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**Health sport campaign in Luxembourg:
Evaluation of the Sport-Santé campaign to promote
physical activity for patients with non-communicable
diseases**

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LIST OF ABBREVIATIONS

BMI	Body Mass Index
COPD	Chronic obstructive pulmonary disease
FLASS	Fédération Luxembourgeoise des Associations de Sport de Santé
GP	General Practitioner
NCD	Non-communicable disease
NGO	Non-governmental organisation
PA	Physical activity
WHO	World Health Organization

SUMMARY

Background. ‘Non-communicable disease’ (NCD) is defined as a disease that has a prolonged progression and results from the interaction of several factors; such as, for example smoking or a sedentary lifestyle. The main types of NCDs are cardiovascular diseases and cancer. The prevalence and mortality rates due to NCDs have been increasing over the years. Physical activity (PA) contributes towards the prevention and management of NCDs. PA confers multiple health benefits to patients suffering from NCDs, such as improving their quality of life and reducing the mortality rate. Considering that the benefits of exercising are irrefutable, Sport-Santé set itself the task to promote PA as a form of medical treatment for patients with NCDs in Luxembourg. Therefore, Sport-Santé launched a national campaign in the summer of 2018 to inform the Luxembourgish population and medical doctors about the existing health sport offers for patients suffering from NCDs and to promote an active lifestyle. The national campaign aimed at promoting PA to the Luxembourgish population by the means of TV-spots and radio adverts, as well as directly to medical doctors based in Luxembourg by providing promotional items, like the Sport-Santé Actimeter (a tool to evaluate PA levels) and promotional flyers.

Purpose. This study aims at evaluating the qualitative and quantitative impact of the national Sport-Santé health campaign to promote PA as a medical treatment for patients with NCDs. In this respect, the study was split into three parts: 1) medical doctors’ study, 2) participants’ study and 3) non-governmental organisations’ (NGOs) study.

Materials and Methods. 1) A total of 251 general practitioners (GPs) were phoned and asked to answer a questionnaire before and after the campaign about their professional day to day experience regarding PA promotion. 2) A total of 232 participants in health sports groups answered a questionnaire after the campaign regarding their participations in the health sports groups. The data was compared to similar data collected in 2016. 3) Thirteen NGOs offering PA for people with NCDs were evaluated after the campaign and the data were compared to similar data collected in 2016.

Results. 1) After the national Sport-Santé campaign, the Luxembourgish GPs counselled less PA than before ($\chi^2 = 39.43$, $p < 0.001$). Nevertheless, GPs recommended increasing PA promotion and PA-related training ($\chi^2 = 4.88$, $p < 0.027$), as well as a longer consultation time ($p < 0.001$). 2) Most participants of the sport groups were recruited by their medical doctor to participate in the health sport offers. However, compared to 2016, recruitment via family and friends tended to increase ($\chi^2 = 5.01$, $p = 0.081$). Moreover, the awareness of the [2](http://www.sport-</p></div><div data-bbox=)

sante.lu website increased to 33.7% in 2018 ($\chi^2 = 9.26$, $p = 0.003$). In addition, one fifth of the participants interviewed after the campaign recalled having heard the Sport-Santé Radio clip, additionally, more than one quarter of the participants saw the Sport-Santé TV spots. 3). The health sport offers have increased since 2016 ($t = -4.33$, $p = 0.005$), whereas the number of participants per PA course has remained stable ($t = -0.23$, $p = 0.83$).

Conclusion. This study shows that PA promotion is limited by several factors. The drop in PA counselling after the campaign could be explained by an increase in the number of medical consultations for more acute diseases, which contraindicate PA. Therefore, not every consultation allows for PA counselling due to various reasons, some are discussed in this thesis. From a GPs point of view, major limitations of PA promotion are the lack of opportunities and time during a consultation. Longer consultation time and financial incentives, such as remuneration for PA counselling, may counteract these limitations. Furthermore, we discuss part of a solution, which could be implemented. Training of medical doctors is important and PA counselling should be included in medical school curriculums and further education. The national Sport-Santé campaign did not increase the participation in the health sports groups and did not change the way the participants were recruited, at least during the short time span between 2016 and 2018. However, the national Sport-Santé campaign did contribute towards an increase in the Sport-Santé offer and its participants' knowledge during these two years. Moreover, changing the sedentary lifestyle of the population can only occur if the population is willing to adapt their habits and when the environment is conducive to allowing safe practice of PA. In addition, the possibility of "PA on prescription" may facilitate patients to adopt to a healthy lifestyle. Therefore, a cooperation between medical doctors, patients and the government is essential for the promotion of PA.

Gesundheitssportkampagne in Luxemburg: Evaluierung der Sport-Santé-Kampagne zur Förderung der körperlichen Aktivität von Patienten mit nichtübertragbaren Krankheiten

Einleitung. Nichtübertragbare Krankheiten, auch chronische Krankheiten genannt, sind als Krankheiten definiert, welche eine lange Progression haben und sich aus einem Zusammenspiel von mehreren Faktoren, wie dem Rauchen und einem sitzenden Lebensstil, entwickeln. Die Prävalenz und Mortalität dieser nichtübertragbaren Krankheiten wurden in den letzten Jahren zu einer immer größer werdenden Bedrohung. Regelmäßige körperliche Betätigung kann jedoch nachweislich diese nichtübertragbaren Krankheiten vorbeugen und helfen, mit diesen Erkrankungen umzugehen. So kann körperliche Betätigung die Lebensqualität steigern aber auch die Mortalität senken. Aus diesem Grund fördert Sport-Santé körperliche Betätigung als Medizin für genau jene Patienten. Die nationale Aufklärungskampagne von Sport-Santé wurde deshalb im Sommer 2018 in Luxemburg gestartet. Ziel war es, die luxemburgische Bevölkerung und die Ärzte über das Gesundheitssportangebot zu informieren und einen gesunden Lebensstil zu fördern. Die Bevölkerung sollte mit TV- und Radiospots über körperliche Betätigung sensibilisiert werden und die in Luxemburg tätigen Ärzte sollten die Bevölkerung mit Werbeartikeln wie dem Sport-Santé Actimeter (einem Instrument zur Bewertung der körperlichen Aktivität-Werte) und Flyern informieren.

Fragestellung. Ziel dieser Studie war es, die Auswirkungen der nationalen Aufklärungskampagne von Sport-Santé zur Förderung von körperlicher Betätigung als Medizin für Patienten mit chronischen Erkrankungen zu evaluieren. Deswegen wurde die Studie in drei Teile aufgeteilt: 1) Ärzte-Studie, 2) Teilnehmer-Studie und 3) nicht-staatliche Organisationen-Studie.

Material und Methoden. 1) Insgesamt 251 Allgemeinmediziner beantworteten vor und nach der Kampagne einen telefonischen Fragebogen zu ihren Gewohnheiten in Bezug auf die Bewegungsförderung ihrer Patienten. 2) Alles in einem beantworteten 232 Teilnehmer von Gesundheitssportgruppen nach der Kampagne einen Fragebogen bezüglich ihrer Teilnahme an diesen Gesundheitssportgruppen. Die Daten wurden mit ähnlichen Daten welche 2016 erhoben wurden, verglichen. 3) Auch wurden 13 nicht-staatliche Organisationen, die körperliche Betätigung für Menschen mit chronischen Krankheiten anbieten, ausgewertet. Die Daten wurden mit ähnlichen Daten aus dem Jahr 2016 verglichen.

Ergebnisse. 1) Nach der nationalen Sport-Santé-Kampagne haben die Luxemburger Allgemeinmediziner weniger Bewegungsförderung ausgeführt ($\chi^2 = 39,43$, $p < 0,001$). Sie verlangten jedoch mehr Förderung und spezifisches Training über körperliche Betätigung ($\chi^2 = 4,88$, $p < 0,027$), sowie eine längere Konsultationszeit ($p < 0,001$). 2) Im Vergleich zu 2016 wurden die meisten Teilnehmer der Sportgruppen von ihrem Arzt angeworben, die Rekrutierung über Familie und Freunde nahm jedoch tendenziell zu ($\chi^2 = 5,01$, $p = 0,081$). Zudem hat die Anzahl der Teilnehmer, die die Website www.sport-sante.lu kennen, zugenommen ($\chi^2 = 9,24$, $p = 0,003$). Darüber hinaus hat sich ein Fünftel der nach der Kampagne befragten Teilnehmer daran erinnert, den Sport-Santé-Radioclip gehört zu haben, und mehr als ein Viertel der Teilnehmer haben die Sport-Santé-TV-Spots gesehen. 3) Das Angebot an Gesundheitssport wurde seit 2016 erweitert ($t = -4,33$, $p = 0,005$), während die Anzahl der Teilnehmer pro Kurs stabil blieb ($t = -0,23$, $p = 0,83$).

Schlussfolgerung. Diese Studie zeigt, dass die Förderung von körperlicher Betätigung mehreren Hindernissen unterliegt. Der Rückgang der Anzahl der Gespräche zur Bewegungsförderung könnte durch den Anstieg der Anzahl der Konsultationen für akute Krankheiten erklärt werden. Hierbei handelt es sich oft um Erkrankungen bei denen körperliche Betätigung kontraindiziert ist. Eine Beratung zur körperlichen Betätigung kann also nicht in jeder Arztkonsultation durchgeführt werden, diverse Faktoren, die hierbei eine Rolle spielen, werden in dieser Dissertationsarbeit ausgearbeitet. Aus Sicht der Allgemeinmediziner sind wichtige Hindernisse der Bewegungsförderung, der Mangel an Möglichkeiten und die Zeit zur Aufklärung des Patienten während der Sprechstunde. Eine längere Konsultationszeit sowie deren finanzielle Vergütung könnten diesem Problem entgegenwirken. Ein Teil der Lösung, die umgesetzt werden könnte, wird ebenfalls diskutiert werden. Auch konnte festgestellt werden, dass die Ausbildung und Fortbildung von Ärzten eine sehr wichtige Aufgabe in der Bewegungsförderung darstellen, aus diesem Grund sollten die Effekte von körperlicher Betätigung auf die jeweiligen Erkrankungen auch Teil des Lehrplans der Universitäten sein. Die nationale Sport-Santé-Kampagne hat, zumindest nicht über die Zeitspanne von 2016 bis 2018, die Teilnahme an den Gesundheitssportgruppen nicht erhöht und die Art und Weise, wie die Teilnehmer auf das Angebot aufmerksam gemacht wurden, nicht verändert. Jedoch hat die in den letzten zwei Jahren durchgeführte Arbeit dazu beigetragen, das Sport-Santé-Angebot und die Kenntnisse der Teilnehmer zu verbessern. Jedoch damit sich der sitzende Lebensstil der Bevölkerung ändert, muss diese auch gewillt sein ihre Gewohnheiten anzupassen. Allerdings ist es auch von Nöten, dass Umgebungen vorhanden sind, in denen sich sicher körperlich betätigt werden kann. Darüber hinaus kann die Möglichkeit von „Körperlicher Betätigung auf Rezept“ den Menschen helfen, einen gesunden Lebensstil anzunehmen. Daher ist eine Zusammenarbeit von Ärzten, Patienten und der Regierung für die Förderung der körperlichen Betätigung unabdingbar.

1 INTRODUCTION

1.1 NON-COMMUNICABLE DISEASES

The World Health Organisation (WHO) defines non-communicable diseases (NCDs), also referred to as chronic diseases or long-term conditions, as diseases that have a long duration of suffering and which have developed due to several factors. In particular, NCDs are used as a generic term for various diseases including cancer, chronic respiratory diseases, diabetes or cardiovascular diseases [163].

Altogether NCDs are considered to cause over 70% of deaths worldwide [163]. Regrettably, mortality rates resulting from NCDs have been rising over the years. While in 1990, 9.5 million of the world's population aged between 30-69 years died due to the consequences of NCDs, in 2017, NCDs caused a total of 12.9 million deaths worldwide, meaning 62.9% of all deaths in that age group are linked to a NCD [89].

Moreover, the prevalence and mortality rate of NCDs is increasing worldwide. For instance, the number of people with hypertension in the world has increased by 90% from 1975 to 2015. Especially in low-income and middle-income countries hypertension is becoming an increased threat to the population and is linked to the growth and ageing of the population [103]. Moreover, the prevalence of diabetes has nearly doubled since 1980, demonstrating that 8.5% of the adult population worldwide (approximately 422 million people) was affected by this disease in 2014 [161]. These two diseases, hypertension and diabetes, can lead to the development of other cardiovascular diseases [154,161]. In fact, cardiovascular diseases are the reason for 18% of disability-adjusted life years lost in high income countries, and 10% in low- and middle-income countries [90]. In fact, the situation for cancer is highly similar with regards to disability-adjusted life-years and mortality rates, both increasing worldwide [55].

In Luxembourg, in 2016, a total of 3978 deaths were recorded [139]. Not less than 31.8 % of these deaths can be attributed to cardiovascular diseases, notably the leading cause of death in Luxembourg. Neoplasms/cancers being the second highest cause for deaths with 28.2%. Therefore, it can be shown that NCDs are responsible for the majority of deaths recorded in Luxembourg (Figure 1).

The risk factors associated with NCDs are genetic, environmental, physiological and behavioural. Besides smoking, which increases the occurrence of NCDs, such as cardiovascular diseases [120], lung cancer [83] and chronic obstructive pulmonary disease

(COPD) [48], physical inactivity was ranked as the 4th modifiable risk factor for NCDs by the WHO [160]. In fact, cardiovascular diseases [115], various types of cancer [14] and type 2 diabetes [48] are all linked to physical inactivity. Therefore, changing habits like increasing PA may reduce the risk of development or aggravation of NCDs.

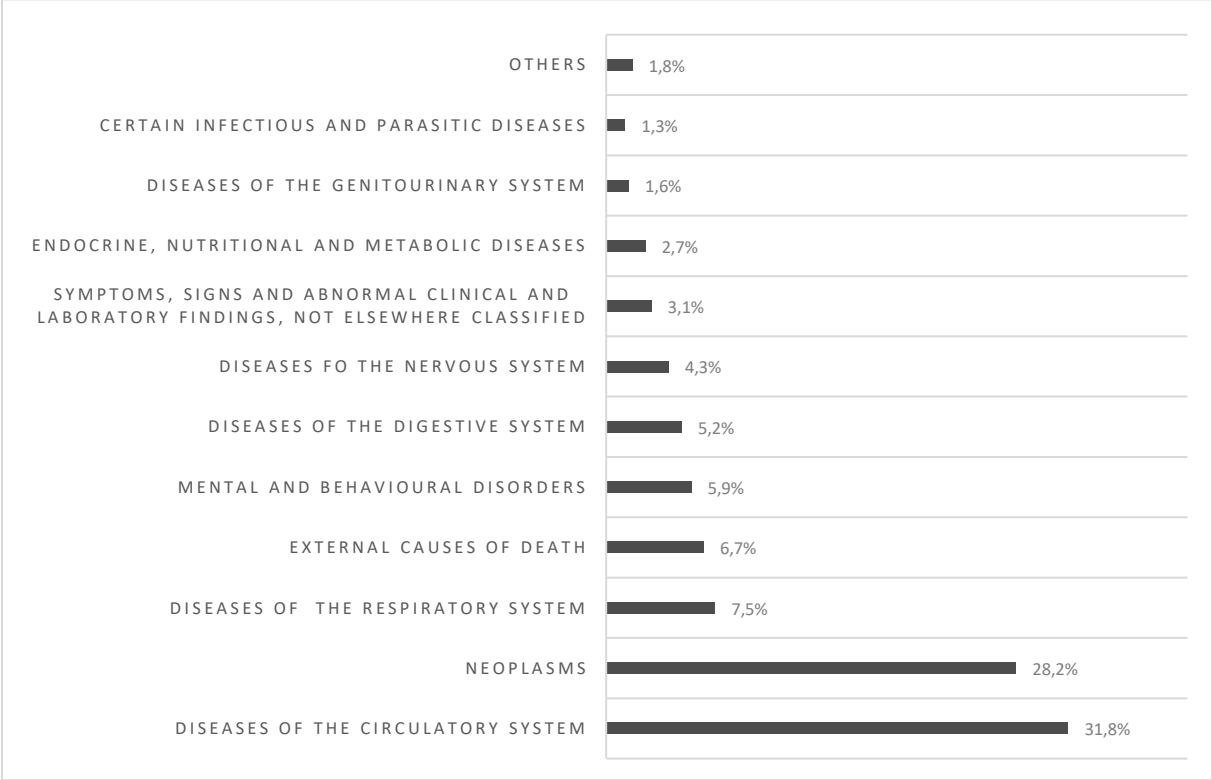


Figure 1. Death by causes in Luxembourg during 2016 [139].

1.2 EFFECTS OF PHYSICAL ACTIVITY ON HEALTH

1.2.1 DEFINITION OF PHYSICAL ACTIVITY

'Physical activity' (PA) is defined as a movement of the body generated by skeletal muscles that results in an increase of energy expenditure depending on the intensity [21]. It includes all planned and not planned activities performed throughout the day, meaning during leisure time, working hours and sleep. 'Exercise' is described as a planned and goal-directed activity and is a sub-category of PA [21].

1.2.2 THE USE OF PA FOR PREVENTIVE STRATEGIES

PA can be used for preventive strategies. The goal of a primary prevention is to prevent the occurrence of illnesses by changing unhealthy behaviours [47]. Therefore, healthy lifestyle education, including a more active lifestyle, is the key factor for a primary prevention. The government can play an important role in primary prevention education by creating more programs and supporting health and sporting events. Safe environments like bicycle paths, pedestrian zones and playgrounds should be built. Overall, the government should offer the possibility of increasing physical movement to the entire population [164].

PA not only has a positive effect on healthy people, but also provides great benefits for sick people. Therefore, the effects and benefits of PA can also be used as secondary and tertiary prevention. In comparison to primary prevention, secondary prevention is performed to diminish the influence of a disease, improving early detection and prohibition of the progression and chronification of the disease via regular examinations and check-ups [166]. Lastly, tertiary prevention aims to prevent the progression, decrease the recurrence risk and prevent the consequences of a disease or injury. Improving the quality of life and life expectancy are also a goal of tertiary prevention, including rehabilitation measures and support groups, like for example sport clubs for patients [58].

1.2.3 POSITIVE EFFECTS OF PA ON HEALTH

1.2.3.1 EFFECTS OF PA ON CARDIOVASCULAR DISEASES

Cardiovascular diseases include diseases of the heart, diseases of the blood vessels and vascular diseases of the brain. Atherosclerosis is the main cause for the development of coronary heart disease [155]. This creeping process takes several years to develop and finally leads to a narrowing of the vascular lumen, principally due to the incorporation of cholesterol and fatty substances, leading to the formation of plaques. Due to these plaques, the endothelium no longer functions adequately and blood flow decreases. These plaques can rupture and may potentially obstruct, amongst other vessels, the coronary arteries causing a myocardial infarction [155]. However, PA positively affects the endothelial and ventricular functions [59,153] and can prevent or slow down the progression of the disease [31,153]. Moreover, studies show that cardiovascular mortality and the attributed clinical signs, such as angina pectoris, can be reduced by exercising on a regular basis [6,60]. Endurance PA has traditionally been promoted to manage cardiovascular diseases. Interestingly, over the last two decades (2000 to 2019) strength training has also demonstrated health benefits and is often combined with endurance training to optimize the effect of PA [33].

Another clinical sign for cardiovascular diseases is hypertension. Hypertension is defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg [154]. Blood pressure may be reduced by 11/5 mmHg by performing medium-to-high-intensity aerobic activity on a regular basis [12].

Stroke is a disease that occurs when the blood supply to an area of the brain is reduced, causing cell death. Two types of stroke are defined: an ischemic stroke is due to an interruption of blood supply to brain tissue, whereas a haemorrhagic stroke results from a rupture of a blood vessel. The symptoms depend on the severity of cell death and the affected brain area [7]. Up to 30% of patients suffer from permanent impairments (e.g. balance, gait, coordination, etc.) [119], which can be reduced via PA during and/or after rehabilitation [122]. It has been shown that almost all types of PA improve balance and coordination [84].

However, after suffering from a cardiac event, exercise testing is strongly recommended prior to starting exercising for cardiac rehabilitation [45,95]. Moreover, after a cardiovascular event, it has been shown that PA can significantly prevent the occurrence of subsequent cardiac related events and reduce mortality [142]. PA is therefore used in cardiovascular rehabilitation and patients are strongly encouraged to be active beyond the in-hospital rehabilitation.

1.2.3.2 EFFECTS OF PA ON DIABETES

Diabetes is defined as a metabolic disorder characterised by hyperglycaemia leading to microvascular and macrovascular complications. Type 1 diabetes is due to an autoimmune process, whereas type 2 diabetes is primarily the consequence of a metabolic syndrome and an unhealthy lifestyle. In fact, a low-grade inflammation is involved in the pathogenesis of type 2 diabetes [157]. In particular, increased levels of inflammatory mediators and markers, like pro-inflammatory cytokines or C-reactive proteins which are associated with insulin resistance [126]. Glycated haemoglobin HbA_{1c} is a form of haemoglobin linked to glucose that provides information on a patient's blood sugar levels over the past 3 months and is therefore used as a diagnostic tool [159]. The level of C-reactive protein can be reduced by exercising on a regular basis, which may lead to a suppression of the low-grade inflammation [93]. Besides medication, a reduction of this glycated haemoglobin HbA_{1c} can be achieved by a healthy diet and PA [145]. Additionally, regular PA is a preventive strategy for the development of long-term complications like stroke and nephropathy and for decelerating the progression of diabetes [4].

1.2.3.3 EFFECTS OF PA ON OVERWEIGHT/OBESITY

Overweight and obesity are two conditions that are characterized by an excess of body fat. Overweight in adults is defined by a Body Mass Index (BMI) greater than or equal to 25 and obesity is characterized by a BMI greater than or equal to 30 [167]. The causes are mostly physical inactivity and an energy disequilibrium [56]. Altogether, both conditions have negative effects on health, for example obesity is linked to most cardiovascular diseases including hypertension and heart failure [80,81]. A negative energy balance is an important strategy for weight loss and can be achieved by either increasing energy expenditure, decreasing energy intake or both [132]. A possible way to increase energy expenditure is by being physically active and exercising [82].

