Psychological diagnostics in the talent development program of the German Soccer Association: A stepwise procedure to examine the relevance of personality characteristics in talented soccer players

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Dipl.-Psych. Philip Feichtinger

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Dean:	Prof. Dr. Josef Schmid
First reviewer:	Prof. Dr. Oliver Höner
Second reviewer:	Prof. Dr. Henning Plessner

Danksagung

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Abstract

Sport psychological training and coaching has become increasingly relevant in the context of youth promotion programs in soccer. Likewise, numerous sport psychologists are integrated into support frameworks at clubs and associations. Scientifically sound diagnostics of personality characteristics can be regarded as an important foundation for the optimization of such sport psychological work.

The present dissertation examined the relevance of psychological personality characteristics in talented soccer players in order to provide an empirical basis for the application of psychological diagnostics. For this purpose diagnostics of personality characteristics were implemented in the talent development program of the German Soccer Association. In accordance with previous research in sport science and psychology, a stepwise procedure was used to examine the prognostic value of personality characteristics. Taking into consideration a multidimensional, domain-specific, dynamic, and prospective understanding of talent, this procedure comprised four steps, which were addressed in three empirical studies as part of this dissertation.

For the purpose of selecting potentially relevant predictors of soccer talent (Step 1), an analysis of the literature on psychological characteristics in talent research was conducted. Subsequently, the characteristics were presented to experts in science and soccer, whose task was to evaluate their importance for soccer performance. On this basis, psychological personality characteristics were selected that could be assigned to the areas of motivation, volition, self-referential cognition, and emotion.

Regarding the personality characteristics' assessment (Step 2), established sport-specific questionnaires were identified and the individual scales were modified in terms of soccer-specific and age-appropriate adaptations. Study 1 examined whether the personality characteristics of U12 soccer

players could be assessed based on scientifically sound diagnostics. This study demonstrated that the modified questionnaires show satisfactory psychometric properties in terms of reliability and validity. Furthermore, these findings revealed small effects of socially desirable responding that should be further considered.

With respect to development over time (Step 3), Study 2 provided useful insights into the stabilities and changes of psychological personality characteristics across the U12 to U14 age classes. Moderate differential stabilities imply that, to a certain degree, the relative ordering of individuals within such characteristics changes over time. Small mean- and individual-level changes indicate that no major developmental effects seem to occur in such personality characteristics during early adolescence. An analysis of structural stability provided empirical evidence concerning the complex interplay between various personality characteristics over time.

Finally, Study 3 examined the relationship of U12 players' personality characteristics with current and future performance criteria (Step 4). Cross-sectional analyses demonstrated that these characteristics – except for self-referential cognition – were empirically unrelated to motor performance. Furthermore, these analyses revealed small but relevant associations with the players' overall performance as subjectively rated by their coaches. Prospective analyses indicated that U12 players' personality characteristics explained significant proportions of the players' performance level four years later in the U16 age class.

Against the backdrop of a stepwise procedure in talent research, the present dissertation provided new insights into the relevance of psychological personality characteristics in talented soccer players. Building on these findings, this work identified avenues for future research and highlighted conclusions for sport psychological work in the context of talent identification and development.

Zusammenfassung

Sportpsychologische Training und Coaching erfährt im Rahmen von Nachwuchsförderprogrammen im Fußball eine zunehmend größere Bedeutung. Dementsprechend sind zahlreiche Sportpsychologen in die Förderkonzepte von Vereinen und Verbänden integriert. Eine wissenschaftlich fundierte Diagnostik von Persönlichkeitsmerkmalen kann als wichtige Voraussetzung zur Optimierung einer solchen sportpsychologischen Arbeit betrachtet werden.

Die vorliegende Dissertation untersuchte die Bedeutung von psychologischen Persönlichkeitsmerkmalen bei talentierten Fußballspielern, um eine empirische Grundlage für die Anwendung psychologischer Diagnostik zu liefern. Zu diesem Zweck wurde eine Diagnostik von Persönlichkeitsmerkmalen im Talentförderprogramm des Deutschen Fußball-Bundes durchgeführt. In Anlehnung an frühere sportwissenschaftliche und psychologische Ansätze, wurde ein schrittweises Vorgehen zur Überprüfung der Prognosegüte von Persönlichkeitsmerkmalen gewählt. Unter Berücksichtigung eines multidimensionalen, bereichsspezifischen, dynamischen und prospektiven Verständnisses von Talent, umfasst dieses Vorgehen vier Schritte, welche anhand von drei empirischen Studien im Rahmen dieser Dissertation bearbeitet wurden.

