# Strategies to Support Developing Talent

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## Abstract

The high performance unit within the Swiss Federal Institute of Sports Magglingen (SFISM) is chartered with supporting talented athletes via its collective inputs to students, athletes, coaches and national sporting federations. This is achieved by drawing upon the multi-disciplinary expertise of practitioners in the areas of sports medicine, recovery and rehabilitation, training science, sports psychology, nutrition, endurance and power physiology, strength and conditioning, and data management. This critical mass of specialists provides opportunities to collaborate "broadly" across a specific talent theme (e.g. on what basis should we select future sporting talent?), as well as the provision of sufficient content expertise to provide "deeper" knowledge and insights related to these interdisciplinary discussions (e.g. how can we account for biological maturity?). Therefore, this paper presents an example of the "broad" interdisciplinary work undertaken by SFISM to improve talent selection, and the complementary "deep" work used to investigate biological maturation as one component of this process. New and ongoing projects will continue to harness the collective potential of the multidisciplinary experts to better understand the processes of talent identification, selection, and development at the broadest and deepest levels. Our collective ability to support Switzerland's best and brightest talent will require us to maximise the considerable expertise of the many stakeholders which influence and impact on development.

## Zusammenfassung

Das Ressort Leistungssport der Eidgenössischen Hochschule für Sport Magglingen (EHSM) hat die Aufgabe, talentierte Athleten durch kollektive Dienstleistungen, Lehre, Forschung und Entwicklung zu unterstützen. Dies gelingt dank der multidisziplinären Expertise in Sportmedizin, Physiotherapie, Rehabilitation, Trainingswissenschaft, Sportpsychologie, Sporternährung, Leistungsphysiologie, Athletiktraining und Datenmanagement. Diese kritische Masse an Spezialisten bietet Möglichkeiten zur «breiten» Zusammenarbeit an Talentthemen (z.B.: Auf welcher Grundlage sollen zukünftige Talente selektioniert werden?) als auch zur «Vertiefung» von spezifischen Fragestellungen (z.B.: Wie kann die biologische Entwicklung von Nachwuchsathleten bestimmt werden?). Der vorliegende Artikel präsentiert ein Beispiel des «breiten» interdisziplinären Ansatzes der EHSM im Bereich der Talentselektion und die dazu komplementäre «vertiefte» Forschung zur biologischen Entwicklung von Nachwuchsathleten.

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## Introduction

Between 2005 and 2009, a number of popular books related to the topic of sporting talent and success [1–4] generously apportioned the "secrets of success" to the concept of "deliberate practice" – or the often cited "10 year-rule" or "10,000 hours" of sport specific practice proposed by Ericsson and colleagues [5]. Within this paradigm, success is believed to be the result of focused, effortful practice, that is not inherently enjoyable. This oversimplification of achievement attributed to deliberate practice alone, claims that absolutely everyone is capable of high performance success irrespective of natural abilities and negates many other variables influencing development [6–8]. Gulbin & Weissensteiner [9] recently discussed the complexity of talent development and proposed that the attainment of success is a result of much more than practice alone, but rather the complex choreography of specific athlete, environmental, system and chance factors and their variable contribution at the non-elite, pre-elite and elite phases of development.

Adopting a "deliberate programming" approach to talent development is a far more realistic tactic deployed by specialists concerned with the holistic case management of talent [10]. In this paradigm, it is believed that the pursuit of expertise is more likely to be achieved through attentive planning or programming in areas related to coaching quality, technical support, individualised development strategies, and the careful layering of sports science and sports medicine services. Importantly, the complementary strategies to initially identify and select the talents who may ultimately benefit from the support provided under professionally programmed environments, is itself, not without its sizeable challenges [11, 12]. In particular, improving the probability of predicting an individual's potential to perform at some later occasion well into the future will require careful assessment of many elements, including biological development [13], physical capacities [14], and psychological skills [15].

From an applied perspective, the high performance unit within the Swiss Federal Institute of Sports Magglingen

(SFISM) is chartered with supporting talented athletes via its collective inputs to students, athletes, coaches and national sporting federations [16]. This is achieved by drawing upon the multi-disciplinary expertise of practitioners in the areas of sports medicine, recovery and rehabilitation, training science, sports psychology, nutrition, endurance and power physiology, strength and conditioning, and data management. This encourages a multi-disciplinary and multi-factorial approach within the "talent" theme and leads to a range of activities, thereby balancing the "broad" talent themes (e.g. how to select talent), with that of the "deeper" and more specific talent issues (e.g. assessing biological maturation, BM), as shown in *Figure 1.* The remaining sections of this paper illustrate SFISM's broad and deep talent approaches.

