

SPEKTRUM

The Science Magazine of the University of Bayreuth ■ Volume 17 ■ Issue 2 ■ December 2021



BUSINESS & LAW

Future of professional football

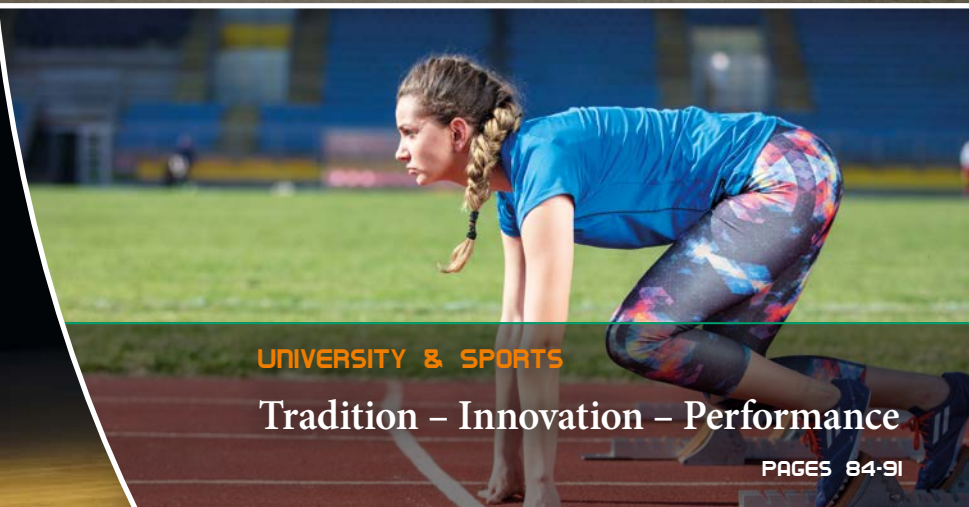
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FOCUS

Sport

Dear Readers,



■ Prof. Dr. Stefan Leible, President of the University of Bayreuth.

Sport science, which is the focus of our new SPEKTRUM issue, has been an outstanding example of the dynamic and far-sighted networking of faculties and disciplines on our campus since the University of Bayreuth was founded. The introduction of Sport, Business & Law was a pioneering achievement more than 30 years ago, followed by other interdisciplinary study programmes, such as most recently the new master's programme in Sports Technology. Today, many of our graduates can look back on successful professional careers in sports management and in the sports industry.

The articles in this issue of SPEKTRUM exemplify how sport science research at the University of Bayreuth picks up on current developments in business and society in order to help shape them with its expertise and innovative ideas. From digitalisation in sport to a health-promoting lifestyle, from governance structures in sports organisations to material science innovations for competitive and health sports, the research topics dealt with in Bayreuth sport science are multi- and interdisciplinary – often in close contact with sports associations and companies in the sports industry. "BaySpo – Bayreuth Centre of Sport Science", which is currently being founded, will further develop this profile, which is unique in Germany, and expand it together with

international partners. In addition, a professorship for Molecular Sports Physiology is currently being established at the new Faculty of Life Sciences on the Kulmbach campus, which will further strengthen this development by linking sport and health science topics.

The COVID-19 pandemic has once again shown us that scientific expertise is needed so that decision-makers in government, business, and society can make well-founded decisions. The University of Bayreuth will certainly continue to contribute its research expertise to answering important questions for the future, given the dynamics of the current changes.

Warm greetings and best wishes for a healthy new year,

Yours faithfully,



Prof. Dr. Stefan Leible
President of the University of Bayreuth

Further SPEKTRUM issues

On the homepage of the University of Bayreuth you will find previous issues of SPEKTRUM on the following topics:

1/2021: Uncertainty	1/2019: Batteries
2/2020: Life Sciences	2/2018: War
1/2020: Hydrogen	1/2018: Planet Earth
2/2019: Africa	2/2017: Sustainability

- www.uni-bayreuth.de/spektrum

The University of Bayreuth was one of the first universities in Germany with the founding mission to promote interdisciplinary research and teaching. The fact that Sport, Business & Law was one of its first interdisciplinary degree programmes is no coincidence. Sport science is already interdisciplinary in itself, combining natural science, social science, and humanities approaches to the topic of sport and exercise, thus promoting thinking beyond disciplinary boundaries.

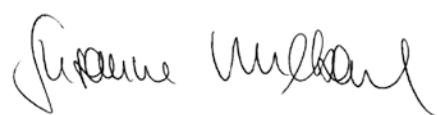
Recently, the interactions between physical activity and nutrition, as part of a healthy lifestyle on the one hand, and health on the other, have increasingly moved into public consciousness. At the same time, there is growing attention to the sustainability aspects of sport, which is now a globally expanding industry driven by technological innovations. The digital transformation is opening up completely new perspectives. Our current SPEKTRUM issue shows how sport science at the University of Bayreuth is addressing these exciting developments and trends – be it in basic research, in application-oriented empirical studies, or in new future-oriented study programmes.

Furthermore, sport science is an area in which the University of Bayreuth's "third mission" – building bridges from the campus to society and the econo-

my – is particularly apparant. In regional cooperations, it supports local sports clubs with its expertise in health and mass sports, and it contributes to the health literacy of children and young people not least through modern teaching concepts in schools. At the same time, as a Partner University of Elite Sport, the University of Bayreuth is very successful in promoting the interests of students wishing to get involved in national or international sports competitions. Moreover, the numerous partnerships and cooperations of Bayreuth's sport science strengthen its interdisciplinary orientation. They provide impetus for far-sighted research projects and promote the innovative further development of teaching, from bachelor's and teaching degree programmes, to master's degrees and part-time MBAs.

We hope you enjoy reading this issue and wish you all the best.

Yours faithfully



Prof. Dr. Susanne Tittlbach
Vice-President of the University of Bayreuth
for Digitalisation, Innovation & Sustainability



■ Prof. Dr. Susanne Tittlbach is the Chair of Social and Health Sciences in Sport at the University of Bayreuth.

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■ Cover photos: ist

■ Figure left: The "Space Curve" on the Campus of the University of Bayreuth, a steel sculpture by Norbert Kricke (1922-1984) (Photo: Chr. Wißler).

■ Aerial view backpage: View of the Institute of Sport Science, University of Bayreuth. (Photo: UBT).

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■ Research and teaching at the University of Bayreuth have always been interdisciplinary – especially in sport science (Photo: UBT).

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More exercise in everyday life makes an important contribution to the prevention of obesity and diabetes mellitus (Photo: ist).

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E-sport has an increasing influence on youth culture worldwide and is now a strong growth market (Photo: H. Heidenreich).



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The University of Bayreuth is awarded the official label of a Partner University of Elite Sport and a much sought after cooperation partner in research and teaching (Photo: UBT).

From institute to research centre BaySpo

■ Markus Kurscheidt
Othmar Moser

Sport science at the University of Bayreuth

As one of the founding subjects at the University of Bayreuth, sport science can look back on an extraordinary development over a good 45 years. It has repeatedly succeeded in providing significant impulses in research and teaching on campus and far beyond, both regionally and nationally. A pioneering achievement in the 1980s continues to be identity-forming and highly regarded: The introduction of the interdisciplinary degree programme in Sport, Business & Law, which was far ahead of its time and is still unique despite the many competing models at other universities. This laid the foundation for the special approach and distinctive profile of Bayreuth's sport science.

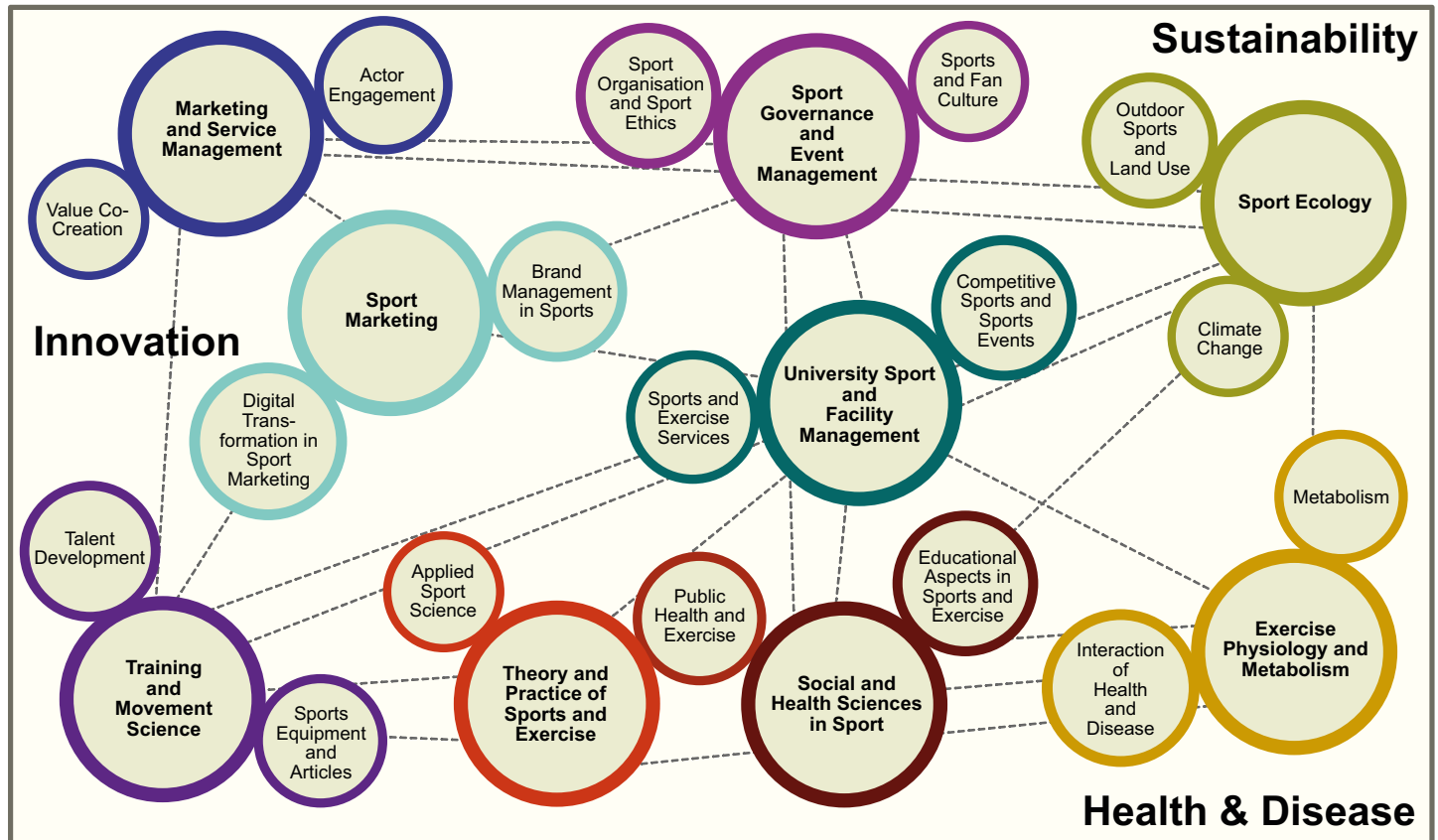
No other sport science institution has succeeded so successfully in combining tradition with innovation and dovetailing its activity with other subjects.

The result are regular top positions in national university rankings of sport science, such as in the evaluation of the Centre for Higher Education Development (CHE). International recognition is expressed, among other things, in exchange agreements, and especially in international Multi Centre Studies, which the University of Bayreuth pursues in cooperation with outstanding universities abroad. A lighthouse project in this context is the programme with Ohio University in the USA, in which a doub-



■ Figs. 1 and 2: In the immediate vicinity of the University Campus: the sports facilities of the University of Bayreuth (photos: Uli Fehr (top), Uwe Scholz (right)).

BAY S PO



- **Sport Science I:** Prof. Dr. Andreas Hohmann
- **Sport Science II:** Prof. Dr. Markus Kurscheidt
- **Sport Science III:** Prof. Dr. Susanne Tittlbach
- **Sport Science IV:** Prof. Dr. Othmar Moser
- **Sport Science V:** Prof. Dr. Manuel Steinbauer
- **Sport Science VI:** Dr. Sascha Hoffmann
- **University Sport and Facility Management:** Dr. Uwe Scholz
- **Business Administration VIII:** Prof. Dr. Herbert Woratschek
- **Business Administration MAS:** Prof. Dr. Tim Ströbel

■ Fig. 3: The Institute of Sport Science is undergoing a structural change towards becoming the Bayreuth Centre of Sport Science. The opening of the BaySpO research centre is planned for spring 2022. The graphic shows the current status of the moderated strategy process, which will be continued in the coming years (Graphic: Sandra Haupt).

le bachelor's degree is awarded. This links the two pioneering universities of sport management on this side and the other side of the Atlantic. In research, Bayreuth sport scientists have received awards from renowned professional societies and are represented on the boards of national and international associations as well as leading professional journals. In the supervision of doctoral students, the sport science at the University of Bayreuth was ranked first in the nationwide CHE Ranking 2021.

Bayreuth's sport science is currently setting the course for the future and will once again set new standards. In spring 2022, the Institute of Sport

Science, which has the status of a department within the Faculty of Humanities and Social Sciences, will be replaced by an independent research centre under the name "BaySpO – Bayreuth Centre of Sport Science". This is the next logical step of sport science at the University of Bayreuth towards a cross-faculty institution that further expands and intensifies its proven interdisciplinarity. Scientists from different faculties and other universities can be accepted as full members of the centre. This will make the BaySpO much more broader-based and influential than in the previous structure. This issue of SPEKTRUM clearly demonstrates this multidisciplinary interlocking, which is set to be expanded.

AUTHORS



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Prof. Dr. Othmar Moser is Deputy Managing Director of the Institute of Sport Science at the University of Bayreuth.



■ Markus Kurscheidt

The future of professional football

Challenges for the governance of leagues



■ UEFA Champions League trophy (Photo: sst). Small Picture: Football jerseys of superstars from teams that play in the UEFA Champions League and are almost all investor-owned (Photo: ist).

Long before COVID-19, the structures and developments in modern professional football were already fiercely contested among stakeholders. However, the interruption of the season in various leagues due to the pandemic and the early resumption of league matches played behind closed doors were a fundamental turning point for professional football. Two systemic problems of top-level football, which experts and fan associations have been warning about for some time, were clearly brought to the attention of all parties involved:

- The professional clubs and leagues such as the German Football League (DFL) have, in many cases, been managed with a financially too risky attitude trusting on an unrestrained growth in revenues and in their pursuit of sporting success. In German professional football, many clubs would not have survived the loss of TV broadcasting income and matchday revenues if the season had been cancelled. Previously strong clubs such as SV Werder Bremen and FC Schalke 04 were not only relegated for failure on the pitch but also as a result of financial shortfalls in the Corona season.

- Still, football has an unbroken social significance. However, the professional business of football is perceived as detached from and no longer centred in society such that the public would accept dubious financial behaviour in the industry. There is an alienation between fans and football officials.

Professional football must tackle these problems. Nothing less than the future of professional football is at stake. This was also recognised by the DFL in October 2020 when it set up a "Task Force Future of Professional Football" to develop goals and recommendations for action on the relevant topics. Immediately, supporters' associations reacted and also presented their ideas in concept papers under the same heading "Future of Professional Football" even before the DFL.

The results of both working groups confirm generally accepted findings of sport science in the field of football organisation: isolated measures will not help to solve the problem. Fundamental reforms in the governance of leagues are needed. The concept of league governance may be understood as the entirety of regulation and control of economic and sporting competition within sports leagues as well as between leagues. The football officials are thus confronted with a complex task at several interconnected levels of action.

National challenge: 50+1 rule and football as a cultural good

Under the impact of the massive criticism during the COVID-19 pandemic, the DFL has for the first time publicly reaffirmed its commitment to the guiding principle of football as a cultural good, whereas in the past the focus was on the business side of professional football. The response of the fans, but also of the DFL task force with its membership of representatives from all social stakeholders, is clear: the 50+1 rule must be secured on a legally solid basis and strengthened. The rule states that the majority of votes of the general assembly of the "parent association club" must be guaranteed against the influence of the outsourced corporation running the professional team. Recent scientific fan surveys have found independently from one another that around 80 per cent of supporters agree with this rule. Surprisingly, first surveys among (potential) football investors also show a high approval of almost 70 per cent, even though the 50+1 rule restricts the property rights of the owners of professional teams. Apparently, at least in this country, investors appreciate the consensus-oriented corporate culture in German

AUTHOR



Prof. Dr. Markus Kurscheidt is the Chair of Sport Governance and Event Management at the University of Bayreuth.

League governance in European professional football

The competitiveness of national leagues in the UEFA Champions League and the Europa League is a key issue in the debates on European professional football. Two doctoral theses at the research group of Sport Governance and Event Management have examined European league competition in more detail at the two key market levels: the overall market of 55 leagues within UEFA and the dominant top segment of the leading "Big Five" leagues (Germany, England, France, Italy and Spain):

- Florian Hösl finds that the German Bundesliga – taking into account the different market environments in the "Big Five" leagues – is more competitive and efficient than its European rival leagues. The study thus refutes the widespread thesis of the Bundesliga's lack of international competitiveness. It also shows that large investment flows do not guarantee success: Wealthy clubs and leagues, above all the English Premier League, have often used their lavish funds inefficiently. In contrast, the Bundesliga's governance model is more effective and fan-oriented.

- Michael Renz's work provides empirical evidence for the first time that market concentration in favour of the "Big Five" leagues has increased significantly and continuously over the last five decades. The study confirms the prevailing thesis that the economic gap between the big and small as well as the rich and poor leagues is widening. One countermeasure could be the merger of smaller national leagues, as recently sought by the initiative for a joint league of Belgium and the Netherlands.

F. Hösl: Wettbewerbsfähigkeit nationaler Ligen im europäischen Profifußball: Eine institutionelle und strategische Analyse der Ligen-Governance. Wiesbaden 2020.

M. Renz: Internationaler Wettbewerb europäischer Profifußballligen: Eine ökonomisch-rechtliche Analyse der Wettbewerbskonzentration und Ligenstrukturen. Wiesbaden 2020.

League governance in world football

In early 2017, news galvanised European football fans and officials alike: The Chinese Super League (CSL) topped the table of highest spend-ing on player transfers ahead of the “Big Five” leagues from Europe. For the first time, the CSL was perceived as a serious competitor in world football. Therefore, the Chinese doctoral student Yang Ma at the research group of Sport Governance and Event Management analysed the latest data on the CSL's league governance based on sound organisational theory and systematically evaluated the articles published in China on this topic. His studies offer the first comprehensive picture of the structures of Chinese professional football. A core finding is that the CSL is dominated by state-affiliated real-estate and technology companies as investors and, despite liberal directives from the central government, cannot free itself from the state dirigisme which is typical for the country. Funded by the DAAD, a Russian and a South Korean doctoral student in Bayreuth

are currently investigating the organisation of professional leagues in their home countries. In addition, the research group of Sport Governance and Event Management wants to advance the scientific understanding of league structures in world football as part of a joint research project with the University of London – Birkbeck and Shanghai University.

Y. Ma, M. Kurscheidt: Governance of the Chinese Super League: A struggle between governmental control and market orientation. *Sport, Business and Management: An International Journal* (2019), 9(1), 4-25. DOI: 10.1108/SBM-11-2017-0070.

Y. Ma, M. Kurscheidt: Doing it the Chinese way: The politically-led commercialization of professional football in China. *Journal of Global Sport Management* (2020), online first. DOI: 10.1080/24704067.2020.1753332.

regulatory policy, with its emphasis on collective bargaining and strong employee rights. The 50+1 rule is the equivalent in professional football.

In addition, recent results from research in sports economics indicate that the restrictive league governance of the Bundesliga is internationally competi-

ve and efficient. This refutes objections that German professional football with the 50+1 rule will soon not stand a chance in the competitions of the Union of European Football Associations (UEFA) if it does not open up more to investors. Moreover, foreign individual investors have even been involved in clubs of lower leagues such as TSV 1860 Munich and KFC Uerdingen 05. The lack of success of these investments is actually more evidence of the problems of too much dependence on benefactors than a counterargument to the 50+1 rule.

In May 2021, the Federal Antitrust Agency's (*Bundeskartellamt*) assessment on the initiative of the DFL was both a tailwind for the 50+1 rule and a challenge. In principle, the sporting policy objectives of maintaining association-based professional football in Germany and ensuring the competitive balance within the league competition were found to be in line with antitrust law. However, the rule exemptions for Bayer 04 Leverkusen, VfL Wolfsburg and TSG 1899 Hoffenheim were questioned under competition law. In conclusion, this means that the 50+1 rule holds legally but is in need of reform, as demanded by fans and investors alike.

Challenge in Europe: Strong industry with major imbalances

The Bundesliga is taking a special path in the European professional football market with its investor restrictions. It would be highly problematic though to follow the mechanisms and models of compe-

League governance from supporters' perspective

Active football supporters, who regularly go to the stadium and often accompany their teams to away games, understand their fan scene as fan culture. They are increasingly confirmed in this view by specialised fan research that has emerged over the last two decades and is intensively concerned with the cultural practices of active football fans. The methods used range from qualitative interviews to participant observation and standardised surveys.

Different projects of the research group of Sport Governance and Event Management use these methods to make contributions to broadening and

deepening the understanding of football fan culture. Repeated online surveys among active fans in Germany are gradually being extended to international leagues in order to comparatively analyse fan cultures in world football. The studies conducted so far show: The self-image of fans and their personal struggle with the often disturbed relationship with their favourite club can only be more accurately understood by in-depth interviews. Many football fans in Germany are thinking about leaving active fan culture. The growing disenchantment with trends in modern professional football is now even leading to the founding of alternative fan-led football clubs, the so called “break-away clubs”.

C. Brandt, F. Hertel, S. Huddleston (eds.): *Football fans, rivalry and cooperation*. London 2017.

L. Hauser: *Fanperspektiven auf Investoren im europäischen Profifußball: Eine Interviewstudie zum FC Bayern München*. Bachelorarbeit, Universität Bayreuth 2022.

Y. Ma, C. Brandt, M. Kurscheidt: *Supporter attitudes toward league governance in emerging football markets: Evidence from fans of the Chinese Super League*. Sage Open (2021, under review).

ting leagues in Europe and of UEFA competitions such as the Champions League and Europa League. This is rarely taken into account in the national debate, except by the supporters' associations. It is true that the business figures of the 712 European professional clubs in 55 leagues on the UEFA's territory are quite impressive. However, the imbalances are extreme, as UEFA itself points out in its industry report.

In the 2018 financial year, the total revenues of European professional football amounted to a good 21 billion euros. The clubs and leagues reached a total of 105 million of stadium attendance. The exceptional growth dynamics of professional football within UEFA is evidenced by the 80 per cent increase in revenue over the last decade, with an average annual growth rate of 6.7 per cent. TV revenues in domestic markets is clearly the most important revenue pillar for European professional clubs, accounting for 37 per cent, followed by sponsorship with 22 per cent and matchday revenues with 15 per cent.

Until the introduction of the Champions League in the early 1990s, four to six clubs from smaller leagues were able to reach the quarterfinals of the predecessor competition. Since then, however, more than 70 percent of the 28 titles of the Champions League have been concentrated in six major clubs of the four strongest leagues. The reason is obvious, because the "Big Five" leagues (Germany, England, France, Italy and Spain) account for 75 per cent of the total revenues in European professional football. The other 50 leagues, mostly small, have to make do with a quarter of the total market. Nevertheless, the Spanish top clubs Real Madrid and FC Barcelo-

League governance from investors' perspective

Those responsible in German professional football are currently striving to open up the clubs more to investors. The focus is on strategic equity partnerships that are designed for the long-term business development of the partners. The best-known example in the Bundesliga is FC Bayern Munich. Well-known companies such as Audi, Allianz and adidas hold minority shares to secure their close sponsorship relationship with the industry leader.

To facilitate such models, football clubs in the top three leagues in German professional football spin off their teams as corporations. As a result, only one third of professional football teams in Germany are now organised as registered association clubs. With the participation of investors, however, dependency increases. While the latter demand control over the football business of the clubs, the club representatives have to weigh up whether the economic and sporting advantages outweigh the disadvantages. Within the framework of an empiri-

cal thesis at the research group of Sport Governance and Event Management, it was proven for a sample of 56 clubs in German professional football that, on average, investor dependency has no significant effect on economic variables nor on the achievement of points and table positions. If these findings can be confirmed, the effectiveness of investor models must be doubted. This in turn would mean that the German Bundesliga should rather pursue cautious reforms in its investor policy.

D. Zangl: *Beteiligungsstrukturen im deutschen Profifußball: Eine quantitative Analyse der Auswirkung auf den sportlichen Erfolg*. Bachelorarbeit, Universität Bayreuth 2021.

T. Duffner: *Strategic equity partnerships in professional football: Evidence on stakeholder attitudes for the case of the German Bundesliga*. Wiesbaden 2020.

na, for example, have run into considerable financial difficulties due to the COVID-19 pandemic. These facts and figures are proof enough of the need for reform in the UEFA leagues. Therefore, the Bundesliga is well advised to focus on the stability of its own governance model and to accept compromises in international competitiveness if in doubt.

RECOMMENDED READING

DFL (2021). *Zusammenfassender Ergebnisbericht der Taskforce Zukunft Profifußball*. 3. Februar 2021. https://media.dfl.de/sites/2/2021/02/2021-02-03_Zusammenfassender-Ergebnisbericht_Taskforce-Zukunft-Profifussball.pdf.

Zukunft Profifußball (2020). *Integrität des Wettbewerbs*. 14. September 2020. <https://zukunft-profifussball.de/wp-content/uploads/2020/09/Zukunft-Profifussball-Integritaet-des-Wettbewerbs-1.pdf>.

UEFA (2020). *The European Club Footballing Landscape: Club Licensing Benchmarking Report Financial Year 2018*. January 2020.



■ Fig. 1: In the 2012 UEFA Champions League final, FC Bayern Munich and Chelsea Football Club faced each other. The venue was the Allianz Arena in Munich (Photo: wikimedia commons / rayand / CC-BY-2.0).

BUSINESS & LAW

■ Peter W. Heermann

European Super League

Assessments from a
legal perspective



■ Images: iStockphoto.com

The field of sports law has always been approximate.¹ Sports law rests on two pillars: Firstly, all state law, but then also supranational law, for example European law norms, are applicable to the sports sector. Secondly, sports federations autonomously set law in relation to their members, especially in the form of statutes, rules, and regulations. With the increasing commercialisation of sport, sports associations have moved towards enacting regulations in their statutes with restrictive effects, not only on association members, but also on third parties independent of the association. These include regulations on players' agents, restrictions on investors such as the "50+1 rule" in German professional football, marketing restrictions affecting equipment suppliers and sponsors, and non-competition clauses for private rival organisers. In this context, sports associations regularly engage in entrepreneurial activities. Where does the scope of protection of the associations' autonomy end in such constellations? Where are the boundary lines, as set by (supra)national law, for the activities of sports associations? How is any overstepping of such lines to be legally assessed and how can it be avoided?

These and similar questions have been part of the research focus of the Civil Law VI research group at the University of Bayreuth for more than two decades now. As professional sport in particular continues to develop dynamically worldwide, new, extremely interesting and exciting legal questions are constantly arising. This development is illustrated below by a current and much-discussed example.

In April 2021, plans to establish a European Super League in football dominated the headlines for a few days. These plans were withdrawn, at least for the time being, after the intervention of the World Football Association (FIFA), the European Football Association (UEFA), many national football associations and clubs, as well as their sponsors, after massive fan protests and almost entirely critical statements in the media. Is the idea of a Super League thus dead? And what is the legal framework that has been largely neglected in the discussion so far?

Context

Twelve well-known football clubs from England, Spain, and Italy – disparagingly known as the dirty dozen – dreamed of the surprisingly announced foundation of a European Super League for two days in April 2021, before nine clubs distanced them-

selves from the project again within a few hours. They were reprimanded by UEFA and promised, not entirely voluntarily, to pay financial compensation. In the event of renewed attempts at secession, they agreed to contractual penalties amounting to millions. The other three football clubs – Juventus Turin, Real Madrid and FC Barcelona – were still under disciplinary investigation by UEFA. In September 2021, under pressure from a state commercial court in Madrid, UEFA finally decided not to pursue the case against the three renegade clubs, and to refrain from imposing sanctions against the remaining nine clubs. The decision of the European Court of Justice on the compatibility of UEFA's action with European law is still pending.

Sports federations do not operate in a legal vacuum

How could this happen when, with the exception of the three top clubs mentioned above, almost all stakeholders seem to agree that efforts to introduce

THE SUPER LEAGUE

■ Abb. 1: Das im April 2021 veröffentlichte Logo der Super League (Quelle: wikimedia commons / European Super League Company, S.L.).



■ Fig. 2: Twelve football clubs from three European countries announced the "Super League" in April 2021: Liverpool FC, Manchester United, Manchester City, Tottenham Hotspur, Arsenal FC, and Chelsea FC (England), Juventus Torino, Inter Milan, and AC Milan (Italy), Real Madrid, Atletico Madrid, and FC Barcelona (Spain) (Image: ist / Christian Göppner).

AUTHOR

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a European Super League should be nipped in the bud for a variety of reasons? The answer is as simple as it is unpopular in wide circles of the sports world: sports associations must respect the limits set by European and national law – in this case by European antitrust law and European fundamental freedoms. This applies all the more when sports associations engage in entrepreneurial activities. The autonomy of associations, which is usually reflexively invoked by sports associations and protected by the German constitution (Grundgesetz) and the European Convention on Human Rights, cannot change this. This autonomy does not apply when sports associations hinder third parties, such as the independent "European Super League Company SL", in the development of their entrepreneurial activities.

the associations, presumably more attractive from a sporting point of view, and backed by billions of euros from financially strong investors. Realistically, many top European clubs can only effectively reduce their debts – which in some cases amount to more than € 1 billion – in the short term by means of the sign-on bonuses promised by the Super League, each amounting to several € 100 million, and subsequent win bonuses. At the same time, national football associations and football leagues, their members, and the sponsors involved fear considerable losses in importance and revenues.

Restrictions to competition intended by UEFA

If UEFA, as an entrepreneurially active sports association, de facto prevents an association-independent company such as the "European Super League Company SL" from developing entrepreneurial activities by prohibiting the football clubs subject to the association and their players from participating in the Super League with sanctions, and categorically refuses to authorise the Super League, this constitutes an intended restriction of competition. According to the prevailing legal opinion, a sports association with a monopoly on the market for the organisation and implementation of, as well as the admission to, competitions in a certain sport – such as UEFA – may not categorically exclude the organisation of potential competing competitions. Rather, there is a need for an admission procedure regulated on the basis of objective, transparent, and non-discriminatory criteria. In the statutes of UEFA, as in the statutes of many other sports associations, one will search in vain for such regulations!

"It is likely that the introduction of a European Super League in football will not be permanently prevented."

Serious economic interests

Obviously, the (inter)national football associations and their football clubs are pursuing economic interests with their attitude of rejection. UEFA and its sponsors are not without good reason afraid of a loss of income from their premium product, the UEFA Champions League, if it were exposed to competition from a Super League that is independent of

Can this limitation of competition be justified?

This is the legal question, as interesting as it is not yet conclusively decided, which will dominate the discussion in the coming years. Such a justification would be conceivable, for example, if the association regulation or measure in question initially pursues legitimate objectives and actually pursues them in a coherent and stringent manner. If this were the case, the restriction of competition would furthermore have to be inherent in the pursuit of the legitimate objectives and finally be proportionate to them (suitable, necessary, and appropriate) in order to be able to justify the restriction of competition. These



Photo: iStockphoto.com

are high legal hurdles, and UEFA is currently already in danger of stumbling at the first stage of any such examination:

■ UEFA undoubtedly wishes to protect its own competitions and the national football leagues from possible competition from a presumably very attractive Super League. However, the pursuit of its own commercial interests by UEFA is definitely not one of the legitimate objectives recognised in antitrust law, especially since this would prevent competition for innovation. It is not unlikely that a Super League with matches exclusively between the best clubs in terms of sport would meet with significantly more interest among football fans than, for example, the UEFA Champions League, which is characterised by clear differences in performance between its participants. The same can be observed in basketball, where the EuroLeague, which has been organised privately for many years, is miles ahead of the Champions League of the European Basketball Federation FIBA in terms of sporting quality and spectator interest.

