



## Positioning Climate Therapy Stays as a Health Tourism Product: An Evidence-Based Approach

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### Abstract

**Background:** The relationship between Length Of Stay (LOS) and Metres Above Sea Level (MASL) of Climate Therapy Stays (CTSs) and their therapeutic effectiveness and efficiency has been under-researched in the last four decades. As a consequence, the potentials of short-term and low-altitude CTSs remain unknown. **Objectives:** The purpose of this study is twofold. Firstly, it aims to ascertain whether LOS and MASL are related to the percentage change of Forced Expiratory Volume in 1 second (FEV<sub>1</sub>) and the percentage change of FEV<sub>1</sub> Compound Daily Improvement Rate (FEV<sub>1</sub> CDIR % Change). Secondly, it aims to provide an evidence-based positioning of CTSs by considering the same specific variables. **Methods/Analysis:** The study focuses on young people (age <18) who have asthma problems. The Resource-Based Theory, postulating the valuability of natural resources generating above-average benefits, has been adopted as a conceptual lens. Primary studies carried out in eastern and western European countries and separately reviewed have been considered jointly. Spearman's rank correlation coefficient was used to determine the relationship between LOS and MASL of CTSs with FEV<sub>1</sub>Change (%) and FEV<sub>1</sub>Change CDIR (%) as indicators of health improvements. The descriptive statistics were implemented in calculating standardized and aggregated values. **Findings:** Negative and significant relationships have been highlighted between FEV<sub>1</sub> Change (%) and MASL and between FEV<sub>1</sub> Change CDIR % and LOS. In other words, subjects can achieve significant health improvements even by experiencing very short climate therapy stays at very low altitude mountain centres. Considering the FEV<sub>1</sub>Change (%) and the FEV<sub>1</sub> Change CDIR (%) of climate stays by duration and elevation, the evidence-based knowledge platform has been established as a possible framework for developing an evidence-based marketing strategy for new health tourism products. **Novelty/Improvement:** Notwithstanding the need for further research, the metrics facilitating interdisciplinary, human health and economic studies have been devised. Further research on the effects of low altitude climate therapy stays could help define the healing potentials of macro and microclimatic conditions as potentially valuable 'health devices' for those suffering from respiratory diseases living in the COVID-19 era. Quantifying these effects through further studies, an evidence-based approach to formulating marketing strategies may be devised, useful both for supporting public health provision and policies, and for facilitating practitioners in health tourism interested in offering nature-based activities for their clients.

### Keywords:

Positioning;  
Nature-Related Health Tourism Products;  
Climate Therapy Stays;  
Forest Therapy Stays;  
Evidence-Based Approach.

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## 1- Introduction

Since the seminal study "Bronchial Asthma concerning Climate" [1], climatic conditions have been considered a non-biomedical, natural resource waiting to be leveraged for human health purposes, especially for people suffering from chronic respiratory diseases [2, 3]. In the last few years, the COVID-19 pandemic has caused unprecedented damage to the global society at large, and to the tourism industry in particular [4-6], while it has also caused the emergence of post-COVID-19 Syndrome even in those who have otherwise recovered from infection [7]. Nevertheless, while many scholars

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underline the enormous damage caused by this pandemic, others focus on the need to improve public health prevention initiatives and innovate health tourism products [8, 9]. Without analyzing the COVID-19 pandemic as both a tremendous disaster and also as a huge opportunity for improvement, the possibilities of harnessing the immense healing potentials of natural resources seem unlikely to increase.

This study is focused on CTSs experienced by young people suffering from asthma, a well-known non-communicable respiratory disease [10]. CTSs experienced by young asthmatic patients, often at mountain destinations, represent “a well-known and lowly counter-indicated health tourism product and prevention initiative, even though their indication for asthma treatment is increasingly questioned” [11]. They seek to leverage the healing potentials of clean air, characterizing mountain destinations [12]. Nevertheless, despite the dozens of primary (medical) studies assessing the healing effects of CTSs, the daily improvements obtained by patients experiencing them have never been quantified for the purposes of health tourism innovation. Consequently, CTSs heterogeneous by duration and altitude continue to suffer from a lack of comparability. Moreover, the shape of the relationships linking physiological improvements obtained from experiencing CTSs, the LOS, and the MASL has never been portrayed. As a result, the healing potentials of local climatic conditions found at different LOS and MASL seem far from being fully recognized for the purposes of health tourism.

In the sector of health tourism, the umbrella term used to indicate both wellness tourism and medical tourism [13], the results obtained from primary studies have rarely been considered for positioning health tourism destinations, despite the fact that the critical role played by natural resources in leveraging tourism marketing strategies has been acknowledged [14]. Quite differently, in the wider tourism sector, destinations focus on reinforcing high-quality resources and offerings in an effort to maintain their competitiveness [15]. The general concept underpinning this study, therefore, is that the research results of nature-based medical studies could represent valuable information for comparing CTSs in health tourism initiatives, and for the evidence-based positioning purposes of the latter in the context of sustainability.

In consideration of the above, then, the Research Questions (RQs) this study seeks to answer are as follows:

- RQ1: Is there any relationship between FEV<sub>1</sub> Change (%) and LOS for young patients?
- RQ2: Is there any relationship between FEV<sub>1</sub> Change (%) and MASL for young patients?
- RQ3: Is there any relationship between FEV<sub>1</sub> Change (%) CDIR (%) and LOS for young patients?
- RQ4: Is there any relationship between FEV<sub>1</sub> Change (%) CDIR (%) and MASL for young patients?
- RQ5: How are climate therapy stays positioned considering FEV<sub>1</sub> Change (%), FEV<sub>1</sub> Change CDIR (%), LOS, and MASL?
- RQ6: How are climate therapy stays positioned considering their environmental sustainability?

Consistently, the Research Targets (RT) of the study are as follows: RT1-4 - to ascertain the relations linking the above-mentioned variables; and RT5-6 - to provide an evidence-based positioning of CTSs considering each variable. The paper is organized in three parts. Firstly, the literature review highlights the key features of primary studies focusing on the effects of climate therapy stays at different altitudes and for varying durations. Following this, the research method is outlined, and the results obtained are presented and discussed. Finally, the implications of the study, as well as observations regarding emerging research directions are illustrated and conclusions are drawn.

