 Dropout rate of Slovenian’s most successful young athletes

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Abstract:
Engaging in year-round intense, systematic sport training programs, for some young athletes, results in negative outcomes, such as overuse injuries, burnout, and dropping out of their chosen sport. The present article discusses issues related to the dropout of young sportspersons in competitive athletics. The purpose of the research was to find the dropout rate among the most promising young athletes from Slovenia, aged between 13 and 15 years. The sample group was selected based on International Association of Athletics Federation scoring tables, dating from 1993 to 2004. Ten of the best young athletes were chosen from each discipline. We were interested in whether or not differences existed between those disciplines (sprints, jumps, throws, middle- and long-distance runs) and what percentage of young athletes managed to achieve visible results in the absolute age category on a national and international level. The dynamics of an individual athlete's sports career development were studied. The main finding of the research showed that the dropout rate in Slovenian competitive athletics is very high. We also demonstrate that: (1) dropout rate is independent of athletic discipline; (2) young athletes, who are most successful competitively (place within the first 5 positions in scoring tables) persist in athletics longer, more often participate in large international championships, and hold national records more frequently in comparison with those who are not on top of the “under 16” age category; (3) in addition, very young athletes (13 and 14-year-olds) who are successful among older athletes, more often reach the senior age category and achieve better results on national, as well as international levels.

Key Words: talent, youth, track and field, training, competition, specialization

Introduction
The development of top sports abilities is a long-lasting process, which presents many obstacles and problems for athletes on their professional path. There are many ways of helping to lead them toward success [29]. Based on Ericsson’s theory on specialized training, at least 10,000 hours of deliberate practice are needed, during a period of at least ten years, for an athlete to achieve top results in the senior category [7]. Consequently, children should be involved in sports from an early age, which could positively affect the budding athlete, if a suitable, enjoyable training approach is used. The majority of coaches and athletes still agrees with Ericsson’s theory, because it has been proven that (today’s) elite sportspersons have spent many more hours training, by the age of 18, than former top athletes [9]. The average age, at which children come into competitive sports, is increasingly lower, and the amount of training within a defined number of years, has grown significantly. In the US, one-third of all children join a sports activity before reaching the age of 8 [2]. Early sport specialization also appears to be increasing in young athletes [15]. It is believed that the pressure to select one sport and drop all others comes from coaches, parents, and other young athletes. Engaging in year-round systematic, intense training programs within one chosen sport results in some young athletes having negative outcomes, such as overuse injuries, burnout, and dropping out of sports altogether. The lack of diverse activities may prevent young athletes from developing neuromuscular skills that aid in injury prevention.

In the past two decades, divergent development models have been superseding classical models [14]. Many researchers are finding that future elite athletes do not need early specialization, but should, in fact, play different sports during childhood to gain a wider motor spectrum [8; 10]. Hockey players, included in Güllich’s and Emrich’s research [10], who became London (2012) Olympic champions, had, on average, almost a third fewer hours of training, compared to Ericsson’s paradigm [7]. As children, these sportsmen trained around 1800 hours in other sports and started playing hockey exclusively no sooner than at the age of 15. Athletes who participate in different sports are rarely injured and stay in sports longer than those who specialize before maturity [4]. There were 322 athletes invited to the 2015 National Football League Scouting Combine, 87% of whom engaged in a variety of sports during high school, and 13% of whom only played football. Those talented adolescents who had not engaged in age-appropriate sports training during childhood were more likely to possess poor fundamental movement skills (FMS) [12]. One study showed that teaching track and field within the IAAF Kids’ Athletics program, which is based on deliberate play and focuses on FMS, can help 11-12 years old
children improve their physical fitness and event performance more than using the traditional repetitive skill teaching method [17].

