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This is the published version of a paper published in *Scandinavian Journal of History*.

Citation for the original published paper (version of record):

Lidström, I. (2025)

Modern Skis in Nostalgic Landscapes: The Technological Development of Swedish Cross-Country Skiing, 1892–1932

Scandinavian Journal of History, : 1-23

<https://doi.org/10.1080/03468755.2024.2447297>

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To cite this article: Isak Lidström (15 Jan 2025): Modern Skis in Nostalgic Landscapes: The Technological Development of Swedish Cross-Country Skiing, 1892–1932, Scandinavian Journal of History, DOI: [10.1080/03468755.2024.2447297](https://doi.org/10.1080/03468755.2024.2447297)

To link to this article: <https://doi.org/10.1080/03468755.2024.2447297>



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Published online: 15 Jan 2025.



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Modern Skis in Nostalgic Landscapes: The Technological Development of Swedish Cross-Country Skiing, 1892–1932

Isak Lidström^{a,b}

^aDivision of History of Science, Technology and Environment, KTH Royal Institute of Technology (KTH), Stockholm, Sweden; ^bDepartment of Movement, Culture and Society, The Swedish School of Sport and Health Sciences (GIH), Stockholm, Sweden

ABSTRACT

This article is a study of technological change in cross-country (XC) skiing in Sweden from the late nineteenth century to the 1930s. While technological development in sport is usually seen as a linear and predetermined process, it is instead treated in this context as an arena where wills and intentions – grouped under the concepts of nostalgia and intensification – are negotiated. Nostalgia, in this sense, reflects a scepticism of innovation and change based on contemporary civilizational and rural-romantic concerns, whereas intensification represents the total mobilization of resources to improve sporting performance. The article shows that in its beginnings at the end of the nineteenth century, XC skiing expressed a romantic vision of a distinctive Swedish national landscape where skis were to be made using traditional and old-fashioned craftsmanship. In the early twentieth century, however, XC skiing changed and became progressive. The traditional Swedish skiing landscape was abandoned and the sport adapted to international conditions to enable Swedish athletes to compete successfully abroad. In other words, skiing was intensified because of the mobilization of resources by the Swedish Ski Association in close cooperation with the Swedish ski industry, which was then in an expansion phase.

ARTICLE HISTORY

Received 18 April 2024
Revised 16 December 2024
Accepted 20 December 2024

KEYWORDS

Cross-country skiing; intensification; nostalgia; technology of sport; ski industry

Introduction

In the modern era, sport and society have been united by a passion for technological advances. The development of equipment and the refinement of training methods reflect the driving forces of the modern project: increased growth, the pursuit of records and the idea of progress. It is for this reason that histories of sport, and especially of the technological development of sport, tend to be success stories; innovations are put into practice, achievements are surpassed again and again in an ever-increasing spiral of success that seems to be predetermined and beyond the influence of human beings.¹ In contrast to such a deterministic view, technological development can be regarded as the result of negotiations and conflicts between the wills and intentions of actors,

CONTACT Isak Lidström  isak.lidstrom@gih.se

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translated into action. From this standpoint, it becomes essential to consider ideology, tradition, and nostalgia when studying the development of technology in sport.²

Sports philosopher Sigmund Loland defines sports technology as ‘human-made means to reach human interests and goals in or related to sport’. These goals may include the prevention of injuries or other safety issues, but most often they relate to performance-enhancing measures achieved through specific training methods, equipment, suits, machinery or biochemical substances.³ However, such a definition is not universal or applicable in all historical contexts. It does not include, for example, the training of the mind, from which sport psychology developed in the late twentieth century.⁴ Since the middle of the twentieth century, an increasing number of scientific disciplines have been concerned with optimizing the performance of athletes.⁵ Moreover, in pre-industrial societies, traditional sports and games evolved from the interplay between humans and their local biota, contrasting with the rationalized and performance-driven focus of modern sports.⁶

Although sports technology usually refers to such performance optimization based on specific physical or mental exercises or the modification and development of equipment and substances, there is yet another dimension that needs to be addressed, particularly in the case of cross-country (XC) skiing. Since changing the course profiles of XC skiing competitions at a local level can be a measure to improve performance at an international level, topography must also be considered as a variable in the context of sports technology.

This article highlights the technological changes of XC skiing in Sweden from the late nineteenth century until the 1930s. It focuses on the establishment of a Swedish skiing landscape (and its appearance in terms of topography and terrain) and how the transformation of this landscape led to a technological reorientation in terms of the equipment (such as skis, poles and bindings) with which the skiing landscape was forged. In doing so, the study contributes to ongoing discussions about how collective identities are shaped by the interplay between sport, landscape and nation.⁷ Different sporting landscapes throughout history have given rise to different sport technologies, both in terms of how equipment for sporting purposes has been produced and how it has been used. However, sport technology as a cultural phenomenon and as a source of collective identity formation is still an unexplored field of historical research. Instead, accounts of the technological change of XC skiing are most often located in historical reviews of studies in the material sciences or physiology.⁸

There are exceptions, however. Gertrud Pfister has explored the links between social change and the development of ski technology, arguing that an increased fixation on materials and equipment satisfied a growing need for conspicuous consumption, making skiing a clear symbol of modernity.⁹ Moreover, Rudolf Müllner has demonstrated the importance of a common alpine skiing technique as a physical socialization practice in forging a national identity in Austria. The conventions of ‘moving together’ have since led to conflicts as different skiing pioneers have claimed to represent the most optimal technique.¹⁰ There is also a great deal of popular science literature, of which Thor Gotaas’ monograph on Norwegian ski makers stands out.¹¹ Although there are overviews of the development of ski production in the Nordic countries from traditional craftsmanship to factory production, the driving forces behind the technological changes are still an understudied area of research.¹²

Critical of modernist perceptions of the nation as only an idea or something imagined, historian Anthony D. Smith argues that 'the landscapes of the nation define and characterize the identity of its people'.¹³ Following Smith, Alain Bairner's emphasis on sporting landscapes and their role in shaping national identities highlights the importance of making visible the 'material substance' of nations.¹⁴ The adaptation of skis, poles and boots to a distinct landscape can thus function as a materialization of the nation, which is also embodied when the physical movements of the skiing human are performed according to its particular topographical specificities.¹⁵

Historian Daniel Svensson has argued that crises, such as a lack of competitive success, have driven technical innovations in XC skiing. A notable example is the 'scientific turn' during the mid-twentieth century, when the endurance training of elite athletes was heavily influenced by natural sciences and physiological research.¹⁶ The change followed an earlier period of success. From the late 1920s to the 1940s, Swedish skiers excelled in both international events such as the Olympic Games and the ski competition in Holmenkollen in Norway. As this study will show, this success was also triggered by a crisis followed by a radical change. In contrast to the scientific turn, however, it was an equipment-topographic turn that took place in the early 1920s. This shift involved altering ski models, equipment, and course terrains to optimize conditions for international competition.