### ***1-1- Climate Therapy Stays as Altimetrically Differentiated Health Tourism Products***

Human health can be described as “a state of complete physical, mental and social well-being, and not only the absence of illness or ailment” [16]. Given its focus on the economic potential of climatic conditions for tourism, this study adopts the definition supplied by Smith & Puczkó, according to which health-tourism can be described as “the provision of health facilities using the natural resources of the country, in particular, mineral water and climate” [17]. Furthermore, health tourism has been defined as “the attempt on the part of a tourist facility (e.g. hotel or destination), to attract tourists by deliberately promoting its health-care services and facilities, in addition to its regular tourist amenities” [18]. Despite the historically grounded importance of health tourism, this sector lacks reliable data sources due to its interdisciplinary nature [19].

### ***1-2- High Altitude (HACT) Stays as a Health Tourism Product***

HACT stays represent a natural resource-based preventive and integrative low-counter-indication solution that have been prescribed by medical doctors to asthmatic patients since the last century [11]. Based on the definition of high altitude by Schultze-Werninghaus (2006) [11], for the purposes of this study, “high altitude” is assumed to be >1.500 MASL.

The scientific rationale supporting HACTs as preventive-integrative treatments include a reduced level of house dust mites found at those altitudes [20, 21] as well as a significantly lower level of airborne allergens associated with asthma [22].

In the last century, HACT stays were offered by a few, often private and socially exclusive, clinics operating in wealthy countries and in internationally recognized exclusive tourist destinations, such as Davos (1,560 MASL) in Switzerland, Misurina-Dolomites (1,756 MASL) in Italy, and Aspen, Colorado (2,438 MASL) in the United States.

Despite the generally good reputations of these HACT resorts, some criticisms have emerged. Firstly, the number of clinics seem insufficient to help the 262 million asthmatic people worldwide [23] improve their health condition. Moreover, COVID-19, like other viruses, is suspected of leading to the further development of pulmonary vascular diseases, including the so-called Post-Covid-19, over time [24]. The increasing rates of asthma around the world and, more recently, the emergence of COVID-19 as a global phenomenon, require more heterogeneously distributed and easily accessible places for patients to seek rehabilitative activities [25]. Secondly and most importantly, both the overall costs and the environmental sustainability of evidence-based long HACT stays have been questioned [26], particularly by health insurance systems [11, 27], in the last two decades. Due to the lack of interdisciplinary studies in this field, and to the high level of investment required to build a new clinic at a high-altitude mountain destination, which act as 'entry barriers' [28], the competitive scenario in the climate-based health tourism industry has remained essentially static for the last fifty years.

### ***1-3- Low Altitude (LAFT) Stays as a Health-Tourism Product***

Forests can be described as "lands of more than 0.5 hectares, with a tree canopy cover of more than 10 percent, which is not primarily under agricultural or urban land use" [29]. Despite the initial recognition of their importance in preserving other ecosystems, as stated in the UN Millennium Ecosystem Assessment [30], the potential benefits of forests for human health and wellness purposes have rarely been considered in official policy [31, 32]. In fact, the beneficial effects of forests for human health have been elucidated by various scholars in Northern European countries [33-35]. Specifically, LAFT stays exploit the healing potential of the Biogenic Volatile Organic Compounds (VOCs) produced by trees, which constitute the forest atmosphere and that can be easily inhaled while experiencing forests [36]. Building upon this knowledge, the concept of low altitude 'forest therapy' has recently been devised to indicate 'an evidence-based medical approach supporting the individual's healing through immersion in forests' [37]. From this, the potential of natural resources such as forests for developing both health tourism and rural tourism has been attracting increasing attention [38, 39].

### ***1-4- The Resource-Based and Evidence-Based Approaches***

The Resource-Based Theory - RBT [40-43] assumes that heterogeneously distributed productive resources, rather than products or services, can allow territories and firms to achieve a defensible or 'Sustained' Competitive Advantage (SCA). Knowledge represents one of the most critical resources whose potential needs to be harnessed for the same purpose, according to the Knowledge-Based View (KBV), which constitutes one of the main RBT spillovers [44]. In particular, knowledge 'transferability', 'aggregation', and 'appropriability' represent key features of such resources for SCA purposes, following the KBV [45]. Only very recently, the evidence-based knowledge approach has been adopted in relation to the focus on environmental preservation [46]. Stigsdotter and Sidenius [47] recommend an evidence-based design process model to ensure a design that supports health. They describe a comprehensive, evidence-based approach to health design in landscape architecture. Their proposal is the Evidence-Based Health Design in Landscape (EBHDL) process model. The main benefits of this model are that it is user-centred, interdisciplinary, systematic, and transparent [46]. In such an approach, rather than the production of knowledge, priority should be placed on the collection of evidence, and then on "programming", "designing", and "evaluation".

This paper adopts the results of primary medical, thus monodisciplinary, studies in order to highlight the health benefits of climate therapy stays. The data is used to provide evidence-based knowledge for tourism marketing in relation to sustainability and SCA, thus for interdisciplinary purposes. Furthermore, one of the aims of this study is to evolve the evidence-based approach by adopting evidence generated by previous scientific studies published as scientific contributions. Such a research approach, which can be called the "scientific evidence-based approach", is implemented to increase the reliability of knowledge-based decisional processes.

### ***1-5- Using a Scientific Evidence-Based Marketing Approach in Developing Health Tourism Products and Their Positioning***

In destination positioning through nature-related health tourism products, marketing managers should focus efforts on product design, which has sustainability benefits for destination and emphasizes personal benefits to the consumer [47, 48] and, at the same time, enables tourist destinations to meet any of the Sustainable Development Goals [49].

In the past twenty years, a few marketing scholars have focused their attention on deploying the potentialities of natural resources for marketing purposes [50-54]. Starting from the contributions made by Srivastava, Fahey, and Christensen [53], marketing has come to represent one of the five most important areas for the resource-based view.

Moreover, productive resources can play an essential role in determining cash flows and the competitive advantage of businesses and tourism destinations [51]. Maibach et al. [52], highlight the value of marketing for the public health community in disseminating evidence-based approaches to preventative treatment. Marketing can improve the destination's environment, social conditions, and ecology in evidence-based ways, and the critical role played by natural resources in leveraging marketing strategies has been acknowledged accordingly [14, 55, 56].

By following those scholars, medical studies need to gather evidence of the health-related benefits of natural resources for health tourism. In turn, these effects need to be made accessible to the guest through a suitable health tourism product. As such, the health benefits of experiencing forest environment need to be scientifically clarified, and the duration of the visit and the activity level at which the intended effects can be achieved must be accurately determined [57]. Such medical research results represent the evidence-based marketing information that is necessary for creating health tourism products, after which it is the task of the tourism service providers to design attractive offerings and itineraries based on these visit durations and activity levels for guests [57].