In sports disciplines of late specialization such as track and field, triathlon, rowing, hockey, and others top results are achieved after maturation – when an individual’s morphological and physiological adaptations have already occurred [25]. The most appropriate time, in track and field, for integrating children into systematic training is between the ages of 10 and 12 [21]. Specialization should not begin earlier than 13/14; however, elite levels could be reached by 18 years of age. The time for their best achievements is found to be between the ages of 24 and 28 [11]. According to the Long-Term Athletes Development (LTAD) model, talented athletes could achieve top levels after 8-12 years of training [1]. Supporters of LTAD think that fun, joy, pleasure, and play aid most notably to the appropriate development of top sportspeople [9; 27; 1]. The results of research, in which climbers were studied, do not show statistically significant differences between elite and almost-elite athletes, pertaining to variables such as the average amount of training (in hours) at the ages of 8, 10, 13, 15, 18, and 21; the age of entering the specialization phase. Despite the insignificant differences, authors found that elite climbers gather fewer hours of training, by the age of 15, than non-elite climbers and that they start gradually increasing the number of training units after they are 21 years old [16].

The optimal number of training hours depends on the sports discipline and varies between athletes [8]. In athletics, children often specialize and start taking part in events with a stressed competitive character too early. The training is thus too exertive for the young, undeveloped organisms. This kind of work brings overload (as a consequence of an inability to adapt to exertion suitably), overtraining, burnout, injuries and different illnesses, lack of will, unwillingness to work, or even a wish to finish one’s sports career. A study by Wall and Côté [26] showed that young hockey players, who had had high-intensity training during childhood, which caused their bodies enormous exertion, finished their sports career earlier. In addition, people differ from one another, so the same approach cannot be used for everyone [9; 19]. Moreover, both the length and the end of an individual’s sports career is biologically dependent [9]. The qualitative selection process in every training phase is enabled by anthropometric data [28]. Those who have higher anthropometric values are recognized as the most promising athletes.

In the US more than 6 million youngsters, between the ages of 6 and 17, play basketball [13]. During selection, lots of these promising young players drop out. Only 440 individuals, or 0.07%, will succeed in advancing to the highest competitive level – playing in the NBA. This is just one of the examples proving that dropping out is not accidental, that it is not present only in athletics, and that it is present worldwide, where competitive forms of sport exist. A number or percentage of young promising athletes, who succumb to “problems”, such as selection procedures, early specialization and its consequences, will drop competitive sport at a young age, a phenomenon which is professionally called dropout. For example, less than 50% of U16 tennis players (under 16 years old) and 34% of young cyclists achieve a top senior level [5; 18]. Enoksen [6] found that 90% of girls and 75% of boys, labelled as young elite Swedish athletes, left athletics within the first 5 years of training and competing. Vaeyens, Güllich, Warr, & Philippaerts [23] found that dropout among the most promising athletes from Germany and Britain added up to 50/60%. In Belgium, 80% of athletes fail in achieving a top senior level [24]. Dropout is proven to be higher for those young talents, who started to train earlier [20]. Premature and frequent dropout of athletes is a problem, which requires serious management and a search for suitable solutions.

The purpose of the present study was to find the quantity of dropout among the most promising young athletes in Slovenia, aged between 13 and 15. We were also interested whether dropout differs between different athletic disciplines, what the rate of dropout was among very young athletes (13, 14 years old), and whether or not there were later differences between U16 youths, who were more or less successful in competitions, in the percentage of those, who abandoned athletics prematurely. Furthermore, we wished to find the number of young athletes (U16) who succeeded in achieving visible results in the senior category at the national or international levels, as well as the success rate while passing through different age categories (U18 and U20), and how substantial the dropout rate transitioning between those categories was.

