



An even colder war? Specialization and scientization in the training methods of cross-country skiing from the 1940s in Sweden and the Soviet

Downloaded from: <https://research.chalmers.se>, 2025-06-18 04:28 UTC

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

Svensson, D., Åberg, A. (2017). An even colder war? Specialization and scientization in the training methods of cross-country skiing from the 1940s in Sweden and the Soviet Union.. Beyond Boycotts. Sport During the Cold War in Europe. Eds. Phillippe Vonnard, Nicola Sbeti and Grégory Quin: 33-54.
<http://dx.doi.org/10.1515/9783110529098-003>

N.B. When citing this work, cite the original published paper.

An even colder war?

Specialization and scientization in the training methods of cross-country skiing from the 1940s in Sweden and the Soviet Union

Introduction

The Cold War was a period of increasing international competition in sports. With the participation of more countries and the gradual restoration of elite athlete communities in countries which had been damaged by the 2nd World War, the need for rational preparation and training grew. For cross-country skiing, this was certainly true as the Soviet Union entered the international scene in the 1950s.

Scientization of training methods, in endurance training in general and in cross-country skiing in particular, accelerated in the 1950s.¹ In several European countries physiologists influenced physical practice in many areas of society (such as industry, domestic work, military, and education). The labs that produced this new knowledge also had links to the military sector. Athletes were often hesitant to this new development, but in the hardening competition on international level, sport associations saw new methods as necessary to stay competitive.

In this paper, we study the official (state-funded and published by governing organizations of sport, such as the Swedish Ski Association) training advice given to prospective elite skiers in Sweden and the Soviet Union from the late 1940s onwards. How was training advice affected by the Cold War context? In what ways did Sweden differ from the Soviet Union? What type of organizations took an interest in training and what ideas about the athletic body did they express? The question of how ties between rational training and military purposes influenced individual skiers in Europe can shed new light on how the Cold War affected sports, and vice versa.

The comparative method within historical research has been widely discussed, especially in the light of the emerging fields of *historie croisée* and transnational history.² Meanwhile, as Heinz-Gerhard Haupt has pointed out, although comparison has its pitfalls, it has a place in what he calls, a *histoire problème*, guided by theoretical reflections.³ In this

¹Svensson, Daniel. *Scientizing performance in endurance sports: The emergence of 'rational training' in cross-country skiing, 1930-1980*. Stockholm: Kungliga Tekniska Högskolan, Dissertation, 2016.

²E.g. Kocka, Jürgen. Comparison and beyond. *History and Theory*, 42 (2003): 39-44, Friberg, Katarina *et al.* Reflections on Transnational Comparative History from an Anglo-Swedish Perspective. *Historisk Tidskrift* 127 (2007): 717-737, Levine, Philippa. Is Comparative History Possible. *History and Theory* 53 (2014): 331-347.

³Haupt, Heinz-Gerhard. Comparative History- A Contested Method. *Historisk Tidskrift* (127) 2007: 697-716, 714.

article, using the theory of sportification, we want to compare training methods in two countries on either side of the Iron Curtain, during the post-war period, focusing on skiing, a sport in which they are two of four leading nations during this period.

The scientization of training in Sweden and the Soviet Union will be analyzed using the theory of sportification. According to this theory, certain key factors such as rationalization, standardization, specialization and professionalization occur in all sports. In essence, sportification means that sports develop in similar, predictable ways, becoming more rational, systematic, organized, and professional.⁴ Earlier research in sport history highlight training as one area where sportification is evident, and cross-country skiing is no exception.⁵ Today, younger sport-like activities such as competitive gaming (e-sport) undergo similar developments. Recent additions to the theory have argued that certain “technologies of sportification”, among them training manuals such as those studied here, has been an important tool for those who have advocated scientization of training.⁶ This article could further add to this development of sportification theory by comparing two politically and culturally different countries and their respective approach to scientific training in cross-country skiing. Does the sportification process change under different national and international political contexts, such as the Cold War? The sportification process is inherently transnational, as it includes organization (on all levels, not least internationally) and regimentation.

The texts studied here are the training manuals published by leading training scientists and organizations. For Sweden, we use the official training manuals published by the Swedish Ski Association. For the Soviet Union we use books and collections of articles written by researchers working as educators and scientists at the skiing faculties and research laboratories of different state institutes of Physical culture in the Soviet Union.⁷

We will begin with a short introduction about the organizations and other actors involved in the respective countries. Then we will move on with a detailed discussion of the

⁴Goksøyr, Matti. *Sivilisering, modernisering, sportifisering: fruktbare begreper i idrettshistorisk forskning?* Oslo: Oslo Universitet, 1988. Guttman, Allen. *From Ritual to Record. The Nature of Modern Sports*. New York: Columbia University Press, 1978 (see: 54-55). Yttergren, Leif. *Täflan ärlifvet: idrottens organisering och sportifiering i Stockholm 1860-1898*. Stockholm: Stockholmia, 1996 (see: 21-22).

⁵E.g. Yttergren, Leif. *Träna är livet: träning, utbildning och vetenskap i svensk friidrott, 1888–1995*. Malmö: idrottsforum.org, 2012. Svensson. *Scientizing performance in endurance sports*.

⁶Svensson, Daniel. Technologies of sportification - Practice, Theory and Co-Production of Training Knowledge in Cross-Country Skiing Since the 1950s. *European Studies in Sports History* 9 (2016): 1-29.

⁷ The names as well as the affiliation of these institutes change slightly over the studied period, but the main structure remains.

development of training in Sweden and the Soviet Union, and end with a comparison and a discussion about the differences and similarities we have found.

The organizations of training and sport science in Sweden and the Soviet Union

For a comparison between how two countries worked with scientization of training, it is important to look closer at the institutions and organizations involved in the process. Below we will shortly present a main background.

In Sweden, the leading center for sport-related physiology was the Royal Central Institute of Gymnastics (GCI), today known as the Swedish School of Sport and Health Sciences. The GCI had started already in 1813 but their department of physiology was opened in 1941. The physiologists there (among them Per-Olof Åstrand, Bengt Saltin and Björn Ekblom) made important contributions to Swedish and international work physiology, and they saw sports as an important outlet for their research. They were the architects behind the “rational training” model in Sweden, introducing interval training, carbohydrate loading, high-altitude training and acclimatization periods, bicycle ergometer testing, and much more.⁸

The other main actor driving the scientization of skiing was the Swedish Ski Association. It was on their initiative, following an embarrassing Swedish failure in the Olympic Winter Games in Oslo in 1952, that scientists from GCI in 1954 were engaged in testing and analyzing the physical performance of cross-country skiers in the Swedish national team. Soon these scientists had completely changed the theoretical base for training, even if it took much longer for training to change in practice. The Swedish Ski Association was, compared to their counterparts in other leading winter sport nations such as Norway, an early adopter of scientific training. This rather dramatic change in training ideology was motivated by increasing international competition, mainly represented by the Soviet Union who also had ambitious plans for increasing sport performance through science.⁹

In the Soviet Union, the Sport and Physical health was a central issue for the state from the start. Sports were an important means of activating and educating the workers in the rapidly urbanizing and industrializing state. Two means to inspire the populace and engage them was to create an elite of professional sportsmen as role models and to use competition as a means of encouraging people to both watch and participate. In the early days of the Soviet

⁸See: Schantz, Peter. Along paths converging to Bengt Saltin's early contributions in exercise physiology. *Scandinavian Journal of Medicine and Science in Sports* 25 (2015): 7-15; Svensson, Daniel. How Much Sport is there in Sport Physiology? Practice and Ideas in the Stockholm School of Physiology at GCI, 1941-1969. *The International Journal of the History of Sport* 30 (2013): 892-913.