Zum Zwecke der Auswahl potentiell relevanter Talentprädiktoren (Schritt 1) wurde zunächst eine Analyse des Forschungsstandes zu psychologischen Merkmalen in der Talentforschung durchgeführt. Daran anschließend wurden die recherchierten Merkmale Experten aus Wissenschaft und Fußballpraxis vorgelegt, die deren Bedeutung im Fußball einschätzen sollten. Darauf aufbauend wurden psychologische Persönlichkeitsmerkmale ausgewählt, die den Bereichen Motivation, Volition, selbstbezogene Kognition und Emotion zuzuordnen sind.

Zur Erfassung der Persönlichkeitsmerkmale (Schritt 2) wurden bereits etablierte sportspezifische Fragebögen identifiziert und eine fußball- und altersspezifische Anpassung vorgenommen. Studie 1 untersuchte, ob die Persönlichkeitsmerkmale von talentierten U12 Fußballspielern wissenschaftlich

fundiert erfasst werden können. Diese Studie zeigte, dass die modifizierten Fragebögen zufriedenstellende Gütekriterien der Reliabilität und Validität aufweisen. Zusätzlich resultierten geringe Effekte sozial erwünschten Antwortverhaltens, die es weiterhin zu berücksichtigen gilt.

In Bezug auf die Entwicklung über die Zeit (Schritt 3) betrachtete Studie 2 die Stabilität und Veränderung der psychologischen Persönlichkeitsmerkmale im Altersbereich U12 bis U14. Moderate differentielle Stabilitäten von Persönlichkeitsunterschieden weisen darauf hin, dass sich die relative Reihenfolge der Spieler in solchen Merkmalen über die Zeit hinweg verändert. Geringe Veränderungen auf Gruppen- und Einzelebene deuten auf geringe psychologische Entwicklungseffekte in der frühen Adoleszenz hin. Eine Betrachtung der strukturellen Stabilität ermöglichte einen Einblick in das komplexe Zusammenspiel verschiedener Persönlichkeitsbereiche über die Zeit.

Schließlich untersuchte Studie 3 den Zusammenhang der Persönlichkeitsmerkmale von U12 Spielern mit Erfolg im Fußball (Schritt 4). Eine querschnittliche Betrachtung konnte zeigen, dass diese Merkmale – mit Ausnahme der selbstbezogenen Kognition – empirisch unabhängig vom motorischen Leistungsniveau sind. Zudem resultierten kleine jedoch relevante Zusammenhänge mit dem subjektiv von Trainern eingeschätzten, aktuellen Leistungsvermögen. Prospektive Analysen konnten zeigen, dass eine Vielzahl von Merkmalen signifikant das vier Jahre später erhobenen Leistungsniveau der Spieler in der Altersklasse U16 vorhersagte.

Vor dem Hintergrund eines schrittweisen Vorgehens in der Talentforschung, lieferte die vorliegende Dissertation neue Einsichten zur Bedeutung psychologischer Persönlichkeitsmerkmale bei talentierten Nachwuchsfußballspielern. Aufbauend auf diesen Erkenntnissen wurden Konsequenzen für die zukünftige Forschung identifiziert und Schlussfolgerungen für die sportpsychologische Arbeit im Kontext der Talentidentifizierung und -entwicklung gezogen.

Contents

I Introduction

On the 13th of July 2014 at 6:36 pm (Brazilian time) in Maracanã Stadium, Rio de Janeiro, the German national soccer team won its fourth World Cup title. A few minutes before, André Schürrle dribbled on the left-hand side and crossed the ball into the Argentinian penalty area. Mario Götze received the ball with his chest, shot it with his left foot and scored the winning goal. It may not be by chance that both of these players exhibited decisive influences on the outcome of this final game. Both players passed through the 2002 restructured youth promotion system of the German Soccer Association (Deutscher Fußball-Bund, DFB) and therefore symbolized its success in the previous years. Currently, with Götze and Schürrle as role models, thousands of youth players are aspiring to become professional players and dream of participating in a World Cup final. However, the reality is that only a very small minority of these players has a realistic chance of living that dream.

To provide the best possible promotion of each German player on his path from the very beginning in a small amateur club to the elite adult level, the DFB runs what is most likely the world's largest sport-specific youth development system. The primary aim of this system is to detect every talented German soccer player and introduce him to a systematic training process. A fundamental cornerstone is the *DFB talent development program*, which includes the U12 to U15 age classes (Schott, 2011). Within this program, competence centers and youth academies are the most important institutions (Figure 1). On the one hand, the DFB promotes approximately 14,000 players from amateur clubs with one additional practice session per week at 366 regional competence centers. On the other hand, about 800 players in each age group are trained at 54 youth academies of the German professional clubs. The participants of this talent development program are among the top 4% of all German youth players in their age groups. As a next step, the most talented of these players are further developed at youth academies as part of the elite promotion program. Here, the best 1% in the U16 to U19 age classes compete at the highest national level.