1.2.3.4 EFFECTS OF PA ON CANCER

Cancer is defined by abnormally elevated and uncontrolled cell division [100]. Over time, the newly formed cells invade the surrounding tissues or spread as metastases throughout the body. The classification of the cancer depends on the tissue of origin and malignancy (benign or malign) [100]. Warburton and Bredin stated in their scientific literature review, that regular PA reduces mortality for many types of cancer [152]. Indeed, leisure-time PA was associated, independently from other risk factors, with reduced risks of 10 types of cancer [97].

The type of therapy varies depending on the stage and type of cancer, most common forms are surgery, chemotherapy and radiation therapy [101]. These therapies are often accompanied by many side effects; fatigue, hair loss, lymphedema, pain, neuropathy and many more [102]. Many of these side effects can be reduced by PA. Cancer-related fatigue can be reduced by being physically active [70,151]. Exercising can improve muscle strength and may reduce pain and anxiety [124]. Furthermore, many patients report that exercising helps them forget about the disease and facilitates focusing on the future, therefore PA has a positive impact on the mental well-being of patients [17].

Post treatment, PA decreases the risk of a relapse [124]. It can also be used to recover the physical deconditioning that occurred during therapy [14]. Cancer survivors state that post-treatment PA helped them to feel healthy and fit again [17]. Even patients in palliative care can benefit from PA as it improves their functional status, symptoms and health-related quality of life, as long as possible [5].

1.2.3.5 EFFECTS OF PA ON NEUROLOGICAL DISEASES

Parkinson's disease is a progressive neurological movement disorder induced by a decay of dopaminergic neurons in the substantia nigra [67]. It is a syndrome characterised by a large number of motor and non-motor symptoms, the principal symptoms being rest tremor, bradykinesia, rigidity and unstable posture [66]. PA not only has an impact on motor symptoms as it improves balance, motor function and gait pattern [127]. Non-motor symptoms like depression and sleeping disorder may also be positively influenced by PA [29].

Multiple sclerosis is defined as an inflammatory autoimmune disease of the central nervous system and is characterized by demyelination and axonal loss [27]. Due to the destruction of the myelin sheath, impulses are transmitted more slowly; motor sensitivity is increased; and spontaneous impulse triggering can occur [27]. Throughout the clinical course of the disease, a decrease in mobility is described, which can be intensified by fatigue [27,42]. Patients suffering from multiple sclerosis can benefit from regular exercise as it has a positive effect on fatigue, muscle strength and functional capacity [42]. In addition, endurance training also improves the mental health as it improves mood, counteracts depression and thus enhances health related quality of life [32,92].

1.2.3.6 EFFECTS OF PA ON THE RESPIRATORY DISEASES

COPD is caused by a chronic inflammation of the small airways, provoked by the inhalation of noxious substances (especially tobacco). The irreversible obstruction of the respiratory tract is caused by hypertrophy of the smooth muscle cells and remodelling processes, both causing a lack of gas exchange surface followed by hypoxia and hypercapnia. As breathing becomes more and more difficult, the consequence being the exhaustion of the respiratory muscles [7]. Patients suffering from COPD benefit from PA as it boosts functional lung capacity and enhances their life quality [109]. The risk of hospitalization or mortality due to COPD can be reduced by 30-40% by doing a mere two hours of endurance exercise per week [52].

1.2.3.7 EFFECTS OF PA ON MENTAL HEALTH

Depression is marked by various symptoms like dysphoria (dissatisfaction), anhedonia (loss of experiencing joy and happiness) and functional impairment. Per definition, symptoms must last for at least two weeks to be considered as a depression [162]. PA can reduce these depressive symptoms in combination with antidepressants or without medication [78]. Moreover, exercise reduces the likeliness of relapsing more compared to pharmacotherapy [8].

Stress is a normal reaction of the human body triggered by various factors as for instance nonideal working conditions, burn-out and diseases. The reaction to stress permits an increased physiological, psychological and behavioural alertness. However, a long period of exposure to stress may lead to illness, malfunction and non-optimised performance of the human body [118]. Exercising on a regular basis diminishes sensitivity to stress [121] by not only building a better physical system, but also enhancing the emotional well-being by effective release of hormones. Additionally, realistic assumptions and motivating factors during exercise can positively affect happiness and individual health [118,150].

1.2.3.8 EFFECT OF PA ON THE ORTHOPAEDICAL DISEASES

The systemic skeletal disease, osteoporosis, is defined by low bone mass, microarchitectural deterioration of the bone tissue and additionally characterized by low bone mineral density [71]. The consequences are bone fragility and a higher tendency to fracture [169]. Weight training and running increase bone mineral density and additional loss can be reduced by walking [144]. Beyond that, falling can be prevented by regular PA, especially if performing balance exercises [84,125].

1.2.4 ADVERSARY EFFECTS OF PA ON HEALTH

Like all types of medical treatments, PA can also have side effects on health. The most popular PA-related side effects are musculoskeletal and cardiovascular events.

Musculoskeletal events are the most common negative side effects of PA and result from acute traumatic incidents or chronic overuse. The results of a follow-up survey performed by Hootman et al. show that one quarter of the participants signalled a musculoskeletal injury after being physically active twice a week [63]. A total of 83% of these injuries were related to PA and mostly affected the lower extremity [63]. For example, the risk of developing tendon injuries depends on various risk factors like age, gender, BMI and/ or training errors [104]. However, the frequency of the complications also depends on the type of PA performed: the injury rate of people practising collision and contact sports is higher than the injury rate of people walking or swimming for exercise [113,141].

Exercise-related sudden death is mostly attributable to pre-existing cardiac conditions [142,147]. The cause of the event most often depends on the age of the individual affected. Hereditary or congenital cardiovascular abnormalities are the most frequent reasons for cardiovascular events occurring in young individuals, whereas exercise-associated cardiac events in adults are mostly due to coronary artery disease [123,142]. Life-long extreme endurance sports, like marathons and triathlons, may induce fibrotic changes that lead to atrial fibrillation and/or ventricular arrhythmias [106]. In order to reduce the risk of occurrence of cardiac events, exercise testing is recommended for individuals with known cardiac conditions [95,142] and specific exercise recommendations should be followed [111].

Therefore, medical supervision and guidelines are important measures to reduce the occurrence of adversary effects of PA.

1.3 PROMOTION OF PHYSICAL ACTIVITY

1.3.1 INTERNATIONAL ADVOCACY

A positive influence of PA on disease progression and personal health of a patient cannot be denied. The Ottawa Charter for Health Promotion published in 1986 by the WHO after the First International Conference on Health Promotion was an important step towards facilitating people to improve their health. The Ottawa Charter defines the basic requirements for health and provides help and concepts for health promotion, as for instance the creation of supportive environments [156].

Furthermore, in 2010, the WHO proposed recommendations for the degree and duration of PA for different age groups: 5-17 years old, 18-65 years old and 65 years old and older (Figure 2). A minimum of 60 minutes per day of moderate-to-vigorous PA was suggested for children and adolescents. The adult group (aged 18–64) should perform at least 150 minutes of moderate-intensity aerobic PA or at least 75 minutes of vigorous-intensity aerobic PA throughout the week or an equivalent combination of both [158]. An aerobic PA is currently defined as a unit of movement of a duration of at least 10 minutes [158]. Notably, the new recommendations from the *PA Guidelines for Americans* from 2018 established that the minimum duration of a unit of movement is no longer 10 minutes, but any amount of movement can be quantified as PA, thus daily life tasks, such as climbing the stairs instead of taking the lift, can also be taken into account when summing the amount of weekly PA [114]. The recommendations for adults also include muscle-strengthening activities on two or more days a week [158]. The suggestions for people aged 65 or older mostly overlap with those for the adult group. They are however additionally completed with balance exercises three times a week. If the health of the elderly adult group makes it difficult to follow the recommendations, they should not completely cease exercising, but perform as much PA as their condition allows [158].

The WHO published the “Global Action Plan for the Prevention and Control of non-communicable diseases 2013-2020” in 2013. Six objectives were put forward in order to reduce the negative burden of NCDs. For instance, the third objective underlines the importance of a reduction of modifiable risk factors and the formation of health-promoting surroundings. The action plan also contains support methods and strategies for member states to meet the objectives set out [160].



Figure 2. WHO recommendations for the degree and duration of PA for adults [164].

Finally, the “Global Action Plan on Physical Activity 2018-2030” was set up in 2018 in order to reduce global inactivity. The aim is to decrease physical inactivity by 15% by 2030. The action plan is valid for all countries and includes four objectives (Active Societies, Active Environments, Active People and Active Systems) and twenty evidence-based policies. Firstly, communication is key to promoting PA (Active societies, action 1.1). In order to boost awareness of the positive effects of PA, promotional campaigns should be launched and

should promote available PA offers in their specific countries (sports clubs, health sports etc.). Secondly, people working in the health care system should be involved too. PA counselling is an important item to reduce sedentary behaviour (Active people, action 3.2). Both principles (actions 1.1 and 3.2) are also part of the control and prevention of NCDs [165].

1.3.2 HEALTH SPORT IN NEIGHBOURING COUNTRIES OF LUXEMBOURG

Huge variations are observed in the implementation of these recommendations across the neighbouring countries of the Grand-Duchy of Luxembourg. Governments and/or organizations set themselves the task to create models to fulfil these recommendations. For this reason, several models were established in recent years and a few of these are presented in the upcoming sections.

1.3.2.1 BELGIUM

The model „*Sports sur Ordonnance*“ (Sport on Prescription) is implemented in the Federation Wallonia-Brussel. “*Sport sur ordonnance*” allows medical doctors to prescribe exercise and is designed to integrate PA as part of the treatment for NCDs. After a personal conversation with the medical doctor based in Belgium, it was evident that patients are oriented towards sports structures which are located in their vicinity proposing PA adapted to their pathology [135]. Patients with NCDs can then perform regular PA under medical supervision in accordance with the guidelines proposed by “Exercise is Medicine” [46]. The patients exercise together in small groups in adapted facilities. The courses are monitored by qualified tutors.

In collaboration with the Cliniques Universitaires Saint-Luc, the Faculté des Sciences de la Motricité from the Université Catholique de Louvain developed two university certificates: Exercise Medicine and Exercise Therapy [146]. Both certificates aim to better integrate PA into the treatment of certain NCDs. Candidates must have a master's degree in movement sciences, with focus on physiotherapy and rehabilitation or physical education to obtain the certificate in Exercise Therapy. For the certificate in Exercise Medicine, applicants must hold a medical doctor degree or a master's degree in medicine. To obtain the university certificate, the following modules are mandatory: general, oncology, cardiology, PA and mental health, metabolism, pneumonology, neurology and locomotor system.

The model “*Sport Sur Ordonnance*” is financed by the municipalities. Patients must pay to obtain access to the activities, but many health insurances reimburse part of the fees [99,110].

1.3.2.2 FRANCE

The law n°2016-41 from the 26th of January 2016 was introduced to modernise the French health care system [25]. Furthermore, under the new law, Article L.1172-1 allows medical doctors to prescribe PA via “sport sur ordonnance”, which is adapted to a patients’ pathology, physical abilities and medical risk [24].

In fact, the prescription should be made by the attending medical doctor as part of a care pathway (Figure 3). It should be personalized in terms of type, intensity and duration of the exercise. Thus, the condition/disease of the patient must be characterised. There are four severity levels of limitations: severe, moderate, minimal and no limitations. The severity levels define not only which PA a patient can do, but also to whom she/he should be referred. The decree n° 2016-1990 from the 30th of December 2016 [96] determines who can propose different training courses, including for example health professionals, professionals with a degree in the field of adapted PA, sports educators, civil servants and military members or qualified persons holding a certification by an approved sports federation. Patients with severe functional limitations can only be taken care of by health professionals (psychomotor therapists, physiotherapists and occupational therapists) [10,96].

Implementation of training for PA prescription in the curriculum proposed by the French medical schools is slowly increasing but is not regulated. Moreover, a guide to promote PA and to facilitate the prescription of PA was created by the French National Institute of Health (Haute Autorité de Santé). This guide also contains PA guidelines and limitations for various diseases [61,116].

If the patient agrees, a periodic monitoring can be set up by a local coordinator (professional in sport health or physiotherapist) and this report is sent to the prescribing medical doctor and their patient. The medical doctor may also formulate proposals for the continuation of PA and the inherent risks. An evolution to a different level of limitation is possible.

Tampon du Médecin	
-------------------	--

DATE :

Nom du patient :

Je prescris une activité physique et/ou sportive adaptée

Pendant, à adapter en fonction de l'évolution des aptitudes du patient.

Préconisation d'activité et recommandations

.....

.....

.....

.....

.....

.....

Type d'intervenant(s) appelé(s) à dispenser l'activité physique (en référence à l'Article D. 1172-2 du Code de la santé publique¹), le cas échéant, dans le cadre d'une équipe pluridisciplinaire²:

.....

Document remis au patient

La dispensation de l'activité physique adaptée ne peut pas donner lieu à une prise en charge financière par l'assurance maladie.

Lieu date signature cachet professionnel

¹ Décret n° 2016-1990 du 30 décembre 2016 relatif aux conditions de dispensation de l'activité physique adaptée prescrite par le médecin traitant à des patients atteints d'une ALD

² Concerne les titulaires d'un titre à finalité professionnelle, d'un certificat de qualification professionnelle ou d'un diplôme fédéral, inscrit sur arrêté interministériel qui ne peuvent intervenir dans la dispensation d'activités physiques adaptées à des patients atteints de limitations fonctionnelles modérées que dans le cadre d'une équipe pluridisciplinaire (cf. annexe 4 de l'instruction interministérielle n° DGS/EA3/DGESIP/DS/SG/2017/81 du 3 mars 2017 relative à la mise en œuvre des articles L.1172-1 et D.1172-1 à D.1172-5 du code de la santé publique et portant guide sur les conditions de dispensation de l'activité physique adaptée prescrite par le médecin traitant à des patients atteints d'une affection de longue durée)

Figure 3. Prescription form for doctors and patients in France [13].

In eastern France, especially in the “Grand Est” Region, the model “Prescri’mov” was launched at the end of 2018 to improve the health of patients with NCDs via PA prescription by implementing new laws. So far, health sports for type 1 and 2 diabetes, COPD, various cancers, lower extremity arthritis, stable coronary heart disease and overweight grades 1 and 2 are offered. This offer is to be expanded during the next years.



Figure 4. Label Prescri'mouv [2].

The model consists of five stages that a patient should go through:

- Stage 1: Appointment with a medical doctor (“Rendez-vous avec le médecin traitant”).
The first stage involves an appointment with the attending medical doctor. Medical doctors should talk to their patients about the benefits of health sports and introduce Prescri’mov to them. Beforehand, all doctors practicing in this region received an array of informational and work related materials to help them prescribe PA: a practical guide for the prescriber and a patient follow-up booklet, a leaflet and a presentation poster as well as a link to a dedicated "Presci'mouv" website with animations.
- Stage 2 : First contact with a "Presci'mouv" professional (“Prise de contact avec le professionnel du dispositif”).
In this phase, the patients should contact a "Presci'mouv" professional. All the professionals working within "Presci'mouv" model are trained in the care of patients with NCDs and are specialists of PA. They perform assessments and offer an appropriate support.
- Stage 3: Measuring of the fitness level and assignment to the specific groups (“Réalisation du bilan initial”).
The patient’s fitness level is evaluated using a variety of tests: timed up & go test, balance tests, chair test, 6-minute walking test and 2-minute stepping test. This evaluation is performed by a professional in sport health or by a physiotherapist. Depending on the patients’ autonomy and severity of their disease, patients are

subsequently divided into three groups. If placed into the first group, the health sport professionals provide advice on PA, either for self-directed practice or for signing up to a sport club or sports association. In the second group, patients should perform PA supervised in "Presci'mouv" labelled organisations. To receive this label (Figure 4) the organisation must meet the following criteria: follow the development of a patient, offer regular sports activities, have qualified trainers, undergo an annual evaluation and promote the model "Presci'mouv". Finally, the third group aims at boosting NCD patients' self-confidence. Here, in addition to sports activities, small group and individual sessions are also offered.

- Stage 4: Approval of the medical doctor ("Validation du parcours par le médecin traitant").

In a next step, the patient should once again contact the treating medical doctor with his/her assessment and group allocation. The doctor must at this stage give his final approval, which also includes a certificate that there are no contraindications.

- Stage 5: Final status report ("Réalisation du bilan final").

The fifth and final stage represents further support by the "Presci'mouv" professionals. All the information is recorded in an activity passport. This not only serves as a link between all stakeholders (patient, medical doctor and health professionals, PA professionals), but the patient should also record his/her progress (Figure 5). After six months, an evaluation is conducted by the local coordinator [2].




Date	Contenu, durée, ressenti, remarques	Forme
		
		Émotions
		
		Satisfaction
		

Figure 5. Part of the activity passport: Participants need to fill out the form after exercising including the date, content, duration, feelings, remarks, form, emotions and satisfaction [3].

All medical practitioners (general practitioners (GPs) and specialists) are allowed to prescribe PA [62], however it is not part of the official classification of medical procedures in France [18]. Interestingly, GPs and specialists have the possibility to charge more for a consultation with a child between the ages of three and 12 years of age being at risk of obesity [19,20]. In addition,

specialists can charge a higher price for a complex consultation, such as for neurodegenerative diseases [19]. Usually, the counselling and prescription of PA are not reimbursed by the health insurance in France. The model Prescri'mouv, nonetheless, is free of charge, except for the access to the labelled organisation. The financial contribution, such as entrance fees, is set by the facility itself. Nevertheless, some health insurances, like the "MAIF"¹, offer a refund of 500€ per person over two years [91]. Moreover, certain cities sometimes subsidise, at least partially, the cost of the offered PA (e.g. in the city of Strasbourg) [149].

¹ Mutuelle d'assurance des instituteurs de France, société d'assurance mutuelle

1.3.2.3 GERMANY

The prescription of PA as part of a medical treatment for patients with a disability or a NCD is identified in the §42, §43 and §64 of Volume IX of the German Social Insurance Code [129–131]. Medical doctors are allowed to prescribe functional training and rehabilitation sport [15].

Functional training aims

- to preserve and improve the function of body parts or to delay its loss
- to relieve the patient from his/her pain
- to improve movement
- to assist in coping with the disease
- to help patients help themselves

Rehabilitation sport however aims

- towards strengthening endurance, coordination and flexibility
- to improve self-confidence
- to help patients help themselves

In cooperation with the German Federal Medical Association (Bundesärztekammer), the German Olympic sports association (Deutscher Olympischer Sportsbund, DOSB) created the label of quality “Sport Pro Gesundheit” in 2000 in order to help interested individuals to find the right health-centred sporting activity (Figure 6). The goal of “Sport Pro Gesundheit” is not only to lower the risk factors but also to give patients psychiatric and psychosocial support.



Figure 6. Label of quality “Sport Pro Gesundheit” [39].

If a sport course or sports club aims to obtain this label of quality “Sport Pro Gesundheit” (Figure 6), six quality criteria must be fulfilled [37]:

- **Criteria 1: Targeted offer (“Zielgruppengerechtes Angebot”).**
The offer needs to be assigned to one of the following areas "cardiovascular", "musculoskeletal system", "relaxation / stress management" or "general prevention sport". Due to the different requirements for children, adolescents, adults and the elderly, target groups must be organised to fulfil the needs of each individual. Finally, gender and living environment should also be considered.
- **Criteria 2: Qualified leader (“Qualifizierte Leitung”).**
The health sports group instructors must undergo a specific training “Sport in der Prävention” or have a vocational training in the sport or health field to become a licenced trainer. In addition, he/she must attend training seminars and exercises to update his/her knowledge.
- **Criteria 3: Uniform organizational structures (“Einheitliche Organisationsstrukturen”).**
The number of participants is limited to 15 people. A course consists of 10-15 lessons and every week at least one lesson must be offered. The number of lessons may vary according to the disease.
- **Criteria 4: Preventive health check (“Präventiver Gesundheitscheck”).**
People over the age of 35 should attend a preventive health check as formulated in § 20 Volume V of the German Social Insurance Code, children or adolescents should be seen by their family doctor, if they are not allowed to attend school sports. A certificate can be requested on demand. A person can be excluded due to health reasons.
- **Criteria 5: Accompanying quality management (“Begleitendes Qualitätsmanagement”).**
With the support of the DOSB, the instructors are supervised by member organizations. Participants surveys, quality evaluations or complementary examinations are necessary.
- **Criteria 6: The club as health partner (“Der Verein als Gesundheitspartner”).**
The association should intend to work with schools, senior citizen organizations, health departments, health insurances and hospitals. Especially the cooperation with resident doctors is recommended.

Suitable sports clubs in a specific area can be looked up on the dedicated website. The search criteria are location, distance, area and target group (Figure 7). The website provides a list of the offers including the venue and event day.

Hier geht es zu Ihrem SPORT PRO GESUNDHEIT-Angebot

Stadt/PLZ:

Entfernung:

Bereich:

Zielgruppe:

Figure 7. Search criteria for a suitable sports club [38].

The DOSB and the German Medical Federal Association also created the “Rezept für Bewegung”, a prescription for exercise (Figure 8). In the federal states of Bavaria, Berlin, Bremen, Hamburg, Hesse, Rhineland-Palatinate, North Rhine-Westphalia, Schleswig Holstein and Thuringia, medical doctors can order free flyers and prescription forms. This prescription should serve as a guide for patients but is not necessary in order to participate.

Another label of quality is “Sport Pro Fitness”, which is primarily given to a gym or a sports club. This label was created by the DOSB, the German Gymnastics Federation (Deutscher Turner-Bund) and the federal association of German weightlifters (Bundesverband Deutscher Gewichtheber) in 2008. The goal was to extend the high standard of sport-for-health to fitness centres and to offer health care more flexibly. This makes it easier to reach working people. Qualification of the management and the knowledge of the staff, sports-related support, spatial conditions, equipment, service and environmental criteria are included in the assessment [40].