⁹Svensson. Technologies of Sportification - Practice.

state, in the context of the civil war and so called War communism, control over all sports clubs and organizations were given to the newly formed Central Board of Universal Military Training. After the war this organization changed and the militarization of sports came under criticism during the 1920s, especially from scientists, many of which worked at the Moscow State Institute of Physical culture. This Institute was created in 1918 and, together with the already existing Lesgaft Institute of Physical Culture in St Petersburg, tasked with the education of physical culture instructors. In the early 1930s, similar institutes were also set up in Kiev, Tbilisi and Stalingrad, and state research institutes for physical culture were created in Tbilisi, Leningrad, Moscow and Kharkov.¹⁰ By that time, the criticism regarding the competitive nature of sports and physical culture had been mostly silenced, and from the mid-1920s onwards, competition became central to Soviet sports ideology.¹¹ Further, a re-militarization took place, with sports again becoming a means of providing pre-military training and overall fitness in order to prepare for the nation's defense, not least through the "Ready for Labour and Defense"-programme (GTO, Gotov k Trudu i Oborone), consisting of a badge and ranking system for all soviet citizens. The two-fold goal of the GTO was to broaden the participation in sports as well as to establish a "mass base" from which to draw star athletes and soldiers, and skiing was one of the mandatory categories.¹² In 1934 the official title "distinguished master of sport" was instated, and this year can be seen as a starting point for the formation of a Soviet sports elite through the development of structural frameworks, hierarchies, models of behavior and internationalization.¹³ Earlier, the Soviet Union had stayed out of "bourgeoisie" international events (such as the Olympic Games) and international federations and committees, opting for encouraging a proletarian sport system through the creation of and participation in the Socialist Workers' Sport International. During the 1930s, however, the attitude towards the western sports system changed, and opened up

¹⁰Grant, Susan. *Physical Culture and Sport in Soviet Society: Propaganda, Acculturation, and Transformation in the 1920s and 1930s*. New York: Routledge, 2013, (see: 30-33 and 181); Riordan, James. *Sport in Soviet Society: Development of Sport and Physical Education in Russia and the USSR*. Cambridge: Cambridge University Press, 1977 (see: 69-70; 77 and 146).

¹¹ Gounot, André. De L'hygiène du corps à l'obsession des records. Les mutations politiques et idéologiques de la fizkul'tura en russie, 1921-1937. *Science Sociales et Sport* 6 (2013) : 9-34 (see: 21-31).

¹²Grant. *Physical Culture and Sport in Soviet Society* (see: 37-41); Riordan. *Sport in Soviet Society*: 129; Kobchenko, Kateryna. Emancipation within the Ruling Ideology: Soviet Women in Fizkul'tura and Sport in the 1920s and 1930s. In *Euphoria and Exhaustion : Modern Sport in Soviet Culture and Society*, Katzer, Nikolaus et al. (eds.): 250-267. Chicago: Chicago University Press; Frank, William D. *Everyone to Skis!: Skiing in Russia and the Rise of Soviet Biathlon*. DeKalb, Ill.: Northern Illinois University Press : 81.

¹³ Dufraisse, Sylvain. Les "Héros du Sport". La Fabrique de l'Elite Sportive Soviétique (1934-1980). *Bulletin de l'Institut Pierre Renouvin* 44 (2016) : 147.

for later memberships in the international sports federations, after the Second World War.¹⁴ Although the country came out of the war bearing many losses and with an exhausted and physically weak population, it also came out with a newborn patriotism and a will to, as O'Mahoney has put it, "claim further victory on the sports field of the world".¹⁵ This meant, among other things, joining international sports federations and starting to compete in the "bourgeoisie" international competitions, and the Soviet Union joined the International Ski Federation (FIS) in 1946.¹⁶

Training instructions in Sweden – From experiential to scientific training

In Sweden there has been a clear shift from "natural", experiential training in the 1940s to a more scientific approach in the 1970s. The changes in training ideology came due to a scientific turn initiated by the Swedish Ski Association, together with the leading environment for physiology research in Sweden, the Royal Central Institute of Gymnastics (GCI). However, the scientific turn was also the result of a changing and growing transnational sport community, with increasing participation and competition.

Starting before the scientific turn, in 1948, the training manuals were written by the Swedish training ideologist Gösta Olander, who apart from being active as a coach for the national team also was a hotel manager at Vålådalen alpine station in the mountains outside Östersund, a filmmaker, writer and tourist guide. Olander's views on training were based on experience and tradition, rather than science. He advocated a holistic method that built on practical experience, and he saw the movements of the Sami and of mountain wildlife as a source of inspiration for would-be athletes. He even refers to the classic idea of *mens sana in corpore sano* – a sound mind in a sound body.¹⁷ A few years later, such references would be replaced by scientific test results. This change was inspired by research tracing its roots to the Copenhagen School of Physiology, intensified when Soviet skiers started to make an impact on the international scene and was widely discussed and negotiated within the international organizations of sport (such as the IOC and FIS).¹⁸ The national process of scientizing training in endurance sports was both part of and affected by an international context.

¹⁴ Keys, Barbara. *Globalizing Sport: National Rivalry and International Community in the 1930s*. London : Harvard University Press, 2006 (see: 161-162 and 169-172).

¹⁵ O'Mahony, Mike. *Sport in the USSR: Physical Culture - Visual Culture*. London: Reaktion Books, 2006 : 152.

¹⁶ Riordan. *Sport in Soviet Society*: 365.

¹⁷ Olander, Gösta. *Träningsråd för skidåkare*. Stockholm: Swedish Ski Association, 1948, 1950, 1952: 4.

¹⁸ E.g.: Svensson. How Much Sport is there in Sport Physiology?; Schantz, Along paths converging to Bengt Saltin's early contributions in exercise physiology; Åstrand, Per-Olof. Physiological aspects on cross country skiing at the high altitudes. *FIS Bulletin* 8 (1962): 24.

For Olander, the natural variations of the landscape were not a problem but rather a potential advantage, if used right. Olander recommended running in moors and slopes during the summer, while running in deep snow or skiing during the winter.¹⁹ Olander was not alone in appreciating the mountains as an arena for training – some of his international colleagues already in the 1930s advocated training in mountain landscapes.²⁰ He did not use any of the scientific language found in later editions of the official training manual, such as lactic acid threshold, periodization or oxygen uptake. Olander was also modest about the universality of his training model, and stated that “what suits one, may not suit the other at all”.²¹ At the time, Swedish skiing was still a male-dominated endeavor, even though there was Swedish Championship races arranged also for female skiers since 1917. In Olander’s manual, there is no sign of female skiers whatsoever. He repeatedly talks about men or boys, and all the pictures show male skiers. The pictures in Olander’s book are quite interesting. They show male skiers running in snow, running in mountains, sawing wood, and of course skiing. Only one image shows anything that could be linked to a more scientific training regime, and that is a picture of a male skier training with a bicycle tube.²² Almost as to anchor this rather apart picture in Olander’s natural training ideology, the bicycle tube training is done with the tube wrapped around a birch tree.

Following the Swedish failure in the Olympic Winter Games in Oslo in 1952, the Swedish Ski Association removed most of Olander’s assignments and replaced his training manuals with new editions, this time written by physiologists and/or officials within the Swedish Ski Association who had a background at the Royal Central Institute of Gymnastics (GCI). When physiologists and educated officials took over the duty of writing these manuals, the advice on training gradually changed.

In the 1958 edition, written by the former GCI student Calle Briandt, Olander’s naturalistic training was already being replaced by a more scientific approach.²³ There was much less focus on the role of landscape and mind, and much more on physiology. Oxygen uptake and other concepts from physiology were introduced. In terms of practical training, Briandt argued for more intervals, higher intensity and in general a scientific base. Briandt, himself a supporter of scientific training and organized development of talent, would be one

¹⁹Olander. *Träningsråd för skidåkare*: 4-5.

²⁰Yttergren. *Träna är livet: träning, utbildning och vetenskap i svensk friidrott, 1888–1995*: 85-87.

²¹Olander. *Träningsråd för skidåkare*: 3.

²²Olander. *Träningsråd för skidåkare*: 7.

²³Briandt, Calle. *Träningsråd i längdloppning*. Stockholm: Swedish Ski Association, 1958, 1962.

of the architects behind the Swedish system for elite sport education on upper-secondary level, the so called Riksidrottsgymnasium which started in 1972.

