Comparative analysis of sport competition systems on national and international level for talent selection

Abstract of PhD Thesis

Zsombor Márton Zilinyi

Doctoral School of Sport Sciences
Hungarian University of Sports Science

Supervisor: Dr. Tamás Sterbenz, professor, PhD
Consultant: Dr. Ágoston Nagy, assistant professor, PhD

Official reviewers: Dr. Éva Bácsné Bába, professor, PhD
Dr. Tamás Dóczi, associate professor, PhD

Budapest
2024

Introduction

The sports science scene has always been concerned with tangible means of predicting talent. The question of the extent to which various junior tournaments and prestigious youth events abroad determine the life course of an athlete has been addressed. If we achieve outstanding results as swimmers, runners, footballers or basketball players at a young age, how confident can we be that we will be able to pursue a professional career and repeat our childhood successes at adult level?

Researchers' conclusions about later success from preliminary results related to talent selection are contradictory, with experts reaching different conclusions in different sports about whether adult success can be predicted. Consistent predictive models are also being tried at national, international federation level, mainly using sport-specific measures for talent selection. In order to predict the likely development path and potential of talent, psychological, cognitive, anthropometric, motor skills and other sport-specific measures are used. However, factors that also influence performance but are not considered primary tend to be given less importance. Competitive performance, competitive experience and sport-specific statistics (e.g. playing time, points scored) that are linked to talent selection have not yet been typified in the context of talent selection research, but their role is not negligible. The literature in the sport of basketball also focuses mainly on direct, effectively measurable factors related to talent selection, and does not examine comparisons of competitive systems in the sport in the context of adult success. My dissertation defines adult success in terms of whether the athlete has been able to showcase in a match for the adult national team or, in the context of research on Hungarian athletes, whether the athlete has played in the NB1 championship?

In summary, the present research is justified by a combined lack of both sport and literature:

1. talent research and models primarily examine key factors in relation to player profile development, but there are a number of underlying influencing factors that have not been researched or there is relatively little literature, and their presence may be predictive (taking into account noise and the luck factor). Complex talent management programmes aim to find direct answers to talent selection factors for several sports at the same time, but it is very difficult to synthesise a single identification for different sports, and it is worth taking into account the specificities of each sport. The analysis

of the effectiveness of sport competition systems at the system level has not yet been done, and this has given me the opportunity to look at a complex known sport.

2. The present research may also be a niche in basketball sport-specific research, because the focus, like relevant literature in other sports, is also on research measuring psychological factors, motor skills, anthropometry, other factors influencing selection and efficiency, which are relevant to this dissertation, have so far been less focused in the sport science context. For example, studies of the effect of relative age on several team sports occur in the international literature, and research on individual statistical indicators is also embedded in the sport science scene, but the contextualisation of this research has been lacking.

3. There is a lack of feedback on sport economic and sport professional competitiveness in a holistic way. Although each aspect is examined separately, this often leads to one-sided conclusions. The exploration of the economic potential and trends in domestic sport and the juxtaposition of international sport competitiveness and thus the dual value creation can initiate a frank and objective scientific debate to better target sport governance strategies and provide alternatives for reforming the competition systems in each sport.

The research has been divided into a national and international dimension, and each of the background variables has been analysed accordingly.

Objective and hypotheses

The main objective is to investigate the relationship between competitive experience and key statistical indicators (time on court, points scored, assists and rebounds) and to evaluate the results of the different competitive systems in basketball. As a complementary research, I would like to shed light on the extent to which participation in European Youth Championships, the games played and the minutes played on the court can influence the performance of national teams at adult age. To what extent do the European Youth Championships prepare you for the adult national team? Is there any statistical correlation at all between results, statistical indicators and performance at the adult level? In essence, can we weigh up the importance of youth tournaments? Of course, not every player will become a professional athlete at adult level, but I expect that the critical success factors, the stages of a player's career, can be localised.

We were also able to look at trends in terms of how the rate of players' participation in the FIBA youth national teams have changed over the last decades.