■ It can be assumed that UEFA will try to justify its defensive stance against a Super League with the loss of importance of the other European and national football competitions, and with a corresponding loss of revenues. The latter in particular could have fatal effects for amateur and grassroots sport. So, would the Super League be allowed to cherry pick teams for its competition without having to compensate in this respect? After all, the players have been trained under the umbrella of UEFA or other continental associations. Moreover, the national leagues have contributed considerably to the attractiveness of the top clubs for the Super League. A complex question indeed!

■ Can perhaps the protection of the relegation model with promotion and relegation, typical of European league sport, justify the restriction of competition? It should be borne in mind here that the Super League – just like the EuroLeague in basketball, by the way – wanted to keep a few places free for new applicants each season. In the meantime, a two-tier league system with 20 members each and with a relegation system has been forwarded.

■ To justify the restriction of competition, UEFA will hardly be able to argue with protection against the players' physical overload. After all, UEFA itself has only recently decided to drastically increase the number of matches in the UEFA Champions League and thus the physical burden on the players concerned.

What will the future bring?

It is likely that the introduction of a European Super League in football will not be permanently prevented. If the league members are then allowed to remain in their national league competitions with UEFA's blessing, the squads of players of the clubs concerned will increase in size noticeably – as has already been observed in the EuroLeague in basketball – in order to be able to be successful on both the European and national stage. Or else the Super League will shower its members with so much money that the football clubs concerned will break away from UEFA and the national leagues (which the latter could not effectively prevent) and players will even be prepared, if necessary – as is already partly the case in the North American NBA basketball league – to forego calls to the national team in favour of their league.

1 Peter W. Heermann: Was ist eigentlich Sportrecht?, in: SPEKTRUM. Das Wissenschaftsmagazin der Universität Bayreuth (2007), 22-23.

LL.M. Sports Law (University of Bayreuth) – for success in the sports world

Anyone who wants to be successful in the sports sector must know the legal, economic and social peculiarities of the industry. The master's programme "LL.M. Sports Law (University of Bayreuth)" is not only aimed at fully qualified lawyers working in the sports sector, but also at all those responsible in sports management who are confronted with legal issues in the field of their professional activity.

The degree programme specifically deals with the know-how related to the sports sector in the following areas of law: Law of associations and federations, arbitration, European and international law, criminal law, tax law, labour law, antitrust law, copyright law, trademark law and unfair competition law, media law, and compliance. Additionally, the content of business administration of sports and the leadership modules impart key skills for professional success.

In the sports industry, the University of Bayreuth enjoys an outstanding reputation as

state university. Students acquire comprehensive and application-oriented qualifications that enable them to present themselves in a professional and compelling manner in the sports world. Therefore, the "LL.M. Sports Law (University of Bayreuth)" credibly signals these success factors to all business partners and potential employers in the sports industry.

Communication with students in the MBA Sport Management, who are present on the days of the event, promote networking with personalities from the world of sports management with both industry- and work-experience. Moreover, the mixture of lecturers from research and practice expands the student's network to include important contacts in the industry.

The "LL.M. Sports Law (University of Bayreuth)" offers the chance to replace intuition with the ability of conscious thought and action. In short, it provides students with the professionalism – for their success in the world of sports.



■ Herbert Woratschek

Value co-creation in sports management

The special importance of social interactions in sport

■ Recent research has shown that all actors where sporting activities are at the core of interest contribute to the value of a brand or event through their interactions (Photo: ist).

The traditional way of thinking about the creation of value in sports management is based on economics and business administration. Companies and organisations create products and services that contain value for their customers. Consumers buy and consume the products and services because they contain value. They are therefore traditionally also called "consumers". In this view, the value contained in the products and services is perishable.

If we transfer this way of thinking to sport, this means, for example, that a sports federation organises a competition series that is demanded both by the audience in the stadium, or in an arena and via different media. The customers pay to watch because they find the sporting competitions attractive. They consume the events as products and "consume" their value. In this context, sports economics emphasises above all that the attractiveness lies in the tension of the sporting competition. There are some special features here:

- Athletes or teams compete not only athletically but also economically when it comes to sponsorship, merchandising, or ticket sales. For the "production" of a competition, however, they have to cooperate. In sport, therefore, co-competition, a simultaneity of competition and cooperation, is constitutive.
- Another special feature is that sporting competitions are marketed on multiple sides, both in the stadium and via the media such as radio, television, or the Internet.

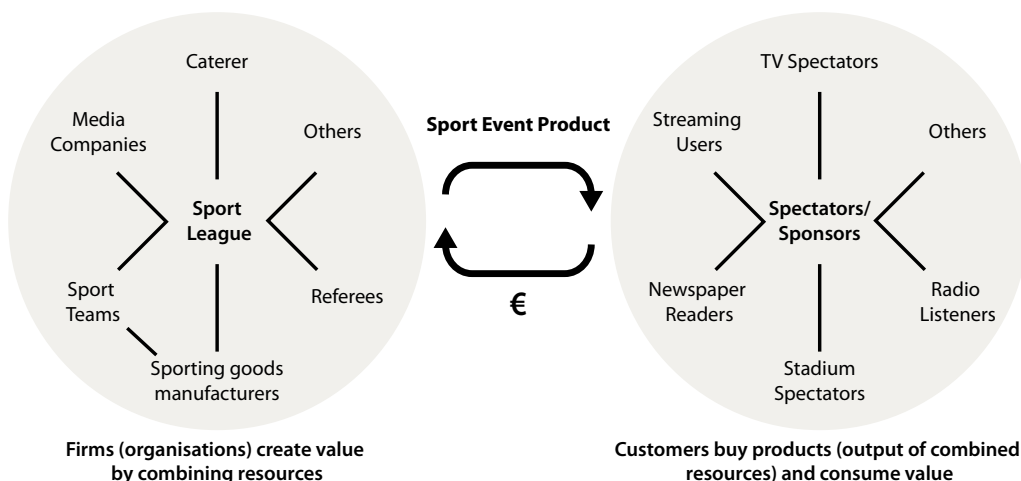
This traditional way of thinking is referred to in sports economics as the "logic of sports products" (Fig.2).



In focus: social interactions

The "logic of value co-creation" is a new way of thinking. It assumes that sporting events are not consumed. Rather, the value of a sporting event can be "revived" again and again. An example is the 1954 World Cup. Even today, the results of the final and stories from the competition can be retrieved by students who are passionate about sports and make their eyes shine. These students were not yet born in 1954. But they know the stories from stories, television documentaries, and cinema films, for example the film "The Miracle of Bern", which was made almost 50 years later. But what is the source of this value? It arises primarily from the *social interaction* associated with this sporting competition (Fig. 3).

■ Fig. 1: The "Miracle of Bern" at the German Football Museum in Dortmund (Photo: DFM/Kobow).



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■ Fig. 2: The "logic of sports products" (Graphic: Herbert Woratschek / Christian Göppner).

Social interactions generate value even before the sporting competition has begun. Many fans feel anticipation when they plan a trip to the World Cup with their social group, for example. Thus, this value cannot come from the production of a sporting event. Even during a sporting event, fans with their choreographies, sponsors with their competitions, and many other actors contribute significantly to

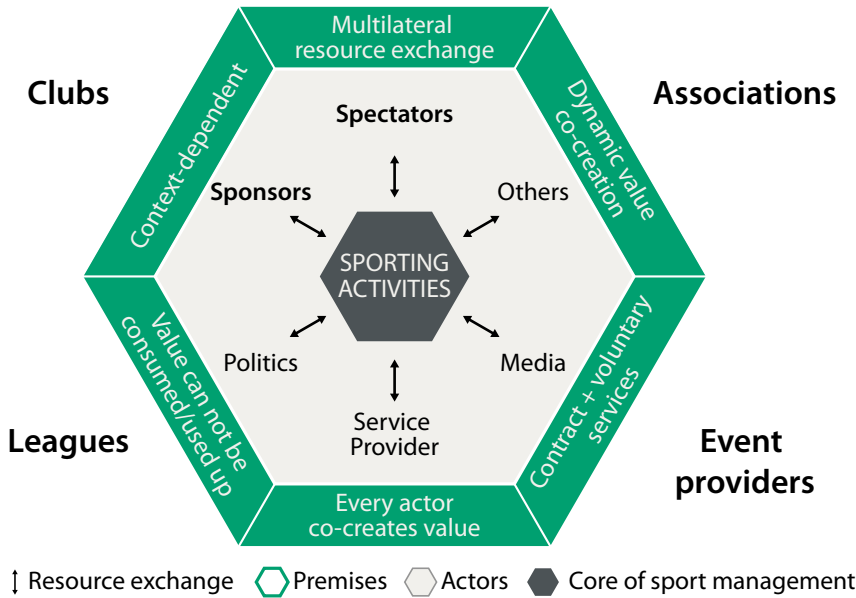
financial value. Several empirical studies at the University of Bayreuth have shown that the audience's willingness to pay increases with the prospect of social interaction.

If one follows the logic of sports products, the value of a ticket lies in the quality features of a sports event. These are expressed, for example, in the different seating categories of a sports arena and in the expectations regarding the attractiveness of a match, which in some cases can also be shaped by the opposing team. The higher the seating category and the better the opponent, the more customers are willing to pay. The logic of value co-creation extends this perspective. It emphasises that value depends not only on the intended use of the ticket, but also on the context of use. This logic particularly emphasises the social context (value-in-social-context) and thus, for example, also the expectations regarding the social interactions when purchasing a ticket.

In an empirical study by the University of Bayreuth on attending a football match in Nuremberg, it was shown on the basis of the logic of value co-creation that those who purchase a ticket in the best seating category for a match against a top opponent (SpVgg Greuther Fürth) are willing to pay considerably more for it if they do not attend the match alone, but together with their social group. The willingness to pay is around 80 per cent higher in comparison. Another study on attending a basketball game in Bayreuth showed that the buyer of a ticket in the best seating category for a game against a top opponent (Brose Bamberg) has a more than 300 per cent higher willingness to pay if they go to the game in their social group instead of alone. This impressively illustrates how much research underestimates the willingness to pay in a sports context when it follows the logic of sports products instead of the logic of value co-creation.

Sports events as engagement platforms

Many more insights could be gained thanks to this new perspective. Traditionally, for example, the focus in sponsoring is on the effects on image, sales figures, and the fit between sponsor, sponsored brand, and target group (the "sponsoring fit"). However, it is precisely those aspects that are neglected that only come into view through the logic of value co-creation and become a research topic – such as the advantages generated by voluntary benefits of



■ Fig. 3: The "logic of value co-creation" (Graphic: Herbert Woratschek / Christian Göppner).

the value of the sporting event. Referees can also influence the value of a sporting event, depending on whether they preside over it "unfairly" or "fairly" in the opinion of the players and the audience. After the game, the media reports, the public discusses controversial scenes, and coaches comment on the games.

Value is therefore not created through the production of sports providers, but through the interaction of actors interested in sports. The providers of a sporting event, for example FIFA, coordinate other actors - these include teams, referees, athletes, security services, stadium operators, authorities, and many more. Together with them, the providers shape the sporting event and all stakeholders contribute to the creation of value.

The value before, during, and after the game is often referred to as value-in-use to distinguish it from financial value (value-in-exchange). While the two concepts of value are not identical, they are related. Value from social exchange can be used to generate



■ Fig. 4: Public viewing (Photo: ist)

the sponsors and the sponsored, the networking of the sponsors among each other, and the effects of group decision-making processes. In brand policy, one has therefore meanwhile moved away from the view that brand value is shaped by the owner. Instead, it is now assumed that all actors for whom sporting activities are at the core of interest co-create brand value.

Value is thus created in sport through a multilateral exchange of resources. It develops dynamically before, during, and after the sporting activities and, in addition to contractual benefits, it also includes many voluntary benefits that are not matched by any direct countervalue. The value of a sporting event is thus never "consumed". In the logic of value co-creation, the view of sporting events as a "product" is therefore rejected. Sport events, but also other "touchpoints" between sport providers and other actors interested in sport, are understood as engagement platforms. Different actors use these platforms for their leisure and business activities. Sport event providers grant (or deny) access for this purpose. They provide an engagement platform to enable and facilitate social and economic exchange between different actors. These have a common interest in the sporting activities, for example a football match in a World Cup or a league game in basketball. Therefore, sporting activities form the core of an engagement platform that serves the co-creation of value. Those responsible for sports management must therefore be aware that they alone cannot determine the value of engagement platforms. Rather, their function is to regulate access to engagement platforms – and in this context, they enable and facilitate economic and social exchange.

Digitisation in sport is a catalyst for the exponential growth of social interactions in which sporting activities are the lynchpin. And this not only applies to e-sports. In fantasy sports, players start by putting together a virtual team from real-life professional leagues. The results of the real competition provide points for the fantasy team based on goals scored and kept, fouls, and many other game aspects of the real competition. These points are calculated in "real time" and determine the champion in the fantasy league at the end of a playing season. Fan apps make it possible for the audience to take on coaching or management tasks. For example, Fan Controlled Football is a professional league that since 2017 has been the first league to offer viewers the opportunity to intervene in the game by voting



■ Fig. 5: US fantasy football emblems (Image: ist).

on suggestions of plays. In addition, fans can also have a say in team names and team colours.

"Value is not created through the production of sports providers, but through the interaction of stakeholders interested in sports."

Communicative research@Bayreuth

The logic of value co-creation is derived from the work of numerous international researchers in service management, including Service Dominant Logic, whose originator – the US marketing expert Stephen Vargo – has been a guest at the University of Bayreuth on several occasions. At this year's conference of the European Association for Sport Management (EASM), four Bayreuth research groups jointly offered a separate track on the logic of value co-creation to underline the importance of this new way of thinking. The Bayreuth sports economists are living the "Third Mission" of the University of Bayreuth by publishing their research work "brief and straight to the point" in Open Access, as MAS podcasts, or as explanatory videos to provide students and managers with quick and easy access to new findings and developments. They cooperate constructively with the flexible Sport Management Academy Bayreuth GmbH (SMAB), a spin-off from the University of Bayreuth, which also ensures the necessary flexibility in the organisational implementation of teaching. On the topic of value co-creation, there is now even a MOOC on the international university platform edX – thanks to the cooperation with the University of Bayreuth's highly competent Centre for Learning & Teaching in Higher Education.

RECOMMENDED LINKS



SMAB Relevant Management Insights:

<https://www.sma-bayreuth.de/publishing/relevant-management-insights/>



MAS Sport Management Podcasts:

<https://www.mas.uni-bayreuth.de/de/Podcast/index.php>



SMAB Clips on Youtube:

<https://www.youtube.com/channel/UCud3SNXR-pBSK2RjBb-56rHw/videos>



MOOC on EdX:

<https://www.edx.org/course/value-co-creation-in-sport-management-a-new-logic-in-a-changing-society?index=product&queryID=e6652da8987ab860eba1001c766c893b&position=1>



BUSINESS & LAW

■ Tim Ströbel
 Claas Christian Germelmann

Brand management and consumer behaviour in sport

A network-oriented perspective increases brand value

■ Sports club brands are more than passively perceived sign systems: they are an expression of social processes that need to be included in brand management (Figure: GoodLifeStudio / iStockphoto.com).

Brand management and consumer behaviour are fields of research that have undergone enormous change in the recent past. New theoretical concepts have been introduced in research, and innovative marketing measures have been tried out in practice. Terms such as engagement platforms, experience society, co-creation of value, brand authenticity, brand cosmos, brand tribe, and purpose or integrative branding dominate the debate. The task of research is now to sort out these developments and to build a bridge between science and practice with the help of theory-based approaches and empirical findings.

Sport in particular offers special framework conditions that allow for a wide range of design options. *"Did you perhaps simply choose a different type of musli for a change the last time you went shopping?"* The associated brand change in consumer behaviour is out of the question for a sport fan. Die-hard fans do not simply change their club, they remain loyal to that club for life, regardless of current sporting success. Certainly, sporting success can be seen as a fundamental element in sporting competition. However, it always remains to be defined in each individual case what exactly is meant by sporting success. Brand management in sport has a very special role to play here, because strategic brand management can make it possible to become less dependent on sporting success and to strengthen the club brand with other content, meaning, and values.

This aspect is also reflected in consumer behaviour in sport. For consumers in sport, it is no longer sufficient for their favourite club to be successful in sport and represent a likeable brand. The critical debate and the protest of the fans regarding the introduction of a European Super League in football in the summer of 2021 has shown that consumers expect more than just "higher, faster, further". Today, they want more, they even demand more. Typical manifestations in sport, such as club brands, competitions or (mega) events, can no longer be built up as a matter of course and driven to new record results from year to year, as it was virtually the case for decades. Not least the COVID-19 pandemic has revealed this development in sport and sport management. Authenticity and basic objectives are gaining in importance, especially among younger consumers.

Brand loyalty and authenticity

Consumers are increasingly questioning the marketing activities and communication measures of

major sports brands. If the intelligently formulated and creatively designed slogans, for example, do not (or no longer) correspond to the actual appear-

ance of athletes, sports clubs, or the appearance of a team, this not only leads to criticism, but in the worst case even to a change in behaviour, or even to turning away from the sports brand. Especially in sport, which is per se associated with certain values such as honesty, fair play, and respect, brands must therefore be authentic. In marketing, brand authenticity means that a brand is perceived as credible and consistent. In addition, a brand should allow the various actors, from consumers to suppliers and other social groups, to contribute and engage with their own ideas.¹

This principle is also pursued by the concept of "higher purpose", which can be described as the overarching purpose of the brand owner. Purpose summarises the long-term reason for the brand's existence, which in turn is derived from the values and beliefs of the relevant stakeholders.² The higher purpose is thus crucial for the success of a brand, which is also based on being in contact with these actors, showing them opportunities for interaction, and offering them real-world opportunities. This includes reflecting on their ideas and dealing with them. Only in this way, is it possible to position a sports brand as a brand for me, as suggested by the US economist Russel Belk in his 1988 article on possessions as extended selves: People are always on a quest to discover themselves and to portray to the outside world how and what they desire to be.³ Sports brands with a higher purpose can help them show what is important to them in life. They provide the necessary symbols and emotions, which in turn can be communicated via social media, for example, and immediately understood by others.

This is a process that is often neglected in sports management, as could be seen in the example of the European Super League. Although fans are

"Higher Purpose is not fairy dust that you simply sprinkle over brand communication as needed, but the central guiding principle of (sports) brand action. It aims to align values and actions in order to be authentic and relevant to the 'my self' project as a sports brand, and therefore requires an active and consistent approach."

Prof. Dr. Claas Christian Germelmann

RECOMMENDED READING

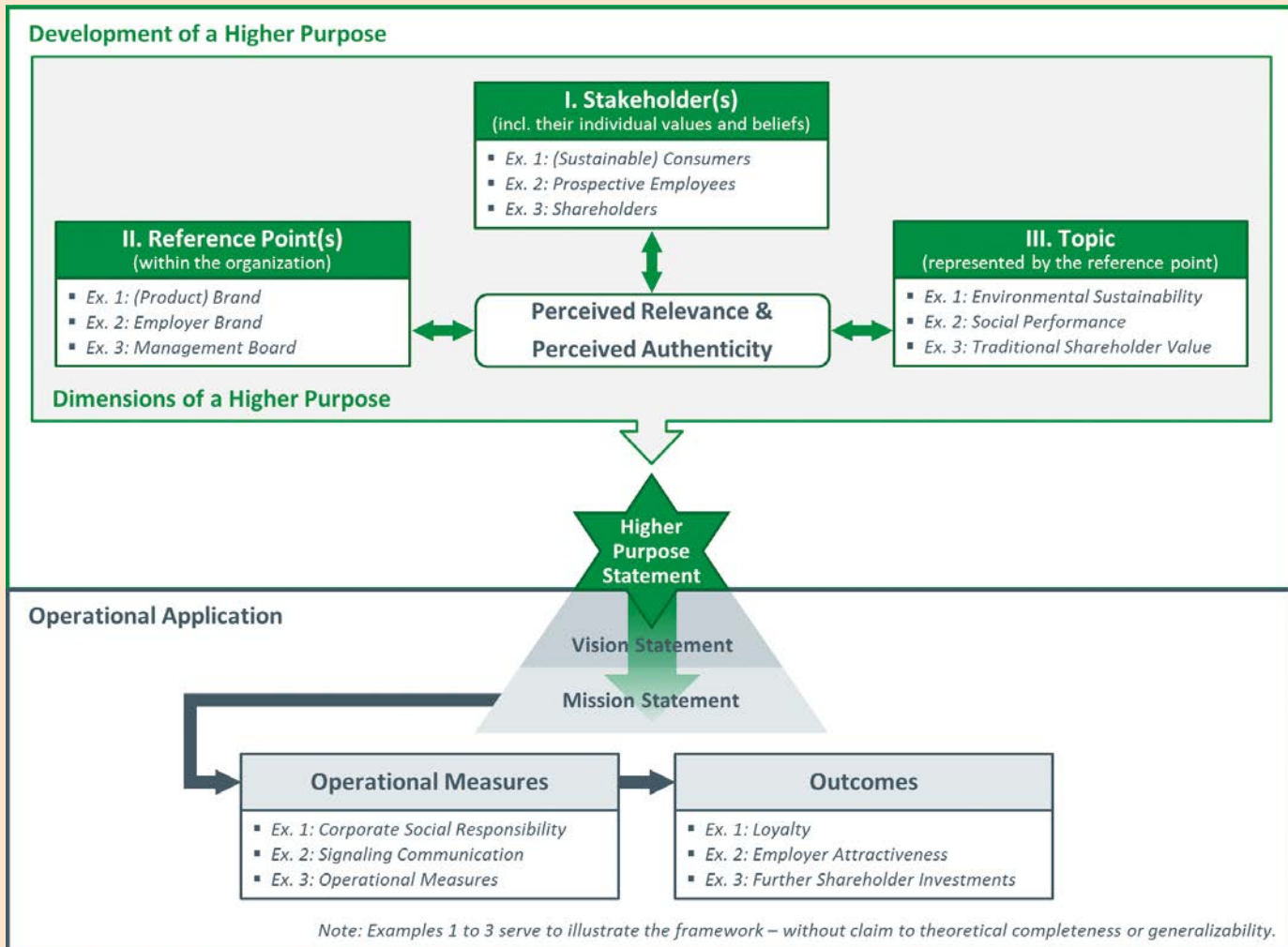
A. Winter, C. C. Germelmann: Is the role of purpose at a crossroads? A novel conceptualization and insights from the COVID-19 crisis. *Projectica/Projectique* (2020), 27(3), 21-38. DOI: 10.3917/proj.027.0021.

T. Ströbel, C. C. Germelmann: Exploring new routes within brand research in sport management: directions and methodological approaches. *European Sport Management Quarterly* (2020), 20(1), 1-9. DOI: 10.1080/16184742.2019.1706603.

L. Griebel, T. Ströbel, H. Woratschek: Integrative Branding – Brand Management in the Light of Value Co-Creation. *SMAB Relevant Management Insights* (2020), 1(22), 1-5. DOI: 10.1016/j.jresmar.2015.07.001.

H. Woratschek et al.: Vernetztes Branding: Ein Konzept zur Markenpolitik aus der Perspektive der Service Dominant Logic, in: F.-R. Esch (ed.): *Handbuch Markenführung*. Wiesbaden 2019, 121-139.

The concept of Higher Purpose



Graphic: Andreas Winter and Claas Christian Germelmann, published in *Projectics/Projectica/Projectique* (2020).

Brand owners who use the concept of Higher Purpose address all stakeholders relevant to them in order to arouse interest in the brand, to strengthen the emotional connection to the brand, and to enable interactions. For this purpose, relevant points of reference in the own organisation are identified on the one hand and the content-related object of the Higher Purpose on the other hand, tailor-made for the respective stakeholders. The diagram illustrates this connection using three selected stakeholders as examples. For consumers who attach

great importance to aspects of environmental sustainability, a product brand is often in the foreground; environmental and climate issues are particularly important topic areas for them – also in emotional terms. The situation is different for potential employees who need to be recruited or for shareholders. Here, the focus must be on other points of reference and topics that are individually tailored to these stakeholders. The three dimensions (stakeholder, reference point, and subject matter) are mutually dependent. They only lead to success in

the subsequent operational application if they are perceived as relevant and authentic by the stakeholders.

Based on a forward-looking vision and a strategic "mission statement" derived from it, brand owners define targeted measures at the operational level. These are geared towards the respective stakeholders and lead to specific results, such as greater consumer loyalty, increased attractiveness as an employer, or a greater willingness to invest on the part of shareholders.

consistently understood as central actors in sport management, open exchange with them is still too rarely sought. In addition, the perspective must be broadened beyond the pure consideration of fans. Other stakeholders such as sponsors, the media, and government must be actively included. This is certainly not an easy requirement to implement, but it can be decisive for the success of a brand. In sport, this applies in particular to brands that are not regularly successful in sport and thus already exert great influence. The latest brand concepts address this very point by looking at brands from a network-oriented perspective.

On our way to integrative branding

Brands are no longer understood as mere sign systems and means of communication that are merely passively received and perceived. Brand management is a dynamic and social process. This means that brands change and different actors actively participate in brand processes. A theoretical basis for this perspective is integrative branding as a so-called network-oriented platform approach.⁴

Integrative branding consists of two interconnected processes: building brand identity and co-creating brand meaning on the brand platform. Typically, the brand owner designs an identity and communicates it. However, brand identity should only be understood as a proposal by the brand owner to build a brand meaning. The core of integrative branding is the brand platform, which includes all interested stakeholders or actors. Brand owners, fans, sponsors, media, they all reshape the sports brand on the interactive brand platform through brand-related social interactions. These processes can be defined as resource integration of actors. In the process, the co-created brand meaning must always flow anew into brand communication.⁵



■ Fig. 1: The bond between fans and their club creates emotional dynamics (Photo: ist).

"Branding is a dynamic and social process. Multiple actors interact with the brand and thus help shape its meaning. Traditional brand concepts need to be rethought today – from a view centred on the brand owner to a network-oriented perspective."

Prof. Dr. Tim Ströbel

Conclusion

Two major consequences of this platform understanding are firstly, that the brand owner must provide opportunities for actors on the brand platform to co-create brand meanings, and secondly, that integrative branding means other actors can initiate brand-related interactions on the brand platform. Brand owners should try to orchestrate this, but must also be aware that they do not have full control over their brand. However, the more brand owners understand this concept and offer opportunities to co-create brand meaning, the more relevant stakeholders will engage in the process. This increases their identification with the brand, their loyalty, and ultimately the brand value.

AUTHORS



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1 F. Morhart et al.: Brand authenticity: An integrative framework and measurement scale. *Journal of Consumer Psychology* (2015), 25(2), 200-218. DOI: 10.1016/j.jcps.2014.11.006.
 2 A. Winter, C. C. Germelmann (2020), see recommended reading.
 3 R. W. Belk: Possessions and the Extended Self. *Journal of Consumer Research* (1988), 15(2), 139-168. DOI: 10.1086/209154.
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 5 L. Griebel, T. Ströbel, H. Woratschek (2020) und H. Woratschek et al. (2019), see recommended reading.

ECOLOGY

■ Peter Kuhn



"Think sportainable"

Towards an ecological redesign of sport

■ *The environmental impact of ski tourism was already the focus of public criticism in the 1980s, although the dimension of the ecological problems had not yet been fully recognised (Large photo: ist; small photo: ist / Jason Finn).*

Meanwhile, 25 years have passed since my dissertation in which I outlined the self-conception of sports ecology as an independent scientific discipline.¹ But the time was not ripe – neither for such a discipline nor for the sustainable development of the sports system as established in Germany. Its representatives recognised the topic as "important" in personal conversations, but the implementation of corresponding concepts was considered "difficult" and occasionally even "dangerous" with regard to their consequences. Thus, in the following years, I decided to wait for further developments in science and sports policy. Two studies that appeared in 2016 and 2019 then motivated me to revisit my earlier thoughts on sustainable sport and to deal more intensively with sports ecology issues again.² The breakthrough finally came with the appointment of the first chair of sports ecology in Germany, at the University of Bayreuth in 2019. In my joy at this development, a new idea developed in me, brought to the point by the new neologism "think sportainable", i.e. thinking about sport as a whole and each of its elements in a sustainable way. Under this motto, an innovative research programme is currently being developed on the Bayreuth campus. It is even in part breaking away from the concepts that guided our first considerations on the relationship between sport and ecology.

First scientific impetus

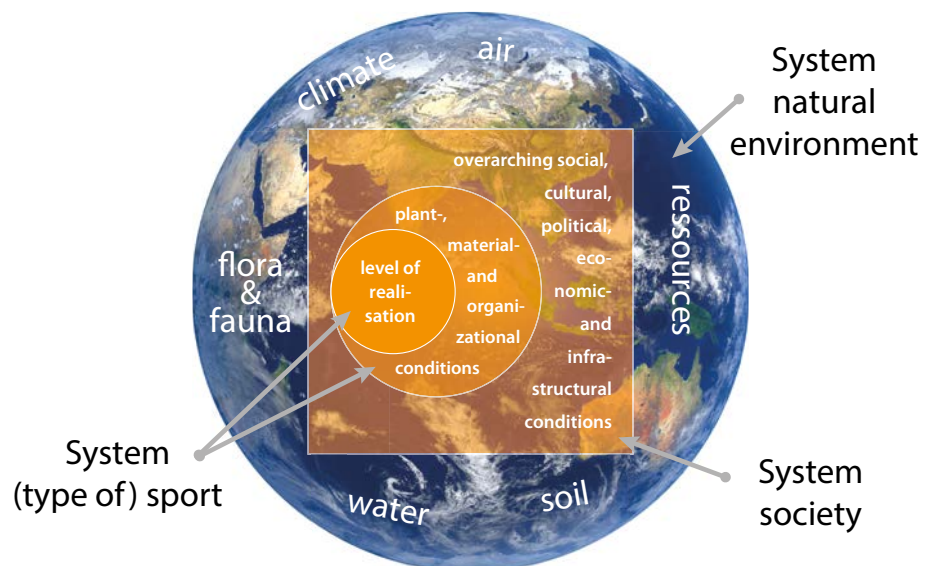
When the "environmental movement" gained momentum in the 1980s, the scapegoat was quickly found in sport: alpine skiing. The cutting of pistes into areas of wilderness, the mechanical damage to the soil on ski slopes, the water consumption for snow cannons, and more rarely, the land use for car parks and lifts were all denounced. The fact that the energy consumption and emissions involved in tourist travel as well as material turnover could be the biggest problems of ski tourism was not yet recognised at that time – or people did not want to recognise it. A study published in 1993 entitled "Skiing and Ecology" developed an apt description of this problematic situation and at the same time proposed a solution strategy. It called for measures to raise individual awareness as well as measures of a legal and administrative nature in the areas of "skiing", "outward and return journey", and "accommodation and stay".³ The wisdom of these analyses, which regarded sports and nature as a systemic context, was lost in the tenor of the time. For the sport-environment conflict was mainly understood as

something that people cause when they enter the natural environment.

"The central task of sports ecology in future will be research networked with natural, social, technical and economic sciences."

The Salzburg researchers Fritz Seewald, Elvira Kronbichler, and Stefan Größing countered this view with a completely different way of thinking in their work "Sport Ecology" published in 1998. In it, they conceive of human beings as nature and as a part of nature – and thus at the same time as beings that need an encounter with nature for their development.⁴ Their solution strategy was based on interventions that are nowadays called "slow sport": exercise activities in the landscape related to the experience of nature and the body without performance demands. This behavioural approach is undoubtedly significant and deserves to be pursued vigorously in research. Nevertheless, the problem also calls for a relationship-oriented approach, precisely because the sport-environment conflict is a system conflict. This is exactly why the consideration cannot be limited to "nature sports" such as skiing or canoeing, to "sports in nature", or to the way to get there. This realisation formed the starting point for me back in the early 1990s for the development of a holistic model that can be applied to all sports (Fig.1).

