

*Original research papers***TALENT DETECTION AND COMPETITIVE PROGRESS IN BIATHLON –
A NATIONAL EXAMPLE***Talent detection in biathlon – a national example*

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Abstract

The main purpose of this study was to explain later years' success among Swedish biathletes. Sportive talent is regarded an interactional process within the frame of Bronfenbrenner's ecological model for human development. The national team (the elite group) consisting of 13 individuals was investigated along with a control group – matched in pairs in variables age, sex and athletic performance. All athletes were graduates from the upper secondary education sport schools (RIG sport academies). Data was collected via interviews and observations during training and world cup competitions. Based on quadruples of a year elite biathletes were more often born early in a year compared to controls. Hence, the prevailing system for division in competition classes based on age during adolescence could favour early developers. The elite group athletes revealed more positive experiences from sport academy years – in particular concerning the acting and behaviour of coaches in terms of individualisation in training and reciprocity in communication. Furthermore, controls were more often injured and experienced greater difficulties to carry out sufficient training. The results indicate the negative impact of competition classes based on age per se during adolescence and competence issues referring to sport academy coaches.

Key words: biathlon, talent development, competition, coaches behaviour, speed of growth

Introduction

Skirmishes between Swedish and Norwegian border patrol units in mountainous areas as far back as the 1700s is referred to as the origin of biathlon [1]. Modern biathlon was introduced in 1955 allowing participation in the 1960 Squaw Valley Games represented by one discipline – 20 km men. The sport gradually expanded in the Olympic program, at present represented by 5 disciplines.

Over the years, Swedish biathletes of both sexes achieved some 65 World Cup victories, 12 World Championships, 3 Olympic gold medals and 6 total World Cup triumphs. This trend of success resembles the development in Swedish tennis during the 1980s. Just a few years after the retirement of Björn Borg, 5 male Swedes were ranked among the 15 best in the world in 1985. Early sportive experiences along with coaches' actions and behaviour were determined as important influents on this developmental process [2].

Supported by the Government in 1972 a system was introduced to facilitate the combination of sport training and upper secondary education for talented athletes (RIG sport academies). Some 36 sports are involved throughout the nation, including biathlon and cross-country skiing. In the Vancouver Olympics 85% of the Swedish participants in cross-country skiing, freestyle and biathlon were former RIG students.

Purpose

Why is it that men and women in a small sport in a small country achieved international success and ranked among the

best in the world? The main purpose of this study was to contribute to an explanation to the success Swedish biathletes achieved in later years. The following areas were considered to be of particular interest:

- athletes' background, early experiences and personal characteristics,
- environmental structures and its function in the development to elite,
- interactive processes between the athlete and the surrounding environment.

A frame for development to success

Based on an ecological model for human development [3], this study analyses roles, activities and perceptions during adolescent and adult years among the investigated athletes. This approach (Fig. 1) focuses aspects in the immediate environment where the developing person is an important influent in the developing process (*micro* and *meso* levels) as well as more external structures mainly beyond influence and control (*exo* and *macro* levels). The ecological aspect is based on the continual interaction involving all four levels.

The *micro* level consists of settings in the immediate environment such as friends and coaches where the developing person is an active participant. Interactive processes involving these settings and the developing person form the *meso* level. The *exo* level includes different influents in the local environment such as neighbourhood facilities and community standards. Societal foundations like economy or sport in society form the *macro* level thus dictating terms for sport practice. The horizontal ar-

row through the model indicates possible changes over time in the different levels such as the impact of winning or demands on the athlete.

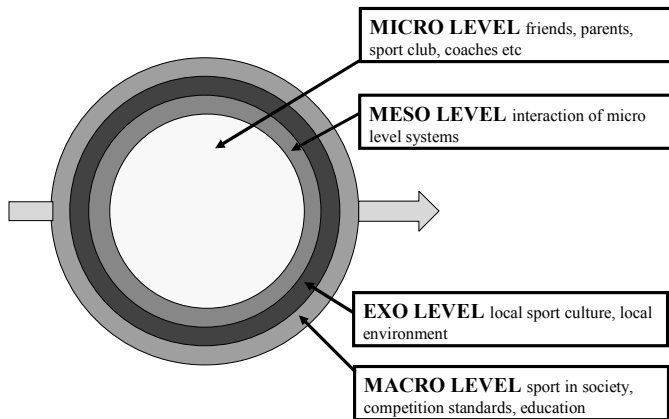


Figure 1. An ecological model for human development (after Bronfenbrenner)

The concept of competition

Competitive sport attracts interest in most cultures and most ages. For children and youth it is a dominant leisure time activity and an important influent in the socialising process [4, 5, 6, 7]. The core of competition is the uncertainty of the outcome. The more attractive the winning is and the better the chances for success, the higher motivation and mobilisation of resources. In order to optimise the attractiveness of the competition, constructed norms and systems vary between sports [8, 9, 10, 11, 12, 13, 14, 15]. Due to variations in the speed of growth during the adolescent period a division in competition classes is necessary [16, 17, 18, 19, 20, 21, 22]. Age is the predominant criteria, in power sports often combined with weight.