Our secondary research objective was to find out whether the changes made, the increased competition opportunities, have led to an increase in the number of players selected for the youth team and the players' youth experience? We hoped that statistical data analysis in sufficient depth would give us a relevant picture of this question. This was done by comparing the data of players who had already been involved in the previous post-competition system with those who had been involved after 2004.

The relevant financial reports of the sports federations give a true picture of the financial background of the individual sports. The results of recent years can be analysed in both aspects through the dual value-added function of sport, thus linking sport competitiveness with sport-related economic competitiveness at national level.

The tertiary aim of my thesis is to offer new research alternatives in the field of talent identification and management by interpreting the results of our academic research. I also consider it important to typify research directions that have not been highlighted so far or that have been ignored by decision-makers when evaluating players.

The following hypotheses have been formulated for this dissertation:

H1- Examination of the domestic arena

H1.1- We hypothesize that the expansion of domestic sport funding opportunities will have a significant positive impact on the competitiveness of domestic basketball youth sport in terms of performance.

H1.2 We hypothesize that, for the male basketball players studied, players selected into individual talent development programs are more likely to achieve adult national team selection than their counterparts not selected into the program.

H2 - Examining the international scene

H2.1 It is hypothesised that competitive experience at post-school level has a significant effect on the attainment of adult selection.

H2.2.1 We hypothesize that the bias of the relative age effect is detectable at the post-graduate level for the male basketball players studied.

H2.2.2. It is assumed that the bias of the relative age effect is detectable at the adult level for the basketball players studied.

H2.3. We hypothesize that proven players who have reached the adult selection level have significantly higher statistical indicators at the post-graduate level than athletes who have not reached the adult selection level.

H2.4 We hypothesize that there is a correlation between individual statistical performance at the European post-graduate championships and statistical performance at the adult national level in terms of point shooting, rebounding, minutes played, and scoring.

H2.5. It is assumed that the U20 European Championship is the most efficient tournament system in terms of cashing in.

H2.6. Assume that all-star players selected at the European Junior Championships are more likely to be selected for the adult national team

Athlete's background interview:

H3. We hypothesised that the impact of the post-graduate European Championships is more significant for established athletes than for non-established athletes.

Methods

The dissertation uses both qualitative and quantitative research methods. I have analysed strategy documents available on the internet to understand the national and international sporting objectives. In order to meet the research objectives and to investigate the stages of youth sport and the pathway to adult selection, the relationships between youth and adult sport, I used quantitative methodology. To analyse the trends observed in the post-school competitions and to analyse the secondary objectives of the research, I also used a data-cleaned statistical database (n=3779) retrieved from official websites. Another aspect of the research, the analysis of the Hungarian sport competition system, for which I compared the competition experience and statistical indicators of the adult Hungarian sample (n=30) with international data, as well as the men's basketball players of the Hercules programme (n=143) in terms of the relevant age group. IBM SPSS Statistics was used for data analysis.

The research uses both modern bottom-up and top-down methods. It is "bottom-up" because it examines the players (N=3779) of post-graduate tournaments from 2004 to 2019 in terms of relevance to post-graduate experience, results, statistics and adult success. "Top-down", because in targeting adult players, we aimed to look retrospectively at the post-graduate playing history of adult national team players (N=281), and we looked at players who achieved adult medal finishes at national team level after the millennium. The study also provided an opportunity to investigate the presence of selective bias in the sample due to the relative age effect.

The dissertation also aimed to investigate the professional development of players who have been awarded prizes in junior competitions and to examine the putative correlations between youth – senior statistical indicators. For this purpose, we analysed the statistics of all available individual award-winning players of the age group we studied (N=320).

We were able to measure subjective experiences mainly by qualitative means. We used an expert sample of players who had participated in the same tournament system, i.e. all of whom had played in a European post-graduate championship. We thus relied on the opinion of coaches of national junior teams to define the expert sample. We narrowed the expert sample down to 8 players, taking into account the appropriate stratification as well as age specificity (26-28 years old is the "performance plateau") and the ratio of proven-unproven players. QDA MINER LITE - free qualitative data analysis software was used to conduct the qualitative research.

Results

Hypothesis H1.1, which hypothesized that the expansion of domestic sports funding opportunities would have a significant positive effect on the competitiveness of domestic basketball youth sports in terms of performance, was rejected after examining several aspects. Over the past 12 years, the revenues of the Hungarian basketball federation have increased from HUF 197 million to HUF 6 billion 331 million, with incomparably better financial opportunities in the present era. There has also been an increase in the number of athletes in the sport, as measured by the number of competition licences issued. The level of spending on youth competitions has also increased in recent years. In this form, therefore, the sporting background is there, but there has been no explosion in competition results in the field of junior sports. The changes in revenues showed a strong correlation ($r=0.713$) with the results of the U16 national team. While maintaining the causality link and the influence of team performance on marginal selection, it is necessary to identify the underlying causes and to imply real indicators in the system. The results obtained are in line with the findings of Kendelény-Gulyás (2017) that the increase in public funding has not necessarily led to an increase in competitiveness in Hungarian team sports.

In order to put the results into an international context, it is important to map the intentions of the domestic federation through secondary research based on the documentary analysis. Based on the available public documents (MKOSZ Utánpótlás Program- Nurture basketball players, Shoot to the basket - MKOSZ Sport Sector Development Programme, Új Pályán - Strategic concept for the renewal of Hungarian basketball, MKOSZ current competition rules), the focus of the Hungarian federation is primarily on the development of the sporting landscape (academies, coordination with higher education, more efficient financing, knowledge transfer). A comprehensive strategy document on complex talent identification was not found in the documents of the national federation, but the main principle of a quantity-to-quality orientation can be localised. The necessary age group and basketball-specific areas of development and training methods are defined by the federation for the youth training workshops, as well as the sporting timetable and selection principles for the youth teams. The indicators of sporting success other than mass participation and the tools that can be associated with them are not currently given priority in order to achieve the sporting strategy objectives. Talent management and talent selection is carried out in the framework of the

Sport XXI programme, then the Herculean task of selecting players for individual sporting teams, and within the framework of academic and youth workshops.

During the documentary analysis, improving the competitive conditions (joint communication between clubs and national teams during the assemblies, taking into account Herculean tasks, mentors and joint professional programmes) was identified as a priority in the context of youth selection and talent selection. The competition rules and strategic concepts outlined show that the national sporting leadership is trying to bring the junior competition system in line with international junior competitions, so that athletes compete in similar age groups. The challenge is to improve the performance of national teams and thus the competitiveness of Hungarian basketball. Research shows that countries with structured and organised talent development programmes in sports federations have a higher success rate in talent selection (Gonçalves et al., 2011; De Bosscher et al., 2015). Our country has talent development programmes that promote early talent identification, but this can be counterproductive, as some research shows that too early selection can often lead to drop-out (Barreios and Fonseca, 2012; Enoksen, 2011).

The structural conditions are increasingly given. Although a large number of young Heracles players were able to make their debut in the first division of the Hungarian sportsmen and women studied, the largest proportion (58, 41%) were able to play in the second division for a longer period of time. In our opinion, this is due to the annual league competitions and the decisions of the owners and coaches, as the majority of the playing time in the first divisions is given to foreign players and the dominant, older Hungarian players. In the second-tier league, teams are currently not allowed to employ more than one foreign player, which further encourages young Hungarians to play there. The aim of the association is, of course, to give as many young players as possible a chance to play in the top flight, and it will do everything in its power to support this. The academies and youth training centres must work effectively to promote the best possible training for youngsters. The effective work of academies and training workshops remains essential to achieve this. Although the training clubs of the participants in the Herculean programmes studied are geographically diverse, the selection of Herculean players at adult national team level is strongly Western-centred.

Resolving this requires a two-pronged approach: on the one hand, optimising the federation selection processes and developing a broader perspective, and on the other hand, rethinking the youth training strategies of the sports organisations representing the eastern part of the country and developing a more effective youth training approach.

In 2004, the European Basketball Federation reformed its youth competition systems with the aim of giving more players the opportunity to showcase their skills at national level and to attract more players to the highest level. This trend was clearly visible when analysing the frames of adult medal-winning teams, as the proportion of players who had played in the old competition system was significantly lower than that of their counterparts born in 1984 and after. The possibility of competing every two years in the old competition systems has been replaced by the possibility of annual competitions, giving young players the opportunity to participate in several events per year, thus significantly increasing their competitive experience.