■ Fig. 1: Structural elements and relationships of the Systems (type of) sport, society, and natural environment (Image: Peter Kuhn / Andreas Gaube; cf. P. Kuhn 1996, 60, n. 1. View of the Earth: ist).



■ Fig. 2: Discarded sports and hiking shoes in a forest area on Vancouver Island (Photo: ist).



Sports ecology studies: The case study on volleyball

In a case study on volleyball, I wanted to show that every sport is ecologically significant, and volleyball, for example, is no less problematic than alpine skiing. For this purpose, I collected data on mobility and material requirements by surveying 838 volleyball teams in Germany. The result was clear: everyday cultural sport is simultaneously motor sport and material sport. Extrapolated to the entire competitive sport of volleyball, active volleyball players covered 91 million kilometres per year in vehicles. Based on an average consumption of eight litres per one hundred kilometres, this results in an average of around 21,000 tonnes of CO₂ emissions per year. Extrapolated to the sport organised in the German Olympic Sports Confederation (DOSB), that would be about 1.2 million tonnes of CO₂ per year. In relation to a single volleyball player, this results in annual CO₂

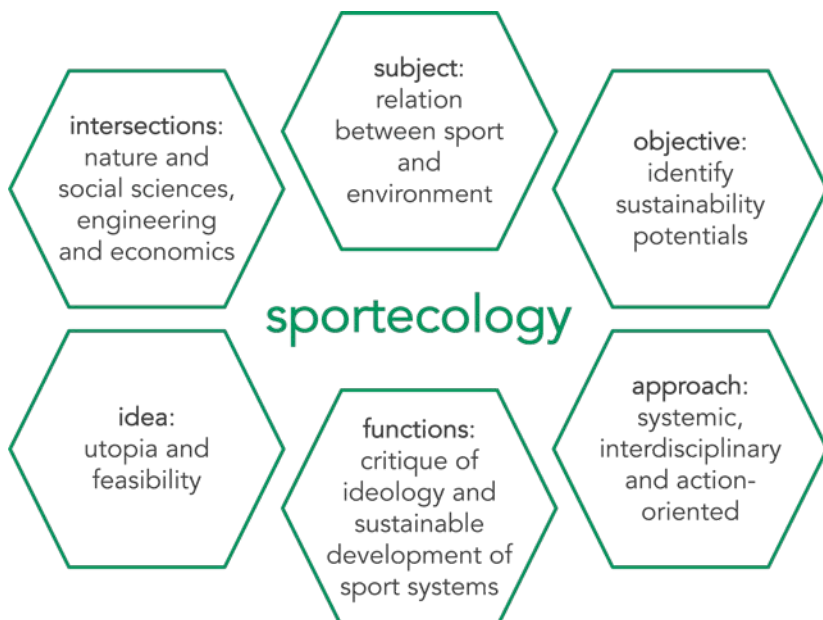
emissions of around 0.2 tonnes. A study published in 2019⁵ even calculated 0.4 tonnes for each volleyball player, with an average of 0.84 tonnes for each active athlete in Germany. The difference results from the fact that international competitive sport, and thus also air travel, was included in this study.

The calculated per-capita CO₂ emissions of 0.84 tonnes in active sports only account for 7.7 per cent of the current individual CO₂ emissions per year in Germany. But this value is by no means unproblematic in view of the per capita guideline value of two tonnes, which, according to Greenpeace, should not be exceeded with immediate effect in order to achieve the central climate goal of the Paris Conference – global warming of less than two degrees.⁶ This means that an average competitive athlete in Germany comes very close to this guideline value in the context of their sport alone.

As far as material requirements are concerned, consumption – and thus the need for replacement – in the teams I studied was 330,500 items per year, including items such as clothing, balls, nets, and bags. This resulted in about 130 tonnes or about 1,500 cubic metres of material waste per year in volleyball alone. This corresponds to the loading capacity of three to four articulated lorries or the volume capacity of a gym. The sports shoes discarded could be used to cover 20 volleyball courts per year. Worn out balls could be used to build a pyramid with a base area of 54 square metres and a height of 7.5 metres. Extrapolated to the sport organised in the DOSB, that would be about 7,500 tonnes or about 85,000 cubic metres per year. These quantities would have to be treated as hazardous waste, because sports equipment is rarely made of sustainable materials. Similarly, sporting goods are rarely produced in a sustainable way, and they often travel long distances before reaching customers. Therefore, to measure the ecological damage potential of sport, a CO₂ equivalent of the material consumption would have to be added to the CO₂ emissions of road transport.

The findings of this study are still relevant today. They show that every sport is ecologically significant, and that actions in all sports are influenced by underlying structures. And today more than ever sport is motor and material sport. In one respect, however, there has been a great leap forward. The demand to establish sustainable sports development as a scientific discipline has been fulfilled with the establishment of the Bayreuth Sports Ecology research group.

■ Fig. 3: Sport ecology as a scientific discipline (Peter Kuhn, 1996, 223-226, see n.1).



Challenges for research and the further development of sport

A central task of sports ecology in the future will be research that is networked with natural, social, technical and economic sciences, the findings of which can be used for sustainable sport development (Fig. 3). In this context, considerable forces of inertia in the sports system must be reckoned with. Nonetheless, a lot has happened in Germany and internationally. For example, at major events, more and more emphasis is being placed on reducing environmental impacts. For sustainable development worthy of the name, however, a consistent transformation of everyday cultural sport is needed. In the area of **materials**, it will be particularly important to offer athletes of all sports sustainably produced and recyclable materials, as well as corresponding recycling systems. In my own study, I was already able to show that teams use take-back systems and pass on materials to youth teams if such structures are established locally.⁷ In the area of **mobility**, three measures appear to be effective:

- Individual requests for transport to specific sports facilities are received at a *mobility centre* that is run by clubs or municipalities. At the same time, public and private transport companies as well as private individuals send their transport offerings to the mobility centre. The centre compares offers and requests and organises public or private transport options on this basis, taking into account the shortest possible journey distance. The fare is calculated according to the individual distance travelled.

- *Event tickets* for spectators can be linked with discounts for public transport. If sports associations and sports clubs or their marketing agencies cooperate with regional or national public transport companies, reduced fares for active athletes can also be negotiated on this basis.

- The *organisation of competitions* could be designed in such a way that the venues of leagues are adapted to bus and train lines, and that match schedules are designed with the aim of minimising travel distances.

A forward-looking project at the University of Bayreuth

Building on my own sports ecology studies as well as on fundamental findings of systemic ecological

research, the "sportainable"[®] research programme was initiated at the University of Bayreuth in 2020 (Fig. 4). First of all, empirically based criteria for the sustainability of elements of sport are to be developed here. These criteria will then form a basis for the development of a sustainable sports system and thus also serve as orientation markers for corresponding evaluation and advisory services. The new structures of this system will enable people to do in sport what they think is right from an ecological point of view backed up by good arguments.⁸

The three levels on which we cooperate with active athletes, sports clubs, and associations in the sportainable[®] programme are assessment, development, and certification. Based on a holistic approach that combines established instruments of life cycle assessment and labels based on them, a meta-frame is developed that is binding for all participants. In principle, this orientation framework should be able to illustrate the sustainability of all elements of sport in a clear and at the same time differentiated way. One of our partners in the development of this meta-frame is the young company "PLANETICS", a start-up that has no less a goal than to become the "Amazon of sustainable sport". At the same time, we are working on a survey that will shed light on what consumers would understand to be an informative sustainability label. In cooperation with the "Sports for Future" association, which was founded in 2019 to promote climate and environmental protection in sport, we are analysing events and organisations in competitive sport with the aim of certifying them. In the medium term, a company is to emerge from this research work. It will profile itself as a gamechanger of sustainable sports development in the areas of evaluation, consulting, and certification, and be a competent partner of the University of Bayreuth. With this sports ecology program, we will show how sport can be rethought and redesigned in terms of sustainability.

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■ Fig. 4: Graphic: Peter Kuhn.

RECOMMENDED LINKS

<https://sportainable.jimdosite.com>

<https://www.planetics.de>

<https://sportsforfuture.de>

- 1 P. Kuhn: Indoor-Sport und Ökologie. Studien zur Umweltproblematik des alltagskulturellen Sports. Schorndorf 1996, hier: 223-226.
- 2 M. Kopatz: Ökoroutine. Damit wir tun, was wir für richtig halten. München 2016. – P. Wicker: The carbon footprint of active sport participants. Sport Management Review (2019), 22(4), 513-526. DOI: 10.1016/j.smr.2018.07.001.
- 3 R. Eggers: Skisport und Ökologie. Schorndorf 1993.
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- 5 P. Wicker: The carbon footprint of active sport participants. Sport Management Review (2019), 22(4), 513-526. DOI: 10.1016/j.smr.2018.07.001. In this study, the author confirmed in principle the scale of my findings from 1996.
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- 7 P. Kuhn (1996), 215-217, see n. 1.
- 8 Cf. dazu bereits P. Kuhn (1996), n. 1, and M. Kopatz (2016), n. 2.



■ Veronika Mitterwallner
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People and nature

Sport ecological studies on the effects of mountain biking

■ *Mountain bikers on narrow paths in the forest (Photo: © Cube).*



■ Fig. 1: Spotted by the camera trap: a lynx on a forest path used by mountain bikers on Ochsenkopf in the Fichtelgebirge (Photo: Sport Ecology, University of Bayreuth).

Mountain biking has enjoyed worldwide, steadily growing popularity since the emergence of this sport in the 1970s. E-mountain biking has once again increased the appeal of this sport. In 2020, three times as many e-mountain bikes were sold in Germany as conventional mountain bikes.¹ With an estimated 12.2 million mountain bike owners, mountain biking is now a major factor in the sports economy in German-speaking countries.² On average, mountain bikers in Germany buy a new mountain bike every four years for an average price of over € 1,000.³

However, the raising interest in this outdoor sport also increases pressure on natural areas. Mountain biking activities interact with other forms of recreation such as hiking and these activities may disturb mountain or forest-dwelling wildlife species. To avoid conflicts with the social and the natural environment, a comprehensive understanding of interactions between mountain bikers and the environment is necessary. Research in Sport Ecology at the University of Bayreuth thus sets a thematic focus on mountain biking as well as other outdoor sports. Projects in this field aim to build fundamental understanding in order to derive management recommendations for the sustainable use of forest and mountain ecosystems by mountain bikers and other outdoor sport enthusiasts.

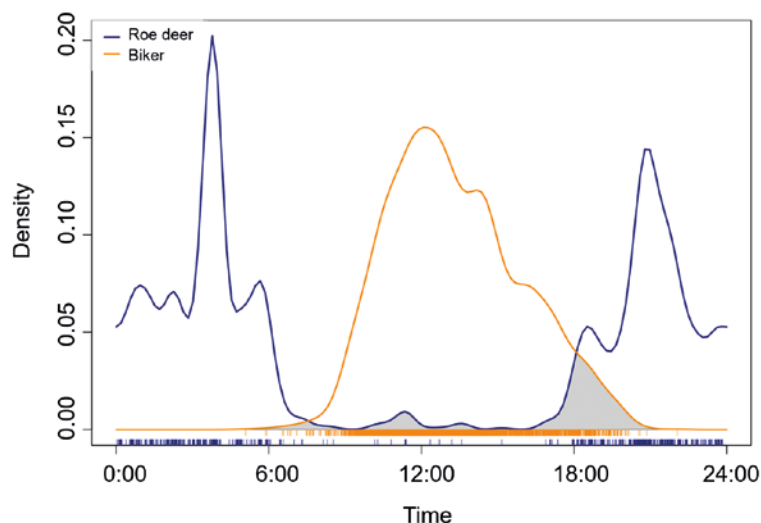
One methodological focus of our research is to use modern methods and technologies to conduct quantitative surveys of spatially and temporally high-resolution data and to develop models of the use of natural areas by mountain bikers. Therefore, we integrate data on the spatial use of landscapes

derived from online applications and GPS⁴ with large-scale long-term monitorings with camera traps in several Bavarian nature parks. The growing availability of data allows addressing research questions concerning the relationship of mountain biking with the social and natural environment.

From a comprehensive database to models and reliable predictions

One of these projects is dedicated to the direct and indirect interactions of mountain bikers and wildlife species such as roe deer, fox, red deer, and lynx (Fig. 1). Information on the activities of animals and sportsmen at selected locations form the basis for analysing how these activities overlap in spatial

■ Fig. 2: Activity curves of roe deer and biker. The lines indicate the probability of their activities during the day. Although the main activity of the roe deer falls in the hours of dawn, there is an overlap with the activities of bikers during the day, especially at dusk (Graphic: Sport Ecology, University of Bayreuth).



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A.-M. Schweizer et al.: Outdoor cycling activity affected by COVID-19 related epidemic-control-decisions. PLOS ONE (2021), 16(5): e0249268. DOI: 10.1371/journal.pone.0249268.

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and temporal terms (Fig. 2). Results provide insights regarding behavioural adaptations of wildlife in response to mountain bikers. Of particular interest are the avoidance reactions of wild animals – to what extent they take flight, avoid certain paths, or refrain from activities at certain times of the day.

The time series of reliable data also provides the basis for developing models that enable predictions of visitor numbers. Visitor numbers often depend on factors such as holiday seasons, the trail network, the tourism infrastructure, and the weather. For improving the understanding of these factors and their influence on the behaviour of mountain bikers and wildlife, one of the Bayreuth research projects cooperates with a newly developed bike park. Hence, the behaviour of people and animals before

"Understanding differences in riding behaviour allows assessing if the increasing popularity of e-mountain biking results in growing potential for environmental damage and disturbance to wildlife, as well as social conflicts."

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and after its construction will be recorded and compared. The comparison not only allows quantifying the influence of mountain biking on wildlife, but simultaneously the social conflicts between different recreational groups. The spatio-temporal data obtained with the help of the camera traps are supplemented by surveys, evaluations of press reports, and spatial modelling of legal access regulations. For example, the state forest law of Baden-Württemberg stipulates that mountain bikers may only use paths in the forest that are wider than two metres. It has turned out that such a two-metre rule, transferred to the trail network in Bavaria, would result in a considerable reduction in the number of trails that can be used (Fig. 3). Considering the increasing popularity of mountain biking and the growing demand for trails, such a measure seems to promote rather than solve conflicts. A possible source of conflict in the field of mountain biking seems to lie in insufficient possibilities for challenging trails. As part of a sport ecology thesis at the University of Bayreuth, trails used by mountain bikers in an area of the Franconian Jura were mapped. The study found significant proportion of the bike trails to be newly built unofficial trails, which illustrates the high and yet unmet need (Fig. 4).

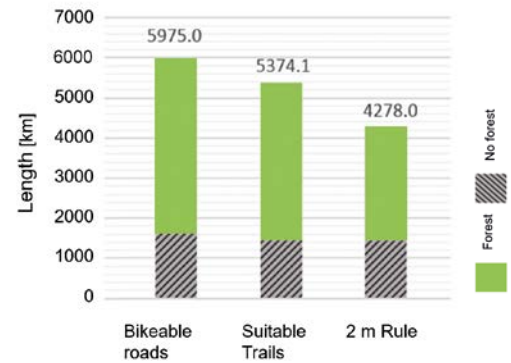


Fig. 3: Total trail network in the Bavarian Alps study area depending on applicable regulations. In Baden-Württemberg, the 2-metre rule currently applies, whereas in Bavaria any suitable trail may be used. The number of trails suitable for mountain biking would be reduced by 28 percent in the study area with a 2-metre rule (Graphic: Stefanie Geib).

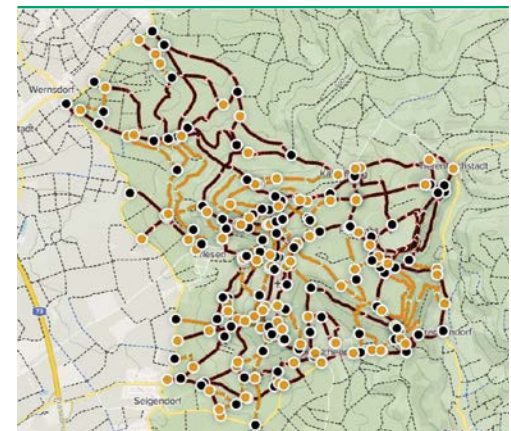


Fig. 4: Entire trail network of the Friesener Warte, Franconian Jura. Official trails are marked in brown, unofficial trails in orange (Graphic: Patrick Schuster).

E-mountain bikes provide access to protected natural areas

Another research project on mountain biking addresses the question how riding behaviour changes with advanced technology – especially with the switch from conventional mountain bikes to e-mountain bikes. The aim is to find out what consequences the "switch" to e-mountain biking has for the environment. Based on an experimental research approach, it was tested whether, as a result of the electrical assistance, the riding speed, the length of the distance covered, the difference in total climb, and the preferred trail type differ from conventional mountain biking. Knowledge of the differences in riding behaviour will allow assess-

ing if the potential for environmental damage and disturbance of wildlife, but also for social conflict, could grow as a result of the increasing popularity of e-mountain biking. First study shows how electrical assistance makes it easier to ride uphill over difficult passages for less physically fit persons. The results suggest that e-mountain biking allows a growing number of visitors access to mountain ecosystems, which were previously only accessible with much greater physical effort (Fig. 5). In addition, field research conducted by Bayreuth Sport Ecology investigated the impact of the electric motor on field and forest paths when setting off and braking. Initial results indicate an increasing risk of erosion and thus clearly show how important it is to investigate this connection further (Fig. 6).

Prospects

With its research in the field of mountain biking, Bayreuth's Sport Ecology aims to gain reliable insights into the demands mountain bikers place on the natural environment, what spatial conditions and paths they prefer for their outdoor sport and how they influence ecological systems. The gained knowledge will enable more precise predictions about the routes, times, and intensity with which natural areas are used by mountain bikers. They thus provide an important basis for sustainable management and for providing targeted information for sport enthusiasts.



■ Fig. 6: Skid marks when braking with an e-mountain bike (left) and a conventional mountain bike (right). Groove depth and groove width were measured (Photo: Manuel Schenkl and Tizian Weis).

■ Fig. 5: Only conventional bikes are used for the mountain bike course at the University of Bayreuth in the Allgäu Alps. With e-mountain bikes, such routes can be tackled with much less physical effort (Photo: Eiko Berlitz).



- 1 Zweirad-Industrie-Verband (ZIV), Wirtschaftspressekonferenz am 10. März 2021 in Berlin: Zahlen – Daten – Fakten zum Fahrradmarkt in Deutschland 2020. https://www.ziv-zweirad.de/fileadmin/redakteure/Downloads/Marktdaten/PM_2021_10.03._ZIV-Praesentation_10.03.2021_mit_Text.pdf
- 2 Cf. statista (ed.): Anzahl der Personen in Deutschland, die ein Mountainbike im Haushalt besitzen, von 2017 bis 2021 (Survey by V. Pawlik): <https://de.statista.com/statistik/daten/studie/264971/umfrage/besitz-eines-mountainbikes-in-deutschland/>
- 3 Cf. Deutsche Sporthochschule Köln (R. Roth) und Deutsche Initiative Mountainbike (eds.): Mountainbiking. Köln 2019. <https://www.natursport.info/natursportarten/zu-land/mountainbiking/>
- 4 See recommended reading.



■ Andreas Hohmann

Competitive sports research and talent development

Current studies from athletics to ice hockey

■ Game analyses by Bayreuth Sport Science during the 2019 Germany Cup have shown the great importance of controlling space – both in attack and defence (Photo: ist).

Today, the public and the media often complain about insufficient performance and success in elite sport. In order to improve competitive sport, however, solutions must be developed for a number of challenges. On the one hand, performance improvements in elite sport cannot be guaranteed by optimising high performance training alone. On the other hand, improved training in youth and at junior age, and the early successes associated with this, often cannot be seamlessly transferred to elite sport in adulthood. The number of top sporting performances and successes can therefore only be increased through the long-term, systematic, integrative, versatile, and sustainable training of top athletes. This training should extend over the different stages of children's and youth training up to high performance age.

Against this background, the Training & Movement Science (TBWS) research group at the University of Bayreuth has designed a comprehensive interview study with top German and international coaches. The result is a handbook on concepts for successful youth training that is now widely used in German-speaking countries.¹ It takes a system-dynamic perspective and requires coaches to assess causes, effects, and consequences with a view to personality development, long-term success in adulthood, and biopsychosocial sustainability. Within the framework of several years of cooperation with the German Football (DFB), Basketball (DBB), and Handball (DHB) Associations, Bayreuth's TBWS developed the concept of a sports-scientific technical education on the basis of current international trends. This is aimed in particular at sports associations and coaches, but also at scientists. The core of this concept is a systematic sequence of age-specific training focal points and methodological guidelines.²

Top-class sport: performance improvements before the finals

In the field of training control, a Bayreuth research team recently tackled one of the main problems of German elite sport: How does an athlete manage to present his or her personal best performance at the "right" time at major events? This requires an increase in performance from the qualification competition to the top event, be it the Olympic Games, at European, or World Championship competitions. However, such an increase in performance causes great problems even for top athletes, as could be seen once again at the Tokyo 2021 Games. The

long-term, medium-term, and short-term structured process of form intensification is called peaking.³ Peaking is based on a long-term performance build-up and includes the complex coordination of a targeted annual planning (periodisation) with a targeted high-load phase in the immediate preparation for competition. It ends with the tapering phase shortly before the competition. This involves a reduction of about 50 percent of the load. In this phase, measures for physical regeneration and mental regulation as well as individually planned training and nutritional measures are combined in such a way that they enable a timely presentation of a personal best performance. What is new in particular is the realisation that the preparation schedule before an important competition depends above all on the influence of strength and speed abilities on the competition performance. In addition, women can push themselves harder than men until close to the competition and also need more strength training than men at times. Overall, however, the "pie model" still applies to competition preparation: the broader and more stable the basic conditional and coordinative-technical layers are, the easier and higher performance can be raised.

Focus on performance diagnostics and talent research

The diagnosis of top sporting performance as well as performance dispositions in children and young people has developed into a central research fo-

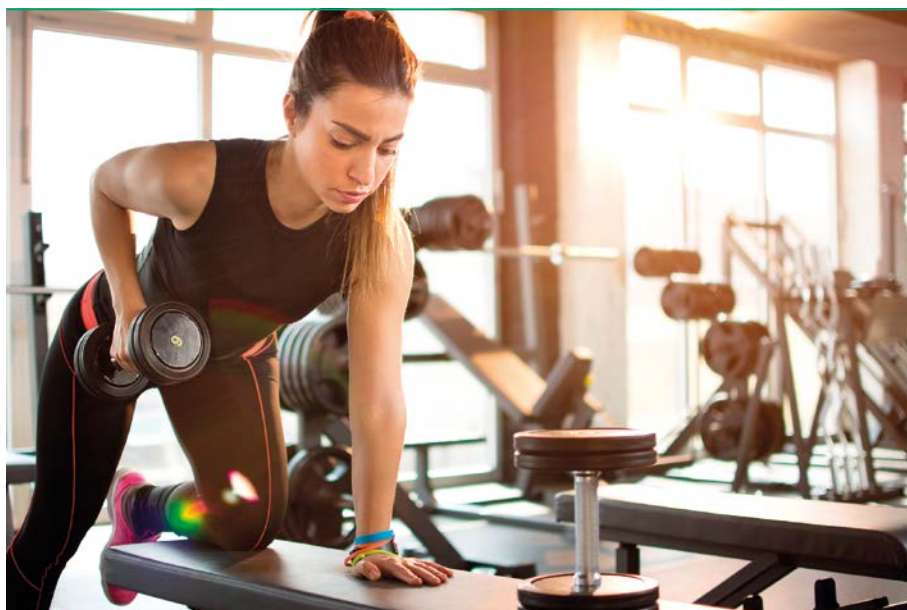
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This article was written with the collaboration of Lennard Voigt, Ajit Singh, Micha Pietzonka, Stefan Hochstein, and Maximilian Siener.

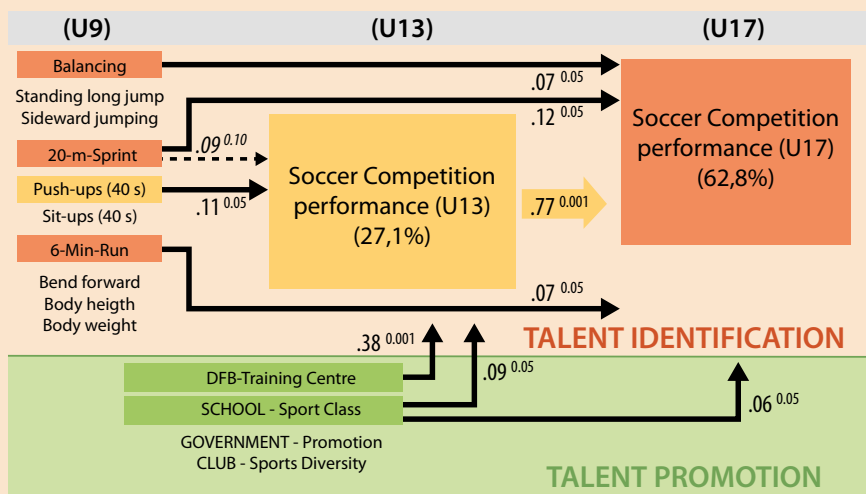
■ Fig. 1: Strength training is an essential factor in competition preparation (Photo: sst).



cus of training and movement science in Bayreuth. For several years, young and top athletes from the sports of basketball (BBC and Medi Bayreuth), ice hockey (EHC Bayreuth), football (MGF-Gymnasium Kulmbach) and swimming (SV Bayreuth) have been supported in the Upper Franconia region with the help of regular performance diagnostic examinations. At the same time, talent research has gained particular importance in recent years. For example, on the basis of cooperation agreements with municipalities and schools, repeated physical activity checks are carried out in Bayreuth, Fulda, and Bad Dürkheim, as well as in Shanghai, with up to 3,000 children each. Each child is presented with a certificate immediately afterwards. This lists the personal results of the performance tests and contains



Promoting talent



■ Source: A. Hohmann, M. Siener: *Frontiers in Sports and Active Living* (2021), see recommended reading.

Scientific studies on identifying talent regularly include statistical methods such as regression analysis. Often, different variables are related to each other in such a way that causal relationships become apparent. The graph on football performance in adolescence is based on a path analysis and shows that early and scientifically based talent identification in the second primary school grade is very well suited to explaining more than 62 per cent of the complex football performance at B-youth age (U17). The preceding performance in D-youth age (U13) naturally contributes the most to this ($R = .77$).

Nevertheless, early body coordination - such as balance when balancing - and sprinting speed are also important building blocks of future performance development. With regard to the promotion of talent through positive environmental factors, a study by the Bayreuth Institute of Sport Science came to the following conclusion: The greatest effects on career success in youth football are achieved in the short term through membership of a DFB support centre and in the long term through attending a "sports class" in a partner school of competitive sport.

a recommendation for five types of sport that best suit the respective individual abilities and dispositions. In addition, low-performing children are offered free health-related physical activity promotion. As has been shown in initial effectiveness studies, especially the lower-performing children exert themselves very intensively in sports, games, and exercise when they can remain "among themselves" in an exercise promotion course, and when the exercise and play equipment is of an animating character. The physical strain that these children go through during a fun-filled play lesson in a climbing and trampoline hall is considerably higher than in the course of a lesson in conventional physical education at school. During the play lesson, the time and intensity of physical activity is significantly prolonged and calorie consumption is considerably increased.

Based on these movement checks, Bayreuth's TBWS has developed mathematical (linear and non-linear) models for meaningful talent prediction in the sports of table tennis, tennis, and football⁴, as well as for talent selection in apparatus gymnastics⁵. In addition, a study in cooperation with the Universities of Paderborn and Hamburg came to the conclusion that motor performance is already influenced by physical self-concept and intrinsic motivation at primary school age.⁶ In order to increase physical activity in children, it is therefore not sufficient to increase motor performance alone. Rather, and especially in the case of girls, nutritional weight management must be added. This is because a lower BMI not only contributes to improved performance, but also - in a roundabout way via a better physical self-concept and higher intrinsic sport motivation - to more physical activity. Against this background,



performance is less due to early childhood talent characteristics than to accelerated performance development in the course of youth training.⁸ The steeper performance curve of Chinese children results, on the one hand, from an earlier start in competitive sports, and on the other hand, from a higher training effort in Chinese sports schools. From the German point of view, club sport, which is widespread in this country, compensates for this shortfall to a certain extent, at least at primary school age. Later, however, this is only possible at those locations where highly qualified coaching staff look after the children and young people. Unfortunately, this is precisely where Germany falls far behind the Chinese junior sports system.

■ Fig. 2 and 3: Motivation-boosting: fun-filled playtime with trampoline and climbing exercises (Photos: ist).

the Bayreuth TBWS is currently investigating how the restrictions on school and club sports caused by the coronavirus pandemic have affected children's motivation, self-concept, and motor performance.

An intercultural study that compared the motor skills and physical activity of primary school children in China and Germany also dealt with the causes of sporting performance development.⁷ In Germany, it was above all club sports and playing outside the home that proved to promote activity and performance, while Chinese children benefit more from sporting activities in the family. The research team from Bayreuth, together with partners at the Shanghai University of Sport, therefore investigated the reasons for the general superiority of Chinese top-class sport. It turned out that this high level of

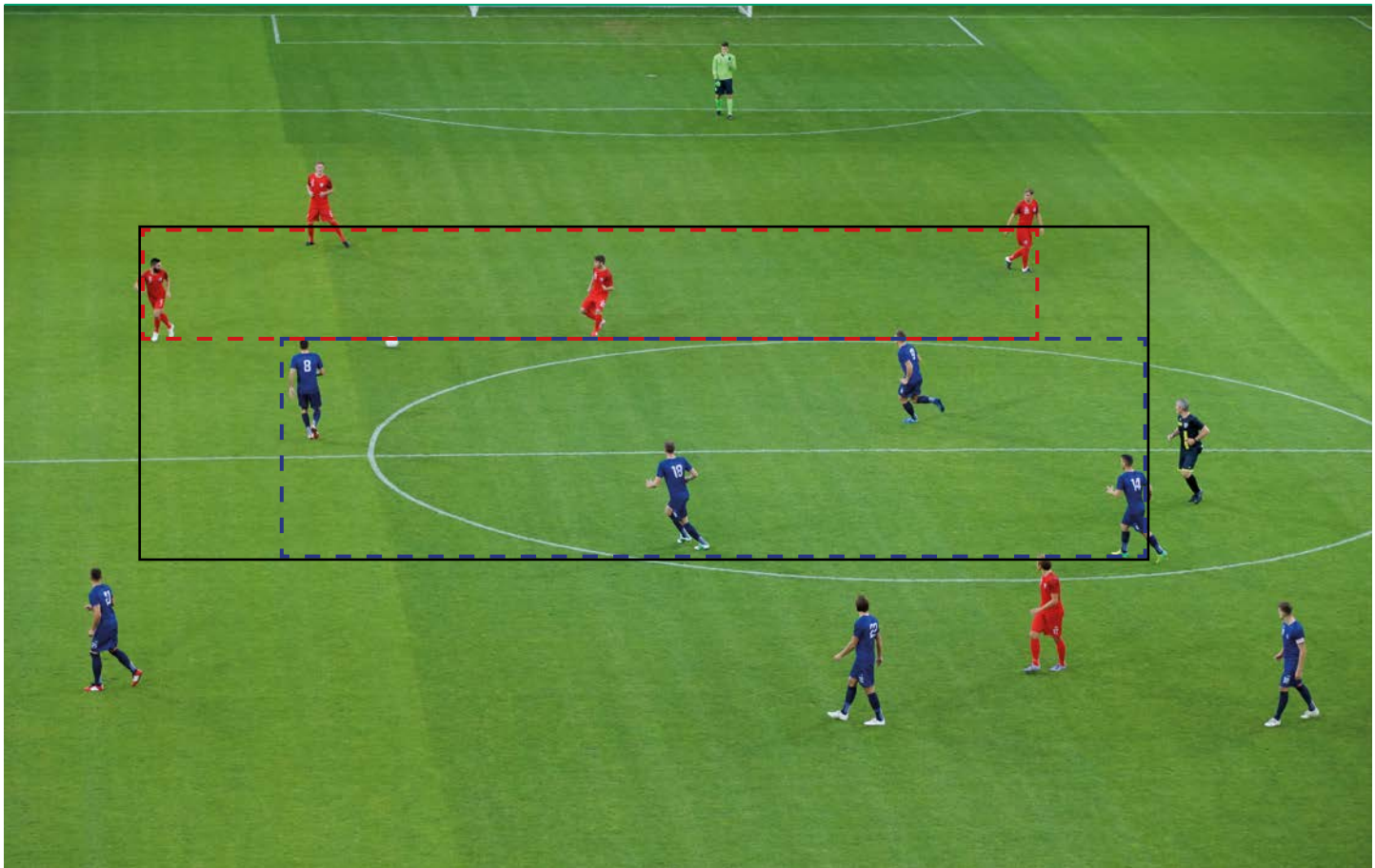
"Motor performance is already influenced by physical self-concept and intrinsic motivation at primary school age."

Projects from competition research

Analyses of competitions and sports games open up new perspectives in and outside of academia for researchers, teachers, and students at Bayreuth Sport Science. They produce innovative scientific questions and at the same time qualify them for responsible positions in various professional fields of sport.



■ Fig. 4: Morning gymnastics in a preschool in Zhao Xing, China (Photo: ist).



■ Fig. 5: Situational pressure in men's football is analysed using the pitch area covered by the ball owner and his nearest three teammates and the nearest four opponents. The red rectangle quantifies the partial area of the offensive team in the 4-4 pressure situation, the blue rectangle the partial area of the defensive team. The black rectangle quantifies the total area as a measure of the situational pressure in the 4-4 situation (Image: ist, Andreas Hohmann / Andreas Gaube).

There is a high demand in the sport of football, where Bayreuth's TBWS has conducted basic research on the analysis methodology of data mining⁹ and the simulative application of Markov chains¹⁰ in recent years. Tactical game analyses in junior football have complemented and extended these investigations. In cooperation with the top clubs RB Leipzig and SG Hoffenheim, the match-specific pressure level in the youth national football league was examined. The aim of the match observation was to determine the average size of the rectangular areas containing the player in possession of the ball, his three closest teammates, and his four closest opponents. The smaller this area around the ball possessor, the greater the situational "game pressure" acting on him and the greater the chance for the defending team winning the ball. While the relevant textbooks recommend a small playing area of 540 square metres for training the 4-4 game situation, the Bayreuth sports scientists have found out that the rate of successful passes only drops at much higher game pressure, i.e. a rectangle size of 300 square metres. From a practical training point of view, group tactical practice games should there-

fore preferably be arranged on small pitches of 20 x 15 metres in order to create realistic competitive pressure.¹¹

Two service projects funded by the Federal Institute for Sport Science were similarly practice-oriented:

■ In cooperation with the German Swimming Association (DSV), the Bayreuth analysis team evaluated the final round tournament of the 2018 Water Polo World Cup in Berlin.¹² A comprehensive video-based game observation aimed to clarify the individual throwing performance of the German national players and to find out any differences to the competition-specific throwing behaviour of the leading Eastern European teams, especially the Olympic champions Hungary (2000, 2004 and 2008), Croatia (2012) and Serbia (2016 and 2021). The focus of the investigations was on the technique variants used and the tactical dependence of the goal throw on certain situational conditions (constraints). It was shown that the players of the top nations completed successful attacks with more technically demanding throwing variants, higher ball speeds (up to

over 90 km/h), and better collective control of the attacking zone.

■ The Bayreuth game analysts also came up with detailed results for the 2019 Germany Cup in ice hockey. When it came to shots on goal, the slap shot was hit with the highest speed (on average about 111 km/h), the curler most often, and the backhand shot most effectively. In addition, around 61 per cent of all goals were scored within a distance of less than five metres. From a tactical point of view, the speed of the puck is of great importance for successful goal attempts, and – similar to water polo – the control of space in the attacking or defensive third also plays an important role. From the German national

team's point of view, the game simulations led to the recommendation to increase the number of dribbles and at the same time to reduce duels with defenders as much as possible.¹³

The broad range of topics covered by Bayreuth's performance sports research attempts in particular to take into account the diversity of scientific interests as well as the intended professional fields of application of Bayreuth's sports economists. Many of the projects presented here were also promoted by the Bayreuth students of sports technology, who contributed a whole series of novel technical solution methods for improving research on performance, training, and competition.



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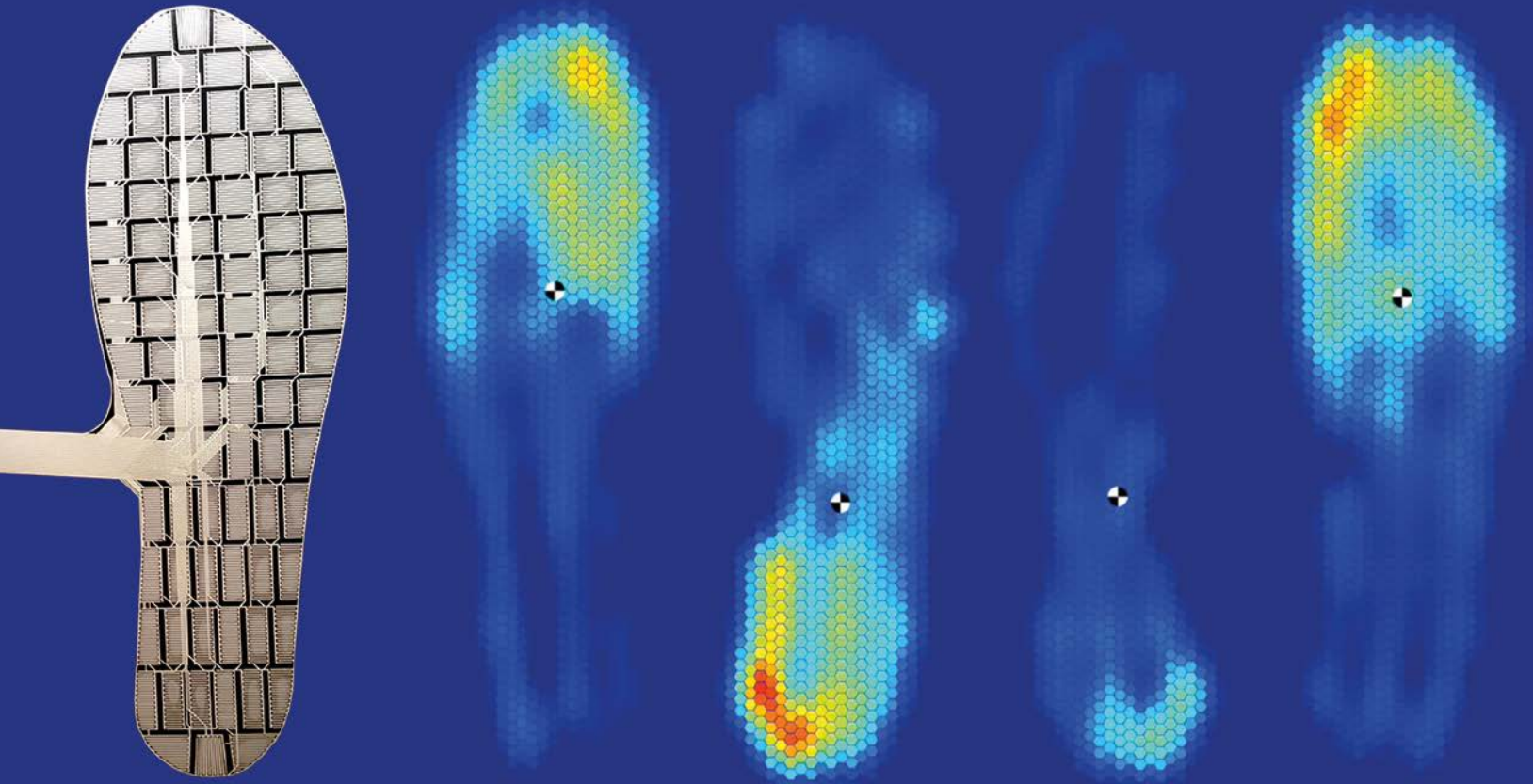
A. Hohmann et al.: Physical Fitness and Motor Competence in Chinese and German Elementary School Children in Relation to Different Physical Activity Settings. *Children* (2021) 8(5). DOI: 10.3390/children8050391.

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■ Fig. 6: Technically more demanding throwing variations increase the superiority in water polo (Photo: ist).

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- 7 A. Hohmann et al. in *Children* (2021), see recommended reading.
- 8 K. Zhao et al.: A 2-year longitudinal follow-up of performance characteristics in Chinese male elite youth athletes from swimming and racket sports. *PLOS ONE* (2020). DOI: 10.1371/journal.pone.0239155.
- 9 T. Liu et al.: Using Diagnostic Analysis to Discover Offensive Patterns in a Football Game, in: M. Tavana, S. Patnaik (eds.): *Recent Developments in Data Science and Business Analytics*. Heidelberg 2018.
- 10 T. Liu, A. Hohmann: Applying the Markov Chain Theory to Analyze the Attacking Actions between FC Barcelona and Manchester United in the European Champions League Finale. *International Journal of Sports Science and Engineering*, (2013) 7(2), 79-86.
- 11 M. Pietzonka, A. Hohmann, in *Leistungssport* (2020), see recommended reading.
- 12 A. Hohmann et al.: Torwurfanalyse im Wasserball. *Leistungssport* (2021), (51)6. The studies were carried out in cooperation with the Martin Luther University Halle-Wittenberg.
- 13 A. Hohmann et al.: Spielanalyse im Eishockey, see recommended reading (in print).



■ Michael Frisch
Franz Konstantin Fuss

Humanity and technology

Innovative research opens new possibilities in sport

■ Market-ready, high-precision and at the same time cost-effective insole (left); pressure distribution of different phases of the gait cycle (right) (Images: Franz Konstantin Fuss).

„Faster, higher, further“ – this has always been the motto of the Olympic modern era, and sport has become more than a hobby. To become "better and better" and thus achieve increased performance, people have long concentrated on improving physical characteristics and functions according to the requirements of the respective sporting discipline. Today, training science studies, biomechanical analyses with sensors and special software and, last but not least, nutritional-physiological support for athletes contribute to the fact that sporting records are surpassed time and again. But this trend towards optimising the body often has a dark side: prohibited medications that are not only ethically irresponsible, but also harmful to health in the long run.

For athletes to be able to run faster, jump higher, and jump and run further, various scientific and technical approaches aiming to optimise the sports equipment and clothing they use have been applied for quite some time. Examples thereof are swimming suits developed according to the bionic principle of shark skin, or running shoes that have elements of carbon fibre reinforced plastic (CFRP) integrated into the sole and are supposed to act like a spring.

One area of sport that would not exist in its current form without technical aids is the sport of people with disabilities, colloquially known as parasports. Through certain classification systems, it is possible, on the one hand, to ensure fairer competitions (each disability is individual) and, on the other hand, give the sport a degree of attractiveness. Depending on the disability, various technical aids are necessary. For example, sprinters with a leg amputation need special running prostheses that have to withstand a load of about 4,000 newtons – which corresponds to the weight of a mass of about 400 kg – during the race. At the same time, these prostheses must be lightweight, which is why they are usually made of CFRP. In wheelchair basketball, on the other hand, it is necessary for the wheelchair to be very robust in order to reduce damage, and at the same time as light as possible to be fast and agile on the court. An equipment like this can no longer be compared to a typical commercial wheelchair.

The newly founded Chair of Biomechanics at the University of Bayreuth, chaired by Prof. Dr. Franz Konstantin Fuss, is dedicated to investigating the interaction of humans and technology in a wide variety of sports. Three research areas are interlinked here: medical technology, sports equipment development, and sensor technology in sports and medi-

cine. Especially with regard to practical applications of research results, intensive cooperation with innovative sports and medical technology companies is crucial. Cooperation partners of the research group are therefore both companies in the region, such as medi or Powerslide, as well as global companies such as adidas, Puma, or uvex. The following examples of current research topics of the research team show the innovative impulses that can come from interdisciplinary networking with the technical sciences – from sensor and measurement technology to the development of functional materials.

Sensor technology for sport

For many years, during the digital transformation, new electronic products have been continuously developed that are used to monitor the performance of athletes. Sensors are indispensable here – for example during training, when the trainer receives continuous feedback on the athlete's movements in real time. In professional running, a "smartwatch", with which running speed can be continuously monitored, has long been standard equipment.

In addition, sensors can also help optimise the motor skills of athletes. Plantar pressure measurement insoles can record the foot actions during running with high accuracy. These soles are placed in the shoe like insoles, and the pressure distribution of the foot during running can then be displayed on a PC or smartphone via Bluetooth. Such soles are state of the art today. However, where they are already commercially available, they have two disadvantages: they are expensive and their durability is very limited due to low shear strength. This is particularly noticeable when running at high speed. However, a novel and patented manufacturing method is now helping to significantly reduce these disadvantages. The new plantar pressure measurement soles¹ developed by Professor Franz Konstantin Fuss and his team at RMIT University in Melbourne and Swinburne University Melbourne have the same high accuracy as commercial products, but would be a hundred times cheaper in comparison.

RECOMMENDED READING

F. K. Fuss et al.: Mobile computing with a smart cricket ball: discovery of novel performance parameters and their practical application to performance analysis, advanced profiling, talent identification and training interventions of spin bowlers. *Sensors* (2021), 21(20), 1-28. DOI: 10.3390/s21206942.

Y. Weizmann et al.: Benchmarking study of the forces and centre of pressure derived from a novel smart-insole against an existing pressure measuring insole and force plate. *Measurement* (2019), 142, 48-59. DOI: 10.1016/j.measurement.2019.03.023.

"Sports technology research in Bayreuth will focus on the entire life cycle of high-tech products."

AUTHORS



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Dr.-Ing. Michael Frisch is a research associate at the Training and Movement Science research group at the University of Bayreuth, and is responsible for the area of "sports technology".



■ Fig. 1: Cricket thrower in action (Photo: ist).

More than 80 piezoresistive sensors, all individually controlled, have significantly improved the accuracy of the measurement results. Currently, a solution is being developed that makes it possible to integrate such a pressure measurement sole directly into a shoe sole. The new sensor material consists, among other things, of Graphene, which already has a very high measuring range of 300 pascals to 5 Megapascals in the laboratory.

In the sport of cricket, the Smart Cricket Ball has revolutionised playing techniques worldwide. It contains three coupled gyroscopes. These sensors can measure the rotation speed of the cricket ball. By coupling three gyroscopes, it is possible for the first time to analyse bowling techniques.² The performance and skills of bowlers are calculated and assessed based on ten parameters and the centre of pressure of the ball is determined. Going forward, coaches are able to identify inaccuracies or potential for improvement in bowling in real time.

Additive manufacturing as a key technology

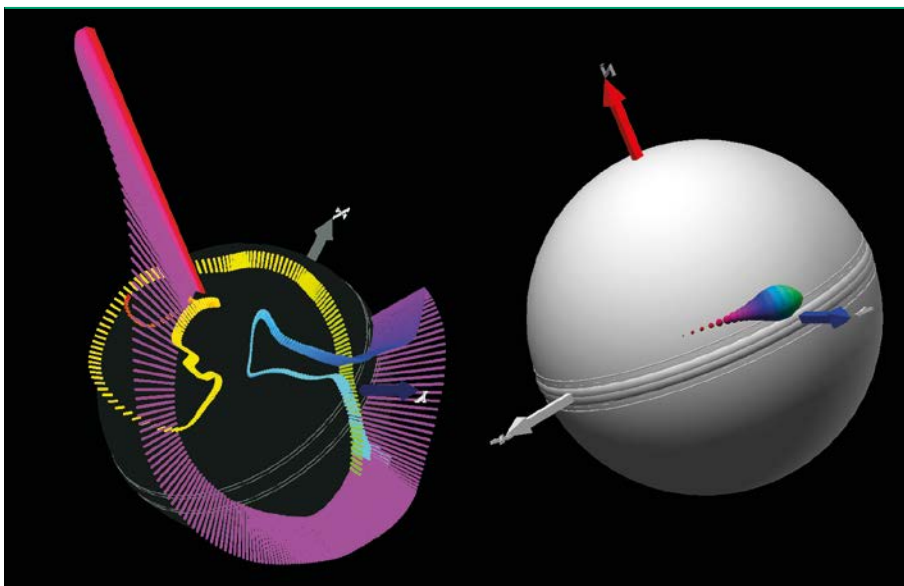
Materials and manufacturing processes make an important contribution to the development of innovative sports products, as the following example from inline skating shows. Here, the wheels on skates have a significant influence on the performance. The most popular type of wheel among skaters in competitive sports currently contains two components: a soft core and a harder outer shell. Both are made

of thermoplastic urethane (TPU), which has different degrees of hardness. The soft core makes it possible to maintain better cornering contact in the oval of an inline skating arena and thus achieve higher cornering speeds. But although the currently widespread wheel has a very good performance, there is one decisive disadvantage: the manufacturing process. It has been shown that due to the casting process used so far, air bubbles often form between the core and the shell, which leads to increased instability when riding and thus significantly increases the risk of injury. The challenge for materials research was therefore to develop a wheel that is a combination of soft and stiff areas and at the same time is lightweight. The solution lay in the combination of two processes: additive manufacturing and structural optimisation, which in virtual product development adds material at points of high stress and removes material at points of low stress (biological growth rule³). In this way, it is now possible to circumvent previous problems with the original manufacturing process and produce a wheel out of just one "shell".

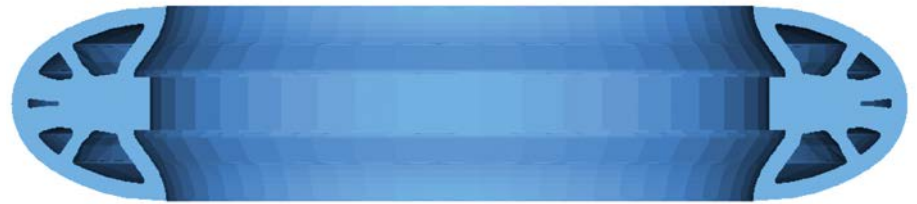
It is already becoming apparent that additive manufacturing will play an increasingly important role in the development of sports and medical products. Compared to conventional methods, it has two advantages. In particular, these are the production of products that are precisely tailored to the individual characteristics and needs of athletes, and the integration of various functions. An example of this is a children's foot prosthesis. Students of the Bayreuth master's programme in "Sports Technology" developed it and won second place at the German 3D Printing Challenge 2021⁴ with its "Tiger Toe". The foot prosthesis consists of the plastics TPU and acrylonitrile butadiene styrene (ABS) and was produced in a special additive manufacturing process, Arburg Plastics Freeforming (AFA), using 3D printing. Up to now, sports prostheses for children who have had a lower leg amputated, for example, have been very expensive. The costs can be as high as those of a small car and are not usually covered by health insurance. At the same time, children are always growing. To enable them to do sports continuously, parents would have to buy a new prosthesis for each new growth phase. But additive manufacturing, which is the basis of the award-winning Bayreuth development, will in future offer a cost-effective way of responding to children's personal needs and develop the perfectly fitting prosthesis for their preferred sport at the right time.

With this in mind, the cooperation between sports technology and materials science on the Bayreuth

■ Fig. 2: The Smart Cricket Ball contains sensors that measure the rotation speed of the ball and enable a precise analysis of throwing techniques in cricket (Graphic: Franz Konstantin Fuss).



campus is to be further strengthened. Under the umbrella of Campus Additive.Innovations and in cooperation with various industrial partners, plastics that are contained in sports products, for example, are to be investigated in terms of their material efficiency and reusability. In this way, sports technology research in Bayreuth will address the entire life cycle of high-tech products. First, products from the fields of sports and lifestyle will be additively manufactured in the laboratory, then tested for their applicability by means of biomechanical analyses and recycled after their simulated service life has expired. After repeated recycling, however, it can be that the original strength of the products is significantly reduced. To avoid this degradation, and to ensure that the recycled material can be used again without weakening its functional suitability, adaptive designs are necessary, which, in turn, need to be tested to optimise products.



■ Fig. 3 (top): Cross-section of the optimised roller under skating shoes produced using additive manufacturing (Photo: Michael Frisch).

the Bayreuth campus. The research will link sports and exercise science and medical aspects, such as chronic or acute diseases – not least through intensified cooperation with the Upper Franconia Medical Campus. In this project, too, the interdisciplinary networking of sports technology will strengthen an integrative view of the topic of "humanity & technology".

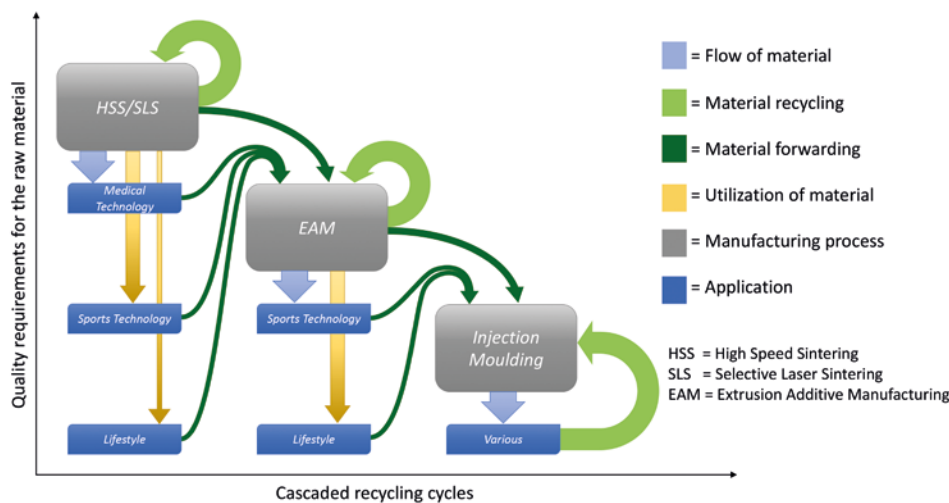
Perspectives

There are currently plans to establish a centre for the requirements of people with impaired mobility on



■ Fig. 4: Photo: ist

■ Fig. 5 (left): The "Tiger Toe" foot prosthesis developed in Bayreuth from synthetic material (Photo: Michael Frisch).



- 1 Y. Weizmann, A. M. Tan, F. K. Fuss, Measurement (2019), see recommended reading.
- 2 F. K. Fuss et al.: Identification of key performance parameters during off-spin bowling with a smart cricket ball. Sports Technology (2012). 4(3-4), 159-163. DOI: 10.1080/19346182.2012.726225. – F. K. Fuss et al., Sensors (2021), see recommended reading.
- 3 C. Mattheck: Design and growth rules for biological structures and their application to engineering. Fatigue & Fracture of Engineering Materials & Structures (1990), DOI: 13. 535-550. DOI: 10.1111/j.1460-2695.1990.tb00623.x.
- 4 Hochschule Neu-Ulm – University of Applied Sciences: 3D-gedrucktes anatomisches Lehrmodell gewinnt beim Finale der Deutschen 3D-Druck-Challenge. Press release, 22 October 2021.

■ Fig. 6: Sports technology research in Bayreuth in future investigate and redesign the entire life cycle of products in the fields of medical technology, sports technology and lifestyle. Fundamental to this is the concept of cascaded recycling cycles, which integrates the material flows in the manufacture of these products. The three research groups of Biomechanics, Engineering Design and CAD, and Manufacturing and Remanufacturing Technology as well as the Neue Materialien Bayreuth GmbH are working closely together on this (Graphic: Michael Frisch).



■ Nadine Wachsmuth
Janis Schierbauer
Walter Schmidt

Performance in elite sport

Sports medicine studies on endurance performance

■ Spiroergometric tests to determine the performance of endurance athletes in the laboratory of the Exercise Physiology and Metabolism research group at the University of Bayreuth (Photo: Hans Pastyrik).

On 12 October 2019, Kenyan track and field athlete Eliud Kipchoge amazed the sports world. He became the first person to complete a marathon in under two hours with a finishing time of 1:59:40 as part of the "INEOS 1:59 Challenge" in Vienna. However, according to the International Association of Athletics Federations (IAAF), this run is not an official world record – for a whole series of reasons: 41 alternating pacemakers were used, hydration was provided by bicycle, no other athletes were allowed to participate, and the running course was chosen to minimise wind and changes in incline or direction. In addition, the venue was in the same time zone as Kipchoge's home and training location, so there was no arrival-related jet lag. Nevertheless, his record time conveys very impressively what the human body is capable of after years of systematic endurance training. For decades, scientists from all over the world have been investigating exactly which bodily functions play a relevant role in being able to run "as fast as possible for as long as possible".¹ It has been shown that three criteria in particular determine endurance performance: maximum oxygen uptake ($VO_2\max$), the lactate threshold, and running economy.

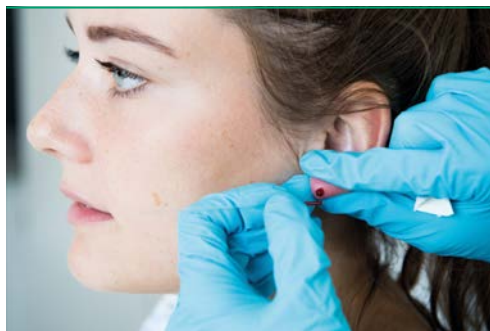
Maximum oxygen uptake ($VO_2\max$)

$VO_2\max$ is the classic measurement for assessing physical endurance performance. It describes the maximum amount of oxygen that a person can take in during hard physical work using of a large muscle mass. All mechanisms involved in the performance are recorded, including gas exchange in the lungs, the amount of blood that the heart pumps into the bloodstream in one minute, known as cardiac output per minute (HMV), and oxygen uptake into the working muscles. Some of these mechanisms can be changed through systematic training, while others cannot be influenced or can hardly be influenced at all. In highly trained endurance athletes – for example in long-distance running, triathlon or cycling – $VO_2\max$ is between 70 and 85 millilitres per kilogram body weight and minute. In comparison, the $VO_2\max$ of untrained middle-aged men and women is much lower, between 30 and 50 mL/kg/min. Women have values that are 10 to 15 percent lower than men.

The total amount of haemoglobin in the body is a decisive factor for oxygen transport and thus for $VO_2\max$. If a person has more haemoglobin, they can theoretically transport more oxygen per unit

of time. The team from Bayreuth Sports Medicine has shown that a change in the amount of haemoglobin by one gram is accompanied by a change in $VO_2\max$ of around four millilitres per minute.² Incidentally, the haemoglobin levels of top endurance athletes are 40 to 50 percent higher than those of the untrained; however, recent studies suggest that this parameter is mainly genetically predisposed. Increases through systematic training or a stay at high-altitude are only slight, but through blood manipulation they are possible to a large extent.

A routine determination of the total haemoglobin amount therefore lends itself to talent diagnostics, the control of training measures, but also to the detection of blood manipulation. Sports medicine at the University of Bayreuth under the direction of Prof. Dr. Walter Schmidt has developed a method for this purpose that makes it possible to determine the total amount of haemoglobin *in a short time and with little effort*.³ In the field of talent diagnostics, extensive studies have been conducted



■ Fig. 1 and 2: Determination of total haemoglobin mass using the optimised CO rebreathing method (Photos: Hans Pastyrik).



■ Fig. 3: Determination of maximum oxygen uptake including lactate diagnostics on the treadmill (Photo: Hans Pastyrik).

on children and young people using this method. The Bayreuth sports physicians have continuously observed competing children from the Bayreuth area over a period of three years. Furthermore, in cooperation with scientists from the National University in Bogotá/Colombia, almost 500 children and adolescents were examined and the effects of puberty, training, and altitude exposure on blood and performance were measured for the first time. The results show unanimously that blood and haemoglobin mass are mainly subject to genetic influences. An effect of training on haemoglobin mass can only be observed with the onset of puberty and is only around 10 percent. However, since adult endurance athletes have on average 40 to 50 per cent more haemoglobin and blood, the determination of these parameters could have an enormous diagnostic value already in childhood. In some countries – including Norway, Finland and Switzerland – the method developed in Bayreuth is already routinely used for talent diagnostics.

"A routine determination of the total haemoglobin mass lends itself to talent diagnostics, to control training measures, but also to detecting blood manipulation."

Knowing the total haemoglobin amount also enables sports medicine diagnostics to gain valuable insights into the causes of disorders of the haematopoietic system. To this end, Bayreuth sports medicine has investigated how an iron deficiency affects the amount of haemoglobin and consequently performance.⁴ Iron is the basic building material of the haemoglobin molecule: If there is not enough of it, no new haemoglobin can be formed. This leads to a reduced oxygen transport capacity, which in turn leads to a reduction in performance. Since athletes generally have a higher iron requirement, it is particularly important for them to regularly check their iron balance and, if possible, their haemoglobin levels. It has also been shown that blood loss, for example from donating blood, has a negative influence on haemoglobin levels and performance. It was particularly interesting that women in particular had not yet regained their initial haemoglobin level even 12 weeks after donating blood and also displayed iron deficiency.

A large amount of haemoglobin is thus the prerequisite for transporting as much oxygen as pos-



sible in the blood. However, the heart must also distribute the corresponding amount of blood in the body. With each heartbeat, the heart ejects a certain amount of blood, which is called stroke volume. This volume also plays an important role in achieving high $VO_2\max$ values and is thus absolutely necessary for peak endurance performance. Interestingly, however, it has been found that even completely untrained individuals can have higher stroke volumes and thus $VO_2\max$ values. These people obviously have a naturally high blood volume, which allows the heart to eject more blood with each beat. Bayreuth Sports Medicine was able to show that those people who have the most blood

RECOMMENDED READING

J. Schierbauer et al.: Effect of Exercise-Induced Reductions in Blood Volume on Cardiac Output and Oxygen Transport Capacity. *Frontiers in Physiology* (2021), 12, 1-10. DOI: 10.3389/fphys.2021.679232.

N. B. Wachsmuth et al.: Monitoring recovery from iron deficiency using total hemoglobin mass. *Med Sci Sport Exerc* (2015), 47(2), 419-427.

N. Wachsmuth et al.: Changes in blood gas transport of altitude native soccer players near sea-level and sea-level native soccer players at altitude (ISA3600). *Br. J. Sports Med* (2013), 47 Suppl 1, i93-i99. DOI: 10.1136/bjsports-2013-092761.



can also produce the higher stroke volumes and that a high stroke volume very probably makes the greatest contribution to achieving high VO_2max values.⁵ However, the extent to which the trainability and maximum endurance performance of untrained people depends on the size of their blood volumes has not yet been conclusively determined.

The lactate threshold

Since the VO_2max is determined at the end of an exercise session, it only allows limited conclusions to be drawn about a person's competition perfor-

mance. As is well known, a marathon is run at sub-maximal speeds, which is why the question arises as to how high the proportion of VO_2max is that is continuously available to endurance athletes over the course of exercise lasting several hours. For this purpose, a concept is used according to which the rate of aerobic metabolism that can be maintained during exercise is described by lactate production. In untrained subjects, a sustained increase in the blood lactate concentration and thus the lactate threshold at around 60 percent of VO_2max is seen with increasing load on a bicycle ergometer. In trained test persons, on the other hand, this only occurs at 75 to 90 percent of VO_2max . As a result, there are clear differences in the so-called performance VO_2 . This is the oxygen consumption that can be maintained over long periods of time and at a constant blood lactate concentration. Top endurance athletes have a performance VO_2 that is approximately twice as high as that of untrained people. This enables them to run at sustained high speeds of more than 20 kilometres per hour, as achieved by Eliud Kipchoge in the marathon, for example.

