-esteem and physical self-perception, was measured using the Physical Self Inventory (PSI-6, (29)). This shortened version of the original Physical Self Inventory (25 items) is based on a single-item self-assessment related to six dimensions of self-perception: Global Self-Esteem / Physical Self-Worth / Physical Condition / Sport Competence / Physical Attractiveness / Physical Strength, with a horizontal visual analogue scale (VAS) of 10 cm, from 0.0: not at all to 10.0: absolutely.

3.2 *Adapted Physical Activity Program (APAP)*

The General Physical Preparation (GPP) was conducted in a fun, child-friendly mood. Due to the putative weak physical fitness of children and adolescents under treatment, GPP consisted here solely

in general conditioning to improve strength, speed, endurance, flexibility, skill and body's ability to

handle greater workloads (i.e. decreasing fatigability). GPP was conducted by APA instructors in the same way as done in physical education classes in scholar setting. The intensity of physical activity was adjusted to each young patient according its age and level of fitness. In addition, ongoing adjustments were performed during the sessions according both the feedback of the young patients (i.e. perceived level of physical exertion) and the objective capability to follow the instructions of the APA professionals.

To assess the effectiveness of our GPP, we used a battery of tests dealing with endurance, resistance, strength, flexibility and balance workout. The sessions contained various methods and materials and the intensity, number of repeats and recovery time for exercise were individually adapted to each patient. The GPP was conducted as follows.

- warm-up exercises: joint rotation or auto-massage muscle, to warm the muscles and to wake up the body (with or without ball) (10 minutes) / cardio warm-up: trots and little fun games (20-30 minutes) / active stretching (5 minutes);
- muscle building (30 minutes): circuit between different fun workshops for working the lower limbs, upper limbs and trunk (abdominal muscles, muscle tone, pushups, small dumbbells, plates of balance and proprioception, gym ball, medicine ball);
- aerobic fitness (30 minutes): treadmill (simulation of the up and down sledding at different speeds), exercise bike, running in the courtyard with stairs, jump rope;
- recovery (15 minutes): stretching and breath work.

An additional boxing session (60 minutes with recovery time) was also conducted in order to work on the fighting spirit and a session of physical expression (dance, physical expression; 120 minutes with recovery time) to work on trust, cooperation and communication was also performed. Advices on stretching, injury prevention, body aches, nutrition, hydration and sleep were also provided to children. This GPP program was followed by a 5 days expedition in a camp in the forest in Quebec (Canada) and near lakes. A session of physical training in the snow and a first contact with the pack of dogs and the sleds were held the day before departure. From day 1 to 5, between two to five hours per day of dog sledding sessions occurred, including speed records. Moreover, the patients participated in sporting games in the snow and ice fishing on the frozen lakes. Globally, children practiced between 4 to 5 hours of physical activity per day, for a total of a minimum of 35 hours of activity throughout the program (preparation + trek). All throughout the PAP, sports and medical professionals accompanied participants.

3.3 Statistical analysis of data

The differences between groups (i.e. pre- vs. post-program) were assessed using either the parametric test (T-test) when the data followed the normal distribution either by the non-parametric Wilcoxon test. Differences were considered statistically significant when p value was below .05.

4 Results

Eleven children and adolescents participated to this program. There were 4 girls and 7 boys. The mean age of participants was 14.3 ± 2.9 years. Among the 11 patients, 7 were still on treatment and four were in remission and off treatment for less than one year. The mean value anthropometric parameters observed during the study were: weight (48.4 ± 8.5 kg), height (154 ± 11 cm) and BMI (20.3 ± 3.0 kg.m⁻²). Details of some characteristics of the enrolled population are reported in Table 1.