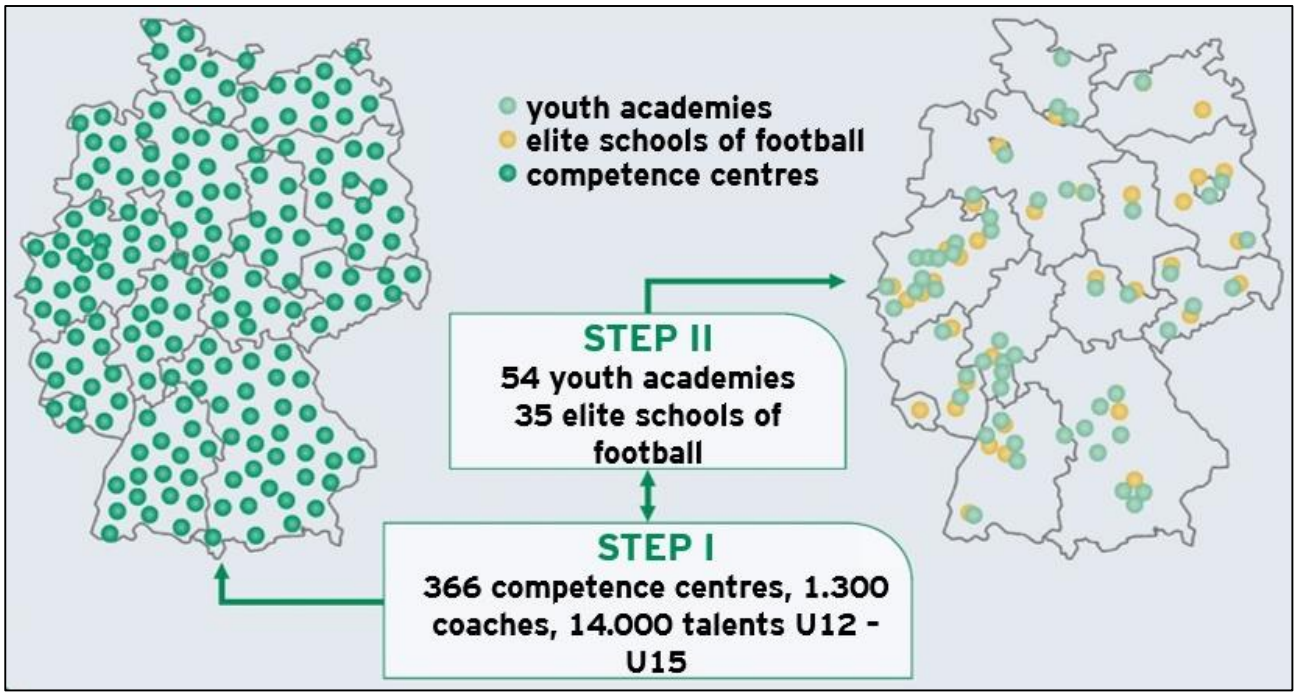

Figure 1. Talent development program of the German Soccer Association (Daniel, 2014).

Talent identification and development in soccer

The fundamental challenges of youth promotion programs in soccer include the process of recognizing current participants with the potential to become elite adult players (*talent identification*; Reilly, Williams, & Richardson, 2008) and providing the most appropriate learning environment so that these individuals have the opportunity to realize their potential (*talent development*; Vaeyens, Lenoir, Williams, & Philippaerts, 2008). Based on this understanding of youth promotion, talent identification attempts to match young players' performance characteristics to the requirements of elite adult soccer, and talent development enables access to high quality training and practice for those who are identified as likely to be successful in the future. Typically, talent identification and development are regarded as parallel and mutually related procedures (Hohmann, 2009). Therefore, talent identification can be viewed as both 'the start of' and an 'element within' the talent development process, which consequently involves the prediction of success at different stages (Vaeyens, Coehlo e Silva, Visscher, Philippaerts, & Williams, 2013).

However, talent identification and development in soccer is extremely difficult because clearly defined and objectively measurable characteristics that may indicate an individual's potential to succeed at the elite adult level are still lacking (Abbott & Collins, 2004). This deficiency has led several researchers (e.g., Reilly et al., 2008) to the conclusion that the progression of young players to professional soccer cannot be accurately predicted. Consequently, a shift in emphasis from talent identification to development has been suggested (Durand-Bush & Salmela, 2001). In contrast to this perspective, youth promotion programs must select or deselect players from a large population, so that their limited resources can be focused on a smaller number of individuals (Williams & Reilly, 2000). Hence, there is a substantial need to identify the most talented players within the talent identification and development process.

