

# Performance Perception and Relationship Quality in Bug-In-Ear Coaching in On-Court Sports

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## List of Abbreviations

AVE.....	Average Variance Extracted
BIE .....	Bug-In-Ear
CFA.....	Confirmatory Factor Analysis
CFI.....	Comparative Fit Index
CMC .....	Computer-Mediated Communication
F2F .....	Face-To-Face
IR.....	Indicator Reliability
LK.....	Leistungsklasse
NFI .....	Normed Fit Index
NNFI.....	Non-Normed Fit Index
RMSEA .....	Root Mean Squared Error of Approximation
VMC.....	Video-Mediated Communication

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## 1. Introduction

The shortage of coaches in German tennis clubs is a prevalent issue, as highlighted in an interview with Dirk Hordorff, the former vice-president of the German Tennis Federation in 2019 (Deutscher Tennis Bund 2019). This shortage is further supported by global figures, with the ITF Tennis Report 2021 indicating over 87 million tennis players but less than 150,000 tennis coaches worldwide. This equates to more than 580 players per coach. In Germany, the situation is slightly better but still amounts to more than 330 players per coach (International Tennis Federation 2022). This scarcity of coaches is not limited to tennis alone but is a prevalent concern in sports clubs in general, especially at the grassroots level, as the Württembergischer Landessportbund e.V. (2017) highlights for Germany. This represents a significant issue, given that coaches play a pivotal role in the realm of sports. The shortage poses a threat to the viability of numerous sports clubs, encompassing a broad spectrum of potential consequences. These ramifications span from individual-level effects, such as a limited availability of sporting activities, to broader social repercussions, including the potential demise of sports clubs. Addressing the shortage of coaches should thus be viewed as a collective societal priority.

A similar problem – the shortage of trainers for student teachers in the United States – has been addressed through digitalization, specifically by employing Bug-in-Ear (BIE) technology. This communication medium enables real-time interaction between coaches and students, allowing them to communicate while the coach observes the student through a video. Consequently, the coach no longer needs to be physically present but can provide guidance digitally. This approach saves travel time and enables more students to be supervised by the same number of coaches within a given time frame (e.g., Coogle et al. 2015; Kahan 2002). It is plausible that this approach could alleviate the shortage of coaches in sports, particularly in tennis. It should be emphasized that BIE is a digital approach that facilitates human connection rather than replacing it.

To date, the research literature primarily focuses on the use of BIE technology in education and to a lesser extent in the medical field. It has been demonstrated that BIE can improve communication between coach and student by providing immediate feedback (e.g., Coogle et al. 2015; Owens et al. 2020) and in some scenarios, it is even preferred over traditional coaching (e.g., Lynch et al. 2021). Moreover, the literature explores the impact of communication media on communication outcomes in general. There is a broad consensus that the medium influences outcomes, such as relationship quality and effectiveness (e.g., Passarelli et al. 2020; Rice 1992), with media richness being a key concept first investigated by Daft and Lengel (1983; 1984; 1986) and is still further emphasized by Passarelli et al. (2020) and Rice (1992), among others.

However, limited research has been conducted on the influence of communication media in sports coaching. Particularly, the use of BIE as a communication medium between coach and athlete is unexplored. The existence of this research gap is also apparent in practical contexts, such as the *Tennis Innovation Conference*, a prominent industry event focused on the latest advancements in tennis. However, the emphasis at this conference primarily revolves around the digitalization of coaching methods to enhance data-driven approaches for professionalizing coaching. The potential of digital coaching methods to address the shortage of coaches has received limited attention within these forums.

To address the issue of coach shortage through the implementation of BIE coaching, it is essential to first examine the effectiveness of BIE in sports coaching. This study aims to take an initial step towards investigating the potential of BIE coaching in sports, including its impact on coaching outcomes and the coach-player relationship. The core topic of interest of this paper, with tennis being the representative sport, will guide the entire research endeavour.

**Core Topic of Interest:** Performance Perception and Relationship Quality in BIE Coaching in On-Court Sports

The objective is not to fully resolve the problem but to provide an initial investigation that demonstrates the relevance and feasibility of the topic and encourages further research and practical implementation.

To achieve this objective, chapter 2 provides an overview of the fundamental concepts, while chapter 3 reviews the existing literature on the subject. In chapter 4, the research gap is defined in detail and several hypotheses are proposed, including the hypothesis that BIE coaching positively influences coaching performance as perceived by the athlete. The implementation of a field experiment to test these hypotheses, comparing BIE and traditional coaching sessions, is described in chapter 5.1. The results of the field experiment is analysed in chapter 5.2. Finally, chapter 6 presents a discussion of the findings and concludes this paper.

## 2. Foundations

After motivating the topic of BIE sports coaching in chapter 1, this chapter lays the foundations for the subsequent elaborations and investigations. First, the study overview presents a comprehensive depiction of the presumed relationships (chapter 2.1). Second, the conceptual and content-related foundations will be introduced (chapter 2.2). Third, building upon that, three fundamental theories are presented (chapter 2.3). At the end of this chapter the partnering company *ahead-coach* and its contribution to this paper is introduced (chapter 2.4).

## 2.1. Study Overview

Chapter 1 introduced BIE coaching as a promising and human-centred sports coaching approach with potential for the future. This paper aims to investigate the impact of communication medium on coaching outcomes to confirm this assumption. Figure 1 illustrates the relationships between constructs that are hypothesized and will be explored in greater depth throughout the paper.

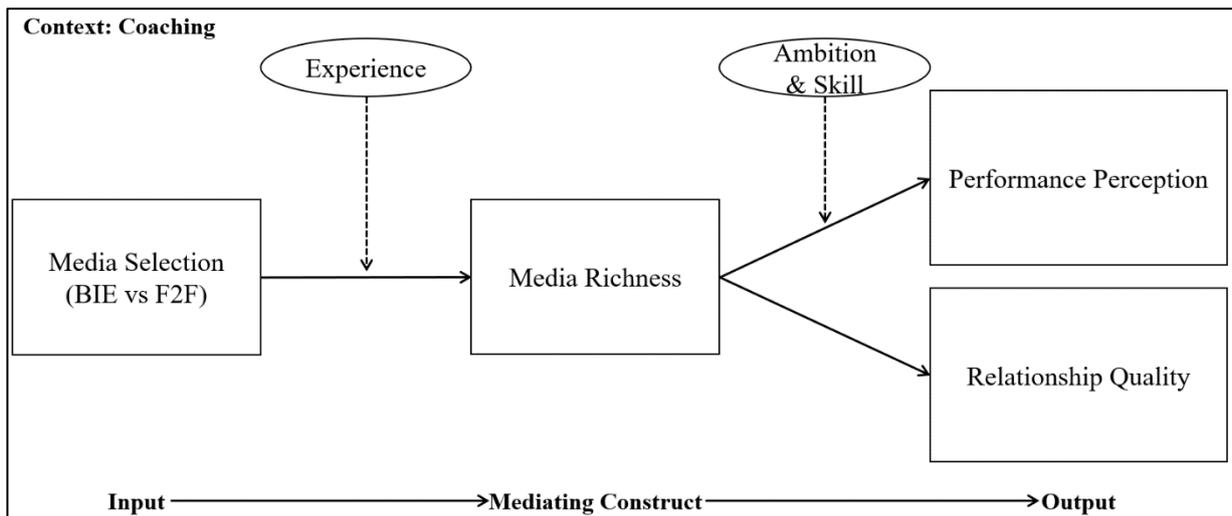


Figure 1 - Study Overview

This paper puts forward and examines two fundamental hypotheses: First, the BIE coaching methodology enhances the perceived performance during coaching in comparison to the conventional face-to-face (F2F) coaching approach. The strength of this effect is anticipated to depend on the skill and ambition of the player. Second, the BIE coaching approach does not diminish the short-term relationship between the coach and student during coaching in comparison to F2F coaching. For both effects, the richness of communication medium is believed to be the mediating factor. The player's experience is likely to moderate the impact of media selection on media richness.

All the mentioned constructs will be precisely defined and introduced in greater detail in the following chapter.

## 2.2. Conceptual and Content-Related Foundations

In the following, the relevant context, input, and output of the communication scenario being studied (refer to Figure 1) will be introduced, as well as definitions of key terms used in this paper to establish a shared understanding. Additionally, *Media Richness* will be introduced as a mediating construct.

### **The Context: Coaching**

The operational context of this paper is *Coaching*, which encompasses related terms such as *Training*, *Mentoring* or *Teaching*. Passarelli et al. (2020) synthesize definitions of coaching from various sources and concluded that coaching is a “relational helping process aimed at facilitating heightened learning, change, or performance at individual or organizational levels” (Passarelli et al. 2020, p. 1). This suggests that coaching is a process involving multiple parties and a specific desired outcome.

Gregory and Levy (2010) outline the roles involved as *supervisor* (the coaching role) and *subordinate* (the coached role) (Gregory and Levy 2010, p. 109). Although the supervisor may appear to be the active role, while the subordinate is the passive one in the formed relationship, it is stressed that coaching is a two-way relationship and each role must make actively contribute to the common objective (Gregory and Levy 2010, p. 112f.). In this paper individuals in the supervisory role are referred to as *coach*, while those in the subordinate role are referred to as *student*.

Ennis et al. (2020) introduce the concept of self-coaching, where the coach and student role are fulfilled by the same individual (Ennis et al. 2020, p. 150ff.). However, this specific scenario is not considered in this paper.

Coaching relationships can be further differentiated by the number of individuals involved per role, which can be formalised as coach:student tuples. For instance, an 1:1 coaching relationship can be seen in business mentoring, which involves one coach and one student as described by Gregory and Levy (2010) and Passarelli et al. (2020). On the other hand, a typical classroom scenario in school involves an 1:n coaching relationship where one coach (teacher) coaches multiple students (pupils).

Chapter 3.2 provides an overview of the various areas of application for coaching with a specific emphasis on video coaching. In this paper, the focus is on coaching in the field of sport, particularly in tennis.

In the context of sport coaching, a distinction is made between on-court and off-court coaching. On-court coaching takes place on the court where the sport is played, such as tennis coaching on a tennis court. In contrast, off-court coaching refers to coaching that takes place in a different setting, such as fitness or mental coaching conducted at home or in a natural place like a forest (Fernandez-Fernandez et al. 2011, p. 540).

### **The Input: Mode of Communication**

There are different modes of communication that can be used for coaching, and this paper focuses on the impact of selecting one mode over another. Therefore, this section introduces the foundational concepts of communication media and their role in coaching. The literature on the individual modes of communication is examined in detail in chapter 3.2.3.

In the most fields of application, such as school or university education (Chen and Siau 2016, p. 40), business coaching (Passarelli et al. 2020, p. 1), and sports (Atienza 2021, p. 30) the traditional mode of communication in coaching scenarios is F2F. Hence, this paper considers F2F as default coaching scenario.

An approach that goes beyond F2F and plays a central role in this paper is *Virtual Coaching*. It is characterized by the fact that the interaction between coach and student is mediated by some kind of electronic communication media (Maritz and Roets 2013, p. 82; Rowland 2012, p. 231). Therefore, the term *Computer-Mediated Communication (CMC)* can be used (Yao and Ling 2020).

The mediating media used in virtual coaching can be categorized into two types: *synchronous* and *asynchronous* communication (Maritz and Roets 2013, p. 82; Rowland 2012, p. 236). Synchronous communication involves real-time exchange of messages between communication partners. In contrast, asynchronous communication may have a temporal delay between sending and receiving messages (IJsselsteijn et al. 2003, p. 3; Lim 2017, p. 231).

Besides F2F communication scenario, there are two mediating synchronous media that this paper focuses on, and which are introduced briefly below: *Video Call* and *BIE*.

*Video Calls*, also known as *Video Conferencing* or *Video Chat*, are a type of synchronous communication that allows two or more individuals to communicate visually and audibly in real-time, although they are spatially separated. To engage in a video call, each participant utilizes a device that is equipped with essential components such as a camera, microphone, speaker, and display. The internet is typically used for the transmission of synchronous data between the participants (Lin and Liu 2009, p. 646ff; Jones et al. 2010, p. 1193f.).

*BIE* is a synchronous communication medium that is specifically used in coaching scenarios. It involves the use of a device, such as a Bluetooth headset, that is worn by the student in their ear. This device allows for real-time communication with the coach, who is located in a different location from the student. In the default case, the coach can see the student via video connection while the student can hear and speak to the coach. BIE enables the student to perform in their natural environment while receiving immediate feedback and instructions from the coach (Rosenberg et al. 2020, p. 410f; Coogle et al. 2015, p. 106; Owens et al. 2020, p. 67f.).

As the coach is not visible to the student, BIE can be classified as two-way audio, one-way video communication (Theriot et al. 2020, p. 49). BIE can easily be implemented using standard video call software, such as Skype (Rock et al. 2014, p. 8ff.).

Technically surpassing video call and BIE, communication can be mediated by *Immersive Technologies*. According to Ranieri et al. (2022), immersive technologies refer to a range of digital tools and environments, such as Virtual Reality, Augmented Reality, and 360° video, which capture the real environment through a camera (Ranieri et al. 2022, p. 2). While these technologies offer exciting possibilities for further development, this paper does not investigate them in detail and instead focuses on video call and BIE.

Another mode of communication that is observed in coaching and requires introduction, is *Asynchronous Video Communication*. It is here defined by the asynchronous exchange or unilateral provision of videos (Kock et al. 2007, p. 334; Li et al. 2022, p. 2f.).

### **The Output: Communication Outcomes**

This section introduces the observed aspects of communication outcomes that result from the selection of communication mode. The characteristics of these aspects are comprehensively examined in chapter 3.2.2.

In the literature, various communication outcomes have been examined, including credibility and satisfaction (Allen et al. 2004), decision-making performance (Dennis and Kinney 1998), and customer loyalty (Tseng et al. 2022). However, there is no agreed-upon definition of communication outcomes in the literature. For the purposes of this paper, *Communication Outcomes* are defined as any kind of change in the internal state (such as feelings or attitudes) or external behaviour of a person involved in a communication that was caused by their participation in the communication.

The focus of this paper is specifically on communication outcomes that are influenced or caused by the mode of communication. Several articles in the literature have compared the communication outcomes of CMC and F2F communication, such as in Kahai and Cooper (2003) and Rockmann and Northcraft (2008) or Suh (1999).

In the context of the literature review, in chapter 3.2.2 three categories of communication outcomes are identified, into which individual outcomes can be classified: *Hard Outcomes*, *Soft Outcomes* and *Technology Usage*. The categories are briefly outlined below.

*Hard outcomes* refer to communication outcomes that can be linked to a change in the external state of a person or a situation. They are distinguished by their high measurability and objectivity. Hard outcomes are typically tangible or observable and are often associated with

measures of performance such as effectiveness or efficiency. Chapter 3.2.2.1 provides a comprehensive analysis of the literature on hard outcomes.

A hard outcome that is of particular interest to this paper is *Performance Perception*, as it is at the core of the research being conducted. *Performance* refers to how well a task has been completed or the degree to which coaching goals have been achieved. In coaching scenarios, goals may not always be clear or measurable and may be strongly influenced by the perception and expectations of individual participants. To address this issue, Suh (1999) introduced *Performance Perception* as an outcome measure. This measure does not assess the objective results themselves, but rather the participants' evaluation of their own performance. Nonetheless, the focus of this investigation is on objective performance, which is why the measure is considered a hard outcome (Suh 1999).

In contrast, *Soft Outcomes* are more abstract and subjective. They encompass communication outcomes that are associated with a change in a person's internal state. Soft outcomes cannot be measured objectively, but rather depend on how individuals perceive the communication. The literature on soft outcomes is examined in detail in chapter 3.2.2.2.

A soft outcome that is of special interest in this paper is *Relationship Quality*, as it is central to the research being conducted. *Relationship* refers to the interpersonal bonding and reciprocal relationship between coach and student. Since this outcome is based on subjective measures such as feelings, emotions, and reciprocal perception, it falls into the category of soft outcomes. *Relationship Quality* describes the perception of the goodness of the relationship. According to Gregory and Levy (2010), high relationship quality comprises four dimensions: Genuineness of the relationship, effective communication, comfort with the relationship, and facilitating development (Passarelli et al. 2020, p. 1f; Gregory and Levy 2010, p. 112). In this paper, long-term relationships evolving over time are not considered, but rather the short-term relationship during one specific coaching session.

While hard outcomes and soft outcomes result from a communication – here with a special focus on the medium through which the communication was carried out – the category *Technology Usage* works the other way round. Here the outcome is the selection of a specific medium in terms of using it, depending on expectations or specific requirements. The existing literature on Technology Usage is discussed in detail in chapter 3.2.2.3.

### **The Mediating Construct: Media Richness**

Following the introduction of various communication modes and their resulting outcomes, this section proceeds to introduce the mediating construct of *Media Richness*. This construct is of particular interest as it serves as the link between the input and output of the model presented

in the study overview (refer to Figure 1) and has the potential to elucidate the relationship between the two.

Rice (1992) posits that the effectiveness of communication media in addressing time, location, permanence, distribution, distance, and transmission of social cues varies depending on the type of communication media being used (Rice 1992, p. 476). This means that the capacity of communication media to process rich information differs across media types (Daft and Lengel 1984, p. 14; Daft and Lengel 1986, p. 560).

The associated construct is called *Media Richness* and was coined by Daft and Lengel (1983; 1984; 1986) and Daft et al. (1987) within the *Media Richness Theory* (refer to chapter 2.3). The term *Media Richness* refers to the capacity of a medium to effectively convey information (Daft and Lengel 1984, p. 7; Daft and Lengel 1986, p. 560; Daft and Lengel 1983, p. 7). Therefore, the concept of media richness functions as a mediating variable that provides insight into the underlying factors contributing to differences in relationship quality across various communication modes (Passarelli et al. 2020, p. 1). Furthermore, it can serve as a crucial determinant in the selection of appropriate communication media in different contexts (Daft and Lengel 1984, p. 4).

While the terms *Information Richness* and *Communication Richness* are used interchangeably in the literature, for the purpose of this discussion, *Media Richness* will be the preferred terminology.

The concept of media richness can be viewed through two distinct lenses: the objective and subjective perspectives. A detailed exposition of each perspective is presented below.

The Media Richness Theory (refer to chapter 2.3) introduces the initial perspective on media richness, namely the *Objective Media Richness*. This viewpoint posits that the communication medium is the sole determinant of media richness (Rockmann and Northcraft 2008, p. 108; Daft and Lengel 1983, p. 7). Each communication medium possesses a specific degree of media richness (Daft and Lengel 1983, p. 8), but media richness cannot be measured by an absolute numerical value; instead, it is an ordinal measure that enables the ranking of multiple media according to their level of richness (Daft and Lengel 1983, p. 8).

Daft et al. (1987) proposed a framework for determining the media richness of a communication medium based on four factors: feedback immediacy, cue multiplicity, language variety and personal focus. *Feedback Immediacy* refers to the speed and quality of communication that allows for prompt feedback and facilitates the exchange of questions and answers. *Cue Multiplicity* refers to the number of communication cues employed, such as verbal and nonverbal cues like body language and physical presence. *Language Variety* concerns the ability of the medium to

express meaning using diverse linguistic symbols, such as numbers, formulas, and natural language. *Personal Focus* refers either to the medium's capacity to convey affective states and emotions, or to tailor the communication to the recipient's individual needs and perspectives (Passarelli et al. 2020, p. 2; Daft et al. 1987, p. 358; Tsai et al. 2015, p. 91).

The Channel Expansion Theory (refer to chapter 2.3) introduced a second perspective on media richness, known as *Subjective Media Richness*. This viewpoint acknowledges that media richness is influenced by the communication medium but posits that the medium does not solely determine the level of media richness. Instead, individuals may perceive the richness of the communication medium differently based on their experience with it. This perceived level of media richness is referred to as subjective media richness, as it is contingent upon the communicators' subjective perception (Passarelli et al. 2020, p. 3; Carlson and Zmud 1995, p. 2).