The scientific turn in Swedish skiing was clearly manifested through changes in training setup illustrated by these manuals. As the official publications of the Swedish Ski Association, the manuals represented the training theory advocated by the most influential sport leaders and work physiologists in the country. These manuals were published with uneven intervals, from the 1940s and onwards. Most were printed in at least two editions, and in this text we therefore list all the editions where applicable.

After the dropping of Olander from the position as leading training ideologist, Briandt held the position throughout the 1950s and 1960s, informally with the aid of physiologists from GCI. His manual from 1958 was re-printed in 1962 and 1965, with the same content. It was a clear step away from much of what Gösta Olander had focused on. Briandt mentions “rational ski training” already in the beginning and states that those who undergo such training can testify that it is not only efficient but also fun.²⁴ In contrast to Olander, Briandt also argues that a stopwatch should be used in training sessions as it works stimulating and enhances the training effect.²⁵ And unlike his predecessor, Briandt provides a detailed training program with more focus on interval training and constant increase in intensity. In line with the scientization of training, the use of a training log for evaluation of training is recommended.²⁶ This is also the first time that something similar to carbohydrate loading before a competition, an idea developed by GCI physiologists, is described in the official training advice.²⁷

Briandt was also involved in the new manual from 1967 which he co-authored together with the national team coach and former elite skier Lennart Larsson.²⁸ Larsson also had a background at GCI and was a supporter of scientific training setup if paired with experience and individualization.²⁹

With the entrance of Lennart Larsson, the editorial team for the training manual now included both practical, experiential knowledge (represented by the former elite skier Larsson) and theoretical, scientific knowledge (represented by the former GCI student Briandt). This setup meant that while the base of the manual came from physiology, it also had a practical perspective which made it more useful for skiers.

²⁴Briandt. *Träningsråd i längdloppning*: 3.

²⁵Briandt. *Träningsråd i längdloppning*: 5.

²⁶Briandt. *Träningsråd i längdloppning*: 19.

²⁷Briandt. *Träningsråd i längdloppning*: 24.

²⁸ Larsson, Lennart and Briandt, Calle. *Träningsråd i längdloppning*. Stockholm: Swedish Ski Association, 1967.

²⁹ Interview with Lennart Larsson, 7 January 2013.

In 1970, GCI physiologist Sune Wehlin was responsible for the training manual. He started by claiming that the era of forestry workers as the best skiers was coming to an end, and that Sweden now was in need of a more scientific approach to secure future success in the international competitions.³⁰ This volume is also the most ambitious regarding ski wax, with an entire chapter devoted to different types of wax, discussion of weather conditions etcetera.³¹ Ski wax is not discussed by Olander in his 1948 manual, but sporadically appears in the other earlier volumes.

By 1974, the scientization process had really made its mark on the training manuals. Already in the first sentence the word rational is used to describe a scientifically guided training setup. The new feature in this volume was the emphasis put on the individuality of the skier. Ulf Bergh clearly stated that what science could provide was not an exact training program that would work for everyone, but rather a scientific base, leading principles which each skier then had to adapt to their own qualifications and preferences.³² Nevertheless, Bergh and his co-authors did not abstain from making detailed training programs, with advice regarding periodization, intensity and amount. They also provided detailed numbers on oxygen uptake, pulse, lactic acid concentration and other indicators to explain the effect of certain types of training, such as rollerskiing.³³ Another notable change in the 1974 edition was the comeback of psychological factors, which had been more or less absent in the previous editions. In Olander's manual from the 1948, psychological factors were very important even though Olander did not talk about psychology but rather about the importance of enjoying training and never becoming a "training machine" as that may lead to losing "the spark".³⁴ We thus see that the psychological aspects of training were absent during the first decades of scientization, but returned during the 1970s in a scientific form, as sport psychology and mental training.

In summary, the official training advice given by the Swedish Ski Association shifted quite dramatically from the natural, experiential training of Gösta Olander in the 1940s and early 1950s, to a scientific approach designed by physiologists in the 1970s. It is interesting to see this change in relation to the Cold War context, as the removal of Olander from the leading positions was sparked by Swedish failure in the 1952 Winter Olympics in Oslo, and a fear that Soviet skiers were going to be more and more successful (which they were, starting

³⁰ Swedish Ski Association. *Åk skidor*. Täby: Larson, 1970: 7.

³¹ Swedish Ski Association, *Åk skidor*: Täby: Larson, 1970: 87-106.

³² Bergh, Ulf (eds.). *Längdloppning på skidor: träningsråd*. Bjästa: CeWe-förlaget, 1974: 5.

³³ Bergh. *Längdloppning på skidor: träningsråd*: 32.

³⁴ Olander. *Träningsråd för skidåkare*: 4.

in Falun two years later). The increasing competition of the early Cold War was an important factor in the Swedish change of training ideology, and like in so many other areas of Swedish society, science was the solution.³⁵ Even if the Swedish Ski Association took an interest in other nations and their approach to training, there was a firm belief that a close cooperation with science would result in more Swedish medals. This may seem like an obvious development, given the sportification theory and its emphasis on continuous specialization and rationalization. However, Norway did not make a similar scientific turn until much later, in the 1970s.³⁶ An important explanation of the early Swedish attempts to make training more scientific was that it was part of a larger rationalization movement, which affected not only sports but industry, military, schools, household work and much more.³⁷ Without this connection, it is hard to see how such ambitious research on athletes could have been financed. The Swedish sport-related research was therefore implicitly political, closely linked to military research and ambitions which were clearly connected to the Cold War arms race. This was an era when “success in the sports realm reflected superior managerial, geopolitical, and fiduciary ideology”.³⁸

Training instructions in the Soviet Union – Periodization for the pride of the nation

In 1948, the Central Committee of the USSR named skiing one of the prioritized sports to develop within the Soviet Union, as an activity having both a use in everyday life, as well as being indispensable for the army. Skiing had long been a sport closely connected with the armed forces, and although skiing developed as a mass phenomenon before the war, its members constituted an exceptionally large proportion of practitioners. Not least during the Finnish-Soviet war, skiing was proven to be of central strategic value, when Finnish troops opposed the Soviet army mainly through guerrilla warfare on skis. Finnish tactics and skills were then adopted by the Soviet troops in the following war efforts.³⁹ After the war, images of the Soviet skiing troops would become iconic, and skiing acquired an important symbolic value through its connection to the Great Patriotic War; in the words of William Frank it became an “all-encompassing Soviet metaphor”.⁴⁰ This symbolic value, in combination with a

³⁵Svensson. *How Much Sport is There in Sport Physiology?*

³⁶Sandbakk Øyvind and Tønnesen, Espen (eds.). *Den norske langrennsboka*. Oslo: Aschehoug, 2012.

³⁷Svensson. *How Much Sport is There in Sport Physiology?*

³⁸Wagg, Stephen and David L. Andrews (eds.). *East plays West: sport and the Cold War*. Routledge, London, 2007: 45.

³⁹Frank. *Everyone to Skis!: Skiing in Russia and the Rise of Soviet Biathlon* : 88-89; Harlamov, N. I., Krivcov, M. M. *Обучение и тренировка лыжника* [The Education and Training of the Skier]. Moscow: Voennoe Izdatel'stvo, 1949: 9; Riordan, *Sport in Soviet Society* : 140.

⁴⁰ Frank. *Everyone to Skis!: Skiing in Russia and the Rise of Soviet Biathlon* : 117.

view of skiing as embodying ideals of endurance, moral and physical health, courage, and possibility for mass participation while also speaking to a nationalist narrative about skiing as originating in Siberia and the Altai-mountains and being inherently “northern”, made skiing the “quintessential example of social realist sport”.⁴¹ When the battle against the capitalist system was transferred to international sports competitions, skiing therefore became a central arena for exhibiting Soviet mastery. Training was a crucial weapon in this international battle, and a lot of resources were put into scientific research into training methods in a broad range of sports.