Material and Methods

Ten of the best young U16 athletes in separate disciplines were studied from Slovenian athletics scoring tables (1993 to 2004) – for every year in order of their placing. We defined one or more disciplines for every group (depending on the number of athletes): sprints – 100 m; jumps – long and high; throws – shot put, javelin, discus, hammer; runs – 1000 m and 2000 m. 1017 young, promising male athletes (sample A), born in 1978 or younger, were selected for the sample. To avoid repetition across disciplines and result timeframes, every competitor was chosen only once based on his best result, according to the IAAF (International Association of Athletics Federation) scoring tables for outdoor athletics (2017). The research encompassed 566 youths, aged 15 years or less (sample B, hereafter referred to as “sample”). Their average age was 14.87 years. The sample

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1 We named young athletes who were placed between 1. and 5. place in scoring tables, for the U16 age category, competitively the most successful individuals. Athletes, also placed in the top ten (6.-10. place) are labelled as competitively less successful individuals.
contained 187 throwers, 165 jumpers, 130 runners, and 84 sprinters. The majority of the athletes were high jumpers, followed by equally present 100 m and 1000 m runners, while throwers were the least present.

In order to rationally assess and justify early specialization and discover particularly talented athletes, sample A was filtered to obtain a subsample (subsample C) of 13- and 14-year olds. The subsample consisted of very young athletes placed in the top ten of the scoring tables for the U16 age category in all the above-mentioned disciplines. We were interested in whether there were differences, concerning the development of an individual’s sports career, between sample and subsample, and if these differences were statistically significant. The subsample included 178 young promising athletes. Their average age was 13.92 years. Within the subsample, the majority were throwers (44.94%), followed by runners and jumpers, while sprinters were the least present (7.30%). Disciplines in the subsample were represented evenly. Sprinters (100 m) were the only ones who represented less than 10% of the subsample.

Sample formation and analysis were performed using AZS (Athletic Federation of Slovenia) Scoring tables for outdoor competition for the following age categories: U16, U18, U20, and absolute (senior) category. A review of whether any of the sample's athletes had broken a national record was carried out in the age categories from 1993 onwards. There were no reliable records for the U22 age category prior to 2009. The analysis started with searching the athletes from the sample on different scoring tables. We investigated whether an individual’s career lasted through all age categories [YES/NO] or whether it was completed somewhere in between. Nominal (dichotomous) variables were used. During examination of the scoring tables, we recorded an athlete's best placement, regardless of discipline. After sports careers had been roughly set down, we reviewed each young athlete's history of obtaining a national record throughout his career. At the same time, we monitored which young athletes competed at the highest international athletic competitions at any point and how many athletes from the sample were included on the 30 best Slovenian athletes of all-time list in their respective disciplines.

Microsoft Office Excel 2010 and IBM SPSS Statistics 21 were used for statistical analysis. Due to an excessive amount of data, we limited ourselves to the male population of Slovenian athletes. In view of the nominal metric level of almost all variables, statistical significance was tested using the two-tailed $\chi^2$-test and Cramer’s V coefficient. Data processing was carried out with a significance level ($\alpha$) of 5%.

**Results**

*Dropout and Dynamics of Sports Career Development by Young Successful Athletes*

Dropout rate for 566 young athletes is captured in Figure 1. Only 15.19% of young promising athletes persisted until the absolute age category.

![Dynamics of dropout between U16 and absolute category](image)

*Fig.1. Dynamics of dropout.*

The dropout rate was compared between groups of athletic disciplines, but differences were not statistically significant.

*Success at the National and International Levels*

14.31% of young athletes from the sample were ranked among the 30 best Slovenian athletes of all-time in each athletic discipline. That percentage is much higher than that of participation at international championships. Out of all the promising U16 athletes ($n=566$), 45 (7.95%) participated in European or World Youth (U18) Championships. Among them, 28 athletes (62.22%) persisted to the senior category. The
correlation between the described pair of variables is statistically significant ($\chi^2 = 83.906$; Cramer’s V = 0.385; $P = 0.00 < \alpha$). Interestingly, a relatively large percentage of young athletes (11.33%), who did not compete at an international championship in the youth category, succeeded in developing sports careers and reached their peak in the absolute category. The correlation between the above-mentioned pair of variables is even stronger in the U20 category. Of all the young athletes in the sample, 9.54% took part in a European or World U20 Championship, and 1.06% participated in at least one major international athletic competition in the absolute category.