## Broad Talent Work – Talent Selection

Until recently, the majority of Swiss sports federations selected young athletes based exclusively on current competition results, rather than their future development potential [17]. This meant that the talent selection processes of many federations failed to systematically consider socio-psychological aspects and the extent of current biological maturation (BM) when assessing future potential [17].

A crucial problem with this approach is that physically precocious young athletes who perform well in competition can receive federation support even though they may have limited long-term prospects. On the other hand, due to their delayed biological development, late developed athletes with high potential who perform poorly in current competition, can be overlooked for selection and potentially lost to senior elite sport [18, 19]. Therefore, talent selection should be a broad, multi-disciplinary, dynamic process focusing on the potential for success at adult age and taking into account the biological and psychosocial development of children and adolescents [20].

On the basis of these shortcomings, SFISM in collaboration with partner organisation Swiss Olympic, developed a standardised talent selection instrument for all Swiss sports federations with the intent of optimising the targeted and efficient use of public and private funding to improve future international sporting success. Through the combination of reviewing the scientific literature, conducting expert interviews, and reflecting on the concerns related to the practicalities of sport federation implementation, the nationwide talent selection instrument known as PISTE was subsequently developed [21]. PISTE is an acronym which reflects the following themes:

- **P**rognostically oriented with a view to future performance at the elite level rather than on current performance;
- **I**ntegrative of several factors that are relevant for future performance;
- **S**ystematic and offers standardised methods;
- Relying on coaches (**T**rainers[1]) as the main source of knowledge;
- Using **E**valuations by coaches as an assessment method.

Since 2009, the PISTE instrument is used throughout Switzerland by 90% of sports federations that are active in youth sports.

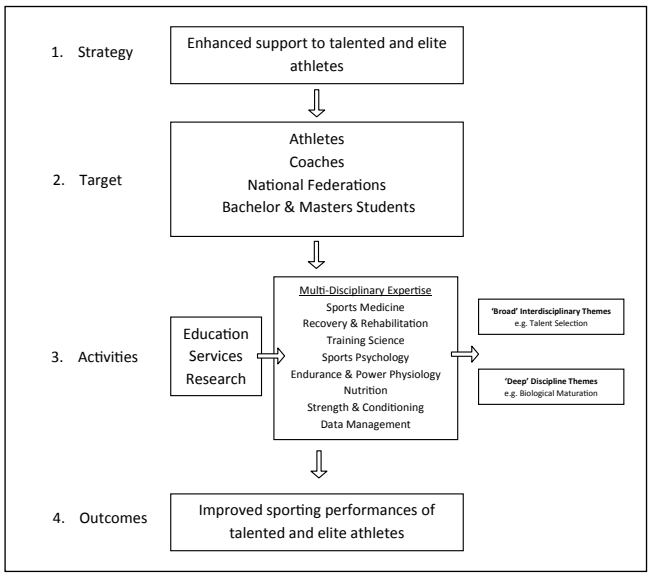


*Figure 1:* Schematic representing the approach of the Swiss Federal Institute of Sports Magglingen (SFISM) to support talented and elite athletes and coaches.

## Elements of PISTE

In brief, the national talent selection instrument PISTE includes six major assessment criteria, and a number of sub-components. These components and their contribution to a more holistic selection profile are summarised in *Table 1* and in the text below:

### *Competition performance*

Using simple competition results as the only talent selection criterion is highly problematic due to the difficulties associated with biological development. Complementary to final competition results, coaches are encouraged to systematically consider additional criteria. Competition observation grids can allow a more task-orientated evaluation of the athlete to be undertaken by considering psychosocial (e.g. focusing skills, positive attitude), technical (e.g. specific motor skills) or tactical performance factors (e.g. anticipation and decision making skills) [21].

### *Performance tests*

General physical motor skill tests have their place in talent selection, especially in sports which depend largely on the physiological elements [14]. However, in isolation, these tests remain unsuitable for selection purposes in technically demanding sports where the sport-specific performances are deemed to be more relevant [21]. By way of example, the performances of Swiss alpine skiers are regularly and systematically evaluated by coaches using various criteria such as the timing of movements, dynamics of body position, pressure distribution and flow of movement. Similarly, in team sports, standardised forms of relevant game situations are recommended to assess technical and tactical skills, including elements linked to creativity and game intelligence [22].

### *Performance development*

Although there is little scientific understanding of the pace of performance development, and the rate of learning, coach-

[1] The German translation of 'coach' is 'trainer'.