The goal of the Central Committee in 1948 was two-fold: for the “mastery of Soviet skiers” to increase, and for Soviet skiers to reach a leading position internationally.⁴² The committee also asked especially for a sharing of knowledge between the generations so that older ski champions could teach and inspire the younger ones, and at least two books were published in 1951 and 1953 with this goal in mind.⁴³ This way of teaching skiing and training seems to have been widespread, at least according to authors who partly came to criticize what they considered an un-critical transfer of knowledge and style from one generation to another, as we will see further on.

However, there was also a longer scientific research tradition on sports and training, with roots from prerevolutionary Russia.⁴⁴ Thus, the bases of ski training proposed in the late 40s and early 1950s when our period of analysis starts, were already established before the war. These base presumptions can be found for example in Lieutenant Colonel Kharlamov and Major Krivcov’s manual from 1949, aimed at army coaches and skiers. The authors cite systematic exercises, a constant but slow increase of workload, a diversified training, a correct match between training and rest, and a correct intensity of work load as the basic principles of

⁴¹ O’Mahony. *Sport in the USSR: Physical Culture - Visual Culture* : 165, Frank; *Everyone to Skis!: Skiing in Russia and the Rise of Soviet Biathlon*: 5-6, 114-118. For examples see Harlamov, Krivcov, *Обучение и тренировка лыжника*: 3; Serebrjakov, V. A. *Лыжный спорт: Обучение и тренировка* [Skiing: Teaching and training]. Moscow: Fizkul’tura i Sport, 1952 : 4.

⁴²Serebrjakov, V. A. *Лыжный спорт: Обучение и тренировка* : 4.

⁴³Drugov, V. (ed.), *Мастера лыжного спорта делятся опытом: Сборник статей. [Masters of Sports Share their Experience, Collection of Articles]* Moscow: Voennoe Izdatel'stvo, 1951; Nemuhin, I. A. *На спортивной лыжне: Очерки об опыте мастеров лыжного спорта* [In the Ski Racing Track: Remarks on the Experience of Masters of Skiing]. Moscow: Fizkul’tura i Sport, 1953.

⁴⁴I.e. Zamjatin, A.M. Развитие методики обучения и тренировки лыжников в России [The Development of instruction and training methods for skiers in Russia]. In *Лыжный спорт: Сборник научных работ. Выпуск 1* [Skiing: Collected Scientific Work. First Edition], M.A. Agranovskij, 26-48. Moscow: Fizkul’tura i Sport, 1957 : 37-38.

training.⁴⁵ Another basic principle of soviet sport that can be traced back to pre-revolutionary authors was periodical year-round training also for those sports with a very clear seasonal cycle, such as skiing.⁴⁶ Although details of the planning of these periods were discussed and developed over time, the idea and practice of year-round training as well as its basic principles seems to have been completely undisputed from the very beginning of the post-war period and onwards.

Periodical training in skiing was organized in three periods: The preparatory period, the main period (when competition takes places, sometimes called the competition period), and the transitional period.⁴⁷ Of these, the preparatory period was the longest and most important one. From the beginning, the aim of training in the preparatory period was simply to train endurance, flexibility, strength, coordination of movement as well as what was called “will qualities”, such as courage, willpower and decisiveness. The point was for the athlete to be in as good condition as possible before the first snowfall so that all snow time could be spent competing and training on skis.⁴⁸ Over time, technique became more and more important during the preparatory period, and in 1971 D. D. Donskoi and H. H. Gross, researchers in biomechanics at the State Central Institute of Physical Culture in Moscow, pointed out that the times when skiers train technique only on snow are long gone, since skiers simply do not have the time to practice technique during the winter anymore.⁴⁹ The main period started when the first snow fell, and the goal during this period was to get back onto the skis and train technique and endurance, while reaching peak performance and work capacity. Then

⁴⁵Harlamov, Krivcov. *Обучение и тренировка лыжника* : 160.

⁴⁶Zamjatin. Развитие методики обучения и тренировки лыжников в России : 42-43; Matveev, L. P. *Проблема периодизации спортивной тренировки, 2-е издание* [The issue of periodisation of sports training]. Moscow: Fizkul'tura i Sport, 1965: 5-7.

⁴⁷Bergman, B. I. *Лыжный спорт: Тренировка лыжников-гонщиков, слаломистов, прыгунов с трамплина и двоеборцев* [Skiing: Training Skiers in Cross Country, Downhill, Ski Jumping and Biathlon]. Moscow: Fizkul'tura i Sport, 1959: 8-12; Zamjatin, Развитие методики обучения и тренировки лыжников в России : 43-44; Koškin, A. A. Исследование некоторых вопросов методики тренировки лыжников-гонщиков в подготовительном периоде [Research on issues of training methods for cross-country skiers in the preparatory period]. In *Лыжный спорт: Сборник научных трудов* [Skiing: Collected scientific works], V. S. Martynov, 2-7. Moscow: VNIIFK, 1978; Harlamov, Krivcov. *Обучение и тренировка лыжника* : 162; Naumov, V.M. Тренировка лыжника-гонщика [Training the Cross-country Skier]. In *Лыжный Спорт: Методические материалы (В помощь инструкторам-общественникам и тренерам)* [Skiing: Methodological Material (to the Aid of Community Instructors and Coaches)], A.A. Alekseev, 23-47. Moscow: Goskul'tprosvetizdat, 1954: 23.

⁴⁸I.e. Donskoj, A. Тренировка лыжниц [Training female skiers]. In *Сборник методических писем по лыжному спорту и зимней тренировке легкоатлета* [Collection of Methodological Letters on Skiing and Winter Training of Track and Field Athletes], 4-8. Saransk: Komitet Po Delam Fizičeskoj Kul'tury i Sporta pri Sovete Ministrov Mordovskoj ASSR, 1952; Harlamov, Krivcov. *Обучение и тренировка лыжника* : 167; Naumov. Тренировка лыжника-гонщика : 24-25.

⁴⁹Donskoj, D. D., Gross, H. H. *Техника лыжника-гонщика: Техническое мастерство*. [The technique of the cross-country skier: Technical mastery] Moscow: Fizkul'tura i Sport, 1971 : 90.

competitions would start, as well as a strict regime of competition and rest in order to keep performance up during the whole season. The transition period was a period of less training and so called active rest. Already in 1954 V. M. Naumov, a master of sports at the skiing faculty of the Moscow State Central Institute of Physical culture, argued that professional athletes should never stop training completely, unless there were medical reasons.⁵⁰

The main tool used to fulfill these basic principles of training was rigorous and correct planning of work and work load. Already in Kharlamov's manual there is a daily training plan for the month before races of different distances, and from the early 50s exact plans for the whole year are elaborated.⁵¹ Several authors write specifically about training women, and in the plans over activities in the manuals there are always parallel plans for women.⁵² In the late 1940s and early 1950s, other sports were encouraged as training methods outside of the main period, and it seems to have been common that athletes competed both in a summer sport and a winter sport.⁵³ Over time, however, as more and more time during the preparatory period came to be dedicated to specialized exercises in skiing technique, professional athletes were discouraged from competition in other sports.⁵⁴

This strict periodisation and planning was paired with scientific research on specific training activities. Advanced formulas for calculating the angles of track topography as well as the skiers body parts in movement, were combined with physiological research on muscles and nerves as well as sports psychology. The Soviet Union was at the forefront of the field of sports psychology during this time, while the field was not very active in the west.⁵⁵

Although biomechanical studies of technique had been a part of skiing research for some time biomechanical analysis of skiing technique became even more a focus for the researchers and authors of the skiing manuals we have studied during the end of the 50s and 60s, and this seems to a large extent connected to the international context of competition.⁵⁶ After the goal set up by the Central Committee in 1948, Soviet skiers started to compete in

⁵⁰Naumov. Тренировка лыжника-гонщика : 47.

⁵¹Harlamov, Krivsov. *Обучение и тренировка лыжника* : 179-180; Naumov. Тренировка лыжника-гонщика : 34-43.

⁵²I.e.; Bergman. *Лыжный спорт* : 141-143; Donskoj. Тренировка лыжниц.