### **2.3. Theoretical Foundations**

After outlining the fundamental terminology and concepts related to the research topic in chapter 2.2, this chapter provides a succinct overview of three interconnected theories derived from literature: *Social Presence Theory*, *Media Richness Theory* and *Channel Expansion Theory*. These theories serve as the groundwork for the mediating factor *Media Richness* and may facilitate the formulation of hypotheses in advance of the investigation, and the post hoc explanation of results.

#### **Social Presence Theory**

Although *Social Presence* is not a primary focus of this paper, *Social Presence Theory* is closely related to *Media Richness Theory* (Rockmann and Northcraft 2008, p. 108) and therefore briefly discussed in this paragraph.

*Social Presence* refers to an individual's subjective perception of the extent to which a communication medium can effectively convey a sense of physical presence between communicators and is determined by both verbal and nonverbal cues (Rice 1992, p. 476; Short et al. 1976). As such, *Social Presence* can be considered a component of *Media Richness* (refer to chapter 2.2). The Social Presence Theory, proposed by Short et al. (1976), posits that communication media differ in their ability to enhance the sender's capacity to create a sense of physical presence in the receiver, thereby improving the effectiveness of communication (Rockmann and Northcraft 2008, p. 108; Short et al. 1976).

#### **Media Richness Theory**

In chapter 2.2 the concept of media richness was introduced, which refers to a medium's capacity to effectively convey information. It originates from the *Media Richness Theory*

developed by Daft and Lengel (1983; 1984; 1986) and Daft et al. (1987), who researched in the field of organizational communication.

The theory posits that each medium has a specific and fixed media richness, and that media can be ordered according to their media richness. Daft and Lengel (1983) and Daft et al. (1987) provide a hierarchy of typical organizational communication media ordered by media richness. F2F is considered to be the richest media, followed by telephone, personal written documents (e.g., letters or memos), and unpersonal written documents (e.g., bulleting or fliers). Formal numeric documents (e.g., computer outputs) are considered to be the least rich media. This hierarchy is determined by four factors that influence media richness, which are presented in chapter 2.2 (Daft and Lengel 1983, p. 7ff; Daft et al. 1987, p. 358ff.). This theory reflects the approach to objective media richness (refer to chapter 2.2).

Given the time period and organizational context in which the Media Richness Theory was developed, the original hierarchy of media richness proposed by Daft and Lengel (1983) and Daft et al. (1987) did not include certain media that are now relevant to this study, such as video calls and BIE. Henceforth, a brief preview is provided on several authors who have modified or expanded the hierarchy over time to encompass these emerging forms of communication.

Rockmann and Northcraft (2008) have evaluated the media richness of CMC in terms of text-based chatting and video-mediated communication (VMC) in comparison to F2F. They have determined that F2F is the richest medium followed by VMC and text-based chatting, based on the four determining factors of media richness discussed in chapter 2.2 (Rockmann and Northcraft 2008, p. 108). Cable and Yu (2006) suggest that synchronous media have a higher media richness than asynchronous ones, and oral media have a higher media richness than text-based ones (Cable and Yu 2006, p. 830). Despite the specific media considered, the literature generally agrees that F2F is the richest medium of communication (Rockmann and Northcraft 2008, p. 108; Daft and Lengel 1983, p. 7; Dennis and Kinney 1998, p. 257).

Based on the established media richness hierarchy, Daft and Lengel (1986) propose recommendations on the use of different media for specific organizational tasks. Equivocality and uncertainty are introduced as distinguishing criteria for such task (Daft and Lengel 1986, p. 556f.). It is suggested that media with higher media richness should be used when task equivocality and uncertainty are high (Suh 1999, p. 297f; Daft and Lengel 1986, p. 560ff.).

### **Channel Expansion Theory**

The preceding section demonstrates that Media Richness Theory characterizes media richness as an objective measure that can be assigned unequivocally to a medium based on the four

determining factors. Carlson and Zmud (1995; 1999) build on this notion of media richness and introduce additional aspects in the *Channel Expansion Theory*.

Carlson and Zmud (1999) validate that the concept of objective media richness works well for the media listed in the original hierarchy of Daft and Lengel (1983) and Daft et al. (1987). Nonetheless, they contend that this inflexible classification is no longer applicable to newer media, such as VMC (Carlson and Zmud 1999, p. 155).

The Channel Expansion Theory posits that the perceived media richness of a communication medium can vary among users of the same medium, implying that media richness is subjective (Carlson and Zmud 1995, p. 2). In addition to the objective specifics of a communication medium, this theory considers the experience of the respective user as decisive for their perception of media richness (Carlson and Zmud 1999, p. 155; Carlson and Zmud 1995, p. 1f.). The experience of using the medium, the topic of communication, the organizational context, and the communication partner are identified as the most significant experiences (Carlson and Zmud 1999, p. 155). Moreover, the more experience a user has, the higher their perceived media richness (Passarelli et al. 2020, p. 3; Carlson and Zmud 1999, p. 155).

The assertions of Channel Expansion Theory extend beyond the scope of the present discussion and do not bear any relevance to the subsequent proceedings of this study. In brief, the theory posits that subjective media richness, in addition to objective media richness, is contingent on the experiences, particularly the four experiences mentioned earlier, of the communicator.

## **2.4. Partnering Company: ahead-coach**

To provide a comprehensive background for this paper, this section presents the collaborating company - ahead-coach - and its role in this research.

ahead-coach is a fledgling startup that specializes in remote tennis coaching and endeavours to create a technological solution along with a platform for pairing coaches and students. The founding team comprises three individuals with diverse backgrounds, encompassing tennis, information technology, platform design, and entrepreneurship, among other domains.

### **The Coaching Approach**

In the conventional tennis coaching approach, the coach guides the students on the court by providing instructions, corrections, and passing them balls as needed. In contrast, ahead-coach offers a remote coaching approach where the coach is not physically present on the court with the students. However, the students still are physically on the court while the coach joins remotely via a video call. Although the coach is not physically on the court, this coaching method

qualifies as on-court coaching since it pertains to the location of the students, as discussed in chapter 2.2.



*Figure 2 - Digital Coaching Approach ahead-coach*

The technical setup is depicted in Figure 2. To elaborate, students attach their mobile phones to the back of the tennis court and use wireless earphones for real-time auditory and vocal communication with the coach. The coach, using their personal computer, can view the students through the mobile phone camera feed and conduct coaching sessions regardless of their geographical position. As explained in chapter 2.2, this mode of communication falls under the category of synchronous CMC, specifically BIE. Currently, the approach has been tested in both 1:1 and 1:2 coaching situations.

The vision of ahead-coach is to revolutionize the coaching industry by enabling all coaches – including injured and elderly ones – to share their knowledge and expertise through remote coaching. They believe that every player, regardless of their location, should have access to high-quality coaching, and strive to overcome regional price dependencies by providing affordable coaching services to all. Furthermore, they seek to enhance traditional coaching by incorporating advanced technical means and providing a seamless and personalized coaching experience to our clients.

### **Contribution to this Paper**

ahead-coach contributes to this paper in several ways. First, they developed the innovative remote coaching approach that is at the core of this paper and is investigated in the field experiment described in chapter 5. Second, ahead-coach has provided the necessary infrastructure for the coaching sessions to take place as part of the field experiment, including the technical setup and communication tools used during the coaching sessions. Finally, ahead-coach has also

provided part of the test subjects (both, coaches, and players) for the field experiment through their network, allowing for a wider and more diverse range of participants to be included in the study.

It is imperative to acknowledge that ahead-coach provided support for the study; however, they did not exert any influence on the data collection, evaluation, or interpretation of the results, thereby eliminating the potential for manipulation or biased outcomes.

### 3. Literature Review

Following the establishment of the foundations for comprehending the topic of this paper in chapter 2, the present chapter presents the procedure (chapter 3.1) and the results (chapter 3.2) of the literature review. The objective of this chapter is to analyse the literature pertaining to the *Core Topic of Interest* and to recognize the most significant articles. The purpose is to provide an outline of the present literature and thus the present state of research with the intention of identifying the research gap in chapter 4.

#### 3.1. Procedure for Literature Review

This chapter aims to provide an overview of the structure and methodology used in conducting the systematic literature review. It is designed to ensure that the reader can understand and replicate the findings presented in the following chapter 3.2. The diagram presented in Figure 11 (refer to Appendix 1) illustrates the seven-step procedure followed during the review process, which is briefly described below.

**Step 1:** Initially, an exploratory literature review was conducted to obtain a preliminary understanding of the literature field related to the *Core Topic of Interest* and to subsequently formulate appropriate search strings. A free try-and-error search was performed using various search strings to identify relevant articles. A total of 50 potentially interesting articles were identified, and the key messages of each were extracted. Subsequently, the articles were categorized based on their relevance to the *Core Topic of Interest*, with 28 out of the 50 articles considered as *relevant* or *highly relevant*, while the remaining 22 were deemed *medium relevant* or *of little relevance*.

**Step 2:** Drawing on the knowledge gained from the exploratory literature review and a preliminary understanding of the literature field, seven search strings were formulated that approach the *Core Topic of Interest* from various perspectives. The purpose of these search strings was to comprehensively cover the main topic by considering it from different angles. The search strings are listed in Figure 12 (refer to Appendix 1).

**Step 3:** Using the formulated search strings, a comprehensive search was conducted in all available databases in EBSCO. The search results yielded a total of 1,195 articles (Figure 11 illustrates the distribution of articles retrieved by each search string). Of the initial 28 *relevant* and *highly relevant* articles identified in the exploratory search, 25 were included in the search results obtained using the formulated search strings, indicating that the *Core Topic of Interest* was well covered by the search strings.

**Step 4:** After the initial results were obtained, the articles were screened based on their titles, and the irrelevant articles were eliminated. This resulted in 30% of the articles that were initially identified.

**Step 5:** The remaining 359 were subjected to screening at the abstract level to identify their relevance. The irrelevant articles were sorted out, leaving 9% of the initially identified articles. In this step, duplicate articles that were identified in multiple search strings were identified and removed accordingly.

**Step 6:** After a closer examination of the remaining 99 articles on full-text level, 83 of them were deemed to be highly relevant to the *Core Topic of Interest*.

**Step 7:** In addition to the results of the structured search, two articles were included manually based on either the initial unstructured search or their relevance as cited in other relevant articles. As a result, a total of 85 articles that met the eligibility criteria were categorized, and significant findings were extracted. The outcomes of this analysis are presented in the subsequent chapter 3.2.

### **3.2. Results of Literature Review**

This chapter aims to provide a comprehensive overview of the results obtained from the literature review. Figure 3 offers a visual representation of how the literature field is organized in this study, with the *Core Topic of Interest* at its centre. In analysing the literature field, three key characteristics were identified: *Domain*, *Category of Communication Outcome* (refer to chapter 2.2, Input), and *Coaching Mode* (refer to chapter 2.2, Output). Each article was subsequently categorized according to its domain and assigned to either a category of communication outcome or a coaching mode or both, resulting in two distinct subfields. The first subfield, *Communication Outcomes*, explores communication outcomes in different domains with a focus on video communication and thus focuses on the output side of communication. The second subfield, *Video Coaching*, examines different modes of communication in video coaching across different domains and thus focuses the input side of communication. Together, these subfields aim to frame the *Core Topic of Interest*.

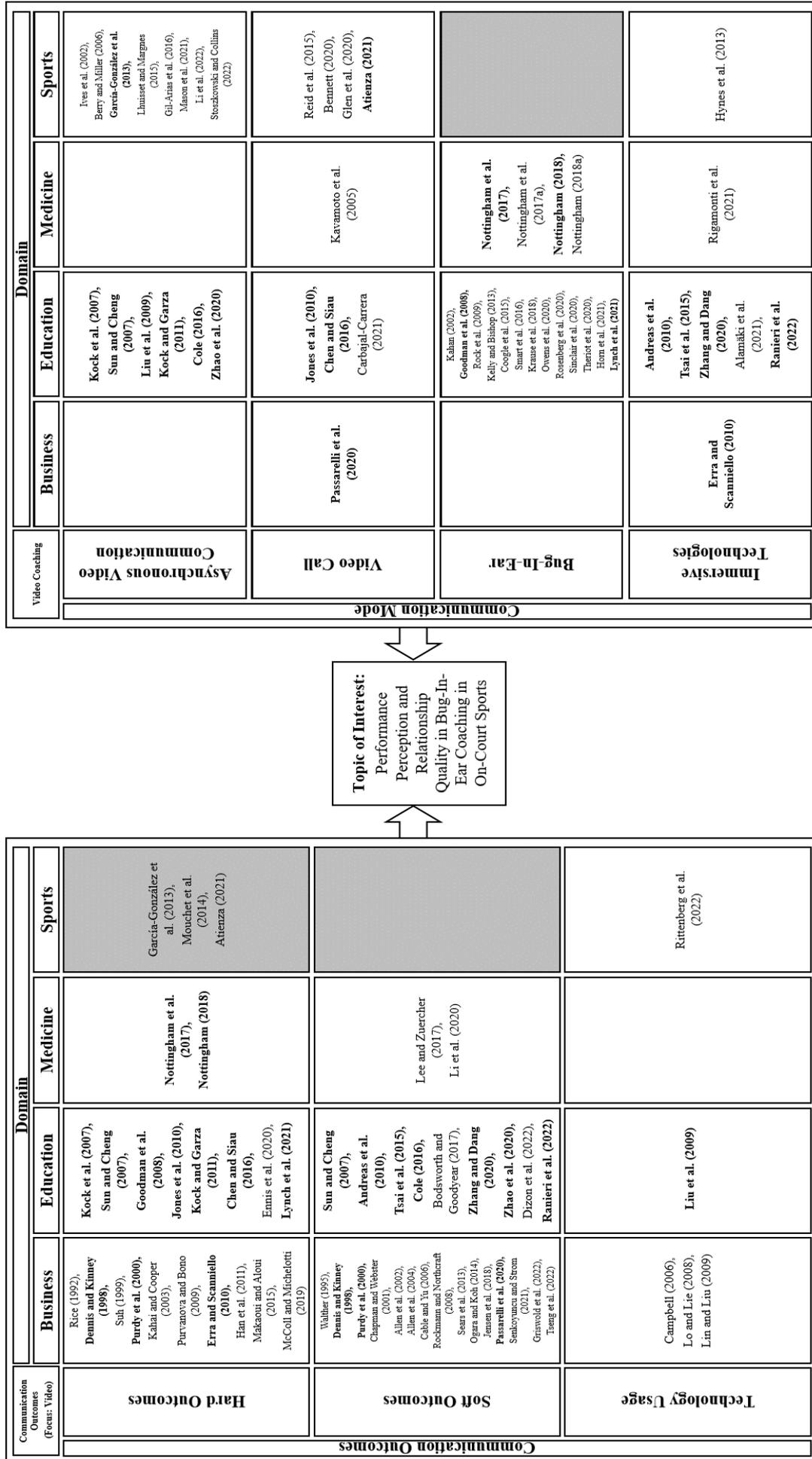


Figure 3 - Overview Literature Fields and Research Gaps

The following chapters present the detailed findings in the discovered domains (chapter 3.2.1) as well as the two subfields of literature (chapters 3.2.2 and 3.2.3) and their respective contributions to the *Core Topic of Interest*.

### **3.2.1. Domain**

The articles identified in the systematic literature review were categorized into one of four domains: *Business* (refer to chapter 3.2.1.1), *Education* (refer to chapter 3.2.1.2), *Medicine* (refer to chapter 3.2.1.3), or *Sports* (refer to chapter 3.2.1.4). The term *Domain* refers to the field of application in which the article is relevant, irrespective of its actual object of study. Analysing the domain is crucial as it provides the context for understanding the research and its significance. Therefore, it may serve to underscore the potential for further investigation into unexplored areas, thereby paving the way for future research endeavours.

The following section provides a brief overview of each domain and its relevance to the *Core Topic of Interest*, without delving into content-specific outcomes. As domain is a distinguishing factor in both literature subfields, the chapters on communication outcomes and video coaching will examine the domain in greater detail, along with their specific outcomes.

#### **3.2.1.1. Business**

In the literature field *Communication Outcomes*, the domain *Business* is prominent alongside the domain *Education* in terms of article frequency. However, the literature on *Video Coaching* has a limited representation of this domain. The identified articles within the broad field of *Business* address topics such as recruiting, communication with customers or inter-company communication, leadership, and co-working.

##### **Recruiting**

Several of the identified articles examine the effects of communication media on the organizations' interaction with applicants and the effects on the recruitment process. Among other, the authors Griswold et al. (2022), McColl and Michelotti (2019), and Sears et al. (2013) focus on the use of video calls or other CMC media as an addition or alternative to traditional F2F employment interviews, with a particular emphasis on the advantages of low cost (Chapman and Webster 2001) and geographical independence in the increasingly global competition for employees (Chapman and Webster 2001; Griswold et al. 2022). Among other topics, the articles investigate the impact of communication media on various aspects of the recruitment process, such as applicants' interview and interaction behaviour (e.g., Griswold et al. 2022; McColl and Michelotti 2019; Sears et al. 2013), applicants' pre-hire perceptions (Allen et al. 2004), and the organizational image (Cable and Yu 2006).

### **Communication with Customers and Inter-Company Communication**

Tseng et al. (2022) investigates the impact of communication media on customer loyalty in the context of online gaming, whereas Makaoui and Aloui (2015) examines the influence of communication media on inter-organizational relationships within supply chains.

These use cases involve communication between an organization and external parties, similar to the case of recruiting. In contrast, the following two categories are characterized by their focus on internal communication within an organization.

### **Leadership**

Some of the articles identified in the literature investigate the impact of communication media on leadership (e.g., Jensen et al. 2018; Passarelli et al. 2020; Senkoyuncu and Strom 2021). For instance, Passarelli et al. (2020) examine how the choice of media affects the relationship between leaders and employees. Digital communication, particularly video communication, is expected to have advantages over F2F communication, such as timesaving and the ability for managers to engage with more employees (Jensen et al. 2018), as well as the possibility of leading fully virtual teams (Purvanova and Bono 2009). Kahai and Cooper (2003) and Senkoyuncu and Strom (2021) provide managers with implications on selecting technology that is suitable for their organizational settings with a focus on task-technology fit.

### **Co-Working**

Several of the identified articles explore the impact of communication media on co-working among colleagues (e.g., Erra and Scanniello 2010; Lin and Liu 2009; Ogara and Koh 2014). Specifically, Walther (1995) differentiates between two types of communication: task-oriented and relational (identity, roles, character, relationship) communication, while Rockmann and Northcraft (2008) focuses on the social aspects of communication that result from media use. Lo and Lie (2008) and Rice (1992) examine the relationship between optimal communication media and task and investigate whether performance improves when there is a good fit. Ogara and Koh (2014) emphasizes the importance of real-time communication options for teams, regardless of their geographical location. Many articles examine team performance in terms of quality and quantity of output (e.g., Dennis and Kinney 1998; Han et al. 2011; Purdy et al. 2000).

In summary, the domain *Business* contributes to the *Core Topic of Interest* in two ways. Firstly, it examines the deployment of video calls as a substitute for F2F communication and its associated impacts, which parallels the shift from F2F coaching to video coaching in sports. Secondly, the relationship between leaders and employees as well as communication among

employees may exhibit similarities to the coach-student relationship in sports, which refers to the *Core Topic of Interest*.

### **3.2.1.2. Education**

In terms of quantity, the domain *Education* is the most prominent domain, comprising over a third of all articles. The literature is well-represented in both literature fields, *Communication Outcomes* and *Video Coaching*. Research has been conducted across a wide range of educational institutions, including professional education (Jones et al. 2010), universities (e.g., Dizon et al. 2022; Lynch et al. 2021; Tseng et al. 2022), elementary schools (Owens et al. 2020), high schools (Kahan 2002), and colleges (Chen and Siau 2016) as well as institution-independent language learning (Carbajal-Carrera 2021), and special education (e.g., Coogle et al. 2015; Horn et al. 2021; Rosenberg et al. 2020).

The articles can be classified into two primary categories: distance learning as a substitute for classroom education and the utilization of BIE to enhance classroom education. Notably, there seems to be a particular emphasis on physical education.

#### **Replacement of Classroom Education**

Several articles investigate the impact of digital alternatives on learning outcomes compared to F2F instruction (e.g., Carbajal-Carrera 2021; Dizon et al. 2022; Tseng et al. 2022). Carbajal-Carrera (2021) cite the COVID-19 pandemic as a trigger for research, while Kock et al. (2007) cite the increased flexibility and convenience of digital alternatives as well as the need to find solutions for time and distance constraints of students. Also, the emergence of learning tools based on the internet is named as reason for rise in online education within institutions of higher education can be attributed to (Kock et al. 2007).

In terms of technology, investigations cover a wide range of approaches. Some articles test the impact of interactive learning through video calls (e.g., Carbajal-Carrera 2021; Chen and Siau 2016; Kock and Garza 2011), while others investigate asynchronous online or e-learning (e.g., Kock et al. 2007; Tseng et al. 2022; Zhao et al. 2020). Zhang and Dang (2020) test blended environments that combine both F2F and online components, while Andreas et al. (2010) investigate collaborative learning in Second Life, a platform discussed in more detail in chapter 3.2.3.4. Alamäki et al. (2021) and Ranieri et al. (2022) test the learning effects of virtual reality and 360° videos on knowledge transfer and student motivation.

#### **Improvement of Classroom Education**

Numerous articles explore the utilization of BIE technology (e.g., Krause et al. 2018; Sinclair et al. 2020; Theriot et al. 2020) to enhance classroom education. The approach involves

connecting the classroom teacher to a remote teacher-teacher system, enabling paraprofessional teachers (Rosenberg et al. 2020) and student teachers (Lynch et al. 2021; Kahan 2002; Theriot et al. 2020) with insufficient coaching to perform their duties effectively.

The approach offers various benefits, described in chapter 3.2.3.3.

### **Physical Education**

The literature in domain *Education* places particular emphasis on physical education (e.g., Bodsworth and Goodyear 2017; Lynch et al. 2021; Krause et al. 2018). Since physical education pertains to sports, these articles could also fall under the domain *Sports*. However, since they focus on teaching and teacher-student relationships content-wise, they are categorized in the domain *Education*. Most of the articles explore teach-the-teacher scenarios (e.g., Dizon et al. 2022; Smart et al. 2016; Theriot et al. 2020). Notably, Bodsworth and Goodyear (2017) specifically examines the use of digital technologies, such as mobile devices, in the context of physical education.

A significant contribution to the main topic pertains to the shift from F2F to digital education and its implications, which are analogous to those of the transition from F2F coaching to video coaching in sports. Moreover, sports coaching and education share numerous similarities, such as the transfer of knowledge and the coach-student relationship. Furthermore, BIE and teach-the-teacher scenarios are highly relevant to the *Core Topic of Interest*, because they involve the virtual presence of the teacher during the lesson, akin to BIE coaching in on-court sports. The difference, however, is that in the teach-the-teacher scenario the communication between coach and the coach's coach is digitally mediated, whereas in on-court sports it is the communication between coach and student that is of interest.

### **3.2.1.3. Medicine**

In terms of quantity, the domain with the least representation in both fields of literature is *Medicine*. However, some articles explore digital communication among medical personnel. For example, Rigamonti et al. (2021) investigates long-distance research and clinical collaborations and explores ways to connect remote experts over long distances. Additionally, clinical BIE supervision in supporting the education of clinical students is explored in Nottingham (2018a; 2018b), Nottingham et al. (2017a), and Nottingham et al. (2017b).

Other articles focus on digital communication between medical personnel and patients. This approach can be used to provide quality healthcare services cost-effectively in rural, underprivileged areas (Li et al. 2020; Kavamoto et al. 2005). In general, digital communication can expand access to quality healthcare services. While the aforementioned applications in the domain

of *Medicine* all deploy synchronous communication, Lee and Zuercher (2017) delves into the barriers and advantages of asynchronous digital written doctor-patient communication.

The main contribution to the *Core Topic of Interest* is the deployment of 1:1 synchronous video or BIE communication, which has similarities to communication in BIE sports coaching.

### **3.2.1.4. Sports**

In terms of content, *Sports* is the most significant domain for this paper as it encompasses the *Core Topic of Interest*. However, the importance is not adequately reflected in the number of articles identified in the literature on *Communication Outcomes* and *Video Coaching*.

#### **Coaching Development with Focus on the Coach**

Bennett (2020) emphasizes the importance of high-quality coaching in achieving success in sports. Some articles focus on improving coaching, with an emphasis on the coach's behavior. Mouchet et al. (2014) analyzes coaching behavior in rugby using video analysis, while Stoszowski and Collins (2022) investigates the use of asynchronous video exchange platforms to promote collaborative learning and analytical dialogue among student-coaches. Rittenberg et al. (2022) examines the relationship between coaching experience, coaching efficacy, and the use of technology in golf coaching.

#### **Video Communication between Coach and Student**

In addition, there are articles that investigate various applications of video communication between coaches and students. One such application is the *demonstration* of complex movements, as seen in the use of asynchronous video communication for strength training in martial arts (Lhuisset and Margnes 2015; Li et al. 2022) and athletic training (Berry and Miller 2006).

Another application is post-game *analysis*, where individualized asynchronous videos are used to analyze the own in-game performance. Such analyses can help students improve their decision-making skills and tactical knowledge (e.g., Canal-Bruland et al. 2007; García-González et al. 2013; Gil-Arias et al. 2016). Therefore Bennett (2020) introduces a platform for amateurs to receive feedback from expert coaches, which promotes high coaching quality for everyone while Mason et al. (2021) investigates the effectiveness of video feedback provided by coaches. Another application are synchronous *video calls* that are used in various off-court coaching scenarios, such as individual and team video sessions between a hockey team and a psychologist (Reid et al. 2015) and video coaching warm-up and coordination sessions for tennis players during the COVID-19 pandemic (Glen et al. 2020). Atienza (2021) investigates the use of synchronous video calls for strength and power training in golf, while Hynes et al. (2013) examines the use of wearable technologies to monitor students' performance.

### **Coach-Student Relationship**

The coach-student relationship is also an important aspect of sports coaching literature, with Stanford et al. (2022) discussing key characteristics for managing and maintaining a long-term coach-student relationship. Davis et al. (2018) and Woolliams et al. (2021) investigate the impact of the quality of the coach-student relationship on student performance and the factors influencing such a relationship. It should be noted that these elaborations on the relationship are unrelated to video coaching or any other digital coaching format.

Overall, *Sports* is the most significant domain for the *Core Topic of Interest*, particularly in the deployment of synchronous video coaching and the elaboration of the coach-student relationship. However, it is noticeable that the literature almost exclusively focuses on professional sports rather than amateur sports and all synchronous video call applications can be specified as off-court coaching (refer to chapter 2.2). There was no literature found on digital synchronous on-court coaching, which is further discussed in chapter 4 as a literature gap.

### **3.2.2. Communication Outcomes**

This chapter presents a comprehensive summary of the literature field *Communication Outcomes* and its relevance to the *Core Topic of Interest*. The primary objective is to examine the communication outcomes in any form of video communication in conjunction with the understanding of domains introduced in chapter 3.2.1. Based on the analysis, three distinct types of communication outcomes have been identified, namely *Hard Outcomes* (chapter 3.2.2.1), *Soft Outcomes* (chapter 3.2.2.2), and *Technology Acceptance* (chapter 3.2.2.3). Chapter 2.2 provides a definition of these outcome types and their differences. This chapter comprises three subchapters, each dedicated to one of the outcome types. In total, 51 articles have been included in this literature field.

#### **3.2.2.1. Hard Outcomes**

Nearly 50% of the 51 articles examined focus on hard outcomes, with business and education domains having a higher number of articles than medicine and sports.

In the realm of business, the most extensively researched topics are the influence of communication medium choice on the effectiveness and efficiency of business interactions, as well as the appropriateness of the media used for specific tasks. Despite the Media Richness Theory's existence, authors do not unanimously agree on whether the medium used has an impact on the aforementioned outcomes.

On the one hand, some studies indicate that richer media positively affect effectiveness. For example, Erra and Scanniello (2010) discover that in software development, the richness of the

communication medium used by the development team affects software quality in terms of the number of issues that arise. Kahai and Cooper (2003) support this finding by examining Cue Multiplicity and Feedback Immediacy as parts of media richness (refer to chapter 2.3) and find that both have a positive impact on decision quality. Additionally, McColl and Michelotti (2019) find that the chosen medium has an impact on recruiting outcomes.

On the other hand, Han et al. (2011) cannot find evidence supporting the notion that the medium used for an initial short meeting of a group, which subsequently works together via asynchronous text communication, has an impact on decision quality in the later process. Mixed results are identified by Makaoui and Aloui (2015) in inter-company communication (refer to chapter 3.2.1.1). They show that media has an impact on supply chain cooperation, but email and F2F communication show the best results, while video communication does not promote cooperation. This contradicts the media order established in the Media Richness Theory (refer to chapter 2.3).

Regarding efficiency, Erra and Scanniello (2010) and Purdy et al. (2000) find evidence supporting the notion that media richness positively influences negotiation time. Some studies explore whether there is an interaction effect between task condition, media richness, and performance. Dennis and Kinney (1998) and Suh (1999) find no interaction effect on decision time or decision quality. Lastly, Rice (1992) find little support for an interaction effect on performance.

In the domain *Education*, the primary focus is on learning effectiveness. While Sun and Cheng (2007) report that high media richness does not necessarily improve learning performance over low media richness, most other studies support the use of high media richness in educational settings. Chen and Siau (2016) even suggest that the younger generation of college students prefer technology-mediated communication over F2F interaction. In health professional education, Jones et al. (2010) find no difference in learning performance between video calls and F2F teaching. Similarly, Kock et al. (2007) and Kock and Garza (2011) report no difference in performance between university students taught through video and those taught F2F, but only after a period of acclimatization. They report lower performance for video-taught students midway through the semester, but equal performance by the end of the semester. This finding supports the Channel Expansion Theory (refer to chapter 2.3), which suggests that experience with a particular medium and situation impacts the perceived media richness, not the medium alone (refer to chapter 2.3).

Regarding BIE, in special education, Goodman et al. (2008) find that learning performance of students can be improved if the student teacher is supported by BIE technology compared to a

F2F scenario. Additionally, Lynch et al. (2021) find that student teachers themselves prefer BIE observations over F2F if the experienced supervisor is more experienced than the physical one. This implies that the communication partner's expertise has a greater impact on the communication outcome than the media used.

In the domain *Medicine*, BIE teaching is used in clinical education. While Nottingham et al. (2017a) find that BIE can reduce the time spent on managerial tasks and instructions, Nottingham (2018a) shows that it does not improve learning performance compared to F2F.

In *Sports*, there are no articles specifically addressing hard outcomes of BIE, but some studies show that athletic training via video call can increase strength and power over a 16-week period (Atienza 2021) and video analysis of one's own in-game performance can improve cognitive expertise (García-González et al. 2013).

Overall, there is mixed feedback in the literature, but a majority of articles support Media Richness Theory and Channel Expansion Theory for hard outcomes. Video communication, particularly BIE, can be an adequate alternative to F2F scenarios in coaching and can even outperform it in some cases.

### **3.2.2.2. Soft Outcomes**

This category encompasses a little bit more than the half of the 51 articles. Similar to hard outcomes, there is a strong representation in the *Business* and *Education* domains. However, there are only two articles in the domain *Medicine*, and no articles on soft outcomes in the domain *Sports*. In terms of the *Core Topic of Interest*, the main focus of research on soft outcomes is on how communication media affects the relationship between communicators.

Passarelli et al. (2020) emphasizes the importance of effective communication as the foundation of high-quality coaching relationships, highlighting that the coach-student relationship is pivotal for achieving positive coaching outcomes. The authors further suggest that communication media with higher subjective richness, as perceived by the student, can lead to improved relationship quality and a stronger sense of trust. However, they find no significant effect of objective media richness on these outcomes.

In the domain *Business*, Purdy et al. (2000) demonstrate that media richness affects outcome satisfaction in negotiations and decision-making. Therefore, media selection should be done with caution. However, Rockmann and Northcraft (2008) argue that video-mediated communication cannot completely replace F2F communication in co-working teams, as it may lead to non-cooperative behaviour and dishonesty. In contrast, Walther (1995) suggests that electronic communication can have a positive impact on some aspects of interpersonal communication (e.g., communication about character, role, and relationship), compared to F2F communication,

while other dimensions remain unchanged. For long-term relationships, Senkoyuncu and Strom (2021) even find that video calls as well as texting can enhance the perceived quality of the relationship.

Soft outcomes of media usage in recruiting are well-represented in the literature. Allen et al. (2002; 2004) find that the delivery media of recruitment messages influence the perceptions of communication outcomes, attitudes, and intentions. However, when it comes to recruitment interviews, Sears et al. (2013) observe that video employment interviews have a negative impact compared to F2F interviews. Interviewers tend to rate applicants lower and are less inclined to recommend them for the position, while applicants perceive the video interviews as less relevant to the job and feel they have fewer chances to perform well. However, according to Chapman and Webster (2001), if interviewers perceive the media as having lower richness, they tend to rate the applicant more favorably by making external attributions for their performance. Furthermore, Cable and Yu (2006) and Jensen et al. (2018) find that the media richness of recruiting media has an impact on initial beliefs about the firm as well as the employee's attraction to the organizational mission.

In the domain *Education*, multiple scenarios are investigated. In blended learning environments (refer to chapter 3.2.1.2), Tsai et al. (2015) demonstrate that integrating multimedia tools in the classroom can increase students' attention. Zhang and Dang (2020) add that media richness has a significant impact on students' perception of the learning climate, task-technology fit, and learning flexibility. For physical education, Bodsworth and Goodyear (2017) find that when integrating digital technologies, unfamiliarity with technology and poor group cooperation are the main barriers to pupil learning. In the scenario of synchronous online courses in university education, Cole (2016) finds no evidence that a student's preference for F2F education negatively impact their satisfaction with online courses. Students' communication satisfaction with the online instructor has the most significant impact on satisfaction with the online course. Andreas et al. (2010) add that online collaborative learning via virtual environments can increase students' interest, participation, and amusement compared to media of lower richness. In asynchronous e-learning, Zhao et al. (2020) find that media richness has a positive impact on learners' virtual experience. Sun and Cheng (2007) add that using media of high richness in all cases to increase learning performance is not effective. The fitness of content and media is important for learners' performance and satisfaction.

In the domain *Medicine*, Li et al. (2020) discover that patient satisfaction with telemedicine consultations is affected by the perceived media richness, along with diagnostic complexity and the fulfilment of healthcare needs for the patient in question.

In the domain *Sports* there are no articles that elaborate on soft outcomes related to video communication.

In general, there is a significant body of evidence supporting both Media Richness Theory and Channel Expansion Theory, regarding the influence of subjective and objective media richness on soft communication outcomes.

### **3.2.2.3. Technology Usage**

Technology usage is a peripheral area in this discussion and is included here for the sake of completeness, with only 5 relevant articles identified. The focus is on the factors that influence the choice of medium, which then is considered as outcome.

In the domain *Business*, Campbell (2006) and Lo and Lie (2008) find that user apprehension and perceived media richness are significant factors influencing media choice. Regarding the introduction of new media, Senkoyuncu and Strom (2021) note that they do not instantly replace old media, but rather provide users with an additional choice. Lin and Liu (2009), Cole (2016), and Lo and Lie (2008) discuss adoption criteria and name the main factors as perceived critical mass, perceived usefulness, perceived price, perceived enjoyment, perceived ease of use, network externality, ability to facilitate friendship development, personalization of communication, and sense of connection to one's community. In the domain *Education*, Liu et al. (2009) identify a continuous growth of e-learning market with streaming media as one of the main segments. Rich content presentation and perceived usefulness are the main factors for adoption. According to Rittenberg et al. (2022), technology usage in the domain *Sports* has increased exponentially in recent years and provides coaches with more opportunities to enhance the performance of their athletes. For instance, in golf, a coach's higher technique efficacy increases their use of technology in coaching, while coaching experience does not have a significant impact (Rittenberg et al. 2022).

These factors should be taken into consideration when introducing a new means of communication, although this information is not directly relevant to the *Core Topic of Interest*, it can help to increase the adoption of the BIE coaching solution.

### **3.2.3. Coaching Mode**

While the field *Communication Quality* (refer to chapter 3.2.2) elaborates on the communication outcomes, in this chapter, the focus is on the used media as communication input. With 47 articles, the literature field *Coaching Mode* is comparable to the literature field *Communication Quality*. Together they strive to encompass the *Core Topic of Interest*. The articles in the field *Coaching Mode* examine the transfer of knowledge or skills through different means of video-

mediated communication between coaches and students. Four different types of coaching modes have been identified: asynchronous video, video call, BIE, and immersive technologies. The literature on coaching modes has adequate coverage of all types of modes. However, the distribution of the modes across different domains varies. For detailed specifications and delimitations of each coaching mode, refer to chapter 2.2. The subsequent chapters examine the utilization of each coaching mode in various domains, arranged in ascending order of media richness.

### **3.2.3.1. Mode: Asynchronous Video**

This coaching mode is defined by the utilization of asynchronous videos as a means of communication. This results in one-way communication, which limits the student to the consumption of the videos with no opportunity for immediate reaction. The identified literature exclusively employs this mode within the domains *Education* and *Sports*.

In the domain *Education*, asynchronous video communication is primarily used in the context of e-learning, which has become an important method of learning with advances in computers and the internet (Kock et al. 2007; Sun and Cheng 2007; Cole 2016). It is characterized by 1:n communication, with the coach providing a video to multiple students (Liu et al. 2009; Kock et al. 2007; Sun and Cheng 2007). The provided videos typically contain the same content as would have been provided in a F2F lecture (Kock et al. 2007; Kock and Garza 2011). For questions and remarks, an asynchronous text-based communication channel is often provided between coach and students (Kock et al. 2007; Cole 2016). Asynchronous delivery of content offers students flexibility in time and space (Liu et al. 2009; Kock et al. 2007; Sun and Cheng 2007), making learning more convenient for the students (Kock et al. 2007; Zhao et al. 2020). The asynchronous nature of video learning places greater responsibility on the students, which is why it is predominantly offered to older or more experienced learners, such as those in university (Liu et al. 2009; Kock et al. 2007), adult education (Zhao et al. 2020), and senior high school (Sun and Cheng 2007). Zhao et al. (2020) identifies the feeling of telepresence and social presence as an important factor in keeping participants engaged. The richness of e-learning is found to be crucial to the learning performance and satisfaction of students (Liu et al. 2009; Sun and Cheng 2007). Zhao et al. (2020) and Kock et al. (2007) find that asynchronous video learning has no negative impact on learning performance after an acclimatization period. Similarly, Cole (2016) finds no evidence that a student's preference for F2F learning has a negative impact on satisfaction with online courses, but communication satisfaction with the coach was found to be the most significant predictor of students' satisfaction with online courses.

In the domain *Sports*, two types of applications of asynchronous video communication are identified: instructional and analytical. The instructional application is similar to the one found in education, characterized by the 1:n provision of generalized videos for individual consumption by multiple students (Lhuisset and Margnes 2015; Li et al. 2022). Research by Lhuisset and Margnes (2015) finds that video demonstrations of complex movements are more effective than live demonstrations, possibly due to the simplification of visual information caused by the loss of one dimension in the video representation compared to F2F. Examples of its use include Kungfu core strength training (Li et al. 2022) and complex judo movements (Lhuisset and Margnes 2015). Fitness instruction videos provided on platforms like YouTube, however, are not represented in the identified literature.

On the other hand, the analytical application is characterized by personalized asynchronous 1:1 communication, where video recordings of the student's own in-game situations are provided for analysis. This approach aims to improve tactical knowledge, decision making, cognitive expertise, and technical skills. The coach may include comments or leading questions in combination with the video provision (e.g., Gil-Arias et al. 2016; Ives et al. 2002; Mason et al. 2021). Compared to other use cases, this coaching situation is highly personalized as it is tailored to the specific student or team. The availability of digital video systems hardware and software has made broader usage of video analytics feasible (Ives et al. 2002).

### **3.2.3.2. Mode: Video Call**

The coaching method video call is characterized by synchronous two-way video communication and is used across multiple domains, primarily in education and sports. Although only one article in the domain *Business* was found, it discusses the use of 1:1 video calls in executive coaching and leadership development and emphasizes that the choice of media affects the coach-student relationship (Passarelli et al. 2020).

In the domain *Education*, interactive video calls are rather used as a replacement for lectures, but for more personal or practical situations in smaller groups, such as tutorials or language learning classes (Jones et al. 2010; Chen and Siau 2016; Carbajal-Carrera 2021). The trend towards remote learning due to the global COVID-19 pandemic is cited as a reason for the increased use of video calls by Carbajal-Carrera (2021), while Chen and Siau (2016) already noted before the pandemic that the new generation of college students prefers technology-mediated communication over F2F interactions in the context of education. According to Jones et al. (2010), there is no difference in grades or experience between the two learning scenarios.

In the domain *Medicine*, video calls are used for small-grouped courses, as described by Kavamoto et al. (2005) in online courses for amputee rehabilitation and back pain. The advantage

of using video calls in medicine is the decreased need for travel for patients with disabilities in rural areas with limited health care infrastructure.

In the domain *Sports*, two applications of video calls are identified. Reid et al. (2015) describes video calls as a medium for video-mediated psychology sessions in elite sport, similar to scenarios in *Education* and *Medicine*. On the other hand, most of the applications found in *Sports* are in real sports coaching. Glen et al. (2020) uses video calls for coordination and skill practices for youth tennis coaching, Bennett (2020) for high-performance movement coaching in Japanese martial arts, and Atienza (2021) for the strength training of a golfer. It is notable that these are all single and no team sports, and video calls are exclusively used in off-court scenarios. The reasons for the deployment of video calls in sports coaching are the possibility for coaches and students to stay in contact and conduct coaching sessions without getting in F2F contact during the COVID-19 pandemic (Glen et al. 2020; Atienza 2021) and the possibility to enable consistency in coach-student relationships, even when F2F exchange is limited (Bennett 2020; Atienza 2021).

### **3.2.3.3. Mode: Bug-In-Ear**

This communication mode is crucial for *Core Topic of Interest*. The 17 articles analyzed primarily focus on *Education*, with a few articles related to *Medicine*, but none in the domains *Sports* or *Business*. The BIE communication technology is exclusively utilized in 1:1 coaching scenarios.

There are several variations of BIE, which differ based on how the camera for the video stream is positioned. For example, the camera may be worn by the student, allowing the coach to see things from the student's perspective (Kelly and Bishop 2013). Additionally, stationary mobile devices (e.g., Horn et al. 2021; Krause et al. 2018; Lynch et al. 2021) or permanently installed video systems (Theriot et al. 2020) may be used. Finally, BIE scenarios may also involve only a 1:1 audio connection without any video (e.g., Goodman et al. 2008; Nottingham 2018a; Nottingham 2018b).

BIE is primarily employed for instructing student teachers (e.g., Coogle et al. 2015; Rosenberg et al. 2020; Theriot et al. 2020) in the domain *Education*. The literature mostly focuses on special education and physical education (e.g., Lynch et al. 2021; Rock et al. 2009; Smart et al. 2016). Across all articles, the primary benefit of BIE is seen as the immediate and real-time feedback it provides (e.g., Horn et al. 2021; Kahan 2002; Sinclair et al. 2020), which enhances the quality and timeliness of feedback (Kelly and Bishop 2013; Rosenberg et al. 2020). This immediate feedback improves the use of communication strategies by teachers (Coogle et al. 2015) without disrupting the instructional environment (Lynch et al. 2021; Owens et al. 2020),

making it a discreet medium of communication during class (Kahan 2002). Moreover, BIE can help overcome time and financial constraints for expert coaches (Kelly and Bishop 2013), reducing travel time and costs (Kelly and Bishop 2013; Lynch et al. 2021; Rosenberg et al. 2020), and significantly increasing the number of student teachers supported by experts (Rosenberg et al. 2020). Lynch et al. (2021) find that student teachers prefer BIE over traditional F2F coaching if the virtual coach has greater expertise than the onsite one.

In *Medicine*, BIE is used solely without video for clinical education of students (Nottingham 2018b; Nottingham 2018a; Nottingham et al. 2017a; Nottingham et al. 2017b).

### **3.2.3.4. Mode: Immersive Technologies**

The objective of this chapter is to provide a broad overview of technical communication solutions that surpass BIE in terms of media richness. Eight articles are identified that discuss these solutions.

In the domain *Business*, Erra and Scanniello (2010) propose Second Life, a distributed three-dimensional virtual environment where each participant is represented as an avatar, for negotiating software requirements. Andreas et al. (2010) and Tsai et al. (2015) describe how Second Life is used as a collaborative learning platform in *Education* to increase student interest, participation, and engagement. Similarly, 360° videos and virtual reality (Alamäki et al. 2021; Ranieri et al. 2022) are used in *Education* for the same reasons. In *Medicine*, Rigamonti et al. (2021) explore the use of augmented reality with two-way video communication for long-distance research and clinical collaboration. In *Sports*, Hynes et al. (2013) describes the possibility of coaches tracking their students' real-time performance via wearable data, which can aid in planning, monitoring, and comparing coaching sessions.

All these applications demonstrate that there are numerous technical possibilities available to enhance coaching, with even more possibilities emerging constantly. This emphasizes the need for continued research in this direction to further improve coaching.

## **4. Research Gaps and Hypotheses**

The previous chapter 3 provided a comprehensive review of the existing literature. The current chapter aims to identify any gaps in the literature related to the *Core Topic of Interest* (chapter 4.1). Subsequently, specific research questions are formulated to address these gaps (chapter 4.2). Finally, based on the insights gained from chapter 3, hypotheses are proposed to answer the research questions and fill the identified gaps in the literature (chapter 4.3). These hypotheses are tested in chapter 5.

## 4.1. Research Gaps

In chapter 3 two literature fields are introduced, that attempt to address the *Core Topic of Interest*. The field *Video Coaching* examines the technical and media input side (refer to chapter 3.2.3), while the field *Communication Outcomes* focuses on the outcome side (refer to chapter 3.2.2), which also considers media richness. Although the *Core Topic of Interest* is within the domain *Sports*, the search was not restricted to this domain but rather open to others. Figure 3 highlights two research gaps in these literature fields that are noticeable due to the shortage of articles. However, the lack of research in these areas can also be explained in terms of content.

### Research Gap on Input Side

In the field of *Video Coaching*, the domain *Sports* is well represented, but it is noticeable that all video mediations only support off-court coaching, and there is no article about digitally supported on-court coaching (refer to chapter 3.2.1.2). This may be due to the fact that traditional video media like video call are difficult to use in on-court situations, and media with which it would be possible - like BIE - are not represented in sports literature. The literature reveals that sports coaching research predominantly focuses on low richness video coaching formats, such as asynchronous communication and video calls, with no studies addressing the use of BIE technology in sports coaching (as discussed in chapter 3.2.3.3). This observation contrasts with Smart et al.'s (2016) report of BIE technology being utilized in professional football to facilitate communication between coach and quarterback and in NASCAR races to enhance communication between coaches and drivers.

There are multiple factors contributing to this research gap, including the assumption that BIE is either already implemented or not perceived as a comprehensive communication solution in the professional sports setting. Additionally, within the amateur sector, various barriers may hinder the adoption of BIE, such as limited familiarity with technology, concerns about reduced personal interaction, and constraints in terms of time and financial resources required for digital coaching methods.

However, there are some initial developments in this area. For instance, the COVID-19 pandemic highlighted the need for digital communication in sports (Glen et al. 2020; Atienza 2021).. Additionally, the technological prerequisites for implementing BIE coaching have become more accessible, with the proliferation of wireless earphones and internet contracts offering increased data volume. Nevertheless, the question remains as to who has a vested interest in advancing video coaching, as thus far, there has been a lack of interest in BIE coaching solutions, particularly in the amateur sector of sports. Nonetheless, with the current availability of the

necessary technology, there is potential to attract start-ups and investors to foster research in this field.

### **Research Gap on Output Side**

In the domain *Sports*, there is a scarcity of research on *Communication Outcomes* of video-mediated communication, particularly in relation to the concept of media richness, with only three articles focusing on hard outcomes and no research on soft outcomes. The scarcity of research on the input side of communication is expected to contribute to the limited number of studies on the output side. This is primarily due to the fact that the examination of communication outcomes can only be pursued when the communication medium itself is actively utilized. It can also be assumed that in sports, the primary focus is on athletic performance, and coach-student communication is not regarded as a significant factor that influences athletic performance. In contrast, other fields already have recognized the importance of communication and its impact on diverse outcomes. Therefore, the dearth of research in this domain could signify significant potential for improvement in sports coaching.

## **4.2. Research Questions**

Based on the identified research gaps, several essential questions arise that need to be addressed to complement existing literature to cover the *Core Topic of Interest*. Firstly, in relation to the input side, the feasibility of implementing video-mediated coaching in on-court sports using BIE technology must be examined. This inquiry is the focus of research question *RQ1*.

**RQ1:** Is it practical and cost-effective to carry out BIE coaching in on-court sports, considering the availability of necessary materials, set-up effort, and difficulty?

The answer to *RQ1* is a prerequisite to the exploration of more interesting questions related to the impact of digital coaching and its comparison with traditional F2F coaching. The outcomes are to be examined separately, as described in chapter 3.2.2. Performance perception (refer to chapter 2.2), which represents hard outcomes, is of primary interest in sports since performance is the primary outcome of competitive sports. Therefore, research question *RQ2* is formulated.

**RQ2:** Does BIE coaching in on-court sports have an impact on performance compared to F2F coaching as perceived by the student?

The answer to *RQ2* could be crucial for the future use of BIE technology in sports coaching. Similarly, the effects of BIE coaching on soft outcomes, specifically on the quality of the coach-student relationship (refer to chapter 2.2), which is representative of soft outcomes, need to be studied. This information is the focus of *RQ3*.

**RQ3:** Does BIE coaching in on-court sports have an impact on relationship quality between coach and student during one coaching session compared to F2F coaching as perceived by the student?

Answering these three research questions could significantly contribute to addressing the identified research gaps in sports coaching.

### 4.3. Hypotheses

The empirical study conducted in chapter 5 focuses on addressing the research questions introduced in chapter 4.2. The primary objective of this chapter is to establish hypotheses regarding the anticipated outcomes of the study, drawing on insights obtained from existing literature and domain expertise.

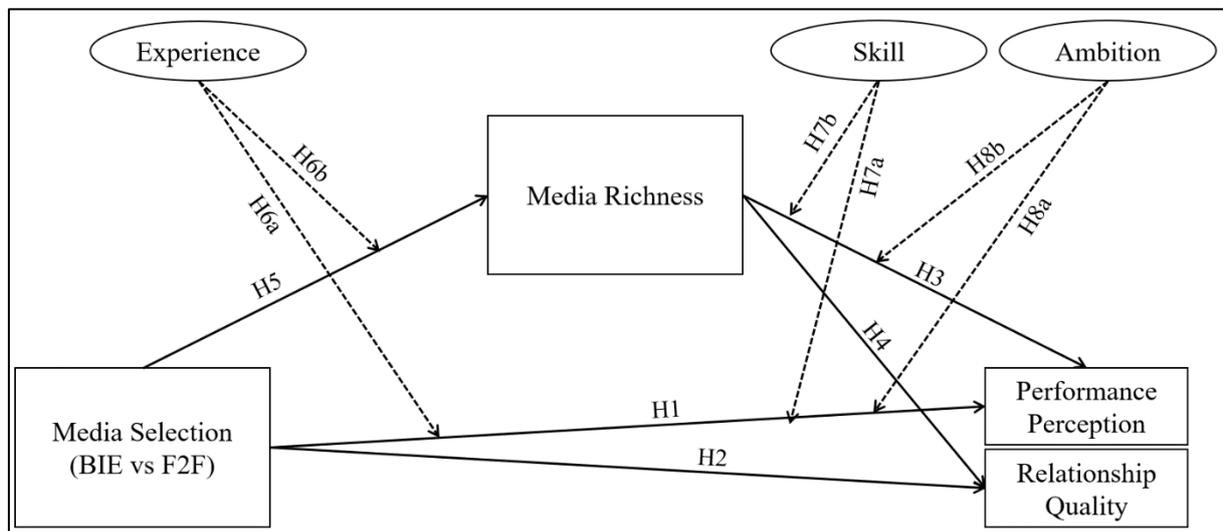


Figure 4 - Research Model and Hypotheses

To accomplish this, the communication scenario outlined in the study overview (refer to Figure 1) is examined in greater detail. Figure 4 illustrates the key components, including the independent input variable *Media Selection*, the two dependent output variables *Performance Perception* and *Relationship Quality*, the mediating construct *Media Richness*, and the three moderator variables *Experience*, *Skill*, and *Ambition*. The paths connecting these variables are labelled with the respective hypotheses, which are presented and substantiated in the following sections. These hypotheses are formulated to address *RQ2* and *RQ3*. *RQ1*, on the other hand, is answered in chapter 6.1 without predefined hypotheses. With the exception of *H6a* and *H6b*, all hypotheses were formulated prior to conducting the study (refer to Appendix 2). Figure 4 provides a comprehensive overview of all hypotheses examined in the study and their support. The first fundamental hypothesis posits that BIE coaching has a positive impact on hard outcomes, particularly *Performance Perception* (refer to chapter 2.2). This hypothesis is based on several factors discussed in chapter 3.2.3.3. The advantages of BIE coaching, such as the

improved quality and timeliness of feedback without disrupting the instructional environment, are considered beneficial in sports coaching. By utilizing BIE coaching, coaches can provide immediate feedback to students during in-game situations without interrupting the flow. Additionally, compared to F2F coaching, BIE coaching allows coaches to have a better visual perspective, as they are not restricted to standing on the sidelines and can provide feedback without resorting to shouting. Further support for this hypothesis can be found in chapter 3.2.2.1, where it is noted that in other scenarios, such as special education, the use of BIE coaching has already been shown to enhance performance compared to F2F coaching. Considering these points collectively, it leads to the formulation of hypothesis *H1*.

**H1:** BIE communication mode in sports coaching will increase performance perception compared to F2F scenario.

The second fundamental hypothesis states that BIE coaching does not have a negative impact on soft outcomes, specifically *Relationship Quality* (refer to chapter 2.2). It could be argued that relationships may suffer due to the digital mediation of communication. However, it is assumed that the potential drawbacks in personal contact resulting from digital mediation are offset by the improved communication properties mentioned earlier. This assumption is supported by the findings presented in chapter 3.2.2.2, which do not provide clear evidence for the impact of BIE coaching on *Relationship Quality*. Additionally, insights from Lynch et al. (2021) discussed in chapter 3.2.3.3 suggest that *Relationship Quality* is influenced more by the individuals involved rather than the communication medium used. Based on these considerations, hypothesis *H2* is formulated.

**H2:** BIE communication mode in coaching will not result in a worse short term relationship quality between coach and player compared to F2F communication.

While *Media Selection* can be considered as determining the objective media richness (refer to chapter 2.3), in Figure 4, *Media Richness* represents the subjective media richness as perceived by the student (refer to chapter 2.3). It is assumed to act as a mediating construct for the two aforementioned hypotheses. The underlying concept is that higher *Media Richness* has a positive impact on hard outcomes (refer to chapter 3.2.2.1) and at the very least does not have a negative impact on soft outcomes (refer to chapter 3.2.2.2). This leads to the formulation of hypotheses *H3* and *H4*.

**H3:** Perceived media richness is positively associated with performance perception.

**H4:** Perceived media richness will not affect the short-term relationship quality between coach and player negatively.

For the path from *Media Selection* to *Media Richness*, it is posited that BIE coaching leads to a higher perceived media richness than F2F coaching in the specific context of on-court sports coaching. This contradicts the fundamental assumption that F2F communication is always the richest medium (refer to chapter 2.3). However, it can be argued that in the context of on-court, in-game sports coaching, the most crucial aspect of communication between coach and student is the immediate provision of feedback. As described earlier, delivering feedback through headphones in high quality and timely manner is considered to be richer than a coach shouting from the sidelines, where the student may only understand parts of the message or receive delayed feedback. Based on these considerations, the bold hypothesis *H5* is formulated.

**H5:** For on-court sports coaching, BIE communication mode will result in increased perceived media richness compared to F2F communication.

Having formulated the hypotheses for the fundamental assumptions and the mediating construct, now additional hypotheses regarding the moderating effects of certain constructs are introduced. As explained in chapter 2.3, the subjective perception of media richness is influenced by the communicators' experience in addition to the chosen medium. In this context, *Experience* serves as a moderator for the effects of *Media Selection* on *Media Richness* and the direct effects of *Media Richness* on *Performance Perception*. These considerations lead to the formulation of two hypotheses, namely *H6a* and *H6b*.

**H6a:** The direct effect stated in *H1* is moderated by the experience of the player, where higher experience would lead to stronger effect.

**H6b:** The direct effect stated in *H5* is moderated by the experience of the player, where higher experience would lead to stronger effect.

The *Skill* and *Ambition* of the student are introduced as additional moderating variables. It is hypothesized that advanced and highly motivated students in sports, who are already knowledgeable and eager to improve, will experience an even more positive impact on their *Performance Perception* through the use of BIE coaching. Beginners who need to learn fundamental movements and foundations may place greater importance on personal contact and visual cues from the coach for coaching success. As skill levels increase and coaching focuses shift from technique to tactics and in-game situations, BIE coaching may become more effective in these scenarios. Therefore, it is assumed that *Skill* and *Ambition* act as moderators in this context, influencing the relationship between the *Media Selection* and its outcomes. These assumptions based on practical domain experience and observations result in the hypotheses *H7a*, *H7b*, *H8a*, and *H8b*.

**H7a:** The direct effect stated in *H1* is moderated by the skill of the player, where higher skill would lead to stronger effect.

**H7b:** The direct effect stated in *H3* is moderated by the skill of the player, where higher skill would lead to stronger effect.

**H8a:** The direct effect stated in *H1* is moderated by the ambition of the player, where higher ambition would lead to stronger effect.

**H8b:** The direct effect stated in *H3* is moderated by the ambition of the player, where higher ambition would lead to stronger effect.

## 5. Empirical Study

The purpose of this chapter is to address the research gaps identified in chapter 4.1 by examining the research questions formulated in chapter 4.2 and empirically testing the corresponding hypotheses put forward in chapter 4.3. The overarching purpose of the study is to contribute to the *Core Topic of Interest*. To achieve this objective, a field experiment was conducted. In chapter 5.1, the study's foundations are introduced. Subsequently, in chapter 5.2, the analysis methods used and the corresponding results are presented.

### 5.1. Study's Foundation

The primary objective of this chapter is to offer a comprehensive overview of the essential elements that form the basis of the field experiment conducted. These elements include providing background information about the study (chapter 5.1.1), detailing the experiment design and procedure (chapter 5.1.2), providing an overview of the measures and scales employed in the study (chapter 5.1.3), and presenting a descriptive account of the sample participants (chapter 5.1.4). By establishing these foundational aspects, readers will be better equipped to assess and interpret the results presented in chapter 5.2.