**Table 1:** Assessment criteria for the selection of young Swiss athletes and an estimation of prognosis validity in terms of success in elite sport performance.

| Assessment criteria | Subcriteria | Estimated prognosis validity | Recommended assessment methods | References |
|---|---|---|---|---|
| **Competition performance** | Performance at early junior athlete age | * | Competition results, coaches evaluation | [7, 40] |
| | Performance at late junior athlete age | **** | Competition results, coaches evaluation | [41, 42] |
| **Performance tests** | Sport-specific performance tests | **** | Objective tests, coaches evaluation | [43] |
| | General physical motor skills tests | * | Objective tests | [43] |
| **Performance development** | Competitions and performance tests | **** | Competition performance, performance tests over time | [7] |
| **Psychological factors** | Achievement motivation | **** | Coaches evaluation, questionnaire | [23, 24, 44, 45] |
| | Dealing with pressure | | | [46] |
| **Athlete's biography** | Resilience | **** | Coaches evaluation, questionnaire | [47] |
| | Environment (parents, school) | *** | Questionnaire | [27] |
| | Anthropometrics and body type | *** | Body measurements | [19] |
| | Training effort | ** | Questionnaire | [5] |
| | Training age | ** | Questionnaire | [5] |
| **Biological development** | Maturation | ** | Body size measurements | [13, 32] |
| | Relative age | ** | Month of birth | [35, 48] |

Note: Sport-specific adaptations are necessary for all criteria. Two to three assessments ('dynamic') should occur per year. Prognosis validity refers to success in senior elite sport performance. Estimation of prognosis validity is based on scientific literature and expert interviews (*Very poor; ** Poor; *** Average; **** Good; ***** Excellent).

es consider this criterion to be extremely reliable. This criteria can be assessed by observing and cataloguing the development of competition performance and the results in performance tests over a defined time period. [7].

*Psychological factors*

Amongst others, motivation is regarded as one of the key psychological factors in elite sports performance [23]. Motivational behavioral tendencies (hope of success/fear of failure) and goal setting (activity and competitive orientation) are of particular significance in the PISTE profile [24]. The modified 'Achievement Motives Scale-Sport' [25] and the Motivational Climate Scale [26] questionnaires are used respectively, to help evaluate whether the 'hope of success' and high levels of 'task' and 'competition' motivation prevail in young athletes [29, 30].

*Athlete biography*

*Resilience*
Coaches active in Swiss junior competitive sports consider mental and physical resilience a key element in long-term performance development. Retrospective studies confirm that premature abandonment for athletic careers are closely associated with susceptibility to injury and health problems [13]. Therefore, the main goal in the process of selection consideration is to evaluate physical resilience through the athlete's ability to cope with a heavy training and competition demands.

*Environment*
A positive and supportive environment promotes athletic success. Environmental factors such as parents, coaches, daily training setting, school circumstances and financial aspects influence the development of young talents [27]. As indicated in *Table 1*, this is evaluated using questionnaires combined with coach evaluations.

*Anthropometrics and body type*
Certain body types and anthropometric characteristics are important prerequisites for specific sports [28]. Body dimensions such as arm span in swimmers or vertical reach in volleyball and basketball players ought to be taken into consideration by relevant sports when selecting talents. Similarly, it is useful to provide estimates of adult height in sports where height is relevant for performance. Using basic anthropometric measurements (body weight, standing height, sitting height), adult height can be estimated by a mathematical formula [29].

*Training effort and training age*
Training effort and training age strongly influence current sport performances of young athletes [5]. What is important with regard to future performance development when assessing these criteria is an individual's opportunity to maintain or increase their training effort or commitment. Training and competition experience in other sports can have a positive effect on performance development in the main sport [30, 31].

*Biological development*

*Biological maturation*
The BM of children and adolescents of the same age is a crucial issue in talent selection because of the inherent variability [32]. An assessment of BM is therefore necessary in order to accurately categorise the performance of young athletes. Many features of physical (and mental) ability such as height, weight, strength, speed and endurance are highly dependent on BM [13, 32]. Broad estimations of BM (i.e. early, normal and late maturation) can be achieved using equations proposed by Mirwald and colleagues [29].

*Relative age*
Studies on 'relative age' show that even a small difference of a few months in age may have a significant effect on athletic development [33]. It has been observed specifically in Switzerland, that relatively older children and adolescents, (i.e. those born closest to the sporting 'cut-off' date) are significantly over-represented in higher squad levels [33–35]. Sports are encouraged to consider the introduction of quotas, or a 'bonus point' selection system to increase the representation of athletes born furthest from the 'cut-off' date.