Hence, the most critical decision about the product is 'how' the destination should position these products. There is a lack of agreement about the exact meaning of the positioning concept in the marketing literature. Based on the literature review of previous scientific studies, efficient positioning provided to destinations follows a number of different strands: a) Competition – creating an image separate or apart from competitors; b) Empty/slot mind – finding and filling an empty slot/window in the minds of the prospective buyers; c) Consumer perception – establishing or evoking changes in the consumer's mind regarding offer; d) Differentiation – differentiation in the offering is a crucial aspect of positioning; e) Competitive advantage – gaining competitive advantage by implementing a value-creating strategy not simultaneously being implemented by any current or potential competitors [58].

Positioning describes the process of studying, defining, and implementing a differentiated offering of value whose attributes provide for the achievement of a sustainable advantage over other players in a competitive scenario, from the point of view of the target audience [59]. In the field of strategic planning, "positioning" is understood as the process of developing competitive strategies that focus on the identification of potential advantageous positions regarding competitors and the creation of a unique and valuable identity, composed of a different set of activities aimed at sustaining it [60]. For destination positioning through nature-related health tourism products, marketing managers should focus efforts on product design that has sustainability benefits for the destination and emphasizes personal benefits for the consumer [47, 48] while, at the same time, enabling tourist destinations to meet Sustainable Development Goals [49]. Following this, 'implementing sustainable marketing activities and their effects on destinations' environmental, economic, and social dimensions provides the destination with an opportunity to contribute to sustainable development and sustainable growth entities' [61].

### ***1-6- Hypothesis Development***

Based on the previous research results regarding HACT stays explored by Vinnikov et al. [2] and Massimo et al. [3], and the research targets concerning LOS and MASL previously defined, the following Research Hypotheses (RH) have been formulated:

- RH1: There is a significant relationship between FEV<sub>1</sub> Change (%) and LOS for young people.
- RH2: There is a significant relationship between FEV<sub>1</sub> Change (%) and MASL for young people.
- RH3: There is a significant relationship between FEV<sub>1</sub> Change (%) CDIR (%) and LOS for young people.
- RH4: There is a significant relationship between FEV<sub>1</sub> Change (%) CDIR (%) and MASL for young people.
- RH5: Differentiating FEV<sub>1</sub> Change (%) and FEV<sub>1</sub> Change CDIR (%) based on LOS and MASL enable the development of differentiated and complementary health tourism products.
- RH6: Sustainability indexes provide improvements in positioning health tourism products.

### **2- Literature Review**

An Internet search was made using the following keywords: "climate therapy", "high altitude", "mountain", "asthma", and "literature review". The number of publications found using Mendeley Data were: 92, Google Scholar citations: 12, PubMed: 0, and hand search: 2. Following the Internet search, two literature reviews of primary studies

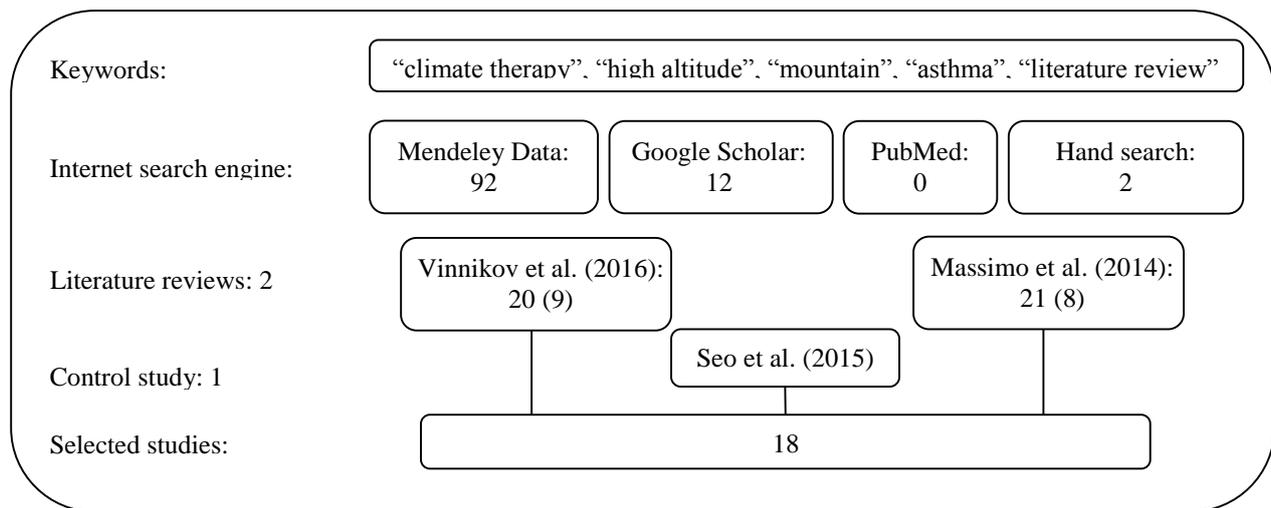
highlighting the health benefits of CTSs were found [2, 3]. Vinnikov et al. [2] found 342 primary studies, carried out mainly in Eastern Europe countries, using PubMed, Elibrary.ru, and Embase. Massimo et al. [3] found 195 primary studies, conducted in mainly Western Europe countries, using Medline, Embase, Medpilot.de, and hand search. Both of these studies focus on especially High Altitude (>1,500 MASL) Climate Therapy (HACT) stays.

### 3-1- Inclusion and Exclusion Criteria

Following the processes of screening, evaluation of eligibility, and final selection, 21 primary studies included in [2] and 20 primary studies identified in [3] were considered for the purposes of this study. The HACT stays primary studies mentioned above have been further improved by including the early research focusing on the benefits of LAFT stays [62] as a control study. For the purposes of this comparative study, the primary studies did not consider FEV<sub>1</sub> as an outcome, and quantify FEV<sub>1</sub> in liters/second. In addition, results obtained by conducting control group studies have also been excluded. The selected studies do not include studies in which improvements have been measured using outcomes other than FEV<sub>1</sub> % predicted Change, nor studies whose FEV<sub>1</sub> % predicted Change (study end - study beginning) was negative. The selected studies include studies in which FEV<sub>1</sub> % predicted Change (study end - study beginning) is  $\geq 0$ .