All children completed the whole program and were assessed on physical and psychological dimension of health, as detailed in Table 2. Following the program, PSI scores increased and the differences were significant for dimensions Global Self-Esteem (6.2 ± 2.1 to 7.7 ± 1.8 ; $p=.02$), perceived Sport Competence (5.3 ± 3.2 to 7.4 ± 2 ; $p=.02$) and perceived Physical Strength (5.6 ± 2.5 to 7.1 ± 1.8 ; $p=.001$). The Physical Self-Worth dimension tended to statistical significance (5.4 ± 2.3 to 7 ± 2.2 ; $p=.06$). For physical tests, the differences were significant for sit-ups (13.8 ± 2.6 to 21.75 ± 5.4 ; $p=.01$), muscle tone ($76 \text{ s} \pm 23.7 \text{ s}$ to $100 \text{ s} \pm 22.9 \text{ s}$; $p=.01$) and resting HR ($96.1 \text{ bpm} \pm 3.2 \text{ bpm}$ to $91.6 \text{ bpm} \pm 4.5 \text{ bpm}$; $p=.03$). The values of the distance in the 6MWT ($602.3 \text{ m} \pm 36.9 \text{ m}$ to $618.1 \text{ m} \pm 46.5 \text{ m}$; $p=.06$) and the strength of the upper limbs ($3.41 \text{ m} \pm 0.32 \text{ m}$ to $3.55 \text{ m} \pm 0.44 \text{ m}$; $p=.09$) also tended toward statistical significance.

No injuries were reported during the participation of the children to the program.

5 Discussion

Given the relative lack of knowledge about the impact of "physical activity and sport" on the health of children and adolescents with cancer, we report here on the preliminary evaluation of an adapted physical activity program (APAP) performed outside of the hospital including a dog sledding expedition. The purpose of this study was to measure changes in physical and psychological health-related parameters of children and adolescents treated for cancer, whatever the time of treatment (initial phase of treatment, relapse, palliative care) during a 6-week APAP. Thus, we report that an adapted physical program is feasible and harmless for children and adolescents even during treatment and even in a palliative setting outside of the hospital. This may be at least in part related to the organization of the program that aimed at generating gratification through physical activities without concern for performance or evaluation, where fun/games intend to mask the physical effort.

The APAP has led to a statistically significant improvement of several physical parameters (muscle tone, sit-up, resting heart rate) and psychological items (global self-esteem, sport competence and physical strength). It should be noticed that the 12-day delay between the end of the trek in Canada and the final testing session in France, chosen to abolish the putative negative effects of a jet lag fatigue, might have slightly decrease the performance of the young patients by a weak deconditioning. Thus, physical parameters that depicted a non-statistical trend toward improvement (i.e. total distance in 6MWT, number of sit-ups, muscle tone and upper limb strength) should be viewed with that time constraint. The results of physical tests, which explicitly measured in young patients their physical fitness and development (i.e. a part of the physical dimension of health), support the results of PSI survey (Physical self-inventory), which highlights the perception that children and adolescents have on physical, the body image and self-esteem in general. Interestingly, in addition to having a mean 16 meters increase in the 6MWT, the heart recovery rate was maintained and the endurance test results showed improvement. Adaptation to the effort tends to be better since the coefficient of recovery was stronger in the final testing. This demonstrates the potential benefits of physical and psychological health of such a PAP. In addition, the 6MWT and measures of the strength of upper and lower limbs showed a trend towards improvement between the beginning and the end of the APAP, but without reaching the level of significance. To the best of our knowledge, these observations have never been reported previously.

Among the items that were improved by the program (abdominal muscle endurance, sit-ups scores, muscle tone, baseline heart rate, self-esteem, sport competence and physical strength, for psychological health), some had already been evaluated in children in normal population, or with chronic diseases such as cancer. (20,24,30). Thus, in normal population an average of 25.1 sit-ups were completed in 30 seconds for children from 9 to 19 years (mean age 14 years). Our population reported scored well below these references at the beginning of program scores, during initial tests, since it gets an average of 13.8 sit-ups. However, the final test results are close to the scores of the normal population averaging 21.7 (i.e. a 57% increase in the number of sit-ups) strongly suggesting that such a program is beneficial for maintaining abdominal muscle endurance of young cancer patients. Keats M. et al. (7) postpone similar improvements in their study, following a 16 week program in children with cancer.

Our results for the endurance test are not statistically significant, although there was a trend towards an improvement of the distance reached after our program and noteworthy, this improvement may be in part related to a better adaptation to the effort as evidenced by the increase of the recovery factor. Although the observed improvement was not statistically significant.