To verbalize the driving forces behind the equipment-topographic turn of Swedish XC skiing, the concept of intensification appears useful. Inspired by the Finnish sociologist Kalevi Heinilä, the concept was introduced in 1998 by the Swedish sports historian Jan Lindroth. As modern sport becomes increasingly performance-oriented, it mobilizes economic, technological and administrative resources to optimize the conditions for sporting success.¹⁷ Intensification is paving the way for a global sport in which competition itself is only the visible part of a broader struggle between national elite sports systems, with states, sports science, organizations, and technology driving the athletes' performances.¹⁸ The latter, as Josef Fahlén and Paul Sjöblom have pointed out, also contributes to the increasing homogenization or standardization of sport. As the prestige of sport increases and greater resources are invested, standardization becomes more pronounced to ensure that competitive conditions remain as uniform as possible.¹⁹

Intensification is an expression of the spirit of progress and the quest for records that has characterized modern industrial society in general and modern sport in particular. Technological advances in society at large have often led to innovations that have also enhanced performances within sports. In the mid-twentieth century, when ski tracks began to be prepared first by sledges and then by snow groomers, the conditions for fast skiing were radically improved, giving rise to the new technique of skating.²⁰

However, this forward-looking force of optimism and faith in technological development has not been allowed to operate freely, neither in XC skiing nor in society at large. Rapid change tends to create dislocation and nostalgia.²¹ As a result, progress in sport is often met with a preoccupation with the familiar and stable. Perhaps the clearest example is that XC skiing did not embrace the skating technique wholeheartedly at its inception, but instead established two separate styles: classic and skate technique. By characterizing the ideas, actions and conflicts of the actors involved in the technological development of XC skiing, this article uses the concepts of intensification and nostalgia to discuss skiing as a projection surface from which modernization has been both resisted and affirmed. The

first tension concerned the extent to which Swedish skiing should retain its topographical uniqueness or adapt to international conditions. This dilemma, in turn, led to the question of equipment: were domestic Swedish skis going to be preserved or sacrificed on the altar of foreign skis? Once these conflicts were resolved in favour of internationalization, the technological battle remained: to develop a ski model that would surpass the existing ones.

The ideas, actions and tensions investigated in this article were sought in a variety of published and unpublished textual materials that were subjected to qualitative content analysis. As the topic of the article is the change of XC skiing throughout its history, the focus is on sources from contemporary skiing associations. The Swedish ski sports movement during the period studied consisted of two main organizations. The Association for the promotion of skiing (*Föreningen för skidlöpningens främjande*, hereafter abbreviated to the 'Ski Promotion') was founded in 1892 and began to organize so-called national competitions the following year.²² The Ski Promotion organized Swedish XC skiing during the last years of the nineteenth century and the beginning of the twentieth century. Gradually, the Swedish Ski Association (*Svenska skidförbundet*, founded in 1908) took over the leading role in organizing skiing competitions, while the Ski Promotion focused more on less performance-oriented activities such as outdoor recreation. There were also social differences between the two organizations. While the Ski Promotion was top-down and had a certain upper-class character, the Ski Association emerged from grassroots initiatives as part of the growing popular sports movement.²³

The analysis is based on the board minutes and annual reports of the Swedish Ski Association and the Ski Promotion. The annual journal of the Ski Promotion, *På skidor* (On skis), was also important in the research process, as were several anniversary publications published by the organizations. Press material from particularly important ski competitions has also been studied in the Swedish National Library's collection of digitized daily newspapers.

With such a selection of sources it is possible to capture the intentions and actions of the main actors behind the development of XC skiing in Sweden, the Ski Promotion and the Swedish Ski Association. Analysing the sports press of the time allows for uncovering what transpired during significant sporting events, while also highlighting the media's role as an influential actor in shaping opinions on the sports pages. The voices, wills and intentions of elite athletes themselves can also be captured, albeit second-hand, through the daily press. In some cases, elite skiers have written autobiographies, which are important first-hand sources for this study.²⁴

From territorial adaptation to a national skiing landscape

During the late nineteenth century, Sweden experienced major social changes. In just a few decades, industrialization radically transformed the face of society and fundamentally restructured people's lifestyles. Following this wave of optimism, ideological shifts took shape, inspired by a romanticized view of nature and a nostalgic critique of civilization, yearning for the authentic and unspoilt.²⁵ Rapid changes gave rise to a need for the construction of a national landscape in which the spirit of Swedishness would be defined by specific topographical features within the borders of the country. A distinct Swedish national landscape became even more important after the dissolution of the union

between Sweden and Norway in 1905.²⁶ In this respect, too, the northern parts of the country became important. Mountains, vast forests and snowy winter landscapes were given a prominent place in the canonization of the Swedish landscape and functioned as educational tools for instilling a sense of patriotism in citizens.²⁷ Alpinism, tourism and skiing were popular activities through which Swedes internalized the nationalist spirit.. As Björn Sundmark has pointed out, there were close links between 'skiing and being Swedish'.²⁸ By the turn of the century, several movements and organizations had sprung up to cater to this passion for nature. These included the Swedish Tourist Association (founded in 1885), the Ski Promotion and, finally, the Swedish Society for Nature Conservation (1909).

At the turn of the century, Swedish XC skiing was clearly influenced by the idea of a specific Swedish national landscape. Initially the technique and the terrain on which the competitions were held were characterized by what cultural geographer Klas Sandell has called 'territorial adaptation'.²⁹ In other words, skiing was developed on the basis of the surrounding geographical conditions; both the equipment and the way of skiing were adapted to the topography in which the sport was practised.³⁰

The local craftsmanship used to make skis before the advent of the modern sport was therefore diverse. The methods of production and the shapes of the skis were adapted to the local landscape and therefore varied from place to place. However, there were certain types of skis that were used over a wide area. A common type used for a long time in Sweden, Norway and Finland consisted of an odd pair of skis: a long ski that went straight in the direction of travel and a shorter ski, called *andur* in Swedish, that was used for pushing and gaining speed.³¹

Over the centuries, different types of skis spread both within and between countries. Skis in Finland were mainly used for transport on flat terrain and were therefore long, narrow and light. Ski production in northern Sweden was influenced by these Finnish types of skis, and Finnish skis also became common in central Sweden, probably as a result of the migration of the so-called forest Finns in the 17th century.³² However, the most common type of ski in Norway was very different from those in Sweden and Finland. The so-called *telemark* ski was shorter and wider and was used for jumping, downhill skiing and regular XC skiing – a versatility that is still reflected in the popularity of the sport of 'Nordic combined' in Norway, though it remains less common in most other countries.³³ However, telemark skiing was not isolated to Norway. As soon as ski jumping started in Sweden, Norwegian skis were introduced. The development of skiing prior to the establishment of XC skiing as a modern sport was thus characterized by a diversity of ski types, but also by transnational movements and exchanges of dominant ski types within and between countries.³⁴

When XC skiing was transformed into a modern sport, both the technique and the equipment had a distinct local character. However, when the Ski Promotion began to organize annual national competitions in the 1890s, involving competitors from all over the country, a shift occurred that made XC skiing in Sweden somewhat more homogeneous. The clearest example is the standardization of the race-efficient method of skiing with two poles instead of one. When skiing for utilitarian purposes, one arm was usually kept free for tools, rifles, or sledges. However, when performance was the focus, two poles were used – an uncommon practice before the 1890s, except in areas bordering Finland and parts of central Sweden.³⁵ This change, marking an early step of intensification, was

actively promoted by Ski Promotion – or at least by its representative in the northern town of Arvidsjaur, Axel Orstadius. When he organized local qualification races for the national competitions, skiing with a single pole was completely banned. Anyone who did not use two poles was disqualified. Lars Olofsson, a Sámi ski pioneer and the most successful XC skier of the 1890s, represented Arvidsjaur at the national skiing competitions and was one of the athletes who preferred to ski with one pole, but had to change his technique because of the strict rules.³⁶ The prohibition of single-pole skiing illustrates the contrast between indigenous Nordic physical activities and imported English ball games during the emergence of modern sports. While the latter evolved from folk games through rapid sportification, skiing retained its roots in ancient, utilitarian means of transport.³⁷