**National Records**

37 U18 national record holders were identified in the sample. Among them, only 40.54% competed later in the absolute category or developed senior careers. One variable is in statistically significant correlation with the other: $\chi^2 = 19.737$; Cramer’s V = 0.187; $P = 0.00$. Among the young athletes included in the sample, 8.13% in the U16 age category, 2.83% in U20, 3.36% in U22, and 2.30% in the senior category set national records.

**Influence of Young U16 Athlete Competitive Success on Career Length and Success in the Absolute Category**

Although we had assumed inversely, a senior career was developed by a higher percentage of the most successful athletes in competitions (21%) in comparison to only 10% of the less successful individuals who persisted into the absolute age category. While the difference in the percentage is large, statistical significance is small or even equal to 0 and consequently smaller than the set significance level – $\alpha$ ($\chi^2 = 18.277$; Cramer’s V = 0.180). Thus, the difference is statistically significant.

Placement on U16 scoring tables correlated with participation in international competitions. The results in Table 1 show that several of the most successful individuals were representatives of the U16 group, who had participated in at least one European Championship (EC), World Championship (WC), or the Olympic Games (OG).

<table>
<thead>
<tr>
<th>Placing in scoring tables U16</th>
<th>1.-5. place</th>
<th>1.-5. place [%]</th>
<th>6.-10. place</th>
<th>6.-10. place [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U18_int_comp</strong></td>
<td>YES</td>
<td>34</td>
<td>10,79</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>NO</td>
<td>281</td>
<td>89,21</td>
<td>240</td>
</tr>
<tr>
<td>Together</td>
<td>315</td>
<td>100,00</td>
<td>251</td>
<td>100,00</td>
</tr>
<tr>
<td><strong>U22_int_comp</strong></td>
<td>YES</td>
<td>42</td>
<td>13,33</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>NO</td>
<td>273</td>
<td>86,67</td>
<td>239</td>
</tr>
<tr>
<td>Together</td>
<td>315</td>
<td>100,00</td>
<td>251</td>
<td>100,00</td>
</tr>
<tr>
<td><strong>Ac_int_comp</strong></td>
<td>YES</td>
<td>31</td>
<td>9,84</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>NO</td>
<td>284</td>
<td>90,16</td>
<td>246</td>
</tr>
<tr>
<td>Together</td>
<td>315</td>
<td>100,00</td>
<td>530</td>
<td>100,00</td>
</tr>
</tbody>
</table>

**Legend:** U18_int_comp – participation in EC and/or WC U18; U20_int_comp – participation in EC and/or WC U22; Ac_int_comp – participation in EC and/or WC and/or OG in the absolute category

Thus far, the analysis of placement on U16 scoring tables was carried out through variables, which had been created through combining placements into categories. Subsequently, the exact placements of young athletes and the percentage of those who were later included on the list of 30 best Slovenian athletes of all-time for each discipline was considered. This list included mostly athletes, who had achieved second place in scoring tables (29.51%), followed by top Slovenian athletes (27.78%), then those in 3rd, 4th, and subsequent places. Analysis showed statistically significant differences between placements($\chi^2 = 38.156$; Cramer’s V = 0.260; $P = 0.00$).

**Discussion and Conclusions**

**Dropout and Dynamics of Sports Career Development by Young Successful Athletes**

The rate of dropout in Slovenian sport is estimated to be around 75% [2]. In the present study, we found that 85% of Slovenian athletes drop athletics on the way to the senior age category. Top level – EC and/or WC and/or OG in the senior category – is reached by less than 15% of the most promising athletes from the country. Around 70% of U16 athletes manage to persist until U18 and only 56% until U20. The results are quite
comparable with research findings from other countries and different sports. For example, less than 50% of tennis players (U16) and 34% of young cyclists advance and achieve a top senior level [5; 18].