In the early 1980s Heinilä [8] introduced a model for the totalisation process in competitive sport (Fig. 2) with reference to an increased level of demands on the athlete. According to this perspective Heinilä identified three interacting components. The globalisation of competitive sport and competition standards links Heinilä's model to the macro level in Bronfenbrenner's ecological model.

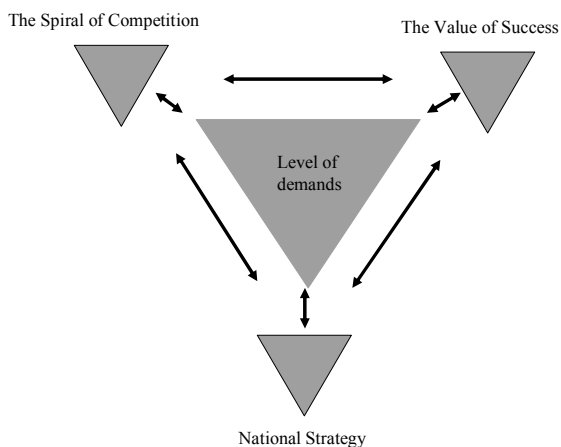


Figure 2. The totalisation process in competitive sport (after Heinilä)

The spiral of competition refers to the core of competition, the uncertainty of the outcome. The more important the winning and relevant chances to succeed, the greater mobilisation of efforts by the athlete. An excessive strive to win without succeeding might encourage the use of unpermitted substances. Hence, variations in the speed of growth during puberty and criteria for the dividing in competition class must be considered. *The value of success* refers to the recognition of athletic performance. Few, if any, achievements in institutionalised domains receive comparable attention. *National strategy* is exemplified by initiatives to develop athletic talent. The RIG system is one example.

Sportive talent

Talent in competitive sport is generally regarded as a process from childhood to adult age emphasising interaction between the developing person and the surrounding environment [20, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33].

The search and identification of talent at an early age are often prime concerns. Selections are based on performances achieved before or during puberty. This infers great difficulties and risk of increased drop-out rate. Early developers are favoured while late developers are left out due to factors beyond their own influence [16, 34]. Many youngsters deserve a second chance – a kind of talent recycling [35]. Research does furthermore indicate that internationally successful athletes were involved with several sports on a parallel basis during early adolescence and got involved with their main sport to be in the mid teens or later [21, 36].

Biathlon competition structure

Distances vary from 6 to 20 km with stops at a shooting range to shoot two or four times. The competitor starts at a start line, skis one course loop, comes to the range and shoots, skis another loop and shoots and so on. Five rounds are fired in each bout at five targets except in Relay competition where the competitor has three spare rounds for each bout. The two shooting positions, prone and standing, are done in sequence depending on the competition in question. Time penalties are imposed for each missed target, either as one minute of added time for individual competitions, or as a 150 m penalty loop immediately after each bout of shooting for all other competitions. There are 8 different competitions, Individual, Sprint, Pursuit, Mass Start, Relay, Mixed Relay, Supersprint Qualification and Supersprint Final.

Method

In order to describe the athletes, the environment and the interaction between the two, data was collected via interviews and observations during training and competition. Along with coaches and the team manager from the Swedish Biathlon Federation (SSSF) the investigated biathletes consisted of an elite group with controls. Information concerning RIG was collected from coaches and teachers from the two national biathlon sport academies.

The elite group was the national team consisting of 13 individuals – 7 men and 6 women. All members of the team were products of the national sport academies in biathlon or cross-country skiing. The controls were identified among graduates from RIG who did not qualify for the adult national team. The controls were matched in pairs in variables age, sex and sport performance. Data were collected during pre season camps and World Cup events in November 2009.

Research on biathlon

An analysis from 7 world cup seasons revealed an increased number of travel days, competition days and kilometres raced [37]. This retrospective study also found biathlon as more demanding based on self-reported stress scores among both sexes. The increase between the easiest season and the most demanding season exceeded 100%.

Ten members of the Canadian biathlon team participated in a study analysing the effects of physiological arousal, cognitive anxiety and gaze control [38]. The prime goal was to determine why some individuals overcome effects of extreme exercise, performance pressure and anxiety whereas others choke under the combined weight of those pressures. In laboratory conditions the biathletes took standing shots to a target after exercising on a bike ergometer at individually prescribed power output levels of their maximum oxygen uptake. Performance pressure was manipulated in counterbalanced conditions such as general testing of target fixation or presence of the national coach telling the athletes that the results would affect team selection. The results showed that those who did not choke changed their target eye fixation from a shorter duration during low pressure conditions to a longer duration during high pressure conditions. The findings support the role of automaticity in performance emphasising external focus rather than internal [39].