In our research on competitive experience, we have observed an increasing trend in effectiveness, and therefore take-up, for both the adult sample and the large sample of junior athletes. 84% of adult players had a post-graduate selection and the proportion of players selected in all post-graduate tournaments increased. Our hypothesis H2.2 is thus confirmed by our results.

The majority of youth selections in the adult field were made by former U20 national team players, and similarly the majority of the U20 sample was selected for the adult national team. Hypothesis H2.5 was confirmed by our bottom-up and top-down research. Since the closest step to the adult national team at the European youth level is the U20 championship, those who are present at this step have the highest chance of making the adult elite. There is a high turnover of talented players between the different competition systems, with several players missing out on a stage. Reasons include injuries, different coaching approach, club commitments, etc.

Previous research on both individual and team sports has shown that selection programmes are not characterised by the initial selection and then long-term systemic care of talented athletes, but by a dynamic process of selection, re-selection and de-selection (Barth et al., 2018; Güllich, 2013). The presence of high turnover was also detected in our research, as a marginal proportion of players participated in all the post-graduate stages.

The relative age effect has also been observed previously in sports as diverse as baseball (Stebelsky and Barnsley, 1991) hockey (Sherar et al., 2007), basketball (Delorme and Raspaud, 2009) and football (Helsen et al., 2005). Esteva et al. (2006) find that at basketball level the effect is 80% in a post-graduate sample, 60% in adult Spanish leagues for those born in the first half of the year, and 50% in the NBA. For our own sample, the proportion of Hungarian players born in the first half of the year is 56.7%, and the adult medal sample is

also more representative of the first half of the year (57%). These results are in line with international averages. Thus, our hypothesis for the adult sample is rejected (H2.2.2.)

For our post-graduate samples, we found significant differences in the first quarter of birth, with the highest proportion of U16s (38.6%). In terms of quarters of birth and statistical indicators, we found inverse results for former post-graduate national team players who were selected for the adult national team, with those born in the fourth quarter having better statistical indicators. Relatively younger players who make the cut are more likely to reach the professional level than their relatively older national team counterparts (Gil et al., 2020), while those who rely on a maturational advantage do not perform as well in the adult field (Fumarco et al., 2017). This may be explained by the fact that those born in the second half of the year are more adaptive, easier to adjust to and their evaluation is based on their actual performance in relative terms. Our hypothesis H2.2.1 is accepted on the basis of our findings. Based on the bumpy road theory (McCarthy and Collins, 2014) or the 'underdog effect' hypothesis (Gibbs et al., 2012), players who persevere through traumatic events in a sport have a good chance of being selected for national teams later on. Previous studies across different team sports have shown that higher paid, award-winning athletes (Ford and Williams, 2011; Fumarco et al., 2017) or even All-Star athletes in the Canadian National Hockey League (Gibbs et al., 2012) are more likely to be born later in the year. Taken together, these data suggest that there is a 'reverse advantage' whereby some athletes can increase their competitiveness and overcome chronological limitations by developing skills related to their sport context (e.g. technical and tactical performance) to compete with their peers born earlier in the year. Our large sample of offspring also confirmed the inverse advantage, with those born in the last quarter of the year having significantly higher statistical indicators.

It can be observed that the most researched statistics are game-related statistics, and the most commonly used metrics for the analysis of individual performance in an academic context are game-related statistics (Sampaio et al., 2010). Academic research focuses on the decisive factors that distinguish winning and losing teams and determine the outcome of a match or a tournament. (Zhang et al., 2020, Casals & Martinez, 2013, Csataljay et al., 2009, Puente, 2015, Zhang et al., 2018, Gomez et al., 2016). Although recent studies mainly analyse team performance indicators (Kubatko et al., 2007), the study of individual performance variation and correlates at youth and adult levels helps to understand competitive sport systems. We believe that performance analysis in basketball can lead to better understanding and decisions. These game-related statistics nowadays provide a wealth of opportunities to evaluate