### 3-2- Selection of Studies

The health benefits obtained through experiencing both HACT and LAFT stays have been compared by considering 18 primary studies. 9 of those primary studies were reviewed by Vinnikov et al. [2], and 8 by Massimo et al. [3]. The primary study [62] was added as a control study to compare health benefits obtained at mountains located at both high and low altitudes, as previously mentioned (Figure 1).



**Figure 1. Flowchart of literature search and selection**

As shown in Table 1, the year of publication of the studies ranges from 1977 to 2015, a 38-year period. The respiratory pathologies considered by the primary studies were: House Dust Mites (HDM) allergy, Atopic Dermatitis (AD), Asthma, and other respiratory-system related pathologies. The age of the patients in the studies ranged from 6 years to 58 years (age range of 52 years). A total of 771 patients were enrolled in the studies, while the average number of patients enrolled in each primary study was 40.58. A total number of 1,483 LOS in days was required to carry out the studies, while the average LOS for each primary study was 78.05 days. The altitude necessary to obtain benefits ranged from 388 MASL to 6,965 MASL. The average altitude needed to obtain benefits was 2,150.4 MASL. In total, the 13 primary studies involved 248 people, all “children and adolescents” aged  $\leq 18$  years old, duly referred to in this study as “young” people/patients [63-74] and the control study [62]. Through the process of inclusion-exclusion mentioned above, a database of primary studies has been established. Table 1 presents the essential characteristics of studies included in those literature reviews and adopted for the purposes of this research.

**Table 1. The key features of adopted previous primary studies and the database**

No.	Primary studies/Authors	Pub. Year	Rev.	Patients' targets (A/Y)	Measure FEV <sub>1</sub> - % predicted- study beginning	±	Measure FEV <sub>1</sub> - % predicted- study end	±	Changes- absolute	Changes- %	Cases	LOS (days)	Duration class	MASL	Elevation class	Place
1	Kolesar et al.	1977	Vinnikov et al. (2016)	Adults	67.1	6.6	69.9	7.3	2.8	4.17	15	14	4	1,800	4	Czechoslovakia
2	Boner et al.	1985	Vinnikov et al. (2016)	Young	65.4	10.8	82.5	17.2	17.1	26.15	14	240	8	1,756	4	Misurina, Italy
3	Brimkulov	1991	Vinnikov et al. (2016)	Adults	74.9	5.5	86.4	7.4	11.5	15.35	132	28	5	3,200	3	The Tyuya-Ashu pas, Tien Shan, Kyrgyzstan
4	Simon et al.	1994	Vinnikov et al. (2016)	Young	95.7	9.7	104	14.7	8.3	8.67	14	35	6	1,560	4	Davos, Switzerland
5	Bober et. al	1995	Massimo et al. (2014)	Young	94.6	8.8	95	9.7	0.4	0.42	30	14	1	1,756	4	Misurina, Italy
6	Peroni	1995	Massimo et al. (2014)	Young	84.5	7.4	85.1	8.6	0.6	0.71	23	365	9	1,756	4	Misurina, Italy
7	Allegra et al.*	1995	Vinnikov et al. (2016)	Adults	102.7	20.4	104.8	20.1	2.1	2.04	11	7	3	4,805	1	Italy (Regina margherita Hut at the Mt. Rosa) and Nepal (Italian National Research Council Pyramid Laboratory at the Mt. Everest
8	Benckhuijsen et al.	1996	Massimo et al. (2014)	Young	97.6	6.3	101	5.5	3.4	3.48	13	30	5	1,560	4	Davos, Switzerland
9	Van Velzen	1996	Massimo et al. (2014)	Young	92	5.1	97	5.1	4.9	5.43	16	30	5	1,560	4	Davos, Switzerland
10	Kokov	1996	Vinnikov et al. (2016)	Young	74.7	28.9	83.4	23.1	8.7	11.65	68	21	5	1,850	4	Stavropol, Russian Federation
11	Valletta et al.	1997	Vinnikov et al. (2016)	Young	82	16	85	14	3	3.66	14	84	7	1756	4	Misurina, Italy
12	Grootendorst	2001	Massimo et al. (2014)	Young	85.6	4.5	94.8	4.2	9.2	10.75	18	70	7	1,560	4	Davos, Switzerland
13	Peroni et al.	2002	Massimo et al. (2014)	Young	100.5	3.6	100.5	2.3	0	0.00	18	365	9	1,756	4	Misurina, Italy
14	Straub et al.	2004	Massimo et al. (2014)	Young	104.5	Na	105	Na	0.5	0.48	48	30	5	1,560	4	Davos, Switzerland
15	Rijssenbeeck-Nouwens	2012	Massimo et al. (2014)	Adults	88.4	20.4	94.2	20.1	5.8	6.56	137	90	7	1,560	4	Davos, Switzerland
16	Seys et al.	2013	Vinnikov et al. (2016)	Adults	90.2	12	98	14	7.8	8.65	18	14	4	6,965	1	Aconcagua National Park, Argentina
17	Verkleij et al.	2013	Vinnikov et al. (2016)	Young	105.8	3.4	106.1	13.7	0.3	0.28	134	42	6	1,560	4	Davos, Switzerland
18	Seo et al.	2015	Control Study	Young	91.2	9.9	92.9	11	1.7	1.86	48	4	2	388	6	Saneum National recreation Forest-Rep. of Korea

\*Allegra et al. - The study was carried out at two locations (4,559 MASL and 5,050 MASL). For destination positioning purposes, therefore, the average elevation was calculated (4,804.5 MASL), for which it was considered in CLASS 1.

### 3- Research Methodology

The RBT's Valuability-Rarity-Inimitability-Nonsubstitutability (VRIN) model [42] was adopted for the purposes of this study as a conceptual framework of analysis. Following the VRIN model, the productive resources allowing tourism marketing strategies to generate SCA of, at least, above the average (threshold) results are thus 'Valuable'. Furthermore, those valuable resources should not be concentrated among competitors ('Rare'), be lowly imitable or 'Inimitable', and be Non-substitutable, or at least lowly-substitutable. For this paper's purposes, only above the average (threshold), thus 'valuable', performances have been considered, while future studies could consider their rarity, inimitability, and non-substitutability.

The above-presented database is the starting point for performing the Meta-Analysis (MA) research method. This can be described as "the statistical analysis of a collection of analyses resulting from individual studies to integrate the findings" [75]. By adopting this method, the following criterion variables and predictor variables were studied. The relation linking variables' shape and intensity was described by implementing Spearman's rank correlation coefficient for this study. The RBT-grounded analysis model was applied to predictor variables (LOS and MASL of stays) and criterion variables (FEV<sub>1</sub> % Change, and FEV<sub>1</sub> CDIR % Change) where descriptive statistics were used. The descriptive statistics were implemented in calculating standardized and aggregated values.

#### 4-1- Predictors and Criterion Variables Used in the Study

For this research, the predictor variables are the LOS and MASL of stays. LOS represents one of the essential key measurements for the tourism industry at large [76] and is essential to this study's purposes. This paper classifies forest therapy stays by considering specific health improvements in patients and the LOS necessary to produce those improvements.

There is a certain degree of ambiguity concerning the few existing systems that classify tourism stays according to LOS. For this study, we have adopted the following Duration (LOS) classes, linking the minimum number of nights (1) and the maximum number (359) required by institutions to define people as "tourists". As noted, LOS classification is based on the simple arithmetic (x2) progression of the LOS period. Table 2 illustrates the classes. This metric distribution is considered helpful for linking human health studies and health-tourism marketing studies.

**Table 2. Duration classes of climatic stays and stays for health tourism purposes. Interdisciplinary metrics**

CLASSES (9)	Climatic stays		Health tourism purposes	
	Night LOS	Days	CLASSES (5)	Days
1	1	2		
2	2-3	3-4	Very short	<8
3	4-7	5-7.99		
4	8-15	8-16	Short	8-16
5	16-31	17-32	Medium	17-32
6	32-63	33-64	Long	33-64
7	64-127	65-128		
8	128-255	129-256	Very long	>65
9	256-364	257-365		

This paper adopts the standard definition of mountains within the UN and the UNEP-WCMC framework [77]. Five adopted elevation mountain classes are defined, following previously described criteria for seven elevation classes (Table 3).

**Table 3. Adopted MASL classes for health tourism purposes**

MASL	Kapos et al. (2000)		Adopted classes (5)
Very low	Class 7	0-299	<1,000
	Class 6	300-999	
Low	Class 5	1,000-1,499	1,000-1,499
Medium	Class 4	1,500-2,499	1,500-2,499
High	Class 3	2,500-3,499	2,500-3,499
	Class 2	3,500-4,499	
Very high	Class 1	≥4,500	>3,500

\*Aggregation of [77] Kapos et al. (2000) Class 6 and Class 7 ("Very low") and Class 1 and Class 2 ("Very high").

This distribution is considered helpful for linking human health studies and studies evaluating travel costs and energy costs, heating, and other tourist destinations' accessibility issues [78].

Two dependent variables, Forced Expiratory Volume in 1 second (FEV<sub>1</sub>) Change (%) and FEV<sub>1</sub> Change Compound Daily Improvement Rate – CDIR (%), were selected as proxies of functional effectiveness and efficiency of climate therapy stays in asthmatic patients.

FEV<sub>1</sub> % predicted, as the most often adopted outcome, was considered the main health benefit for the comparative purposes of this study. The FEV<sub>1</sub> % of predicted values has the disadvantage of not being the only outcome that can be used to assess the asthmatic patient's lung functionality [79]. Nevertheless, that outcome is often monitored in primary studies, such as those considered by [2, 3]. Moreover, FEV<sub>1</sub> % indicates an improvement of the asthmatic patient's pulmonary functionality and allows this study to quantify the functional effectiveness of each period of stay.

Several authors, including Pellegrino [80], have pointed out that there are advantages in calculating the Change in FEV<sub>1</sub> and/or FVC (Forced Vital Capacity) as a percentage of predicted values from the baseline. In these cases, most health authorities require a minimum of 12% -15% Change in FEV<sub>1</sub> and/or FVC to define a significant response. Following this, the 12% threshold of FEV<sub>1</sub> Change is assumed to be significant and, therefore, 'valuable' for the purposes of this study.

For this study, a climate therapy stay is described as "functionally effective" where the expected positive FEV<sub>1</sub> Change (%) has been confirmed through a medical, scientific publication.

**Table 4. FEV<sub>1</sub> Change proposed ranking for health tourism purposes**

FEV <sub>1</sub> Change	% *	Valuability threshold**
Very low	<7	
Low	7-11.99	
Medium	12-14.99	12
High	15-17.99	
Very high	>18	

\* Ranking system classification of health improvements based on [80].

\*\* Valuability threshold of health improvement of asthmatic patients based on Global Initiative for Asthma (GINA) guidelines (<https://ginasthma.org>)

This study suggests quantifying the functional efficiency of climate therapy stays according to their financial costs (LOS) and accessibility (MASL). An effective climate therapy stay can also be described as "functionally efficient" if LOS and MASL, required for the guests to achieve the evidence-based health improvements, are lower than those required by at least one competing destination.

Today, there are no tourism economic indicators available to quantify the efficiency of climate therapy stays based on LOS. From a medical point of view, the curvilinear trend of a response to a climate stay, as to any other conventional medicine, would hinder the adoption of a clinically valid, average value. Nevertheless, for tourist destination marketing purposes, the study assesses the FEV<sub>1</sub> CDIR (%) as follows:

$$\text{FEV}_1 \text{ Change CDIR (\%)} = (\text{FEV}_1 \text{ After stay} / \text{FEV}_1 \text{ Before stay})^{1 / \text{Days LOS}} - 1 \quad (1)$$

FEV<sub>1</sub> Change from baseline CDIR (%) is assumed as a basis for the calculation of Valuability classes. FEV<sub>1</sub> Change from baseline CDIR (%) variation range (0% - 0.525989048922737%) is assumed as a 100% value and subdivided by 5 (0.1188345%) to formulate five classes used in calculations, which are illustrated below. A baseline value of 0.23768% represented by the minimum (baseline) value of "Medium" FEV<sub>1</sub> Change CDIR% is assumed as the valuability threshold.

**Table 5. FEV<sub>1</sub> Change from baseline CDIR (%) health improvement classification system**

FEV <sub>1</sub> Change CDIR %	Valuability classes %	Valuability threshold
Very low	<0.1188345	
Low	0.1188346-0.23767	
Medium	0.23768-0.3565	0.23768
High	0.3566-0.47534	
Very high	>0.47534	

Spearman's rank correlation coefficient was used to determine the relationships linking indicators of health improvements, FEV<sub>1</sub> Change % and FEV<sub>1</sub> Change CDIR %, to LOS and MASL.

#### 4-2- Segments Considered

This study focuses on young people (age $\leq$ 18) who have asthma problems. Children and young people represent poorly investigated tourism marketing research fields [81-85]. In fact, while Canosa and Graham [84] point out the important role played by children in influencing the purchasing processes of their parents, Poria and Timothy [83] (p. 93) underline that “children in tourism researches still represent a critical gap and an additional tourist cohort almost absent in the academic literature”. This is consistent with the findings of Small [84], and Graburn [85] in their studies. On the other hand, childhood asthma represents the most common serious CRD in infants and children in medicine today, also because it is difficult to diagnose (American Academy of Allergy Asthma Immunology [86]).

This research, which focuses on young people with asthma problems as weak components of the wider population, seeks to highlight the relevance and possibilities for developing nature-related health tourism products in a sustainable context.

### 4- Results and Discussion

#### 5-1- Relations Linking Health Improvements and Climate Therapy Stays Positioning

Table 6 illustrates the relationship between FEV<sub>1</sub> Change and LOS for young people. The results indicate no significant relationship between FEV<sub>1</sub> Change and LOS ( $r_s=-0.130$ ,  $p=0.0672$ ); accordingly, hypothesis RH1 is not confirmed. Analysing the relationship between FEV<sub>1</sub> Change CDIR % and LOS, based on Spearman’s coefficient, a moderate negative correlation ( $r_s=-0.606$ ) was determined for young people. The relationship is significant at  $p<0.05$  ( $p=0.028$ ); accordingly, hypothesis RH3 concerning LOS is confirmed. The results indicate a significant and moderate decrease of FEV<sub>1</sub> CDIR (%) with an increasing LOS. Differentiating between FEV<sub>1</sub> Change % and FEV<sub>1</sub> Change CDIR % in respect to LOS could then be used to develop new health tourism products.

Given the low statistical relevance of the Seo et al. control study, it is evident from Table 6 that there is a moderate negative correlation between FEV<sub>1</sub> Change (%) and MASL ( $r_s=-0.572$ ) for young people, indicating that an increase of the predictor MASL would result in a moderate but statistically significant decrease of FEV<sub>1</sub> Change for young asthma patients. In fact, the relationship is significant at  $p<0.05$  ( $p=0.041$ ). These results duly confirm hypothesis RH2. Finally, a weak negative correlation was found to exist between FEV<sub>1</sub> Change CDIR % and MASL ( $r_s=-0.259$ ,  $p=0.392$ ) for young people, therefore RH4 is not confirmed.

**Table 6. Spearman’s rank correlation coefficient for young people**

Research Hypotheses No.	Variable	Spearman’s correlation coefficient ( $r_s$ )	Sig. (2-tailed)	N
1	FEV <sub>1</sub> Change % / LOS	-0.130	.672	13
2	FEV <sub>1</sub> Change % / MASL	-0.572*	.041	13
3	FEV <sub>1</sub> Change CDIR % / LOS	-0.606*	.028	13
4	FEV <sub>1</sub> Change CDIR % / MASL	-0.259	.392	13

\*Correlation is significant at the level of 0.05 (2-tailed).

The primary studies Vinnikov et al. and Massimo et al. [2, 3] cited have identified physiological effects obtained through experiencing HACT. Despite this, no previous primary studies or literature reviews have analysed the shape of the relationships existing between health benefits and altitude, or between health benefits and length of stay. In this sense, the results obtained in this research represent a significant scientific contribution.

Table 7 illustrates the key features of the CTs reported in the primary studies by FEV<sub>1</sub> Change (%), FEV<sub>1</sub> Change CDIR (%), duration class, and elevation class. As one may observe, the highest recorded FEV<sub>1</sub> Change of 26.14% [63] was achieved where there was a very low FEV<sub>1</sub> Change CDIR (0.097%) value. Conversely, the greatest improvement in FEV<sub>1</sub> Change CDIR of 0.463% [62] resulted where there was a not impressive FEV<sub>1</sub> Change of 1.864%. As it emerges, these variables seem to have behaved independently.

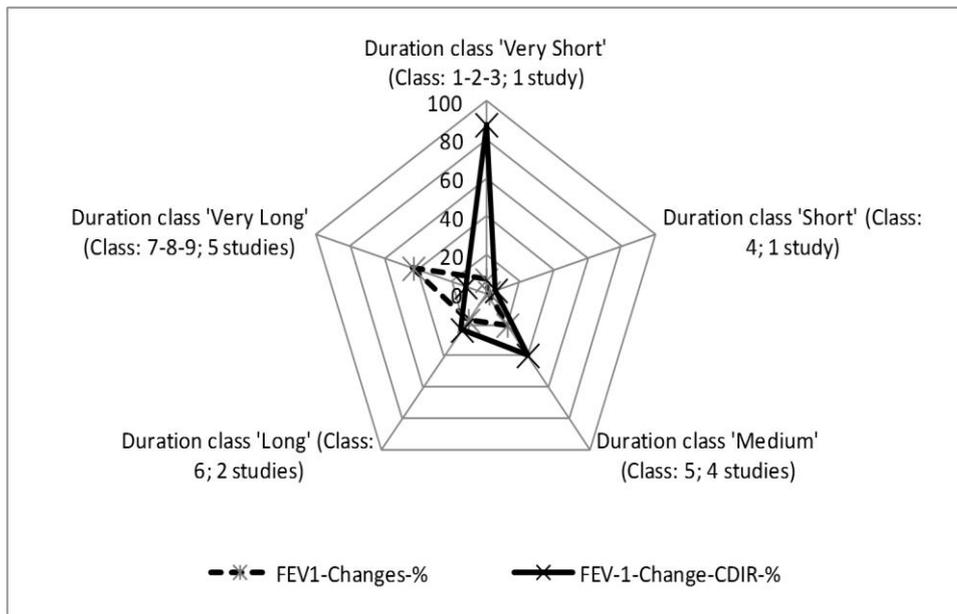
CTs whose duration is “Very long” (class 7-8-9, >65 days) achieve the highest average standardised positive FEV<sub>1</sub> Changes (42.97%), based on the considered 13 studies. Conversely, the same class of stays achieve the second-lowest standardised FEV<sub>1</sub> Change CDIR (12.18%). On the other hand, CTs of duration class “Very short” (1-7 Nights) achieve the highest FEV<sub>1</sub> Change CDIR (87.98%) based on the original study considered [62]. Conversely, they accomplish the second-lowest standardized FEV<sub>1</sub> Change (7.129%). Meanwhile, CTs of “Short”, “Medium”, and “Long” duration achieve intermediate positions.

In brief, CTs of “Very short” and “Very long” duration seem to generate very complementary health benefits. These results confirm hypothesis RH5 concerning the duration class of CTs. The possibility of integrating the healing benefits obtained by experiencing HACT stays through experiencing LAFT ones and vice-versa emerged.

**Table 7. FEV<sub>1</sub> Change % and FEV<sub>1</sub> Change % CDIR for young people**

No.	Study	FEV <sub>1</sub> Change (%)	FEV <sub>1</sub> Change CDIR (%)	Duration CLASS	Elevation CLASS
1	Boner et al., 1985	26.14678899	0.09682853	8	4
2	Simon et al., 1994	8.672936259	0.23791858	6	4
3	Boner et al., 1995	0.422832981	0.030143225	4	4
4	Peroni, 1995	0.710059172	0.001938512	9	4
5	Benckhuijsen et al., 1996	3.483606557	0.11420858	5	4
6	van Velzen, 1996	5.434782609	0.176563695	5	4
7	Kokov, 1996	11.64658635	0.525989049	5	4
8	Valletta et al., 1997	3.658536585	0.042785352	7	4
9	Grootendorst, 2001	10.74766355	0.145940856	7	4
10	Peroni et al., 2002	0	0	9	4
11	Straub et al., 2004	0.4784689	0.015912195	5	4
12	Verkleij et al., 2013	0.283553875	0.006741956	6	4
13	Seo et al., 2015	1.864035088	0.462786282	2	6

Figure 2 illustrates the results exposed by Table 7, standardised and aggregated to verify hypothesis RH5.

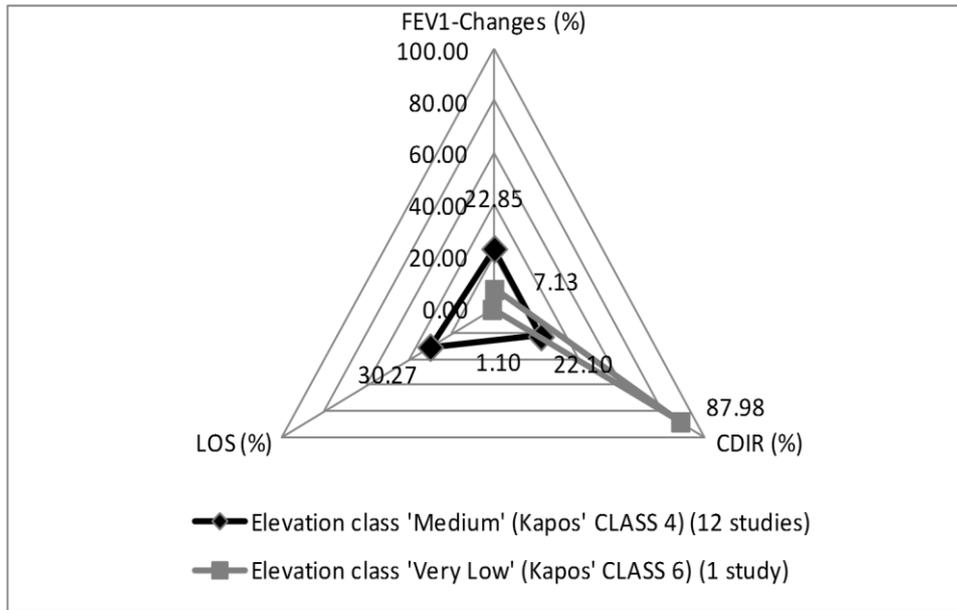


**Figure 2. Positioning CTSs by considering Duration classes (Values standardized by considering the maximum FEV1 Change (26.15%) and FEV1 Change CDIR (0.526%). Average values calculated by duration classes, “Very short”, Short, “Medium”, “Long”, and “Very long”, as specified in Table 2).**

Figure 3 illustrates the results exposed by Table 7 standardized and aggregated to obtain the average value for each elevation class of CTSs. CTSs involving young asthmatic patients were carried out in destinations at elevation class “Very Low” – 5 and 6 (0 – 999 MASL) and elevation class “Medium” - 4 (1,500 – 2,499 MASL). No studies conducted at different elevation classes emerged.

CTSs experienced by young asthmatic patients at destinations located at elevation class “Medium” - 4 (FEV<sub>1</sub> Changes: 22.85%), revealed by 12 studies, out-perform CTSs experienced at destinations located at Elevation class “Very low” - 6 (7.13%), measured in the control study. In other words, standardised values of FEV<sub>1</sub> Changes (%) achieved by young patients experiencing CTSs at destinations located at elevation class “Medium” - 4 revealed by 12 studies, tend to be 3.2 times higher than those achieved at elevation class “Very low” - 6 measured in the control study.

Conversely, CTSs experienced by young asthmatic patients at destinations located at elevation class “Very low” - 6 (FEV<sub>1</sub> Change CDIR: 87.98%) out-perform CTSs experienced at destinations located at elevation class “Medium” - 4 (22.10%). In other words, standardised values of FEV<sub>1</sub> Change CDIR (%) achieved by young patients experiencing CTSs at destinations located at elevation class “Very low” - 6 measured in the control study tend to be 3.9 times higher than those achieved at “Medium” - 4 revealed by 12 studies, whose results are somewhat anomalous.



**Figure 3. Positioning climate therapy stays considering Elevation class (Values standardized considering the maximum FEV1 Change (26.15%) and FEV1 Change CDIR (0.526%). Average values calculated by Duration classes, “Medium” and “Very Low”, as specified in Table 3).**

Counterintuitively, climate therapy stays experienced at elevation class “Very low” can be even more efficient than those carried out at elevation class “Medium”. As such, differentiating between FEV<sub>1</sub> Change (%) and FEV<sub>1</sub> Change (%) CDIR % in regards to MASL can be useful for developing new differentiated health tourism products. In brief, CTSs having “Medium” and “Very low” altitudes seem to generate very complementary health benefits, confirming hypothesis RH5 concerning the elevation class of CTSs. Meanwhile, the results support the findings of Martinez-Garcia & Raya [87], which suggest the possibility of developing health tourism products of long and, especially, short duration, the latter being the most consistent with the apparent reduction in the average stay that has been observed in the tourism sector over the last two decades. Furthermore, such complementarity of HACT stays and LAFT stays and their relative health benefits offers the possibility of integrating HACT stays through LAFT stays, and *vice-versa*.

**5-2- Sustainability Indexes for LOS and MASL**

The adoption of primary studies specifying the key features of CTSs according to a homogeneous set of elements represented by MASL and LOS offers the rare possibility to position those stays by considering their economic sustainability (cost per stays) and physical accessibility (distance of places).