*Deep Talent Work – Biological Maturation*
A deeper investigation into BM as one of the broader suite of PISTE elements was initiated by staff at the SFISM. It is important to understand the extent of individual BM when assessing any given level of adolescent sports performance, because there can be up to five years variation within a given chronological age (CA) group [32]. This inter-individual variation can lead to a bias in preferential support to the early maturing athletes, at the expense of late maturing athletes [13]. Furthermore, having the knowledge regarding which athletes in any given training cohort are biologically immature, might help coaches to be more considerate of individualised training loads, thereby potentially reducing injuries as late maturers inevitably try to "keep up" with their earlier maturing counterparts.

Assessing BM can include the evaluation of secondary sex characteristics like pubic hair and genitals [36], anthropometric measurements and associated prediction equations [29] or the more classically accepted method of skeletal age (SA) [32]. The SA method is based on the recognition of changes in the maturity indicators in hand–wrist X-rays (gold standard) and comparison with standardized reference images [37–39].

Given that BM is an important consideration in the identification and selection of talent, a research project was developed in cooperation with the Swiss Soccer Association to assist them with these talent challenges. In this study, the BM of 63 Swiss under-15 national players were categorised as early, normal, or late developers using X-Ray [13], anthropometric measurements [29] and a subjective estimation by trained coaches. The study was approved by the cantonal ethical committee.

Results of X-Rays indicated that players had a mean CA of 14.0 ± 0.3 yrs and a mean BA of 15.0 ± 0.9 yrs. However, there was large inter-individual variation between the players, with the extremes of BM graphically illustrated in *Figure 2* (range: 13.0–17.3 yrs). This lead to 11 players (17.5%) being classified as late developers, 12 players (19%) assessed as early developers, and the remaining 40 players (63.5%) classified as normal development. Pleasingly, the trained coaches were able to demonstrate a good "feel" for predicting developmental status, with their subjective assessments combined with the objective Mirwald data, agreeing closely with the x-ray profiles on 59 of the 63 occasions.

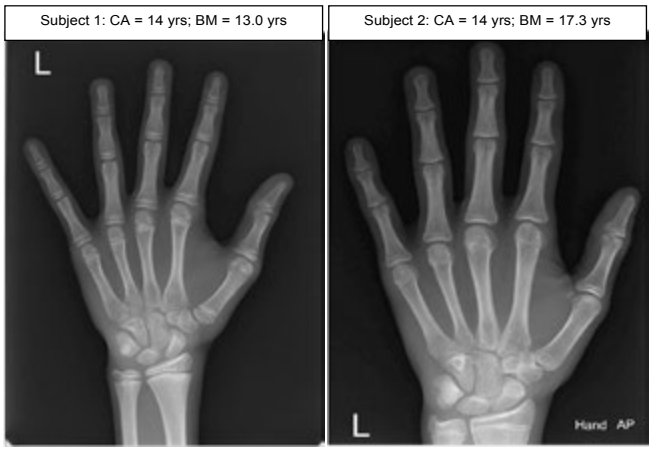


*Figure 2:* A comparison of two U-15 players from the Swiss National Soccer Squad, with the same chronological age (CA) but demonstrating extremes in biological maturation (BM), as evidenced through hand-wrist X-ray assessment [39].

These data demonstrate that the previously observed over-representation of early maturers in the selection of adolescent talent is not apparent within the Swiss U/15 National Soccer squad. We hypothesize that the coach and federation education programs focusing on reducing BM selection biases, have played a major role in achieving this outcome. This is also reinforced by the high levels of accuracy in the classification of maturity status by the trained coaches. The logical extension of this work is to support other sporting federations and their coaches to develop a similar level of command with their classification skills – which could potentially be supported by other sports medicine practitioners with the capacity to verify classification skills training with their X-ray related capabilities.

## Conclusion

The support of talented athletes (and coaches) within SFISM's Ressort Leistungsport remains an important area of focus. New and ongoing projects will continue to harness the collective potential of the multidisciplinary experts to better understand the processess of talent identification, selection, and development at the broadest and deepest levels. Our collective ability to support Switzerland's best and brightest talent will require us to maximise the considerable expertise of the many stakeholders which influence and impact on development. In particular, the development of an agreed developmental framework, or 'Athletenweg', that more optimally integrates the combined efforts of sporting stakeholders throughout the developmental lifespan is a current area of prioritisation.

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