Running economy

Another factor that contributes significantly to endurance performance is running economy, also called movement efficiency. It is the amount of oxygen needed to achieve a certain performance – for example, a running speed or cycling performance. This oxygen consumption can vary by up to 30 percent between different athletes. For example, a study by the Bayreuth research group of Sports Medicine showed that the oxygen consumption of Kenyan runners was 10 percent lower than that of the best German runners, even though their running speed was the same. Causes for this include longer legs, which are also lower in weight due to a smaller amount of muscle, and Achilles tendons which can store energy better. This could be at least one explanation for the dominance of African athletes in middle and long-distance endurance competitions. Running economy, like the lactate threshold, depends on the performance VO_2 . Both factors can be easily improved by training, mainly due to adaptations in the skeletal muscles. Incidentally, this could explain why endurance competitions such as the Tour de France, which depend on the interaction of VO_2max , lactate threshold, and running economy, are often dominated by athletes who are older than those who are successful in competitions of shorter duration. This is because peak performance is not

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Prof. Dr. Walter Schmidt is the former Chair of Sports Medicine / Sports Physiology (today: Exercise Physiology and Metabolism) at the University of Bayreuth.

- 1 Cf. among others A. M. Jones et al.: Physiological demands of running at 2-hour marathon race pace. *Journal of Applied Physiology* (2021), 130(2), 369-79. DOI: 10.1152/jappl-physiol.00647.2020.
- 2 W. Schmidt, N. Prommer: Impact of alterations in total hemoglobin mass on VO_2max . *Exercise and Sport Sciences Reviews* (2010), 38(2), 68-75. DOI: 10.1097/JES.0b013e3181d4957a.
- 3 W. Schmidt, Walter, N. Prommer: The optimised CO_2 -rebreathing method: a new tool to determine total haemoglobin mass routinely. *European Journal of Applied Physiology* (2005), 95(5-6), 486-495. DOI: 10.1007/s00421-005-0050-3.
- 4 N. B. Wachsmuth et al. in *Med Sci Sport Exerc* (2015), see recommended reading.
- 5 J. Schierbauer et al. in *Frontiers in Physiology* (2021), see recommended reading.
- 6 N. Wachsmuth et al.: The effects of classic altitude training on hemoglobin mass in swimmers. *European Journal of Applied Physiology* (2013), 113(5), 1199-1211. DOI: 10.1007/s00421-012-2536-0.

Method for measuring endurance performance

A routine procedure for determining endurance performance is spiroergometry. The word "ergometry" generally refers to a diagnostic procedure for measuring performance. Using a suitable device, the ergometer, test subjects are required to perform a physically precisely defined task. The data obtained in this way enable performance to be monitored and also provide a basis for assessing various organ systems in terms of how they are involved in the performance. The prefix "spiro" stands for respiration, which is measured under conditions of exertion. Of particular interest are the proportions of different gases in the exhaled air, which provide information about the current metabolic processes in the body.

Spiroergometric performance diagnostics is often extended to include lactate diagnostics. Here, the increase in lactate concentration in the blood is measured during gradually increasing physical exertion on the basis of standardised protocols. In principle, the higher the physical performance in relation to the increase in blood lactate concentration, the higher the endurance performance. Spiroergometry with lactate diagnostics can be used to reliably determine $VO_2\max$. This has become established as a parameter for endurance performance in both high-performance and recreational sports. At the same time, it is an important indicator in internal medicine when it comes to assessing the severity of cardiopulmonary diseases. Occasionally, $VO_2\max$ is also used to derive general training recommendations. However, this should be viewed critically, as it has been shown in test subjects with the same $VO_2\max$ that their energy metabolism can be stressed to very different degrees under load. In addition, a valid determination of $VO_2\max$ is only possible when the test subjects reach their actual exercise limit.

Further parameters for endurance performance are the ventilatory threshold (VT) and the respiratory compensation point (RCP). VT marks the transition from aerobic to mixed aerobic-anaerobic energy metabolism, while RCP marks the transition to anaerobic energy metabolism. VT is usually between 60 and 70 percent of $VO_2\max$ in endurance athletes and between 40 and 60 percent in the untrained. Similar to $VO_2\max$, these two parameters also allow an assessment of endurance performance.

The team at the Exercise Physiology & Metabolism research group regularly supervises endurance athletes in elite sports. Anne Haug is currently being supported by Exercise Physiology & Metabolism in the area of sugar metabolism and nutrition. Anne Haug had developed a COVID-19-induced sugar metabolism disorder, which limited her performance and recovery. The team of the Exercise Physiology & Metabolism research group intervened in the form of continuous glucose measurements and corresponding dietary guidelines, and was thus able to normalise her glucose setting again. The research group is looking forward to a long-term collaboration!



■ Anne Haug
(Photo: private).

so dependent on lactate threshold and running economy.

Studies on altitude training of top endurance athletes

An important goal of endurance athletes in elite sports is to increase their performance. That is why many of them take part in altitude training camps. With increasing altitude, the oxygen partial pressure in the ambient air decreases, so that less oxygen is available, especially to the working muscles – a phenomenon known as hypoxia. The body responds to this with intra- and extramuscular adaptations designed to improve performance. The best known and probably most important adaptation to the lack of oxygen is to stimulate the production of red blood cells (erythrocytes). As a result, the oxygen transport capacity in the blood increases, and there is also an improvement in buffer capacity in the medium term, which helps to regulate the pH value of the blood. In order to achieve corresponding adaptations, various concepts of altitude training are applied, the best known of which are: Live High – Train High (LH-TH); Live High – Train Low (LH-TL); Live Low – Train High (LL-TH). In a classic high altitude training camp (LH-TH), athletes are exposed to the same hypoxic conditions for several days without interruption. In LH-TL, they train under normal oxygen conditions but spend the rest of the day under hypoxia. In LL-TH, it is the other way round: here, only the training is completed under hypoxia.

In order to achieve effects on the formation of new blood, a certain hypoxia stimulus must be present, i.e. both the altitude and the duration of the stay at altitude must fulfil certain conditions. A meta-analysis has shown that the amount of haemoglobin increases by one percent per 100 hours of altitude during a classic high altitude training camp (>2,100 metres) or a live high altitude train low altitude training camp (around 3,000 metres). The athletes should be exposed to hypoxia for at least 14 hours per day for at least two weeks to achieve the desired effects. The Bayreuth research group was able to show that even after three weeks at altitude, no plateau in the increase in haemoglobin levels was reached, so that a stay at altitude should last between three and four weeks.⁶ The recommendations for the optimal altitude are between about 1,900 and 2,400 metres, although there are certainly individual differences here.

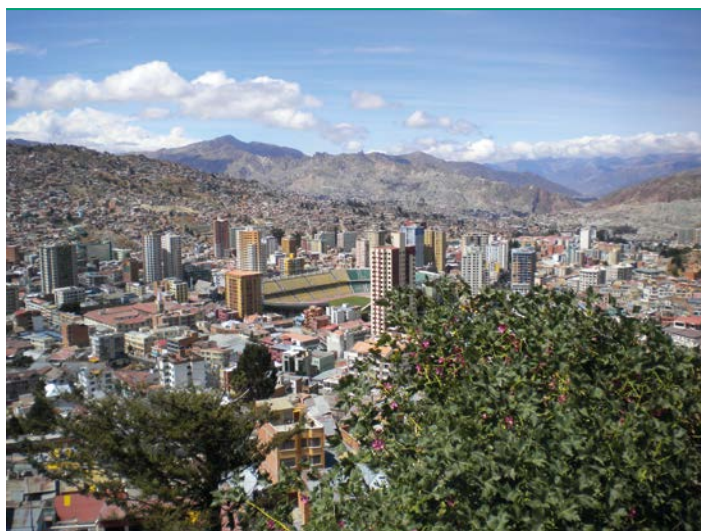


■ Fig. 4: Current altitude study with the biathletes of the German Ski Association (DSV) (Photo: Kristian Mehringer, DSV).

But not all athletes react in the same way to altitude training. A change in haemoglobin mass of -2 to +13 per cent was found in top German swimmers, and a change of -4.5 to +16.9 per cent in swimmers from eight different nations, all of whom trained at an altitude of 2,320 metres for between three and four weeks. This can have different reasons. A decisive factor influencing the formation of new blood is the iron balance of the athletes. Before the start of and during a stay at altitude, their blood iron stores must be sufficiently filled. Other influencing factors could be changes in body composition due to altered energy metabolism and the intake of food supplements and medication. This will be investigated in more detail in future sports medicine studies at

the University of Bayreuth in cooperation with German elite sports associations.

Furthermore, the sports medicine team investigated the question of how performance changes at altitudes of over 3,000 metres, and whether competitions between athletes who live at this altitude and athletes from the lowlands are fair at all from a physiological point of view. They were able to determine that the performance of football players from the lowlands is immediately reduced by more than 20 percent after arrival at altitude without a postulated delay, and only slowly improves after two weeks. Thus, football players who live at altitude have far more than just the usual home advantage.



■ Fig. 5: The football stadium in the city centre of La Paz (Photo: Nadine Wachsmuth).



■ Fig. 6: Football study in the football stadium of La Paz at an altitude of around 3,600 metres (Photo: Walter Schmidt).

A man and a woman are jogging along a dirt path in a forest. The trees are covered in vibrant autumn leaves in shades of yellow, orange, and red. The man is on the left, wearing a blue long-sleeved shirt and black shorts. The woman is on the right, wearing a white long-sleeved shirt and black leggings. They are both smiling and appear to be enjoying their run.

EXERCISE & NUTRITION

■ Susanne Tittlbach
Sascha Hoffmann
Othmar Moser

People who exercise live healthier lives

Studies on the
prevention of modern
diseases of civilisation

■ *A new study by Bayreuth Sport Science proves the high health benefits of endurance-oriented exercise (Photo: ist).*

Modern diseases of civilisation reflect ambivalent social structures and lifestyle conditions and are caused by constantly available sources of energy, a low demand for exercise, and chronic stress. Chronic “over- and understraining” increasingly displaces a balance of strain and relief that is necessary for the human body. As a result, pathophysiological dysfunctions can arise that may lead to modern diseases of civilisation (for example cardiovascular diseases, diabetes mellitus type 2, and obesity). Considering this, concepts and measures that aim at a holistic change of lifestyle are better suited for the prevention and therapy of these diseases than changes that are limited to individual areas of everyday life – for example nutrition or exercise.¹ Measures for the preventive transformation of lifestyle, which above all strengthen healthy metabolism and the cardiovascular system, should be offered across the board to people of all ages and gender groups to prevent modern diseases of civilisation.

The evidence of recent scientific studies presented in the following concerns the question of how people's physical activity behaviour and the occurrence of diseases are related to each other. The focus in this article is on overweight / obesity and diabetes mellitus.

Overweight and obesity

The prevention of overweight and obesity is one of the greatest public health challenges worldwide. Obesity is classified as being overweight to a degree that greatly exceeds normal weight (p. 50). Obesity increases the risk of modern civilisation diseases such as cardiovascular diseases, hypertension, type 2 diabetes mellitus, depression, musculoskeletal disorders, and some cancers. In OECD (Organisation for Economic Co-operation and Development) member countries, the average proportion of adults with obesity increased from 21.3 per cent in 2010 to 24.0 per cent in 2016. This means that during a six-year period, around 50 million people within the OECD developed obesity. In Germany, it is estimated that about 18.0 per cent of adults are obese.²

Recent research suggested that regular exercise can help prevent several diseases of civilisation and thus also counteract the development of overweight and obesity.³ This research has identified cut-off values that indicate how long, with what intensity, and with which mode adults should exercise in order to reach

the recommended minimum level of physical activity. Both the global WHO recommendations and the German national recommendations for physical activity are based on these values (Table 1).⁴

The following is recommended:

- moderate to vigorous aerobic physical activity (MVPA) for at least 150 minutes per week,
- muscle-strengthening exercise (MSE) at least two days per week; and
- avoiding prolonged sitting wherever possible.

Even though these recommendations are available, specifically what type of physical activity shows efficiency with respect to prevention or occurrence of different diseases have not yet been sufficiently researched. A first study on this topic was recently published by a research team from the University of Bayreuth. These investigations were based on data from a representative study published by the Robert Koch Institute (GEDA, Gesundheit in Deutschland Aktuell).⁵ The sports scientists from Bayreuth analysed how the recommended types of exercise affect the prevention or management of obesity in adults (Table 1).⁶ The aim of this study was to investigate how the level of obesity risk is related to achieving the targets for the following types of physical

RECOMMENDED LINKS

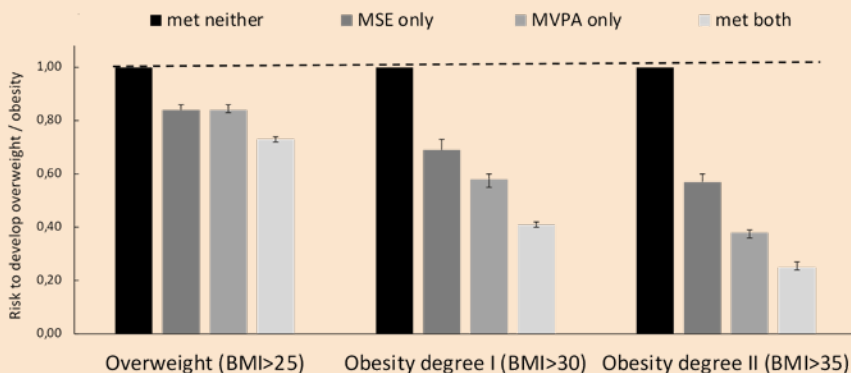
OECD: The Heavy Burden of Obesity: The Economics of Prevention. OECD Health Policy Studies, OECD Publishing, Paris 2019.
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■ Table 1: Physical activity recommendations for adults (Source: Bundeszentrale für gesundheitliche Aufklärung im Auftrag des Bundesministeriums für Gesundheit (ed.): Menschen in Bewegung bringen. Köln 2019, 12.).

Physical activity recommendations for adults				
A	or	B	or	C
Moderate-intensity physical activity		Vigorous-intensity physical activity		Moderate-to-vigorous-intensity physical activity
Examples: fast walking, cycling, swimming		Examples: running, fast cycling, fast swimming		Combination of physical activities from A and B
At least 150 minutes per week (e.g. 5 x 30 minutes daily)		At least 75 minutes per week (e.g. 5 x 15 minutes daily)		
In any case, additional muscle strengthening exercise on at least 2 days per week. Example: functional gymnastics exercises, lifting weights.				
... and besides that: Avoid long periods of sitting and interrupt sitting with physical activity. Examples: short walks, working in a standing position.				

Overweight and obesity



■ Less prevalence overweight/obesity (Graphic: Susanne Tittlbach).

According to the classification of the World Health Organisation (WHO), there are three degrees of severity as well as a preliminary stage of obesity. These four levels result from the calculation of the body mass index (BMI). According to the German Obesity Society (DAG), the grading into the different degrees is mainly conducted to assess the risk for concomitant and/or secondary diseases of obesity. In addition to the degrees of severity shown here, there is also degree III, where the BMI starts at 40 kg/m².

Obesity is associated with numerous health risks because it promotes the development

of a pathological abdominal fat distribution pattern. This fat distribution pattern basically determines the risk of metabolic or cardiovascular diseases. The risk of disease is therefore significantly greater in the case of abdominal obesity. Abdominal obesity is also a factor of the metabolic syndrome characterised by the simultaneous presence of various diseases and symptoms. These include abdominal obesity, insulin resistance, impaired fasting glucose, dyslipoproteinaemia, and hypertension. The (DAG) therefore classifies the risk of concomitant diseases as high in obesity grade II in particular.

activity using a representative sample of German adults:

- Endurance-based exercise *and* muscle-strengthening activities
- *only* endurance-based exercise
- *only* muscle-strengthening activities
- *neither* endurance-based exercise *nor* muscle-strengthening activities

The results showed:

■ From a health perspective, some exercise is always better than no exercise. Those who avoid both endurance-based exercise and muscle-strengthening activities have the highest risk of developing obesity.

■ Both forms of exercise have their own benefits in terms of obesity prevention.

■ The benefits of endurance-based exercise are higher than the benefits of strength-oriented activities.

■ The most effective way to prevent overweight and obesity is to follow recommendations for both types of exercise.

■ The protective effect of both types of exercise occurs primarily in people who are severely affected by obesity (obesity grade II).

In the comparative analyses, many factors were considered to map the health effects of the two types of exercise as clearly as possible: socio-demographic factors such as gender, age, and socio-economic status, but also health and lifestyle factors such as health restrictions, smoking, and fruit and vegetable consumption. It turned out that those people who followed the recommendations for *both* types of physical activity had the *lowest* risk of developing overweight and obesity. This result was seen in all overweight classes: Depending on the grade of obesity, the combination of endurance and strength training reduced the risk by 27 to 75 percent. Endurance training alone reduced the risk by 16 to 62 percent, strength training alone by 16 to 43 percent. However, for sustainable and effective prevention of overweight and obesity, exercise should always be combined with a health-oriented diet.

The incidence of overweight, including obesity, has dramatically increased in Germany in recent years. Not least the pandemic-related restrictions have contributed to a further increase, although the Robert Koch Institute (RKI) only recorded an average per capita increase in body weight of one kilogram for the population in Germany in 2020. However, if only those who gained weight during the pandemic lockdown are considered, it shows that their body weight increased by an average of 5.5 kilograms.⁷

From a public health perspective, there is therefore a great need in Germany to sustainably promote compliance with the recommendations for endurance and strength-oriented exercise. Attention should be paid to people with severe obesity. Currently, however, most exercise programmes are geared towards promoting endurance alone for overweight and obese people in Germany. For example, health insurance companies and sports associations recommend sports such as swimming, cycling, and walking in their programmes. However, especially those exercise programmes that are aimed

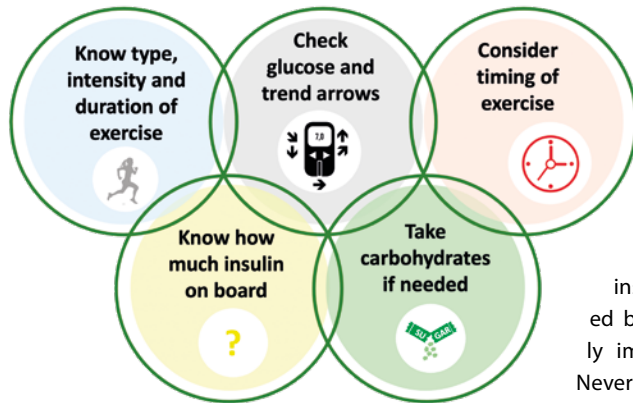
at obese people should also include strength-oriented forms of exercise. A central role is not only played by professional guidance, but also by the integration of strength training into everyday exercise behaviour. To make this as effective as possible, appropriate tools should be provided and used, such as app-based technologies, virtual fitness trainers, or openly accessible training equipment in communities.

Diabetes Mellitus

Research dealing with metabolic diseases emphasises the positive effects of a physically active lifestyle and regular physical training on diabetes mellitus.⁸ In general, two types of diabetes mellitus can be distinguished (Table 2).

Diabetes Mellitus Type 1	Diabetes Mellitus Type 2
INSULIN PRODUCTION	
<p>The body no longer produces insulin because cells of the pancreas (β-cells) die due to an autoimmune process.</p> <p>Measurable lack of insulin (Insulin must be injected)</p>	<p>The body does not react adequately to the insulin produced due to various factors (e.g. metabolic syndrome).</p> <p>No measurable lack of insulin (Insulin resistance)</p>
AGE AT DIAGNOSIS	
Usually between 0–40 years (basically childhood and adolescence).	Usually from the age of 40 (can also occur in childhood)
SYMPTOMS DIAGNOSED	
<ul style="list-style-type: none"> ■ Increased urge to urinate and feeling of thirst ■ Weight loss ■ Tiredness ■ Irritability ■ Blurred vision ■ Poor wound healing ■ Frequent infections 	<ul style="list-style-type: none"> ■ Often asymptomatic ■ Increased urge to urinate and feeling of thirst ■ Fatigue ■ Blurred vision ■ Poor wound healing ■ Frequent infections
DIABETES PREVENTION	
There is currently no way to prevent the development of type 1 diabetes mellitus.	The development of diabetes mellitus type 2 is preventable in most cases by adhering to dietary measures and regular physical activity.
DIABETES TREATMENT	
<ul style="list-style-type: none"> ■ Exogenous insulin therapy ■ Close blood glucose monitoring ■ Balanced and regular meals ■ Encouraged physical activity and exercise 	<ul style="list-style-type: none"> ■ Eating a balanced and regular diet ■ Forced physical activity and exercise, especially with the aim of weight loss ■ Mostly a combination of calorie-restricted diet and oral antidiabetic drugs as well as injectable GLP-1 receptor agonists ■ The frequency of blood glucose monitoring depends on the complexity of the blood glucose-lowering therapy. ■ Insulin therapy is often necessary after a long duration of diabetes.

■ Table 2: Comparison of diabetes mellitus types 1 and 2. In the health sciences, clearly distinct subtypes are now also distinguished.



■ Fig. 1: Recommended therapeutic measures for people with diabetes mellitus type 1 (Graphic published in O. Moser, *Diabetologia* (2020), cf. note 11).

In people with type 1 diabetes mellitus, exercise and regular physical training are associated with significantly longer life expectancy,⁹ with less blood glucose fluctuations and a lower insulin requirement,¹⁰ improved body constitution, and partly improved glycaemic control. Nevertheless, the possibility that sudden hypoglycaemia can occur during physical exercise cannot be underestimated. Since exercise and insulin follow a similar mechanism of action on glucose absorption, hypoglycaemia can occur that fast. Both transport glucose that has accumulated in the bloodstream into the cellular system. If insulin therapy is not adjusted by adequately via reducing the dose, the interaction of both factors can cause (severe) acute hypoglycaemia accompanied by unconsciousness. Therefore, people with type 1 diabetes mellitus should follow a series of therapeutic measures to be able to experience the positive effects of exercise (Fig. 1).

Before starting exercise, people with type 1 diabetes mellitus should be aware of the type, intensity, duration, and time of exercise. In addition, they should consider how much insulin is circulating and consume fast-acting carbohydrates depending on their current glucose level and glucose trend. Only

if these therapeutic measures become a habit, can safe participation by people with diabetes mellitus type 1 be guaranteed. Then they too can take advantage of the full range of positive effects of a healthy and happy life.¹¹

In contrast to diabetes mellitus type 1, people with diabetes mellitus type 2 are significantly less at risk of acute blood glucose level disturbances during exercise. Nevertheless, they should also seek medical advice before starting a physically active lifestyle in order to exclude possible complications. Exercise has almost the same potential as drug therapy for metabolic diseases such as diabetes mellitus type 2. A recent study showed that switching to a lifestyle focusing on high physical activity level leads to a significant decrease in disease symptoms in people with diabetes mellitus type 2. This effect is three times more pronounced in them than in a comparison group of people with diabetes mellitus type 2 who do not change their lifestyle.¹² The type of physical activity or physical strain plays a subordinated role as long as a degree of regularity is maintained. For aerobic endurance training, it has been shown that both the functional capacity and the insulin sensitivity of people with type 2 diabetes mellitus improve. They run a lower risk of cardiovascular disease mortality and generally have a higher life expectancy. Health-promoting effects have also been demonstrated for strength training: muscle mass increases, insulin sensitivity increases, and the cardiovascular system is strengthened.

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■ Fig. 2: Nordic walking on the beach (Photo: ist).

In addition to increasing physical activity, care should be taken to interrupt periods of prolonged sitting – for example, by standing, walking, cycling, or running.¹³ Even in healthy people, these breaks in inactivity lead to a reduction in post-meal peaks in blood glucose levels. Thus, it can be assumed that shorter periods of sitting generally reduce the risk of impaired glucose metabolism.¹⁴

Conclusion

In view of the results of previous studies, it must be stated that physical activity and exercise training

reduce the risk of diseases of civilisation, increase longevity and enable a healthy life. In this way, they can contribute to reduce the overall risk of modern diseases of civilisation. Measures that bring about behavioural changes towards an active lifestyle should therefore find a permanent place in public health programmes.



■ Photo: iStockphoto.com

“Exercise and physical training reduce the risk of diseases of civilisation, increase longevity and enable a healthy life.”

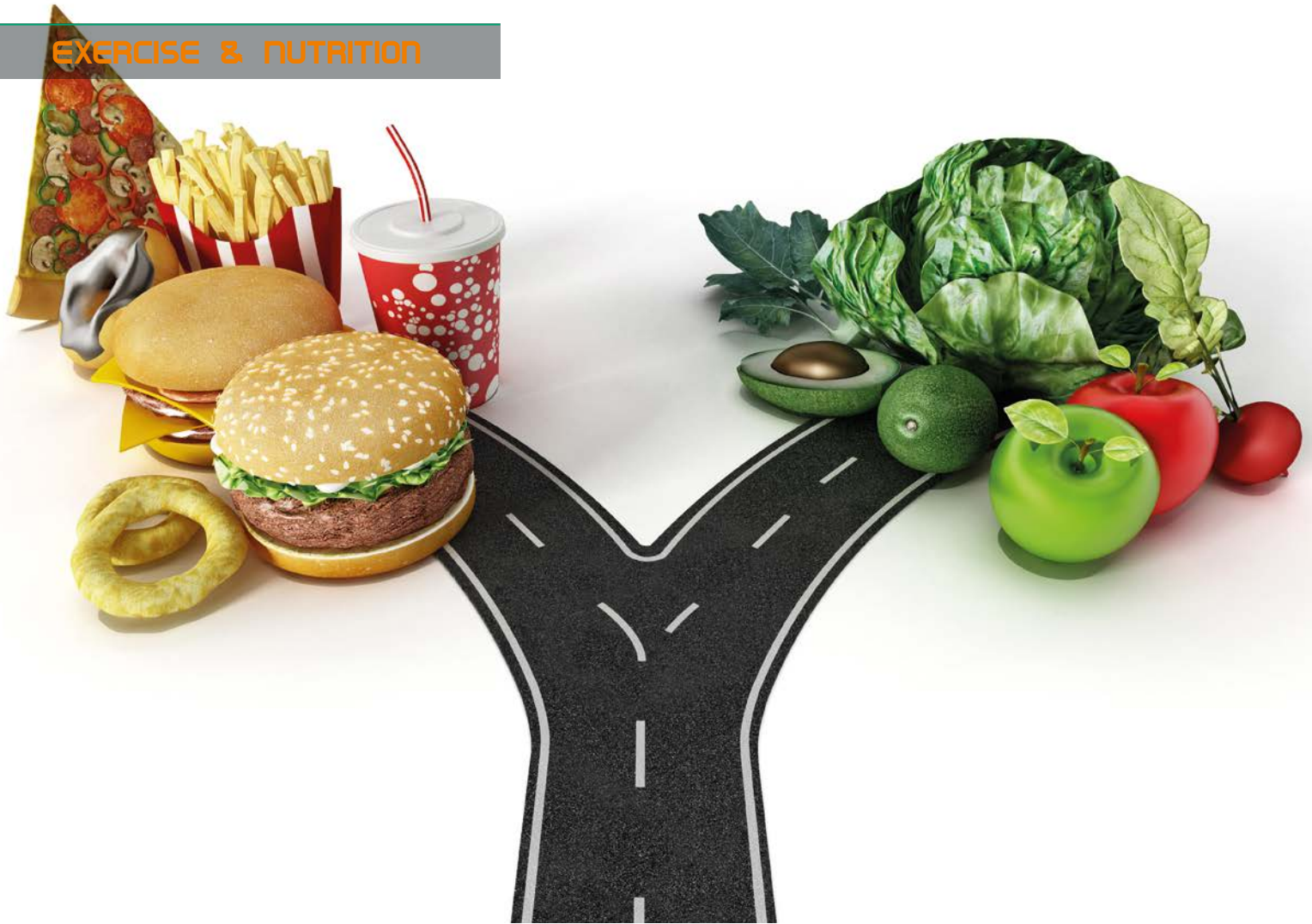
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■ Janin Henkel-Oberländer

Nutrition and obesity

Risk factors for health and life expectancy

■ "Fast food diet" or low-energy, high-fibre diet?
Eating habits determine health risks (Foto: ist).

The number of people suffering from being overweight and from obesity is rising rapidly and is increasingly becoming a global health problem. It has tripled worldwide in the last 50 years, and currently almost 40 percent of adults worldwide are classified as overweight because they have a Body Mass Index (BMI) of over 25. There has also been an alarming increase in prevalence among children and adolescents, both nationally and globally.¹ Diseases resulting from being overweight and obese include metabolic associated fatty liver disease (MAFLD) and the development of metabolic syndrome, in which different diseases and symptoms are present at the same time, including abdominal obesity ("belly fat"), insulin resistance, hypertension, and dyslipidemia. This combination significantly increases the risk of developing diabetes mellitus type 2 as well as atherosclerosis and other cardiovascular disorders that increase the risk of heart attack and stroke, and it thus reduces the life expectancy of those affected.²

A positive energy balance: the main cause of obesity

The causes of obesity are mainly due to a positive energy balance. In terms of developmental history, within a short period of time, living conditions have changed from low-energy, high-fibre food in short supply to the constant availability of high-energy, rather low-fibre food. At the same time, the energy demand of the population has steadily decreased. Especially in the last 200 years, not only the availability of food, but also the quality of food in particular has increased drastically due to technological processes in the production and processing of food. In particular, the consumption of energy-dense food rich in refined sugars and processed oils has been linked to the rise in unhealthy weight gain / obesity and systemic inflammatory diseases.³ The diet of the population in the so-called Western world, which historically included mainly industrially well-developed nations in Europe and the Americas, is typically characterised by high levels of saturated and/or unsaturated fatty acids, cholesterol, and carbohydrates such as fructose. It is also known as the Western Diet, Fast Food Diet, or Cafeteria Diet.

Compared to the diet of people in the hunter-gatherer era, modern agriculture and the industrial revolution have dramatically increased the consumption of fat in particular. Dietary fats should account for less than 30 percent of the energy con-

tained in the total daily diet, but in fact up to 50 percent of daily calories are often derived from fat.⁴ To counteract the potentially detrimental effects of animal fats, which contain mainly saturated fatty acids and high amounts of cholesterol, national and international nutrition and health organisations recommend replacing saturated fatty acids with polyunsaturated fatty acids from plant sources. However, care should be taken that no more than five times as many omega-6 fatty acids as omega-3 fatty acids are consumed (omega-6 fatty acids : omega-3 fatty acids < 5:1).⁵

Besides saturated fatty acids, fatty meat and eggs also contain cholesterol. This lipid, especially in combination with trimethylamine, which is also found in animal foods, is held responsible for an increased risk of atherosclerosis and associated cardiovascular disorders.⁶ The author's own research with model organisms shows that it is primarily the combination of omega-6 fatty acids and cholesterol in the diet that leads to unhealthy weight gain / obesity as well as massive damage to the liver. It

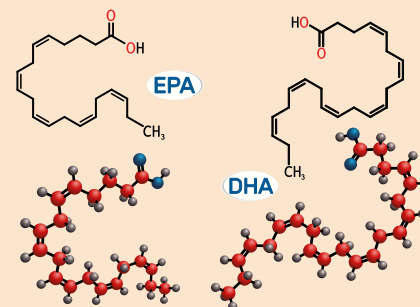
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Key to a healthy diet: polyunsaturated fatty acids

The polyunsaturated fatty acids (PUFAs) are divided into omega-6 and omega-3 according to the position of the last double bond in the lipid structure. The omega-6 fatty acid linoleic acid and the omega-3 fatty acid α -linolenic acid belong to the essential fatty acids. They cannot be formed in the human body and must be ingested with food. Good sources of the long-chain omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), whose precursor is α -linolenic acid, are fatty varieties of fish such as mackerel and herring, but also salmon and tuna. However, only a few vegetable oils, for example canola, hemp, and linseed oil, are rich in omega-3 fatty acids, while commonly used oils such as sunflower, corn germ, pumpkin seed, grape seed, and soybean oil are mainly rich in omega-6



■ Fig. 1: The omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) contained in fish oil (ist).

fatty acids. PUFAs are generally important for the fluidity of biological membranes that surround all our body cells, and thus also for signal transmission between cells. They also form precursors for various signalling substances. However, these differ. Mediators, derived from the omega-6 fatty acid, can increase acute and chronic inflammatory reactions. In contrast, the mediators formed from the omega-3 fatty acids primarily have an anti-inflammatory effect and promote the resolution of inflammation.