A study done by Wall and Côté [26] showed that young hockey players, who had already had high-intensity training during childhood, which had caused enormous exertion to their bodies, concluded their sports careers earlier. These findings were confirmed by a study of the Russian national swim team members [3]. The swimmers, who had specialized for their discipline earlier, needed more time to achieve international status and did not stay on the national team for long. They stopped competing in swimming earlier than the group of swimmers who specialized later. Examples of good practice in Slovenia inform us that reaching top results is possible even if an athlete develops their talent slowly. An example in athletics is Matic Osouvnikar – a Slovenian promising athlete from Germany and Britain adds up to 50/60%. In Belgium, 80% of athletes do not succeed in finishing high school. Furthermore, only 47% of them represented their country at senior international competitions. A Finish researcher found that out of a group of 90 young promising athletes who started specialized training when they were between 11 and 13 years old, only one athlete succeeded in achieving a top national level [6]. The study also showed that women athletes face higher dropout rates than men and that most of them leave the sport by the age of 17.

Very Young Athletes and the Influence of Age on Career Length and Success in the Absolute Category

Questions arising are whether late specialization truly enables top results in the absolute age category, or is success under the age of 18 (or even 16) indeed a guarantee for the development of a successful senior career.

Based on our study's findings, the answer to the first question would be affirmative, although early specialization was not a central subject of research and it did not prove to be negative at all. We found that very young athletes (13- and 14-year-olds), who got into U16 scoring tables, more often reached the senior category. They were also more successful in competitions than 15-year-olds. The most probable reason for younger athletes being more persistent and successful, was connected with the giftedness of those athletes. Very young individuals are more talented than those whose results in scoring tables were achieved with 15 years. For this reason, younger athletes are competitive with less training, even in the U16 age category. An athlete must be capable of effective adaptation to training, which means that they are able to reach better progress in a defined time period.

Influence of Young U16 Athlete Competitive Success on Career Length and Success in the Absolute Category

The second question also has several possible answers. Our study showed that a higher percentage of competitively successful young athletes develop a senior career. This means that success in youth competitions could represent one of the indicators for success in the absolute category. Again, experts in the field do not always agree on this issue. Some claim that success in one's senior career depends on the quality of childhood sports results. Škof and Bačanac [21], on the other hand, proposed that a high level of competitive success might not be a guarantee for achieving absolute sport efficiency. Güllich's research [8] similarly showed that the correlation between the two variables of competition success in childhood and absolute sport effectiveness is very small or even negative. This research included elite and average athletes and studied the differences between the two samples in career development. It was reported that in about 64% of future top sportspersons, every second training was devoted to other sports until a relatively later age.

The most important findings of our research are:

- In Slovenian competitive athletics, dropout is very frequent.
- 13- and 14-year-olds, who get into U16 scoring tables and are among the top 10, persist in athletics longer and more often reach the senior category. Furthermore, they take part in major international championships more frequently and are more likely to break national records. The list of 30 best Slovenian athletes of all-time is full of younger athletes (compared with 15 years old athletes).
- Competitively, the most successful young athletes persist in athletics and progress to the senior category more often than those who place 6th to 10th in U16 scoring tables.
- Competitively, the most successful young U16 athletes more often take part in major international competitions for all age categories than less successful young athletes.
- There is a higher percentage of competitively most successful promising individuals among the 30 best Slovenian athletes of all-time.
The contribution of the paper is theoretical as well as practical. According to research results, the question about early or late specialization is not the most important. It is necessary to identify young talents as soon as possible and adjust training programs to each individual. Only such an approach enables promising youths to achieve good results even in the senior age category and, on the other hand, prevents high dropout rates. For future athlete studies, we encourage researchers to include women in their studies, as it would be very interesting to see if the processes between genders are similar and whether women's athletic careers develop differently. While discussing the findings and summing up the results, we realized that it might be better – instead of U16 placement in scoring tables – to use athletes' achievements (times, distances) for analysis. Athletics enables this because it belongs to the class of cgs sports (CGS = Centimeter, Gram, Second), for which achievements are easily measurable. In this way, the sample's inclusion of young sportspeople, whose results are high above the Slovenian average and are competitively the most successful young athletes, could be demonstrated.

Conflicts of interest

The authors declare that they have no competing interest.

References:


