Daniel Memmert | Stefan König

Foreword by Dirk Bauermann

THE MENTAL GAME

Cognitive Training, Creativity, and Game Intelligence in Basketball

OVER 50 PRACTICE GAMES AND DRILLS

MEYER & MEYER SPORT

The Mental Game

With love to Ute and Katja and our children

Daniel Memmert • Stefan König

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Cognitive Training, Creativity, and Game Intelligence in Basketball

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FOREWORD

EuroBasket 2025 will see the best basketball teams in Europe playing games in four different countries. Of course, I hope that the German national team will be part of it and play successfully due to frequent creative individual actions, but also as a consequence of effortless combinations and fast, effective passes. It will be important that everyone is in top shape—especially mentally.

This has always been the case for me and my players; for many years, in the national league and national team, we have very consistently trained abilities like perception, attention, and intelligent decision making. That is why it sometimes looks effortless to score a basket from a turnaround or from long range or to play a decisive pass to a free teammate. After all, these are exactly the things fans want to see.

This book gives coaches the opportunity to devote themselves intensively to the often-neglected cognitive skills. The importance of the head for ambitious junior teams up to the regional league or even for the professional level is undisputed. I myself have therefore always attached particular importance to cognitive training.

Up to now, coaches in Germany have had to rely on their own knowledge or laboriously search for tips and game forms on cognition in basketball in the relevant specific journals. This volume closes this gap. With the numerous game forms on the six domains of cognition—anticipation, perception, attention, game intelligence, creativity and working memory—it is now possible to get quick and uncomplicated suggestions for daily training practice.

I hope this part of the Cognitive Training, Creativity, and Game Intelligence series will be widely read. I also hope that reading it will help to place cognitive skills, which have so far received the least attention in the training process, more at the center of training. The greatest potential lies dormant in the cognitive area; we should learn to use it as effectively as possible in all performance classes.

Dirk Bauermann

Germany national basketball coach from 2003–2011

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1 BASKETBALL MATCHES ARE DECIDED IN THE HEAD

Dirk Nowitzki, or currently Dennis Schröder, seems to effortlessly conjure up unusual, but also technically-tactically best solutions on the court in extremely complex situations. Successful coaches or teammates mention mental speed, the importance of the head, and intelligence in the context of exceptional players.

Some good examples are statements in basketball magazines, which talk about action speed (see the following sidebar), and also in science (Laurent et al., 2006) as well as basketball textbooks (Erčulj & Zovko, 2022), which repeatedly emphasize that basketball games are decided in the head. In addition, a number of studies are described in sport science journals, which underline the special importance of the interconnection between perceptual skills and reaction or action speed (i.e., reactive agility).

"Basketball is a head thing. But it helps to have great hands." —Scottie Pippen

"If the head is not in the game, the athlete will not be able to perform to his full potential and, as a result, will perform below his potential." —Alexander Elwert

"It's not about the number of hours you practice, it's about the number of hours your mind is present during practice." —Kobe Bryant

Action Speed

"Especially in sports games, it is essential to implement technical and tactical actions successfully according to the situation. The level of action speed is defined by the total time required for the cognitive processes (mental speed) and the movement execution of the active task" (Friedrich, 2005, p. 143).

Common to all terms and approaches is that the mind, and therefore cognitions, seems to play a fundamental role in basketball and other sports (see also Bourbousson et al., 2012).

In sport, cognition is the problem-solving process necessary for generating adequate solutions in specific situations. To this end, this book presents a model of the processes of human decision making. Cognitive abilities such as anticipation, perception, memory, or attention that contribute to creativity are described. This also includes game intelligence, which describes the selection of the best decision. In a more general sense, cognition also includes will, moods, and emotions. In exercise training, it can now be a matter of practicing all these abilities individually or in combination, making them available in the memory.

Basketball has a high status in sport science in general. There are many research results on this topic from different disciplines and magazine and journal issues (e.g., social behavior: Yaaribi et al., 2018; social interactions: Bourbousson et al., 2010; self-talk: Latinjak et al., 2019; scouting: Rösch et al., 2021; injuries: Conti et al., 2019).

Of particular relevance for this book, however, are the areas of perception, anticipation, attention, creativity, game intelligence, and working memory, with a sufficient number of publications available only for the first three cognitions. Nevertheless, even from these studies, not all scientific results have been transferred into practice. This can be deduced from the fact that people are amazed when Rolf Brack teaches games for perception and situation-appropriate decision making, in which four different colors (shirts of the different teams referring to four goals) play a role, or when he combines brain teasers with motor responses in training. Although this is considered revolutionary, much more is possible in this respect.

For the first time, scientifically founded statements about cognitive training in basketball are provided in this book. The content, methods, diagnostics, and practical aspects of cognitive training are also discussed.

The first part of the book presents the basic elements of cognitive training:

- What are the key factors that can be trained?
- What kinds of models are available?
- What kind of evidence is available?

In addition, these findings are linked to coaching practice. With a single word, coaches can vary the players' focus of attention. Maximum attention is needed in situations where variability and creativity are required. If, on the other hand, movements and actions are to be anticipated or attention is required for specific events, then a narrow focus of awareness can help. Over the past 15 years, many studies have been conducted and the role of working memory in such situations is now apparent.

The possible cognitive diagnostics are subdivided into tests on elementary cognitions in the laboratory or on the court on the underlying model. To determine, for example, how meaningful the focus of a player is, his attention window can accurately be determined in the laboratory.