■ Fig. 2: Flower of the canola plant, a variety of rapeseed from which an edible oil rich in omega-3 fatty acids is extracted (Photo: wikimedia commons / Honeyhuyue).



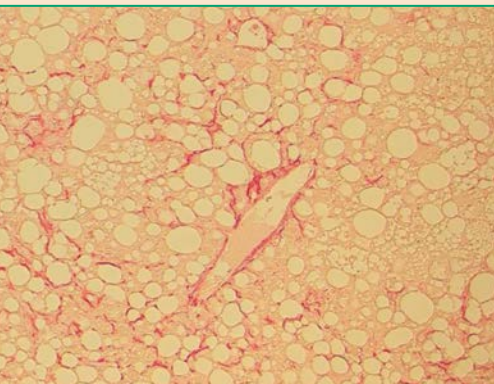
also promotes the development of non-alcoholic steatohepatitis (NASH).⁷

Another risk factor for the development of unhealthy weight gain is the intake of simple carbohydrates. In addition to sweets, cakes and pastries and sweetened beverages (soft drinks) in particular contribute to increased glucose and especially fructose consumption, which has more than doubled over the last 30 years. Glucose is used as an energy source throughout the entire human body. With excessive intake, it can be converted into fatty acids and stored in the body as fat droplets. Increased consumption of fructose, especially in the absence of complex food, promotes fatty liver dis-

"Increased physical activity or regular endurance training, combined with moderate calorie reduction, can counteract damage to the liver."

ease and the development of metabolic-associated fatty liver disease (MAFLD). (see info box). Furthermore, fructose alters the microbiota contained in the gastrointestinal tract.⁸ Microbiota is the term used to describe the microorganisms that live in or on an organism. In humans, we find a large number and variety of bacteria, especially in the large intestine, which not only help digest food components and produce vitamins, but also protect against pathogens and influence the immune system. The composition of the microbiota in the gastrointestinal tract depends largely on the components of the food we consume. The combination of simple carbohydrates and lipids, including cholesterol and the compounds formed from cholesterol, has a major influence. The diversity of the intestinal bacteria is an important factor in the context of metabolic diseases that are partly caused by diet.⁹

Metabolic-associated fatty liver disease (MAFLD)



■ Fig. 3: Photomicrograph of a fatty liver. The circular light areas indicate stored fats. Liver fibrosis has already developed, as shown by the red coloured collagen fibres. These are the main components of connective tissue that has increased pathologically as a result of chronic damage (Picture: Janin Henkel-Oberländer).

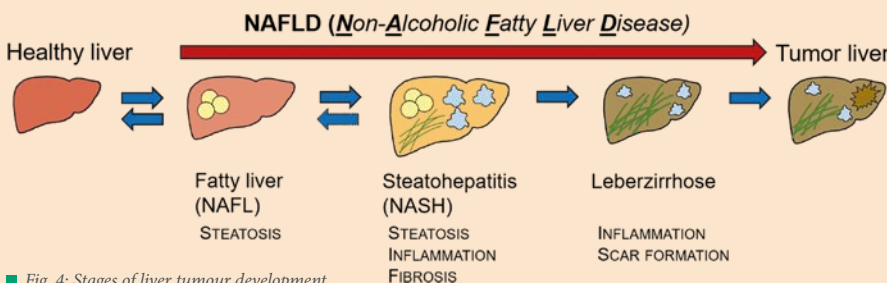
of death. The main characteristic of this liver disease is an excessive lipid accumulation in the cells (steatosis). The prevalence of the disease increases with age and is found in about 30 percent of the population. In high-risk groups, such as patients with obesity, up to 90 percent have MAFLD/NAFLD, with an average of one in three developing a severe course of steatohepatitis (NASH). In steatohepatitis, fatty degeneration (steatosis) is accompanied by chronic inflammation and increased collagen fibre formation (fibrosis). Progression to NASH increases the risk of developing a liver tumour. It leads to incurable cirrhosis and fatal organ failure in up to 20 percent of cases

Non-alcoholic fatty liver disease (NAFLD) is associated with metabolic risks such as obesity, type 2 diabetes, and dyslipidemia. NAFLD is considered a manifestation of metabolic syndrome and has recently been renamed metabolic-associated fatty liver disease (MAFLD). It is now the most common cause of liver dysfunction worldwide and increases the risk of cardiovascular disease, which globally, is the leading cause

Influence of physical activity

However, it is not only poor dietary behaviour that promotes unhealthy weight gain and the resulting metabolic diseases. Another cause is a dormant and physically non-active lifestyle.¹⁰ Regular moderate physical activity not only has a positive effect on the skeletal muscles, but also influences nutrition-related metabolic processes in the fatty tissue and liver. Detailed recommendations for weekly physical activity behaviour have therefore been published by the WHO and the Federal Centre for Health Education.¹¹ In addition to other initiatives, the "Further Development IN FORM" action plan, which was adopted by the Federal Government in June 2021, is also intended to contribute to the prevention of malnutrition, lack of exercise, and obesity with suitable measures.

The early stages of fatty liver disease, especially the development of simple fatty liver, are still reversible. They can be reversed by lifestyle changes that include a drastic reduction in calorie intake. Medical research now suggests that a change in diet



■ Fig. 4: Stages of liver tumour development (Graphic: Janin Henkel-Oberländer).



■ Fig. 5: Healthy, low-calorie foods for a balanced diet (Foto: ist).

must result in a weight loss of more than ten per cent of the initial weight in order to counteract the development and progression of the disease. However, many patients do not achieve these nutritional goals in the medium and long term.

Recent studies have shown that increased physical activity or regular endurance training, combined with a moderate reduction in calories, can counteract damage to the liver, even if this does not result

in a significant reduction in body weight. Therefore, this pathway is now being discussed as an alternative treatment option for overweight patients with MAFLD.¹² The author's own work on diet-related fatty liver disease, using a specific type of animal model (rodent models), confirmed the positive influence of endurance training. Dangerous deposits of lipids and resulting stress reactions in the liver decreased, while insulin resistance and glucose intolerance were improved.¹³

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- 10 Cf. L. Longato (2013), n. 3, and J. S. Lim et al. (2010), n. 8.
- 11 Cf. the article by S. Tittlbach, S. Hoffmann and O. Moser, p. 48-53.
- 12 On fatty liver disease, risks and treatment options cf. S. Singh et al.: Treatment options for alcoholic and non-alcoholic fatty liver disease: A review. *World J Gastroenterol* (2017), 23, 6549-6570. DOI: 10.3748/wjg.v23.i36.6549 – D. J. van der Windt et al.: The Effects of Physical Exercise on Fatty Liver Disease. *Gene Expression* (2018), 18, 89-101. DOI: 10.3727/105221617X15124844266408. – N. Chalasani et al.: The diagnosis and management of non-alcoholic fatty liver disease: practice guideline by the American Gastroenterological Association, American Association for the Study of Liver Diseases, and American College of Gastroenterology. *Gastroenterology* (2012), 142, 1592-1609, DOI: 10.1053/j.gastro.2012.04.001.
- 13 J. Henkel et al. (2019), see recommended reading.



■ Susanne Tittlbach
Julia Mahr
Helmut Strobl

Health, fitness and nutrition in modern physical education

Facilitating physical literacy for a health-oriented lifestyle

■ Children and adolescents discuss the route for a joint run with their teachers (Photo: ist).

Physical activity and nutrition are unanimously considered key elements to a healthy lifestyle. The instilling of a health-oriented lifestyle is an educational goal in our society and accordingly integrated in educational curricula. However, scientific data show that less than half the population of Germany is sufficiently physically active and eats a sufficiently balanced diet according to the current recommendations of the World Health Organisation (WHO). A health-oriented lifestyle is thus not a matter of course for a large part of the population.

In order to develop a health-oriented lifestyle, it is important for people to be empowered to take control of their own health, and thereby also of their physical activity and nutrition. Schools as educational institutions play a major role in empowering people to lead a health-promoting lifestyle, as all children and young people in society can be reached at this stage. Physical activity and its orientation towards aspects of health is taken up as a topic in the subject of physical education (PE) at school. Nutrition, on the other hand, is not centrally represented in any school subject at Bavarian grammar schools, for example. However, health-oriented points of reference can be found, among other things, in the PE curricula. Nevertheless, studies on sport didactics show that broader health-related topics, such as healthy nutrition, are only marginally addressed in PE.¹

Modern physical education concepts focus more on health-promoting aspects and aim at the de-



velopment of physical literacy. Pupils should be empowered to understand their own exercise and physical activity from a health perspective, and to act in a self-determined and responsible way in pursuing it, so that positive effects in their health result. However, such a concept of physical education has not yet been widely implemented in Germany. Instead, the focus is often exclusively on time spent on physical activity, which is understood as a counter-measure to the otherwise predominantly sedentary school day.

Nutrition and physical activity in schools: A practical pilot project

Against this background, the University of Bayreuth initiated the study "Health.edu" in cooperation with FAU Erlangen-Nuremberg and the University of Augsburg. The project was integrated into the research network "Capital4Health" and was funded within this framework by the Federal Ministry of Education and Research (BMBF). "Health.edu" explored the question of how physical education regarding the topic of health should be methodically and didactically designed in order to promote the physical literacy of pupils, for implementation in schools. At the same time, it should tie in with the pupils' lifeworld and everyday experience, as well as incorporating their wishes and needs.

In order to answer this research question, a project was carried out in four schools over the course of one school year, based on the concept of "participatory intervention". This means that close coordination and cooperation between the school stakeholders involved was ensured in all phases of the project. The project aimed at empowering pupils in grades 7 to 10 to make health-enhancing decisions about exercise and physical activity by strengthening their physical literacy. In order to design teaching-learning processes that meet this goal, physical education teachers need to focus on aspects of health in physical education, and take into account the relevant methodological-didactic features of competence-oriented physical education – for example, cognitive activation, reflection, openness, and pupil orientation.

In order to integrate these requirements for modern physical education into daily teaching practice, an effective exchange of knowledge and experience between researchers and school stakeholders, especially school administrators, pupils, and physical

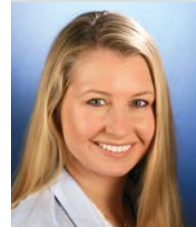
"Now I always look at how much sugar there is in products, for example with muesli I mix oat flakes with muesli. I used to eat almost pure muesli. The reason for that is the sugar, [...] I read about it on the nutritional value table. Before the project I already knew about the table, but I didn't look at it."

Quote from an interview with a pupil.

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■ Fig. 1: Exercise and healthy nutrition go together (Photo: ist).

RECOMMENDED READING

R. Sygusch et al. (eds.): Gesundheit in Sportunterricht und Sportlehrerbildung. Bestandsaufnahme, Intervention und Evaluation im Projekt 'Health.edu'. Wiesbaden 2020 (<https://www.springer.com/de/book/9783658271404>).

"Modern physical education concepts focus more on health-enhancing issues and aim at the development of physical literacy."

education teachers, is necessary. To this end, planning groups were formed at all four schools. The participants discussed content-related aspects of health, methodological-didactic measures for the design of competence-oriented teaching-learning processes, and different possibilities of implementing these measures in physical education according to the respective circumstances of the school. The concept developed in these discussions was then implemented in teaching practice.

The evaluation of the measures implemented shows that the pupils' physical literacy improved significantly over the course of the project (Fig. 2). After one year, it was more pronounced than among pupils at comparable schools where no cooperative planning process had taken place. At the same time, however, there were considerable differences between the four project schools. The greatest increase in physical literacy was seen in those pupils whose teachers had a strong interest in the topic of "health" and in the inclusion of scientific expertise in lesson planning. It also proved to be beneficial when school management and teaching staff actively supported school-wide development processes such as those initiated in the project.

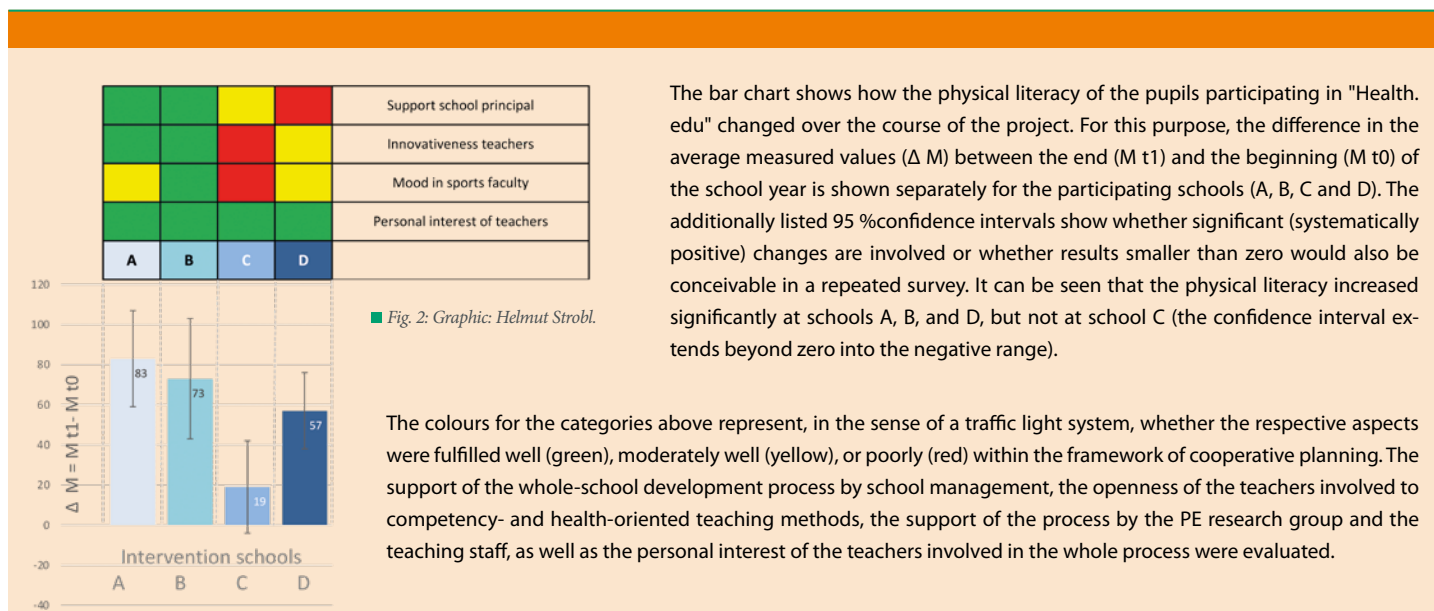
"Healthy with pleasure"

The focus was on physical aspects of health, for example

- Pupil-led warm-up programmes,
- Functional strengthening programmes and accompanying fitness tests,
- Fitness training in preparation for the school ski course,
- Linking theoretical content on the topic of "health" with physical activity, whether in presentations by pupils or by teachers who introduce nutritional aspects into physical education lessons.

The project "Health.edu" led to a long-term school development process at one of the four schools – a Bavarian grammar school – which aimed at combining issues of nutrition and physical activity.² The 5th grade was the focus of interest because various studies on health education had shown that such developments should be initiated as early as possible. An analysis of the Bavarian curriculum "LehrplanPLUS" indicated that various subjects contain nutrition and/or physical activity related educational goals. Without a doubt, the subject of physical education, as the only physical activity subject, plays a central role in this – both aspects can be experienced in a special way in physical education. The subjects of nature and technology as well as

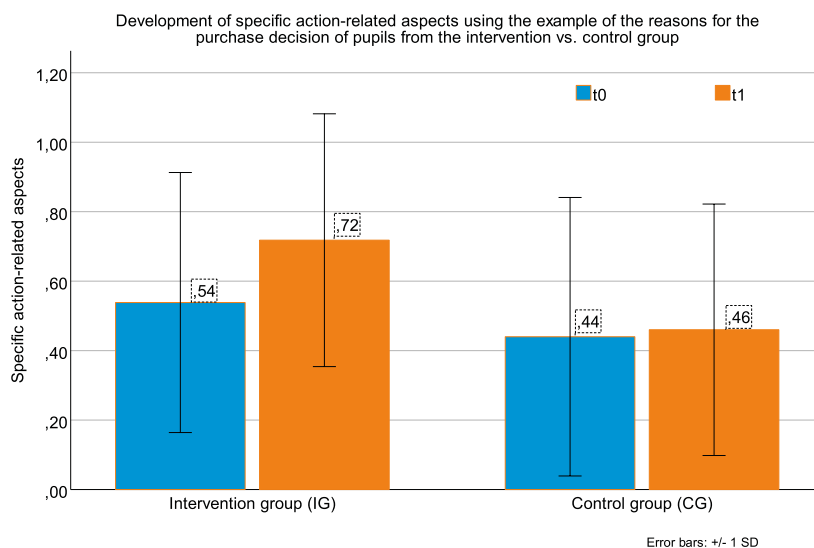
1 K. Ptack, S. Tittlbach: Bestandsaufnahme zum Thema Gesundheit im Sportunterricht, in: R. Sygusch et al. (eds.), 2020 – see recommended reading.
 2 The results on the school development process presented here come from the dissertation by Dr. Julia Mahr completed in 2021.



geography also offer thematic approaches – for example in the area of healthy and sustainable nutrition. The didactic-methodical preparation of nutrition and physical activity topics was therefore carried out in an interdisciplinary way in order to combine their differing educational potential in the best possible way. The resulting lesson unit "Nutrition and physical activity – an inseparable couple" exemplifies how several school subjects, but also different forms of teaching and learning, are intertwined in this topic.

As overarching goal of the teaching sequence, which lasted 18 lessons over two school weeks, the pupils should consider essential aspects of a healthy diet in their everyday lives and engage in physical activity in a sufficiently way. At the same time, they should develop an awareness of their own nutritional and physical activity behaviour, which is shaped by socio-cultural differences, but also personal needs. Pursuing this aim, the nature of the food pyramid is developed in the subjects of nature and technology as well as geography using relevant teaching materials. In addition, the advantages and disadvantages of conventional and organic farming on food quality are in focus in the teaching concept with regard to an ecological, sustainable way of eating. In physical education, the cognitive activation of pupils plays a central role: In a chatathon, active focus groups and recurring reflection phases, they deal in depth with their own eating and exercise habits. For example, the pupils are given the task of discussing a specific topic (e.g. more wholemeal products, less sweets or more exercise) during stretching and strengthening exercises and deriving ideas for action. In preparation for the lesson, they receive a diary template to fill out at home a few days in advance (Fig. 2). Here, the pupils record the food and drinks they have eaten as well as the amount of physical activity they have done on three consecutive days. In this way, they are continuously challenged to document their own dietary and physical activity behaviour in order to reflect on it later. The diary entries are explicitly included in the lessons in order to derive ideas for an individual health-oriented daily routine from the general knowledge acquired in the above-mentioned subjects as well as from their own records.

The qualitative and quantitative evaluation of the school development process shows that the pupils who took part in the interdisciplinary lessons were able to increase their health-related competencies more than a comparison group, especially in the areas of "acting in connection with break sales", "snacks", "drinks" and "ingredients of food" (Fig. 4).



■ Fig. 3: Development of the mean values of specific action-related aspects using the example of the reasons given by pupils in the intervention and control groups for their purchasing decisions. The pupils were given the task of shopping for different - regionally, nationally, or ecologically produced, healthy - foods with the help of a general shopping list for the family lunch and to justify their choice. Data are from the evaluation of the study (Year 5), which was conducted in a two-week before (t0) and after (t1) test design via questionnaires with N = 102 (IG = 52; w20/m32 and KG = 50; w28/m22) pupils (random sample) (Graphic: Julia Mahr).

Specifically, they stated, for example, that they buy less sweets in the break sales, choose healthier snacks in the afternoon or prefer water to sugary drink alternatives. This result indicates the effectiveness of the lessons designed in this way and should contribute to the topics of health, fitness and nutrition being integrated more thoroughly into everyday school life and especially into physical education lessons.

■ Fig. 4: Nutrition and exercise diary (Source: modified from Julia Mahr in (first publication): Sonderheft Sport für die Grundschule, 2/2020, pages 12-16, Cornelsen Verlag GmbH.)

RECOMMENDED LINK

Information from the Federal Centre for Nutrition on the food pyramid:

<https://www.bzfe.de/inhalt/die-aid-ernaehrungspyramide-640.html>

M 1

Diet and exercise protocol

Every day you choose from various food and drink offers. You go to training in a sports club or ride your bike to school as a matter of course. In the next few days we want to take a closer look at our decisions.

Please fill out the protocol in the next three days - as shown in the example - so that you can use it in school. (The minutes are for you only and will not be discussed in front of the class or collected by the teacher.)

Another tip: Always take your notes right after the meal/exercise. So you don't forget anything.

Day/Date	Breakfast/Beverages	Lunch Break/ Snack/Beverages	Lunch/Beverages	Snack/Beverages	Dinner/Beverages	Type of Movement (Sports, Walk, ...)/ Duration
Example	1 bowl of muesli with yogurt	2 rolls with butter and cheese 1 apple	2 plates of pasta with tomato sauce	3 biscuits	1 pretzel roll with butter and sausage 1 cucumber	20 minutes by bike to school and back
	1 cup of tea	0.5 l of water	1 glass of apple spritzer	1 cup of tea	1 cup of water	1 hour football training
1st Day	Food					
	Beverages					
2nd Day	Food					
	Beverages					



■ Tim Ströbel

Digitalisation in sport

Technological creativity opens up new fields of action

■ Digital technologies have also found their way into the German Football Museum (DFM), which has organised the DFM eFootball Cup for the first time in 2020. Modern installations offer a time travel through German football history from 2006 to 2014 under the title "Golden Generation" (Photo: DFM / Angerer).

Digitalisation is recognised as one of the core topics and one of the central challenges of our time. In the context of the 2021 federal election campaign in Germany, digitalisation was defined as an election issue prominent in the election programmes of all parties. Digitalisation is mostly understood as the dissemination and use of digital technologies, for example in the sense of a nationwide expansion of digital infrastructure in Germany. However, digitalisation in marketing and especially in sport marketing involves a much more diverse understanding of the term. In its original meaning, digitalisation described the process of converting analogue information into digital data in the course of the increasing spread of computers suitable for mass marketing and the internet.¹

As a result of continuous development, we now understand digitalisation to mean the use and application of digital technologies that go beyond the traditional use of computers.² The "Quantified Self" movement that originated in the USA and is spreading in Germany is an example of how digitalisation influences our lifestyle habits and also our sporting activity. A multitude of apps offer possibilities for quantifying one's own body, analysing sleep, or improving athletic performance. Smartphones and apps have become our daily companions, almost as a matter of course. Especially in times of the COVID-19 pandemic, the use of digital technologies is taken for granted – be it for the online university lecture via Zoom, team meetings in the home office, the expansion of one's own LinkedIn profile for better networking and easier contact, checking in via the coronavirus app when visiting a restaurant or the online yoga class.

The regular introduction of new digital innovation and their application to the point of almost universal social acceptance go beyond mere digitalisation. They are therefore better summarised by the term

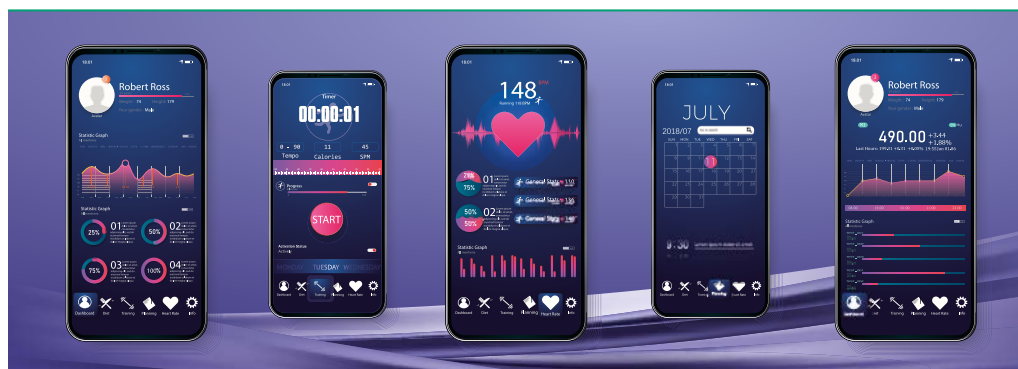


"Digital transformation". Digital transformation is a radical and disruptive change process that aims to achieve fundamental improvements by combining various technologies in the field of information, communication, and connectivity.³

■ Fig. 2 and 3: Wide range of uses for GoPro cameras in sport (photos: ist).

Digital and disruptive: Innovations in sport

Digital transformation also plays a central role in sport and sport marketing. Let's look at the example of GoPro, a brand that became successful worldwide in particular through the possibilities of using a compact and handy video camera during sporting activities. Meanwhile, however, most smartphones offer comparable possibilities. So why hasn't GoPro disappeared from the market yet? GoPro did not stop its transformation process after the digital innovation of a robust video camera for sports, but is – in addition to the continuous further development of the cameras – still focused on an extensive range of digital services for its customers, who have long since become part of the GoPro brand community. The company has transferred much of its corporate



■ Fig. 1: "Quantified Self": Fitness and health apps have also become daily companions for many people in Germany (Photo: ist).

■ Fig. 4: Levi's Stadium in Santa Clara, California is home to the San Francisco 49ers of the National Football League (NFL) (Photo: wikimedia commons / Flickr / Jim Bahn / CC-BY-2. 0).



RECOMMENDED READING

P. Stegmann, S. Nagel, T. Ströbel: The digital transformation of value co-creation: a scoping review towards an agenda for sport marketing research. *European Sport Management Quarterly* (2021), DOI: 10.1080/16184742.2021.1976241.

T. Ströbel, M. Stieler, P. Stegmann: Guest editorial. Digital transformation in sport: the disruptive potential of digitalization for sport management research. *Sport, Business and Management: An International Journal* (2021), 11(1), 1-9. DOI: 10.1108/SBM-03-2021-124.

H. Woratschek et al.: Vernetztes Branding: Ein Konzept zur Markenpolitik aus der Perspektive der Service Dominant Logic, in: F.-R. Esch (ed.): *Handbuch Markenführung*. Wiesbaden 2019, 121-139.

sovereignty to the members of the brand community by offering them the opportunity to share their thoughts and ideas, build new social relationships, or participate in video challenges. Members of the brand community are able to contribute their resources in a variety of ways and thus participate in a shared value creation process. In marketing research, this process is called 'value co-creation'.⁴

the value of the event with other stakeholders. These examples illustrate the many opportunities that digital transformation opens up for sports organisations.

Digital transformation brings new challenges

However, new digital innovations and technologies keep bringing challenges to sport. Shouldn't a football stadium be a smartphone-free zone? Shouldn't children rather play football outdoors instead of on a game console? Does the digital transformation lead to an alienation from sport? The digital transformation is not a new phenomenon, but a process that has already been going on for a very long time, which merely picked up speed enormously at the beginning of the 21st century, but seems to have no expiry date. In fact, there are no simple answers to all these questions, which not only affect sport but also extend to other areas of society. The digital transformation cannot be stopped. If you don't take it seriously, you risk losing touch. Especially with or after the COVID-19 pandemic, sports clubs have to fight for young target groups as never before. Club brands are no longer as popular, while athlete brands are already generating significantly higher follower numbers and engagement rates on social networks. Why watch a football match "in the wide shot" for two to three hours on a Wednesday evening if you are only interested in the goals and the skills of selected favourite players, which are available on social networks right afterward the event.

"Digital transformation is a radical and disruptive change process."

Digital innovations in sport extend beyond digital tools and social networks; digital transformation is also omnipresent in the context of sporting events. Today, sports venues offer far more than just Wi-Fi hotspots for their visitors. The stadium of the San Francisco 49ers in the North American National Football League NFL, for example, is technically equipped in such a way that visitors cannot only call up information on the game and statistics in real time at any time via the stadium's own app. They can also use the app to order food and drink to their seat, network and exchange information with other fans in the stadium, record visitor and traffic flows in and around the stadium, and even actively participate in light shows. The stadium experience created in this way can no longer be compared to the classic stadium visit. Spectators and fans now have numerous new opportunities through digital transformation to actively participate in the event, to interact with each other and with other stakeholders, such as athletes or sponsors, and thus to co-create

In studies on digital transformation in sport marketing, some of these questions have already been taken up and further investigated. Fantasy sport, i.e. simulated competitions with invented teams of real athletes, the use of virtual reality in sport, and other digital innovations are the subject of current research. One of the research areas that is currently being worked on particularly intensively is the area of social media in sport. Concrete questions here relate, for example, to user behaviour, especially fan behaviour. This has been investigated in connection with major sporting events such as the Olympic Games or the UEFA Champions League. But the connection between social media and brand management is also becoming increasingly clear. In this context, researchers are investigating the possibilities for sports organisations and athletes to build



Photo: iStockphoto.com

Fantasy Sport strengthens fan loyalty

A new empirical study by the University of Bayreuth has investigated the effects of participating in a fantasy sports league, which is based on an existing league brand and thus represents a gamification of real competition. The study shows that the participants devote more time, attention, and interest to sports, but do not neglect or limit their own sporting activities. In addition, their loyalty to the sport league brand is growing. Word-of-mouth marketing also increases because participants express their own interest in the league brand in their everyday communication. Therefore, it is advisable for league brands to specifically promote fantasy sport competitions. With this form of gamification, they can maintain their fan base and gain new fans.

M. Buser, H. Woratschek, B. D. Ridpath: Gamification through fantasy sports – Empirical findings from professional sport leagues. *Sport, Business and Management* (2021), 11(5). DOI: 10.1108/SBM-08-2020-0080.

Social Media as platforms of marketing communication

The marketing communication of sports clubs is increasingly shifting to social network platforms. However, there is often a lack of an integrative, strategically oriented approach. A study by the Universities of Bayreuth and Bern has therefore used the example of a Swiss football club to illuminate in detail for the first time how the most diverse actors in the marketing communication of a football club are connected with each other. The results show that for a club's social media use to be successful, it is crucial that messages (for example about sporting

performance) be communicated in a coordinated way. The players should be proactively involved and invited to interact in a target group-specific manner. It is precisely the new forms of interaction made possible by social media that offer great potential for the co-creation of value and thus for the economic success of sports clubs.

P. Stegmann, Y. Scheitlin, T. Ströbel: Interaktionspotenziale im Rahmen der Marketingkommunikation auf sozialen Netzwerkplattformen am Beispiel eines Schweizer Fußballklubs. *Transfer* (2020), 01, 12-19.

and develop their brand. The research topics on the use of social media platforms in sport are even more diverse and also concern negative aspects such as racism or unethical behaviour in the area of doping.

Another large area of research in sports marketing deals with various questions on e-sports. In particular, this involves the question of whether or not e-sports can be defined as a sport. But the question of motives for e-sports consumption and fan behaviour in e-sports are also discussed. Especially in sport management, exciting questions arise regarding the expansion of classic sports offerings to include e-sports. Nevertheless, research on digital transformation in sport marketing is still in its infancy. Above all, questions about value co-creation in the context of digital transformation will reveal far-reaching research topics in sport marketing that need to be addressed in the future. The digital transformation raises diverse and innovative possibilities for networking and interaction between a wide range of players. This opens up a wide field for scientific analyses that get to the bottom of these potentials: starting with individual actors, to the interactions of several actors on engagement platforms, to entire service or sport ecosystems.⁵

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- 1 D. Tilson et al.: Research commentary – digital infrastructures: The missing IS research agenda. *Information Systems Research* (2020), 21(4), 748-759. DOI: 10.1287/isre.1100.0318.
- 2 C. Legner et al.: Digitalization: Opportunity and challenge for the business and information systems engineering community. *Business & Information Systems Engineering* (2017), 59(4), 301-308. DOI: 10.1007/s12599-017-0484-2.
- 3 G. Vial: Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems* (2019), 28(2), 118-144. DOI: 10.1016/j.jsis.2019.01.003.
- 4 H. Woratschek et al. (2019), see recommended reading.
- 5 P. Stegmann et al. (2021) and T. Ströbel et al. (2021), see recommended reading.

■ Markus Kurscheidt
Susanne Tittlbach
Tim Ströbel

E-sport – opportunity or threat for the established sports system?