A study including results from the World Cup and Olympic Games during the 2001/2002 season involved biathletes from 65 nations [40]. The results conclude that depending on sports level, the influence of shooting efficiency and the time of the run is varied. Overall results of the run influence the final result to a higher degree than does shooting. Among higher ranked elite biathletes, however, the influence of the time of the run on the final result is smaller than among athletes of lower ranking. Furthermore, shooting efficiency has a significant influence on the end result during individual competition, where shooting occurs 4 times and the possibility of committing mistakes is greater.

Burnout has been characterised by progressive disillusionment and by physical and psychological symptoms that diminish one's self-esteem [41, 42, 43, 44, 45, 46]. In a study involving elite winter sports like alpine skiing and biathlon with the purpose to investigate athletic burnout from a social cognitive perspective it was found that maladaptive motivational profile may be a critical factor to underpin athlete burnout [47]. This infers that when demonstrating perfectionist qualities where they fear making mistakes and doubt their ability, the risk of experiencing burnout is greatly increased. Reasons behind this could be over-training or risk of recovery following previous competitions [48].

With reference to exercise intensity and shooting performance a study involving 13 members of the United States biathlon team indicated minimal effect on shooting accuracy and precision for prone shooting but did effect measures for shooting in the standing position [49]. Bicycle ergometry was chosen as the exercise modality. A similar Soviet study elevating heart rate to comparable levels by ergometry or treadmill did however not demonstrate significant effects on shooting performance in either position [50]. Shooting performance was only assessed by the number of targets hit. Similar conclusions would have been drawn by Hoffman if the same evaluation measurements would have been used.

Results

Athletes' background, early experiences and personal characteristics

The division in competition classes during adolescence is based on age. Using quadruples of a year as a mean for determin-

ing time of birth the investigated group was to a far extent born early in a year compared to late (Tab. 1). Furthermore, the elite group was more often born early compared to the controls (Tab. 2) as well as men compared to women (Tab. 3).

Table 1. Time of birth in a year (%), quadruples (N=26)

1	2	3	4
31	38	19	12

Table 2. Time of birth in a year (%), elite group (E, N=13) and control group (C, N=13)

	1	2	3	4
E	39	15	31	15
C	22	62	8	8

Table 3. Time of birth in a year (%), quadruples, men (M, N=14) and women (W, N=12)

	1	2	3	4
M	54	38	8	--
W	8	46	23	23

During childhood and early adolescence slight differences appeared between the investigated groups concerning early-life sport involvement. Cross-country skiing and soccer was a common combination. All but one of the investigated athletes grew up with both biological parents, thus indicating the strong impact of family identity and influence on the development of sportive habits.

Only one member of the elite group and two among the controls started out with biathlon, the rest as cross-country skiers. All investigated athletes were successful skiers during adolescence, most of them just below national level. Half of them were introduced to biathlon by friends or family with access to a club in the local environment. The 6-time world champion Magdalena Forsberg, a former member of the national cross-country team, also served as an important role model. The most important influent, no matter group identity in the study, was the possibility to get accepted to RIG. The facilities offer excellent training conditions and highly skilled coaches. There is high trust in RIG and a common belief that the chances to reach national level increase a lot if accepted. Previous research reveals that all but one member of the national cross-country team were former RIG students [17].

Environmental structures and its function in the development to elite

There are two RIG biathlon offering 24 athletes 3-4 years of education and training. 2/3 of the athletes graduated from RIG biathlon, the rest from RIG cross-country skiing. Both sites offered excellent training facilities and the combination of both sports. An interesting finding is the fact that representatives from both investigated groups in the study were accepted among a large number of applicants as cross-country RIG students, elite group in particular. Experiencing difficulties to fulfill high expectations they dropped out in favour of RIG biathlon.

Interactive processes between the athlete and the surrounding environment

The athletes spent their late teens at RIG. During this period in life they had access to the best of facilities and coaches. However, some made it to the national team but some did not. The results revealed the following differences between the two groups.

Injuries and sickness

None of the elite group members experienced injuries or sickness to the extent that training was inhibited or strongly negatively influenced. However, four members of the control group – two males and two females, almost 1/3 of the group – clearly stated that this was the case.

Training

To achieve a national level requires a full time engagement and a positive attitude to hard and intensive training. This approach was more obvious among the elite athletes. Controls more often experienced difficulties in training. With ambitions to succeed, motivation decreased and injuries appeared. This development was explained in terms of deindividualised content in training. Strong efforts to catch up often induced stress with further risks for negative training effects. Lack of motivation affected patience and trust in personal capacities.