The health insurances bear the cost of the participation fees, if an application for reimbursement is accepted in advance, otherwise the patient must pay the costs him/herself. Prescribing PA is considered as a recommendation, therefore, the medical doctor cannot charge for a prescription [16]. A medical doctor must fill out a special form including the diagnosis, the reason and purpose of rehabilitation measures, the duration and recommendations on the type of appropriate activities [72]. However, the medical prescription of PA is not intended to continue after the expiration of the granted period. Another request for reimbursement must be submitted or the patient must participate in sports at his/her own expense [15].

Name, Vorname der/des Versicherten	
	geb. am
Datum	

Ich empfehle Ihnen ein Training mit folgendem Schwerpunkt:

- Herz-Kreislaufsystem
- Haltungs- und Bewegungssystem
- Stressbewältigung und Entspannung
- Koordination und motorische Förderung

Hinweise an die Übungsleitung:

.....

.....

.....

.....

.....

.....

.....

.....



Empty box for stamp and signature of the doctor.

REZEPT FÜR BEWEGUNG

Regelmäßige körperliche Aktivität tut Ihnen und Ihrer Gesundheit gut!



Bewegung kann Krankheiten des Herz-Kreislauf- und des Stoffwechselsystems sowie des Bewegungsapparates verhindern und zur Entspannung beitragen. Daher empfehle ich Ihnen die Teilnahme an einem Angebot, das mit dem Qualitätssiegel **SPORT PRO GESUNDHEIT** zertifiziert ist. Die Teilnahme an diesen qualitätsgesicherten Kursen der Sportvereine wird von den meisten gesetzlichen Krankenkassen finanziell gefördert – informieren Sie sich dort über Einzelheiten!

Darüber hinaus empfehle ich, täglich mehr Bewegung in Ihren Alltag zu integrieren!

Stempel und Unterschrift der Ärztin/des Arztes

Figure 8. "Rezept für Bewegung", a prescription for exercise [36].

1.4 HEALTH SPORT IN LUXEMBOURG

To build and promote health sports in Luxembourg, existing models in foreign countries and existing structures in Luxembourg were used as an inspiration to build a new model.

1.4.1 SPORT-SANTÉ

Following a community project, which started in the 80's, establishing health sports groups to encourage patients to perform PA after cardiac rehabilitation [34,35] the Sport-Santé concept was launched in 2013 with the following goals [133]:

- 1) increase the number of participants in existing therapeutic PA groups,
- 2) expand the offer of therapeutic physical activities,
- 3) improve and extent this offer.

The website www.sport-sante.lu (Figure 9) went live in 2015 to promote the local offer of PA for patients with NCDs.



Figure 9. Sport-Santé Logo [133].

1.4.1.1 SPORT-SANTÉ NATIONAL PROGRAM

The promotion of health sports is an important issue for public health. In fact, the promotion of PA should be supported and promoted by the government and the ministries of the different countries [165,168].

Based on the Sport-Santé project, a national project was publicly launched in June 2018 with five objectives:

- 1) to help organise physical activities for patients with NCDs,
- 2) to promote these activities,

- 3) to raise awareness of the health sport offers to professionals like medical doctors, patients and the public,
- 4) to educate trainers and health care professionals,
- 5) to encourage research.

The Ministry of Health, the Ministry of Sports, the Ministry of Social Security and the “Œuvre Nationale de Secours Grande-Duchesse Charlotte” (which distribute the funds of the National lottery) support the different actions performed by the Sport-Santé program. Moreover, Sport-Santé collaborates with scientific and medical institutions like hospitals and many health professionals (medical doctors, physiotherapists, nurses etc.).

Sport-Santé also addresses young people undergoing training for health professionals. An elective training “Sport-Santé” was created for the curriculum of nursing training by the Lycée Technique pour Professions de Santé and for the Bachelor in Sport Sciences from the Lunex High-School. The offer includes theoretical and practical courses [134].

1.4.1.2 HEALTH SPORT OFFERS

In 2014, eleven organisations proposed health sport in the five categories: obesity, cardiology, oncology, neurology and orthopaedics. The offer included for instance Nordic walking, aqua gym or cycling. In the following years, the health sport offer expanded. In 2016, the category stroke was added so that a total of sixteen organisations offered health sport in that year. Two years later in 2018, two more categories were added; from now on patients suffering from diabetes or psychosomatic diseases can also benefit from the sport courses. The large number of health sport offers facilitates patients to choose a type of sport that fits their interest the most (Table 1).

A medical prescription is not necessary to participate in the various health sport offers, however some non-governmental organisations (NGOs) ask for a certificate from a medical doctor. The participation fees depend on the NGOs [133].

Table 1. Summary of the health sport offers in Luxembourg in 2018.

	Stroke	Cancer	Diabetes	Cardiovascular diseases	Neurologic and rare diseases	Psychosomatic diseases	Obesity	Orthopaedic pathologies
Aqua gym		✓		✓	✓		✓	
Boxing					✓			
Cycling				✓				
Dancing / Zumba		✓			✓			
Gymnastics		✓	✓	✓	✓	✓	✓	✓
Sports for kids		✓					✓	
Jogging		✓						
Nordic Walking		✓		✓	✓		✓	✓
Multi-Sports		✓					✓	✓
Muscle Training		✓		✓	✓			
Swimming				✓	✓		✓	
Petanque	✓				✓			
Walking				✓				
Gentle gymnastics (Yoga, Qi-Gong etc.)		✓		✓	✓	✓		

1.4.1.3 THE WEBSITE WWW.SPORT-SANTE.LU AND SOCIAL MEDIA

The website www.sport-sante.lu and social media give patients an opportunity to find out more information about the health sports courses offered in Luxembourg and helps them in their recovery or disease progression. The patients can get information about their disease, which NGO is committed to their disease and which sports are offered with the date and location. The proposals are divided into nine groups: cancer, stroke, diabetes, cardiovascular diseases, neurologic diseases, psychosomatic diseases, rare diseases, obesity and orthopaedic pathologies. There is also an area of the website, which was developed for healthcare professionals, especially for medical doctors. This section contains factsheets from different countries explaining the effects of PA on different diseases/illnesses [133]. Social media (Facebook, Instagram and Twitter) is also used to promote Sport-Santé, to inform the population about upcoming events and inform about changes and news on PA and health.

1.4.2 FEDERATION LUXEMBOURGEOISE DES ASSOCIATIONS DE SPORT DE SANTÉ

The “Fédération Luxembourgeoise des Associations de Sport de Santé” (FLASS) was established in February 2016 from the network created within the Sport-Santé project. The ten members of the FLASS are ALAN – Maladies rares Luxembourg ; Association Luxembourgeoise des Groupes Sportifs Oncologiques; Association Luxembourgeoise des Groupes Sportifs pour cardiaques; Blëtz; Fondation Cancer; Medizinische Sportgruppen Für Personen mit Orthopädischen & Metabolischen Störungen; Multiple Sklérose Lëtzebuerg; Association Luxembourgeoise du Diabète; Association Luxembourg et Grande Région de Prévention et de gestion du Stress and Parkinson Luxembourg.

The aim was to assemble all the NGOs in Luxembourg offering therapeutic PA and representing them under one name to the large public. Moreover, FLASS wants to promote health sports and physical activities. FLASS also supports the trainings of the instructors and aims to professionalize the organisation of already existing and new health sports. Since 2018 FLASS achieved that participation to health sport groups is subsidized by the Luxembourgish Ministry of Health. FLASS redistributes the credits granted by the Ministry to its members. Another objective is that FLASS helps in the management and evaluation of the offers (evaluation of the existing offer, search for trainers...) as well as in the creation of campaigns.

1.4.3 SPORT-SANTÉ NATIONAL CAMPAIGN

To raise awareness of the benefits of PA and promote PA among medical doctors, patients and the general population, a national promotional campaign was launched in summer 2018 in order to publicise the existing health sports offered in Luxembourg and to raise awareness of the negative effects of physical inactivity. The campaign was created within the Sport-Santé project and is supported by the Luxemburgish Ministry of health, the Luxembourgish Ministry of Sports, the Luxembourgish Ministry of Social Security, FLASS, the Luxembourg Institute of Health and the “Œuvre Nationale de Secours Grande-Duchesse Charlotte”.

1.4.3.1 SPORT-SANTÉ LETTER FOR MEDICAL DOCTORS

A letter was sent to 2616 medical doctors and dentists and included a letter of explanation in French and German (Appendix 1), several flyers (Appendix 2) and an Actimeter (Appendix 3), as well as an order form for these Flyers and Actimeters. To encourage medical doctors to open these letters, the letter was sent in an envelope from the Government of the Grand Duchy

of Luxembourg (Appendix 1). Unfortunately, 82 (3.1%) envelopes could not be distributed. The consignment (including printing) was financed by the Luxembourgish Ministry of Social Security.

1.4.3.2 SPORT-SANTÉ VIDEOCLIP AND RADIOCLIP

To reach patients and the entire population, Radio and TV commercials were launched. They were intended to draw attention to Sport-Santé and the positive effects of PA. Six TV commercials were filmed, each 35 seconds long. They were based on patient and health professional testimonials. The spots are in the Luxembourgish language. Videoclips and radio spots were broadcast on RTL, a Luxembourgish TV Channel and radio station between the 15th of June and 29th of July 2018. Additionally, the TV spots are also available on the Sport-Santé Youtube-Channel, the website www.sport-sante.lu (Appendix 4) and on social media like Facebook and Twitter. This part of the campaign was financed by the “Œuvre Nationale de Secours Grande-Duchesse Charlotte”.

1.4.3.3 FLYER

In order to inform medical doctors and patients about health sports, a flyer (Appendix 2) was created. It displays the offers of PA for patients with NCDs in Luxembourg. The offers are divided into nine groups already enumerated: cancer, stroke, diabetes, cardiovascular diseases, neurologic diseases, psychosomatic diseases, rare diseases, obesity and orthopaedic pathologies. For each group the different NGOs are listed with the address, phone number, email address and internet site. In addition, some definitions and recommendations are stated, so that doctors and patients can calculate the duration of their weekly PA and compare it with the WHO's recommendations. Furthermore, these flyers should serve the doctors and the patients as a resource of information. The flyers are available in German and French.

1.4.3.4 ACTIMETER

The Sport-Santé Actimeter (Appendix 3) [86] is designed to evaluate the PA habits of patients. In order to evaluate the activity, the GP should ask their patients the two following questions: “On average, how many days per week do you engage in moderate or higher intensity PA? On average, how many minutes do you engage in this PA on those days?” If the intensity of activity can be categorized as vigorous or higher, the number of minutes can be multiplied by

two. After that, the medical doctors pick the number of days and its corresponding reference line. By turning the wheel this reference line can be adjusted to the according number of minutes. Now the result can be read in the corresponding pre-cut cell. If the pre-cut cell is coloured in green, this means that the minimal PA fits the recommendations and the patient should be encouraged to continue his/her activity. If the cell is coloured in red, the amount of minimal PA is lower than the minimal recommendation, meaning that the risk of chronic diseases is increased. The medical doctor should encourage him/her to start exercising or to increase the number of active minutes of exercise per week. This tool was intended to help the medical doctors in their everyday work to improve their PA counselling. On the other hand, they should also serve as a new source of information and education.

The Actimeter also contains the same definitions and recommendations² as the flyer. A decision algorithm was developed³. It should be used as a guideline to see if the patient meets the current PA recommendations or not and if he/she needs medical permission. Depending on the patient's chronic disease and symptoms, medical permission to do sports should be considered.

Therefore, the Actimeter was sent together with the flyers to medical doctors, giving them a visualisation tool to show if their patients meet the minimal PA recommendations. It is available in English, German and French.

² Based on the recommendation of the WHO 2010 as described in the introduction

³ Based on Whitfield et al. Applying the ACS; Preparticipation Screening Algorithm to U.S. Adults: National Health and Nutrition Survey 2001-2004

1.5 STUDY RATIONALE AND OBJECTIVES

The main purpose of the study was to determine the impact of the Sport-Santé national campaign to promote PA as medical treatment for patients with chronic diseases.

Three separate studies were carried out:

- Study 1: Medical doctor study.
GPs were called and asked to answer a questionnaire about PA counselling before and after the Sport-Santé national campaign.
- Study 2: Participants study.
After the Sport-Santé national campaign, participants in the local health sport groups were asked to answer a questionnaire about their course attendance. The results were compared with similar data recorded in 2016.
- Study 3: Non-governmental organisation study.
The characteristics of the offer were recorded after the national campaign Sport-Santé and were compared to the characteristics recorded in 2016.

The secondary objectives were to assess the TV commercial, the Radio Sports and the tools for the campaign (the Actimeter, the flyer) provided and to highlight new strategies or orientations to better target the interventions.

2 MATERIALS AND METHODS

To evaluate the intervention of GPs and the willingness of patients to participate in health sport, three studies were carried out. Each study refers to another aspect of the expected outcomes of the campaign. The first study was carried out in a collaborative work between the FLASS and the Luxembourg Institute of Health. The two other studies were carried out only by the FLASS.

2.1 STUDY 1: MEDICAL DOCTORS STUDY

2.1.1 QUESTIONNAIRES

The main aim of this study was to evaluate the behaviour of the GPs regarding PA counselling before and after the Sport-Santé campaign. Moreover, the study also aimed at evaluating the Sport-Santé tools. Two questionnaires were developed. Questionnaire 1 (Appendix 5), which was performed before the Sport-Santé campaign, contained six questions about the experience of the GPs and their approach regarding PA counselling:

- years of experience,
- total amount of patients seen during the previous week,
- total amount of patients asked about PA during the previous week,
- self-confidence to guide patients toward a more active lifestyle,
- medical doctors' needs to improve patients' guidance in PA,
- knowledge of the Sport-Santé concept.

Questionnaire 2 (Appendix 6) which was asked after the Sport-Santé national campaign in summer 2018 contained the same six questions as the first questionnaire and seven additional questions:

- years of experience,
- total amount of patients seen during the previous week,
- total amount of patients asked about PA during the previous week,
- self-confidence to guide their patients towards a more active lifestyle,
- knowledge of the Sport-Santé concept,
- receipt of the Sport-Santé campaign letter,

- use of the Actimeter,
- usefulness of the information sent,
- viewing of the Sport-Santé video clips,
- hearing of the Sport-Santé Radio spots,
- total amount of patients spoken to about the Sport-Santé campaign
- suggestions to improve the tool (Sport-Santé Actimeter) or the information received,
- medical doctors' needs to improve patients' guidance in PA.

Questionnaires were available in French, English, German and Luxembourgish language.

2.1.2 SAMPLE SIZE CALCULATION

The study was designed by the epidemiologists of the Luxembourg Institute of Health as a cross-sectional study with two phases (before and after). The campaign was addressed to all GPs and medical doctors working in Luxembourg. A formula for the comparison of the frequencies from two independent samples randomly selected was used to set the sample size:

$$n_1 = \frac{1}{k\Delta^2} \left[U_\alpha \sqrt{\hat{\pi} \cdot (1 - \hat{\pi})(1 + k)} + U_{2\beta} \sqrt{k\hat{\pi}_1 \cdot (1 - \hat{\pi}_1) + \hat{\pi}_2 \cdot (1 - \hat{\pi}_2)} \right]^2$$

We used $k=1$, $U_\alpha=1.96$, $U_\beta=0.84$, $\pi = \pi_1=0.34$ and $\pi_2= 0.59$ and $\Delta= 0.20$, where π_1 was the percentage of patients referred by their GPs in the literature [9], π_2 was the expected number of patients referred by their GPs after the campaign (an increase of 25% was expected), and Δ was the probability of a type-II error (not detecting a difference which actually exists). Based on that formula, 90 doctors will be needed in each phase of the study. In May 2018 a pilot phase with 15 GPs was initiated. Four GPs refused to answer, eight could not answer (lack of time or absent), thus only three GPs answered. In conclusion, it appeared difficult to obtain such a large number of answers, the minimal number of GPs who answered was 50. With 50 GPs included, the probability of a type-II error of the study was 26% instead of 20%.

2.1.3 DATA COLLECTION

GPs working in Luxembourg were randomly called by three operators (two operators at each phase of the survey). The GPs were free to answer or not. Answers were strictly anonymous. Several phone calls were allowed to be placed to reach the GPs. The first survey took place from the 23rd of April to the 2nd of May 2018. The second survey took place from the 8th of

October to the 16th of October, i.e. one month after the end of the Sport-Santé national campaign. Data was entered in SPSS and a double entry was done to ensure data quality. Items from the questionnaire were also used to compute the main outcome of this study: number of PA consultations in relation to the total consultations during the previous week. The proportion of consultations in which PA was discussed with the patient was also calculated. In addition, the answers to the open questions “What do you think could improve your guidance of PA?” and “Do you have any suggestions to help us improve this tool or the information received” were categorized by two operators.

2.1.4 STATISTICAL ANALYSIS

Statistical analysis was performed using SPSS Statistics Version 25. A descriptive analysis was performed to compare the results. Quantitative data were expressed as median (M), first quartile (Q1) and third quartile (Q3). Comparisons between the two groups (before and after the campaign) were produced using a non-parametric Mann & Whitney test (U, independent group comparison test) on account of the relatively small sample size and the non-normality of the data distribution which was tested with the Shapiro-Wilk test. Qualitative data were expressed as number (n) and percentage (%) and compared using χ^2 tests or by Fisher's Exact Tests based on the conditions and limitations of the test. Consequently, a linear multiple regression was performed to explain the proportion of patients counselled for PA. The five explicative variables entered into the multiple regression were:

- phases (before-after the campaign),
- years of experience,
- total amount of patients seen during the previous weeks,
- number of GPs who feel confident enough to guide their patients,
- number of GPs who know the Sport-Santé website.

The logarithm of the continuous variables was used to obtain normal residuals of the linear multiple regression. A 0.05 P-level of significance was set for all analysis. A borderline significance was defined at a level of $p < 0.10$.

2.2 STUDY 2: PARTICIPANTS STUDY

2.2.1 QUESTIONNAIRE

In this study we wanted to find out the proportion of patients suffering from a NCD who were referred by their GP to an NGOs' health sports group, the proportion of patients who have spoken about their PA with their GP and the proportion of patients meeting the recommendations of the WHO⁴. In addition, the participants were asked if they knew Sport-Santé and its national campaign. Therefore, a bilingual questionnaire (French and German) was developed which consisted of fifteen questions (Appendix 7):

- age,
- gender,
- how did you become aware of this association?
- since when do you belong to this sports club,
- how many kilometres do you drive each time to get to this sports club?
- do you practice PA outside this sports club?
- how many times per week are you moderately or strongly physically active?
- how many minutes are you doing PA each time?
- have you practiced PA before?
- do you participate in the courses because of medical advice?
- how many minutes of moderate to strong PA do you think should be done weekly to follow WHO recommendations?
- have you talked to your doctor about your physical activities for the past six months?
- have you seen the Sport-Santé national campaign on television?
- did you hear the Sport-Santé promotional campaign on the radio?
- do you know the website www.sport-sante.lu?

Most of the questions were similar to those which were asked in the same context in 2016 [85].

2.2.2 DATA COLLECTION

Data collection took place from the 19th of November 2018 to the 9th of January 2019 (during a two-week vacation, no courses were offered). The offers of therapeutic PA proposed by the local NGOs were visited and participants were asked to fill out the strictly anonymous

⁴ Based on the recommendation of the WHO 2010 as described in the introduction.

questionnaire. The questionnaires were categorised using date and NGO code, allowing some computations: i.e. the number of participants for each category (orthopaedics, obesity, neurology and rare diseases, oncology, cardiology, diabetes and stress). If a member of an NGO participated in several activities, he/she was only asked to fill out the questionnaire once. Later, the data were entered in SPSS and a double entry was done to ensure data quality.

2.2.3 STATISTICAL ANALYSIS

Statistical analysis was performed using SPSS Statistics Version 25. All questionnaires were used for statistical analysis, even in case of missing data. Qualitative data were presented as number (n) and percentage (%). When data were missing due to the lack of answer (e.g. unable to answer a specific question), valid percent was used. The comparison with similar data recorded in 2016 [85] was done using χ^2 -tests. Quantitative data were expressed as median (M), first quartile (Q1) and third quartile (Q3). A Shapiro-Wilk test was performed and showed the non-normality of the data distribution. Therefore, a non-parametric Mann & Whitney test (U, independent group comparison test) was used for the comparison of the data recorded in 2016 and 2018. For the type of recruitment, a multiple response set was used to calculate the frequencies and the comparison used χ^2 tests. The days and minutes of PA per week were multiplied to get the total of active minutes per week. The data were expressed in mean and standard deviation (SD). A 0.05 P-level of significance was fixed for all analysis, however borderline significance was defined at a level of $p < 0.10$.

2.3 STUDY 3: NON-GOVERNMENTAL ORGANISATION STUDY

2.3.1 QUESTIONNAIRE

In the NGO study, we wanted to find out the weekly number of courses of therapeutic PA offered in Luxembourg and the number of participants for each course in order to compare these numbers with the data from 2016 [85]. Moreover, one analysed if the capacities were fully utilized. Therefore, a questionnaire (Appendix 8) was developed including nine questions:

- name of the NGO,
- type of sport,
- date,
- time,
- number of male participants,
- number of female participants,
- total number of participants,
- number of participants usually observed by the PA instructor,
- maximum number of possible participants for the course.

2.3.2 DATA COLLECTION

The data collection took place at the same time as the participants study, from the 19th of November 2018 to the 9th of January 2019. The questionnaires were filled out by the PA instructors or by the examiners. The data was entered in SPSS, a double entry was performed. To calculate the hours of health sport offers for patients with NCDs, data, from www.sport-sante.lu or the websites of the NGOs, were used.