basketball performance, with an explosion of data volume and depth only available in recent years. In our study, established players outperformed players not progressing to the adult level in statistical indicators as expected, as shown by the significant difference in our two-sample t-test, and we accepted our hypothesis H2.3. We also analysed the indicators separately to support hypothesis H2.4. We observed the smallest correlation with adult scores for scoring, but also relevant admission factors for talent selection were points shot, minutes played and rebounding. The "point kings", "rebounding lords" and "coaches' favourites" were significantly representative of those who would later make their debut in the adult national teams. Thus, although the indicators related to efficiency on the way to victory are relevant for teams, in a post-graduate age group comparison, the primary talent identification criteria, as in the literature on the international adult field, was point scoring. Significant results were obtained primarily in the areas of point shooting and rebounding, and the hypothesis is accepted.

Roles and minutes are often clearer in adult age group selections because performance and success are paramount. In the youth categories, individual development is a major responsibility of coaches. It is also recognised that the performance of adolescent players is very inconsistent. We can agree with the statement that the majority of the players who are awarded will make it to the adult national teams (58%), which is a predictor of future performance, in case they perform well and are awarded in these youth tournaments. Players who go through multiple selections and awards are more likely to be selected for the adult national team later on.

Hypothesis H2.6 is accepted, due to the significant ($p < 0.001$) differences for all-star players. As for the statistics, the scores are at the beginning or end of an official statistics sheet - it should be pointed out that this is the most frequently cited statistic - and presumably these statistical indicators are the most influential in selection decision making. In the sense of bounded rationality, we are looking for satisfactory solutions, so the point spread as a statistical factor may inhibit the enumeration of additional options in most cases. From the players' point of view, this fact may encourage opportunistic play, despite the fact that this behaviour is against the team's interests. From the data obtained, it can be concluded that young players need to be entrepreneurial in order to attract the attention of decision-makers and to be considered for selection at the end of the junior tournament. Another noteworthy finding of our study is that shooting efficiency is not as important as scoring in youth all-star selection, although other studies have shown its importance when considering team wins

(Çene, 2018; Karipidis et al., 2001). The shooting form of players may influence team performance, but it is not a significant determinant of all-star selection.

Efficiency Factor (EFF) is the second most important selection factor in the context of awarding. Despite the fact that it is a game-related statistic that directly measures the efficiency of players, decision-makers prefer scoring rather than EFF. This can lead to tensions between players and teams and calls into question the relevance of this efficiency indicator. This anomaly can be resolved by introducing a new statistical factor that more effectively measures player performance. There have been research attempts to develop an improved efficiency indicator (Sterbenz, 2007; Berri et al., 1999; Bellotti, 2003; Oliver, 2004), but these indicators are not used in official FIBA tournaments. In order to make professional decisions that are acceptable to all, it may be worthwhile to update the official statistical data sheets.

Statistically, defensive rebounds are also a key success factor, both for team and individual success, but in our study the number of minutes played was not as important as we assumed for the all-star team (Zilinyi et al., 2022). The selection of all-star players may be biased by other factors, not insignificant ones being: nationality, team ranking, home team advantage, multiple selections from the past, strong lobbying activity, end-of-tournament injuries, rest during matches, etc.

Although these players have overall performed better statistically than their non-selected teammates, in some ambiguous cases the nomination process is due to the above non-statistical circumstances. Selected players usually have a comprehensive skill set and in most cases the decision-makers will recognise the talent, but there may be a risk of (even unintentionally) downplaying a statistical dimension such as points scored. As the role of prizes becomes more important, decisions to nominate players should be based on deeper analysis.

We accept hypothesis H3, that established players perceive post-graduate tournaments as more important from a professional point of view, as several of our interviewees highlighted the accelerating effect of experience and outstanding performance in tournaments, which helped them to start their professional career.

