How it started
It is always difficult for coaches and scouts to predict the talents who will reach the elite level. Nowadays, talents are being selected if they are the best in their age category. Coaches and scouts do often not take the relative age effect (RAE) into account. The RAE means that athletes who are born earlier in the year have a greater chance of getting selected\(^1,2\). This means that athletes who are born late in the year have a disadvantage to get selected and reach the top. Someone who is born in December can be compared with someone who is born January. The athlete who is born January is almost a year older than the athlete who is born in December and he/she is more likely to be more mature. This does not have to mean that this talent will be better later in their career. However, in alpine ski racing, talents who are born early in the year are overrepresented in the international youth level\(^3\). The talents born early in the year appear more talented. Relatively younger athletes seem to only have a chance for selection if they are early maturing\(^3\). This suggests that the biological maturity status of a talent plays an important role in talent selection\(^4\).

For the international elite level, the RAE becomes smaller\(^3\) or disappears. Sometimes even an inverse RAE\(^5\) appears. The inverse RAE is observed in Bundesliga soccer players\(^6\). On the highest level, only the best talents will remain. Talents who had a disadvantage in the youth due to the RAE could have compensated their temporarily physical underdevelopment with exceptional technical, tactical and psychological skills and therefore have a better development of these skills later in their career. Accordingly, Matthijs Stuifzand, trainer at “Groningen Atletiek”, commented: “physically mature players have an advantage in the youth, but they are more likely to have reduced coordination”. These talents could depend too much on their physical strength and develop less on other aspects of the sport.

Pilart Wesserits, born in December, is an athlete who never made it to the top, even though he had the potential. The reason for not being selected was, that during the selection program he was smaller than the other athletes. Besides Pilart there are many more examples of poor selection. So why wasting talent if also ‘smaller’ athletes can have the potential to reach the top.

“We want to give the less physically developed players a change when their performance doesn’t stand out, but their technical skills are well developed” - Matthijs Stuifzand is a trainer at Groningen Atletiek. He is occupied with the selection process of talented athletics pupils aged 11-14.
Talents who are early maturing have an advantage over talents who are late maturing. However, a talent who matures later (i.e. later growth spurt) can be stronger later in their career than a talent who matures early. There are two factors, the RAE and late maturing, that can cause a disadvantage for some talents. These two factors cause some good talents to not be selected. Consequently, they might not reach the elite level. However, this does not mean that these talents are not capable of reaching the top. These talents can have a lower motivation for continuing the sport if they do not get selected and might increase the drop-out rate among them. This problem must be tackled. If clubs or associations want to develop talents for the elite level, they must not put too much pressure on the coaches to win the competitions at all cost and give all talents an opportunity. Coaches and scouts must be aware of this problem and take the RAE and biological maturity status into account when they make a selection. In this way every talent can get a fair chance to reach the top and no talent will go to waste.

**How do we solve the RAE and the maturation effect?**

One possible solution for the RAE is to increase the amount of cut-off dates. Traditionally, there is one cut-off date in a selection process. This means that all pupils born in the same year take part. For example, if someone is born on the first of January, that pupil is practically a year older than someone who is born on 31st of December. Increasing the amount of cut-off dates decreases that difference. With two cut-off dates the maximum age difference is decreased to half a year. However, this merely reduces the RAE, rather than resolving it. A study by Cobley found that in order to compensate for an age difference of one year (in 13-year-old swimmers, on 100m freestyle), the resulting time of youngest pupil would have to be corrected by 3.5 seconds, relative to the oldest pupil within the same group. This means that the expected deficit caused by half a year age difference would still be approximately 1.75 seconds (3.5/2 = 1.75). In our eyes this is not the solution, because rather than eliminating the RAE, increasing the amount of cut-off dates just diminishes the problem. Instead it seems more legitimate to select potentially talented athletes by introducing a fair comparison between individuals. This can be accomplished by correcting results to an expected value, based on age. The concept is explained in the text box below.

**This is how the system works**

**RAE:** all individuals within an age group get the same, virtual age (Agevir). The results these individuals show in a performance, are subsequently altered in accordance with the difference between the chronological age of every individual and the virtual age (Agechrodiff). The result is altered by a correction value which depends on Agechrodiff and the curve which represents the mean results of the whole age category. For example; if the mean result for age 12.51 is 19.3 seconds, while the mean result for age 12.99 (highest possible age within the age group “12”) is 18.0 seconds, then someone with age 12.51 gets a 1.3 second subtraction of their result.