2.3.3 STATISTICAL ANALYSIS

SPSS Statistics Version 25 was used to perform statistical analysis and to compare the collected data from that of 2016 [85]. A descriptive analysis was performed. Statistical analysis for the number of participants observed, the number of participants per course visited and the number of hours of health sports offered in Luxembourg per week was done by a t-test for paired samples. Furthermore, the quantitative data was expressed as mean (M) and standard deviation (SD). The Shapiro-Wilk tests showed non-normal distribution; a non-parametric Mann & Whitney test (U, independent group comparison test) was therefore performed. The

maximal capacity rate (calculated using the estimation by the clinical exercise trainers of the maximal observed capacity and maximal possible capacity) was expressed as means, the normal distribution was shown by Shapiro-Wilk test and a t-test for paired samples was performed. A 0.05 P-level of significance was used for all analysis, however a borderline significance was defined at a level of $p < 0.10$.

3 RESULTS

3.1 STUDY 1: MEDICAL DOCTORS STUDY

A total of 251 GPs during both phases (before-and-after the Sport-Santé national Campaign) were randomly selected to be contacted in a telephone survey. However, for the phase before the campaign from the 23rd of April to the 2nd of May 2018, out of the 125 GPs designated, 59 agreed to participate in the study (response rate = 47.2%). For the after-campaign-phase (from the 8th of October to the 16th of October 2018), out of 126 GPs phoned, 53 agreed to participate in the study (response rate = 42.1%). Due to the relatively small number of GPs working in Luxembourg (n = 536), 24 GPs were selected for both phases but only four of them answered twice. The flow chart in the Figure 10 demonstrates the loss of contact and the explanations for it. The main reasons were a refusal by the doctor and unavailability, mainly due to a lack of time.

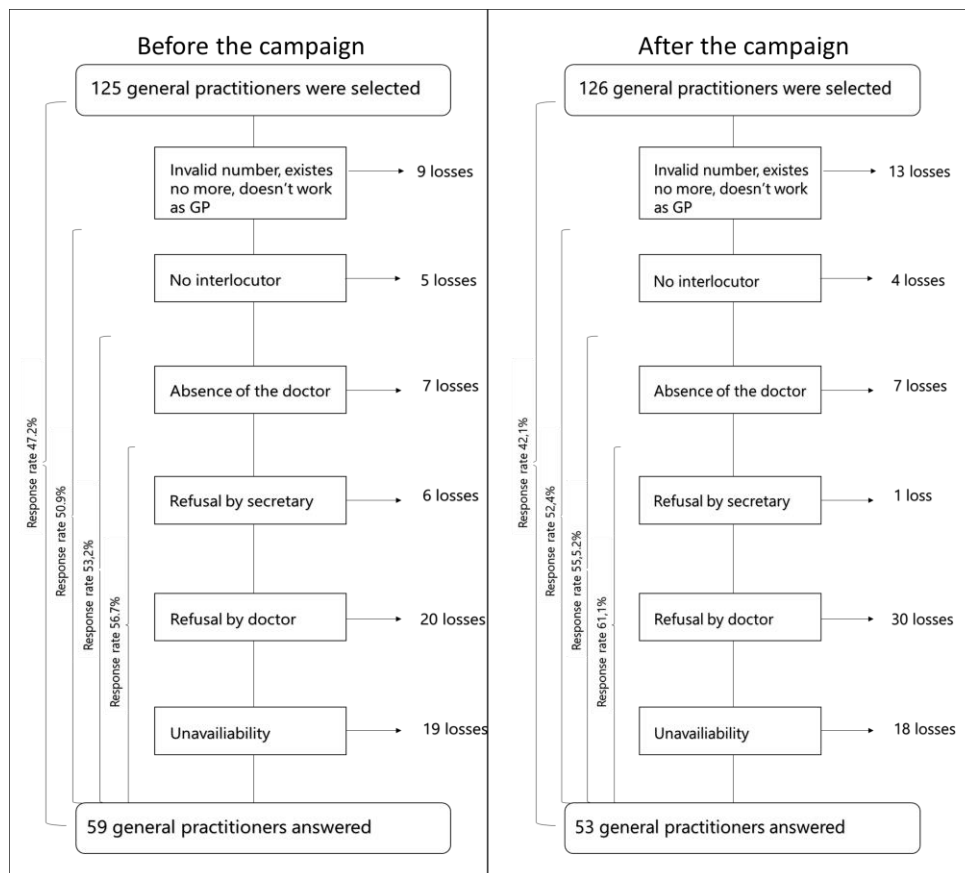


Figure 10. Response rates before and after the campaign.

As presented in Table 2, professional experience of the selected GPs in both phases was similar (M = 10.0 years before the campaign and M = 13.5 after the campaign). The GPs tended to have seen less patients before the Sport-Santé campaign (M = 81.0, Q1 = 52.3, Q3 = 112.0) than after the campaign (M = 100.0, Q1 = 80.0, Q3 = 124.3) ($z = -1.83$, $p = 0.067$) (Table 2). Conversely the number of patients advised about PA decreased after the campaign ($\chi^2 = 39.43$, $p < 0.001$) (Figure 11). In addition, 31 (57.4%) and 25 (48.1%) GPs stated to feel self-confident enough to advise their patients about PA before and after the Sport-Santé national campaign, respectively ($\chi^2 = 0.93$, $p = 0.34$) (Table 2). There was no significant difference associated with knowledge of the Sport-Santé website between the two phases ($\chi^2 = 0.01$, $p = 0.92$) (Table 2). More than 55.8% of the GPs surveyed indicated having received the letter from the Sport-Santé national Campaign, while the return rate was only 3.1% (Table 2). Moreover, only 3.8% of the GPs used the Actimeter with their patients even though 32.7% stated that they found the letter beneficial (Table 2). In addition, 7.7% of the surveyed GPs watched the Sport-Santé clips on TV and 11.5% heard the clips on the radio (Table 2). Regarding the number of patients that have spoken to their GP about the Sport-Santé promotional campaign, only 1.9% of the 52 GPs stated that the campaign was a topic in their consultation (Table 2).

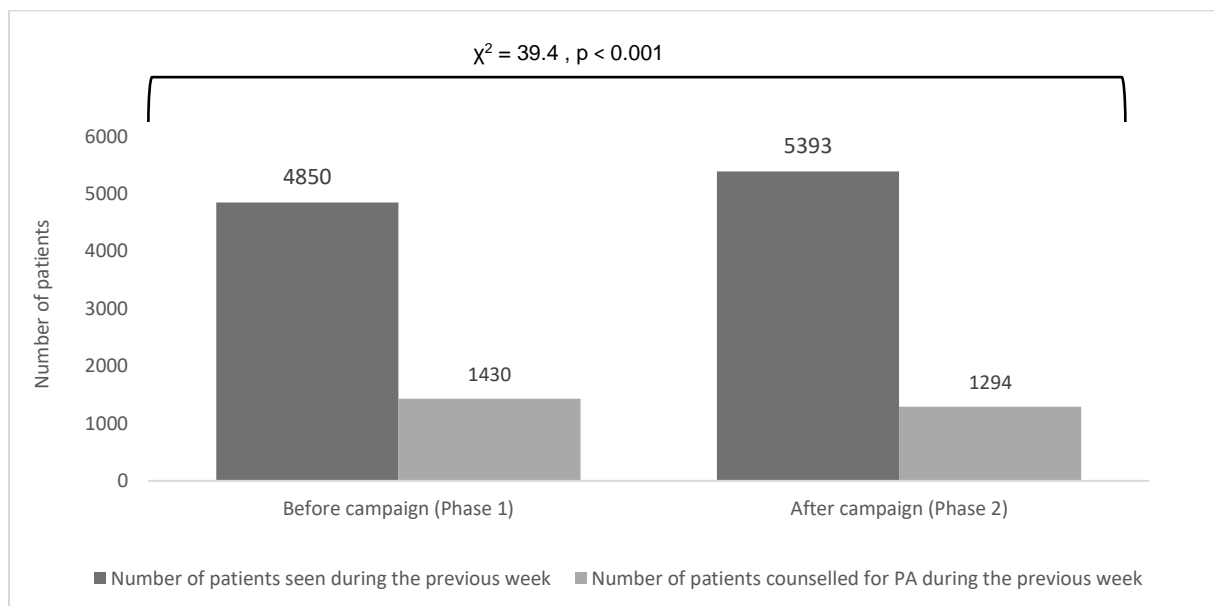


Figure 11. Number of patients seen by the interviewed GPs and counselled for PA before the campaign (May 2018 – Phase 1) and after the campaign (October 2018 – Phase 2).

Table 2. Characteristics of the interviewed GPs before and after the Sport-Santé national campaign.

	Before campaign	After campaign	Mann-Whitney U-test	
	n= 54 ^a	n= 52 ^b	z-value	p-value
	Median (Q1, Q3)	Median (Q1, Q3)		
Years of experience	10.0 (5.0, 22.3)	13.5 (6.3, 31.8)	-1.19	0.23
Total amount of patients seen during the previous week	81.0 (52.3, 112.0)	100.0 (80.0, 124.3)	-1.83	0.01
Total amount of patients spoken to about PA	13.0 (5.0, 31.3)	17.5 (8.0, 40.0)	-1.08	0.28
	Before campaign	After campaign	χ^2 test	
	n = 54 ^a	n = 52 ^b	χ^2 -value	p-value
	n (%)	n (%)		
Number of GPs who feel confident enough to guide their patients	31 (57.4%)	25 (48.1%)	0.93	0.34
Number of GPs who know Sport-Santé	11 (20.4%)	11 (21.2%)	0.01	0.92
Number of GPs who received the Sport-Santé campaign letter	-	29 (55.8%)	-	-
Number of GPs who used the Actimeter	-	2 (3.8%)	-	-
Number of GPs who think the information sent was useful	-	17 (32.7%)	-	-
Number of GPs who have seen the Sport-Santé video clip	-	4 (7.7%)	-	-
Number of GPs who have heard the Sport-Santé radio spot on RTL	-	6 (11.5 %)	-	-
Number of GPs who reported that patients had spoken to them about the campaign	-	1 (1.9 %)	-	-

^a The participants who did not answer every question (2 GPs) or didn't see any patients (3 GPs) were excluded.

^b One participant who did not answer every question was excluded.

Multiple regression analysis was used to try and predict the proportion of patients counselled for PA. The variables entered into the model were; the phase, the years of experience of the GP, the total number of patients seen during the previous week, the number of GPs who feel confident enough to guide their patients and number of GPs who know the Sport-Santé website. The results of the regression indicated that the five expected predictors explained only 2.7% of the variance ($R^2 = 0.03$, $F_{(5,96)} = 0.54$, $p = 0.75$). It was found that none of the expected predictors significantly predicted the proportion of patients counselled for PA (Table 3).

Table 3. Results from the multiple regression.

B = unstandardized beta, SE B = standard error for the unstandardized beta, β = standardized beta, t=t test statistic and p = probability value

	B	SE B	β	t	p
Constant	3.19	0.77		4.16	<0.001
Phases (before-after the campaign)	-0.01	0.19	-0.01	-0.06	0.95
Logarithm of years of experience	0.06	0.09	0.07	0.67	0.51
Logarithm of total amount of patients seen during the previous week	-0.12	0.16	-0.07	-0.73	0.47
Number of GP who feel confident enough to guide their patients	0.26	0.20	0.14	1.32	0.19
Number of GPs who know the Sport-Santé website	-0.11	0.24	-0.05	-0.46	0.65

The five participants in the phase before the campaign who did not answer every question (2 GPs) or didn't see any patients (3 GPs) and one participant who did not answer every question were excluded.

Three cases were deleted from this analysis because their data contained a 0 value (logarithm of 0 does not exist).

After the Sport-Santé national campaign, the GPs were asked with an open-ended question if they had suggestions to improve the tools received (Sport-Santé flyers and Actimeter) (Table 4). As 23 GPs stated not having received the Sport-Santé letter (Table 2), one can conclude that 11 GPs did not want or could not answer this question, meaning that only 19 GPs (35.8%) answered the open-ended question. For instance, 8 (15.1%) answers suggested to continue the work (Table 4).

Table 4. Summary of the answers to question “Do you have any suggestions to help us improve this tool or the information received?”.

Suggestions to improve the tool (Sport-Santé Actimeter) or the information received	n = 53 n (%)
No answer (including those who didn't receive the letter)	34 (64.1%)
To change the method of contact (place of distribution, quantity, more work on the internet)	5 (9.4%)
To change the content (adapt to different pathologies)	7 (13.3%)
Continue work	8 (15.1%)
Discontinue the work	5 (9.4%)

Table 5 presents the results of the open-ended question concerning the GPs' needs to better guide their patients in managing their PA. To categorize the ideas, the four WHO policies action areas (“active societies”, “active environments”, “active people” and “active systems”) were used [165]. GPs wanted more “active societies” after the Sport-Santé national campaign (32.2% vs. 52.8%, $\chi^2 = 4.88$, $p = 0.027$). This included materials like flyers or posters (18.6% vs. 28.3%), but also many GPs saw a need for education and further training for healthcare professionals (1.7% vs. 11.3%). As far as “active environments” are concerned, before the Sport-Santé national campaign 1.7% of the GPs suggested an implementation of PA in daily life, whereas 11.3% of the answers after the campaign apply to this category ($p = 0.058$). Moreover, after the campaign 58.4% of the GPs wanted more “active people”. Especially an increase in the PA offer for people with NCDs was requested (13.6% vs. 30.2%, $\chi^2 = 3.85$, $p = 0.049$). Finally, to better advise their patients about PA, GPs wanted “active systems”, specifically they asked for more time during consultations, after the campaign ($p < 0.001$).

Table 5. Summary of the answers to question "What do you think could help you to better guide your patients in managing their PA?".

GPs needs to better guide their patients in managing their PA	Before campaign	After campaign	χ^2 tests or Fischer Exact Tests	
	n = 59 n (%)	n = 53 n (%)	χ^2 -value	p-value
Active societies	19 (32.2%)	28 (52.8%)	4.88	0.027
• More PA promotion	2 (3.3%)	2 (3.7%)	-	0.99
• More communication materials	11 (18.6%)	15 (28.3%)	1.03	0.31
• More factsheets with specific exercises	0 (0%)	2 (3.7%)	-	0.24
• More training for healthcare professionals concerning PA	1 (1.7%)	6 (11.3%)	-	0.06
• More cooperation with PA specialists	5 (8.5%)	3 (5.7%)	-	0.72
Active environments	1 (1.7%)	6 (11.3%)	-	0.06
• Implementation of PA in daily life	1 (1.7%)	6 (11.3%)	-	0.06
Active people	26 (44.1%)	31 (58.4%)	2.32	0.13
• More PA offers for people with NCDs	8 (13.6%)	16 (30.2%)	3.85	0.049
• More PA evaluation tools	2 (3.3%)	4 (7.5%)	-	0.43
• Implementation of PA prescription	2 (3.30%)	2 (3.7%)	-	0.99
• More PA counselling as part of healthy lifestyle counselling	3 (5.6%)	3 (5.7%)	-	0.99
• More personalized advice	4 (6.8%)	2 (3.7%)	-	0.68
• Increase the motivation of patients	7 (11.9%)	4 (7.5%)	-	0.53
Active systems	1 (1.7%)	12 (22.6%)	-	< 0.001
• More PA reimbursement	1 (1.7%)	1 (1.9%)	-	0.99
• More time for PA counselling	0 (0%)	11 (20.7%)	-	< 0.001
No answer	18 (30.5%)	6 (11.3%)	7.18	0.007

3.2 STUDY 2: PARTICIPANTS STUDY

During the period of the 19th of November 2018 to the 9th of January 2019, a total amount of 232 questionnaires were filled out by the participants of therapeutic PA offers for patients with NCDs in Luxembourg (Table 6). The data have been classified into different groups according to the diseases: orthopaedics, obesity, neurology and rare diseases, oncology, cardiology, diabetes, and stress. The results were compared with similar data collected in 2016 [85]. Most of the interviewed participants in 2018 (48.3 %) were from the cardiologic association, whereas the percentage for diabetes and stress was 0.43% each (this offer did not exist in 2016).

Table 6. Interviewed participants.

	2016	2018
	n = 196	n = 232
	n (%)	n (%)
Orthopaedics	23 (11.7%)	25 (10.8%)
Obesity	35 (17.9%)	7 (3.0%)
Neurology and rare diseases	40 (20.4%)	45 (19.4 %)
Oncology	36 (18.4%)	41 (17.7%)
Cardiology	62 (31.6%)	112 (48.3%)
Diabetes	- ^a	1 (0.4%)
Stress	- ^a	1 (0.4%)
Total	196 (100%)	232 (100%)

^a Offer was launched in 2017 only.

Between 2016 and 2018, the overall gender distribution did not change ($p > 0.05$) and showed near equal parity (Figure 12). However, men were overrepresented in cardiology and underrepresented in oncology. The overall percentage of participants who practiced PA apart from exercising in the NGO did not change from 2016 to 2018 (73.9 vs. 79.7, $\chi^2 = 1.97$, $p = 0.16$) (Figure 13). Nevertheless, participants with neurological conditions tended to be more physically active outside of the specific health sport offers in 2018 (88.9%) than in 2016 (72.5%) ($\chi^2 = 3.72$, $p = 0.05$).

Compared to 2016, more participants of the different groups declared practicing PA (according to their own assessment) before their diagnosis in 2018 ($\chi^2 = 14.33$, $p < 0.001$). Especially, more participants from 2018 suffering from cancer ($\chi^2 = 7.15$, $p = 0.007$) or from cardiovascular diseases ($\chi^2 = 6.53$, $p = 0.011$) declared to be active before their diagnosis (Figure 14).

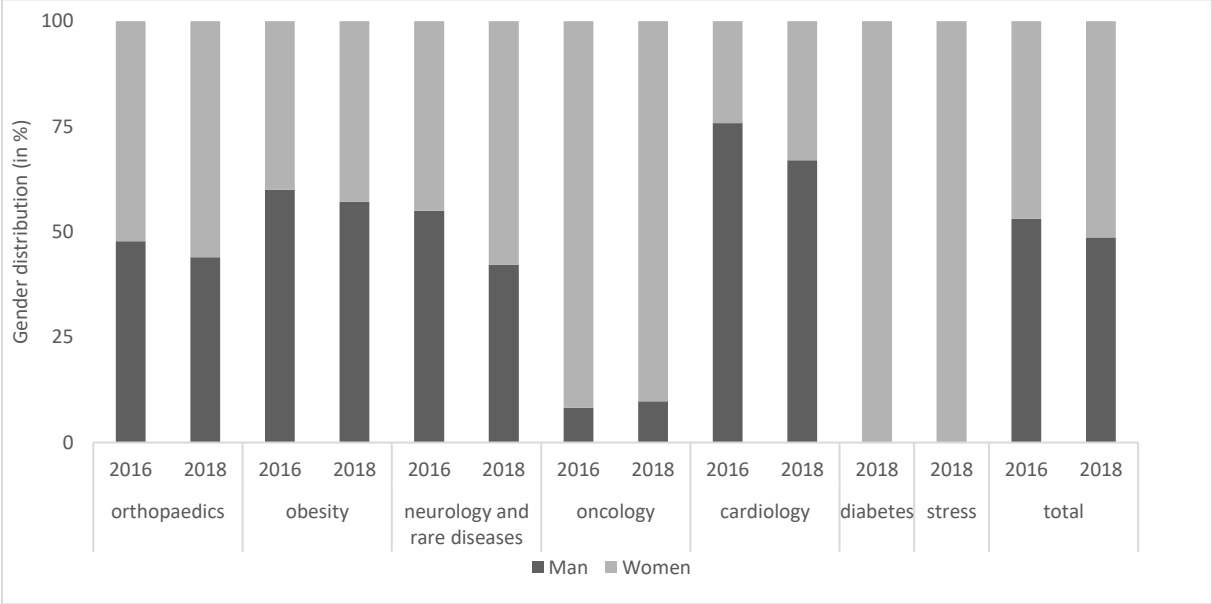


Figure 12. Gender distribution of participants who filled out the participants study.

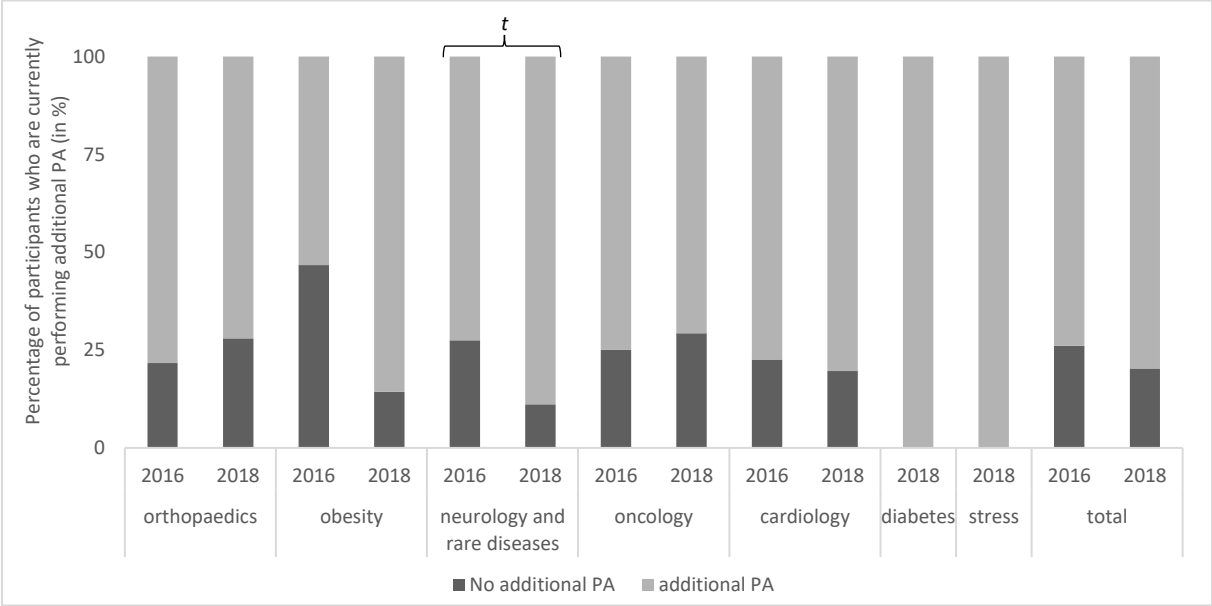


Figure 13. Current additional PA of the participants in the five categories offering health sports ($t^* p < 0.1$).