Conclusions

Although players who missed the post-graduate stages have the potential to reach the adult national team frames, however, when analysing adult medal frames, we found that only seven players were not part of any post-graduate national team. However, these players were in the group of players who played a lot and enough at adult level, with none playing less than 15 minutes on average. Of the adult medal sample, 84.3% (N=287) had participated in some kind of junior national team competition, and 80% of the adult Hungarian national team sample (N=30) had also been present at one of the youth stages. Four of the six players who did not participate in the youth selection were Hungarian nationals, so their participation was not technically feasible. Our results from the top-down research are in line with the research of Kalén et al (2021), and we also see an increasing proportion, as their results show that 303 of the 348 (87%) players participating in the last two adult leagues played in a youth national team. These results are similar to those previously found in Norwegian handball (Bjørndal et al., 2018).

However, the proportions are higher than those observed in Portuguese adult national teams in football and volleyball, where seven out of ten players and seven out of ten players respectively have competed at the post-graduate level (Barreiros and Fonseca, 2012).

Of the adult player sample, 84% had post-graduate competitive experience (Zilinyi, Nagy and Sterbenz, 2020). Closely related to the explanation of these rates is the issue of naturalisation, as more and more nations are adopting this approach to improve their performance. According to official FIBA regulations, a 12-man adult squad is allowed to include one naturalised national. Most countries, including Hungary, have taken advantage of this opportunity in recent times.

Kalén and colleagues (2017), analysing youth national competition experience in basketball, concluded that teams and players who performed better had a higher number of previous championship titles, indicating that a given competition experience can be a determinant of success in both individual and team performance. Arrieta and colleagues (2016) analysed FIBA U16, U18 and U20 championships and concluded that the oldest players performed best in the U20 category and that the oldest athletes performed best in all post-graduate categories.

These descriptive data also confirm the importance of youth tournaments in terms of take-up, but keep the opportunity for those coming from outside the system at a minimum. Where appropriate, these players are playing overseas, focusing very consciously on their individual development at youth level, and therefore leaving the national team could be part of a deliberate strategy. A typical aspect of developing talented players is when coaches train players who are already perceived as talented at higher age groups, so that the player can undergo accelerated development. From a practical point of view, coaches should be aware that it is important for young players to train and compete with different age groups in order to enhance their development at earlier stages (Figueira et al., 2018).

Another aspect of the relevance of post-graduate tournaments was highlighted by our analysis on the adult medal sample, as we found that those who participated in all world tournaments at post-graduate level are not necessarily the most talented and do not automatically get the most minutes in the adult age groups. In terms of uptake, there is no significant stochastic relationship between time on the field and post-graduate competitive experience in the adult field.

In terms of statistical indicators, players who reached the adult national team level had significantly better statistical indicators at the post-graduate level than those who did not reach the elite level later on. In terms of points and playing time, there is a greater variance in the adult field, but the large differences between the variables are realistic for each of the post-graduate age groups due to the increased competition. Another explanation for the greater dispersion is the specific nature of these statistical indicators, as there is a wide range of playing minutes (0-40 minutes) and average points scored.

Significantly higher scores for both all-star and non-selected post-graduate players were found in our study, so that the statistical indicators could be generally considered as an important tool for selection, since in all cases the scores of the later selected players exceeded those of the players who were not selected as teammates (Zilinyi et al., 2022).

In both cases, we can identify benchmarks that are already relevant for the talent selection aspect. In the area of statistical indicators, we registered weak to moderate correlations in some cases. In the field of U20 competition, we have found medium correlations with the statistics related to adult selection, both for the whole sample and for the players who have been awarded. In both cases, this confirmed that performance in the closest age group could be a preliminary indicator for adult membership. Overall, players belonging to the cluster groups of "point kings", "rebounding lords" and coaches' "favourites" were significantly more likely to make the adult national team in the U20 field, while "point kings" from the U18 field

were also the most likely to apply for the national team. Assists were less decisive in the context of qualification for all age groups.

Our hypothesis that point scoring is a significant selection factor and a means of bringing in talent was confirmed, as we observed that this statistical indicator was ranked first for both the post-graduate high-sample and all-star players. We considered this phenomenon as a heuristic trap, as in most cases it is the most visible, easily accessible statistic that carries significant weight at any decision making level. It is advisable to include more complex indicators in the selection decision, as there are several aspects of performance on the field that can be interpreted. Attempts have already been made to develop game-related indicators of effectiveness, but their practical application would be needed to provide selection agents with additional information. Research suggests that pitching efficiency can be a decisive factor in matches and tournaments, but our research suggests that the role of indicators is marginal in the context of selection (Zilinyi et al., 2022).