#### 5.1.1. Background

Up until now, the research and argumentation have encompassed on-court sports coaching as defined in chapter 2.2 in a general sense. However, for the purposes of this study, the scope is limited to the sport of tennis. While the investigation focuses on coaching rather than the sport itself, the findings may still be considered applicable to other sports, although certain limitations should be considered. The rationale behind selecting tennis as a representative sport stems in part from the collaboration with the cooperating company ahead-coach, as outlined in chapter 2.4. ahead-coach played a significant role in the study by providing access to potential participants and the necessary infrastructure to conduct BIE coaching. Furthermore, the company

served as the driving force behind the entire study, introducing a novel coaching approach that is relatively unexplored within the realm of sports coaching. Tennis was also deemed suitable for the study due to its nature as an on-court sport with a stationary playing area.

### **5.1.2. Experiment Design and Procedure**

Within the framework of the field experiment, on-court tennis coaching sessions were conducted. Each session was intended to involve two students and one coach, lasting for one hour on a single tennis court (with minor deviations observed in practice, such as variations in the number of students). The content and structure of the coaching sessions were not standardized but tailored by the respective coach to accommodate the individual interests and skills of the students involved. The manipulation aimed at examining the *Core Topic of Interest* entailed distinguishing between F2F and BIE coaching sessions. This results in a 2x1 factorial design with two experimental conditions: F2F and BIE. The design adopts a between-subject approach, in which each participant was assigned to only one experimental condition to eliminate any potential sequence effects during evaluation. The number of participants was deliberately chosen to ensure adequate representation from both cells, allowing for comparability between the groups and facilitating population inference. To mitigate potential biases arising from exceptionally skilled or ineffective coaches, measures were implemented to limit the number of coaching sessions conducted by any individual coach to a maximum of three. This approach aimed to minimize the impact of coaching proficiency variations on the outcomes of the study. Prior to commencing the experiment, the study was pre-registered, with the hypotheses outlined in chapter 4.3 and the planned analysis steps uploaded on AsPredicted (refer to Appendix 2). Subsequently, data collection was carried out over a period of more than 5 weeks, encompassing approximately 30 coaching sessions. The first coaching session occurred on February 23, 2023 and the last session took place on March 31, 2023. After each coaching session, all participants completed a questionnaire (refer to Appendix 3) designed to measure the constructs of interest, which will be elaborated upon in detail later in this chapter.

The field experiment required significant organizational effort, including the recruitment of test students and coaches, coordinating their availability in terms of time and location, arranging the use of tennis courts, and providing technical setups (the latter only in BIE cells). All of these activities were carried out without a dedicated financial budget, further amplifying the challenges associated with organizing the experiment.

### 5.1.3. Measures and Scales

The questionnaire, available in Appendix 3, serves as a tool for measuring all the constructs necessary for testing the hypotheses. The constructs of interest, shown in the model depicted in Figure 4, include *Media Selection*, *Media Richness*, *Performance Perception*, *Relationship Quality*, and the moderators *Experience*, *Skill*, and *Ambition*. Additionally, the questionnaire collects supplementary information for exploratory analyses, such as willingness to pay.

To measure some of these constructs, established scales from existing literature are adopted. The following description outlines how each construct is measured in the questionnaire and its role within the model depicted in Figure 4.

#### Media Selection

The construct *Media Selection* is utilized to differentiate between the two experimental cells, similar to the procedure of Rockmann and Northcraft (2008). It takes on two possible values, BIE and F2F, and is measured as a binary categorical variable in the questionnaire, with a value of 1 assigned to BIE and a value of 0 assigned to F2F. Within the model, the *Selection of Medium* serves as an independent variable.

#### Performance Perception

The construct *Performance Perception* is defined as a hard outcome of communication in chapter 2.2. To ensure comparability, a standardized measure of performance is required. Given that each coaching session is unique and focuses on individual coaching objectives, there is no single subjective measure to assess performance. Therefore, the students' perception of their own performance is used as a measure of performance in a comparable manner. This approach is also employed by Suh (1999), who utilizes a 10-item questionnaire ( $\alpha=0.81$ ) on seven-point Likert scale to assess process satisfaction and outcome satisfaction in task performance in business context. As the focus here is on the outcome, only the five items pertaining to outcome satisfaction are selected and adapted to the specific context of tennis coaching (e.g., translated: *I am satisfied with the outcome that the coach and I have achieved.*). Within the model, *Performance Perception* serves as the dependent variable.

#### Relationship Quality

The second dependent variable in the model is *Relationship Quality*, which is characterized as a soft communication outcome in chapter 2.2. To assess *Relationship Quality*, a 12-item questionnaire ( $\alpha=0.95$ ) on seven-point Likert scale is adapted from Gregory and Levy (2010) and Passarelli et al. (2020), who examine *Relationship Quality* in the context of manager coaching (e.g., translated: *I was able to have open and honest conversations with my coach.*).

### **Media Richness**

The construct *Media Richness* in this model refers to the subjective media richness according to Channel Expansion Theory as described in chapter 2.3. It acknowledges that media richness is not solely determined by the medium itself but also depends on the student's perception. To measure this construct, an 8-item questionnaire on seven-point Likert scale, which is commonly used and has demonstrated successful application in previous studies by Dennis and Kinney (1998) ( $\alpha=0.89$ ), Suh (1999) ( $\alpha=0.86$ ), and Wheeler et al. (1995) ( $\alpha=0.88$ ), is employed. The items are respectively adapted to the specific scenario (e.g., translated: *In the given communication environment, the coach was able to explain things easily.*). Within the model, *Media Richness* functions as a mediator variable.

### **Experience**

In chapter 2.3, it is explained that various types of experiences influence the subjective media richness, as described in chapter 2.3. As a result, *Experience* is introduced as a moderator variable in the model. To quantify the measure of *Experience*, two types of experiences are considered. The experience with the communication topic is assessed by the number of years of tennis experience, while the experience with the communication partner is evaluated based on the pre-existing relationship with the coach.

### **Skill**

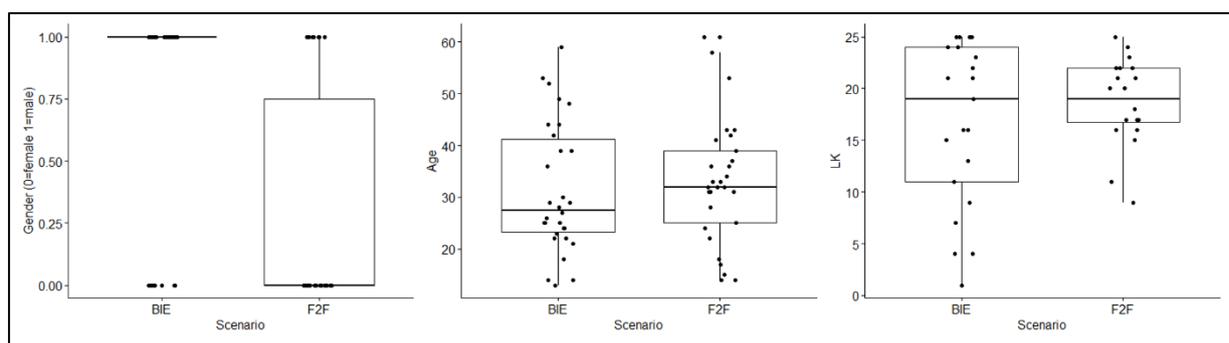
Another moderator variable in the model is *Skill*, which pertains to the tennis skill level of the student. The skill level in tennis is measured by the personal Leistungsklasse (LK), a scale ranging from LK 1 to LK 25, with LK 1 representing professional players and LK 25 absolute beginners.

### **Ambition**

The final construct introduced in the model is *Ambition*, which also functions as a moderator variable and represents the student's ambition to improve their tennis skill. Measuring ambition is not straightforward, but attempts are made to approximate it using several indicators, including the number of matches the student participated in last season, the weekly hours spent on the tennis court, and the frequency of paid tennis coaching sessions.

### 5.1.4. Sample

A total sample of 60 students and 17 coaches were recruited to complete a questionnaire after a coaching session. Subsequently, only the sample of students is taken into consideration as their perspective is sufficient to address the research questions, and given the limited number of coaches available, obtaining statistically significant results would be impractical. The population to be represented by the two experimental cells consists of all tennis players who potentially undergo coaching sessions. The sample is described and analysed in terms of three dimensions: gender, age, and skill. An overview is presented in Figure 5.



*Figure 5 - Sample Description*

Of the 60 students, 30 were assigned to each experimental cell. In the entire sample, there were 29 women, 30 men, and one individual who did not disclose their gender. The distribution of genders within the experimental groups can be observed in Figure 5 (left). Notably, the proportion of females in the BIE cell (26.67%) is significantly lower than in the F2F cell (75.86%). A Welch two-sample t-test indicates a significant difference between the two experimental cells in terms of gender ( $p < 0.01$ ).

The sample covers the entire relevant age range, ranging from 13 to 61 years, with a mean age of 32.19 years. The comparison of age between the experimental cells is presented in Figure 5 (middle). The mean ages of 31.47 years in the BIE cell and 32.93 years in the F2F cell are relatively similar and the Welch two-sample t-test did not find significant evidence for a difference between the two experimental cells ( $p > 0.6$ ).

The sample encompasses the entire LK range, with a mean LK of 17.63. The comparison of skill levels between the experimental cells is displayed in Figure 5 (right). The BIE cell has a slightly better mean LK of 16.67 compared to the F2F cell with a mean LK of 18.65. Notably, the best player in F2F scenario has only an LK of 9, while the BIE scenario includes players of better skill (up to LK 1). However, the Welch two-sample t-test does not find significant evidence for a difference between the two experimental cells in terms of skill ( $p > 0.3$ ).

In summary, it can be concluded that the two experimental groups, particularly in terms of gender, are not perfectly balanced. Nevertheless, and especially since gender is not classified

as a decisive factor in this study, the overall distribution is satisfactory and sufficient for a meaningful interpretation of the analysis results.

## **5.2. Analysis and Results**

Following the establishment of the study's foundations in chapter 5.1, this chapter focuses on the analysis of the collected data and the presentation of the corresponding results. The results are further interpreted and discussed in chapter 6.

The initial step involves assessing the suitability of the measurement items used to quantify the constructs introduced in chapter 5.1.3 (chapter 5.2.1). Subsequently, the hypotheses proposed in chapter 4.3 are tested using a mediated and moderated regression model (chapter 5.2.2). Finally, the chapter concludes with the presentation of insights derived from explorative analyses conducted in the study (chapter 5.2.3).

### **5.2.1. Evaluation of Measurements Scales in Questionnaire**

To assess the adequacy and performance of the measurement scales introduced in chapter 5.1.3 within the specific context of this study, a Confirmatory Factor Analysis (CFA), is employed. The purpose of this analysis is to determine which items from the measurement scales should be used to calculate the respective measures. The procedure and results of the CFA are elaborated in the following section. Specifically, the CFA is conducted for the measurement scales related to the constructs of *Media Richness*, *Performance Perception*, and *Relationship Quality*, which are adopted from existing literature.

#### **Procedure of the CFA**

Initially, a model is constructed encompassing the three constructs, which are represented by all the initial items included in the questionnaire that are intended to describe the respective construct. The process involves iteratively evaluating the indicator reliability (IR) of each item, which represents the share of the indicator's variance explained by the underlying construct, and subsequently per construct eliminating the item with the lowest IR, if it falls below the threshold of 0.45. This procedure, including the recalculation of the model, is repeated until no item remains with an IR below 0.45. It is worth noting that the established threshold of 0.4 (Fleiss 1981) is increased to a stricter value of 0.45 in order to achieve good measurement quality. By adhering to this elevated threshold, the ensuing set of items fulfils the quality criteria outlined below. Therefore, the final selection consists of 4 out of the initial 8 items for measuring *Media Richness*, 2 out of the initial 5 items for measuring *Performance Perception*, and 8 out of the initial 12 items for measuring *Relationship Quality*. The construct value for each participant is determined by calculating the arithmetic mean of the remaining item values.

## Results of the CFA

<i>Construct</i>	<i>Item</i>	<i>Factor Loading</i>	<i>Indicator Reliability</i>	<i>Mean</i>	<i>Standard Deviation</i>
Media Richness	MR_1	0.78	0.61	6.23	0.83
	MR_2	0.80	0.64	6.05	0.91
	MR_3	0.80	0.63	5.92	1.08
	MR_5	0.79	0.62	5.75	1.32
Performance Perception	PP_1	0.88	0.77	5.87	1.02
	PP_2	0.67	0.45	6.02	0.85
Relationship Quality	RQ_4	0.70	0.49	6.25	1.05
	RQ_5	0.87	0.75	6.27	1.22
	RQ_6	0.79	0.62	6.10	1.12
	RQ_7	0.94	0.88	6.00	1.35
	RQ_8	0.91	0.82	5.82	1.43
	RQ_9	0.91	0.83	6.27	1.34
	RQ_10	0.78	0.61	5.67	1.24
	RQ_11	0.70	0.49	5.88	1.17

*Table 1 - Confirmatory Factor Analysis Results on Item Level*

The descriptive statistics for the remaining items are presented in Table 1. It is evident that all IRs surpass the threshold of 0.45. Furthermore, all factor loadings, which represent the strength and direction of the relationship between item and underlying construct, exceed the threshold of 0.5, indicating good convergent validity (Lin and Liu 2009).

<i>Construct</i>	<i>Mean</i>	<i>Standard Deviation</i>	Correlation Matrix with $\sqrt{\text{AVE}}$ on diagonal			<i>Cronbach's Alpha</i>	<i>AVE</i>
			(1)	(2)	(3)		
(1) Media Richness	5.99	0.88	<b>0.79</b>			0.86	0.63
(2) Performance Perception	5.94	0.83	0.70	<b>0.80</b>		0.73	0.64
(3) Relationship Quality	6.03	1.06	0.81	0.63	<b>0.84</b>	0.95	0.71

*Table 2 - Confirmatory Factor Analysis Results on Construct Level*

Based on these findings, the results are evaluated at the construct level, as depicted in Table 2. The internal consistency of the measurement model is assessed using Cronbach's Alpha, which quantifies the extent to which the items are consistently measuring the same underlying construct. All values of Cronbach's alpha exceed the threshold of 0.7 for acceptable results (Nunnally 1978). Also, the Average Variance Extracted (AVE), which represents the average indicator reliability across all items, for all constructs exceeds the threshold value of 0.5 (Fornell and Larcker 1981). Additionally, the Fornell and Larcker (1981)-criterion is examined, which is satisfied when the correlation between two constructs is smaller than the square root of the AVEs of the individual constructs. This criterion is met for all construct pairs, except for the pair of *Media Richness* and *Relationship Quality*, suggesting some similarity between these measures in terms of discriminant validity. However, since all other criteria are met, the scales for these constructs appear to be functioning adequately.

<b>Model 0 - Media Richness (Mediator)</b>					
	<i>R</i>	<i>R</i> <sup>2</sup>	<i>MSE</i>	<i>F</i>	<i>p</i>
	0.0748	0.0056	0.8111	0.1050	0.9568
<i>DV</i>	<i>Predictor</i>	<i>Coeff</i>	<i>SE</i>	<i>p-Value</i>	
Media Richness	Intercept	5.9891	0.1660	0.0000	
	Media Selection	-0.0048	0.2341	0.9838	
	Experience	-0.0842	0.3358	0.8028	
	Int_1	-0.0236	0.3989	0.9530	
<b>Model 1 - Performance Perception 1</b>					
	<i>R</i>	<i>R</i> <sup>2</sup>	<i>MSE</i>	<i>F</i>	<i>p</i>
	0.7624	0.5813	0.3305	10.3140	0.0000
<i>DV</i>	<i>Predictor</i>	<i>Coeff</i>	<i>SE</i>	<i>p-Value</i>	
Performance Perception	Intercept	1.4256	0.8340	0.0939	
	Media Selection	0.4729	0.2246	0.0401	
	Media Richness	0.7274	0.1331	0.0000	
	Experience	-0.2519	0.2232	0.2642	
	Int_1	0.5156	0.2725	0.0640	
	Skill	0.0591	0.0885	0.5072	
	Int_2	-0.0139	0.0292	0.6360	
	Int_3	-0.0105	0.0141	0.4613	
<b>Model 2 - Performance Perception 2</b>					
	<i>R</i>	<i>R</i> <sup>2</sup>	<i>MSE</i>	<i>F</i>	<i>p</i>
	0.7869	0.6192	0.3006	12.0785	0.0000
<i>DV</i>	<i>Predictor</i>	<i>Coeff</i>	<i>SE</i>	<i>p-Value</i>	
Performance Perception	Intercept	1.8206	0.5072	0.0007	
	Media Selection	0.3438	0.1339	0.0205	
	Media Richness	0.6603	0.0830	0.0000	
	Experience	-0.4220	0.2215	0.0623	
	Int_1	0.6319	0.2585	0.0179	
	Ambition	1.1078	0.8154	0.1801	
	Int_4	-0.5610	0.2220	0.0146	
	Int_5	-0.1208	0.1290	0.3533	
<b>Model 3 - Relationship Quality</b>					
	<i>R</i>	<i>R</i> <sup>2</sup>	<i>MSE</i>	<i>F</i>	<i>p</i>
	0.8087	0.6539	0.4018	53.8504	0.0000
<i>DV</i>	<i>Predictor</i>	<i>Coeff</i>	<i>SE</i>	<i>p-Value</i>	
Relationship Quality	Intercept	0.2375	0.5730	0.6800	
	Media Selection	-0.0623	0.1637	0.7050	
	Media Richness	0.9728	0.0938	0.0000	

*Notes:* Media Selection: 0 = F2F, 1 = BIE; Int\_1 = Media Selection x Experience; Int\_2 = Media Selection x Skill; Int\_3 = Media Richness x Skill; Int\_4 = Media Selection x Ambition; Int\_5 = Media Richness x Ambition

*Table 3 - Regression Models*

<i>Overall Quality Criteria</i>	<i>Value</i>	<i>Threshold</i>
CFI	0.95	0.90
NNFI	0.94	0.90
NFI	0.86	0.90
RMSEA	0.09	0.10

*Table 4 - Confirmatory Factor Analysis Results on Construct Level*

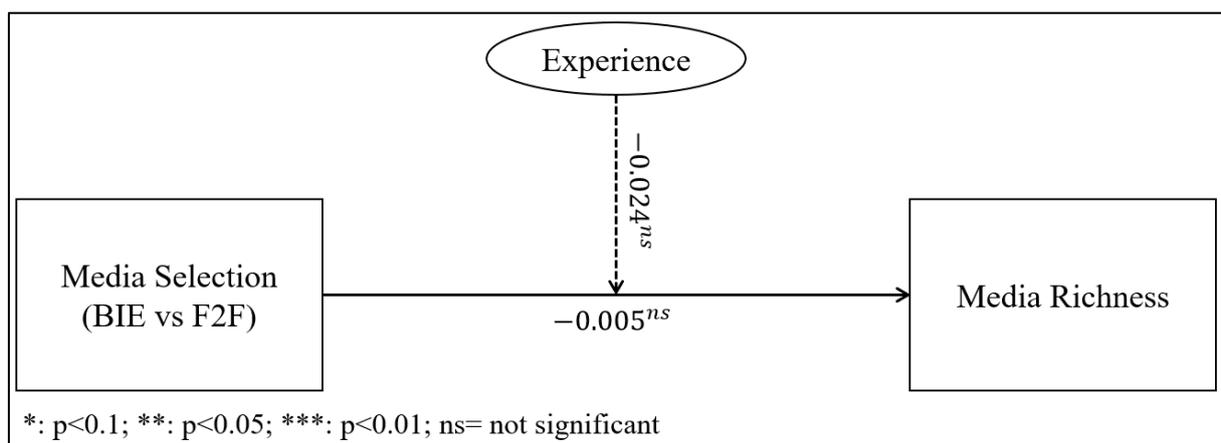
Lastly, Table 4 presents the global goodness-of-fit criteria for the overall model. The Comparative Fit Index (CFI) and the Non-Normed Fit Index (NNFI) exceed the threshold of 0.9 for acceptable values (Homburg et al. 2008). The Normed Fit Index (NFI) slightly falls below the acceptable threshold of 0.9 (Homburg et al.