Table 8 presents sustainability indexes related to HACT stays and LAFT stays. HACT primary studies carried out with young patients (LOS: 110.5 days) show a LOS sustainability index of 69.73%. When considering the elevation of mountain destinations where experimental CTSs were carried out (1,665.83 MASL), the studies on young patients show a sustainability index of 81.17%. In contrast, the four-day LAFT stays carried out at an elevation of 387.5 MASL show remarkable sustainability indexes of 98.9% concerning LOS and 95.62% concerning MASL.

**Table 8. HACT stays and LAFT stays sustainability indexes**

CTSs	Absolute values		Standardized values (%)*		Sustainability indexes (%) **	
	LOS (days)	MASL	LOS (days)	MASL	LOS (days)	MASL
HACT (Avg. 17)	87	2,254.09	23.84	25.48	76.16	74.52
Young (Avg. 12)	110.5	1,665.83	30.27	18.83	69.73	81.17
LAFT (1)	4	387.5	1.1	4.38	98.9	95.62

\* Standardised calculation method: LOS absolute value divided by 365 Days (that constitutes the one year maximum stay to maintain the status as a “tourist” following the UNDP definition); MASL absolute value divided by 8,848 MASL (that constitutes the maximum mountain elevation on planet Earth, being Mount Everest).

\*\* Sustainability indexes = 1 – LOS; MASL standardized values

The interdisciplinary analysis of both dependent and independent variables can facilitate even more sustainable tourism products. By improving the sustainability of health tourism products, tourist destinations can gain better market positioning and achieve competitive advantages, thus confirming RH6. These findings are consistent with those of previous studies, according to which sustainability plays a key role in fostering the competitiveness of tourist destinations in developing countries [88]. As such, it is important to orientate communication to sustainability for the purposes of

tourism product differentiation and attracting new market segments [89]. DMO must be able to design strategies in which an image of sustainability is projected, since the information that the tourist receives through different sources will influence their perception of the destination and, consequently, their decision as to whether to visit that destination [90].

Despite the existence of a few literature reviews assessing the results of primary studies [2-3], the duration of CTSs and the altitude at which they have been performed have until now been poorly considered aspects. This study enlightens the limits of HACT stays as effective, efficient, and sustainable health tourism products.

The findings of this research indicate the need to re-focus on LAFT stays and conduct more research on this under-investigated area. Through this, lower altitude tourism destinations would have greater opportunities for diversifying and developing new health tourism products. In considering FEV<sub>1</sub> Change % and the FEV<sub>1</sub> Change CDIR % of climate stays by duration and elevation, the evidence-based knowledge platform has been established as a potential framework for the development of an evidence-based marketing strategy for new health tourism products. Based on this, the results would suggest using quantifying indicators of health improvement in order to develop evidence-based marketing strategies, both to support public health policies and to facilitate practitioners in health tourism interested in offering nature-based activities to their clients.

This paper has considered the rapidity of achieving measurable health benefits as a key-variable waiting to be considered when comparing CTSs of different Duration. Furthermore, it suggests Duration classes and Elevation classes as crucial features of CTSs waiting to be considered to compare the results previously obtained by primary studies, and to facilitate new interdisciplinary ones. In addition, several scholars underline the importance of diversifying agroforestry to build climate-resilient communities, including [91]. High and, especially, low-altitude mountain places endowed with the right macroclimatic conditions *and* microclimatic conditions could set up targeted primary studies to help the achievement of UN Sustainable Development Goal no. 3, “Ensure healthy lives and promote well-being for all at all ages” [92].

## 5- Conclusion

This paper positions climatic therapy stays at different tourist destinations by comparing the health benefits obtained by young patients, using the available scientific evidence. The data for FEV<sub>1</sub> Change CDIR (%) indicates that young asthmatic patients can achieve significant health improvements even by experiencing very short climate therapy stays at very low altitude mountains or hills, in places that are endowed with the right macroclimate, microclimatic conditions, and capabilities. Accordingly, this study makes clear that the functional effectiveness (FEV<sub>1</sub> Change %), efficiency (FEV<sub>1</sub> Change CDIR %), MASL, and LOS of climate-based therapy stays for asthmatic young people could represent evidence-based marketing information for the development of differentiated health tourism products and their positioning in the tourism market. Finally, it sustains that sustainability indexes can be used for positioning climate therapy stays as tourism products. The results indicate that the same health benefits seem to be achievable through more accessible and sustainable lower altitude climate therapy stays. This would, however, require the adoption of certain public policies such as, for example, reducing the use of individual means of transport in destinations offering LAFT stays in order to preserve air quality.

Marketing strategies aimed at improving the competitive position achieved by climate therapy stays could include fewer single-arm studies and more controlled - randomised ones. They could then consider more closely the scientific evidence-based “health-creation process” characterising the overall climate therapy stay as a whole. Furthermore, they could focus on how competitive positions are marketed towards both the final and intermediate health-tourism markets, and on how they are sustainably managed. Last but not least, this study calls for further efforts to fully deploy the healing potentials of macro and microclimatic conditions as potentially valuable and sustainable ‘health devices’ in the COVID-19 era.

This study does have some limitations. Studies focusing on the health effects of LAFT stays are few in number, thus the possibilities for comparison are limited. Moreover, the methodological heterogeneity of primary studies restricts the possibilities for carrying out closer comparative analysis. With this in mind, this study focuses exclusively on FEV<sub>1</sub> Change (%) as one of the most common and highly standardised outcomes. Furthermore, it invites even more reliable and methodologically homogeneous primary studies to be conducted in this research field in the future.

## 6- Declarations

### 6-1- Author Contributions

Conceptualization, M.D. and L.B.; methodology, M.D. and L.B.; validation, L.B. and F.V.; formal analysis, M.D. and L.B.; investigation, M.D. and L.B.; resources, M.D. and L.B.; data curation, M.D.; writing—original draft preparation, M.D. and L.B.; writing—review and editing, M.D., L.B., and F.V.; visualization, L.B. and F.V.; supervision, L.B. and F.V.; project administration, L.B.; funding acquisition, M.D. and L.B. All authors have read and agreed to the published version of the manuscript.

### 6-2-Data Availability Statement

The data presented in this study are available in article.

### 6-3-Funding

Funding sources (main investigator): Erasmus+ mobility (uninterrupted stay), researching and teaching staff 100 days membership. University of Udine, Research fellowship grant prot. 2701; Tit. VII, cl. 16, 23/11/2020.

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### 6-5-Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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