Takken et al. (24) compared the performance obtained with the 6MWT in children with end stage renal disease and populations of children suffering from chronic diseases. Regardless of the type of chronic disease (end stage renal disease, juvenile idiopathic arthritis, hemophilia and spina bifida) results ranged between 60% to 90% lower than the reference values in normal population reported by Li et al. (25) and Geiger et al. (22). Our results are therefore consistent with these observations since the average distance

measured with the 6MWT for our 11 young patients was also lower than those obtained in a healthy population (25-22) (Table 3). Although, some motor performances were improved during the 6-week program, they mainly remained low in our children and adolescents patients. Thus, as others did previously, we recommend that individualized exercise interventions to attenuate motor deficits and promote physical activity are performed during cancer treatment in order to enhance motor performance and improve social participation during and after cancer therapy (Götte et al., European Journal of Pediatrics 11/2014; 174(6)).

Finally, our results for self-esteem questionnaires are consistent with other studies that have shown that quality of life is improved in patients with cancer following an exercise program during their treatment. Thus, in children with cancer Speyer et al. (20) report a better quality of life during an adapted physical activity (APA) practice during periods of hospitalization as compared to periods when children do not participate to the APA. The improvement mainly concerned self-esteem, physical capacities and mental health.

Our pilot experience display several limits. First, it lacks statistical power because of the limited number of patients included in this program. Then, children and adolescents were also selected based on their ability to perform the entire program, including the ability to perform the trek in Canada, likely generating a bias by selecting the fittest ones. Thirdly, we evaluated the short-term impact of the program since evaluation was performed only 12 days after the trek. Longer follow up is necessary to evaluated whether the observed benefit is sustained or not. In addition, while the duration of each period of physical activity was individually quantified for each children and adolescents throughout the PAP, the exact intensity (i.e. light, moderate or heavy) of each type of activity was missing. Moreover, it is difficult to compare our results to other pediatric studies since these latter were mainly performed in children and adolescents with acute lymphoblastic leukemia and because of an important heterogeneity in the modalities of training (type, duration, frequency, intensity). Finally, the study lacked of an age- and gender-matched control group (healthy children and adolescents), but due to both hospital and sojourn in Canada (“ecological”) contexts, this was clearly impossible to built.

6 Conclusion

The practice of physical activity 60 minutes per day is essential in the development of the child (33-34), and the appearance of the disease should not deprive the child of physical activity. Physical activity programs should, *a priori*, have a place in the care of children with cancer. We report here on the pilot evaluation of a basic adapted physical training program (APAP) in children and adolescents treated for cancer. All participants successfully completed the program without harm. We observed statistical beneficial effects on both physical and psychological health between the initial and the final testing

[sessions of the program](#). Anyhow, these results need to be confirmed and generalized by a state of the art randomized study with longer training program, and including a larger number of patients in order to make meaningful conclusions. This pilot study just showed the harmless feasibility of such [APAP](#) with children and adolescents under cancer treatment.

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7 Figures and Legends

TABLE 1. Population's characteristics.
Abbreviations used: BMI: Body Mass Index

FIGURE 1. Details of the program and evaluation procedures.

TABLE 2. Physical and Psychological Health
Abbreviations used:

SD: Standard Deviation - HR: Heart Rate - LL Strength: Lower Limb Strength - UL Strength: Upper Limb Strength - PSI: Physical Self Inventory - GSE: Global Self-Esteem
PSW: Physical Self-Worth - PC: perceived Physical Condition - SC: perceived Sport Competence PA: Physical Attractiveness - PS: perceived Physical Strength - p: level of significance (statistical test pre vs. post)

TABLE 3. Results of the six-minute walking test (6MWT)

Abbreviations used: M: Mean - SD: Standard Deviation - 6MWD: six minutes working distance

TABLE 1. Population's characteristics

| | | |
|--------------------------------|-------------------------------|---------|
| - Age | 14.3 ± 2.9 years | |
| - Height | 154 ± 11 cm | |
| - Weight | 48.4 ± 8.5 kg | |
| - BMI | 20.3 ± 3.0 kg.m ⁻² | |
| - Sex | | |
| Girls | 4 | (36.4%) |
| Boys | 7 | (63.6%) |
| - Type of Cancer | | |
| Leukemia (1 ALL, 1 AML) | 2 | (18.2%) |
| Rhabdomyosarcoma | 3 | (27.3%) |
| Non-Hodgkin's Lymphoma | 2 | (18.2%) |
| Brain tumor (low-grade glioma) | 2 | (18.2%) |
| Langerhans cell histiocytosis | 1 | (9.1%) |
| Wiedemann-Beckwith Syndrome | 1 | (9.1%) |
| - Stage treatments | | |
| Receiving treatment | 4 | (36.4%) |
| Palliative care | 3 | (27.3%) |
| Off treatment, in remission | 4 | (36.4%) |