Coaches

Expectations on RIG coaches, well educated and sport specific trained, were extremely high. However, 8 of the 13 controls suggested that planning, content and the conducting of the training were not fully in line with their own expectations. This was primarily an individualisation issue as well as perceptions of malfunctioning reciprocity in the communication between athlete and coach.

Discussion

An analysis of time of birth in a year based on quadruples revealed that about every 3rd athlete was born early compared to about every 10th being born late. Furthermore, elite group members were more often born early compared to controls. The findings are well in line with previous research and stress the impact of criteria for the division in competition classes during the period of growth [17, 51, 52, 53]. Sports with high demands on technique and body dimensions like weight, length or oxygen transport capacities are often more affected than others. Variations in spurt growth are most obvious during the ages 9 to 14 [34]. During this period the age interval for competitions in biathlon is two years. This infers that the prevailing system favours early developers and disfavors late developers of reasons beyond their own influence [54]. Most of the examined athletes were however competing in cross-country skiing during this age. As the division in classes in this sport are based on one-year age intervals as well as two, the problem still exists. Given these differences, there are good reasons to believe that early developers more easily could adapt to hard and intensive training at RIG.

A comparison between the sexes and time of birth in a year, with reference to the first quadruple, revealed that approximately half of the men but just a few women were born early. A possible explanation is that focus on endurance in terms of ski performance appealed more to men whereas women more often concentrated on target fixation and shooting performance. Furthermore, women might handle the combination of skiing and shooting more efficiently. If so, this might imply less impact on endurance training among the former. Females on the Swedish team averaged 81 percent hits compared to 77 percent among males. In prone position, considered less demanding in terms of control and target fixation, the difference was 1 percent compared to 6 percent in standing.

The impact of coaches' actions and influence during RIG has been referred to as a major explanation to future development. Coaches at RIG were often former competitors on a national level, highly competent and sport specific educated. Still, differences between the investigated groups occurred. The results

revealed that sport specific criteria were highly satisfactory among coaches but lack of reciprocity in communication was a decisive aspect often referred to among the control group members. The findings are well in line with previous research stressing the relevance of quality in relations between coach and athletes [25, 29, 55, 56, 57].

The complexity of biathlon competition requires certain abilities to cope with stress [37, 38, 47, 49, 50]. All investigated athletes got involved with skiing at an early age. The few involved with organised shooting during early adolescence were all part of the elite group. The study on world cup participants representing 35 nations revealed that 71 percent got involved with the two sports simultaneously [40]. Hence, skiing parallel to shooting at an early age or the sport of biathlon itself if appropriate weapons are available seems to increase a favourable development in adult age.

Those few involved with shooting at an early age were influenced by family members or close friends. Sport was a dominating leisure time and family activity, in particular in the elite group. Parents of both sexes were often former competitors in sport, in particular elite group parents. An interesting finding was the fact that all but one of the investigated athletes grew up with both biological parents in areas with good access to organised or non-organised sport. Parental influence and environmental structures strongly influenced the athletes' sport development. They grew up in competitive sport surroundings and experienced competition as a social arena with predominantly positive perceptions comparable to the concept of deliberate play [20, 58].

With reference to Bronfenbrenner's ecological model for human development the results indicate references to all four levels.

Micro level. Parents concern and their experiences from competitive sport contributed to develop an interest for sport participation and acceptance of sportive values. Athletes had most of their friends in sportive contexts.

Meso level. Micro level settings served as strong influents during the upbringing process. Athletes, parents, friends, coaches etc. interacted for a favourable sportive development – a lifestyle.

Exo level. The RIG academies attracted many and appeared a prime goal to reach. The schools were located in the near environment and well known to the athletes. Cross-country ski clubs were common in neighbourhood areas.

Macro level. Formulated competition standards has increased the impact of winning – in its turn affecting changes in levels of demands according to Heinilä's model.

The micro level content strongly influenced the athletes' development during early adolescence and formed an important base for the future to come. The meso level served as a well functioning joint structure during this period. With respect for the macro framework, the upper secondary education years during the late teens (RIG) was however identified as the strongest influent in this study. Hence, the exo level is referred to as the prime indicator for the development to elite in biathlon.

To conclude

- The investigated athletes were involved with different sports during early adolescence and grew up in areas with several sport clubs in the near surroundings.
- To take part in organised sport became a dominating leisure time activity with parents and friends involved.
- With one exception, all athletes grew up together with both biological parents.

- Cross-country skiing was the dominating debut sport and the activity the athletes spent most of their time taking part in.
- Acceptance to a RIG academy was a prime goal and a believed gateway to later competitive success. The years spent there turned decisive for the future development.
- Due to variations in the speed of physical growth and the prevailing system for the division in competition classes during adolescence, many youngsters were disfavoured of reasons beyond their own control.

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