However, the prohibition proved to be a winning one. In Östersund in 1894, Olofsson was far superior to the South Sámi from Jämtland, who still used a single ski pole.³⁸ The transition from one ski pole to two seems to have taken place without conflict in Sweden. In Norway the debate was more heated in the 1880s and 1890s. Aesthetic and technical arguments were put forward for and against the single and double poles respectively, before the latter became standard.³⁹

While skiing became more uniform, the techniques and the course profiles would continue to differ between the Nordic countries well into the twentieth century. Finland was a country where skiing competitions were often held on frozen lakes. Consequently, time and record keeping were integral to these competitions. The athletes mainly used ten-foot-long and narrow *kajana* skis.⁴⁰ Norwegian skiers, on the other hand, competed on their shorter and wider ca seven-foot-long telemark skis with fixed bindings in more technically demanding terrain with steep slopes. As Tor Bomann-Larsen put it, the telemark style of skiing ‘developed in response to the demands of the terrain’.⁴¹ The Swedish skiing landscape became a middle ground between these opposites. Competitions were held in flat terrain with easy slopes. Skis of almost the same length as the Finnish *kajana* model were required and loose toe straps as bindings.⁴² The simple attachment was different from the robust Norwegian ski binding developed by Fritz Huitfeldt in the 1890s, which was used by XC skiers, downhill skiers and ski jumpers to keep the foot firmly fixed to the ski.⁴³ The long, narrow skis used on the Swedish and Finnish plains were often made of birch, although other native woods such as pine, ash, aspen and spruce could also be used.⁴⁴ Imported hickory was also in use, but more so by the Norwegian skiers, as it was better suited to the hilly terrain.

Although in the last decade of the nineteenth century the Nordic countries maintained their adaptations to their topographical specificities in XC skiing contexts, the emerging internationalization of skiing put territorial adaptation to the test. Norwegian skiers found it difficult to compete in the flat terrain of Sweden and Finland, while Swedes and Finns consistently performed poorly in Norway.⁴⁵ This tradition dated back to 1892, when an international skiing competition was organized in Stockholm, Sweden. The relationship was confirmed each time the Swedes and the Finnish skiers were far behind in the Norwegian ski competition at Holmenkollen, which quickly became the most prestigious to win.

The opposite became evident with the establishment of the Nordic Games, a pan-Nordic winter sports event held every four years in Sweden during the first quarter of the twentieth century. The first edition in 1901 featured two ski races, one over 60 kilometers and the other 30 kilometers, with participants from Sweden, Norway, and Finland. The

competitions were held on distinctly flat terrain, although the Swedish organizers wanted to include some elevation changes, but were prevented by a lack of snow. The Norwegian ski team, and indeed the Norwegian sports press, protested loudly after their failure.⁴⁶ The Swedish sports newspaper *Ny Tidning för Idrott* dismissed the criticism, pointing out that 'the way skiing is performed and the type of skis used depend on the local conditions, and mountain dwellers should not expect to find the same conditions in the lowlands as at home, or vice versa'.⁴⁷

The constant defeat of Swedish skiers in foreign competitions was of no significant concern to the Ski Promotion. Competitions for the elite were first and foremost a means to a greater end: popularizing skiing among the general public.⁴⁸ A typical nationalist message at the turn of the century was the motto of the Swedish Tourist Association: 'Know your country!' In line with this call, the Ski Promotion valued local, preferably hand-made, types of skis, as well as the geographical differences that gave each country its own distinct national identity in terms of skiing.⁴⁹ The differences in the topography of competition and in the equipment of skiers became effective markers when nationalism was to be consolidated not only as an idea, but also as a practice and an experience in interaction with nature and the landscape.⁵⁰ The annual report of the Ski Promotion for the winter of 1897–1898 states:

If we here in Sweden wanted to go for good results and 'records', we would be able to achieve remarkable things, but it is to be hoped that this will not happen, as this would certainly take the beautiful sport of skiing in the wrong direction.⁵¹

Clearly, XC skiing in Sweden at that time placed emphasis on aspects beyond performance. It was first and foremost an aesthetic element in a visual representation of the nationalism of the time. Although competitions were held in which Nordic skiers competed against each other – not least the recurring Nordic Games – there were no clear efforts to homogenize the landscape of ski competitions on an international level during the first decade of the twentieth century.

An emerging ski industry

The establishment of modern ski sport in Sweden coincided with a vigorous industrialization in the 1890s. In the mid-nineteenth century, Sweden was an industrially backward periphery, but the country was entering a period of transformation.⁵² From the 1870s, the railways were extended to link the north and south of the country. Agriculture was mechanized and factories were built. The late nineteenth century was thereby a golden age for entrepreneurs, inventors and engineers.⁵³ Industrial exhibitions, such as the one in Stockholm in 1897, showcased the technological wonders and advances being made in the name of modernization.⁵⁴ At the same time, however, introspective nationalism cultivated a passion for rural and natural romanticism and traditional folk life.

For the burgeoning ski culture, the question was where to place itself on the spectrum between nostalgia and technological optimism. This applied not least to the actual manufacturer of skis. One of the main areas of activity of the Ski Promotion was to encourage the production of skis in the country. Initially, however, modern industrial ski production was not on the agenda. In the spirit of nostalgia, a renaissance of traditional handmade ski production was advocated. During the 1890s and early twentieth century,

several ski exhibitions were organized with the aim of stimulating production and, consequently, skiing as a means of transport for the general public. The Ski Promotion produced special model skis and, from 1896, sent them to schools to encourage children to make their own skis.⁵⁵

As a result of these efforts, there was a significant increase in the production, but perhaps not in the way the Ski Promotion had originally intended. It was the industry, rather than traditional craftsmanship, that flourished. Although Sweden was a decade behind Norway in development, several ski factories were established as early as the 1890s, and there were even more to open their doors after the turn of the century. A few traditional craftsmen had their skis on display at ski exhibitions in Sweden. Soon, however, the exhibitions were dominated by factory-made skis. At the International Ski Exhibition in Stockholm in 1902, the Board of the Ski Promotion in its annual journal *På skidor* promoted the diversity and territorial adaptation of skiing, while deploring the rise of factory production at the expense of craftsmanship:

It is obvious that in a country as extensive as ours, with such varied terrain and snow conditions, there should be a multitude of different types of skis and variations of them. No one would doubt that they are fully justified, for the natural conditions of each country have created and must create different types. A normal type of ski, which the Finns, Swedes and Norwegians could all use, is a priori unreasonable, and no one has yet dared to invent one. It is true that a telemark ski can be used on the rivers and lakes of Finland, but it is certainly easier and better to use a typical flatland ski such as the kajana ski on the large, flat plains. May the beautiful and appropriate types that still exist be preserved but manufactured with due care. The demands of recent years for mass production and cheapness have largely changed the old methods of production, and there were few examples of the old-fashioned craftsmanship that one had hoped to see at the exhibition. The fact that, as far as we can judge from the exhibition, ski-making as a craft has not been able to keep up with the competition from the ski factories is very unfortunate, especially because ski-making could provide the general public in northern and central Sweden with a considerable income during the long winter evenings.⁵⁶

However, the Ski Promotion did not persist in its anti-industrialization stance on ski manufacturing but encouraged traditional craft methods as much as possible. As the number of ski factories grew, resources were mobilized to improve and develop Swedish ski production.

The 1902 Ski Exhibition in Stockholm was thus a manifestation of both nostalgia and progress. The retrospective section of the exhibition brought together the diversity of domestic Swedish ski types that had been produced over the centuries using traditional handicraft methods. The newspapers praised both traditional and industrially produced skis, the latter being seen as a modern, scientifically developed means of transport.⁵⁷

Industrial ski production in Sweden became associated with a particular type of ski, developed in collaboration between banker and ski designer Salomon Sahlin and ski manufacturer L.A. Jonsson. In 1897, the latter replaced planers with machines and established the first ski factory in Sweden, L.A. Jonssons Skidfabrik AB.⁵⁸ The collaboration between Jonsson and Sahlin began at the national competitions in Östersund in 1894, when Jonsson witnessed the skills of the Swedish skiing elite, whose top athletes were Sámi or other inhabitants of Lapland with non-Sami ancestry, usually referred to as 'settlers'.⁵⁹ Both Jonsson and Sahlin were greatly inspired by the technique of the Lapland skiers and began in 1894 a collaboration that resulted in a special type of ski,

modelled on the technique and equipment used by the athletes of the North.⁶⁰ These skis differed from the standard Norwegian ski – the telemark ski – in that they were longer, narrower, made of maple and had loose bindings, as opposed to the fixed bindings of the telemark ski.⁶¹ As early as 1895, Sahlin had introduced his own designed ski to the market.⁶² When the model had been perfected, it was tested by prominent athletes from Arvidsjaur, Lars Olofsson and Anders Edvin Grubbström, at the national skiing competition in Sundsvall in 1899. Olofsson won the 95-kilometer race by almost 30 minutes, which ski experts and competitors attributed to the new ‘Sahlin ski’.⁶³

On a non-profit basis and in the spirit of philanthropy, each ski factory eventually owned the right to manufacture and market the ‘Sahlin ski’ without the inventor making any financial claims.⁶⁴ The Larsson brothers’ ski factory in Örbyhus marketed the product as the ‘most suitable ski for Swedish conditions’, which was used both by the skiing public and by the elite in international competitions and Swedish championships.⁶⁵ The above-mentioned marketing of the Larsson brothers’ ski factory also reveals that the long Sahlin ski was designed with special consideration given to the specificities of the Swedish landscape of ski competition: flat skiing along forest roads with some difference in altitude and without sharp turns. The Sahlin ski celebrated its triumph already at the turn of the century and could be used by the elite well into the 1920s.⁶⁶ As late as 1938, Elias Nilsson was the winner of the prestigious Swedish ski competition Vasaloppet on a pair of Sahlin skis, even though they were considered obsolete by that time.⁶⁷

As national rivalries in international skiing competitions, such as Holmenkollen, began to take shape, a similar competitive dynamic emerged within the ski industry regarding exports. In 1892, before the ski industry in Sweden had gained momentum, the Swedish newspaper *Malmberget* wrote:

It is a pity that we Swedes buy Norwegian skis for tens of thousands of kronor [Swedish currency] a year, and that while the Norwegians have commendably acquired a truly brilliant market in Germany and Austria, we have not yet sold a single pair of skis abroad.⁶⁸

By the early 1910s the situation had changed. There were now several large ski factories in Sweden supplying skis to the domestic population. The Swedish manufacturers were not satisfied with this, however, and had begun to export skis to Finland and Russia, where the long, narrow models used in Sweden were also popular. The competition for ski exports began to resemble the XC ski races, with Norway dominating.⁶⁹ The Norwegian ski manufacturers’ forays into Russia, *Norska Dagbladet* stressed, ‘require energetic and systematic work, because Russia is the only place where the Swedes have had success with their skis. If it is possible to conquer the Russian market for Norwegian skis, it would be a considerable gain’.⁷⁰

Emerging intensification and homogenization

In 1908, the Swedish Ski Association was founded. It was an organization that grew out of the Swedish popular sports movement (the Swedish Sports Confederation) and was characterized by a clear focus on performance. After its foundation, the Swedish Ski Association became responsible for organizing competitions, while the Ski Promotion concentrated on promoting skiing to the public.⁷¹ As the Swedish ski industry’s exports abroad grew, so did the need to encourage Swedish skiers to perform better in

competitions abroad. As shown above, Swedish skiers had difficulty competing in Norway, where the terrain and ski models were completely different. Nevertheless, the Ski Association showed a clear interest in Norwegian skiing techniques and in 1912 sent a board member to Norway to study the terrain at Holmenkollen. He concluded that the long Swedish skis could not be used on such courses.⁷²

At the same time, the Sandström's ski factory in Stockholm was experimenting with a Swedish version of the short Norwegian telemark ski. The intention was to develop this ski model further, but the First World War intervened, and operations were reorganized. Instead of skis for competition, production focused on skis for the armed forces.⁷³

Despite a decline in competitive activity during the war years, the Swedish ski industry expanded significantly during the same period. If Norway was the pioneer in setting up the first ski factories, Sweden overtook its western neighbour during the war years, at least in terms of production and export. The Edsbyn ski factory, which at the time described itself as 'Europe's largest and most efficient specialist ski factory',⁷⁴ produced more skis than all the Norwegian factories put together.⁷⁵

Towards the end of the First World War, the Swedish ski industry remained strong, while Swedish skiers still were inferior at the ski competition in Holmenkollen. As the Swedish Ski Association prioritized performance optimization much more than the Ski Promotion, it developed two strategies in the late 1910s to increase the competitiveness of the Swedish elite. The first was specialized training, whereby the Swedish Ski Association selected the country's best skiers and encouraged them to hone their skills on terrain similar to that in Norway. In addition, training camps were organized to incorporate the Norwegian ski technique.⁷⁶

Specialized training and training camps were new phenomena in the 1910s. However, launching such projects and travelling abroad in connection with international competitive exchanges required financial resources that exceeded the still modest state allocations for sport. As a grassroots organization, the Swedish Ski Association had less financial muscle than the Ski Promotion, which had its roots in the upper echelons of society. The second strategy was therefore to mobilize financial resources to fund special training camps. Sven Hermelin, the president of the Swedish Ski Association (1915–22), was as famous for his ignorance of skiing as for his ability to raise money. He relied on special patrons who paid for the specialized training of Swedish skiers and their trips abroad to compete.⁷⁷

For the 1918 Holmenkollen ski competition, the Swedish ski team was selected at an early stage. The athletes were asked to train on the most difficult terrain possible and were sent to Norway two weeks before the competition to train on site. The specialized training paid off, as Sweden finished second and third in the race. That was by far the biggest success for Swedish XC skiing abroad to date.⁷⁸ Thus, the 1910s, with the Swedish Ski Association as the driving force, was a period when Swedish XC skiing was intensified (mobilized resources to optimize results) and homogenized (adapted to conditions abroad).

Vasaloppet and the opponents of modern technology

As the technological reorientation of XC skiing also took place in Finland in the early 1920s, the homogenization of XC skiing increased. The Finnish engineer Karl Flander

developed a short ski for hilly terrain that was strong and manoeuvrable while retaining the agility of the traditional Finnish ski. A modified and more successful version of this ski was later developed by, among others, the successful skier Tapani Niku.⁷⁹ The homogenization was furthered by increased sporting exchanges with Central European countries, where hilly course profiles and short skis were also the norm.