⁵³Harlamov, Krivsov. *Обучение и тренировка лыжника* : 52.

⁵⁴Naumov. Тренировка лыжника-гонщика : 24.

⁵⁵Frank. *Everyone to Skis! : Skiing in Russia and the Rise of Soviet Biathlon*: 127-128.

⁵⁶Donskoj, D. D. К вопросу о биодинамическом анализе лыжника-гонщика [On the Issue of Biodynamic Analysis of the Technique of the Cross-country Skier]. In *Лыжный спорт: Сборник научных работ. Выпуск I* [Skiing: Collected Scientific Work. First Edition], M. A. Agranovskij, 151-156. Moscow: Fizkul'tura i Sport, 1957 : 152

international events. However, the big entry on the international stage was the world skiing championships in Falun 1954, where Soviet skiers performed well, taking first place in the 30- and 50 kilometre races, as well as a second place in the relay for the men, and first place on 30 kilometre and the relay for women.⁵⁷ The positive results of this competition and others that followed paved the way for the first Soviet participation in the winter Olympic Games in 1956.⁵⁸ However, already in 1954, V.M. Naumov commented on the difficult terrains and high altitudes of contemporary international competition tracks, pointing out that Soviet skiers need to practice more through competition training and under different terrain conditions⁵⁹. In 1957, after the Olympic games in Cortina d'Ampezzo where the Soviet team won most medals in total, albeit only one gold in skiing for the male skiers, the one in relay, he exhibited a clear annoyance regarding what he considers the technical problems of the Soviet skiers. He claimed that the problems encountered by Soviet skiers during the Olympic games in 1956 was due to their technique not being effective and flexible enough in difficult terrain and that they were not able to adapt their endurance and tempo in the long-distance races. Naumov concluded, that Soviet competitions need to be held in more difficult terrain, that more specific imitation exercises should be used during summer and fall, and that in order to secure the future generations of skiers, young skiers need to specialise earlier.⁶⁰ The female skiers, on the other hand excelled in Cortina D'Ampezzo, and this was a pattern that would continue all through the 1960s and 1970s, with the Soviet male skiers performing unevenly, while the women were virtually unstoppable.⁶¹ This, however, did not stop Naumov from specifically criticising the technical inefficiency of the female skiers.⁶²

In a collection of articles from 1964, written by a group of sport researchers from different disciplines, Naumov's critique of Soviet training was almost repeated word for word, although this time concerning the Olympic Games 1960 in Squaw Valley and the World cup 1962 in Zakopane. Both events were surrounded by cold war politics and symbolic, not least

⁵⁷ Frank. *Everyone to Skis!: Skiing in Russia and the Rise of Soviet Biathlon*: 129.

⁵⁸ Riordan. James. *Sport in Soviet Society*: 367.

⁵⁹ Naumov. Тренировка лыжника-гонщика : 44.

⁶⁰ Naumov, V.M. Анализ подготовки советских лыжников-гонщиков к VII зимним олимпийским играм [Analysis of the Preparations of the Soviet Cross-country Skiers for the 7th Winter Olympics]. In *Лыжный спорт: Сборник научных работ. Выпуск 1* [Skiing: Collected Scientific Work. First Edition], M.A. Agranovskij, 49-66. Moscow: Fizkul'tura i Sport, 1957 : 62-66; Donskoj, D. D., Naumov V. M. Гонки на лыжах: Методические материалы по технике и тренировке [Racing on Skis, Methodological Material on Technique and Training]. Moscow: Москва: Komitet po Fizičeskoj Kul'ture i Sportu RSFSR, 1957: 13-15; Donskoj, D. D., Naumov V. M. Лыжные гонки: Методические материалы по технике и тренировке [Ski Racing: Methodological Material on Technique and training]. Moscow: Sovetskaja Rossia, 1957: 3-4.

⁶¹ Frank. *Everyone to Skis!: Skiing in Russia and the Rise of Soviet Biathlon* (see: 129-130; 196; 204-205).

⁶² E.g. Naumov. Анализ подготовки советских лыжников-гонщиков к VII зимним олимпийским играм; Donskoj, Naumov. *Гонки на лыжах* : 13-15.

the cup in 1962, taking place in two places on either side of the Iron Curtain, and both held great expectations for Soviet victories. However, in the end these events had proven disappointments in regards to the male cross-country skiers who despite having a stable team with all members in the top group, won no gold or silver medals.⁶³ The authors of the 1964 collection attribute the problems to one-sided training and a “dismissive attitude” towards specific imitation exercises during the preparatory period, as well as a lack of systematic year-round training.⁶⁴ Although we have no means at this time to know anything about the realities of ski training, as opposed to the theory of these manuals and articles, we may speculate from this reoccurring critique that getting coaches and skiers to comply with the proposed methods of training was not a completely smooth process.

On the cross-country skiing arena, the main rivals were Finland, Norway and Sweden and the Scandinavian skiers are clearly the ones that the Soviet athletes were measured against in the reports from the Olympic Games.⁶⁵ However, although observers followed the rival athletes at competitions, finding information about the everyday training of Scandinavian skiers seemed more difficult. For example, in an article about the preparations of Scandinavian skiers for the Olympic Games in 1962, the sources seem to be rather solid about the Finnish skiers, from whom the author has consulted detailed daily training routines, and other training material, whereas the Norwegian information is based on an interview book portraying Hallgeir Brenden from 1956 (*Gull i spor*). The information about the Swedish skiers is confessed to be sparse, and the few paragraphs about Swedish training seem to be taken from journal interviews with Swedish skiers Sonja Edström and Sixten Jernberg.⁶⁶

Over time, training methods developed in what seems to be a rhythm at least partly decided after the Olympic Games, where Olympic results were evaluated and training regimes proposed in line with what seemed to be the biggest deficits. As an example, in 1964, V. I.

⁶³ Frank. *Everyone to Skis!: Skiing in Russia and the Rise of Soviet Biathlon* : 160-165.

⁶⁴Kamenskij, V. I. Планирование спортивной тренировки [Planning Sports Training]. In *Лыжные гонки: Учебное пособие для тренеров* [Ski Racing: Teaching Guide for Coaches], V. I. Kamenskij, 122-144. Moscow: Fizkul'tura i Sport, 1964: 123; Spiridonov, K. N. Современная техника и ее совершенствование. [Contemporary Technique and its Perfection]. In *Лыжные гонки: Учебное пособие для тренеров* [Ski Racing: Teaching Guide for Coaches], V. I. Kamenskij, 7-81. Moscow: Fizkul'tura i Sport, 1964: 7.

⁶⁵See e.g. Agranovskij, M. A. *Зимние Олимпийские Игры (Лыжный Спорт)* [Winter Olympic Games (Skiing)]. Moscow: Gosudarstvennyj Central'nyj Ordena Lenina Institut Fizičeskoj Kul'tury im. I.V. Stalina, 1959; Dvorjašina, G. V. Об изменении длины и частоты шагов и средней скорости у лыжников на трассах зимних олимпийских игр [On the Changing of Step Length and Interval and the Medium Speed of Skiers on the Tracks of the Winter Olympic Games]. In *Лыжный спорт: Сборник научных работ. Выпуск 1* [Skiing: Collected Scientific Work. First Edition], M.A. Agranovskij, 203-209. Moscow: Fizkul'tura i Sport, 1957.

⁶⁶Šapošnikova, V. I. Подготовка скандинавских лыжников [Preparations of the Scandinavian Skiers]. In *Лыжный спорт: Сборник методических материалов* [Skiing: Collected methodological materials], 63-76. Moscow: Fizkul'tura i Sport, 1962.