These data also show that with persistence and hard work, it is possible to make it to the adult national team without being selected for the youth team. Kalén and colleagues (2021) found an inverse relative age effect in basketball in adult national team settings, where players born in the second half of the year outnumbered those born in the first half of the year. Previous research has shown that the relative age effect evens out in adulthood, but this new aspect also confirms the fact that talent development is not linear and talent identification systems are not well developed. Countries that use talent selection programmes are more successful. The results reinforce the aspect that talent competitions are based on a dynamic balance of selection, re-selection and deletion.

Our country has a talent selection programme (Hercules programme) that is capable of identifying talented players. Players who were present in the talent management programme and in the junior national team were significantly more likely to be predestined for the adult team and to have a professional career. Given the complexity of the talent management process, it is important that sport-specific strategies include more detailed and sophisticated guidelines for talent identification.

Lénárt and Tóth (2017) assessed the current situation of youth basketball education in Hungary and how stakeholders evaluate the training and competition systems currently in place. During the research, online questionnaires were completed by coaches, parents and players involved in Hungarian basketball post-graduate education.

The questionnaires covered topics such as training schedules, competition systems, the qualifications of youth coaches and the relationship between training methods and player

development. Based on the results, the researchers found that the majority of youth development professionals are dissatisfied with the current training and competition systems and believe that changes are needed. In addition, parents and players made a number of suggestions for improving the training and competition system, such as increasing the intensity and variety of training, reducing the number of competitions and improving the quality of competitions. Overall, the research has shown that there is a need to improve the system of youth basketball education in Hungary in a number of areas and that the opinions and suggestions of stakeholders are important for improvements. Regarding the professional trends in the Hungarian basketball sport, our research confirmed the need for further improvements.

The results can be examined from two angles, taking into account the fact that by selecting some talented children, the chances of selection and entry of children with similar abilities are reduced (Pareto efficiency):

1. Player selection is working well at the youth level, as a high percentage of adult national teams (Hungarian sample: 80% n=30, adult sample 84% n=318) participated in youth tournaments.

2. Player selection is not fully effective, as a significant proportion of the junior national team players do not become adult national team players, drop out, get injured, choose other careers. In our sample, this rate is 76.5%.

The question is whether the selection from junior competitions should work well, since the European federation's strategic objective is socialisation, which it is fulfilling with the ever-increasing number of junior tournaments and players. Is it a good sport selection system where there is 100% selection from the junior ranks? This probably does not mean efficiency, but rather an unplanned selection strategy and a rigid framework. The possible argument of a limited number of players playing the game may sway public opinion, but it is not based on sports science. Previous research has also confirmed the hypothesis that players who have been in the focus of selection for the adult national team almost all the time during the youth selection process are the ones who have been selected. Is this a good mechanism for excluding players from selection for various reasons? (e.g. due to different biological maturation processes, injuries, lack of playing time) These players fall off the radar of the sports staff. When looking at the number of players re-selected from one year to the next in basketball, the number of re-selected players was much higher for European youth national teams (Kalén et al., 2021), but similarly, the number of re-selected players was extremely high for German and Portuguese national football teams (Barreiros and Fonseca, 2012;

Güllich, 2014). This trend also confirms the presence of a heuristic trap due to limited rationality. Despite having a relatively large number of alternatives to choose from, sport managers opt for the familiar and safe option of fielding a player who has already been selected.

From a basketball perspective, participation in and reward at talent selection programmes and European youth championships significantly increases the chances of success in adulthood. From a sports management perspective, and from a decision theory perspective, when looking for satisfactory solutions, players who have already undergone multiple selections are selected. However, this can immediately set a decision-theoretic trap. The fact that a significant proportion of the adult national team has been a junior national team (the 'expert eye' of the coach) may be a laudable feature of the selection mechanism, but the evaluation process cannot be so simple, as it would exclude any players from outside the system. This could lead to a lack of competition, inefficiency and excessive expectations for players already in the programme, so it is definitely a strategy to avoid.