2008) at 0.86, indicating that it does not fulfil the quality criterion. All three indices, CFI, NNFI, and NFI assess the goodness-of-fit by the comparison of the hypothesised model with a baseline model that assumes no relationships among the variables. The Root Mean Squared Error of Approximation (RMSEA), which assess the discrepancy between the hypothesized model and the observed data, satisfies the quality criterion by remaining below the threshold of 0.1 for acceptable fit (Homburg et al. 2008). Consequently, with three out of four global goodness-of-fit criteria being met, this provides support for the use of good measurement scales.

### 5.2.2. Hypotheses Tests

This chapter aims to empirically test the hypotheses proposed in chapter 4.3 by employing mediated regression models that replicate the model depicted in Figure 4. Specifically, three regression models are required to examine all the hypotheses, and an additional regression model is needed to assess the mediating effect of *Media Richness* in the other models. In chapter 5.1.3, the specific role of each measure in the models is elucidated. Subsequently, each of the models is presented and the results of all regression models are reported in Table 3.

#### Model 0



*Figure 6 - Regression Analysis - Model 0*

Figure 6 illustrates Model 0, which examines the relationship between *Media Selection* and *Media Richness* (hypothesis H5) moderated by *Experience* (hypothesis H6b). This relationship

plays a crucial role in evaluating the mediating effect of *Media Richness* in Models 1-3. As it is a fundamental part of all subsequent models, it is presented separately here.

To test both the hypotheses *H5* and *H6b* simultaneously, a moderated regression analysis using the PROCESS macro Model 1 (Hayes 2018) is conducted. The results shown in Table 3 and Figure 6 indicate that both, the effect of *Media Selection* on *Media Richness* ( $b = -0.005$ ,  $p > 0.1$ ) and the moderating effect of *Experience* ( $b = -0.024$ ,  $p > 0.1$ ) are close to 0 and not statistically significant.

These findings indicate that neither hypothesis *H5* nor *H6b* are supported by the data. However, it is important to note that the data do not reveal a significant negative effect of *Media Selection* on *Media Richness*. The conclusion is simply that no significant correlation can be observed. For a mediating effect to occur, there must be a significant relationship between the independent variable (here *Media Selection*) and the mediating variable (here *Media Richness*). Since this condition is not met, it can be stated that there is no mediating effect of *Media Richness* in any of the subsequent models.

### Model 1

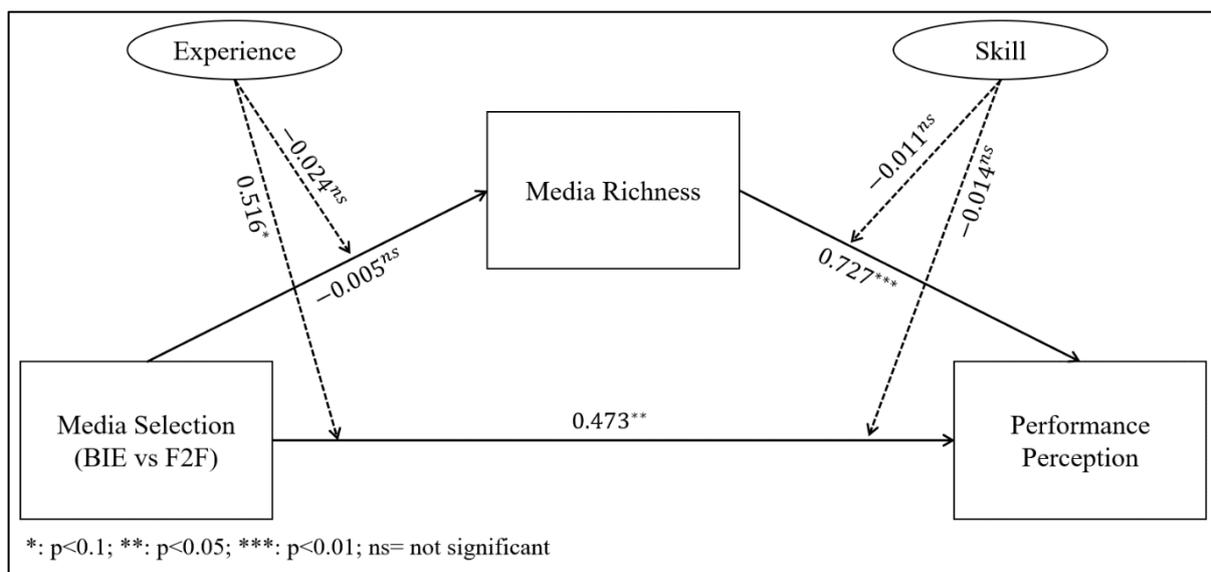


Figure 7 - Regression Analysis - Model 1

In Model 1, the relationships depicted in Figure 7 are examined. Specifically, the impact of *Media Selection* on *Performance Perception* (hypothesis *H1*) mediated by *Media Richness* (hypothesis *H3*) is assessed, with *Experience* (hypothesis *H6a*) and *Skill* (hypotheses *H7a* and *H7b*) acting as moderators. To test these hypotheses, a moderated mediation analysis using the PROCESS macro Model 29 (Hayes 2018) is employed.

As indicated in Table 3 and Figure 7, a significant positive effect of *Media Selection* on *Performance Perception* is observed ( $b = 0.473$ ,  $p < 0.05$ ), supporting hypothesis *H1*. Additionally,

a significant positive moderating effect of *Experience* ( $b = 0.516$ ,  $p < 0.1$ ) is found, indicating that higher levels of *Experience* positively influence *Performance Perception* based on *Media Selection*, thus supporting hypothesis *H6a*. However, there is no support for a moderating effect of *Skill* on this relationship ( $b = -0.014$ ,  $p > 0.1$ ), thus hypothesis *H7a* is not supported.

Although no mediating effect is detected due to the lack of a significant effect from *Media Selection* on *Media Richness*, as discussed in *Model 0*, there is significant evidence for a positive effect of *Media Richness* on *Performance Perception* ( $b = 0.727$ ,  $p < 0.01$ ), supporting hypothesis *H3*. Furthermore, there is no evidence of a moderating effect of *Skill* on this relationship ( $b = -0.011$ ,  $p > 0.1$ ), thus hypothesis *H7b* is not supported.

Overall, with an  $R^2$  of 0.581, MSE of 0.330, and  $p < 0.01$ , there is strong evidence that the model adequately explains *Performance Perception*.

### Model 2

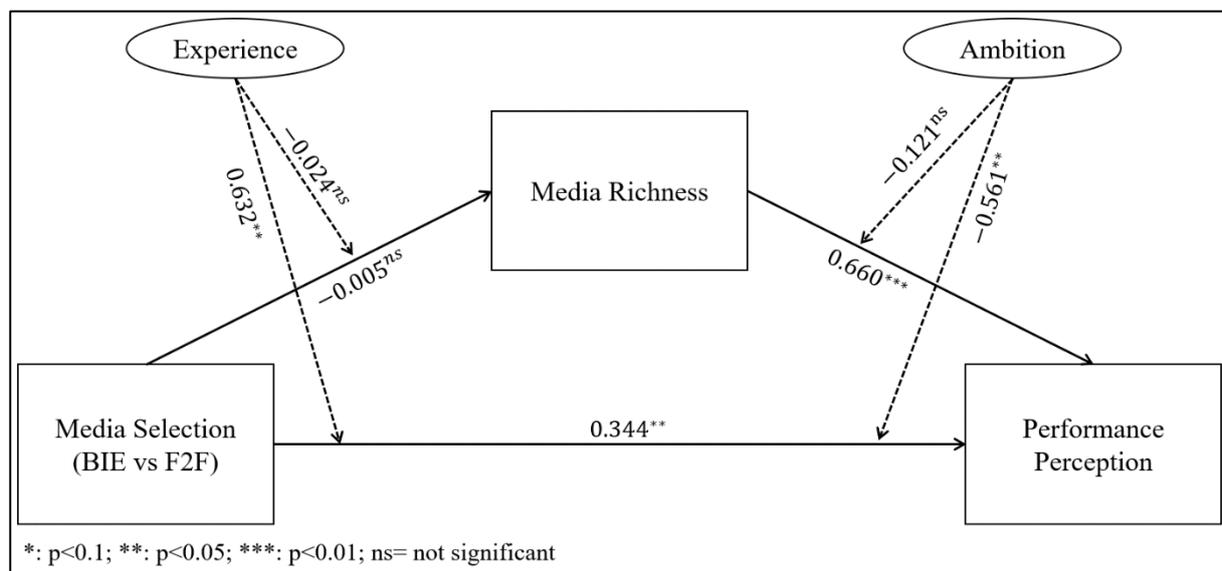


Figure 8 - Regression Analysis - Model 2

As shown in Figure 8, Model 2 exhibits a high degree of similarity to *Model 1*. Due to the missing moderation effect of *Skill*, it is replaced by *Ambition*. Hypotheses *H8a* and *H8b* address these assumptions and examine whether *Ambition* plays a significant role in moderating the relationship between *Media Richness* and *Performance Perception*. Also the results show similarities to *Model 1*. There is a significant positive impact of *Media Selection* on *Performance Perception* ( $b = 0.344$ ,  $p < 0.05$ ). Once again, this effect is mediated by *Experience* ( $b = 0.632$ ,  $p < 0.05$ ), supporting hypotheses *H1* and *H6a*. Furthermore, there is evidence of a significant moderating effect of *Ambition* on this relationship ( $b = -0.561$ ,  $p < 0.05$ ). However, since this moderating effect is negative, it does not support hypothesis *H8a*, which suggests a positive effect.

Similarly, there is still a significant positive effect of *Media Richness* on *Performance Perception* ( $b = 0.660$ ,  $p < 0.01$ ), supporting hypothesis *H3*. Like *Skill*, *Ambition* does not have a significant moderating effect on this relationship ( $b = -0.121$ ,  $p > 0.1$ ), indicating that hypothesis *H8b* is not supported.

With goodness-of-fit parameters of  $R^2 = 0.619$ ,  $MSE = 0.301$ , and  $p < 0.01$ , *Model 2* performs slightly better than *Model 1* in explaining *Performance Perception*.

### Model 3

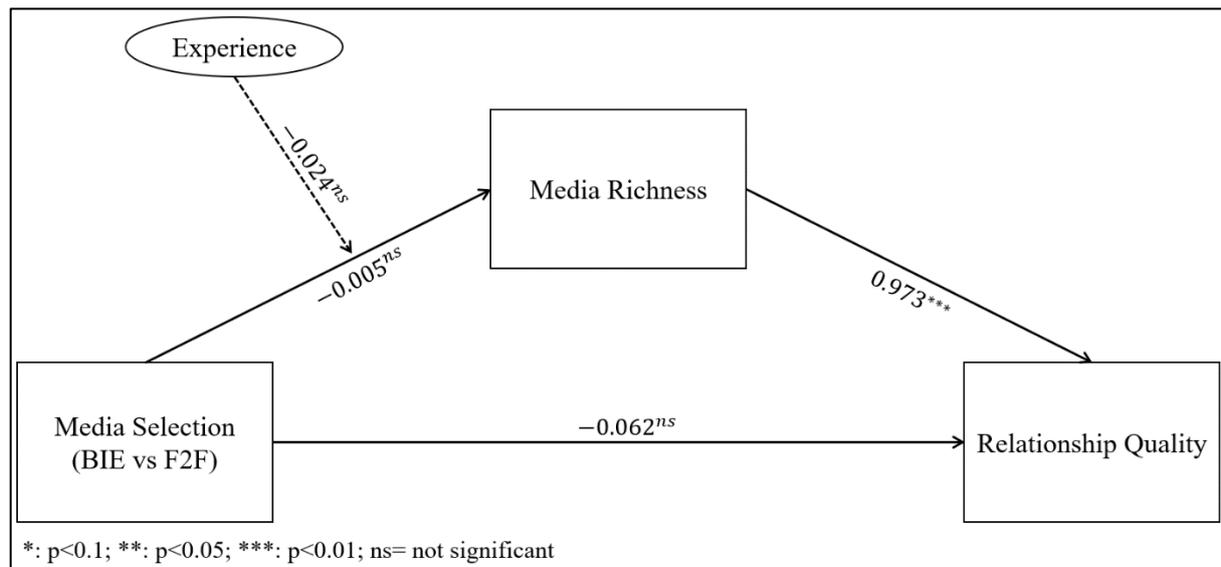


Figure 9 - Regression Analysis - Model 3

Model 3, presented in Figure 9, examines the influence of *Media Selection* on *Relationship Quality* (hypothesis *H2*), mediated by *Media Richness* (hypothesis *H4*), with *Experience* as the moderator. Unlike the previous models, which hypothesize a positive impact, the hypotheses in this model suggest that there is no negative impact. To test these hypotheses, a moderated mediation analysis using the PROCESS macro Model 7 (Hayes 2018) is employed.

The results show highly significant evidence of a strong positive impact of *Media Richness* on *Relationship Quality* ( $b = 0.973$ ,  $p < 0.01$ ), indicating that a negative influence of *Media Richness* can be rejected. This finding supports hypothesis *H4*.

Regarding the effect of *Media Selection* on *Relationship Quality*, there is no significant evidence of an impact ( $b = -0.062$ ,  $p > 0.1$ ), supporting hypothesis *H2*, which suggests no negative impact. Furthermore, statistical power analysis yields a beta value of 0.828 (for  $\alpha = 0.10$ ), which exceeds the threshold of 0.8, providing further support for *H2*.

Overall, with an  $R^2$  of 0.654,  $MSE$  of 0.402, and  $p < 0.01$ , there is strong evidence that the model effectively explains *Relationship Quality*.

## Summary

Table 5 provides a comprehensive overview of all the hypotheses tested in this chapter. It indicates which hypotheses are examined in each model and whether they are supported by the collected data, along with the corresponding significance levels.

Hypothesis	Tested in...				Supported
	Model 0	Model 1	Model 2	Model 3	
H1		X	X		yes**
H2				X	yes~
H3		X	X		yes***
H4				X	yes***
H5	X				no
H6a		X*	X**		yes*/**
H6b	X				no
H7a		X			no
H7b		X			no
H8a			X		no
H8b			X		no

Notes: \*:  $p < 0.1$ ; \*\*:  $p < 0.05$ ; \*\*\*:  $p < 0.01$ ; ~: power analysis

Table 5 - Hypotheses Overview with Analysis Results

### 5.2.3. Willingness to Pay

After demonstrating in chapter 5.2.2 that BIE is a coaching approach that is at least on par with F2F coaching in terms of *Performance Perception* and *Relationship Quality*, this chapter delves into an exploratory analysis of the willingness to pay for one hour of BIE tennis coaching. This investigation expands beyond the research model examined. Nonetheless, from a practical business perspective, understanding the willingness to pay is crucial for assessing the viability of BIE coaching and determining whether the associated costs align with the market's willingness to pay. To evaluate the willingness to pay, the van Westendorp (1976)-method for price sensitivity meter analysis is employed. Although the sample size of 30 per coaching mode falls short of the minimum requirement of 300 for this method, the obtained results can still serve as a preliminary guide.

Figure 10 illustrates, for each coaching mode, the proportion of participants who consider the price to be too cheap, not cheap, not expensive, or too expensive. For BIE coaching, the analysis indicates an acceptable price range ranging from 15.42€ to 38.19€. The point of indifference (intersection of not cheap and not expensive) for BIE coaching is 26.37€, compared to 31.67€

for F2F coaching. The optimal price (intersection of too cheap and too expensive) for BIE coaching is 21.67€, in contrast to 27.50€ for F2F coaching.

These findings demonstrate that there is indeed a willingness to pay for digital coaching. However, it is evident that the willingness to pay for BIE coaching is notably lower than that for F2F coaching. A comparison of the individual intersections of the graphs between the two coaching modes reveals that the willingness to pay for BIE coaching is approximately 20% lower.

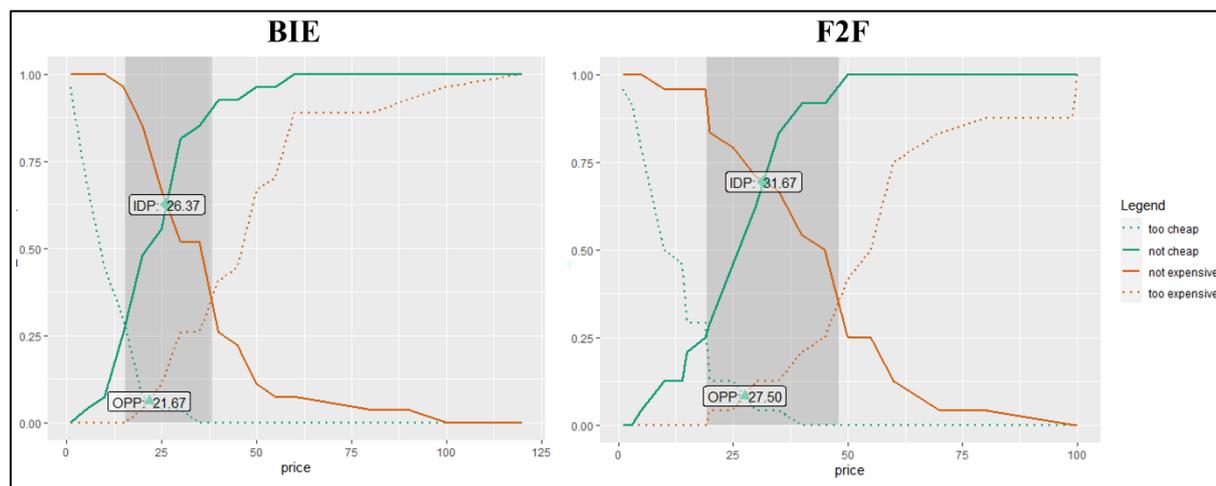


Figure 10 - Willingness to Pay (BIE vs F2F)

## 6. Conclusion

Following the comprehensive account of the methodology and analysis outcomes of the empirical study presented in chapter 5, the objective of this chapter is to draw conclusions from the findings and address the research questions formulated in chapter 4.2 (chapter 6.1), explore the implications for various stakeholders (chapter 6.2), and present the study's limitations (chapter 6.3).

### 6.1. Discussion of Results

The primary focus of this paper is centred around the *Core Topic of Interest*, namely Performance Perception and Relationship Quality in BIE Coaching in On-Court Sports. It is aimed to provide evidence supporting the effectiveness of BIE coaching in sports and its potential as a powerful tool to address the shortage of coaches in the domain *Sports* (refer to chapter 1). The literature review reveals studies examining the use of BIE communication in educational settings and digital communication in off-court sports coaching (refer to chapter 3). However, research gaps are identified concerning the use of BIE in sports coaching and the use of digital communication in on-court sports coaching in general (refer to chapter 4.1). To address these gaps, three research questions are formulated (refer to chapter 4.2) to be subsequently answered

through a field experiment detailed in chapter 5. The findings from the field experiment indicate a positive influence of BIE coaching on *Performance Perception* and no negative impact on *Relationship Quality*. However, a mediating effect of *Media Richness* cannot be established. The following section aims to address the research questions by thoroughly discussing these findings.

Research Question *RQ1* seeks to critically examine the feasibility and cost-effectiveness of BIE coaching from both, practical and business perspectives. Within the empirical study's framework, 30 students participated in BIE coaching, assuming responsibility for the technical setup on site. Since all scheduled coaching sessions were successfully conducted without significant technical issues, it can be inferred that the technical setup is comprehensible and requires reasonable effort. Additionally, no major technical setup problems are reported and the overall technical setup is rated as straightforward.