Kamenskij proposed a new planning strategy, arguing that the most rational planning interval was on the basis of a “perspective planning” over four years.⁶⁷ Technique was especially interesting in this regard, as well as difficult to assess and communicate to skiers. Over time the technology for assessing technique developed. Biomechanics was a central field to draw from, and new methods of measuring and analysing technique developed over this period.⁶⁸ The method of uncritically studying techniques of successful champions and directly transferring their style was criticised at quite an early stage for not taking into account the individual characteristics of the skiers.⁶⁹ In 1971, Donskoi and Gross commented that Soviet skiers and researchers now know that the styles that were passed down during the early 1950s were faulty, and today technique is formulated as a tool to answer to a “system of specific demands”, instead of just advice from individuals.⁷⁰ In 1957, Donskoi described biodynamical analysis of technique citing the study of kinematics (through the use of kinograms and films) of movement and measurement strength using dynamometers, and different ways that these methods are being developed, for example through the invention of dynamographical skis.⁷¹ Roller skis became an important addition to technique training and in the 1970s, other technologies of technique assessment were developed, such as dynamographical tracks and mathematical analysis of materials on computers.⁷² Physiological measurements such as oxygen uptake became increasingly important during the 1960s. This was an area where Sweden excelled, and in a publication from 1964, the Soviet authors have consulted results from oxygen uptake assessments by the Swedish physiologist Per-Olof Åstrand from 1956-

⁶⁷ Kamenskij. Планирование спортивной тренировки.

⁶⁸ For a discussion of biomechanics and its influence on training see Braun, Hans-Joachim and Katzer, Nikolaus. Training Methods and Soccer Tactics in the Late Soviet Union: Rational Systems of Bodies and Space. In *Euphoria and Exhaustion*, Katzer *et al.* (eds.): 269-293.

⁶⁹ Vzorov, B. N., Jananis, S. V. Что дают публикуемые научные работы для теории, методики обучения и тренировки лыжника? [What can Published Scientific Work give to Theory, Methods of Education and Training of the skier?]. In *Лыжный спорт: Вопросы научно-изучения лыжного спорта: Сборник статей* [Skiing: Issues from the Scientific Study of Skiing], G. M. Krakovajak, A. N. Krestovnikov, A. C. Puni, S. V. Jananis, 5-11. Moscow-Leningrad: Fizkul'tura i Sport, 1948: 5.

⁷⁰ Donskoj, Gross. Техника лыжника-гонщика :16.

⁷¹ Donskoj, Gross. Техника лыжника-гонщика : 3.

⁷² i.e. Ermakov, V. V., Makarov, A. A. Сравнительная характеристика техники передвижения попеременным двухшажным ходом на лыжах, лыжероллерах, роликовых коньках и при имитации [Comparative Technical Character of Movement by Rotation in the Double Step on Skis, Roller Skis, Roller Skates and through Imitation] In *Лыжный спорт: Сборник статей* [Skiing, Collection of Articles], N. I. Kuz'min, 122-144. Moscow: Fizkul'tura i Sport, 1967; Ermakov, V. V., Lugovskoj, G. S., Kulešov, A. P., Matveeva, N. V., Kiričenko, A. K., Pirog, A. V., Ermakova, L. D., Jakovlev, I. T., Medvedev, V. A., Kobzeva, L. F. Динамографическая лыжня – установка для регистрации техники лыжных ходов [Dynamographic Skiing Tracks – Settings for the Registration of Skiing Techniques]. In *Сборник научно-методических статей по лыжным гонкам* [Collected Scientific-Methodological Articles on Cross-country Ski Racing] V. V. Ermakov, 9-11. Smolensk: Smolenskij Institut Fizičeskoj Kul'tury, 1973.

1961, and compare the results of the Swedish skiers with that of their own.⁷³ During the whole period, however, authors emphasize the importance of combining practical experience and scientific experimentation, as well as developing psychological and moral characteristics during training.⁷⁴

Discussion

As we have seen, both Sweden and the Soviet Union have had extensive co-operation between cross-country skiing and science, mainly physiology but in Soviet also for example biomechanics. There is a clear and continuous process of scientization of training in both countries. In Sweden, this process began in 1954 when GCI physiologists were invited by the Swedish Ski Association. From the experiential training advice given by Gösta Olander in the 1940s to the scientific advice of the 1970s, Swedish cross-country skiing gradually became more and more influenced by physiology. In the Soviet Union, the scientization had started already in the early years of the Soviet state.

During the Cold War, the role of sport in international politics deepened and it became a propaganda tool in many of the most successful sporting countries, including the U.S. and the Soviet Union.⁷⁵ Totalitarian regimes such as Nazi Germany, East Germany or the Soviet Union have during the 20th century been among the most ambitious in sport-related science, and in using international sport for political purposes.⁷⁶ In the Soviet material this is seen through the orders and aims regarding Soviet athletes' training and results in international competition, as well as through the way authors refer to political structures and the communist agenda.⁷⁷ In the Soviet Union, the political aspects of sport itself were explicit, as good performance was understood as a way to underline the superiority of the Soviet working class.

⁷³ Mihailov, V. V. Физиологические особенности тренировки лыжника-гонщика [Physiological Particularities of Training for Cross-country Skiers]. In *Лыжные гонки: Учебное пособие для тренеров* [Ski Racing: Teaching Guide for Coaches], V. I. Kamenskij, 89-121. Moscow: Fizkul'tura i Sport, 1964: 98-99. Åstrands results were published internationally.

⁷⁴ Bergman. *Лыжный спорт* : 5-6; Donskoj. Тренировка лыжниц : 50; Donskoj, Gross. Техника лыжника-гонщика : 3; Kamenskij. *Лыжные гонки* : 3, 142-143; Šapošnikova, V. I. Общие основы спортивной тренировки лыжника-гонщика [General Bases of Training of Cross-country Skiers]. In *Лыжные гонки: Учебное пособие для тренеров* [Ski Racing: Teaching Guide for Coaches], V. I. Kamenskij, 82-89. Moscow: Fizkul'tura i Sport, 1964: 82-83; Martynov. *Лыжный спорт* : 1; Naumov. Тренировка лыжника-гонщика : 23.

⁷⁵ Rider, Toby C. *Cold war games: propaganda, the Olympics, and U.S. foreign policy*. Urbana: University of Illinois Press, 2016.

⁷⁶ Krüger, Arnd. Breeding, rearing and preparing the Aryan body: creating supermen the Nazi way. *The International Journal of the History of Sport* 16 (1999): 42-68. Hoberman, John M. *Mortal engines: the science of performance and the dehumanization of sport*. New York: Free Press, 1992.

⁷⁷ i.e. Bergman. *Лыжный спорт* : 5; Serebrjakov. *Лыжный спорт* : 4; Kamenskij. *Лыжные гонки* : 3; Šapošnikova. Общие основы спортивной тренировки лыжника-гонщика : 82-83.

In countries like Sweden and Switzerland with its tradition of neutrality sport was apolitical, a view which in Sweden was upheld even in relation to Nazi Germany resulting in controversies between the Norwegian and Swedish Ski Associations during and after the Second World War.⁷⁸ The Swedish approach was in line with the Olympic ideal as laid out by Pierre de Coubertin.⁷⁹ In the Swedish material there is the occasional reference to national pride, but apart from that there are no explicitly political statements. However, the scientization of training was political in Sweden as well. It was part of a larger rationalization movement connected to the expanding Swedish welfare state and its firm belief in the potential of science in most areas of society.⁸⁰ In Sweden, rational training was a tool to rationalize the entire population and make people more productive. Even in a neutral country like Sweden good performances in international ski competitions were related to national pride.⁸¹ This is also suggested in Briandts 1962 training instructions.⁸² So, while the neutrality of Sweden stopped an explicitly politicized sport discourse as the one seen in the Soviet Union, there were still political dimensions to sport and sport science which should be understood in the political context of the Cold War and international sport exchange.

The Soviet Union was in some areas way ahead of Sweden. A big difference was the degree of scientific planning and structure in the early phase. When Sweden still relied mainly on experiential methods, the Soviet Union had already advanced interaction between skiers and scientists. To summarize, there were similar ideas of experience exchange in the early period, then slow movement towards scientization in both countries. However, the importance of practical experience in relation to scientific research is emphasized in the Soviet Union by authors all through the period, while in Sweden this is a bit less emphasized after Olander. The overall developments in both countries can be seen as an example of sportification, where *technologies of sportification*⁸³ (not least the manuals studied here) were important tools as scientists and sport leaders tried to advance scientific training methods.