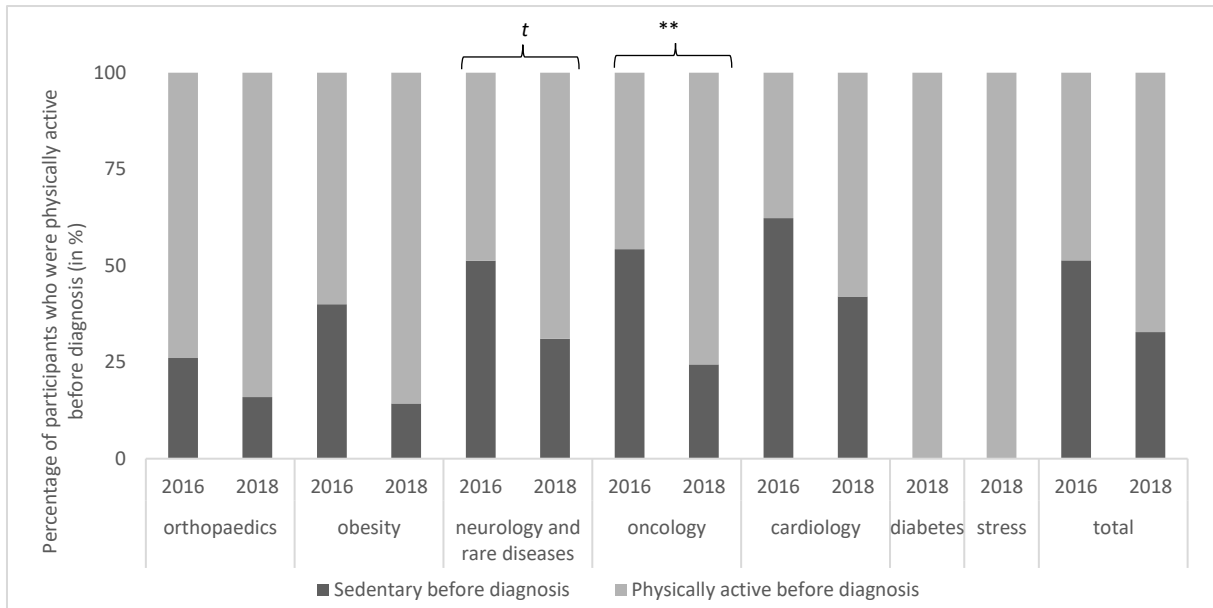


Figure 14. Percentage of participants who practiced PA before their diagnosis ($t p < 0.1$; $ p < 0.01$).**

Figure 15 shows the type of recruitment. Overall, the type of recruitment appears to have changed between 2016 and 2018 ($\chi^2 = 5.01$, $p = 0.081$). In 2016, 57.7% of all participants became aware of the Sport-Santé offer via their doctor, 18.0% were mobilized by family and friends and 24.2% by the media and the NGOs. In contrast, 50.4% of all participants in 2018 state that they were mobilized by healthcare professionals, whereas 27.1% were recruited by family and friends and 22.5% by the media and the NGOs. In 2018, 14.3% of the participants in the category obesity were made aware of the health sport by the media or NGOs, in 2016 no participant indicated this option.

The age, time since enrolment and travel distance between 2016 and 2018 are presented in the Table 7, Table 8 and Table 9. In 2016, the median age of all participants was 60 years (Q1 = 41.0, Q3 = 67.0), whereas in 2018 the median age was 65 years (Q1 = 56.0, Q3 = 72.0); this increase was significant ($\chi^2 = -4.80$, $p < 0.001$) (Table 7). The participants in orthopaedics were older in 2018 than in 2016 ($z = -2.30$, $p = 0.022$). In the same way, the participants in the obesity group ($\chi^2 = -1.732$, $p = 0.083$) and cardiology group ($\chi^2 = -1.80$, $p = 0.072$) tended to be older in 2018 than in 2016.

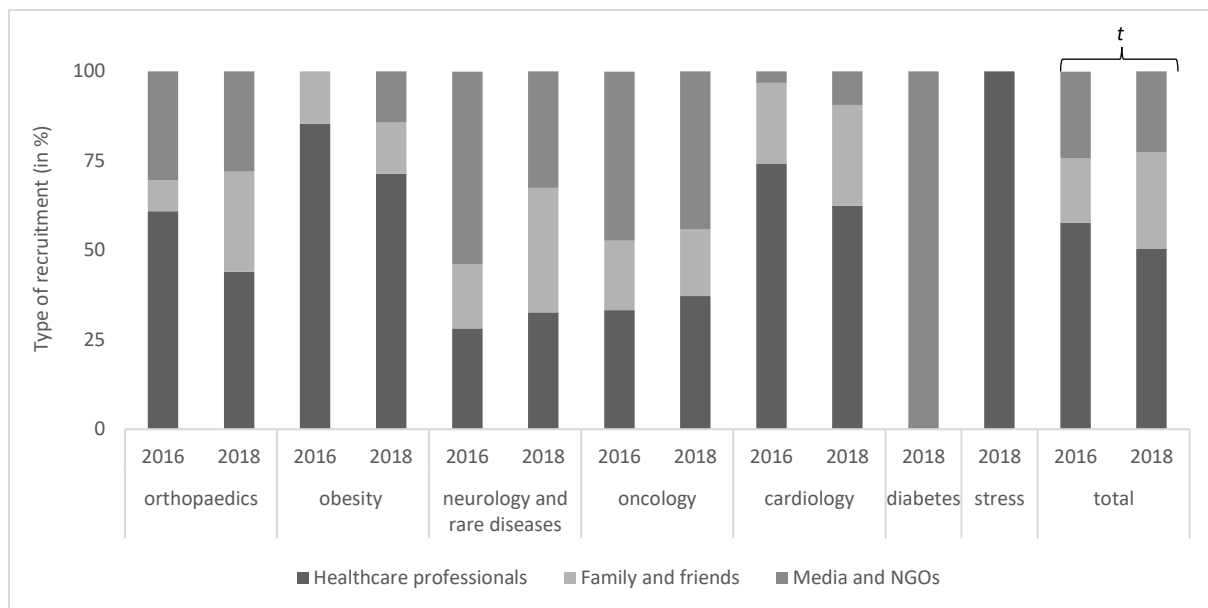


Figure 15. Type of recruitment of participants (t $p < 0.1$).

While in 2016 participants had been practicing health sports for an average of 2 years (Q1 = 0.8, Q3 = 6.0), the median in 2018 was 3 years (Q1 = 1.0, Q3 = 9.0); this difference was significant ($z = -2.41$, $p = 0.016$) (Table 8). Concerning the travel distance (Table 9), no significant difference between 2016 and 2018 was observed (10.50 km vs. 9.50 km, $\chi^2 = -0.37$, $p = 0.71$). In 2018 the travel distance of participants in cardiology group was the shortest, with 6.0 km (Q1 = 2.0, Q3 = 15.0) and the longest was in the stress group with 25.0 km (Q1 = 25.0, Q3 = 25.0).

Table 7. Age (in years) expressed in medians with 1st and 3rd quartiles and Mann-Whitney U-Test.

	Category	2016	2018	Mann-Whitney U-Test	
		Median (Q1, Q3)	Median (Q1, Q3)	z-value	p-value
Age	Orthopaedics	59.0 (36.0, 67.0)	65.0 (59.5, 73.0)	-2.30	0.022
	Obesity	12.0 (10.0, 18.0)	16.0 (13.0, 41.0)	-1.73	0.08
	Neurology and rare diseases	63.0 (48.3, 75.3)	63.0 (54.5, 74.0)	-0.39	0.70
	Oncology	59.0 (50.0, 65.0)	61.0 (54.0, 66.0)	-0.85	0.39
	Cardiology	66.0 (60.8, 71.0)	69.0 (62.0, 75.0)	-1.80	0.07
	Diabetes	-	65.0 (65.0, 65.0)	-	-
	Stress	-	47.0 (47.0, 47.0)	-	-
	Total	60.0 (41.0, 67.0)	65.0 (56.0, 72.0)	-4.80	<0.001

Table 8. Time (in years) since enrolment expressed in medians with 1st and 3rd quartiles and Mann-Whitney U-Test.

	Category	2016	2018	Mann-Whitney U-Test	
		Median (Q1, Q3)	Median (Q1, Q3)	z-value	p-value
Time since enrolment	Orthopaedics	2.0 (0.2, 7.0)	34.0 (0.2, 10.0)	-0.83	0.41
	Obesity	1.0 (1.0, 3.0)	0.5 (0.3, 1.3)	-1.43	0.15
	Neurology and rare diseases	2.0 (0.5, 3.0)	2.0 (0.5, 4.0)	-1.13	0.26
	Oncology	3.5 (0.4, 6.0)	2.0 (0.6, 6.0)	-0.04	0.97
	Cardiology	4.5 (1.0, 10.8)	5.3 (2.0, 12.0)	-0.56	0.57
	Diabetes	-	1.0 (1.0, 1.0)	-	-
	Stress	-	0.8 (0.8, 0.8)	-	-
	Total	2.0 (0.8, 6.0)	3.0 (1.0, 9.0)	-2.41	0.016

Table 9. Distance (in km) expressed in medians with 1st and 3rd quartiles and Mann-Whitney U-Test.

	Category	2016	2018	Mann-Whitney U-Test	
		Median (Q1, Q3)	Median (Q1, Q3)	z-value	p-value
Distance	Orthopaedics	15.6 (12.5, 27.3)	12.0 (5.0, 20.0)	-1.00	0.32
	Obesity	3.2 (3.2, 12.3)	16.0 (2.0, 20.0)	-0.91	0.36
	Neurology and rare diseases	16.8 (9.6, 25.9)	10.0 (8.0, 22.0)	-1.07	0.29
	Oncology	10.6 (5.6, 25.2)	15.5 (5.5, 23.8)	-0.48	0.63
	Cardiology	6.8 (2.5, 6.8)	6.0 (2.0, 15.0)	-0.05	0.96
	Diabetes	-	15.0 (15.0, 15.0)	-	-
	Stress	-	25.0 (25.0, 25.0)	-	-
	Total	10.5 (3.2, 19.0)	9.5 (4.0, 20.0)	-0.37	0.71

The means of active minutes for each category are presented in Figure 16. Overall, the participants followed the minimal recommendations in terms of PA as they were physically active for a mean of 210 minutes of PA per week. Participants from the obesity group seemed to be the most physically active group with a mean of 396 minutes of PA per week. The least active were the participants from neurology, rare diseases and oncology, participants from those groups exercised less than 180 minutes per week.

Although only 50.4% of participants quoted that they were addressed by healthcare professionals (Figure 15), 61.3 % of the participants practiced PA following medical advice (Figure 17). The advice of healthcare professionals mattered a lot in cardiology, where more than 3 out of 4 participants mentioned that their healthcare professionals (i.e. medical doctors and physiotherapists) had advised them that PA was beneficial for them.

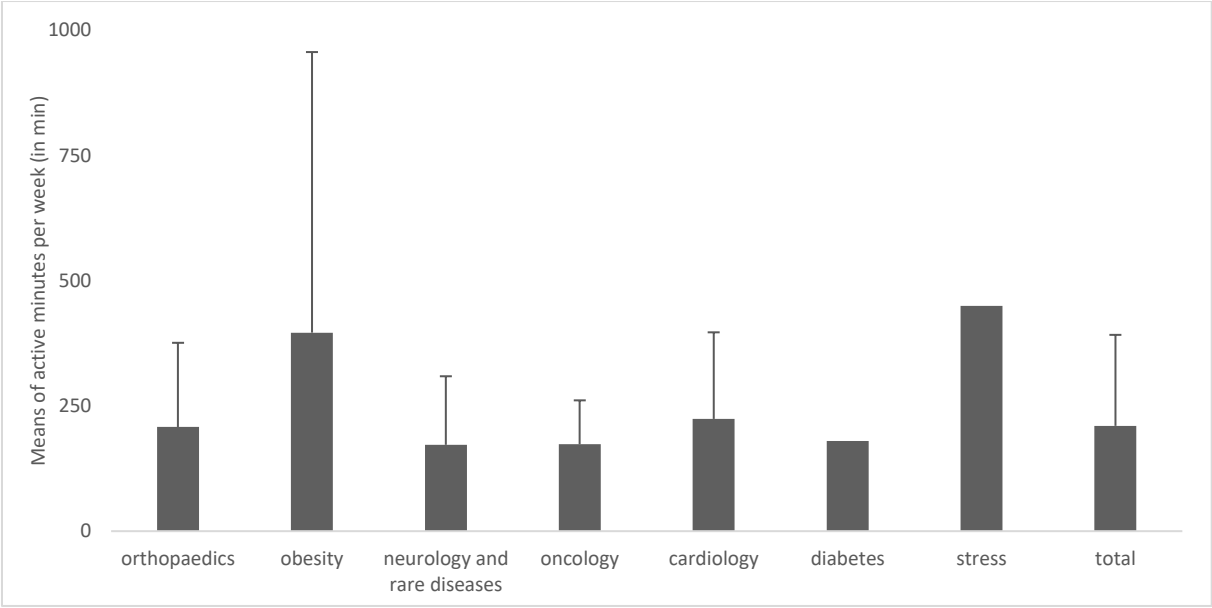


Figure 16. Means of active minutes per week.

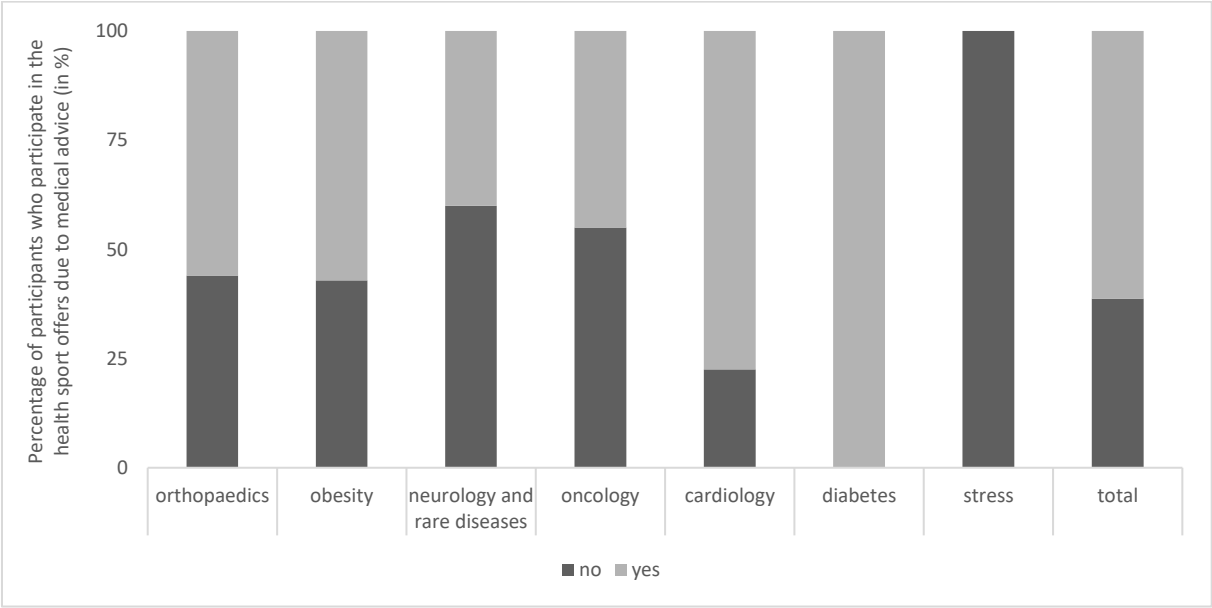


Figure 17. Percentage of participants who participate due to medical advice.

The participants were asked how many minutes of PA per week the WHO recommends (Figure 18). The correct answer was 150 minutes, but only 13.1% chose this response. However, 35.3% of the participants thought that the recommendation stated that people should at least be active for 180 minutes a week. By contrast 51.6% of the participants stated that less than 150 minutes per week were recommended.

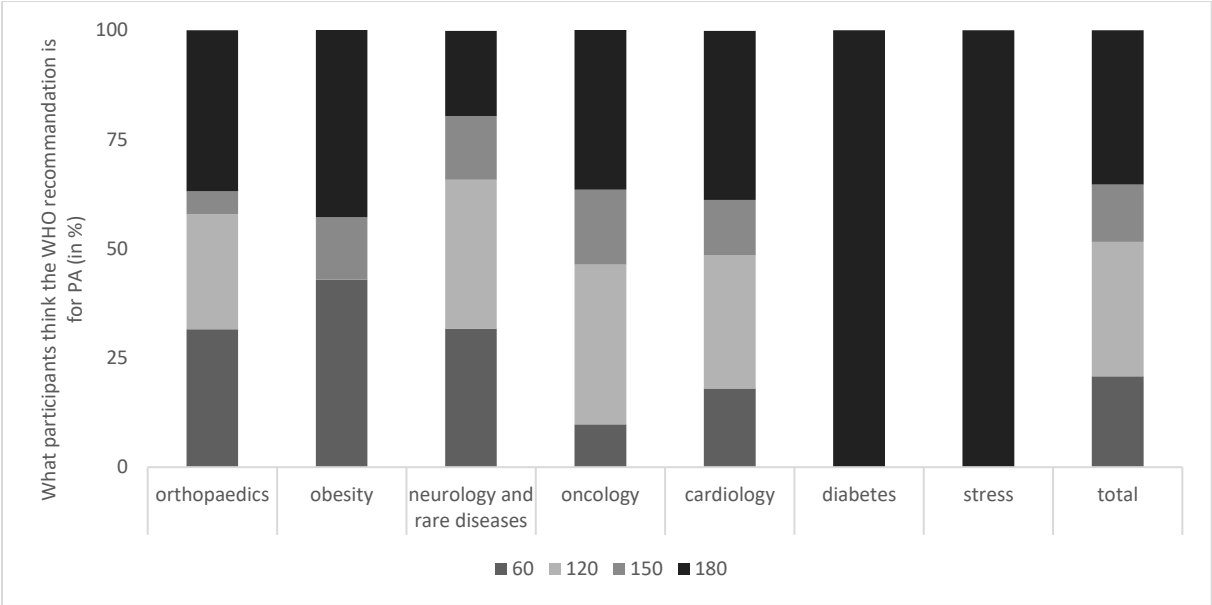


Figure 18. Participants knowledge concerning the WHO recommendations of weekly PA.

Moreover, 52.7% of the participants have spoken to their medical doctor about their physical activities during the past 6 months (Figure 19). The percentage was 44.0% in orthopaedics, 71.4% in obesity, 48.7% in neurology, 43.9 % in oncology, 58.0% in cardiology, 100% in diabetes and 0% in stress.

Finally, the participants were questioned about the Sport-Santé promotional campaign (Figure 20, Figure 21) and the website (Figure 22). The Sport-Santé national campaign TV spot was watched by 28.8% of the participants, whereas 21.8% of the participants had heard the campaign on the radio. Finally, the number of participants knowing the website www.sport-sante.lu increased from 20.4% in 2016 to 33.7% in 2018 ($\chi^2 = 9.24, p = 0.003$).

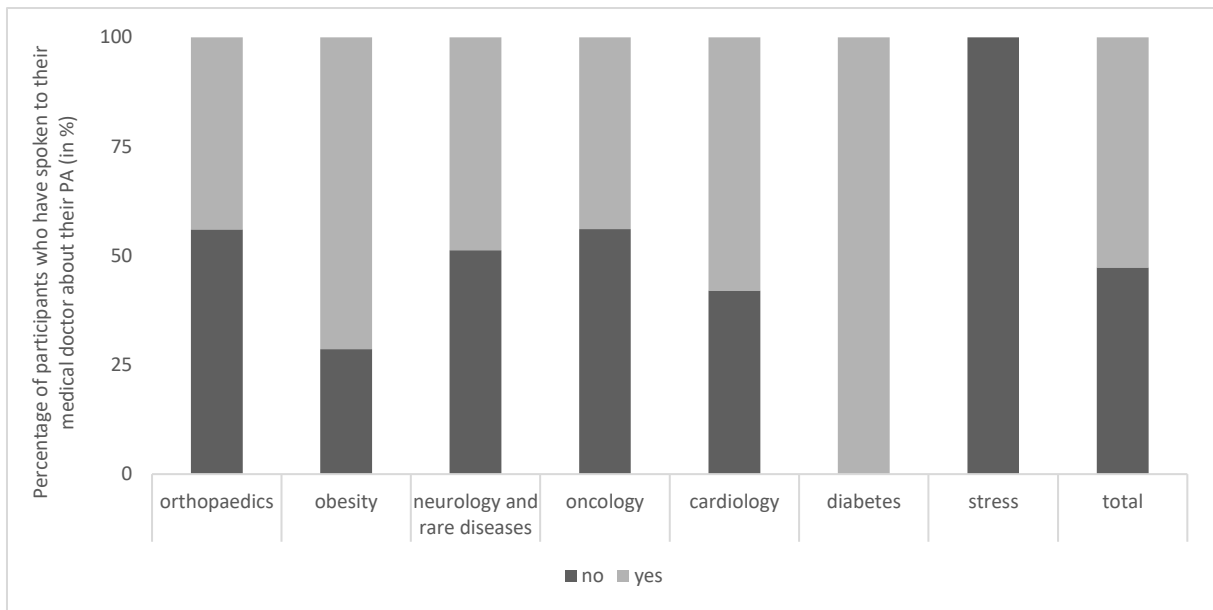


Figure 19. Percentage of participants who have spoken to their medical doctor about their PA in the last 6 months.