Regarding the cost-effectiveness of BIE coaching, the analysis in chapter 5.2.3 indicates a willingness to pay for such coaching, albeit 20% lower compared to F2F coaching. Considering the reduced effort for coaches (no travel time and costs) and thus the potential for conducting more sessions within the same timeframe, it is presumed that the willingness to pay is sufficient to cover the necessary expenses. Moreover, the additional costs associated with equipment installation and communication media are negligible since they can be implemented using commonplace objects and standard software. This evidence supports the notion that BIE coaching is viable and advantageous from both technical and business standpoints, addressing *RQ1*.

Research Questions *RQ2* and *RQ3* delve into the impacts of BIE coaching, examining whether this coaching approach is effective in terms of outcomes. The analysis in chapter 5.2.2 demonstrates the presence of the fundamental underlying assumptions and interrelationships. BIE coaching exhibits a significant positive effect on *Performance Perception* compared to F2F coaching (hypothesis *H1*), thus answering *RQ2*. Additionally, no evidence is found to support a negative impact of BIE coaching on the *Relationship Quality* between students and coaches (hypothesis *H2*), answering *RQ3*. These results highlight the effectiveness of BIE coaching in on-court sports, adding a novel dimension to the existing literature and supporting the core message of this paper.

However, it should be noted that the assumed mediation effect of *Media Richness* could not be demonstrated. Specifically, no support is found for the effect of *Media Selection* on *Media Richness*. This finding contradicts both Media Richness Theory and Channel Expansion Theory (refer to chapter 2.3), which both postulate an influence of the medium on *Media Richness*. Furthermore, it challenges the positively hypothesized effect, indicating an overestimation of

the positive impact of BIE coaching (hypothesis *H5*, as discussed in chapter 4.3). The widely accepted consensus in the literature regarding F2F communication being the richest medium remains unchallenged. Nonetheless, this outcome actually has positive implications for BIE coaching, as it demonstrates that despite limited communication compared to the richest channel, i.e., F2F, no negative effect on perceived media richness is observed. This finding is particularly significant considering that perceived media richness strongly and significantly affects both performance perception and relationship quality (hypotheses *H3* and *H4*).

Moreover, no evidence of a moderation effect or any effect at all of *Experience* on *Media Richness* (hypothesis *H6b*) is observed. This result also contradicts the Channel Expansion Theory, which posits that perceived media richness is influenced by both the *Media Selection* and the user's *Experience*. This raises questions about the appropriateness of the measurement scale for *Media Richness*. However, it is worth emphasizing that the chosen scale has been successfully utilized in previous literature (refer to chapter 5.1.3), and a strong positive and significant effect of *Media Richness* on the output constructs is found. Additionally, in chapter 5.2.1, it is successfully demonstrated that the construct of media richness differs from the two outcome constructs.

Nonetheless, evidence does support the assumed moderation effect of *Experience* on the relationship between *Media Selection* and *Performance Perception* (hypothesis *H6a*). Students with more *Experience*, both in tennis and with the communication partner, exhibit a better *Performance Perception* compared to less experienced players. This finding can be attributed to the familiarity of these students with the overall situation and the reduced novelty of the stimuli provided by BIE coaching, leading to fewer distractions. Consequently, the benefits of BIE coaching can be more effectively harnessed, resulting in more successful coaching outcomes.

On the other hand, the hypothesized moderation effects of *Skill* and *Ambition* (hypotheses *H7a*, *H7b*, *H8a*, and *H8b*) are not supported by the data. Potential reasons for this include the limited sample size or the adequacy of the scales used for the moderating constructs. It is also plausible that the assumed effects may not exist in reality. Furthermore, no evidence supporting these effects are found in the literature. They are assumed solely based on the assessment of the partnering company ahead-coach. Therefore, it is possible that the company's target group assumption is disproven.

While not all hypotheses are fully supported, the study demonstrates that BIE represents a viable alternative in sports coaching, with comparable effectiveness to F2F coaching. Therefore, it is crucial to consider BIE as a potential tool to address the persistent shortage of coaches in the sports industry.

## 6.2. Implications and Outlook

This paper contributes equally to both research and practice. Drawing upon the analysis and interpretation of the results presented in chapter 6.1, several implications can be identified for various stakeholders, like coaches, students, sports associations and clubs, and internet providers. This section provides a concise overview of the implications for researchers, sport coaches, sport students, and the company ahead-coach.

### Researchers

Through the conducted study, a significant contribution is made to address the identified research gap and complement it with empirical evidence. This research enhances the understanding of Media Richness Theory and Channel Expansion Theory in relation to newer media by demonstrating the effectiveness of BIE coaching in the field of sports coaching.

Specifically, this present research contributes to the research stream of Coogle et al. (2015) and Owens et al. (2020). The knowledge about BIE coaching in field of sports coaching is extended and BIE is first examined with regards to Media Richness. The finding that BIE can improve *Performance Perception* has the potential to further strengthen this research area.

Furthermore, this paper contributes to the research stream of Media Richness Theory proposed by Daft and Lengel (1983; 1984; 1986) and Passarelli et al. (2020). Specifically, it expands the understanding of *Media Richness* by introducing a new medium, BIE. The absence of an impact on *Media Richness* compared to F2F coaching suggests the need for further research in this area. Nevertheless, in this scenario the data refute the assumption made by Passarelli et al. (2020) that the communication medium influences the coach-student relationship.

Future research should focus on investigating the effectiveness and feasibility of BIE coaching in various sports, as well as exploring alternative communication media as potential mediators. Additionally, conducting studies with larger sample sizes and longer durations is recommended to ensure the robustness and generalizability of the findings. Such research efforts would provide more reliable and comprehensive insights into the impact and effectiveness of BIE coaching in on-court sports, which could also be applicable in other domains.

### Sport Coaches

The study's findings suggest that BIE coaching offers practicality and cost-effectiveness, making it a viable option for sport coaches. With the absence of travel time and costs, coupled with a demonstrated willingness to pay for BIE coaching, coaches can consider incorporating this approach into their practice. It should be viewed as an opportunity to complement and enhance F2F coaching, rather than a full replacement. By integrating BIE coaching alongside traditional F2F coaching, coaches can expand their reach, increase the number of coaching sessions, and

achieve positive effect of outcomes in terms of performance perception and relationship quality. Therefore, BIE coaching should be regarded as a valuable option for coaches, providing them with additional flexibility and opportunities for success.

BIE communication also presents an opportunity for older and injured coaches to continue providing coaching without the physical demands of being present on the pitch, which can be physically challenging for them. By leveraging BIE coaching, these coaches can still actively contribute to the development of athletes and teams, utilizing their expertise and experience in a digital coaching environment.

### **Sport Students**

The results of the study emphasize the advantages of BIE coaching for sport students. The positive impact on communication quality and the absence of a detrimental effect on relationship quality validate the effectiveness of BIE coaching in on-court sports. Sport students can view this coaching approach as a viable and valuable option for improving their skills, enhancing their performance, and enriching their overall coaching experience. BIE coaching offers increased flexibility, allowing students to benefit from a wider range of coaching opportunities and the ability to engage with their personal coach regardless of their physical location. Therefore, students should consider BIE coaching as a valuable supplement to traditional F2F coaching.

### **ahead-coach**

The study yields valuable insights for the company providing BIE coaching services. The demonstration of BIE coaching's feasibility and positive outcomes strengthens the company's product offering, providing a solid foundation for market entry on a larger scale. Although the willingness to pay for BIE coaching is lower than for F2F coaching, it still indicates a market demand that can be effectively catered to. Moreover, the study contributes to the refinement of the target group definition and understanding of the acceptable price range for BIE coaching services. The company can utilize this information to further hone their target group selection and tailor the product accordingly. Setting the price in line with the insights gained from the study will enhance market competitiveness and optimize customer value.

## **6.3. Limitations**

Finally, it is important to acknowledge several limitations that need to be considered when interpreting and utilizing the findings of this study.

First, only tennis was examined as a representative of on-court sports. While this is not an issue when extrapolating the results to other sports that take place in a relatively confined location

and can be adequately captured by a single camera, caution should be exercised when applying the findings to team sports or non-location-specific sports.

Second, coaching effectiveness was measured by *Performance Perception*, which, although classified as a hard outcome, is still subject to some degree of student discretion and potential misjudgement. Additionally, the effectiveness was evaluated after a single coaching session, neglecting longer-term coaching effects. Ideally, performance should have been assessed over an extended period using a clearly objective measure, potentially supplemented by expert evaluations.

Third, many of the participants (both coaches and students) were recruited from the author's and the company's extended network. Despite efforts to conduct the study as neutrally as possible, it is acknowledged that complete exclusion of minimal biases is not entirely achievable, as potential sympathies towards the project may have influenced a slightly overly positive evaluation of BIE.

In summary, the study provides an initial indication and direction for application of BIE coaching in on-court sports. However, these limitations should be taken into account to ensure a comprehensive understanding and appropriate application of the findings.

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## **Appendix**

Appendix 1 – Graphics Literature Review

Appendix 2 – As-Predicted

Appendix 3 – Questionnaire

## Appendix 1 – Graphics Literature Review

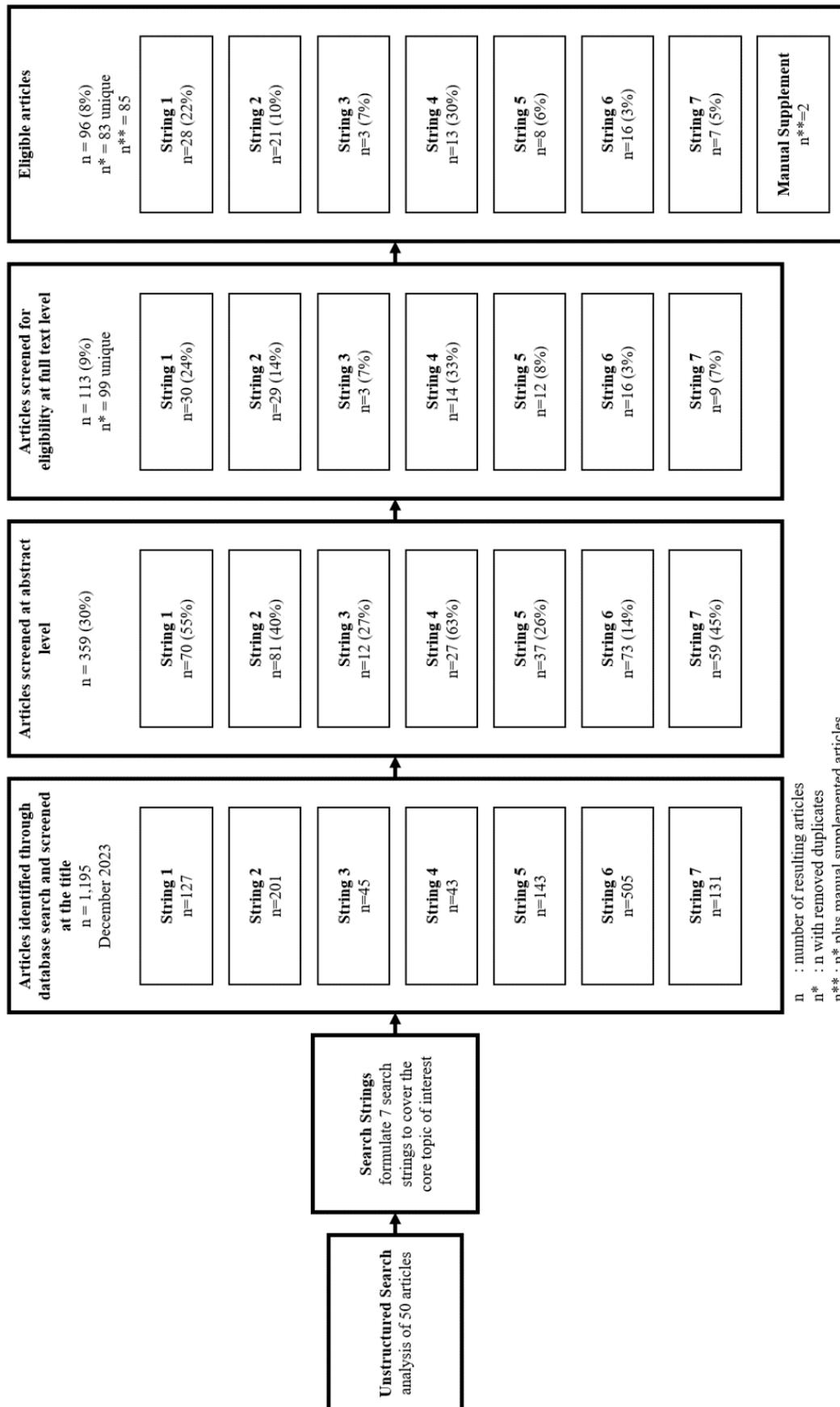


Figure 11 - Literature Review Process

1. (Media Richness)  
**AND** (video **OR** video call **OR** videoconference **OR** videoconferencing **OR** video communication **OR** video chat **OR** facetime **OR** zoom **OR** skype)
2. (Media Richness)  
**AND** (coaching **OR** teaching **OR** education **OR** mentoring **OR** training **OR** learning)
3. (Media Richness)  
**AND** (sports **OR** athletics **OR** athletes **OR** sport **OR** competition **OR** sport psychology **OR** sports psychology **OR** physical education)
4. (bug in ear)  
**AND** (coaching **OR** teaching **OR** education **OR** mentoring **OR** training **OR** learning)
5. (coach-athlete relationship **OR** athlete-coach relationship)  
**AND** (technology **OR** video **OR** video call **OR** videoconference **OR** videoconferencing **OR** video communication **OR** video chat **OR** facetime **OR** zoom **OR** skype)
6. **ABSTRACT**(virtual **OR** remote **OR** online **OR** digital **OR** video)  
**AND** **ABSTRACT**(observation **OR** supervision)  
**AND** **ABSTRACT**(coaching **OR** teaching **OR** education **OR** mentoring **OR** training **OR** learning)  
**AND** **ABSTRACT**(sports **OR** athletics **OR** athletes **OR** sport **OR** competition **OR** sport psychology)
7. **TITLE**(video **OR** video call **OR** videoconference **OR** videoconferencing **OR** video communication **OR** video chat **OR** facetime **OR** zoom **OR** skype)  
**AND** **TITLE**(coaching **OR** teaching **OR** education **OR** mentoring **OR** training **OR** learning)  
**AND** **TITLE**(sports **OR** athletics **OR** athletes **OR** sport **OR** competition **OR** sport psychology **OR** sports psychology **OR** physical education)

*Figure 12 - Search Strings*

## Appendix 2 – As-Predicted



### REMOTE COACHING - Performance perception and relationship quality – Karlsruhe (#122422)

#### Author(s)

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Created: 02/18/2023 02:47 AM (PT)

Public: 02/18/2023 02:52 AM (PT)

#### 1) Have any data been collected for this study already?

No, no data have been collected for this study yet.

#### 2) What's the main question being asked or hypothesis being tested in this study?

Summarized: Selecting digital (1-way video; 2-way audio) communication mode in oncourt tennis coaching, the performance perception will be better and the perceived quality of coaching quality will not be worse compared to face-to-face communication. This effect is mediated by subjective Media Richness.

- H1a: Digital communication mode in coaching will increase performance perception compared to face-to-face scenario.
- H1b: The direct effect stated in H1a is moderated by the skill of the player, where higher skill would lead to stronger effect.
- H1c: The direct effect stated in H1a is moderated by the ambition of the player, where higher ambition would lead to stronger effect.
- H2: Digital communication mode in coaching will not result in a worse short term relationship quality between coach and player compared to face-to-face communication.
- H3: For oncourt tennis coaching, digital communication mode will result in increased perceived media richness compared to face-to-face communication.
- H4a: Perceived media richness is positively associated with performance perception.
- H4b: The direct effect stated in H4a is moderated by the skill of the player, where higher skill would lead to stronger effect.
- H4c: The direct effect stated in H4a is moderated by the ambition of the player, where higher ambition would lead to stronger effect.
- H5: Perceived media richness will not affect the short term relationship quality between coach and player negatively.

#### 3) Describe the key dependent variable(s) specifying how they will be measured.

All variables are measured via questionnaire directly after training, that is filled by both the coach and the player. The questionnaires are tailored to the respective role (coach and player) and thus differ slightly.

- Performance perception: The scale for this variable is adapted from Suh 1999. From the original 10-item questionnaire only the 5 items are taken that deal with outcome satisfaction. Both the coach and the player are asked for their perception of the players performance.
- Perceived quality of coaching relationship: The scale for this variable is adapted from Passarelli et al. 2020 and Gregory&Levy 2010. The 12-item scale originally only covers the coachee perspective. Here it is used to discover both the player and the coach perspective.
- Subjective Media Richness (Mediator): The scale for this variable is adapted from Dennis&Kinney 1998, Suh 1999 and Wheeler et al. 1995. The 8-item scale measures the perception of the communication environment and conditions in terms of communication media used.

#### 4) How many and which conditions will participants be assigned to?

The field experiment is designed in a 2x1 design.

Variation in mode of communication: training sessions will be conducted either in a face-to-face scenario ("traditional" tennis training session) or digitally. In the digital scenario the two players are on the tennis court physically, while the coach is connected to them digitally via video call. The players wear headset via which they can hear the coach and each other. The coach can hear and see the players via a temporarily placed mobile phone. This mode of communication can be specified as 1-way video 2-way audio.

#### 5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.

- (Moderated) Mediation Analysis
- Multiple Regression Analysis
- Two-sample test for proportion (two tailed)

#### 6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.

No exclusions planned, as due to the nature of the field experiment there are no data gaps or other problems expected.

#### 7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.

In a timeframe of round about 3-4 weeks it is planned to conduct as many training sessions as possible. The actual number depends on how easy and timely adequate participants can be recruited. As an absolute minimum it is planned to recruit at least 30 player and 5 coaches (15 triads) in each mode of communication.

#### 8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)

No.

## Appendix 3 – Questionnaire

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### Fragebogen

#### 1 Startseite

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#### Informationen zur Studie

Liebe Teilnehmerin, lieber Teilnehmer,

vielen Dank für dein Interesse an meiner Forschung.

Mein Name ist Johannes Loy und ich schreibe derzeit meine Masterarbeit in der Forschungsgruppe Marketing & Vertrieb (Prof. Dr. Martin Klarmann) am Institut für Informationswirtschaft und Marketing (IISM) des Karlsruher Instituts für Technologie (KIT) in Kooperation mit dem Startup Swingg. Diese Studie befasst sich mit der TrainerIn-SpielerIn-Kommunikation während des Tennistrainings.

Die Teilnahme an dieser Umfrage ist freiwillig und dauert ungefähr 10 Minuten. Du kannst die Umfrage jederzeit abbrechen; durch Abbruch oder Nichtteilnahme entstehen dir keinerlei Nachteile.

Alle deine Angaben werden streng vertraulich behandelt. Der anonymisierte Datensatz wird der betreuenden Forschungsgruppe und Swingg bereitgestellt und dort nach den geltenden Regeln aufbewahrt. Für die Darstellung der Ergebnisse im Rahmen etwaiger Veröffentlichungen werden die Daten aller TeilnehmerInnen aggregiert, das heißt, dass keine Rückschlüsse von den Ergebnissen auf einzelne TeilnehmerInnen möglich sind.

Bei Fragen kannst du mich gerne unter [johannes.loy@student.kit.edu](mailto:johannes.loy@student.kit.edu) kontaktieren.

Vielen Dank und sportliche Grüße!

Johannes Loy

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#### 2 Einführung

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## Einführung

Die Studie besteht aus den folgenden kurzen Abschnitten:

- 1) Fragen zum Trainingsszenario
- 2) Fragen zum Training
- 3) Fragen zur Demographie

Bitte bearbeite die Fragen gewissenhaft.

Bitte verwende nicht den "Zurück"-Button Deines Browsers, da in diesem Fall keine Speicherung der Angaben möglich ist.