Aware that both Finland and Norway had developed their own types of ski for hilly terrain, the Ski Promotion organized a competition in 1923 to produce a similar, internationally competitive ski that would still be 'uniquely Swedish' in the nostalgic sense.⁸⁰ Behind the winning entry was the Sandström's ski factory, which had already produced a similar ski before the First World War and was now working closely with the Swedish Ski Association. The Swedish skiing elite were equipped with the new type of ski, while the Swedish Ski Association encouraged organizers of Swedish championships to hold competitions on hilly terrain. In addition, the Swedish Ski Association organized special competitions in the same technically demanding terrain for the 1924 Chamonix Winter Week, the event that retroactively was recognized as the first Winter Olympics.⁸¹ Despite the long preparations, the Swedes were far from winning any medals at the Olympics. Unaccustomed to the short, wide skis provided by the Swedish Ski Association, the Swedish athletes simply had the edges of their skis planed off!⁸² Ivar Holmquist, vice-president of the Swedish Ski Association and first president of the *Fédération internationale de ski* (The International Ski Federation), explained the defeat by saying that the equipment was 'partly unsuitable and the technique inadequate'.⁸³

The result was an intensified reorganization of terrain and technique by the Swedish Ski Association. The equipment-topographic turn for Swedish XC skiing proceeded. It was led by Sixtus Janson, the new president of the Swedish Ski Association (1922–1948). Unlike his predecessors, Janson had previously been an active competitive skier and had made a name for himself in the field of technical improvement and the training of elite athletes.⁸⁴

However, the process of intensification of XC skiing in Sweden met with resistance. The Swedish elite skiers were reluctant to give up their long and narrow skis for short and wide ones. Most of Sweden's top skiers were based in Norrland, a region associated with a stubborn conservatism in skiing matters. Here the long XC skis and the flat Swedish terrain were particularly favoured.⁸⁵ One possible reason why Swedish skiers preferred to compete at home was that the amateur rules made it impossible for skiers to gain any financial benefit from competing abroad. The fact of the matter was that domestic competitions could be a source of valuable prizes, if not money. A prime example of this was the Vasaloppet, first held in 1922, which featured an extensive and valuable collection of prizes – several silver trophies and a real gold medal for the winner – making it highly desirable for athletes.

The Vasaloppet was at once a national ritual, a symbol of nostalgia and a re-enactment of past royal exploits. The skiers emerged as central figures in the portrayal of the origin myth and creation story of the Swedish nation, set against what was perceived as an authentically Swedish landscape in Dalarna – a province that, inspired by the spirit of national romanticism, attracted significant attention from artists.⁸⁶ The Vasaloppet is thus the epitome of an 'invented tradition', as defined by historian Eric Hobsbawm.⁸⁷ Such a tradition seems timeless precisely because the actors behind it – organizers, journalists

and speakers – actively construct a continuity between past and present, which in this case includes the flat skiing landscape as something eternally Swedish.

On the route that would become the Vasaloppet, four centuries earlier, a young Swedish aristocrat, Gustav Eriksson, later known as Gustav Vasa, along with two commoners on skis, started a rebellion against Kristian II, the Danish king of the Kalmar Union (including Denmark, Norway and Sweden), which eventually led to Gustav's accession to the Swedish throne.⁸⁸ The 90-kilometer-long, flat course, over frozen lakes, through forests and along country roads normally used only by horse-drawn carriages and sledges, reinforced the turn-of-the-century idea of a uniquely flat Swedish skiing landscape.⁸⁹ The lucrative prizes meant that many of the Swedish skiing elite, whom the Swedish Ski Association had intended to retrain as Norwegian-style XC skiers, began to use the long Swedish skis again. The Vasaloppet thus challenged the Swedish Ski Association's reorganization of skiing, which its board member and sports journalist Sven Lindhagen deplored in the leading Swedish sports publication of the 1920s, *Idrottsbladet*:

The Vasaloppet is a typical example of the kind of skiing that we do not consider worthy of encouragement from a principled point of view, because it forces the active to train on the roads and takes them away from the terrain. The Vasaloppet works against the goals of the Swedish Ski Association in Dalarna.⁹⁰

Lindhagen rarely missed an opportunity to sing the praises of internationalization and the Norwegian way of skiing:

Although domestic competition and the enjoyment of the tracks are the most important things, the comparison with foreign countries is a necessary incentive, a propaganda tool of immense importance. If we were always to lose out to the Finns and Norwegians, even to the Southerners, our skiing would soon fade away.⁹¹

However, the Swedish Ski Association was met with resistance from the sports press, which wholeheartedly supported the event. The leading Swedish daily, *Dagens Nyheter*, had even provided financial support for the first Vasaloppet, and at one point criticized the Swedish Ski Association by pointing out that XC skiing was 'specifically national and therefore does not require the international exchange that is a vital part of other sports'.⁹² One reporter of the *Idrottsbladet*, whose writers were not unanimous about the competition, said: 'It is a misguided step towards standardization to completely abandon our old Swedish cross-country skiing in favour of international terrain climbing [...] Compliance with foreign demands must not lead us to destroy our own distinctiveness'.⁹³

Torsten Tegnér, owner of *Idrottsbladet*, agreed:

A distinction should be made between two branches, namely 1) Swedish cross-country skiing in moderate terrain and 2) Norwegian or acrobatic cross-country skiing in hilly terrain, and that number 1) should be number 1 here, as it is the most natural one for us.⁹⁴

The technical reorganization of the Swedish Ski Association was, therefore, first and foremost hindered by the skiers, and to a certain extent opposed by the sports press. The former is in line with the conclusions of previous research, which has shown that the skiing elite in Sweden did not respond favourably to the restructuring of rational and scientific training in the mid-twentieth century.⁹⁵

The Swedish Ski Association had to make a new effort. The strategy was to persuade top skiers to use shorter and wider skis. One skier who was used to

competing for gold in the Vasaloppet on long Swedish skis, but who was also subjected to the Swedish Ski Association's attempt at conversion, was Sven Utterström. He stated in his autobiography that he was sceptical about the short Norwegian skis, that he tried them in the 1920s and then returned to his long skis with loose bindings. But the Swedish Ski Association persuaded him to change again, and once he did, others followed.⁹⁶ The Swedish Ski Association's policy prevailed 'without any open battles', as the Association's secretary, Johan af Klercker, noted.⁹⁷ However, it was not until the late 1930s that the Vasaloppet was brought into line with the policies of the Swedish Ski Association, with a shift towards more advanced and hilly sections.⁹⁸

The mobilization of resources eventually paid off. The proof came at the 1928 Olympics in St Moritz, when Per Erik Hedlund won the 50-kilometer race over difficult terrain, with other Swedes finishing second and third. The success of the strategy was confirmed when Sven Utterström won the same distance at the Norwegian Holmenkollen ski race two years in a row, in 1929 and 1930. These successes were preceded by a long period of preparation. Sixtus Janson, chairman of the Swedish Ski Association, wrote about the preparations for the 1929 race at Holmenkollen: 'In the autumn, all smoking was banned. Throughout the winter, only terrain equipment was used, short skis, Bergendahl bindings and shoes with thick soles. Participation in ski competitions at home in Sweden was reduced to a minimum'.⁹⁹ It seems that all the special training and trips abroad that were part of the internationalization of Swedish XC skiing were paid for by the Consul General and patron of the Swedish Ski Association, Fredrik Hagström.¹⁰⁰ As a result of these efforts, Swedish XC skiing was brought up to Norwegian – and thus European – standards by the early 1930s. Through homogenization, the sport lost the topographical and national characteristics that had distinguished it at the turn of the century.