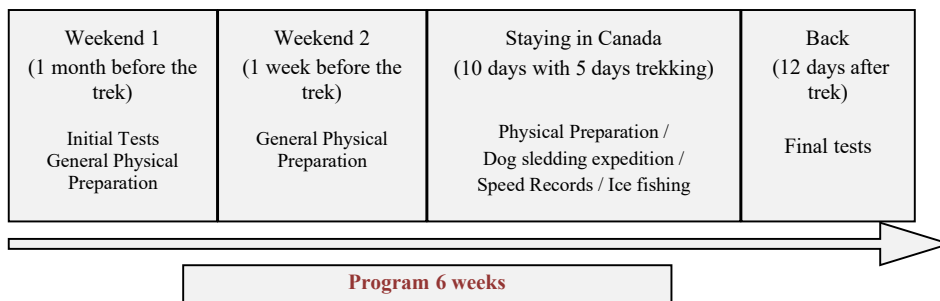


FIGURE 1. *Planning of the adapted physical activity program and testing procedures.*

TABLE 2. *Evolution parameters assessing the physical and psychological dimensions of the health of children and adolescents between the beginning (pre-test) and end (post-test) of the 6 weeks AP program.*

| | Pre-test (M± SD) | Post-test (M± SD) | p value |
|---------------------------------|------------------|-------------------|---------|
| Physical Parameters | | | |
| Endurance | | | |
| Total distance (6MWT) (m) | 602.3 ± 36.9 | 618.1 ± 46.5 | .06 |
| Resting HR (bpm) | 96.1 ± 3.2 | 91.6 ± 4.5 | .03 |
| HR max effort (bpm) | 185.3 ± 17.2 | 184.6 ± 18.1 | .88 |
| Recovery factor (bpm) | 57 ± 11.2 | 60.5 ± 7.8 | .61 |
| Sit-ups (nb/30s) | 13.8 ± 2.6 | 21.75 ± 5.4 | .011 |
| ▲ Muscle tone (s) | 76 ± 23.7 | 100 ± 22.9 | .011 |
| UL Strength (m) | 3.41 ± 0.32 | 3.55 ± 0.44 | .09 |
| LL Strength | | | |
| Jump height (cm) | 18.2 ± 7.1 | 20.2 ± 5.2 | .68 |
| Might (W/kg) | 29.9 ± 8.7 | 30.5 ± 7.3 | .75 |
| Strength (N/kg) | 19.8 ± 2.9 | 20.8 ± 3.6 | .46 |
| Speed (cm/s) | 184.8 ± 38.2 | 197.1 ± 26.2 | .7 |
| Psychological Parameters | | | |
| PSI (score) | | | |
| GSE | 6.2 ± 2.1 | 7.7 ± 1.8 | .02 |
| PSW | 5.4 ± 2.3 | 7 ± 2.2 | .06 |
| PC | 6.2 ± 2.3 | 7 ± 2.2 | .17 |
| SC | 5.3 ± 3.2 | 7.4 ± 2.0 | .02 |
| PA | 5.8 ± 2.1 | 6.4 ± 2.0 | .21 |
| PS | 5.6 ± 2.5 | 7.1 ± 1.8 | .0019 |

TABLE 3. Results of the six-minute walking test

| 6MWT | M ± SD |
|------------------------------------|---------------------|
| 6MWT – Initial distance (m) | 602.3 ± 36.9 |
| 6MWT – Final distance (m) | 618.1 ± 46.5 |
| Predicted 6MWD – Li (m) | 666.8 ± 30.9 |
| Predicted 6MWD – Geiger (m) | 663.2 ± 37.7 |
| % predicted – Li | |
| - Initial | 90.3% |
| - Final | 92.7% |
| % predicted - Geiger | |
| - Initial | 90.8% |
| - Final | 93.2% |