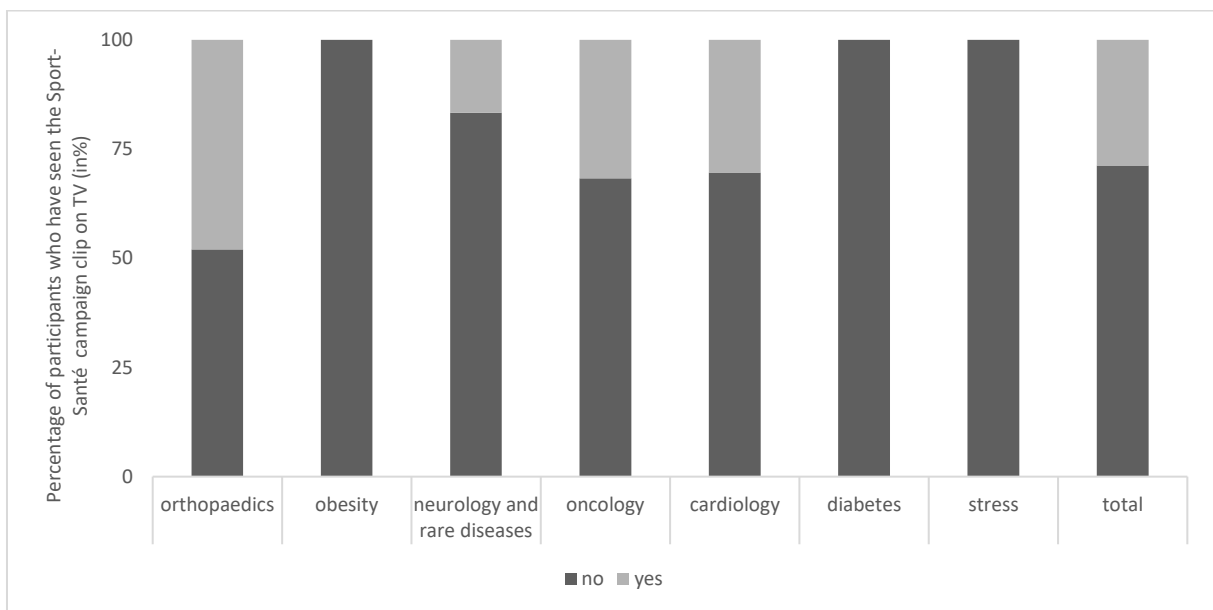


Figure 20. Percentage of participants who have seen the Sport-Santé campaign clip on TV.

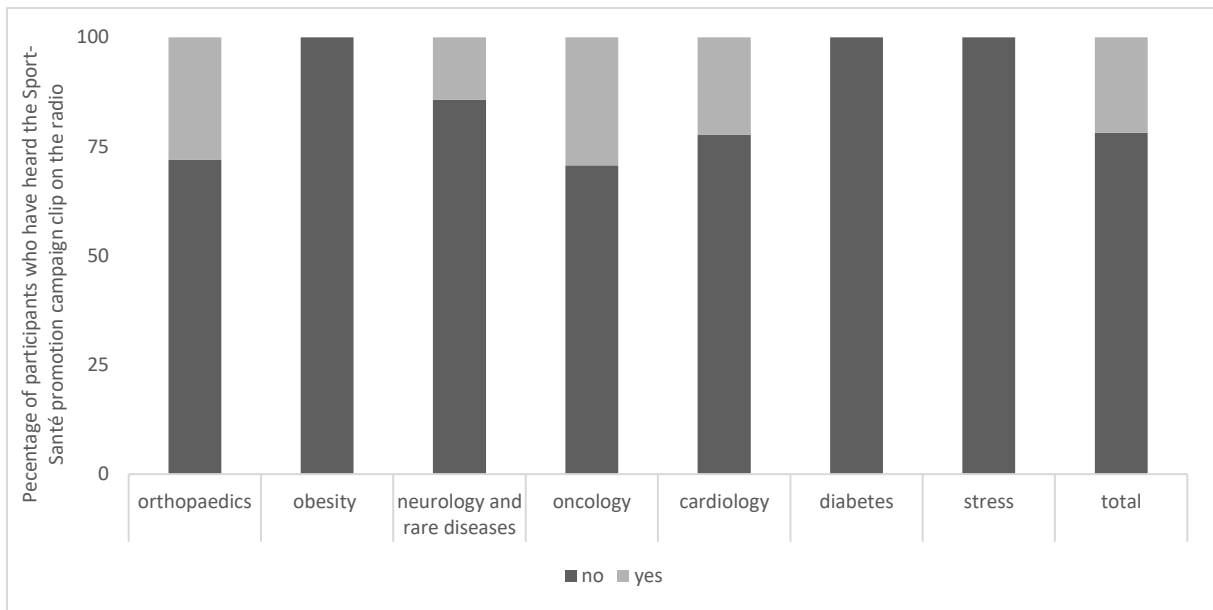


Figure 21. Percentage of participants who have heard the Sport-Santé campaign clip on the radio.

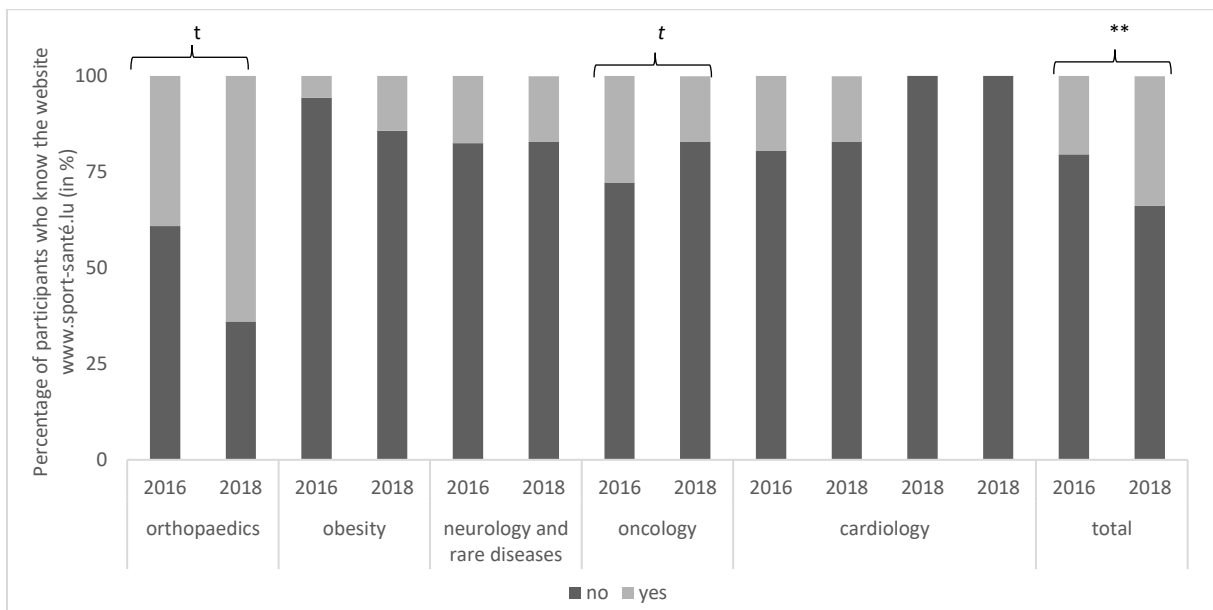


Figure 22. Percentage of participants who knew the website www.sport-sante.lu (t $p < 0.1$; $$ $p < 0.01$).**

3.3 STUDY 3: NON-GOVERNMENTAL ORGANISATION STUDY

The NGOs and groups visited in 2016 and 2018 are presented in Table 10. In 2016 twelve NGOs had been observed, in 2018 thirteen NGOs were visited. Additionally, since 2017, two NGOs, Association Luxembourgeoise du Diabète and Association Luxembourg et Grande Région de Prévention et de gestion du Stress, also started offering therapeutic physical activities.

Table 10. List of the NGOs and groups visited.

Pathology	Non-governmental organisation	2016	2018
Orthopaedics	1. Luxemburger Hüft- und Kniesportgruppe	✓	✓
	1st Return-to-Sports Group Luxembourg	✓	✓
Obesity	Groupe Sportif pour Adultes en Surpoids	✓	✓
	Groupe Sportif pour Adolescents en Surpoids	✓	✓
	Movin' kids	✓	✓
Neurology and rare diseases	Parkinson Luxembourg	✓	✓
	Blëtz	x	x
	Multiple Sclérose Lëtzebuerg	✓	✓
	ALAN Maladies Rares	✓	✓
Oncology	Fondation Cancer	✓	✓
	Association Luxembourgeoise des Groupes Sportifs Oncologiques	✓	✓
	Europa Donna Luxembourg	✓	x
Cardiology	Association Luxembourgeoise des Groupes Sportifs pour Cardiaques	✓	✓
Diabetes	Association Luxembourgeoise du Diabète	a	✓
Stress	Association Luxembourg et Grande Région de Prévention et de gestion du Stress	a	✓

^a offer was launched in 2017

In 2016, 55.8 hours of therapeutic physical activities for patients with NCDs were offered every week. During the next two years, 17 hours of physical activity were added, so that in 2018 a total amount of 72.8 hours were available (Figure 23). This increase was statistically significant ($t = -4.33, p = 0.005$). It should be noted that the offer of PA (extended duration or a new activity) in each category increased. Thus, in 2018 the number of weekly hours of health sport in the seven categories was divided as follows: 2 hours in diabetes, 4 hours in stress, 5 hours in orthopaedics, 7.3 hours in obesity, 16 hours in neurology and rare diseases, 16.8 hours in oncology and 21.8 hours in cardiology. In 2016, 309 participants attending the health sport courses were observed, whereas 391 participants were observed in 2018, even though, no change in the total number of participants was observed ($t = -1.34, p = 0.23$) (Figure 24). However, it must be pointed out that not all the available courses were visited in 2016 and 2018 and the number of courses has augmented since the study in 2016 (Figure 23). The mean number of participants per course visited remained stable with 10.3 in 2016 and 10.0 in 2018 ($t = 0.05, p = 0.96$) (Figure 25). The maximal capacity rate (calculated using the estimation by the clinical exercise trainers of the maximal observed capacity and maximal possible capacity) has remained unchanged ($t = -0.37, p = 0.72$) (Figure 26). In 2018, the maximal occupancy rate was the highest in cardiology (69.6%) and the lowest in diabetes and stress (both 25%).

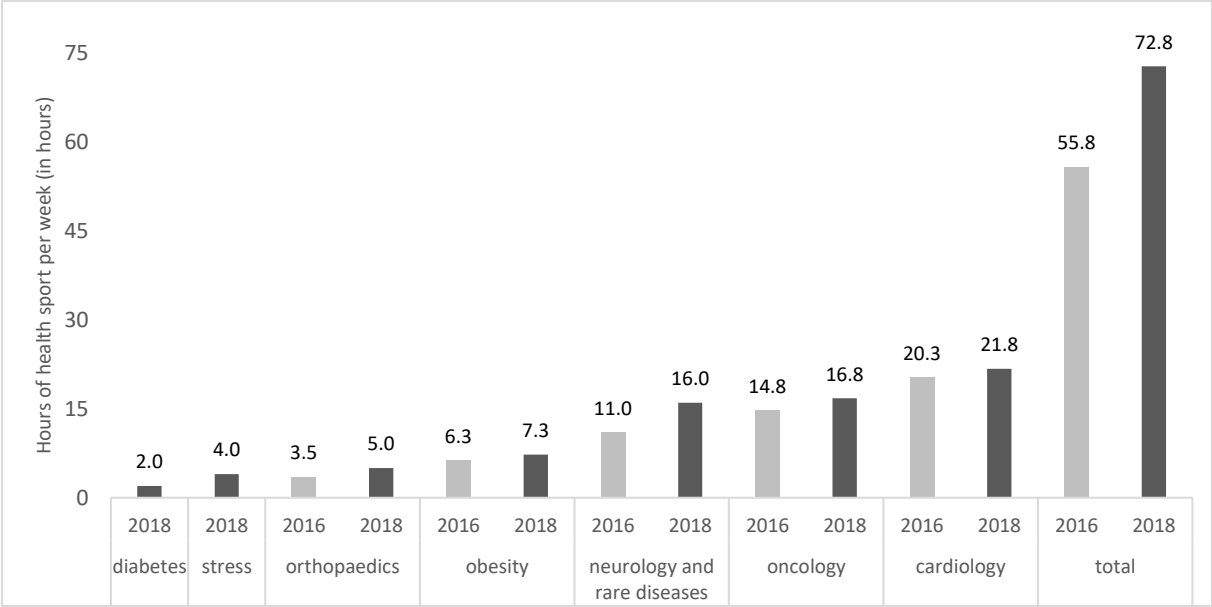


Figure 23. Number of hours of health sport offered in Luxembourg per week.

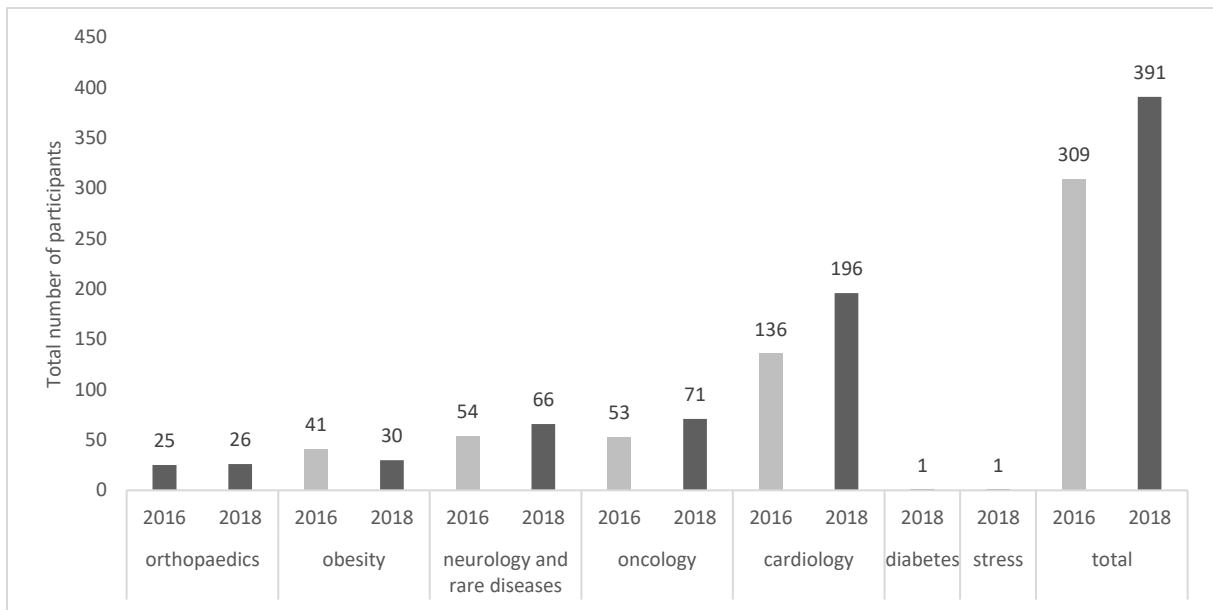


Figure 24. Total number of participants observed.

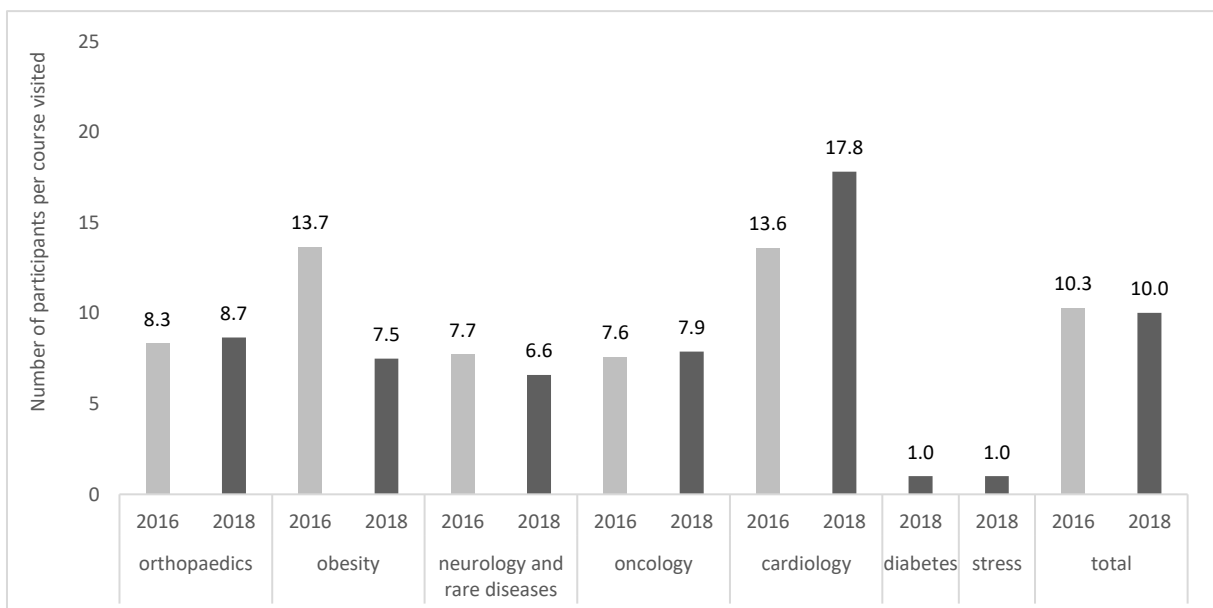


Figure 25. Number of participants per course visited.

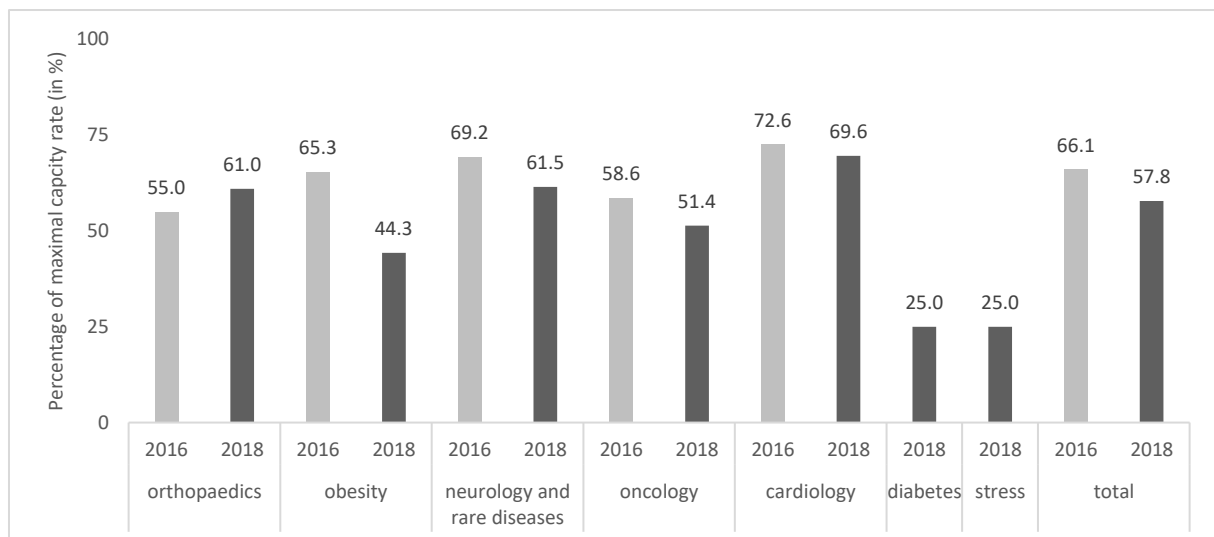


Figure 26. Percentage of maximal capacity rate.

The characteristics of participants are represented in Table 11. In 2018 the number of male participants was the highest in cardiology (Mean = 12.7, SD = 6.02) and the lowest in stress and diabetes, with no male participants. The number of women has not changed in the recent years ($z = -0.17$, $p = 0.87$). In oncology, the number of female participants was notably the highest with 6.8 participants observed (SD = 3.11), whereas the least female participants were observed in neurology and rare diseases (Mean = 3.0, SD = 2.06).

Table 11. Mean of male and female participants per course which were visited in 2016 and 2018.

Category	2016	2018	Mann-Whitney-U-test		
	Mean (SD)	Mean (SD)	z-Value	p-Value	
Men	Orthopaedics	3.7 (1.5)	4.0 (1.0)	-0.23	0.82
	Obesity	8.3 (2.3)	3.5 (1.7)	-2.16	0.031
	Neurology and rare diseases	4.0 (3.1)	3.6 (3.6)	-0.54	0.59
	Oncology	1.2 (1.6)	1.1 (1.1)	-0.25	0.81
	Cardiology	10.7 (9.9)	12.7 (6.0)	-1.06	0.29
	Diabetes	-	0	-	-
	Stress	-	0	-	-
	Total	6.1 (7.0)	5.4 (6.0)	-0.45	0.65

	Category	2016	2018	Mann-Whitney-U-test	
		Mean (SD)	Mean (SD)	z-Value	p-Value
Women	Orthopaedics	4.7 (1.5)	4.7 (4.12)	-0.44	0.66
	Obesity	5.3 (3.2)	4.0 (4.1)	-0.89	0.32
	Neurology and rare diseases	4.0 (4.3)	3.0 (2.1)	-0.05	0.96
	Oncology	6.4 (4.5)	6.8 (3.1)	-0.38	0.71
	Cardiology	3.4 (3.0)	5.1 (5.4)	-0.61	0.54
	Diabetes	-	1	-	-
	Stress	-	1	-	-
	Total	4.6 (3.6)	4.6 (4.0)	-0.17	0.87

4 DISCUSSION

Considering the health benefits of PA, its promotion has increasingly been recognized, especially within the healthcare systems [87]. International NGOs (such as WHO, scientific societies, medical journals, etc.) regularly launch calls for action to raise the knowledge of the general population concerning the health benefits of PA. In these calls of action, PA promotion in the healthcare system is often recognized as a key act. Therefore, the national Luxembourgish Sport-Santé campaign to promote PA as a therapeutic tool for patients with NCDs was developed. It contained a letter to all medical doctors, as well as TV and Radio spots. As part of this thesis, the impact of the Sport-Santé campaign was evaluated on the basis of the following 3 factors: 1) “medical doctors”, 2) “participants” and 3) “NGOs”.

1) The medical doctors’ study was performed to evaluate PA counselling by GPs before and after the Sport-Santé campaign. After the campaign, PA counselling performed by GPs unexpectedly dropped from 29% to 24%. However, GPs declared the need for more information and education, as well as more consultation-time.

2) The participants’ study was set up to analyse the characteristics of the participants of the health sport groups, especially the way they were addressed. Many participants answered that they became physically active following medical advice, however the percentage of participants who were recruited by family and friends rose. Most participants stated they went beyond the minimal WHO recommendations, by being physically active for more than 210 minutes compared to the recommended 150 minutes per week. Furthermore, the effects of TV and Radio spots and tools provided (the Sport-Santé Actimeter, the flyer) were assessed with regards to promoting PA. One-fifth of the participants remembered having heard the Sport-Santé Radio clip and more than one fourth of the participants have seen the Sport-Santé TV spot. In addition, the number of participants who knew the website www.sport-sante.lu increased.

3) The NGO study was carried out in order to analyse a change of the health sport offer in Luxembourg. The number of hours of health sport offers increased from 55.8 hours in 2016 to 72.8 hours in 2018. However, the number of participants observed and the number of participants per course visited remain unchanged.

4.1 PHYSICAL ACTIVITY COUNSELLING: A LACK OF OPPORTUNITIES AND TIME?

The percentage of total patients counselled about PA dropped from 29% to 24% after the Sport-Santé campaign. This decrease could be explained by the increase in the number of consultations in October compared to May. This increase could be explained by a higher rate of acute diseases in October. For instance, about 20% of the GP's consultations in Luxembourg during October 2018 were due to acute respiratory illnesses, whereas the percentage was 10% in May 2018 [79]. Obviously, PA is contraindicated throughout the duration of presenting the symptoms of the acute diseases, especially for viral diseases such as influenza and influenza-like illnesses, as this can lead to myocarditis in the worst case [51]. Performing sports while suffering from myocarditis is completely contraindicated [26,111]. The reason for GP consultations vary with the age of patients [49,50,105]. Prior research has shown that procedural reasons like follow-up visits are the main reason for elderly patients to consult their GP [50], whereas cough and fever are the most common reasons for children and adolescents [49]. Therefore, not every visit to a medical doctor allows PA counselling. Nevertheless, the percentage (24 to 29%) of patients counselled for PA in our study is close to the percentage (32%) observed by Barnes and Schoenborn in 2012 in the United States of America [9] and is still too low.

Another important issue is the consultation time. Having more time to better respond to the patient is also one of the most common wishes of the GPs in our study. The GP's consultation time, including anamnesis and physical examination, is short. Indeed, the average duration of a GPs consultation is typically less than 10 minutes [41,65], whereas the consultation of a cardiologist takes approximately 30 minutes [57]. Petrella and Wight [112] reported that the lack of reimbursement is also a leading limitation for the prescription of exercise. PA counselling is still considered as a recommendation and not as a medical procedure [16], it is presumed to simply be a part of the consultation. "Medical procedure" is a generic term employed for all the procedures used for medical treatments and includes all the propaedeutic, diagnostic, rehabilitative and cosmetic procedures [136]. Diagnostic procedures like sonography and therapeutic procedures like infiltrations are better paid than mere consultation and are therefore more cost-effective for medical doctors and the health care institutions [18,22]. In Luxembourg, PA counselling is not a part of the list of medical procedures and services of the national health insurance [22]. By implementing PA counselling in this list of medical procedures and remunerate PA consultations, the number of PA consultations may increase in the future.

In addition, GPs must individually react to patients' requirements during the consultations. Only one fifth of the German medical doctor visits in 2017 were due to chronic diseases, whereas nearly half of the interviewees suffered from a NCD [73]. Performing PA counselling by explaining the positive effects of PA on the disease may at this point in time not be possible because GPs have to firstly focus on the main reason for appointment. In 2017, 534 GPs were registered in Luxembourg, with a population of 602 000 inhabitants, that means one GP for 1127 inhabitants [137]. Due to the growing population, a vast amount of workload can be expected. Consequently, the number of GPs must increase to ensure the adequate care of the patients and for them to feel valued in the future.

4.2 THE IMPORTANCE OF KNOWLEDGE AND TRAINING

However, having a longer consultation time and financial incentives for PA counselling is worthless, if the knowledge and training are insufficient [43,64]. We found that a large number of GPs want more training concerning PA. Insufficient PA education is also a major limitation for exercise counselling for Canadian doctors [74]. In the Grand-Duchy of Luxembourg, PA counselling is not part of the medical curriculum of the University of Luxembourg. In fact, students of the University of Luxembourg can only enrol for the first year of medical studies, after that the students are obliged to finish their medical studies in foreign countries. Starting with the beginning of the winter semester 2021/2022, the University of Luxembourg will propose a "Bachelor en Médecine", however the last two years (Master en Médecine) must still be completed in a foreign country. Therefore, medical doctors working in Luxembourg are mostly trained in the neighbouring countries and the PA counselling within the curriculum may vary according the countries. Indeed, PA counselling is usually barely taught within medical schools [30]. However, training in PA has been developed and implemented by different institutions across the world [87]. In Australia, most medical schools include training in PA within the medical curriculum [140]. In the UK, ExerciseWorks! and Public Health England developed and implemented a large set of undergraduate teaching resources in medical schools. This set will be implemented in 5 other countries (Lithuania, Estonia, France, Greece and Portugal) via an Erasmus+ grant obtained in mid-September 2019 [44]. PA counselling should be a part of the curriculum at universities, so that future medical doctors are trained from the start [53,54]. This training should be a mandatory part of the curriculum and should also be part of the material to be examined. In addition, continued medical training for GPs and specialists must integrate PA counselling. The Association Luxembourgeoise pour la Formation Médicale Continue (ALFORMEC) has organized a training concerning PA

counselling for the medical doctors working in Luxembourg in November 2019. The PA promotion should also be performed by other healthcare professionals such as physiotherapists. Kunstler et al. showed that the number of PA consultations of physiotherapists depends on the knowledge of how to promote PA [77]. Therefore, initial and long-term trainings should also be implemented for physiotherapists, nurses or pharmacists.

4.3 THE PATIENTS' PART SHOULD NOT BE NEGLECTED

Our study showed that only a small percentage (13.1%) of the participants estimated the minimum weekly PA recommendations of the WHO correctly. Similar results (15%) have been reported by Know et al. [76] surveying adults employed in England in 2015. However, the portion of Luxembourgish participants overestimating the recommendations was far greater than the part in the English sample (35.3% vs.13.8%) [76]. This means that nearly half of the participants in our study estimated the PA recommendations correctly or higher. It was shown by Abula et al. that the level of awareness of PA recommendations among Chinese students correlates with their own level of PA [1]. Most of the participants of the study met or even exceed the minimum weekly PA recommendations of the WHO. They recognize that PA has many positive effects on the body and for disease management. In addition, they are willing to adapt their behaviour and change their habits. In Canada, only one fifth of the residents aged over 18 years were meeting the WHO guidelines in 2017 [138] and only 22% of hematologic cancer survivors comply to the recommendations, as shown in a study performed by Vallerand et al [148].

To increase the number of patients exercising, a written PA prescription might be of assistance [68,107,108]. One further example for PA prescription is the Swedish "PA on prescription"-method which is based on five cornerstones (*written prescription, evidence based PA recommendation, patient-centred individualized counselling, follow-up and supporting environment, community-based network*) [69]. To ensure evidence-based recommendations, a book was published with articles concerning PA and 26 chronic diseases [118]. This book should be used for PA prescription. An advantage of this model is that patients do not necessarily have to participate in sports groups, any physical exercise such as walking should be entered in the PA diary provided. Moreover, patients often forget or have problems understanding the medical information given [75,94], whereas additional written information is better remembered [11]. Nevertheless, a written prescription of PA is not yet recognized in Luxembourg [22]. Even worse, the Luxembourgish national health insurance prohibits the

participation in physical activities during an incapacity of work unless these are part of a specific medical prescription like physiotherapy in order to restore the causes of incapacity for work [23]. Some NCDs like cancer or stress-related diseases often require a long-term incapacity of work. The patients must stay at home for a long time and are thus restricted from the community, which may have effects on their mental well-being. An officially recognised certificate (or a prescription), defining which physical activities (whether in sports groups or individually as walking) are allowed, may release these patients from their inhibitions and enable them to exercise without the fear of breaking the law and losing their jobs. Additionally, patients may feel more obliged to follow the recommendations.

4.4 ACCESSIBLE AND AVAILABLE FOR EVERYONE

In the last two years, much emphasis has been put on health promotion and expansion of the offer of PA so that the health sport offers under the guise of the Sport-Santé national campaign have increased. However, the participation rate per course visited remained stable. This observation may be explained by the fact that there is a larger offer, the participants may have spread to different courses. Nevertheless, expanding the offer is important as it allows people to choose the sport which suits their interest most and to choose a time which fits in with their schedule and daily routines. Employees must have the opportunity to exercise after their working hours; pensioners may feel uncomfortable to drive late in the evening or during rush hour. It is therefore important to adapt the offer to the circumstances and the participants.

4.5 THE IMPORTANCE OF GOVERNMENTAL SUPPORT

Our study has shown the positive influence of medical advice on patients' PA; however, the influence of NGOs and family and friends should not be neglected. Especially nowadays, as NGOs are having problems recruiting unpaid volunteers. In order to offer more health sport activities, more instructors and facilities are needed, consequently causing a financing problem. For this reason, Sport-Santé, which is now led by the FLASS in a collaborative work with its members, is supported by the Luxembourgish government. Since 2018, the payment of the instructors of courses organized by the members of the FLASS is, at least partially, taken over by the Luxembourgish government (Ministry of Health). The support of the governments and insurance companies is an important factor in the promotion of PA for patients affected by

NCDs [64,165,168]. In this context, the national Sport-Santé promotional campaign gained the support of the Luxembourgish Ministry of Health, the Luxembourgish Ministry of Sports and the Luxembourgish Ministry of Social Security.

4.6 EFFECTS OF PROMOTION IN THE PRESENT AND THE FUTURE

The number of patients remembering having heard or seen the Sport-Santé national campaign on the radio or television seems to be low, however there was a large time gap between the broadcast in June-July and the questioning in November-January, which may have influenced the results. Nevertheless, analysing the percentage of Luxembourgish people listening to RTL Radio (34%) or watching RTL Télévision (20%) [143], the results of this study can be interpreted as relatively positive. The number of patients knowing the website www.sport-sante.lu has increased from 2016 to 2018. We cannot say this is a direct effect of the campaign, but it is certain that it is the consequence of all the promotional work done by Sport-Santé during the last years.

The positive impact is also apparent in the number of clicks on the website www.sport-sante.lu, which have significantly increased after the campaign [88] (Figure 27). Compared to 2016 and 2017, the daily number of sessions on the website www.sport-sante.lu increased by 15 sessions per day after the press release from the 15th of June 2018. This significant increase was visible for one month. After the delivery of the letter to the GPs on the 3rd of September 2018 a higher number of clicks on the website was observed compared to the same period in 2016 and 2017.

The mean age of the participants of the Sport-Santé national campaign study may also be an indication of why the percentage of participants knowing the website did not further increase. Craike et al. found that the referral to exercise physiologists depends on the age of the patient, younger or older patients are less often referred compared to patients aged 45-64 years [28]. People aged 55 and over, use the internet less likely than the younger generation [98]. Prensky created the terms “digital migrant” and “digital native” [117], which describes the generation gap really well. While the “digital natives” grow up with the internet and other technologies and master its use, the “digital migrants” had to adapt to the technical progress. Hence, older patients might not use the internet as often as the younger generation to look for information. The website www.sport-sante.lu therefore can also be considered as a medium to inform future patients.

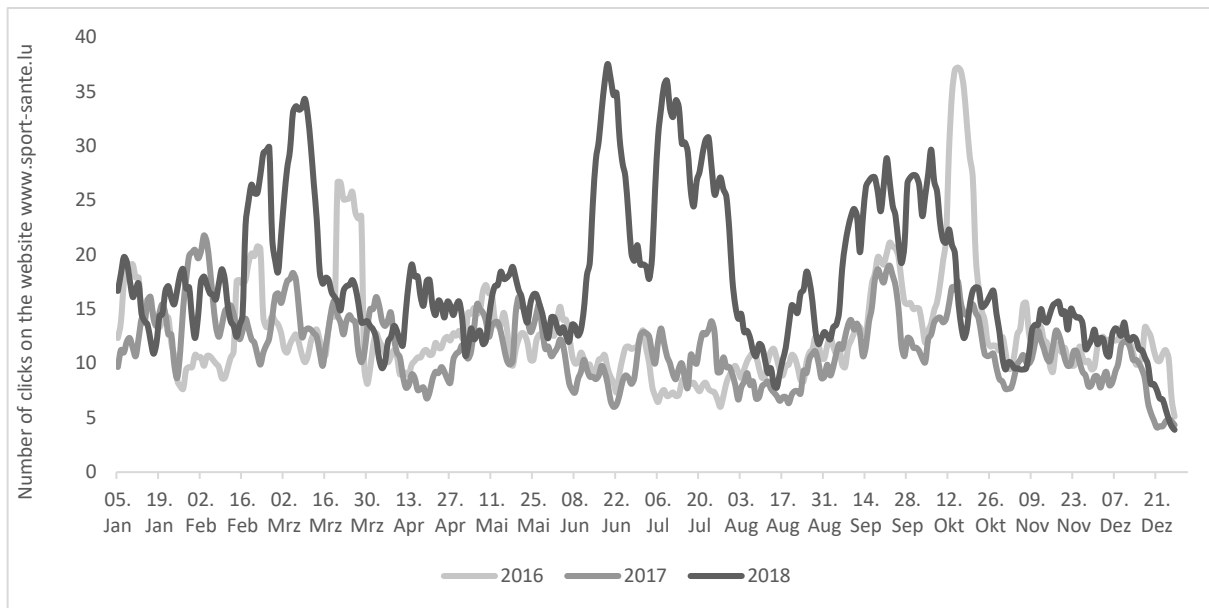


Figure 27. Daily number of clicks on the www.sport-sante.lu website from January 2016 to December 2018 [88].

4.7 LIMITATIONS

This study is not without its limitations. Firstly, the Sport-Santé national campaign focused on all medical doctors (i.e. GPs, cardiologists, oncologists, etc.) working in Luxembourg. However, we surveyed only GPs for practical and theoretical reasons. In fact, we assumed that it was easier to reach GPs than specialists. A non-neglectable part of specialists work at the hospital and it is very difficult to get in touch with them. In addition, we assumed that specialists would be more aware of PA promotion. Indeed, most patients with NCDs are treated by a specialist, for example after a cardiac arrest or a stroke, patients are treated by a cardiologist or neurologist. Therefore, it is important that promotional campaigns focus on all medical doctors, especially with the creation of a stable contact within the fields of specialization. Nevertheless, GPs are essential in PA promotion both in primary and secondary/tertiary prevention.

Secondly, during the GPs study, the phone calls were performed during working hours (of the investigators), which meant reaching GPs was difficult as they were frequently in consultation. Most GPs were reachable after 11.30 a.m. or after 4.00 p.m. [128]. Before and after the campaign the response rate was lower than 50%, many GPs stated not having the time due to the high number of patients waiting in the waiting room. Moreover, surveys over the phone are often affected by investigator bias [128]. This is probably the case in this study too, as the interviewers spoke different languages (only one of the interviewers was fluent in

Luxembourgish and German). Many medical doctors feel more comfortable in their native language and were more willing to participate in the survey. In addition, doctors who are more enthusiastic about the topic PA, preferred participating in such a survey, compared to those for whom the topic is not of interest.

Thirdly, the data of all three studies are subjected to recall bias and fluctuating interpretations of survey questions. The first part of the campaign (June and July 2018) and the survey phase (October 2018) were far apart, some respondents may no longer have remembered having seen parts of the campaign. Finally, the comparisons between the data from 2016 and 2018 cannot lead to definite conclusions on the sole effect of the national campaign, however, more importantly, it does show the effect of the overall work done within the Sport-Santé group, which includes the national campaign.

4.8 CONCLUSION

In conclusion, the national Sport-Santé campaign was unable to fulfil all the (perhaps utopian) expectations, even though positive impacts were observed. The promotional campaign failed to incorporate the GPs in engaging their patients to exercise more. However, the health sport offers increased. The study illustrates once more that the struggle against NCDs is not only a current topic but will have an even greater importance in the future. The solution requires co-operation of several stakeholders. Firstly, all the actors (medical doctors and patients) must understand and no longer ignore the problems of a sedentary lifestyle and they must be willing to change their habits. The adoption of the system “PA on Prescription” in combination with reimbursement of PA counselling may facilitate those changes. Secondly, political support is still needed. Governments need to create and support campaigns against physical inactivity. Improved availability of health sport offers and less distance to be covered to participate in the health sport programs may influence the patient’s willingness to exercise. To allow to professionalize the work of the NGOs, financial support of the government (or from other sponsors) is necessary. This would allow the NGOs to no longer solely count on volunteers, but also have the possibility to hire a paid workforce. The fact that the Luxembourgish government pays the financial compensation of the PA monitors is an appropriate step towards the future. A change of the rules to leave home in conjunction with “PA on Prescription” would also be an asset, in order to allow patients during an incapacity of work to be physically active on medical advice. However, this written prescription must define specifically which physical activities (whether in sports groups or individual activities such as walking) are allowed so that

the patient does not have to fear negative consequences. Finally, it is important to build structures from which people will benefit today and in the future. Sport-Santé is on the right path, the structures have continued to develop in recent years and have increased. It is important to continue this work: continue to advertise health sports, find additional providers for sports groups and enforce the cooperation with the ministries. A combination of all these factors may allow to strengthen the fight against NCDs.

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165. World Health Organization (2018) Global action plan on physical activity 2018-2030: More active people for a healthier world. Geneva
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8 APPENDIX

Appendix 1 : Sport-Santé Letter



ERNEMENT ND-DUCHÉ DE LUXEMBOURG


Campagne Nationale Sport-Santé 2018

Bon de commande / Bestellformular

Nom / Name: _____
 Prénom / Vorname: _____
 Adresse / Adresse: _____
 TEL / Tel: _____
 Email: _____


souhaite commander / möchte gerne bestellen

Flyers Sport-Santé



Flyers – version Française
 Flyers – deutsche Version

Activimètre Sport-Santé / Sport-Santé Aktimeter / Sport-Santé Actimeter







Actimètre (s) – version Française
 Aktimeter – deutsche Version
 Actimeter (s) – English version

A retourner à l'une des adresses suivantes / An eine der beiden folgenden Adressen zurückzusenden

Sport-Santé
 Fondation Norbert Metz
 76 Rue d'Eich, L-1460 Luxembourg
 Tél. +352 26970-819 | contact@sport-sante.lu

Fédération Luxembourgeoise des Associations de Sport de Santé
 18, Rue Thomas Edison, L-1445 Strassen
 Tél. +352 27 72 01 23 | contact@flass.lu

Luxemburg, 26. Juni 2018

Betreff: Programme National Thérapeutique Sport-Santé & Campagne Nationale Sport-Santé 2018.

Sehr geehrte Frau Doktor, sehr geehrter Herr Doktor,

Körperliche Inaktivität ist eine der häufigsten Todesursachen weltweit und einer der größten Risikofaktoren für die Entwicklung von chronischen Krankheiten. Körperliche Aktivität hingegen ist nicht nur vorteilhaft für die Primärprävention chronischer Krankheiten, sondern ebenfalls für deren Behandlung. Demnach hat sie einen positiven Einfluss auf die Lebensqualität, die Körperstrukturen und -funktionen, den Krankheitsverlauf selbst und, in einigen Fällen, sogar die Rückfallrate.

Am 15. Juni haben Frau Lydia MUTSCH, Gesundheitsministerin, und Herr Romain SCHNEIDER, Minister für Sport und Minister für soziale Sicherheit, gemeinsam die „Campagne Nationale Sport-Santé 2018“ als Teil des „Programme National Thérapeutique Sport-Santé“ gestartet. Diese Kampagne wird in Zusammenarbeit mit der Fédération Luxembourgeoise des Associations de Sport de Santé (FLASS), der Œuvre Nationale de Secours Grande-Duchesse Charlotte (Œuvre) und dem Luxembourg Institute of Health (LIH) durchgeführt. Ziel der Kampagne ist es, Ihnen zu ermöglichen, Ihre Patienten umfassender im Bereich der körperlichen Aktivitäten zu beraten, insbesondere wenn diese unter einer chronischen Krankheit leiden.

Im Rahmen der Nationalen Sport-Santé Kampagne 2018 werden zur Zeit Fernsehspots bei RTL ausgestrahlt, um die breite Öffentlichkeit sowie die Patienten über die Vorteile therapeutischer körperlicher Aktivitäten aufzuklären. Darüber hinaus befinden sich in diesem Umschlag zwei neue Sport-Santé Tools: das Sport-Santé Aktimeter und der Sport-Santé Flyer. Beide wurden speziell dafür entwickelt, Ihnen das Beraten Ihrer Patienten bezüglich therapeutischer körperlicher Aktivität zu erleichtern.

- Das Sport-Santé Aktimeter hilft Ihnen die körperliche Betätigung Ihrer Patienten zu erfassen, indem Sie zwei einfache Fragen stellen. Das Ergebnis zeigt an, ob Ihre Patienten die Empfehlungen für minimale körperliche Aktivität befolgen.
- Der Sport-Santé Flyer hilft Ihnen die in Luxemburg angebotenen therapeutischen Aktivitäten für chronisch kranke Patienten schnell aufzufinden. Darüber hinaus enthält der Sport-Santé

Wir danken Ihnen für Ihr Interesse an der Campagne Nationale Sport-Santé 2018 und verbleiben.
Mit freundlichen Grüßen,

Romain SCHNEIDER


 Minister für Sport
 Minister für soziale Sicherheit

Lydia MUTSCH


 Ministerin für Gesundheit

Dr Ulf NEHRBASS


 CEO des LIH

Pierre BLEY


 Président der Œuvre

Dr Charles DELAGARDELLE


 Président der FLASS

Flyer die Kontaktinformationen aller Organisationen, welche diese therapeutischen körperlichen Aktivitäten anbieten. Für weiterführende Informationen laden wir Sie herzlich ein, das Portal www.sport-sante.lu (contact@sport-sante.lu) zu besuchen.