The technological competition

The homogenization of XC skiing meant that the technological competition changed direction. Once the short technical ski became standard, the focus shifted to its development and improvement. Several different native woods could be used in the manufacture of Nordic skis. However, the short Norwegian ski was most commonly made from imported hickory, while the traditionally long Swedish ski was usually made from birch. While birch was soft and light and often broke in hilly terrain, hickory was heavy and difficult to wax but slid easily. Elite Swedish skiers found hickory skis unwieldy and difficult to get used to.¹⁰¹ However, the cross-fertilization between the heavy (and imported) and light (domestic) woods that resulted from the meeting of Norwegian, Swedish and Finnish skiing cultures led to a great deal of experimentation with materials. Hickory worked better as a sliding surface than the porous birch, especially in wet conditions. However, by gluing an underside of hickory to a top of birch, the gliding properties were retained while the weight of the ski was significantly reduced.¹⁰²

The idea was certainly not new. In Kristiania (Oslo), Norway, H.M. Christiansen had already produced such a ski in the 1890s. Several ski manufacturers repeated similar experiments, including the Sandström's ski factory in the 1910s, but never achieved perfection. The problem was that the glue could neither withstand water, the cold nor the high pressure, so the skis often cracked.¹⁰³ In the 1920s, ski

manufacturers began to use more durable types of glue, which was the beginning of the use of laminated skis, albeit initially on a small scale. Sixtus Janson, the president of the Swedish Ski Association, claimed that Swedish skiers were equipped with laminated skis in Chamonix in 1924, but that they had never been used.¹⁰⁴

It is difficult to single out a single inventor of this type of ski. Rather, it was a movement of innovation that transcended national borders, characterized by both cooperation and competition between ski manufacturers and inventors. There were several patent applications, both in Sweden and Norway. In 1929, two Swedish inventors applied for a patent for a similarly designed laminated ski, which led to a minor conflict that Sandström's ski factory seems to have won.¹⁰⁵

However, not all patent applications combined different types of wood. In 1934, the manufacturer Nils Sörlin applied for a patent for the so-called 'Åsele ski' (*Åseleskidan*), a different type of glued ski without two different layers but with a permanent span. The newspaper *Dagens Nyheter* showed a load test with the manufacturer and two other people standing on the Åsele ski, which was severely bent but not broken.¹⁰⁶

As with the introduction of the short terrain ski, there were close links between the Swedish Ski Association and Sandström's ski factory when the technology of laminated skis became widespread. It was the latter's patented skis that Swedish skiers were equipped with when competing abroad.¹⁰⁷ The next step in the intensification process was the individualization of the national team's equipment. The team members sent to the 1932 Olympic Games in Lake Placid were able to specify the dimensions and weight of the skis they wanted. Sandström's ski factory was later able to use the co-operation with the Swedish Ski Association for advertising and marketing purposes.¹⁰⁸ It was a clear win-win situation for the sport and the ski industry. Consequently, when Sven Utterström won the gold medal in the 18-kilometer race at those Olympic Games, it was not just his achievement, but rather the result of a mobilization of resources to which the athletes, the sports movement, the industry and the patrons had all contributed.

Technological development between tradition and change

In early twentieth-century Sweden, XC skiing embodied a duality, simultaneously looking forward to modernity and backward to tradition. On the one hand, it embodied a modern entrepreneurial spirit; within a few decades, the traditional craft of skiing was replaced by rapidly expanding factory production that made skis the property of every man and woman. On the other hand, skiing was part of the nation building of the time. In the wake of the volatility of modernity, skiing made it possible both to experience and to construct a uniquely Swedish national landscape, untouched by the fumes of the factories and the rootlessness of industrial society.

This tension between optimistic change and nostalgic retrospection also affected the technological development of XC skiing. At the beginning of the twentieth century, the question of how and where skiing should be practised was at least as central as the question of who the best skier was. There was no predetermined direction in which the landscape and equipment of Swedish XC skiing would change. The process was gradual and met with resistance. It was driven by a restless sports movement and sometimes it happened unexpectedly. Industrialization intervened in the history of ski sport and

outmanoeuvred the traditional craftsmanship that the Ski Promotion originally intended to promote.

At the beginning of the 1930s, the embryo of an elite sport system had crystallized in Swedish XC skiing. The driving force in this process was not the elite skiers themselves, but the Swedish Ski Association, whose secretary, Sigge Bergman, was able to state in 1943 that 'the "modern" competitive ski sport has definitely taken root in Sweden'.¹⁰⁹ According to Heinilä, it takes talent, training, sport science and technology to build up an elite sport system.¹¹⁰ However, Swedish XC skiing had not reached that point, even though there was plenty of talent. It should be noted, though, that phenomena such as specialized training and training camps were new elements, introduced not primarily to improve skiers' skills, but to change their skiing style and technique. With the homogenization of XC skiing and the experimentation with skis made of laminated wood, technology had certainly taken on a more central role. It would take some time, however, for science to enter the system of elite sport. When it first appeared as part of the mobilization of resources in XC skiing, it did not concern the manufacture of skis per se, but the production of ski wax.¹¹¹

As the Swedish Ski Association established its hegemony over Swedish ski sport, the nostalgia and rural romanticism of the turn of the century were sacrificed on the altar of performance orientation and technological optimism. It is also clear that this shift accompanied a similar change at the level of society at large. As the social democrats adopted a statist position in the inter-war period, retrospective thinking had to take a back seat. Modernity was embraced, and heroes were drawn from the present – preferably among prominent sportsmen – rather than the past.¹¹² But nostalgia and optimism for the future were not mutually exclusive. Although the Ski Promotion, with its national romantic passion for the idiosyncratic Swedish landscape, was forced to yield to a more standardized European sports topography in the interwar period, the struggle over the XC skiing landscapes has by no means ceased.

If the Swedish skiing landscape was adapted to the Norwegian one at the beginning of the twentieth century, the adaptation at the beginning of the twenty-first century has been more about how the sport, because of the increased influence of the media (mediatization) and commercial incentives (commodification), has shifted competitions from natural landscapes to shorter, multi-lap courses around stadiums. This trend is particularly evident in events like the Holmenkollen 30- and 50-kilometer races.¹¹³ Despite the artificialization of the skiing landscape – manifested in the introduction of indoor ski tunnels and the growing use of artificial snow for competitions – it remains clear that XC skiing has not been entirely homogenized.¹¹⁴ While standardization has undoubtedly been prominent, recent research highlights the enduring importance of local geography. For example, Daniel Svensson has identified specific locations in Sweden associated with elite training for young XC skiers. These sites carry a distinct movement heritage, where physical achievements are genealogically linked to places with unique topographies, with specific times and records to beat.¹¹⁵

This nostalgic aspect of XC skiing is not only evident in the sport's landscapes but also in its techniques and skiing styles. Indeed, every technological achievement tends to be met with protests aimed at preserving older types of skiing technology. In this way, the 1980s division of skiing into classic and skate-style, must be understood. Similarly, the abolition of the so called 'diagonal technique' in some classic-style competitions, notably in the XC 'Ski Classics' cup, has led to the introduction of so-called 'technical zones' where

double-poling is prohibited. The development of XC skiing thus shows that technological development has by no means been deterministic, linear, and constantly focused on optimizing performance and results. In fact, innovations and changes have been met with resistance and have been the subject of negotiations and conflicts between technological optimism and nostalgia, between different actors, both now and in the past.