A new sports movement
at the intersection
of conflicting interests

■ Perfectly staged in front of a large backdrop in the Lanxess Arena in Cologne: the Electronic Sports League (ESL) events attract thousands of fans and are thus in no way inferior to the major events in traditional sport (Photo: Heiko Heidenreich).



Computer games are as old as digital devices themselves. Even in the early days of the triumphant advance of computers in the 1980s, today's cult games such as *Pac-Man*, *Space Invaders*, and *Super Mario* thrilled young people. Competition for high scores and so-called LAN parties as tournaments in computer games also appeared early on. Until the 2000s, however, electronic gaming in a competition format similar to sports had the negative image of "nerds" who tended to be on the fringes of youth culture.

This has changed dramatically, not least due to new game formats, online networking, and worldwide communication in the scene, as well as the self-staging of gamers in social media and on video platforms. Today, we speak of e-sports and mean a mass movement of gamers who compete with each other in their gaming skills in a multitude of electronic games via the internet, in organised leagues, or at events in front of large live audiences. This has given rise to the self-image of a new sports movement in an electronic and virtual environment, from recreational and popular sports to professional top-level sports.

From niche to mass movement – the controversy remains

The appropriation of the concept of sport in the gaming scene has far-reaching consequences. What was perhaps once intended as self-legitimation for the countless hours spent in front of the computer screen and was initially still connected with a wink of the eye, is increasingly challenging the established sports system of clubs and associations. This is because the German Olympic Sports Federation (DOSB) sees itself as the umbrella organisation responsible for sport in this country. Even the recognition of chess as a sport is seen by many to this day as a kind of fall from grace. Traditionally, sport is associated with visible physical exertion, motor skills, a clear set of rules, and values such as fairness. These characteristics are denied to e-sports in whole or in part.

The ongoing controversy is sometimes fuelled by gaming representatives, especially from the professional sector. Spurred on by impressive growth figures in the markets surrounding e-sports, it is predicted that digital sports will overtake conventional sports in terms of economic importance in the foreseeable future. It is also said that the Olympic

Games without e-sports will no longer be conceivable in the future if the International Olympic Committee (IOC) wishes to avoid a rival event on a par with e-sports. Ultimately, the conflict between the established sports system and e-sports is also about interpretive sovereignty, power, and money. At the same time, the e-sports movement is striving for social and institutional recognition. Although the nerd image has been shed, the public criticism of lack of exercise in front of the computer, the psychological dangers of endless online gaming, and the violent content of popular games like *Counter-Strike* or *Call of Duty* remains.

Strong economic growth and sponsor interest

However, the broad social impact of e-sports, especially in youth culture, and its various economic dimensions are undeniable. For this reason, research in sport marketing, for example, is increasingly looking at issues such as the motives for e-sports consumption, the potential for sponsors, the acquisition of new fans, or the expansion of existing professional football club brands to include an e-sports commitment.

According to available industry reports, e-sports is a strong growth market. While the global e-sports audience was just under 400 million people in 2019, it is estimated to reach 474 million by 2021 and 577 million by 2024. The majority of e-sports consumers follow professional league competitions. The most popular game categories include first person shooters (e.g. *Counter-Strike*), real-time strategy games (e.g. *Starcraft II*), multi-player online battle arena games (e.g. *League of Legends*), and also sports simulations (e.g. the *FIFA game* for football).

From an economic perspective, e-sports offer many opportunities, especially for sponsorship. Sponsors promise themselves not only access to a global audience, but to a predominantly young audience with above-average income and a high affinity for digitalisation. Sponsorship revenues alone will amount to 641 million US dollars for 2021. Overall, the e-sports market is expected to have an economic potential of well over one billion US dollars in 2021. Sponsorship revenues thus account for around 60 per cent of the entire e-sports market. For the German electronic gaming market, there have been differing figures and estimates so far, but almost all studies have in common that the turnover will be well over

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RECOMMENDED LINKS

Newzoo (2021). Global Esports & Live Streaming Market Report: <https://newzoo.com>

Deloitte (2019). Let's Play! The European esports market: <https://www2.deloitte.com>

PwC (2020). Digital Trend Outlook 2020: Esports: <https://www.pwc.de/en/>

€ 100 million in a few years, more likely even in the direction of € 150 million or more. A comparison with established sports shows the importance of e-sports: the turnover before the COVID-19 pandemic in 2018/19 was € 105 million in handball, € 128 million in basketball, and € 130 million in ice hockey. In fact, e-sports have thus already overtaken established sports in economic terms.

IOC. But the price of inclusion can be high for the development of these sports. For example, snowboarding, a pioneer among action sports, still suffers from fragmented organisation in competing federations, competitions, and competition systems.

Similar institutional struggles for legitimacy and power can be observed in e-sports, and have aroused the interest of sport science research. The starting point in the sports policy and academic debate is, on the one hand, the conceptual demarcation. On the other hand, it is the unusual structure of property rights. Normally, the professional associations determine the rules and regulations of the sports, and issue licences for athletes and competitions. They represent unchallenged monopolies in the respective sports markets. In e-sports, however, the game developers, the so-called publishers, have full copyright control over the rules within their gaming products.

Nevertheless, associations for e-sports have recently been formed to protect the interests of stakeholders. eSport-Bund Deutschland (ESBD) claims to represent all e-sports players, clubs, teams, and event organisers. As a national federation for all e-sports from recreational gaming to professional sports, ESBD basically acts like an established sports association and also strives for membership in DOSB. However, the German umbrella organisation of sport is having an extremely difficult time with the efforts of e-sports to become part of the sports family.

"E-sports – a strong growth market."

Dispute over legitimacy and power between sports federations

In view of this demand and the financial figures involved, questions of sports policy regulation by associations inevitably arise. The challenge posed to established sports organisations by fast-growing trend sports is not new. The so-called action sports such as snowboarding, BMX, mountain biking, bouldering, and speed climbing have posed a recurring threat to sports federations since the 1990s. However, the IOC, in particular, has always succeeded in integrating these initially subcultural sports movements. Only recently, at the Tokyo Summer Games, five new sports were added to the Olympic programme. Even skateboarding said goodbye to its alternative culture after decades and joined the

Committed to E-Sport in Upper Franconia

More Information: <https://esportubt.de/>

■ Leon Janßen

Founded in 2020, E-Sport UBT e.V. emerged from a university group at the University of Bayreuth. The association is aimed at all e-sports enthusiasts in the Upper Franconia region, especially young people over the age of 16, and is divided into two areas: the organisation of the association and the e-sports teams. The organisati-

on coordinates the teams, organises events, hosts live-streams, and creates designs. For this purpose, it is divided into different departments, each with a permanent head who is also a member of the board. The e-sports teams, in turn, usually consist of five players and a coach. They meet regularly for training sessions, tournaments, or league games. The club does not require new members to have previous knowledge, but invites anyone interested to learn about e-sports. In the training sessions, past games are usually analysed, new tactics rehearsed, or training games held. Currently, E-Sport UBT e.V. offers the games *League of Legends*, *Valorant*, *Rocket League* and *Counter-Strike: Global Offensive*. Unfortunately, *Super Smash Bros.* and *Pokemon VGC* cannot be offered due to the

COVID-19 pandemic, but are to be reintroduced to the programme as soon as possible.

Since its foundation, E-Sport UBT e.V. has been working towards being recognised as a non-profit association due to the importance of its activities for the areas of youth welfare and education. But even if this should not succeed, the association will continue dedicate itself to promoting young people through e-sports. For the future, the E-Sport UBT e.V. is seeking to acquire a fully equipped clubhouse, which would give players access to the world of e-sports and serve as a social meeting place for members. Training courses and tournaments, including national competitions, could also be offered there.

AUTOR

Leon Janßen is the first chairman of E-Sport UBT e.V. and a student of media studies at the University of Bayreuth.



DOSB marginalises e-sports in large parts

In fact, a commission was set up, with the help of scientific advice, which presented a position paper in 2018 to guide action. It was to be examined to what extent e-sports can be recognised as a sport or form of sporting activity according to the criteria of DOSB. According to § 2 of the statutes of ESBD, this is undisputed: "eSport [...] is the competitive playing of video or computer games, especially on computers and consoles, according to defined rules". However, the e-sports federation conceals the fact that it has no power over the setting of rules in electronic games, because this lies with the publishers.

For DOSB, however, other criteria are paramount. To be classified as a sport, the practice of the sport must be aimed at a motor activity in its own right, and compliance with ethical values such as fair play and equal opportunities must be guaranteed. DOSB does not consider either of these to be fulfilled in the case of e-sports. In its position paper, however, it suggests the more detailed development of recommendations for the future handling of e-sports. In this context, DOSB recognises that e-sports have become an integral part of youth culture.

However, the term "sport" in the narrower sense is widely considered to be misleading. DOSB therefore explicitly distinguishes between electronic sports simulations and e-gaming. The term "e-sport" is deliberately avoided. The umbrella organisation understands sport simulations as the transfer of real sports into the virtual world. In the view of DOSB, these can be connected to the clubs and associations of organised sport. In this context, the umbrella organisation recommends a systematic elaboration of strategies for the development of sports in virtual space.

For DOSB, e-gaming is the competitive playing of video or computer games of all kinds according to fixed rules that do not correspond to virtual sports. From the association's point of view, they do not fit in with what characterises public welfare-oriented organised sport. Points of criticism are the lack of self-motivated activity, the questionable ethical principles of some e-games (such as *Counter-Strike* and *League of Legends*), and the commercial business model of e-sports. This is because profit-oriented companies decide on rules, content, and forms of play.



■ Fig. 1: The top professional athletes from the e-sports teams are revered and their performances at the events are cheered just like in traditional sports. Gradually, women's teams are also being set up in the professional arena. For the time being, however, e-sports remains male-dominated (Photo: Heiko Heidenreich).

However, DOSB recognises the task of supporting sports clubs with qualifications and concepts in dealing with the modern youth and everyday culture of e-gaming. Here, pedagogical approaches should be taken up in dealing constructively with young people in sports clubs. However, the inclusion of e-sports as a sport and thus of ESBD as a professional association is ruled out. Currently, DOSB is also clearly positioning itself against the Olympic aspirations of e-sports. Only the future will show whether e-sports will be recognised as a sport or remain a social movement with at least sport-like characteristics.

RECOMMENDED READING

H. Heidenreich et al.: Esports associations and the pursuit of legitimacy: Evidence on the case of Germany. *Frontiers in Sports and Active Living* 2021 (under review).

A.-M. Strittmatter et al.: Dual governance structures in action sports: Institutionalization processes of professional snowboarding revisited. *Sport in Society* (2019), 22(10), 1655-1673.



■ Rebecca Zimmer
Sandra Haupt
Heiko Heidenreich
Walter Schmidt

Energy consumption in e-sports

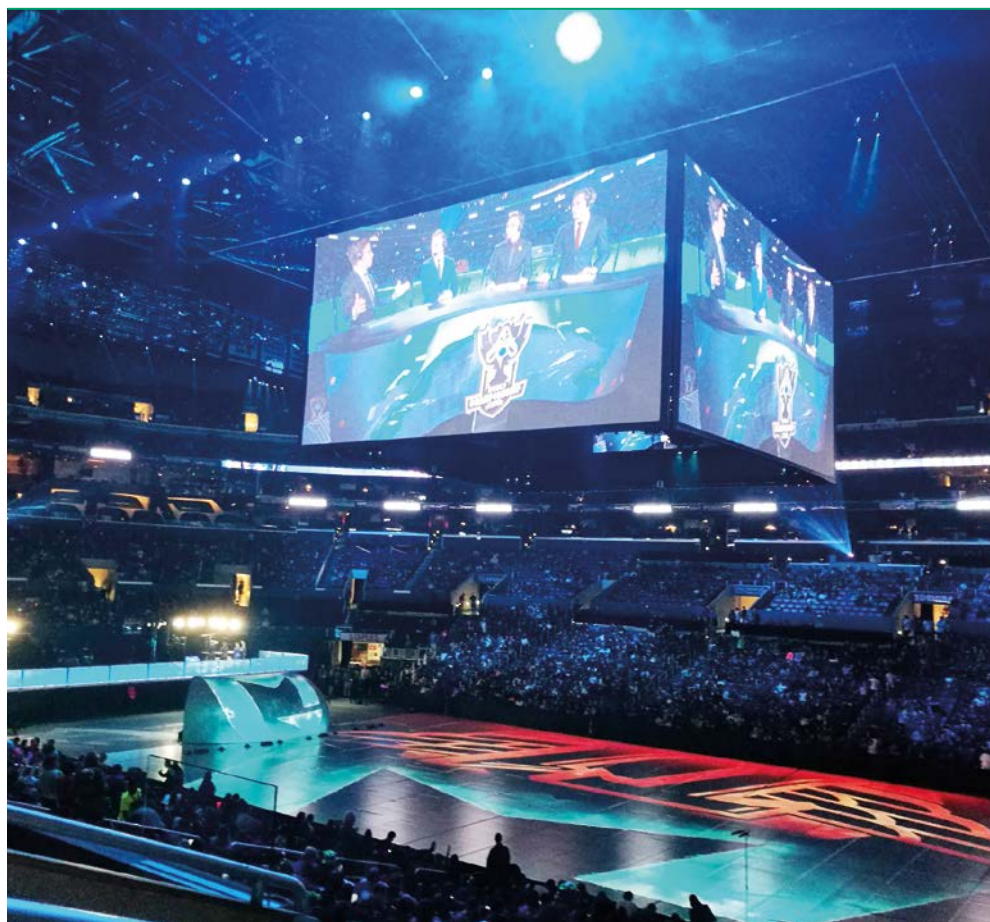
New physiological findings on e-sports

■ Millions of fans worldwide spend their free time playing e-sports, but during this time energy metabolism in the body is not increased - as a recent study from Bayreuth shows (Photo: ist).

E-sports have become extremely popular in recent years. Worldwide, around 550 million fans watch e-sports events every year, and around 27 million recreational players spend several hours a day playing League of Legends – to illustrate the potential importance of just one game. Similar to the established ball sports disciplines, there are organised e-sports leagues at both the national and international level, which at their peak are often run very professionally to an audience of millions. Millions of euros or dollars can be earned in prize money. E-sports have also gained a foothold in the university sector, as the example of the team from the University of Bayreuth shows. Some universities offer the subject of e-sports as a separate bachelor's and master's degree programme.

"E-sports" refers to the competition-driven playing of video games on a console or computer, well-known examples being the sports simulation "FIFA" or the tactical first-person shooter game "Counter-Strike". The respective publishers determine the content of the games and accordingly also control possible further developments or modifications. From a political point of view, e-sports represent a contentious issue, as the last government coalition agreed in its coalition agreement concluded in 2018 to recognise e-sports as a discipline equivalent to established sports and to promote it accordingly. However, since the German Olympic Sports Confederation (DOSB) has so far refused to include e-sports in its own organisation, and to recognise it as a sport, the development of sports policy is deadlocked at this point. Regardless of this, interest in e-sports is steadily increasing and its growing importance is increasingly penetrating into public consciousness.

At present, however, it is not only the organisational structure and promotion of e-sports that are the subject of controversy. It is equally controversial whether the term "sport" should be used at all in this context. In addition to competitive sport, sport is nowadays associated in particular with the health-promoting aspect. It is well-known that regular physical training, especially endurance training, can enormously reduce the risk of cardiovascular diseases. It is now also clear that muscular activity releases muscular messenger substances (myokines) that counteract the development of type II diabetes, dementia, and certain types of cancer. Whether these preventive effects are also caused by e-sports is questionable: players often spend several hours a day in a sitting position, meaning hardly any large



muscle groups are being used. However, some authors of popular science media articles are of the opinion that physical exertion is, in fact, present in e-sports, because professional e-sports players – similar to football players, for example – reach very high heart rates during competition.

■ Fig. 1: League of Legends World Championship is one of the most popular international competitions in e-sports and is held at a different location every year (Foto: wikimedia commons / Patar knight / CC-BY-SA-4.0).

"It is important to always complement and compensate e-sports with muscular exertion, i.e. conventional sports."

Investigations in the test laboratory with amateur e-athletes

Although the topic of e-sports is a matter of controversy at the highest economic, political, and sports policy levels, there has not been a single well-founded scientific study on the health effects of e-sports to date. For scientists who deal with metabolic processes that are directly related to the health-pro

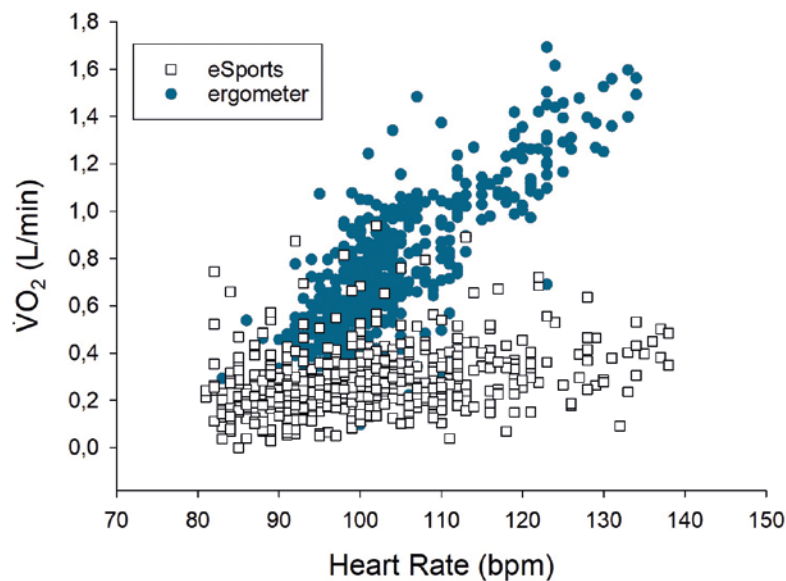
RECOMMENDED READING

S. Haupt, A. Wolf, H. Heidenreich, W. Schmidt: Energy Expenditure during eSports: a Case Report. *German Journal of Sports Medicine* (2021), 72, Issue 1. DOI: 10.5960/dzsm.2020.463.



■ Fig. 2: Performance of the energy metabolism measurement during an e-sports unit. The test person is connected to a gas analyser via a mask, which is used to determine oxygen intake and carbon dioxide output. Energy consumption can then be precisely determined from both variables (Photo: Sandra Haupt).

■ Fig. 3: Correlation between heart rate and oxygen consumption (VO_2) during 30-minute units of e-sport and bicycle ergometer training. Blue=ergometer; black=eSports (graphic from Sandra Haupt et al., *German Journal of Sports Medicine* (2021), see recommended reading).



moting effects of sport, this is extremely surprising. Consequently, a sports medicine working group at the University of Bayreuth, led by Prof. Walter Schmidt, considered it their task to collect initial data on metabolism during the practice of e-sports. The aim of this study was to stimulate further scientific research and thus create a better-founded basis for political and economic decisions in the field of e-sports.

As a first step, e-sports amateurs were studied. The idea was to register their heart rate behaviour – which is considered a parameter of stress reaction in sports medicine – during an e-sports unit, and to determine their energy metabolism at the same time. This was done by first measuring the respiratory gases oxygen and carbon dioxide via a breathing mask, and calculating their energy consumption very precisely on the basis of this measurement data (Fig. 2). In a subsequent test, the e-sportsman was specifically hooked up to a bicycle ergometer so that his heart rate was almost as high as during the e-sports unit. These tests led to a clear result. During the practice of e-sports, a typical stress reaction takes place in which the heart rate increases and other stress parameters change. However, energy metabolism did not increase – in contrast to the stress of cycling (Fig. 3). So, while the physical stress represented a sensible stress load that enables increased muscular energy consumption, both systems were decoupled in the e-sport unit. However, due to coronavirus-related limitations, only a few trials could be conducted in this form, resulting in only one case report published in the *German Journal of Sports Medicine*.

When laboratory work was still only possible with strict safety precautions, further test series being carried out with amateur e-sports-people who spend an average of 12.5 hours per week with the respective game tested. This time, 30-minute sessions of the FIFA football simulation and the widely used tactical shooter *Counter-Strike: Global Offensive* were examined and compared. These tests showed only slightly increased stress parameters at the beginning of the games and no increase in energy metabolism. A difference between the two games could not be determined. After the end of the game, all stress parameters were even lower than before the start of the game.

Although only 30-minute e-sport sessions have been studied so far, the following trends are already emerging:

- In the field of professional high performance, stress reactions occur that are decoupled from the metabolic reaction and thus cannot be equated with physical stress.

- In the amateur and recreational sector, almost no stress load occurs. However, no change in the energy metabolism can be observed here either. E-sports activity lasting several hours therefore has no health-promoting properties whatsoever, but on the contrary is to be equated with physical inactivity, which is associated with health risks.

- After a comparatively short e-sports session of 30 minutes, all the stress parameters studied were reduced in amateur players. Therefore, such a form of e-sport can definitely be considered relaxing and stress-reducing.

One side finding of these comparative studies was very interesting. The players of the football simulation "FIFA" practised slightly less e-sports per week and, with a body percentage fat of 15.8 percent, had significantly lower body fat than the players of the tactical shooter game, who had a body percentage fat of 22.5 percent. This could possibly be due to a more pronounced sports affinity and higher daily activity of the "FIFA" players.

Outlook

In view of the millions of mostly young players who practise e-sports for several hours a day while being completely physically inactive, the possible health consequences must be examined and taken into account in the public discussion. Up to now, those responsible in government and business, but also in the world of sport, have argued fiercely about the role of e-sports, without the biological and medical data necessary to clarify the controversial issues. Current sports medicine studies at the University of Bayreuth aim to draw attention to this gap. Further specific studies investigating the health effects of prolonged e-sport sessions on amateurs and professional e-sport players are planned.

However, e-sports cannot be regarded as a uniform discipline. Depending on the game concept, the performance level of the players and the respective game situation – be it the console at home or a stadium for over 50,000 spectators – the stress level will be markedly different, while the muscles are almost inactive. It is therefore important to always supplement and compensate for e-sports with muscular stress, i.e. conventional sport. Especially in professional e-sports, physical training and fitness exercises are already combined with daily units of several hours on the PC or console.



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■ Fig. 4: Event of the Electronic Sports League (ESL) in Cologne (Photo: H. Heidenreich).



■ Markus Kurscheidt
Susanne Tittlbach
Uwe Scholz

Elite sport and grassroots sport

University of Bayreuth partnerships and cooperations

■ Since 2015, the annual Ball of Sport has been a glittering highlight in the event calendar of the city of Bayreuth. Initially it was hosted in the Town Hall, since 2017 in the Oberfrankenhalle. The photo shows a performance by the Bayreuth Dragons, the local American football club (Photo: Hans Pastyrik).

Traditionally, sport science institutions in Germany maintain close contact with sports practice and are involved in regional sports development. In the course of the professionalisation of competitive sport and growing public attention on public health issues, this cooperation is also becoming ever more important for the University of Bayreuth. In sports practice, it is increasingly recognised that scientific support can lead to improvements in talent development, training management, and match monitoring, but that it can also strengthen initiatives promoting recreational and health sport activity. In addition, there is cooperation in organisational consulting and development. When it comes to structural changes and aspects of marketing, for example, sport science cooperation is even extending to the board level of organisations and companies.

From science to practice: Know-how transfer for mutual benefit

In the degree programmes at the University of Bayreuth, students are systematically involved in this theory-practice transfer. This happens in individual theses in cooperation with realworld partners, in entire series of interrelated studies and, last but not least, in project seminars that offer students opportunities for independent group work with cooperation partners. In this way, they get to know the challenges of sports practice and acquire competencies that make their job placement much easier. It is not uncommon for graduates to find their first employment directly with project partners, or for the practical experience they gained during their studies to be highly relevant on the job market elsewhere.

The sports organisations, in turn, receive conceptual input and support in the targeted application of findings and procedures based on sport science. Empirical studies often include surveys of sports fans, active players, or club board members. Sometimes the cooperation extends to product, brand or programme development. A recent example of such comprehensive scientific consultation is the cooperation with the Bavarian Gymnastics Association. Student projects and theses were used to conduct surveys and interviews among the membership, to organise the 160th anniversary of the association as a stream, and to provide strategic advice to large clubs. This cooperation model will serve as a template for a cooperation with 1. FC Nuremberg, which is currently being developed.

A current example of selective scientific support is a largescale survey for the organising committee of the Munich 2022 European Championships. This innovative competition format unites the European Championships of nine sports with 4,700 athletes in a total of 176 competitions at one location, following the model of multisport events such as the Olympic Games. The event is regarded as a highlight and prestigious project in Bavarian sports policy, which underlines the appreciation for the support provided by Bayreuth's research groups in sports management and sport science. Indeed, renowned sports organisations looking for empirical services are increasingly turning to the University of Bayreuth.

"Sports organisations receive support in the targeted application of sport science-based knowledge and procedures."

Scientific advice for local sport

At the same time, local sport is also a focus of Bayreuth's sport science. For example, *Stadtsportverband Bayreuth e.V.*, the umbrella organisation of over 70 local sports clubs, has already been advised on various topics. Most recently, cooperation related to the development of new and contemporary concepts of integration and inclusion. In the context of these social challenges, sports clubs and associations are becoming increasingly aware of their relevance in society. For several years now, the City's sports association has been offering the "Mentor of Sport" award. This award recognises Bayreuth sports clubs that are socially engaged beyond the scope of sports and games, in order to enable all community groups to participate in exercise and sport.

Scientific support – often in the context of bachelor's or master's theses – is also carried out in cooperation with the City of Bayreuth or the municipal Sports Department. An illustrative example is research on the effects of the so-called Sportgutschein, which was intended to support children's participation in sport. Four-year-olds were able to redeem the voucher for club memberships. Based on the findings of the study, recommendations for local sports policy could be derived in dialogue with all stakeholders. In another project, citizens of the City of Bayreuth were surveyed about their sporting behaviour and

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Dr. Uwe Scholz is Head of University Sport and Facility Management at the Institute of Sport Science at the University of Bayreuth.

■ Fig. 1: The University of Bayreuth is a Partner University of Elite Sport. In June 2018, the "Cooperation Agreement for the Promotion of Studying Top Athletes" was signed. The photo shows (from left to right) Dr. Uwe Scholz, University of Bayreuth; Andreas Seiferth, Sport, Business & Law student and professional basketball player at *medi Bayreuth*; Kay Blümel, national coach for young players at the German Basketball Association; University President Prof. Dr. Stefan Leible; Prof. Dr. Susanne Tittlbach, University of Bayreuth; Josef Tost, Managing Director of Studentenwerk Oberfranken (Photo: UBT).



their wishes and needs with regard to Bayreuth's sporting environment. Such empirical findings are an important basis for decisionmaking in local sports development.

Partner university of elite sport

Another area of practical cooperation directly involves the students as athletes. In 2018, a cooperation agreement was concluded with the German University Sports Association and other partners. By this agreement, the University of Bayreuth is awarded the official label of a Partner University of Elite Sport. The aim is to support students of all study programmes in reconciling their career in sport with the requirements of their studies. *Studentenwerk Oberfranken* (Upper Franconian Association for Student Affairs) is also involved with its services for students. Furthermore, preferential regulations for elite sport athletes are included in the admission and examination regulations.

On the sports side, the German Basketball Association is the main partner. Bayreuth can look back on an eventful history in basketball and has re-established itself as a Bundesliga city with the team of *medi Bayreuth*. Current *medi* players like Andreas Seiferth and prospective players like Christoph Würmseher study at the University of Bayreuth. But the handball club *HaSpo Bayreuth* also benefits from the performance and high motivation of its student players. Last but not least, this sporting commitment of the students raises the profile of the University in the heart of City society.

Bayreuth Ball of Sport

The annual Bayreuth Ball of Sport has been attracting special attention in the City since 2015. Until



■ Fig. 2: The shows put on by Bayreuth sports clubs are always breathtaking. Here, the trampoline athletes of the Bayreuther Turnerschaft show their skills at the Ball of Sport 2017 (Photo: Hans Pastyrik).

■ Fig. 4 (right): Students of Sport, Business & Law transform the Oberfrankenhalle venue into a festive ball-room for the Bayreuth Ball of Sport and thus contribute to the funding of sports promotion by the Bayreuth Sports Council (Photo: Hans Pastyrik).

The former master's student of sports economics Kristin Behr can look back on a runnerup world championship in sabre singles and four German team championships:

"I am very grateful to the people in charge at the Institute of Sport Science. Only with this support was I able to pursue my sporting goals and my master's degree."



■ Fig. 3: Internationally and nationally successful in fencing: Kristin Behr, alumna of the University of Bayreuth (Photo: Marie-Lan Nguyen / Wikimedia Commons / CC-BY 3.0).

the interruption in 2020 due to the pandemic, the charity event for local sports promotion quickly developed into a recognised social event for over one



thousand guests in the *Oberfrankenhalle*. The ball is organised by students of Sport, Business & Law in a project seminar. In this way, the students contribute directly to the financing of sports promotion in the City. In the meantime, the Sports Ball has even become the main source of income for the Bayreuth Sports Council. Profits are used to support sports clubs and, above all, young athletes who are often barely able to cover the costs of participating in national and international competitions. But also initiatives in grassroots sports are regularly supported with these funds. A highlight of the ball is the "Sportswoman / Sportsman of the Year" award. With this festive event, students create a dignified setting for this and other award ceremonies. The event makes a significant contribution to ensuring that the achievements in Bayreuth sport receive a high level of recognition in the community.

Cooperation with schools and companies

In addition to toplevel and grassroots sport, Bayreuth's Sport Science also cooperates with other institutions in research and teaching. For example, a look at school practice is an essential part of the degree programme, not least for students of physical education teaching, which interlinks theory and practice. Therefore, within the framework of cooperation with selected schools in the City and District, students have the opportunity to try out subjectdidactic concepts in physical education, to carry out individual lesson plans and to receive feedback both from physical education teachers in the school and from teachers at the University. Concrete research projects on the topic of "health in physical education" have also been carried out with the *Markgräfin-Wilhelmine-Gymnasium* and the *Graf-Münster-Gymnasium* in Bayreuth over the last six years. The findings thus obtained promote development processes at these secondary schools and at the same time give new impetus to sport science.

Recently, Bayreuth Sport Science has established numerous contacts in the regional economy. Project partners include companies such as TenneT and Rehau, as well as commercial sports providers such as SpVgg Greuther Fürth and BwFit. In project seminars, students learn about the challenges companies face when introducing corporate health management. In order to develop customised solutions, they conduct needs assessments and use the skills they have acquired during their studies to par-



■ Fig. 5: Highlights at the Ball des Sports are the awards for athletes and teams. Here, the women's lacrosse team "USC Bears" of the University Sports Club received an award in the category "Team of the Year" at the Ball of Sport 2018 (Photo: Hans Pastyrik).

ticipate in the development of scientifically sound concepts and recommendations for action.

University health management

In addition, Bayreuth students of sport science are also involved in health management at their own university, which is supported by health insurance companies. For example, they design active breaks to create incentives for more exercise in everyday campus life. They also develop marketing strategies for university exercise and health promotion, and analyse their effects. In the true sense of the word, this adds momentum to teaching and life on campus.

Andreas Seiferth is a national basketball player and professional with medi Bayreuth. After his successful bachelor's degree in Sport, Business & Law at the University of Bayreuth, he is now studying for a master's degree in here:

"My studies alongside my professional career require a lot of coordination and organisation. Thanks to the regulations for top athletes, it was possible for me to take and complete seminars with compulsory attendance, even though I couldn't always keep all my appointments. My training and playing schedules have always been taken into account and constructive solutions found. This allows me to make good progress in my studies while fulfilling the demands of top-class sport."



■ Fig. 6: National basketball player Andreas Seiferth (right) (Photo: medi Bayreuth).



■ B. David Ridpath
Tim Ströbel

Sport management in international university marketing

A pioneering transatlantic study programme

■ Entrance to the campus of Ohio University,
founded in 1804, in Athens/Ohio (Photo: ist).

The sports industry is increasingly becoming a global business. Technological advances and the internet have made it much easier for fans around the world to connect with teams and brands. As a result, the popularity of sport brands that were once inaccessible to the average sport fan is steadily increasing. Many sporting events, such as the Olympics or the World Cup, have always been international events, but have evolved from lower-level amateur events to professional mega-events that are now among the biggest sporting events in the world. The progressive internationalisation of the sports industry is not limited to global mega-events, but there is no doubt that these long-established events contribute to the international growth of the sports industry.