In very extensive scientific sport studies with top athletes, there are also attention tests that were developed to precisely specify the attention window of an athlete. In addition, there are also diagnostic tools that can be used in practice. It is possible to see, for example, how players can shield themselves from interfering factors, how distributed or selected their attention is, and how well they are able to focus. There are now numerous test procedures to assess these situations. At the same time, there are established game-related sports tests on the court (indoor or outdoor) that can be used to evaluate the athletes' skills in finding gaps and support as well as orienting themselves on the court.

These form a basic tactical foundation and are important not only in basketball, but also in other sports.

In chapter 5, training examples are given in the form of games, competitions, and drills for cognitive training. Coaches and clubs must be made even more aware that attention and creativity can be trained. Anticipation, perception, and attention can be trained excellently. For this purpose, numerous examples are presented that are structured according to the content model of cognitive training, which is described in the next chapter.

2 DEFINITION AND RELEVANCE OF COGNITIONS

What exactly is cognition, or a cognitive process, from a scientific perspective?

The use of the term cognition has a long tradition, ranging from Tolman to Hebb and Neisser to Gazzaniga—all famous scientists. At this point, no precise overview of the existing diversity of definitions is presented (for an overview in psychology, Neisser, 2014; for an overview in sport, Memmert, 2004a). In contrast to purely physiological, neuronal, and precognitive processes, Roth and Menzel (2001, p. 539) characterize mental performance through six cognitive processes:

- Integrative, often multisensory and experience-based processes of perception
- Processes that involve recognizing individual events and categorizing or classifying objects, people, and events
- Processes that take place either consciously or unconsciously based on internal representations (e.g., models, imaginations, maps, hypotheses)

- Processes that involve an experience-controlled change in perception, leading to changeable processing strategies
- Processes that require or include attention, expectations, and active exploration of the stimulus situation
- Mental activities

In general, cognition is simply defined as those higher mental functions and processes necessary to generate appropriate solutions in certain situations and in given environments.

The significance of cognitive abilities in sport is not conclusively clarified and is currently the subject of an intensive discussion. This also extends to psychology (for an overview, see Hambrick et al., 2019; Simons, et al. 2016). However, findings from general psychology increasingly prove that, for example, fluid intelligence and creativity are influenced by various fundamental and cognitive processes (e.g., inhibition) (Benedek et al., 2014).

Thus, we are in an exciting phase for both sport science and sport practice. For example, while one research group has been presenting data for years showing that training working memory capacity is positively related to various cognitive performances (cf. Klingberg, 2010), another research group has not been able to confirm this correlation with any regularity (cf. Owen et al., 2010). In principle, the question is always whether training a fundamental domain of cognition leads to transfer effects on other domain-specific performances.

Executive Functions

An actual psychological model for cognition (Alvarez & Emory, 2006), which is also occasionally used in sport psychology as a basis for research programs, describes the control and regulation of specific cognitive processes in humans. These executive functions (EF) regulate goal- and future-oriented behavior (Friedman, 2006; i.e., processes such as decision-making). EF are further divided into core EF (CEF) and higher-level EF (HEF). CEF is characterized by working memory, cognitive flexibility, and inhibitory processes, while HEF involves problem-solving and argumentation strategies, as well as planning processes (Diamond, 2013). These abilities develop with increasing age as they depend on different prefrontal brain structures. The neuronal structure underlying the HEFs is the prefrontal cortex. It matures slowly and lasts in development; full capacity is reached between 20 and 29 years (Luciana, 2005). CEFs, on the other hand, develop earlier in life, mostly before early adolescence (Crone et al., 2006). In this book, both form the basis of the models and findings presented. The CEFs are associated with working memory, tracking of objects, inhibition processes using the perception capacities, and flexibility of the attention window, since these develop earlier than the HEFs and thus could be a key indicator in the early development process of players. The HEFs address anticipation, game intelligence, and game creativity, which can also be profitably trained in later training phases.

In two sport science meta-analyses (Scharfen & Memmert, 2019a; Voss, et al., 2010), low to moderate effects of essential cognitive performance in experts could be demonstrated, which indicates superior (basal) cognitive abilities of elite athletes. Individual working groups have also discovered that sports experts (especially professional basketball players) seem to possess outstanding basal cognitive skills (Verburgh et al., 2016; Vestberg et al., 2012).

However, the number of studies is still too low, the methodological quality is manageable (cf. Furley et al., 2023), and there are some published studies that have not proven any connections (cf. Furley et al.,2017).

Finally, a cross-sectional study by Scharfen and Memmert (2019b) of highly talented young soccer players demonstrates that, for example, a significant attention window can be advantageous for more complex motor skills, such as dribbling. In addition, a greater

reduction of individual perceptual load indicates a higher sprint speed, and a better working memory affects more precise ball control and dribbling ability. These findings will soon need to be replicated, particularly in larger samples.

A systematic overview of commercial cognitive training programs and their impact on sport practices (Harris et al., 2018) shows that many questions remain unanswered and need to be clarified in follow-up studies. Nevertheless, we firmly believe that we must begin to train cognitive skills in practice even before science has answered all of the questions from A to Z. In many places, a little courage is needed and in other places, humility and restraint is required. The dilemma of general unspecific domain cognition can be illustrated best by the metaphor of a transport vehicle such as a car or an aircraft.

On the one hand, regardless of whether the vehicle is a sports car, a tractor, or a truck, the larger the engine (unspecific, since motors are also used in many machines), the faster you will drive. The better the technology (even non-specific), the safer you will be on the road. On the other hand, different means of transport also have different requirement profiles. For example, an aircraft needs different tires and an entirely different engine. However, in the space or automotive industry, the mixture of rubber materials that should be used for the tires of airplanes or cars is already known and perfected, yet, this cannot be said for cognitive processes in complex sports.