Appendix 2 : Flyer

Quelques définitions & recommandations

Quelle est l'intensité de ma pratique d'activité physique ?*

Intensités recommandées pour ma santé				
SÉDENTAIRE	LÉGÈRE	MODÉRÉE	VIGOUREUSE	MAXIMALE
Au repos	Pas d'augmentation de la respiration/transpiration	Légère augmentation de la respiration/transpiration	Forte augmentation de la respiration/transpiration	Sensation d'être au maximum
<40% FCmax	40-54% FCmax	55-69% FCmax	70-89% FCmax	>90% FCmax

FCmax : fréquence cardiaque maximale.

Quelles sont les recommandations minimales de pratique d'activité physique pour la santé des personnes adultes ?**



Quelques conseils

- Pratiquez au minimum **30 minutes** d'activité physique d'intensité modérée à vigoureuse au moins **5 jours/semaine**
- Choisissez des activités physiques qui vous plaisent et pratiquez-les avec des amis ou en famille
- Pratiquez les activités physiques à votre propre rythme
- Augmentez l'intensité ou/et le volume de façon progressive, selon vos capacités

! En cas de maladie chronique, visitez le portail www.sport-sante.lu et demandez conseil à votre médecin

* Selon l'étude de Thornton et al. Physical Activity Prescription: A Critical Opportunity to Address a Modifiable Risk Factor for the Prevention and Management of Chronic Disease: A Position Statement by the Canadian Academy of Sport and Exercise Medicine. Br J Sports Med. 2016;50(11):1109-14.
** Selon les recommandations de l'OMS, Global recommendations on physical activity for health, 2010.

sport santé

L'activité physique au service de votre santé



LE GOUVERNEMENT DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de la Santé

LE GOUVERNEMENT DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère des Sports

LE GOUVERNEMENT DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de la Sécurité sociale

flass

CEUVRE
Maison de Médecine
Quartier d'Orientation Culturelle

LUXEMBOURG INSTITUTE OF HEALTH
Institut für Gesundheitswissenschaften

Organisations proposant les activités physiques thérapeutiques

Accidents vasculaires cérébraux

Bletz
68, rue du Château, L - 2227 Bettembourg
Tél. 623 88 00 88 | info@bletz.lu | www.bletz.lu

Cancer

Association Luxembourgeoise des Groupes Sportifs Oncologiques
23, rue de Steinsel, L - 7395 Hunsdorf
Tél. 691 12 12 07 ou Tél. 691 25 00 28
info@sportifsoncologiques.lu | www.sportifsoncologiques.lu

Europa Donna Luxembourg

BP 818, L - 2028 Luxembourg
Tél. 621 47 83 94 | europadonna@pt.lu | www.europadonna.lu

Fondation Cancer

209, rte d'Arlon, L - 1150 Luxembourg
Tél. 45 30 33 11 | fondation@can.lu | www.can.lu

Diabète

Maison du Diabète de l'Association Luxembourgeoise du Diabète
143, rue de Mühlenbach, L-2168 Luxembourg-Eich
Tél. 48 53 61 | diabete@pt.lu | www.aid.lu

Maladies cardiovasculaires

Association Luxembourgeoise des Groupes Sportifs pour Cardiaques
BP 2366 L - 1013 Luxembourg
Tél. 622 49 65 93 | contact@algscl.lu | www.algscl.lu

Maladies neurologiques

Back To Sport
1, rue Raoul Follereau, L - 8240 Luxembourg
Tél. 661 646 464 | contact@backtosport.lu | www.backtosport.lu

Multiple Sclérose Lëtzebuerg

MS-Day Center - Um Bill, Maison 1, L - 7425 Bill
Tél. 40 08 44 | mslux@pt.lu | www.msweb.lu

Parkinson Luxembourg

Centre Parkinson « La Tulipe »
Domaine Schaefer, 18, rue des Champs, L - 3348 Leudlange
Tél. 23 69 84 51 | info@parkinsonlux.lu | www.parkinsonlux.lu

Maladies psychosomatiques

APGS - Prévention et gestion du stress chronique
Tél. 691 210 093 | info@centre-de-ressources.org
www.centre-de-ressources.org

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LUXEMBOURG INSTITUTE OF HEALTH - LIH

Maladies rares

ALAN - Maladies Rares Luxembourg
27, op Zaemer (ZAE Robert Steichen), L - 4959 Bascharage
Tél. 266 122 21 | info@alan.lu | www.alan.lu

Surpoids / obésité

Gesond Diddeleng - De Wibbel, Service santé scolaire
16, rte de Bettembourg, L - 3424 Dudelange
Tél. 51 61 21 575 | gesondiddeleng@dudelange.lu
www.dudelange.lu | www.facebook.com/gesondiddeleng

Medizinische Sport-Gruppen für Personen mit Orthopädischen & Metabolischen Störungen

Groupe Sportif pour adolescents ou personnes en surpoids | CHL - Clinique d'Eich
Tél. 4411-7333 | patrick.ms@gom@gmail.com
www.chl.lu/fr/dossier/groupe-sportif-pour-personnes-en-surpoids

Movin'Kids, Ville de Luxembourg

Service des sports de la VdL
5, rue de l'Abattoir, L - 1111 Luxembourg
Tél. 47964402 | sports@vdl.lu | www.vdl.lu
Service médical des écoles de la VdL
20, rue du Commerce, L - 3351 Luxembourg
Tél. 4796-2948 | sports@vdl.lu | www.vdl.lu

Pathologies orthopédiques

Gesond Diddeleng - De Wibbel, Service santé scolaire
16, rte de Bettembourg, L - 3424 Dudelange
Tél. 51 61 21 575 | gesondiddeleng@dudelange.lu
www.dudelange.lu | www.facebook.com/gesondiddeleng

Medizinische Sport-Gruppen für Personen mit Orthopädischen & Metabolischen Störungen

Clinique du Sport | Clinique d'Eich
Tél. 4411-7203 | luxhs@gmail.com
www.chl.lu/fr/dossier/luxemburger-huft-und-kniesportgruppe
1st return-to-sports group Luxembourg
Clinique du Sport - Clinique d'Eich
Tél. 4411-7203 | kine.eich@chl.lu
www.chl.lu/fr/dossier/premier-groupe-luxembourgeois-de-reprise-du-sport

Sport-Santé

Fondation Norbert Metz, 76, Rue d'Eich, L-1460 Luxembourg
Tél. +352 26970-849 | contact@sport-sante.lu
www.sport-sante.lu

Fédération Luxembourgeoise des Associations de Sport de Santé

flass
1b, rue Thomas Edison, L-1445 Strassen, Luxembourg
Tél. +352 27 72 01 23 | contact@flass.lu | www.flass.lu

www.sport-sante.lu

La pratique d'une activité physique régulière a une influence positive dans la prévention, le traitement et la gestion de nombreuses maladies chroniques.
Plus de 65 heures d'activité physique sont proposées chaque semaine par les partenaires de Sport-Santé*.
Les cours sont encadrés par des professionnels et sont adaptés au niveau des participants.

	Accidents vasculaires cérébraux	Cancer	Diabète	Maladies cardiovasculaires	Maladies neurologiques	Maladies psychosomatiques	Maladies rares	Surpoids / obésité	Pathologies orthopédiques
Aquagym		✓	✓	✓	✓	✓	✓	✓	
Boxe				✓					
Cyclisme				✓					
Danse / Zumba				✓				✓	
Gymnastique		✓	✓	✓	✓	✓	✓	✓	✓
Jeux pour enfants			✓					✓	
Jogging			✓						
Marche Nordique		✓	✓	✓	✓	✓	✓	✓	✓
Multi-sports		✓						✓	✓
Musculation		✓	✓	✓	✓	✓	✓	✓	✓
Natation				✓				✓	✓
Pétanque/Boccia	✓							✓	
Randonnée				✓					
Gymnastique douce (Yoga, Qi-Gong, etc.)		✓	✓	✓	✓	✓	✓	✓	✓

* Sujet à modifications

Appendix 3 : Actimeter



Physical activity to manage your health





SPORT-SANTÉ ACTIMETER

contact@sport-sante.lu | www.sport-sante.lu |  sport-sante.lu





LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de la Santé



LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de la Sécurité sociale








LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère des Sports

Definitions & Recommendations



Intensity levels of physical activity*

		← Intensities of interest →		
SEDENTARY	LIGHT	MODERATE	VIGOROUS	HIGH
				
At rest	No increase in breathing/sweating	Slight increase in breathing/sweating	Large increase in breathing/sweating	Feels like giving 100%
<40% HRmax	40-54% HRmax	55-69% HRmax	70-89% HRmax	≥90% HRmax

HRmax: maximal heart rate.

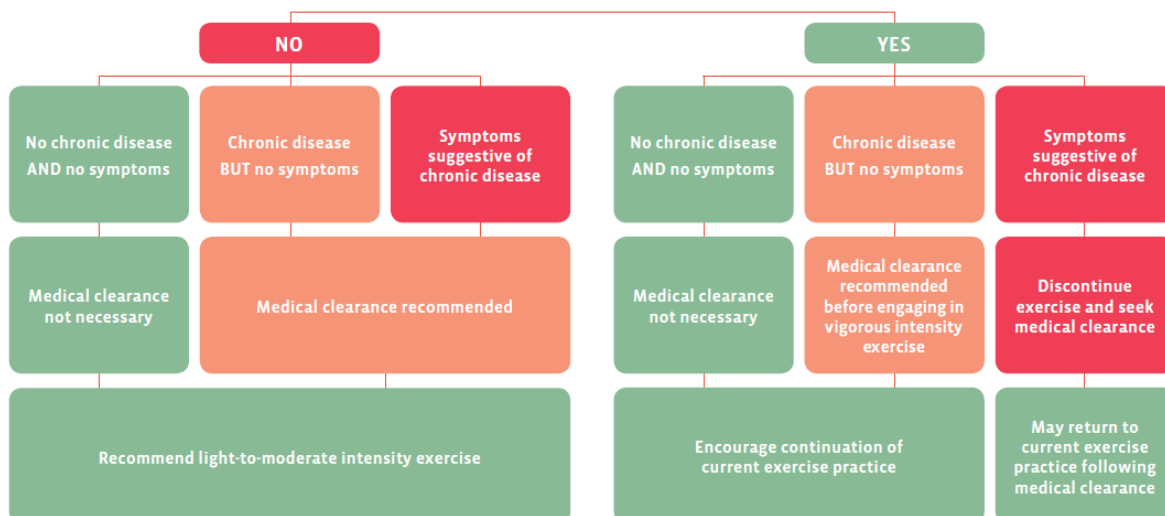
Minimal health-related physical activity recommendations for adults**



* Based on Thornton et al. Physical Activity Prescription: A Critical Opportunity to Address a Modifiable Risk Factor for the Prevention and Management of Chronic Disease: A Position Statement by the Canadian Academy of Sport and Exercise Medicine. Br J Sports Med. 2016;50(18):1109-14.

** Based on WHO, Global recommendations on physical activity for health, 2010.

Does your patient meet the current physical activity recommendations*?



Advices to your patient

- Minimum **30 minutes** of moderate-to-vigorous physical activity at least **5 days/week**
- Select pleasant physical activities and enjoy them with friends or family
- Practice physical activities at your own pace
- May gradually progress as tolerated

! Refer to www.sport-sante.lu in case of chronic disease

* Based on Whitfield et al. Applying the ACSM Preparticipation Screening Algorithm to U.S. Adults: National Health and Nutrition Examination Survey 2001-2004. Med Sci Sports Exerc. 2017;49(10):2056-2063.

Sport-Santé Actimeter

1 Evaluate the physical activity habits of your patient with the two following questions*:

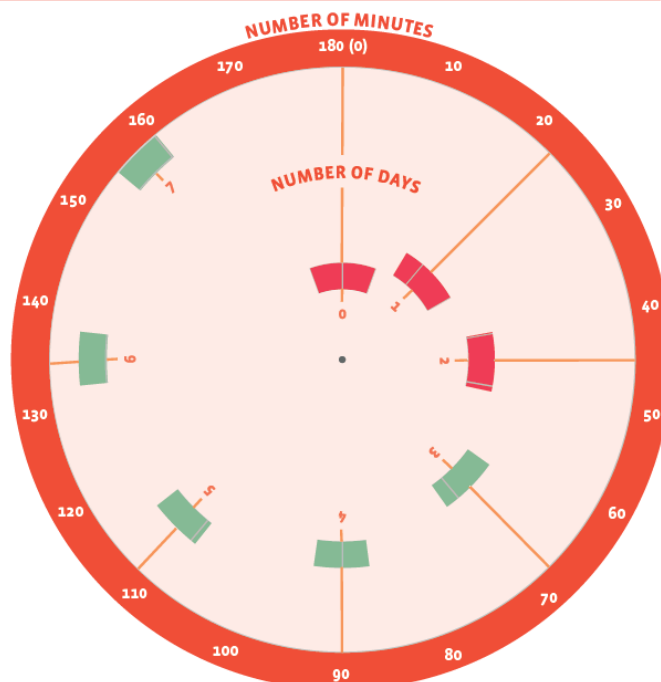
- On average, how many days per week do you engage in moderate or greater intensity physical activity?
- On average, how many minutes do you engage in this physical activity on those days?***

2 Select the number of days and its corresponding reference line

3 Turn the wheel to adjust this reference line to the number of minutes

4 Read the result in the corresponding pre-cut cell

- Green** Your patient meets the minimal physical activity recommendations.
 - >> Encourage him/her to continue his/her current exercise practice.
- Red** Your patient does not meet the minimal physical activity recommendations.
 - >> He/she is at increased risk of chronic disease. Encourage him/her to start practicing exercise, according to the recommendations stated in of this document.



* Based on Sallis. Exercise in the Treatment of Chronic Disease: An Underfilled Prescription. Curr Sports Med Rep. 2017;16(4):225-226.

** If the intensity of the exercise is vigorous or greater, the amount of minutes to be considered for the Actimeter can be multiplied by two.

Appendix 4 : Videos

The screenshot displays a website's navigation bar at the top with the following menu items: Sport-Santé, Où pratiquer?, News, Espace professionnel, Médias, and Conseils. A language selector shows the French flag. Below the navigation bar is a dark red header with the word "Videos" in white. The main content area features a grid of six video thumbnails, each with a title below it:

- Sport-Santé bei Parkinson
- Sport-Santé bei orthopédesche...
- Sport-Santé bei neurologesche...
- Sport-Santé bei rare Krankheiten
- Sport-Santé bei Kribserkranku...
- Sport-Santé fir kardiovaskulär ...

At the bottom of the video grid is a social sharing bar with icons for Facebook, Twitter, LinkedIn, YouTube, and a "Partager" button, followed by a "tous les" button and a plus sign for more options.

Appendix 5 : Medical doctors study: Questionnaire – Before campaign

General Practitioners Sport-Santé Campaign Evaluation’s questionnaire – Before campaign

Introduction:

Standardist: Hello Madam, I am mandated by Dr. Alexis Lion to evaluate a prevention campaign conducted with the Ministry of Health. May I speak to Dr. XXXX?

Doctor: Hello Doctor, I am mandated by Dr. Alexis Lion to evaluate a prevention campaign conducted with the Ministry of Health. For that, I need you to answer 6 questions. Your answers will be strictly anonymous and the estimated duration is 3 minutes. Could you answer now? (When can I contact you?)

1. How long have you been practicing?	[_ _] years [_ _] months
2. How many patients did you see last week, Monday to Saturday?	[_ _ _ _] (number)
3. With how many of these patients did you talk about physical activity?	[_ _ _ _] (number)
4. Do you think you have all the tools you need to guide your patients in managing their physical activity?	[] Yes [] No
5. What do you think could help you better guide your patients in managing their physical activity? (free text)	

6. Do you know Sport-Santé website?	<input type="checkbox"/> Yes <input type="checkbox"/> No
-------------------------------------	---

Thank you for participating. You will soon be receiving documentation and a tool that will allow you to give simple pointers to your patients to help them reach the recommendations in terms of physical activity. I wish you a good day.

Appendix 6 : Medical doctors study: Questionnaire – After Campaign

General Practitioners Sport-Santé Campaign Evaluation's questionnaire – after campaign

Introduction:

Standardist: Hello Madam, I am mandated by Dr. Alexis Lion to evaluate a prevention campaign conducted with the Ministry of Health. May I speak to Dr. XXXX?

Doctor: Hello Doctor, I am mandated by Dr. Alexis Lion to evaluate a prevention campaign conducted with the Ministry of Health. For that, I need you to answer 6 questions. Your answers will be strictly anonymous and the estimated duration is 3 minutes. Could you answer now? (When can I contact you?)

1. How long have you been practicing?	[_ _] years [_ _] months
2. How many patients did you see last week, Monday to Saturday?	[_ _ _ _] (number)
3. With how many of these patients did you talk about physical activity?	[_ _ _ _] (number)
4. Do you think you have all the tools you need to guide your patients in managing their physical activity?	<input type="checkbox"/> Yes <input type="checkbox"/> No
5. Do you know Sport-Santé website?	<input type="checkbox"/> Yes <input type="checkbox"/> No
6. Have you received the Sport-Santé letter?	<input type="checkbox"/> Yes <input type="checkbox"/> No
7. With how many patients did you use the Sport-Santé actimeter last week?	[_ _ _ _] (number)
8. Have you found in the Sport-Santé letter useful information to support your practice?	<input type="checkbox"/> Yes <input type="checkbox"/> No
9. Have you seen the RTL Sport-Santé video clips this summer?	<input type="checkbox"/> Yes <input type="checkbox"/> No
10. Have you heard the RTL Sport-Santé video clips this summer?	<input type="checkbox"/> Yes <input type="checkbox"/> No
11. Have your patients told you about this Sport-Santé Campaign?	<input type="checkbox"/> Yes <input type="checkbox"/> No

12. Do you have any suggestions to help us improve this tool or the information received?

(free text)

13. What do you think could help you better guide your patients in managing their physical activity? *(free text)*

Thank you for participating. If you asked for more flyers and actimeter you will get them in the next weeks. If you are one of the doctors who ordered more Flyers and actimeters, you will receive them soon. If you wish to receive more flyers and actimeter, do not hesitate to let me know.

I wish you a good day.

Appendix 7 : Participants study : Questionnaire



Datum: _____ Verbandscode: _____

Fragebogen für die Teilnehmer der Sport-Santé-Partnerverbände

Liebes Mitglied, ich danke Ihnen, dass Sie sich ein paar Minuten Zeit nehmen, diesen Fragebogen auszufüllen. Ihre Antworten werden anonym analysiert und die Ergebnisse werden auf der Website sport-santé.lu verfügbar sein.

1. Wie alt sind Sie?

..... Jahre

2. Sie sind

- Ein Mann
 Eine Frau
 Andere
 Ich möchte nicht antworten

3. Wie sind Sie auf diesen Verein aufmerksam geworden ?

- Arzt/Physiotherapeut
 Freunde/Familie
 Internet/Presse/Anzeige
 Vereinigung/(Wohn-)Heim

4. Seit wann gehören Sie diesem Sportverein an ?

..... Jahren (oder Monate)

5. Wie viele Kilometer fahren Sie jedes Mal, um zu diesem Sportverein zu gelangen?

..... Kilometer

6. Betreiben Sie außerhalb dieses Sportvereins noch körperliche Aktivität?

- ja nein

7. Wie oft pro Woche sind Sie moderat oder stark körperlich aktiv?

..... mal pro Woche

8. Wie viele Minuten sind Sie dabei jedes Mal aktiv?

..... Minuten jedes Mal

9. Haben Sie bereits vorher körperliche Aktivität betrieben?

- ja nein

10. Nehmen Sie auf ärztlichen Rat hin an den Kursen teil?

- ja nein

11. Wie viele Minuten moderate bis stark körperliche Aktivität sollten Ihrer Meinung nach mindestens wöchentlich durchgeführt werden, um den Empfehlungen der WHO zu folgen?

- 60 min 120 min 150 min 180 min

12. Haben Sie in den letzten 6 Monaten mit Ihrem Arzt über Ihre körperlichen Aktivitäten gesprochen?

- ja nein

13. Haben Sie die Sport-Santé Werbekampagne im Fernsehen gesehen?

- ja nein

14. Haben Sie die Sport-Santé Werbekampagne im Radio gehört ?

- ja nein

15. Kennen Sie die Webseite www.sport-santé.lu ?

- ja nein

Wenn ja, haben Sie nützliche Informationen über ihre körperliche Aktivität gefunden ?

- Nein
 Ja, die gleichen Informationen, welche mein Arzt mir gab
 Ja, genauere Informationen als jene, welche mein Arzt mir gab
 Ja, aber andere Informationen als jene, welche mein Arzt mir gab
 Ja, denn mein Arzt hat mir keine Informationen gegeben

Vielen Dank für Ihre Teilnahme

Appendix 8 : Associations study : Questionnaire

ASBL :

Type de cours / Sportart :

Date / Datum :

Horaire / Uhrzeit :

Nombre d'hommes / Anzahl an Männern :

Nombre de femmes /Anzahl an Frauen:

Total :

Nombre de participants habituellement observé par le moniteur / Anzahl an Teilnehmer die normalerweise teilnehmen:

Nombre de participants au maximum / Maximale Anzahl:

9 PUBLICATIONS

Lion A, Lethal J, Urhausen A, Theisen D, Seil R, Delagardelle C. Effectiveness of a national campaign promoting physical activity for patients with non-communicable diseases in Luxembourg. 10th HEPA Europe Conference, 28-30th August 2019, Odense, Denmark

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