Gender is another area where differences are clear. The Soviet texts on training and sport physiology explicitly discuss the physiology and training of female skiers at least from

⁷⁸ Yttergren Leif. *I och ur spår!: en studie om konflikter och hjältar i svensk skidsport under 1900-talet*. Lund: KFS i Lund, 2006. See also: Holmäng, Per Olof. *Idrott och utrikespolitik: den svenska idrottsrörelsens internationella förbindelser 1919-1945*, Univ. of Gothenburg, 1988.

⁷⁹ Chatziefstathiou, Dikaia and Henry, Ian P. *Discourses of Olympism: from the Sorbonne 1894 to London 2012*. Basingstoke: Palgrave Macmillan, 2012.

⁸⁰ Svensson. How Much Sport is there in Sport Physiology?

⁸¹ Sörlin, Sverker. Nature, skiing and Swedish nationalism, *International Journal of the History of Sport* 12 (1995) : 147-63.

⁸² Briandt, *Träningsråd i längdloppning* : 3.

⁸³ Svensson. Technologies of sportification.

1952 (the effect of menstruation on female skiers was researched already in 1948), and there are a few female authors in the article collections we have studied.⁸⁴ In the Swedish context, such issues are discussed by physiologists in their scientific publications but not in the manuals studied here. Women had a larger role already before the war in Soviet society, and were specifically encouraged to take up sport as well as science during the 20s and 30s.⁸⁵ Still, the majority of the books have men as norm and authors. In the Swedish material this is even more so, especially in Olander's book. The first mention of the possibility of a female skier is in the 1958 book by Briandt.⁸⁶

The role of coaches is also different. Sweden more or less lacked specialized coaches (an important part of the sportification criteria specialization and professionalization) up until the 1970s while such coaches were not uncommon in the Soviet Union even in the 1950s.

Conclusion

This comparison has shown both similarities and differences in the impact of the Cold War on national and international sport and sport science. While we have pointed out some important developments, much remains to be done. The role of the Cold War (and international sport relations in general) in the accelerating scientization of sports during the 20th century deserves more attention. The Swedish case suggests that sport organizations even in neutral countries will be affected by political context on the international level. Sport has historically had a political role, not least for imperialistic reasons.⁸⁷ The apolitical ideal of international sport (and sport science!) is not easily upheld in geopolitical contexts of high tension, as during the Cold War.

This is a quite limited study, with a material that differs greatly on each side in regards to audience and publication context. However, this study has allowed us to identify a broader array of research questions within the field of sport history, especially relating to training exchange.

⁸⁴See e.g. Donskoj. Тренировка лыжниц; Jaskobskij, V. V. Спортивная работоспособность женщин при занятиях лыжным спортом в различные фазы менструального цикла [Working Capacity of Women Doing Skiing Exercises During Different Phases of the Menstruation Cycle.] In *Лыжный спорт: Вопросы научного изучения лыжного спорта: Сборник статей* [Skiing: Issues from the Scientific Study of Skiing], G. M. Krakovajak, A. N. Krestovnikov, A. C. Puni, S. V. Jananis, 123-127. Moscow-Leningrad: Fizkul'tura i Sport, 1948. The author comes to the conclusion that women should not compete during the menstruation period, and that female athletes performed best during the secretion period. The idea that women should not train or compete during menstruation is held at least up until 1959.

⁸⁵Grant. *Physical Culture and Sport in Soviet Society* : 72-98.

⁸⁶Briandt, *Träningsråd i längdloppning* : 35.

⁸⁷Dichter, Heather. Sport history and diplomatic history, *H-Diplo Essay No. 122* (2014) : 2-3.

There is a lack of research regarding how international knowledge transfer within the field of elite training (not least scientific training models) has spread and been interpreted within different political and national contexts. Even though the Soviet authors had knowledge about the training of Swedish, Norwegian, and Finnish skiers and the theory behind it, they did not always appropriate their models. As earlier research indicates, transfers within the realm of sport are complex and there is no standard explanatory model of diffusion.⁸⁸ This is underlined in our study. There are national differences despite a continuous international standardization, not least illustrated by the different views on asthma medication among leading ski nations today.

Other questions that would be interesting to explore are the connection to other research fields than physiology, such as cybernetics and biomechanics. In Sweden, physiology had a dominant role as the leading sport-related science well into the 1970s, while in the Soviet Union (although physiology was a leading field there as well) other scientific fields were more visible according to our material.

The gender aspects also deserve further attention, especially the training practice and theory of the Soviet women's skiing team who were the leading athletes in their field for over 30 years, starting in the 1950s.

Further studies, based on a broader material, could analyze the complex relationships between scientists, athletes and coaches in the Soviet Union, in similar ways that have been studied for other countries, such as Sweden and Norway.

The sportification process accelerated during the Cold War period in both the Soviet Union and Sweden, despite their many differences in political system, international relations, tradition and economy. It is also clear that the scientific contribution to sport, not least skiing, was vital in both countries. As the knowledge about Soviet sport science and training development increases, this also sheds new light on the Cold War era and its impact on sport. For the developments in cross-country skiing as well as sport science, the conscious effort by the Soviet Union to be the avant-garde of scientized training directly affected other countries such as Sweden into accelerating their own efforts. The Cold War was therefore not only fought in space or by military means, but also in labs and skiing tracks. What is particularly interesting is that similar research on athletes was motivated in radically different ways. In Soviet, sports and thus also sport science was highly political. In Sweden, it was framed as neutral, relating more to rationality and scientific ideals than to sport performance.

⁸⁸ Naha, Souvik. "Over the border and the gates?" Global and transnational sport *Sport in Society* (published online) : 5.

Name of the author in English. методики обучения и тренировки лыжников в России [The Development of instruction and training methods for skiers in Russia]. In *Лыжный спорт: Сборник науч. работ. Вып. 1* [Skiing: Collected scientific work], **Name of the author in English**, 26-48. **Moscow: name of the edition in roman alphabet**, 1957.

Bibliography

Agranovskij, M. A. (ed.). *Лыжный спорт: Сборник научных работ. Выпуск 1* [Skiing: Collected Scientific Work. First Edition]. Moscow: Fizkul'tura i Sport, 1957.

Agranovskij, M. A. *Зимние Олимпийские Игры, (Лыжный Спорт)* [Winter Olympic Games (Skiing)]. Moscow: Gosudarstvennyj Central'nyj Ordena Lenina Institut Fizičeskoj Kul'tury im. I.V. Stalina, 1959.

Alekseev, A. A. *Лыжный спорт: Методические материалы: В помощь инструкторам-общественникам и тренерам* [Skiing: Methodological Material to the Aid of Community Instructors and Coaches]. Moscow: Goskul'tprosvetizdat, 1954.

Bergh, Ulf (ed.). *Längdloppning på skidor: träningsråd*. Bjästa: CeWe-förlaget, 1974.

Bergman, B. I. (ed.). *Лыжный спорт: Тренировка лыжников-гонщиков, слаломистов, прыгунов с трамплина и двоеборцев*. [Skiing: Training Skiers in Cross Country, Downhill, Ski Jumping and Biathlon]. Moscow: Fizkul'tura i Sport, 1959.

Briandt, Calle. *Träningsråd i längdloppning*. Stockholm: Swedish Ski Association, 1958, 1962.

Chatziefstathiou, Dikaia and Henry, Ian P. *Discourses of Olympism: from the Sorbonne 1894 to London 2012*. Basingstoke: Palgrave Macmillan, 2012.

Donskoj, D. D., Naumov V. M. *Гонки на лыжах: Методические материалы по технике и тренировке* [Racing on Skis, Methodological Material on Technique and Training]. Moscow: Москва: Komitet po Fizičeskoj Kul'ture i Sportu RSFSR, 1957.

Donskoj, D. D., Naumov V. M. *Лыжные гонки: Методические материалы по технике и тренировке* [Ski Racing: Methodological Material on Technique and training]. Moscow: Sovetskaja Rossia, 1957.