Aus Gründen der Lesbarkeit wird im Folgenden nicht gegendert. Mit „Trainer“ ist immer „Trainerin und Trainer“ gemeint, mit „Spieler“ immer „Spielerin und Spieler“.

Falls du dir bei einer Antwort nicht sicher bist, bitte ich dich, die Antwort lieber zu schätzen, als nicht zu beantworten.

---

### 3 Trainingsszenario

---

#### Rolle

In welcher Rolle hast du an dem soeben durchgeführten Training teilgenommen?

Trainer

Spieler

---

#### 4.1 Wahrgenommene Reichhaltigkeit der Kommunikation

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## Spieler-Trainer-Kommunikation

Folgende Aussagen beziehen sich auf die Kommunikation zwischen dir und deinem Trainer während des soeben durchgeführten Trainings. Bedenke dabei, dass Kommunikation sowohl zwischen als auch während Übungen und Ballwechseln stattfindet.

Bitte kreuze an, zu welchem Grad du den folgenden Aussagen zustimmst.

	Stimme überhaupt nicht zu 1	2	3	4	5	6	Stimme voll und ganz zu 7
Unter den Bedingungen, unter denen wir kommuniziert haben, konnten der Trainer und ich uns gut verstehen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Im gegebenen Kommunikationsumfeld konnte der Trainer Dinge leicht erklären.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Im gegebenen Kommunikationsumfeld war es leicht, Anweisungen und Verbesserungen des Trainers umzusetzen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wenn etwas verbesserungswürdig war, konnte mich der Trainer unter den gegebenen Kommunikationsbedingungen nur schwer verbessern.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wenn etwas verbesserungswürdig war, konnte mich der Trainer unter den gegebenen Kommunikationsbedingungen unmittelbar verbessern.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Die Bedingungen, unter denen wir kommunizierten, verlangsamten unsere Kommunikation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Die Bedingungen, unter denen wir kommuniziert haben, halfen uns, unsere Meinungen auszutauschen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Es gab Punkte, die aufgrund der Kommunikationsbedingungen nicht vermittelt werden konnten.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 4.2 Trainingsziel

### Trainingsziel

Dieser Abschnitt befasst sich mit deinen persönlichen Trainingszielen und den Gründen, aus denen du Tennistraining nimmst.

Ich bitte dich, diese Fragen unabhängig vom soeben durchgeführten Training zu beantworten.

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Nimmst du regelmäßig bezahltes Tennistraining?

- ja
- nein

Bitte kreuze an, zu welchem Grad du den folgenden Aussagen zustimmst (falls du kein Tennistraining nimmst, schätze bitte deine Antwort).

	Stimme überhaupt nicht zu 1	2	3	4	5	6	Stimme voll und ganz zu 7
Ich nehme Tennistraining, um meine Technik zu verbessern.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich nehme Tennistraining, um mehr Matches zu gewinnen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich nehme Tennistraining, um mich sportlich zu betätigen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich nehme Tennistraining, um am Vereinsleben teilzuhaben bzw um in Gesellschaft zu sein.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich nehme Tennistraining, weil es mir Spaß macht.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Was ist der Hauptgrund, warum du Tennistraining nimmst?

- Technik verbessern
- Mehr Matches gewinnen
- Sportliche Betätigung
- Teilhabe am Vereinsleben / Gesellschaft
- Spaß
- 

### 4.3 Zufriedenheit mit dem Ergebnis des Trainings

#### Ergebnis des Trainings

Dieser Abschnitt befasst sich mit dem Ergebnis des soeben durchgeführten Trainings.

„Ergebnis“ bezieht sich jeweils auf die Erfüllung des soeben angegebenen Hauptgrundes, aus dem du Tennistraining nimmst.

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Bitte kreuze an, zu welchem Grad du den folgenden Aussagen zustimmst.

	Stimme überhaupt nicht zu 1	2	3	4	5	6	Stimme voll und ganz zu 7
Mit dem Ergebnis, das der Trainer und ich erreicht haben, bin ich zufrieden.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Das erzielte Ergebnis steht im Verhältnis zum Aufwand.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Das erzielte Ergebnis ist optimal.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Das erzielte Ergebnis war zu einem großen Teil von meinem eigenen Beitrag abhängig.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich bin selbst verantwortlich für das erzielte Ergebnis.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

#### 4.4 Zufriedenheit mit Kommunikation des Trainers

### Spieler-Trainer-Beziehung

Folgende Aussagen beziehen sich auf die Beziehung zwischen dir und deinem Trainer während des soeben durchgeführten Trainings.

Wie ist dein Verhältnis zu dem Trainer, der das Training durchgeführt hat?

- Ich habe vorher schon mit diesem Trainer trainiert.
- Ich kannte den Trainer schon vorher, habe aber noch nie mit ihm trainiert.
- Ich kannte den Trainer vor diesem Training noch nicht.

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Bitte kreuze an, zu welchem Grad du den folgenden Aussagen zustimmst.

Falls du deinen Trainer schon länger kennst, versuche vorherige Erfahrungen bei der Beantwortung nicht zu berücksichtigen, sondern dich ausschließlich auf das soeben durchgeführte Training zu beschränken.

	Stimme überhaupt nicht zu 1	2	3	4	5	6	Stimme voll und ganz zu 7
Mein Trainer und ich hatten gegenseitigen Respekt füreinander.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich glaube, mein Trainer hat sich wirklich für mich interessiert.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich glaube, mein Trainer hat sich mir gegenüber verpflichtet gefühlt.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mein Trainer konnte gut zuhören.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Es ist mir leichtgefallen, mit meinem Trainer zu sprechen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mein Trainer war effektiv in der Kommunikation mit mir (die Informationen sind so bei mir angekommen, wie sie vom Trainer gemeint waren).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich fand es leicht, mit meinem Trainer über meine Leistung zu sprechen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich fand es leicht, mit meinem Trainer über meine Bedenken und Probleme zu sprechen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich konnte mit meinem Trainer offen und ehrlich sprechen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mein Trainer hat mir geholfen, meine Stärken zu identifizieren und auf diesen aufzubauen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mein Trainer hat mich in meiner Entwicklung als Tennisspieler weitergebracht.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mein Trainer hat Übungen eingesetzt, die mir geholfen haben, mein Potenzial zu entfalten.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 4.5 Trainingsszenario

### Trainingsszenario

In welchem Szenario hat das soeben durchgeführte Training stattgefunden?

- Der Trainer war physisch am Platz
- Der Trainer war digital zugeschaltet

### 4.6.1 Gemischte Fragen

#### Gemischte Fragen

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Bitte kreuze an, zu welchem Grad du den folgenden Aussagen zustimmst.

	Stimme überhaupt nicht zu 1	2	3	4	5	6	Stimme voll und ganz zu 7
Das Beitreten zum Videocall hat problemlos funktioniert.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Die Internetverbindung war während des gesamten Trainings stabil und ausreichend gut.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Die Befestigung und Ausrichtung des Smartphones hat problemlos funktioniert.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Die Verbindung meiner Kopfhörer zum Smartphone war während des gesamten Trainings stabil und ausreichend gut.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Das Tragen der Kopfhörer während des Trainings hat mich gestört.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Das technische Setup ist unkomplizierter und schneller als ich es im Voraus erwartet hätte.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unabhängig vom Kontext: Ich habe praktische Erfahrung mit Videocalls.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Hattest du sonstige Bedenken im Voraus oder Probleme vor Ort mit dem technischen Setup?

optional

Bitte kreuze an, zu welchem Grad du den folgenden Aussagen zustimmst.

	Stimme überhaupt nicht zu 1	2	3	4	5	6	Stimme voll und ganz zu 7
Ich bin grundsätzlich offen dafür, am Tennisplatz digitale Technik einzusetzen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Das soeben stattgefunden Training hat mich spieltechnisch weitergebracht.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Das soeben stattgefunden Training hat mich taktisch weitergebracht.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Das soeben stattgefunden Training hat meine Motivation gesteigert.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bei dem soeben stattgefundenen Training hat mir das Zuspiel durch den Trainer gefehlt.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Im Match habe ich grundsätzlich einen Plan, wie ich Punkte gewinnen kann.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Im Match spiele ich besser als im Training.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Im Match spiele ich schlechter als im Training.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Es ist schwierig, einen passenden Tennistrainer zu finden.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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In welchem Szenario könntest du dir vorstellen, bezahltes digitales Training zu nehmen?

- Gar nicht
- Anstatt Training, bei dem der Trainer physisch auf dem Platz steht
- Zusätzlich zu Training, bei dem der Trainer physisch auf dem Platz steht

---

#### 4.6.2 Zahlungsbereitschaft

---

### Preis einer digitalen Trainerstunde

Beantworte folgende Fragen bitte bezogen auf eine einstündige digitale Trainerstunde (wie die soeben durchgeführte).

Gib bitte jeweils den **Gesamtpreis** (nicht pro Person) **ohne Platzgebühr** an.

Zu welchem Preis wäre eine digitale Trainerstunde zu teuer, sodass du diese auf keinen Fall buchen würdest?

Zu welchem Preis würdest du eine digitale Trainerstunde zwar als teuer bezeichnen, würdest diese aber vielleicht trotzdem buchen?

Zu welchem Preis wäre eine digitale Trainerstunde günstig, also ein gutes Angebot?

Zu welchem Preis wäre eine digitale Trainerstunde zu günstig, sodass du die Qualität anzweifelst und diese nicht buchst?

---

#### 4.7.1 Gemischte Fragen

---

### Gemischte Fragen

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Bitte kreuze an, zu welchem Grad du den folgenden Aussagen zustimmst.

	Stimme überhaupt nicht zu 1	2	3	4	5	6	Stimme voll und ganz zu 7
Ich bin grundsätzlich offen dafür, am Tennisplatz digitale Technik einzusetzen, um mich zu verbessern.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe praktische Erfahrung mit Videocalls.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Im Match habe ich grundsätzlich einen Plan, wie ich Punkte gewinnen kann.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Im Match spiele ich besser als im Training.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Im Match spiele ich schlechter als im Training.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Es ist schwierig, einen passenden Tennistrainer zu finden.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

#### 4.7.2 Zahlungsbereitschaft

##### Preis einer Trainerstunde

Beantworte folgende Fragen bitte bezogen auf eine einstündige Trainerstunde (wie die soeben durchgeführte).

Gib bitte jeweils den **Gesamtpreis** (nicht pro Person) **ohne Platzgebühr** an.

Zu welchem Preis wäre eine Trainerstunde zu teuer, sodass du diese auf keinen Fall buchen würdest?

Zu welchem Preis würdest du eine Trainerstunde zwar als teuer bezeichnen, würdest diese aber vielleicht trotzdem buchen?

Zu welchem Preis wäre eine Trainerstunde günstig, also ein gutes Angebot?

Zu welchem Preis wäre eine Trainerstunde zu günstig, sodass du die Qualität anzweifelst und diese nicht buchst?

#### 4.8 Demographie und Tennisvita

##### Demographie und Tennisvita

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Welchem Geschlecht fühlst du dich am ehesten zugehörig?

Weiblich

Männlich

Wie alt bist du?

Trage dein Alter bitte als ganze Zahl ein.

Was ist deine aktuelle LK (Leistungsklasse).

Spiegelt deine LK deiner Meinung nach dein Können adäquat wider? Welche LK hättest du deiner Meinung nach mit deinem aktuellen Können verdient?

Seit wie vielen Jahren spielst du Tennis?

Seit wie vielen Jahren nimmst du an Tenniswettkämpfen teil?

(LK-Turniere, Medenrunde, ...)

Wie viele LK-gewertete Einzel-Matches hast du letzte Sommersaison bestritten?

Wie viele Stunden hast du letzte Sommersaison pro Woche durchschnittlich auf dem Tennisplatz verbracht?

(inkl. Match, Training, freies Spiel, Ballwand)

Wie regelmäßig hast du letzte Sommersaison bezahltes Tennistraining genommen?

einmal wöchentlich

mehrmals wöchentlich

alle zwei Wochen

unregelmäßig

gar nicht

In welcher Gruppenstärke nimmst du üblicherweise Tennistraining?

Gib bitte die Anzahl der Spieler inklusive dir an.

---

## 5.1 Wahrgenommene Reichhaltigkeit der Kommunikation

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## Spieler-Trainer-Kommunikation

Folgende Aussagen beziehen sich auf die Kommunikation zwischen dir und den Spielern während des soeben durchgeführten Trainings. Bedenke dabei, dass Kommunikation sowohl zwischen als auch während Übungen und Ballwechselln stattfindet.

Bitte kreuze an, zu welchem Grad du den folgenden Aussagen zustimmst.

	Stimme überhaupt nicht zu 1	2	3	4	5	6	Stimme voll und ganz zu 7
Unter den Bedingungen, unter denen wir kommuniziert haben, konnten die Spieler und ich uns gut verstehen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Im gegebenen Kommunikationsumfeld konnte ich Dinge leicht erklären.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Im gegebenen Kommunikationsumfeld fiel es den Spielern leicht, meine Anweisungen und Verbesserungen umzusetzen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wenn etwas verbesserungswürdig war, konnte ich dies unter den gegebenen Kommunikationsbedingungen nur schwer verbessern.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wenn etwas verbesserungswürdig war, konnte ich dies unter den gegebenen Kommunikationsbedingungen unmittelbar verbessern.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Die Bedingungen, unter denen wir kommuniziert haben, verlangsamten unsere Kommunikation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Die Bedingungen, unter denen wir kommuniziert haben, haben uns geholfen, unsere Meinungen auszutauschen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Es gab Punkte, die aufgrund der Kommunikationsbedingungen nicht vermittelt werden konnten.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 5.2 Zufriedenheit mit dem Ergebnis des Trainings

### Ergebnis des Trainings

Dieser Abschnitt befasst sich mit dem Ergebnis des soeben durchgeführten Trainings.

Das „Ergebnis“ ist abhängig vom Trainingsziel der Spieler und kann z.B. technischen oder taktischen Fortschritt, aber auch Spaß bedeuten.

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Bitte kreuze an, zu welchem Grad du den folgenden Aussagen zustimmst.

	Stimme überhaupt nicht zu 1	2	3	4	5	6	Stimme voll und ganz zu 7
Mit dem Ergebnis, das die Spieler und ich erreicht haben, bin ich zufrieden.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Das erzielte Ergebnis steht im Verhältnis zum Aufwand.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Das erzielte Ergebnis ist optimal.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Das erzielte Ergebnis war zu einem großen Teil von meinem Beitrag abhängig.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich bin verantwortlich für das erzielte Ergebnis.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### 5.3 Zufriedenheit mit Kommunikation

#### Spieler-Trainer-Beziehung

Folgende Aussagen beziehen sich auf die Beziehung zwischen dir und deinen Spielern während des soeben durchgeführten Trainings.

Wie ist dein Verhältnis zu den Spielern, mit denen du das Training durchgeführt hast?

- Ich habe vorher schon mit diesen trainiert.
- Ich kannte diese schon vorher, habe aber noch nie mit ihnen trainiert.
- Ich kannte diese vor diesem Training noch nicht.

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Falls du deine Spieler schon länger kennst, versuche vorherige Erfahrungen bei der Beantwortung nicht zu berücksichtigen, sondern dich ausschließlich auf das soeben durchgeführte Training zu beschränken.

	Stimme überhaupt nicht zu 1	2	3	4	5	6	Stimme voll und ganz zu 7
Meine Spieler und ich hatten gegenseitigen Respekt füreinander.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe mich wirklich für meine Spieler interessiert.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe mich meinen Spielern gegenüber verpflichtet gefühlt.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich konnte gut zuhören.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Es ist meinen Spielern leichtgefallen, mit mir zu sprechen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich war effektiv in der Kommunikation mit meinen Spielern (die Informationen sind so bei den Spielern angekommen, wie sie gemeint waren).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Den Spielern ist es leichtgefallen, mit mir über ihre Leistung zu sprechen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Den Spielern ist es leichtgefallen, mit mir über ihre Bedenken und Probleme zu sprechen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meine Spieler konnten mit mir offen und ehrlich sprechen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe den Spielern geholfen, ihre Stärken zu identifizieren und auf diesen aufzubauen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe meine Spieler in ihrer Entwicklung als Tennisspieler weitergebracht.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe Übungen eingesetzt, die den Spielern geholfen haben, ihr Potenzial zu entfalten.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 5.4 Trainingsszenario

### Trainingsszenario

In welchem Szenario hat das soeben durchgeführte Training stattgefunden?

- Ich war als Trainer physisch am Platz
- Ich war als Trainer digital zugeschaltet

### 5.5.1 Gemischte Fragen

#### Gemischte Fragen

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Bitte kreuze an, zu welchem Grad du den folgenden Aussagen zustimmst.

	Stimme überhaupt nicht zu 1	2	3	4	5	6	Stimme voll und ganz zu 7
Das Beitreten zum Videocall hat problemlos funktioniert.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Die Internetverbindung war während des gesamten Trainings stabil und ausreichend gut.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Die Befestigung und Ausrichtung des Smartphones hat problemlos funktioniert.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Das technische Setup ist unkomplizierter und schneller als ich es im Voraus erwartet hätte.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unabhängig vom Kontext: Ich habe praktische Erfahrung mit Videocalls.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Hattest du sonstige Bedenken im Voraus oder Probleme mit dem technischen Setup?

optional

Ich bin grundsätzlich offen dafür, am Tennisplatz digitale Technik einzusetzen, um meine Schüler zu verbessern.

 Stimme überhaupt nicht zu

1

 2 3 4 5 6 Stimme voll und ganz zu

7

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Bei dem soeben stattgefundenen Training hat es mir gefehlt, den Spielern Bälle zuspiesen zu können.

Stimme überhaupt nicht zu

1

 2 3 4 5 6

Stimme voll und ganz zu

7

Eine digitale Trainerstunde ist im Vergleich zu einer physischen Trainerstunde...

viel schwieriger abzuhalten.

1

 2 3 4 5 6

viel einfacher abzuhalten.

7

Eine digitale Trainerstunde ist in meiner Vorstellung im Vergleich zu einer physischen Trainerstunde...

viel günstiger für die Schüler.

1

 2 3 4 5 6

viel teurer für die Schüler.

7

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In welchem Szenario könntest du dir vorstellen, digitales Training zu geben?

- Gar nicht
- Anstatt Training, bei dem ich physisch auf dem Platz stehe
- Zusätzlich zu Training, bei dem ich physisch auf dem Platz stehe

Wie viel Geld würdest du für eine Stunde digitales Training erwarten?

(insgesamt, nicht pro Person; ohne Platzgebühr)

Ich sehe digitales Training für mich als...

- Konkurrenz
- Chance

Was interessiert dich besonders an digitalem Training?

- Zeitliche Flexibilität
- Örtliche Flexibilität
- Keine Anfahrt
- Globale Kunden
- Verwendung von Technologie
- Keine Anschaffung von Equipment (Bälle etc.)
- Keine Verletzungsgefahr
- Keine Witterungsbedingungen
- Bequemere Arbeitsbedingungen
- Nichts davon

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## 5.6 Demographie und Trainervita

### Demographie und Trainervita

Welchem Geschlecht fühlst du dich am ehesten zugehörig?

- Weiblich
- Männlich

Wie alt bist du?

Trage dein Alter bitte als ganze Zahl ein.

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Wie viele Jahre bist du schon als Trainer tätig?

Bist du derzeit hauptberuflich als Tennistrainer tätig?

- Ja
- Nein
- Ich plane, es zu werden

Wie viele Trainerstunden hast du letzte Sommersaison pro Woche ungefähr gegeben?

Wie viel Geld bekommst du aktuell für eine Trainerstunde, die du gibst?

(insgesamt, nicht pro Person; ohne Platzgebühr; im Durchschnitt)

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## 6 Endseite

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Vielen Dank für deine Teilnahme und viel Erfolg in der kommenden Tennissaison!

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