The North American National Football League (NFL) exports American football abroad every year - and has done so for more than two decades. The league consistently plays regular season games in the United Kingdom and Mexico. It is currently planning more such games, including in Germany, and runs training camps around the world to promote the sport of football and the NFL brand. The NFL has a clear strategy of expanding into international markets. There are also many other examples of global expansion from the sports industry, including the North American National Hockey League (NHL) and the National Basketball Association (NBA). They hold regular season games in Europe and Asia to reach a growing fan base. European sports leagues and clubs follow the same strategic approach. The English Premier League is famous for its early under-

standing of investing in non-European markets. It often plays matches in the USA, which results in a growing international fan base. Other leagues and sports clubs are following their example and prioritising their international activities to keep up with the rapid growth in the international sports market.

Educational programmes and global expansion of sport

As the sports industry grows worldwide, study and research in sport management must adapt to the changing international sports market. Several international academic associations have existed for decades. After the North American Society for Sport Management (NASSM), the European Association for Sport Management (EASM) and the Sport Management Association of Australia and New Zealand (SMAANZ), sport management associations were founded in Asia, South America and Africa, just as the sports industry has expanded internationally over the last two decades. To keep up with this development and to increase international standing, sport management programmes need to make their curriculum, research, and other collaborations more international.



Study programmes abroad and the exchange of students and staff are typical forms of international cooperation between universities. But when two or more programmes are integrated into a new degree programme with mutually recognised degrees, this is an innovative unique selling point within their

RECOMMENDED LINKS

More information about the programmes at Ohio University and the University of Bayreuth:

<https://business.ohio.edu/sport-management>

<https://www.spoeko.uni-bayreuth.de/de/studierende>

	 UNIVERSITÄT BAYREUTH	 OHIO UNIVERSITY
Year 1	Students at Home Institution	
	General Studies & Fundamentals in Business Administration	
Year 2	UBT students at OU ►	Sport Management Specializations & Business Cluster Courses
Year 3	Advanced Topics in Sport Management & Business Administration	◀ OU students at UBT
	UBT: Bachelor of Sport, Business & Law	
Year 4	UBT students at OU ►	Sport Management Specializations & Capstone Courses
	OU: Bachelor of Sport Management	

■ Fig. 1: The double degree programme of Ohio University and the University of Bayreuth (Graphic: Tim Ströbel / Christian Göppner).

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Prof. Dr. Tim Ströbel is Professor of Marketing and Sport Management at the University of Bayreuth.



internationalisation strategies. *Double degree programmes* enable students to obtain a bachelor's or master's degree at both universities involved in the programme.

The double degree programme of Ohio University and the University of Bayreuth

The proven sports management double degree programme between Ohio University and the University of Bayreuth is an outstanding and pioneering example of the internationalisation of sport management education. A programme like this meets the requirements of international sport and prepares future professionals for a growing international sports industry. The double degree programme significantly strengthens the career prospects of graduates from both universities in the sport sector. The curriculum allows students to earn a bachelor's degree from both universities in just four years. Each of the two universities ensures that students gain international and interdisciplinary experience

professional sports organisations. They study alternately at their home university and at the partner university. This form of exchange enables successful cooperation on both a professional and personal level. At the end of the programme, students receive a Bachelor of Sport Management (BSM) from Ohio University and a Bachelor of Science in Sport, Business & Law (B.Sc.) from the University of Bayreuth.

The option of a double degree at two of the world's leading universities in sport management offers excellent opportunities for future leaders in the sports industry. Interested students must be enrolled in one of the participating degree programmes and apply directly to their home university for the double degree programme. This is aimed at students with a passionate interest in sport management who wish to work internationally and in an interdisciplinary way. The selection criteria include school grades, sporting achievements, language skills, and activities outside of studies at the home university, for example study visits and internships abroad. In addition, application involves a covering letter and a personal interview. The target group of the double degree programme includes the best students from Ohio University and the University of Bayreuth who are enthusiastic about the international sports industry and are ready to face the challenges of intensive sport management studies on two continents.

"An outstanding and pioneering example of the internationalisation of sport management education."

by taking courses in business administration, sport management, and law. The curriculum is specifically designed to address practical applications and current challenges in international sport management. Students are actively supported by lecturers from both universities in their search for internships in

The two degree programmes

With the introduction of the **Diploma Programme in Sport, Business & Law** in 1985, the University of Bayreuth pioneered and continues to pioneer study in the area in Germany and Europe. What sets the

■ Fig. 2: View of Athens/Ohio, in the middle the park of Ohio University (Photo: ist).



RECOMMENDED READING

T. Ströbel, et al.: Co-Branding Through an International Double Degree Program: A Single Case Study in Sport Management Education. *Sport Management Education Journal* (2020), 14(2), 119-128. DOI: 10.1123/smej.2019-0047.

degree programme apart is its interdisciplinary and international approach, the unique combination of tradition and innovation, and a strong concept of cooperation and networking that particularly involves the commitment of alumni. The University of Bayreuth has the strongest and largest alumni network for sport management in all of Europe. It offers close contacts to important players from the most diverse areas of the economy. This ensures that graduates of the Sport, Business & Law programme are ideally positioned for the international job market.

Ohio University and its Department of Sports Administration (DSA) have been leaders in sport management education since 1966. At that time, the **Bachelor of Sport Management (BSM) programme** was accredited as the first academic programme of its kind. Ohio University's College of Business (COB) is consistently ranked among the best US business schools among public educational institutions in the Midwest. The College's sport management programme provides students with the academic foundation and practical training they need to succeed



■ Fig. 3: The Vernon R. Alden Library at Ohio University in Athens (Photo: ist).

in the sports industry. Practice-oriented courses, internships, work opportunities, and international experiences enable graduates to apply their business skills in a variety of professional positions in the sports industry. The programme is accredited by the Commission on Sport Management Accreditation (COSMA), which works to promote and recognise excellence in sport management education at colleges and universities – from bachelor's and master's degrees to doctorates.

From Bayreuth to Ohio

Just a few days after arriving in Athens in the summer of 2021, it was clear to us that the Ohio University (OU) campus offers everything you would expect from a US-university. Of particular interest to us here are the countless opportunities to get involved in sports. In the double degree programme, the personal contact with the teaching staff and the promotion of development on a professional level, for example through personal career coaches, are particularly special. In addition, there are many practice-oriented courses that focus on networking and future professional development. As is common in U.S. universities, we have compulsory attendance, homework and various tests in all our subjects. This results in a very regular weekly schedule. The biggest difference to the university in Germany are the small classes of 20 to 30 students and the teachers' efforts to make the lessons practical and varied. Special emphasis is also placed on teamwork, as many projects have to be worked on together with fellow students.

The eventful start to our studies at Ohio University was topped off by winning the Darren Butler

Case Competition. This competition takes place every year as part of the Darren Butler Business Forum, a career fair that only brings employers from the sports industry to OU. The competition and career fair are named after Ohio University alumnus Darren Butler, whose financial support makes these events possible. This year's competition required us to plan an Esports event for Esports Engine, formulate an appropriate marketing strategy and come up with innovative fan engagement practices. In our entry, we presented a League of Legends tournament in the world's first carbon-neutral arena in Seattle. Here, the jury was particularly impressed by our marketing concept. It included cooperation with local Esports bars and the University of Washington, but also the first Esports Tailgate as a side event. Tailgating refers to the widespread practice in the USA of meeting on a large lawn for a joint BBQ before football games. This competition was a very interesting experience, as it gave us new insights into an industry we knew little about before. We really enjoyed working on a real-life business case together with our mentor from the MBA/MSA programme, Collin Barrett.

■ Lisa Bäumler
Nikolas Rosenberg
Stephan Schneider

The double degree programme at Bayreuth University and Ohio University gives us the opportunity to look at the world of sport from a different perspective and to understand sport management in an international context.



■ Fig. 4: Stephan Schneider, Lisa Baeumler, Nikolas Rosenberg and Colin Barrett as mentor (from left to right) (Photo: Christina Wright).

“I am excited about our cooperation ...”

■ Christian Wißler

INTERVIEW WITH PROFESSOR B. DAVID RIDPATH (OHIO UNIVERSITY, USA)

Two years ago, Ohio University and the University of Bayreuth established a double degree programme for undergraduate students, which you helped initiate as a visiting professor at the University of Bayreuth. How did this programme come about?

David Ridpath: The first inquiries about starting a cooperative relationship between Ohio University and the University of Bayreuth started in 2006-07 when I began my employment as a tenure track faculty member at Ohio University. I had personal and professional reasons in pursuing a potential collaboration. My wife is German and grew up near Bamberg, I was a US Army soldier for almost eight years in Germany-four years in Würzburg and four years in Schweinfurt (where I met my wife). So Germany has been a major part of my life. My kids are dual citizens and I have spent over a decade of my life in Germany. It really was a happy accident that Uni Bayreuth became a target. My former chair was the president of NASSM (North American Society for Sport Management) when Professor Woratschek was the vice-president of EASM (European Association for Sport Management). I had asked my chair about pursuing potential collaborations in Europe, specifically Germany he informed me that he would investigate possibilities as he was making a trip to Heidelberg for an EASM Conference in 2008. He and Professor Woratschek discussed the potential and I was thrilled when I heard Bayreuth as I was very familiar with the city, it was close to where I lived in Germany and was also close to where my wife grew up. It just seemed too perfect and it has been great. I made a site visit in 2009 and the planning and paperwork started then.

We initially started the cooperation with an annual study abroad trip where Ohio students come to Germany for a business consulting project with Adidas. This experience has been going on sans COVID since



2012. In addition we began research and teaching cooperation/exchanges which enabled me to become a guest professor at UBT and also do a year long Fulbright sabbatical in 2014-15 in Bayreuth. Dr. Ströbel came to Ohio University as a professor exchange with me. Our signature effort has been the double degree bachelor's program which was officially launched in 2020. Lots of work to marry up course and logistics but we are excited to celebrate the first two graduates of the program in April 2022. We also had some Bayreuth students come to Ohio for graduate studies and we hope to expand that in the future. We are also collaborating on cooperative classes attended by both German and American students simultaneously online.

You have been familiar with the University of Bayreuth for many years; from 2014 to 2015 you taught and conducted research here as a Fulbright Foundation Senior Researcher. How do sport science and also the role of university sports differ in Germany and the U.S.?

■ Fig. 1: Historical plaque in front of the College Gate of Ohio University in Athens (Photo: ist).

In simple terms the U.S. is the only country in the world that has a significant portion of its elite athlete development and national/Olympic team development grounded in the primary, secondary and higher education systems. While other countries may have a semblance of university sports, there are not the primary mode of elite development and there are systems outside education that specifically support elite athletes. Having commercialized sport in education is rife with problems as winning and money often trump educational primacy. That is the main difference in the most basic way.

As far as sport science – it is very similar in that most sports management programs are moving to more of a business based format and that meshes very well with the UBT programme.

Could you imagine sports at German universities playing a stronger role in university marketing in the future, not least in recruiting students?

I think there is a possibility but it would likely never be as big or commercialized as in the US because the federations and local sports clubs are so embedded in the culture. If it is an extra curricular activity that does not overwhelm academics it can certainly be beneficial and exciting to play other schools in sports but the danger of winning over everything else brings me to the conclusion that Germany should not go down the road of have a professionalized athletic department within its higher education system.

Sport science at the University of Bayreuth has become increasingly interdisciplinary. Are there similar trends at Ohio University?

The trend is moving the business side to business education whereas things like exercise physiology and athletic training are moving to more applicable colleges. There is some overlap and certainly some interdisciplinary aspects of all sports related studies but the big trend is moving the sport management side into business schools.

What role should ethical issues play in sport science courses?

Ethics should be a core area of all sports courses because the desire to win can blur doing the right thing. We often rationalize things we would not normally rationalize because we want to win. It is in the news every day – steroids, cheating on and off

the field etc. It is incumbent that ethics is taught because doing the right thing is never wrong. If sports is a true level and fair playing field, then ethics must be a huge part of it.

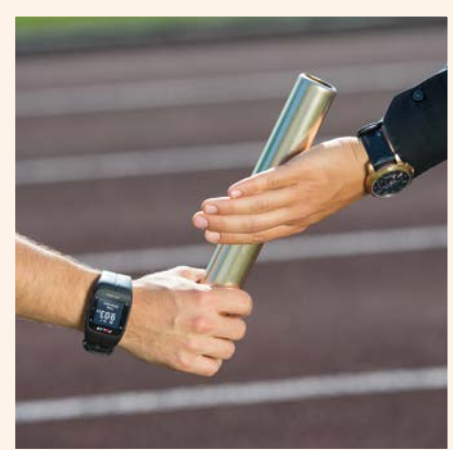
How do you assess the prospects for future university cooperation between Germany and the U.S. – both in university sports and overall? What could and should be done to strengthen transatlantic academic bridges?

I am excited about our cooperation and many schools already want to emulate it because it is vital for the future of sport management education. Sports are increasingly global and sports is one of the largest businesses in the world. Understanding that aspect is critical for sport management program's viability in the future. As far as strengthening bridges – we need to do a better job on the U.S. side and providing more opportunities. Students in Europe want to come to America more while American students want to stay in silos and are more fearful of going abroad. We need to destroy that attitude and make it more desirable to participate in programs like this. I also believe we should make foreign language training more of a requirement.

■ Fig. 2: The Bayreuth participants in the double degree programme in front of the historic entrance to Ohio University in summer 2021: David Hansen, Tabea Oberglock, Megan Fischer, Lisa Baeumler (front), Nikolas Rosenberg, Stephan Schneider (from left to right) (Photo: Nikolas Rosenberg).



UNIVERSITY & SPORTS



Tradition – Innovation – Performance

The degree programmes in sport science at the University of Bayreuth

■ For 35 years, successive generations of students have graduated in Sport, Business & Law at the University of Bayreuth, expanding the large network of alumni who remain involved in shaping the study programme (aerial view of the University of Bayreuth campus: Christian Bay, handing over the baton: Hans Pastyrik).

Three branches of study: Unique study profiles with a special tradition

As a young campus university, the University of Bayreuth succeeded much earlier than other institutions with more tradition in sport science in recognising new developments in sport, and in implementing them in its degree programmes. For example, the diploma programme in Sport, Business & Law was established as early as the mid-1980s, which from the very beginning focused on interdisciplinary networking of sport science with business administration and law. This step was to prove to be a very far-sighted and sustainable pioneering achievement. It was only decades later that other universities followed with successor models at the interface of sport and business, but they all remained entrenched in one of the two disciplines. Only the University of Bayreuth was and continues to be successful in consistently dovetailing the three subject pillars of "sport – business – law".

Over 35 years, Bayreuth's Sport, Business & Law has thus been a success story that has combined tradition with innovation since its beginnings. Even more, in the knowledge that they are part of something special, the founding myth and the idea of interdisciplinarity are passed on from generation to generation. This has resulted in a living mindset that connects all students of Sport, Business & Law far beyond their studies, not least through the support of a vibrant alumni network.

Sport connects: three branches of study, one common philosophy

This mindset has been transferred from Sport, Business & Law to the design of the other sports degree programmes at the University of Bayreuth. The physical education programme has also developed a special profile here. The specialisation area of health and fitness in particular was taken up from the study of Sport, Business & Law, and the young subject area of sports ecology and outdoor sports also found its way into the teaching degree programme. Furthermore, the teaching profession-specific focus on diversity and recognition addresses growing cultural diversity in schools.

The sports student council, which represents the entire sport science student body, works closely together. Sport connects – this is not an empty phrase among students, especially since all degree programmes meet in the practical courses of the sports & exercises. The students of all sport science degree programmes, whether teaching degree, bachelor's, or master's degrees, feel they belong to the living campus community of sports students.

The newest sports degree programme is the Master's in Sports Technology, which links sport science with engineering. Its innovative profile, which, like Sport, Business & Law, is part of the proven tradition of interdisciplinary cooperation on the Bayreuth campus, has contributed significantly to the popularity of the degree programme since its year of inception. In the meantime, graduates of long-established sports technology programmes at other universities regularly switch to the Bayreuth master's programme. In addition, numerous graduates of Bayreuth's Sport, Business & Law opt for Sports Technology as a Master's programme and successfully acquire the engineering knowledge required for this. All of this proves that Sports Technology is thoroughly integrated into the portfolio of Bayreuth's sports degree programmes.

Looking to the future

Thus, Bayreuth's sport science in cooperation with the engineering sciences has once again succeeded in creating a study innovation that takes the success story of Sport, Business & Law into further promising study programmes. The decisive factor here is a coherent overall concept that always remains open to new developments in science, sport, business, and society. The endeavour to be and remain innovative in order to achieve top performance unites students and lecturers from all fields of study. However, this joint commitment cannot be taken for granted. It requires a constant process of improvement as well as an intensive dialogue that also involves alumni time and again. Sport science at the University of Bayreuth will continue to focus on this unifying formula for success in the future.

AUTHOR



Prof. Dr. Markus Kurscheidt is the Faculty of Humanities and Social Sciences Head of its Sport, Business & Law degree programmes.

■ Markus Kurscheidt

Sport, Business & Law: "Passion meets Performance"



■ Fig. 1: Working together as a team: Bayreuth students of Sports, Business & Law (Photo: Hans Pastyrik).

■ Fig. 2: The emblem designed by the Bayreuth students of Sports, Business & Law themselves. The sports student body sells a wide portfolio of merchandising products for this purpose.



Living founding idea – professional and emotional

At the same time, the founding idea of the pioneering degree programme continues to be cultivated and lived. The best example of this is the nickname chosen by the students of Sport, Business & Law themselves. It is derived from the academic degree "Dipl.-SpOec", which was awarded at the end of the former diploma programme. The abbreviation "Spökos" has survived the change to a bachelor's

and master's degree programme, and has stuck to this day. Then as now, the identity-forming reflection on the overlapping fields of sport and business was and is deliberately included in the structure of the study programme. By linking the three subject pillars of "sport – business – law", different, sometimes even contradictory logics are linked in a comprehensible way. As a result, sports business becomes an interdisciplinary subject and field of action, imprinting itself on the minds and hearts of students, who deploy their competencies and passion in their later professional fields. This study profile has been constantly developed and expanded over more than three decades at Sport, Business & Law in Bayreuth.

Pioneering study concept, Top positions in the rankings

It will remain a central component of the study concept that sport science is taught in its breadth with empirically based theory as well as practical applications in the areas of sports and exercise. At the same time, students acquire solid business skills such as accounting and finance, but also in modern sub-disciplines such as sports and service management, sports controlling, and digital business. The legal side of sports business taught goes beyond the basics of civil and criminal law, exploring, for example, sports marketing law. Specialisation subjects such as Sport Governance, Event Management, Marketing & Services, Sport Ecology, and Fitness Management pick up on current developments in business and society and integrate them into the study programme. This is how Bayreuth Sport, Business & Law has been able to shape the university landscape in the field of sports management over the decades, both nationally and internationally. The result is a high level of student satisfaction with their university and their degree programmes. This was reflected in a "gold medal" in 2021 in the highly regarded university ranking of the Centre for Higher Education Development (CHE). Bayreuth was at the top of the list of sport science institutions in Germany in almost all evaluation criteria.

The Spöko network: A lifelong connection to Sport, Business & Law in Bayreuth

■ Jessica Helten

The association "Sportökonomie Uni Bayreuth e.V." is the alumni association of Sport, Business & Law in Bayreuth. It was founded in July 2002 at the initiative of graduates, students, and professors. With over 1,500 members, it is the largest alumni network in German-speaking sports business, and the central networking platform of our "Spökos". The alumni association thus makes an important contribution to a close intergenerational bond as well as a distinctive cultivation of contacts beyond one's studies. This mission is the guiding principle for the alumni association. Various projects are implemented, which in particular strengthen the contact between alumni and current students and enrich the study of Sport, Business & Law at the University of Bayreuth with a strong connection to practice. With its outward looking activities, the alumni association makes Sport, Business & Law in Bayreuth more visible in the relevant industries. Thus, it enhances the reputation of the bachelor's and master's degree programmes in Bayreuth as well as of the entire university.



■ Fig. 1: The Board of the alumni association "Sportökonomie Uni Bayreuth e.V.": Lars Griebel, Jessica Helten, Heiko Heidenreich, Lisa-Marie Merkl, Dr. Mario Kaiser (from left to right) (Photo: UBT).

strengthening the awareness and perception of the brand in the sports business, but also among students, alumni and lecturers. In the development of the degree programmes of Sport, Business & Law, the responsible coordinators regularly search the dialogue with the alumni association and its membership, with the aim of effectively preparing graduates for the challenges of the profession.

■ **Topical lectures:**

As part of the "Bayreuther Sporttalk" series, students are given insights into the current practice of sports business. Graduates like to take advantage of this opportunity to find out about the latest developments in the various sports industries and topics of sports management.

■ **Workshops and practice courses:**

The alumni association focusses its engagement on the theory-practice transfer and thereby sets constructive impulses for expanding and developing the Sport, Business & Law degree programmes. At the same time, companies in sports industries benefit from the intensive exchange with the students.

■ **Platform for job and internship vacancies:**

Companies can publish their job advertisements here and have the opportunity to contact students and graduates.

■ **Brand development:**

The alumni association is also committed to the further development of the "Sport, Business & Law, Bayreuth" brand. Thus, it contributes to

■ **Newsletter:**

The newsletter regularly informs association members about new developments in Sport, Business & Law at the University of Bayreuth as a whole.

■ **Advisory Board:**

This committee at the University of Bayreuth is made up of renowned graduates of Sport, Business & Law at Bayreuth, and is unique in this form. The main goals of the Advisory Board are the intensification of Spöko network structures and the regular exchange of Sport, Business & Law research and teaching with practise. The Advisory Board supports the alumni association and advocates for

- the external presentation of Sport, Business & Law in Bayreuth,
- the acquisition of third-party funds (fundraising),
- the further development of education and training in sports management,
- innovative impulses for research projects from practice,
- practice-oriented content in teaching (excursions, workshops, and lectures).

RECOMMENDED LINKS

Homepage of the Alumni Association of Sport, Business & Law at the University of Bayreuth:

<https://sportoekonomie.net/>

Social media channels:

<https://www.linkedin.com/company/sportoekonomie-uni-bayreuth-e-v/>

https://www.instagram.com/alumni_spoko/

AUTHOR



Jessica Helten is a member of the board of the alumni association "Sportökonomie Uni Bayreuth e.V." and a research assistant at the University of Bayreuth.

■ Andreas Hohmann

Sports Technology: Creative engineering for health and competitive sports

AUTHOR

Prof. Dr. Andreas Hohmann is Head of the Master's Degree Programme in Sports Technology.



Since the Master's programme in Sports Technology was established four years ago at the Institute of Sport Science, it has met with ever-increasing respect from students in Germany who wish to combine an interest in sport science with engineering. With between 20 and 30 new enrolments each year, this "tech community" at the University of Bayreuth has now grown to over 80 students. At the same time, the first graduates have also received their Master's degrees and have successfully started their careers as "sports engineers". The strong demand for this master's programme, which now has the largest number of participants among the engineering sciences at the University of Bayreuth, is due not least to the attractive variety of course content from almost all sport science and engineering disciplines. The Bayreuth "SpoTecs" enthusiastically learn and research not only biomaterials, CAD, additive manufacturing, and technical testing methods, but also health and training science, social sciences of sport, sports economics and ethics of sport. The focus of this interdisciplinary approach is always on the application and transferability of the knowledge gained to the optimisation of sports, play, and exercise equipment for the fitness and health industry, the sporting goods industry, and sports facility construction.

Of particular interest is the "performance show" on new technological developments for the sporting

goods market led by the course initiator Dr.-Ing. Michael Frisch, where the prospective sports technologists present their self-developed product innovations in the form of an elevator pitch. Within the framework of ten-minute presentations and product demonstrations, not only the participating students but also the interested public can get an idea of the creativity and progressiveness of Sports Technology in Bayreuth.

Since the 2021/2022 winter semester, Professor Franz Konstantin Fuss, one of the most renowned international experts in sports technology, has strengthened the interdisciplinary orientation of the degree programme. As Chair of the newly established Biomechanics research group at the Faculty of Engineering Sciences, he will provide forward-looking technical-scientific impetus to support health and competitive sports. A special focus will be on expanded sports opportunities for people with disabilities.

With this latest development, Bayreuth's sports technology has not only consolidated its excellent position among the four German university locations offering degree programmes in sports engineering, but it will also gain considerable international appeal in the competition for the best materials, the most sophisticated technologies, and the most attractive design.

■ Fig. 1: The winning teams of the 2021 German 3D Printing Challenge. Bayreuth master's students achieved second place with their "Tiger Toe" foot prosthesis (Photo: Michael Frisch).



Teaching degrees in Physical Education: Didactic competencies for teaching practice

■ Peter Kuhn



combination with metal technology or electrical engineering.

- Physical Education as a subject studied in depth for the teaching profession at **grammar schools**, in conjunction with German, English, and/or Mathematics.

Further subject combinations for the teaching profession at secondary schools and grammar schools are possible in cooperation with the Universities of Bamberg and Erlangen-Nuremberg.

The teaching degree programmes in physical education at the University of Bayreuth are characterised by three overarching perspectives:

- **Health:** The topic of student health is of great importance and is addressed in concepts such as "Bewegte Schule" (moving school) and in a separate learning area "Health & Fitness".
- **Diversity:** Students gain an in-depth insight into how to deal professionally with a diverse student body. The focus here is on both subject-specific and cultural aspects.
- **Respect:** The lecturers treat the students with respect on the Bayreuth campus. At the same time, they address the appreciative attitude of teachers towards learners in courses, which will ideally later feature in their own teaching practice.



■ Fig. 1: Development of self-realisation skills by e.g. volleyball (Photo: Peter Kuhn).

■ Fig. 2: Development of didactic competences with regard to diversity by e.g. gymnastics (Photo: Katharina Ptack).

The University of Bayreuth has developed a special profile for its physical education teaching degree programme. The focus is on the sports didactic competencies of its students. Courses on a wide variety of sports and physical exercises play a large part in this: here theory and practice are integrated in a didactically and methodologically sophisticated form. The University of Bayreuth attaches great importance to familiarising students with "real" teaching situations in which they encounter children and young people in physical education. To this end, it pursues cooperation projects with schools and set up special course formats. Specifically, students have the following options:

- Physical Education as a subject for the teaching profession at **Realschulen** (secondary modern schools), in conjunction with German, English, Mathematics, or Economic Sciences.
- Physical Education as a subject for the teaching profession at **vocational schools**, in

An essential study objective is the acquisition of subject-specific competency – for example in sports education, sports psychology and sports history, sports biology and sports medicine, exercise and training science, as well as in applied sport science. Equally important is the acquisition of teaching competence. Here, the main focus is on health-oriented fitness as well as a wide range of sports. These include basketball, handball, football, volleyball, gymnastics and dance, apparatus gymnastics, athletics, swimming, and winter sports. The latest trend and leisure sports also appear in the teaching. A large number of internships are integrated into the study programme and always ensure the bridge from the campus to modern school teaching is oriented towards current challenges.

AUTHOR



Prof. Dr. Peter Kuhn is Coordinator of the Physical Education Teaching Degree programmes.

■ Herbert Woratschek
Guido Schafmeister

Nurturing careers: MBA Sport Management at the University of Bayreuth

More than two decades ago, the University of Bayreuth established the part-time continuing education programme "MBA Sport Management". The participants not only familiarise themselves with the latest findings and procedures in sports management, but also experience the transfer of current research results to their everyday professional lives. This concept is very much at the heart of the study programme, and has proven itself throughout its evolution: Allowing people to benefit from scientific findings in their everyday lives.

Since the start of the programme, the world of further education opportunities in sports management has fundamentally changed. Whereas at the beginning there was only one relevant alternative to the University of Bayreuth in German-speaking countries, today there are well over 60 MBA programmes. Sports management has become a fashionable subject in many places and has disappeared again in some places. The Bayreuth programme, however, has remained successful to this day because it has continued to develop over the years in a close exchange between academia and practice. It continues to be held in high international esteem and, as the No. 1 German-language programme, repeatedly achieves top positions in global rankings.

From the very beginning, the programme's content has been aimed at enabling and promoting a timely transfer of the latest findings from science to business. At the beginning of his studies, one participant once remarked, "But research has nothing to do with my everyday professional life." This view is indeed widespread among many sports managers: Research takes place in the ivory tower, while we have to organise everyday life. The Bayreuth MBA programme closes precisely this perceived gap. With its dovetailing of practical orientation and innovative research, it impresses and motivates students, and through the efficient transfer of know-how it also strengthens the competitiveness of numerous companies and organisations in the sports industry.

This approach first becomes concrete through the programme content. The focus is on research priorities that are particularly relevant to everyday working life. The focus is less on "fashionable topics" and more on enduring themes. Currently, these are value crea-

tion, strategic sports marketing, strategic sports management, sports law, and personal development. In all these areas, digitalisation is gaining in importance. But didactics are also important: interactive formats have long been the industry standard in continuing education. The Bayreuth MBA programme is also innovative because module examinations largely take the form of personal projects. All students receive individual project assignments each semester, with which they use the content of their modules in their everyday lives. They do not have to reproduce their knowledge in exams or test it on abstract case studies, but apply it directly to their own professional environment. Intensive and personal support during course days ensures that students take away the necessary competency. It is important that students can apply their acquired knowledge independently and find support when they need it.

Due to this orientation, traditional classroom hours have become fewer since the introduction of the



programme, while support hours in open office hours and personal appointments have been significantly expanded. The last few years have shown that this concept supports the motivation for independent learning particularly well, and that students show impressive developments over the course of their studies. This idea is supported by the question once asked by a prospective student: "What will I do differently when I study in Bayreuth?" The answer today, as it was then, is: "You will use scientifically sound concepts for success that have been tested in practice, so that you will not only know how to do it, but will also be able to realise your goals."

In order for such a concept to work in organisational implementation, some central course settings are required. That is why the University of Bayreuth is working together with the Sport Management Academy Bayreuth GmbH, its own spin-off. The idea of this public-private partnership is to combine the academic strength of the University with the orga-

nisational flexibility of the entrepreneurial service provider.

Of central importance is the question of how the team of lecturers is put together. The decisive factor here is the greatest possible diversity. Each individual teacher offers students different opportunities for inspiration due to their special competencies and experiences. A well-organised change in this respect therefore increases the attractiveness of the programme. By experiencing teachers from different institutions, from different countries, as well as from academia and business, students share in a wide variety of experience. Overall, this orientation increases the organisational effort, but enhances the students' development opportunities and ultimately makes the programme unique.

For the students, it is important that the study effort required can be properly planned. Since the start of the programme in the summer semester of 2010, not a single day of classes has been cancelled, not even during the coronavirus crisis, when the programme switched completely to virtual classes with their own didactics. Students have full planning flexibility because all event dates for the entire programme are fixed before the start of the programme.

The MBA Sport Management is also designed to promote the development of networks. Therefore, students from all semesters always come to events on the Bayreuth campus on the same days. If possible, students at different stages in the course are also taught together. Experience has shown that the exchange of experience and ideas is particularly valuable in this case. The MBA graduates not only establish lifelong friendships among themselves, but are also connected with the Bachelor and Master of Science graduates through the Spöko Alumni Association. All in all, MBA Sport Management is a tried and tested programme that makes science tangible in everyday life and aligns professional practice with proven, successful concepts. Feedback from students, alumni, and lecturers is constantly sought. It helps us to constantly reinvent MBA Sport Management for the future, so that graduates can open up new professional fields, expand sustainable networks, and rise up new challenges in the dynamically developing world of sport.

AUTHORS



Prof. Dr. Herbert Woratschek, University of Bayreuth, and Dr. Guido Schafmeister, Sport Management Academy Bayreuth GmbH, have redesigned the content and organisation of the current MBA Sport Management study programme in a public-private partnership.



■ Fig. 1: The Absolvía with its traditional hat throwing ceremony marks the festive end of the MBA programme (Photo: UBT).