**Maturation effect:** according to Mirwald, the predicted maturity offset can be calculated by using a formula which differs between boys and girls. The formula uses height, sitting height, subischial leg length and weight, as well as the chronological age of the individual.
The maturation effect can be dealt with in a similar fashion. First, a reliable determination of the biological maturity of an individual must be carried out. To do that, several measurements need to be done, as explained in the text box. When the biological age is determined, it can be used in the time correction system. In this instance, the corrected resulting time is calculated using the difference between biological age and the virtual age (Agebiodiff), rather than Agechronodiff. Otherwise, the system works identically. Two different outcome results are left, one based on the chronological age and one based on the biological age. The aim is to solve the RAE and the maturation effect together. Therefore, it makes sense to take the both outcome results into account. One might argue that just using the biological age solves both problems, because it compensates for the maturation effect (by calculating the biological maturity) and subsequently the RAE (as it uses a virtual age). However, the calculated biological age does not take into account cognitive (technical, tactical) advantages a late maturer may have due to the higher chronological age over his/her biological peers (i.e. pupils with the same biological age). How much the cognitive factor plays a role differs per sport. For example, in endurance sports, such as a multiple kilometre run, it is important to apply a certain pacing strategy, which requires a certain cognitive level. On the other hand, a hundred metre sprint does not necessitate pacing, rendering the cognitive aspect of less importance. Therefore, for every discipline it must be determined how much either of the two outcome results influences the final corrected result. In the interview, the system was explained to Matthijs Stuifzand. His thoughts on this solution were positive: “It sounds like a very interesting idea. Using a correcting factor for performance or test results would make the comparison fairer”. However, Matthijs also had a remark: “The tricky thing remains that especially in contest performance, but also test results are not always obtained under equal circumstances. This would cause a deviation in the results”. “If someone has a headwind while someone else has a tailwind in, for instance, a sprint, that results in a difference. In this case the value of the correcting factor is questionable”. In outdoor sports, this is something to keep in mind as wind, rain and temperature can influence running performance. This leads to the assumptions that for outdoor sports, the application can only be used when the circumstances are equal, which is rarely the case. However, in suboptimal circumstances, the application can still be useful to look at intra-test group results, as anyone performing at that moment must cope with the same circumstances. This effect is not present in all sports, however. For example, in swimming, which is indoors, wind does not play a role and water temperatures are constantly regulated.

How does the application work?
The product that will counter those problems is the 'TalSel' application. It stands for 'Talent Selection' and is available for every trainer or coach. It can be useful for scouting upcoming talents. Because the application calculates a correction factor, that makes the time of the athlete comparable to the time of athletes that are born earlier in the year or are more developed. One requirement of the application is that the correction factor can only be used in individual sports where the performance outcome is the duration of the activity over a specific distance. The application can be used during training sessions and during talent selection. Within this application there are three important steps scouts or trainers have to follow.
First of all, the user chooses if a sport specific event or a training event is measured. If 'sport' is selected, the application will show a list of all sports and the trainer has to select one of them. The application is developed for individual sports where the main goal of the sport is to be the fastest, for example: alpine skiing, cycling, running, swimming and speed skating. If 'training' is selected, the trainer or scout can create a new event and give it a specific name. So, if the user wants to know how fast the athletes can run a distance of 60 meter, he or she can create an event called '60m sprint test' and select this event. Secondly, some anthropometrics of the athlete need to be entered in order to create an image of the biological development of the athlete. Subsequently, the application can calculate a correction factor for the maturation effect. Besides that, in order to correct the relative age effect, the date of birth is needed as well.

Finally, the exact time of the athlete is supposed to be entered in the application. The exact time is the time measured with a stopwatch. For instance, during the 200 metres athletics, it is the total time measured from the start shot until the athlete passes the finish line. When all three steps are completed and all the athlete's data is implemented, the app will calculate the corrected time of the performed event. The TalSel application will bridge the gap between science and the practical field. The personal characteristics, filled in during step two, will affect the factors used for the time correction. So, the science behind the application will create a method for trainers and scouts to individually assess all peers in the same age group. In this way, all athletes have an equal chance to get selected, no matter in which month they are born or if their body is not fully developed yet.

Conclusion
So, what is the best way to minimize the waste of talent? This is the main question scouts and trainers wants to know the answer to. The 'TalSel' application is one step in the right direction. Matthijs Stuifzand agreed that the application can be helpful: "Fundamentally, the application is useful to set certain results in relation to the exact age and biological age. Especially, on factors such as velocity and strength it is has added value. However, motivation and fun are import factors as well." With this application talent selection has a broader range of selecting talents. Not only athletes that are better developed at that right moment or born in the first part of the year are picked out but also athletes who are less developed or simply are born later on in the year can be selected. The correction will create an equal opportunity for those 'late mature' and 'young' athletes. So why wasting talent, if there are so many more athletes that have the potential to reach the top in a later stage of their development. Pay more attention to a broader audience because you can miss out the next Churandy Martina without even knowing.

If you want more information about the formula we used, feel free to contact us at the following e-mail addresses:

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References