Notes

1. Omoregie, "The impact of technology on sport performance," 898.
2. Lindroth, "Den moderna tävlingsidrottens intensifiering," 46.
3. Loland, "The Ethics of Performance-Enhancing Technology in Sport," 153.
4. See Yttergren, *Träna är livet*, 174–5.
5. Magdalinski, *Sport, Technology and the Body*, 2.
6. Lidström, Svanberg, and Ståhlberg, "Traditional Sports and Games among the Sámi People in Northern Fennoscandia (Sápmi)".
7. Bale, *Sports Geography*; Svensson, "Skiing through Time"; and Müllner, "The Importance of Skiing in Austria".
8. See Street, "Technological Advances in Cross-Country Ski Equipment"; Kuzmin and Fuss, "Cross-Country Ski Technology"; Sandbakk, "The Evolution of Champion Cross-Country Skier Training".
9. Pfister, "Sport, technology and society".
10. Müllner, "The Importance of Skiing in Austria".
11. Gotaas, *Skimakerne*.
12. Nissing, "Skidstillverkning förr och nu"; Åström and Norberg, "Hantverksmässig skidstillverkning"; Åström, and Norberg, "Maskintillverkade skidor". The development of skiing technology is also highlighted in comprehensive overviews of the history of skiing. See Allen, *The Culture and Sport of Skiing*; Huntford, *Two Planks and a Passion*.
13. Smith, *Nations and Nationalism in a Global Era*, 56.
14. Bairner, "National Sports and National Landscapes," 225.
15. On sport, embodiment and materialization, see Newman, Thorpe, and Andrews, "Introduction".
16. Svensson, *Scientizing Performance in Endurance Sports*.
17. Lindroth, "Den moderna tävlingsidrottens intensifiering".
18. Heinilä, "The Totalization Process in International Sport"; Sandahl, "Dopningsfrågan i historisk belysning".
19. Sjöblom and Fahlén, "The Survival of the Fittest".
20. Street, "Technological Advances in Cross-Country Ski Equipment," 1050.
21. Johannisson, *Nostalgia*; Andersson, "Bandy v. ice hockey in Sweden".
22. These competitions were a kind of precursor to the Swedish cross-country skiing championships.
23. Yttergren, *I och ur spår*, 16–25.
24. The most important source in this respect is Sven Utterström's autobiography, which contains a great deal about the development of XC skiing technology and the attitudes of elite skiers towards it. Utterström, *Mitt skidlöparliv*.
25. Johannisson, *Nostalgia*, 134–5.
26. Nilsson, *Fjällturismens historia*, 17–18.
27. Erlandson-Hammargren, *Från alpromantik till hembygdsromantik*, 104–30; Andersson, *Den döende bandyn*, 27–30.
28. Sundmark, "Skiing and Being Swedish".
29. Sandell, "Ecostrategies," 64–9.
30. Föreningen för skidlöpningens främjandes styrelse, "Årsberättelse 1896–1897," 40–1; von Wolcker, "Anteckningar," 87–91.

31. See Åström, and Norberg, "Skidtyper," 95–6.
32. Åström, and Norberg, "Skidtyper," 100.
33. Yttergren, *I och ur spår*, 64.
34. Åström, and Norberg, "Skidtyper," 100–1.
35. Åström, and Norberg, "Skidstavar," 109; Collinder, "Skidlöpning," 19. See also: Föreningen för skidlöpningens främjandes styrelse, "Årsberättelse 1900–1901," 42–3.
36. Halvarson, "Ur Arvidsjaur's skidhistoria," 184.
37. Goksøyr, *Sivilisering, modernisering, sportifisering*, 51.
38. "De nationella skidtäflingarne i skidlöpning," *Östersundsposten*, March 3, 1894.
39. Berg, *Fra første stavgang*, 55–8.
40. Wilskman, *Idrotten i Finland i början af tjugonde seklet*, 101–7; Sandberg, *Den finska skidan*, 38.
41. Bomann-Larsen, *Den evige sne*, 127.
42. Föreningen för skidlöpningens främjandes styrelse, "Skidlöpningarna vid Saltsjöbaden den 5 februari 1899," 36; Föreningen för skidlöpningens främjandes styrelse, "Årets nationella skidlöpningar vid Sundsvall," 63; Nordenson, "De internationella längdloppstävlingarna på skidor," 133, 144; Nissing, "Skidtilverkning förr och nu".
43. For more about Huitfeldt and his importance to Norwegian skiing ideology, see Bomann-Larsen, *Den evige sne*, 124–39.
44. Åström, and Norberg, "Hantverksmässig skidtilverkning," 90–1; Collinder, "Skidlöpning," 16.
45. Sandberg, *Den finska skidan*, 81; Nordenson, "Gårdsägaren J. A. Grubbström," 392.
46. Jönsson, *Nordiska Spelen*, 36–7.
47. Hj. A. L:th, "Pressomdömen om Nordiska spelen," 108.
48. Föreningen för skidlöpningens främjandes styrelse, "Distansloppet Falun – Gefle Februari 1897," 182–3; Föreningen för skidlöpningens främjandes styrelse, "Årets nationella skidlöpningar vid Sundsvall," 42–3.
49. See Bååth, "Några drag ur skidloppens historia," 117.
50. See A.H., "Några ord om skidlopp med anledning af modellskidors utlemnande till folkskolorna," 107; Nordenson, "Den internationella skidutställningen i Stockholm," 235; Sörlin, "Nature, skiing and Swedish nationalism," 151–3.
51. Föreningen för skidlöpningens främjandes styrelse, "Årsberättelse 1896–1897," 29.
52. Ehn, Frykman, and Löfgren, *Försvenskningen av Sverige*, 38.
53. Erlandson-Hammargren, *Från alpromantik till hembygdsromantik*, 20–5; Frängsmyr, *Svensk idéhistoria*, 102–3.
54. See Ekström, *Den utställda världen*.
55. Föreningen för skidlöpningens främjandes styrelse, "Vid Föreningens för skidlöpningens främjande i Sverige 25-årsjubileum," 7.
56. "Den internationella skidutställningen i Stockholm," *På skidor 1902–1903*, 235–7.
57. See "Skididrott". *Ny Tidning för Idrott*, March 27, 1902; Orstadius, "Den internationella skidutställningen å Tattersall". *Svenska Dagbladet*, March 23, 1902.
58. Åström, and Norberg, "Maskintillverkade skidor," 105.
59. Lidström, *På skidor i kulturella gränsland*.
60. "I vårt referat om skidtävlingarne," *Jämtlands Allehanda*, March 7, 1894; Föreningen för skidlöpningens främjandes styrelse, "Årets nationella skidlöpningar vid Sundsvall," 62; Lindhagen, "Skidsportens utveckling," 64; Nordenson, "Fabrikör L. A. Jonsson," 407–8.
61. Kyrassier, "1:ste pristagaren". *Sundsvalls tidning*, February 23, 1899.
62. Orstadius, "Strödda minnen och rön från längdloppningarna i Bollnäs den 24 februari 1895." *Norrbottnens Allehanda*, February 25, 1896.
63. Föreningen för skidlöpningens främjandes styrelse, "Årets nationella skidlöpningar vid Sundsvall," 50.
64. Sahlin, "Bankdirektör S. Sahlins föredrag å den internationella Skidutställningen om den svenska längdloppningsskidan," 263.
65. Bröderna Larssons Snickeri- och Skidfabrik, *Skidor och tillbehör*, 6.
66. Lindhagen, *Från Pava-Lasse till Mora-Nisse*, 64.
67. Nissing, "Skidtilverkning förr och nu," 229.

68. S.S., "Stor skidtäfling i Upsala Februari 1892," *Malmberget*, December 19, 1892.
69. Föreningen för skidlöpnings främjandes styrelse, "Årsberättelse 1900–1901," 80; Nordenson, "En ny svensk backlöpnings-skida," 234.
70. "Norske ski og sportsartikler til utlandet," *Dagbladet*, January 21, 1910.
71. Yttergren, *Från skidsport till skogsmulle*, 71–6.
72. "Holmenkollentäflingarna 1912. Studieberättelse af Birger Nylund," Protokoll hållet vid sammanträde med Styrelsen för Svenska Skidförbundet den 19 April 1912, Svenska Skidförbundets arkiv A1a:1, RA, Täby, bil. A.
73. Nissing, "Skidtilverkning förr och nu," 234. See also: "Svenska Skidförbundet," *Stockholmstidningen*. January 19, 1912.
74. "Större fabriker och affärer i idrottsbranschen," *Aftonbladet*, January 25, 1914.
75. Gotaas, *Skimakerne*, 88.
76. Protokoll hållet vid sammanträde med Svenska Skidförbundets verkställande utskott den 15 December 1919, Svenska Skidförbundets arkiv A1a:2, RA, Täby.
77. Lindhagen, *Från Pava-Lasse till Mora-Nisse*, 79–83.
78. Svenska Skidförbundet, *Styrelseberättelse över verksamheten under arbetsåret 1917–1918*, Svenska Skidförbundets arkiv, RA, Täby, 7.
79. H. S – g., "Om skidor," 195.
80. "Svensk terrängskida av helt svensk form," *Svenska Dagbladet*, April 5, 1923.
81. Protokoll hållet vid sammanträde med Svenska Skidförbundets verkställande utskott den 24 November 1923, Svenska Skidförbundets arkiv A1a:2, RA, Täby.
82. "Björk och splitkein måste alltid finnas," *Aftonbladet*, March 5, 1939.
83. Protokoll hållet vid sammanträde med Svenska Skidförbundets verkställande utskott den 27 mars 1924, Svenska Skidförbundets arkiv A1a:2, RA, Täby.
84. af Klercker, *Svenska Skidförbundet 1908–1933*, 20.
85. See Lindhagen, "Skidsportens utveckling," 72.
86. Lidström, "Så har Vasaloppet skrivit om vår historia".
87. Hobsbawm, "Introduction".
88. The oft-repeated claim that Gustav himself skied has no historical basis.
89. Romson, *80 år i Fädrens Spår*, 8–9.
90. Lindhagen, "Är Vasaloppet värt uppmuntran?" *Idrottsbladet*, March 12, 1924.
91. "Vasaloppets framtid," *Idrottsbladet*, February 24, 1926.
92. Tim, "Varför skola svenskarna stå med mössan i hand för normän och finnar?" *Dagens Nyheter*, March 16, 1927.
93. Armas, "Vasaloppet är enastående," *Idrottsbladet*, March 4, 1931.
94. Tegnér, "Mora in memoriam," *Idrottsbladet*, March 21, 1927.
95. Svensson, *Scientizing Performance in Endurance Sports*.
96. Utterström, *Mitt skidlöparliv*, 79.
97. Johan "Klehan" af Klercker, "Aktuellt från Lake Placid," *Svenska Dagbladet*, February 14, 1932.
98. Lidström, *Zorn, kyrkloppen & idrottsrörelsen*, 138.
99. Janson, "Segern i Holmenkollen 1929," 286.
100. See Svenska Skidförbundet, *Styrelseberättelse över verksamheten under arbetsåret 1923–1924*, Svenska Skidförbundets arkiv, RA, Täby, 3; Svenska Skidförbundet, *Styrelseberättelse över verksamheten under arbetsåret 1924–1925*, Svenska Skidförbundets arkiv, RA, Täby, 5; Svenska Skidförbundet, *Styrelseberättelse över verksamheten under arbetsåret 1926–1927*, Svenska Skidförbundets arkiv, RA, Täby, 10; Svenska Skidförbundet, *Styrelseberättelse över verksamheten under arbetsåret 1927–1928*, Svenska Skidförbundets arkiv, RA, Täby, 20; Holmquist, "Internationella Skidförbundets tävlingar i Zakopane 1929," 219; "Skidförbundets tack," *Svenska Dagbladet*, March 6, 1930.
101. Utterström, *Mitt skidlöparliv*, 85–6.
102. See Rimfors, "Skidlöparutrustningen," 206.
103. Gotaas, *Skimakerne*, 44–5, 61–7; Åström and Norberg, "Maskintillverkade skidor," 105.
104. "Björk och splitkein måste alltid finnas," *Aftonbladet*, March 5, 1939.
105. "2 uppfinnare av en ny skida! Patentgruff?" *Dagens Nyheter*, November 7, 1929.

106. T – m., "Sågade skidan senaste nytt," *Dagens Nyheter*, November 7, 1933.
107. "På 'Sandströms-skidor' vunnos de svenska framgångarna i Lake Placid," *Svenska Dagbladet*, February 14, 1932; "Efterskörd från Holmenkollen," *Svenska Dagbladet*, March 6, 1930.
108. af Klercker, "Aktuellt från Lake Placid," *Svenska Dagbladet*, February 14, 1932.
109. Bergman, *Svenska skidförbundet 1933–1943*, 26.
110. Heinilä, "The Totalization Process in International Sport".
111. Lidström et al., "The dream of a universal ski wax"; Kuzmin, *Interfacial Kinetic Ski Friction*, 27.
112. Ehn, Frykman, and Löfgren, *Försvenskningen av Sverige*, 53–8.
113. Nybelius, *Förhandling pågåår*; Lindkvist, "Från skogsbyn till masstart".
114. Backman, and Svensson, "Where does environmental sustainability fit in the changing landscapes of outdoor sports?".
115. Svensson, "Landscapes of performance".

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The work was supported by The Physicist Dr. Ragnar Holm's Foundation.

Notes on contributor

Isak Lidström is a postdoctoral researcher in the Division of History of Science, Technology, and Environment at KTH Royal Institute of Technology in Stockholm. He also serves as a senior lecturer in sports science at the Swedish School of Sport and Health Sciences, where he is a member of the research group REMO (Research in Education & Movement Culture). He has authored several articles on traditional games, the history of Sámi sports, and the ethnobiological aspects of sports and games. Currently, he is working on two research projects. The first explores the technological history of Swedish cross-country skiing and is funded by The Physicist Dr Ragnar Holm's Foundation. The second, *Rex ludens*, examines the relationship between tennis, power, and monarchy in Sweden, spanning from the early modern period to the present. This project is funded by the Swedish Research Council for Sport Science.

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