 The validity of selection decisions may be significantly confirmed by certain factors, but if we take game-specific efficiency as an indicator, the statistical indicators currently used may lead us astray. As a significant part of the evaluation is based on individual and team statistical indicators, scoring and minutes indicators can have a significant biasing effect, a heuristic trap for our decisions. However, despite the fact that one of the best measures of collective performance is shooting efficiency, this perspective is less apparent in individual assessments. Players who score high are selected for awards and later selection, and this often leads to opportunistic behaviour. The use of the direct efficiency indicator is not equivalent to the actual performance on the field, as previous research (Sterbenz, 2007) has shown, and its use as a selection indicator is therefore inadequate. A new type of basketball-specific indicator measuring efficiency is recommended. Studies on basketball highlight the importance of motor skills (Erculj et al., 2010) and maturity (Arede et al., 2021) in the selection process and career progression of players. Results from several studies show that more collectivist approaches have better long-term results in talent management, both in terms of promoting team performance and individual performance.

Despite increasing efforts to objectify performance indicators and standardise them for a given sport, it is difficult to exclude some external factors. In the sport of basketball, there is also a trend in research on luck, with Schumaker et al. concluding (2010) that 35% of NBA outcomes are determined by luck, which is remarkably high compared to other sports. Since time and age are dominant background variables, the sample size can vary dynamically over

time. Younger players may get more playing minutes and the list of senior national team players may grow. The peak performance of an athlete may vary depending on the sport. Another confounding factor may be the reluctance of clubs and national federations to allow athletes to participate in senior national championships. However, there is a clear federation willingness to approach the stakeholders' position. An obstacle to implementation in practice may be the self-interested behaviour of clubs, the protection of the player as a sporting market product. Injuries can affect the potential development and opportunities of players. If we consider the selection of players for awards at the end of a youth tournament, other distorting effects can be identified: the potential lobbying of home teams, the psychological pressure of team strength and ranking, the nationality and composition of the jury.

From the data obtained, we can conclude that it may be worthwhile to differentiate our samples on a post-specific basis, as shifts between age groups may also predict the specificities of the post-related selection. The specificities associated with each country may also provide an opportunity to create groups for comparison (successful countries, midfield, lagging, countries moving between divisions), which can be used to typify different approaches to post-race competition. There is a need for a continuous expansion of the scientific discourse on this topic, for which the research possibilities published in this dissertation could open up new aspects.

List of publications

List of publications related to the topic of the thesis

Zilinyi, Z., Nagy, Á., Borbély, S., & Sterbenz, T. (2022). Bounded Rationality and Heuristics: Do We Only Need to Score in Order to Win Individual Awards in Basketball?. *International Journal of Environmental Research and Public Health*, *19*(4), 2383.

Zilinyi Z., Nagy, Á., Sterbenz, T., Nagy, B. Á., Nagy, B. Á. (2021). Useful tools to predict future performance? Analysis of former individually prized young selected male basketball players, *Studia Universitatis Babes-Bolyai, Educatio Artis Gymnasticae*, *66*(3).

Zilinyi, Z., Nagy, Á., Sterbenz, T. (2020c). A felnőtt FIBA világversenyek dobogósainak elemzése az utánpótláskori versenytapasztalat szempontjából a 2000-es olimpiától a 2019-es világbajnokságig, Magyar Sporttudományi Szemle, 21(6), 54-60.

Zilinyi, Z., Nagy, Á., & Sterbenz, T. (2020b). Competition Experience, Relative Age Effect and Average Age of the Senior World Events' Medal-Winning Basketball Players. *Studia Universitatis Babeş-Bolyai Educatio Artis Gymnasticae*, 65(3), 5–18.

Zilinyi, Z., Nagy, Á., & Sterbenz, T. (2020a). Analysis of the efficiency of the Hungarian Heracles-Programs through Hungarian men's basketball. *Studia Universitatis Babes-Bolyai, Educatio Artis Gymnasticae*, *65*(2).