Donskoj, D. D., Gross, H. H. *Техника лыжника-гонщика: Техническое мастерство*. [The technique of the cross-country skier: Technical mastery] Moscow: Fizkul'tura i Sport, 1971.

Drugov, V. (ed.), *Мастера лыжного спорта делятся опытом: Сборник статей*. [Masters of Sports Share their Experience, Collection of Articles] Moscow: Voennoe Izdatel'stvo, 1951.

Dufraisse, Sylvain. "Les 'Héros du Sport'. La Fabrique de l'Elite Sportive Soviétique (1934-1980)". *Bulletin de l'Institut Pierre Renouvin*, 2:44, 2016

Ermakov, V. V. (ed.). *Сборник научно-методических статей по лыжным гонкам* [Collected Scientific-Methodological Articles on Cross-country Ski Racing]. Smolensk: Smolenskij Institut Fizičeskoj Kul'tury, 1973.

Friberg, Katarina, Hilson, Mary, Vall, Natasha, "Reflections on Transnational Comparative History from an Anglo-Swedish Perspective". *Historisk Tidsskrift*, 127:4, 2007, pp. 717-737

Frank, William D. *Everyone to Skis!: Skiing in Russia and the Rise of Soviet Biathlon*. DeKalb, Ill.: Northern Illinois University Press

Grant, Susan. *Physical Culture and Sport in Soviet Society: Propaganda, Acculturation, and Transformation in the 1920s and 1930s*. New York: Routledge, 2013.

Goksøyr, Matti. *Sivilisering, modernisering, sportifisering: fruktbare begreper i idrettshistorisk forskning?* Oslo: Oslo Universitet, 1988.

Gounot, André. "De L'hygiène du corps à l'obsession des records. Les mutations politiques et idéologiques de la fizkul'tura en russie, 1921-1937". *Science Sociales et Sport*, 6:1, 2013, pp. 9-34,

Guttmann, Allen. *From Ritual to Record. The Nature of Modern Sports*. New York: Columbia University Press, 1978.

Harlamov, N. I., Krivcov, M. M. *Обучение и тренировка лыжника* [The Education and Training of the Skier]. Moscow: Voennoe Izdatel'stvo, 1949.

Haupt, Heinz-Gerhard. "Comparative History- A Contested Method", *Historisk Tidsskrift*, 127:4, 2007, pp. 697-716.

Hoberman, John M. *Mortal engines: the science of performance and the dehumanization of sport*. New York: Free Press, 1992.

Holmäng, Per Olof. *Idrott och utrikespolitik: den svenska idrottsrörelsens internationella förbindelser 1919-1945*, Univ. of Gothenburg, 1988.

Kamenskij, V. I. (ed.). *Лыжные гонки: Учебное пособие для тренеров* [Ski Racing: Teaching Guide for Coaches]. Moscow: Fizkul'tura i Sport, 1964.

Katzer et al., *Euphoria and Exhaustion : Modern Sport in Soviet Culture and Society*. Chicago: Chicago University Press, 2010.

Keys, Barbara. *Globalizing Sport : National Rivalry and International Community in the 1930s*. Cambridge, Mass.: Harvard University Press, 2006.

Kocka, Jürgen. "Comparison and beyond", *History and Theory*, 42:1, 2003 pp. 39-44.

Krakovajak, G. M., Krestovnikov, A. N., Puni, A. C., Jananis, S. V. (eds.). *Лыжный спорт: Вопросы научно-изучения лыжного спорта: Сборник статей* [Skiing: Issues from the Scientific Study of Skiing]. Moscow-Leningrad: Fizkul'tura i Sport, 1948.

Krüger, Arnd. "Breeding, rearing and preparing the Aryan body: creating supermen the Nazi way". *The International Journal of the History of Sport*, 16:2, 1999, pp. 42-68.

- Kuz'min, N. I. (ed.). *Лыжный спорт: Сборник статей* [Skiing, Collection of Articles]. Moscow: Fizkul'tura i Sport, 1967.
- Larsson, Lennart and Briandt, Calle. *Träningsråd i längdloppning*. Stockholm: Swedish Ski Association, 1967.
- Larsson, Lennart, telephone interview by Daniel Svensson, 7th January 2013.
- Levine, Philippa. "Is Comparative History Possible", *History and Theory*, 53:3, 2014, pp. 331-347
- Лыжный спорт: Сборник методических материалов* [Skiing: Collected methodological materials]. Moscow: Fizkul'tura i Sport, 1962.
- Martynov, V. S. (ed.). *Лыжный спорт: Сборник научных трудов* [Skiing: Collected scientific works]. Moscow: VNIIFK, 1978.
- Matveev, L. P. *Проблема периодизации спортивной тренировки, 2-е издание* [The issue of periodisation of sports training]. Moscow: Fizkul'tura i Sport, 1965.
- Nemuhin, I. A. *На спортивной лыжне: Очерки об опыте мастеров лыжного спорта* [In the Ski Racing Track: Remarks on the Experience of Masters of Skiing]. Moscow: Fizkul'tura i Sport, 1953.
- Olander, Gösta. *Träningsråd för skidåkare*. Stockholm: Swedish Ski Association, 1948, 1950, 1952.
- O'Mahony, Mike. *Sport in the USSR : Physical Culture - Visual Culture*. London: Reaktion Books, 2006.
- Rider, Toby C. *Cold war games: propaganda, the Olympics, and U.S. foreign policy*. Urbana: University of Illinois Press, 2016.
- Riordan, James. *Sport in Soviet Society: Development of Sport and Physical Education in Russia and the USSR*. Cambridge: Cambridge University Press, 1977.
- Sandbakk, Øyvind and Tønnesen, Espen (eds.). *Den norske langrennsboka*. Oslo: Aschehoug, 2012.
- Schantz, Peter. "Along paths converging to Bengt Saltin's early contributions in exercise physiology". *Scandinavian Journal of Medicine and Science in Sports*, 25(Suppl. 4), 2015, pp. 7-15.
- Сборник методических писем по лыжному спорту и зимней тренировке легкоатлета* [Collection of Methodological Letters on Skiing and Winter Training of Track and Field Athletes]. Saransk: Komitet Po Delam Fizičeskoj Kul'tury i Sporta pri Sovete Ministrov Mordovskoj ASSR, 1952.
- Serebrjakov, V. A. *Лыжный спорт: Обучение и тренировка* [Skiing: Teaching and training]. Moscow: Fizkul'tura i Sport, 1952.
- Svensson, Daniel. *Scientizing performance in endurance sports: The emergence of 'rational training' in cross-country skiing, 1930-1980*. Stockholm: Kungliga Tekniska Högskolan, Dissertation, 2016.
- Svensson, Daniel. "Technologies of sportification – Practice, Theory and Co-Production of Training Knowledge in Cross-Country Skiing Since the 1950s". *European Studies in Sports History*, 2016.

Svensson, Daniel. "How Much Sport is there in Sport Physiology? Practice and Ideas in the Stockholm School of Physiology at GCI, 1941–1969". *The International Journal of the History of Sport*, 30:8, 2013, pp. 892-913.

Swedish Ski Association. *Åkskidor*. Täby: Larson, 1970.

Sörlin, Sverker. "Nature, skiing and Swedish nationalism". In J.A. Mangan (ed.). *Tribal Identities: Nationalism, Europe and Sport*, theme issue of *International Journal of the History of Sport*, 12(2), 1995, 147–63.

Yttergren, Leif. *Träna är livet: träning, utbildning och vetenskap i svensk friidrott, 1888–1995*. Malmö: idrottsforum.org, 2012.

Yttergren, Leif. *Täflan är lifvet: idrottens organisering och sportifiering i Stockholm 1860-1898*. Stockholm: Stockholmia, 1996.

Yttergren Leif. *I och ur spår!: en studie om konflikter och hjältar i svensk skidsport under 1900-talet*. Lund: KFS i Lund, 2006.

Åstrand, Per-Olof. "Physiological aspects on cross country skiing at the high altitudes". *FIS Bulletin*, vol. 8, nr. 1, 1962, p. 24.