Regarding the practical implementation of talent identification in soccer, promotion programs typically rely on coaches and scouts who subjectively assess the qualities of the players presumed to be important for future success (Cobley, Schorer, & Baker, 2012). However, thus far, there is limited information available regarding the criteria that these subjective assessments are based on. Furthermore, some evidence suggests that the talent identification procedures used in clubs and associations are only successful to a limited extent (Vaeyens et al., 2013). Consequently, science-based support systems have been increasingly used to supplement these subjective decisions (Unnithan, White, Georgiou, Iga, & Drust, 2012). Here sport science can contribute a greater degree of objectivity to talent identification in soccer (Williams & Reilly, 2000).

Sport talent research

Regarding science-based support systems, a principal function of sport talent research is to provide an empirical foundation for the talent identification and development process. First and foremost, scholars need to build an understanding of talent in sport. Although talent has been widely researched in this context, there is still no universally accepted definition because talent is an extremely complex concept that lacks a clear theoretical framework (Hohmann, 2009; Vaeyens et al., 2008). Over the

past decades, the discussion of talent has been embedded in a broader debate about whether human development results from genetic predispositions or environmental influences. However, today it is generally accepted that achievement is the product of an interaction among factors related to both of these two areas (Baker & Horton, 2004; Cobley et al., 2012). Beyond the nature versus nurture debate, *four different attributes* that have repeatedly been discussed in the previous literature can be assigned to the concept of talent in sport: (1) multidimensional, (2) domain-specific, (3) dynamic, (4) prospective.

First, it is well recognized that a *multidimensional* approach is needed to understand the talent identification and development process because characteristics from multiple dimensions are required to become an elite adult player. Williams and colleagues (Williams & Franks, 1998; Williams & Reilly, 2000) described the potential predictors of soccer talent and discriminated between physiological (e.g., aerobic capacity), physical (e.g., height), sociological (e.g., parental support), and psychological factors (e.g., perceptual-cognitive skills, personality).

Because very few individuals are outstanding in many different areas, talent is specific to a particular domain (Hohmann, 2009). In the context of sport talent research, this *domain-specific* understanding leads to the demand that the unique requirements of each sport need to be captured (Vaeyens et al., 2008). Elbe, Beckmann, and Szymanski (2003) demonstrated that more accurate predictions of athletic performance can be achieved with more specific assessment. Consequently, soccer-specific diagnostics of potential talent predictors may lead to explanations of more of the variance within youth players' behaviors.

Furthermore, previous research has emphasized the need to adopt a more developmental perspective of talent in sport (Fisher, 2008). Performance and its underlying characteristics change over time due to the *dynamic* nature of talent (Abbott & Collins, 2002; Vaeyens et al., 2013). In this regard, it must be taken into account that the development of talented soccer players primarily takes place dur-

ing adolescence; a key developmental phase in which many changes occur. Further research highlights that individuals need to progress through various phases of development. For example, Bloom (1985) proposed three key phases (i.e., initiation, development, and mastery) in which individuals must successfully manage several transitions during the course of development.

Regarding talent identification in sport, typically those adolescents who demonstrate outstanding current performance are designated as talented athletes. However, adolescent performance has been shown to be a weak indicator of success at the elite adult level (Abbott & Collins, 2004). The main reason for this weak relationship is that performance at a young age is likely to be affected by a wide range of personal (e.g., physical maturity, relative age) and/or environmental (e.g., past experiences, access to resources) factors. Because the primary aim of youth promotion programs is to identify and develop talented players with the greatest probability of adult success, the distinction between players' adolescent performance levels and their potential for progression is important in this context (Vaeyens et al., 2008). Although young athletes need to achieve at least a certain level of performance to be identified as talented individuals (Joch, 2001), Abbott and Collins (2002) emphasized the importance of a *prospective* view regarding the talent question. In conclusion, a talented soccer player can be categorized as an adolescent player who currently performs at a high level, and who has the potential to become an elite adult player.

Psychological diagnostics as part of the scientific support for the DFB talent development program

As part of the scientific support for the DFB talent development program conducted by the University of Tübingen, the present research project focused exclusively on psychological personality characteristics that have been recognized to play an important role in soccer success (Morris, 2000). Considering that with increasing performance level the population of players becomes more and more homogenous in terms of physical and physiological aspects, psychological factors have been identified to distinguish between more and less talented players at the highest standard (Vaeyens et al.,

2008). In connection with the growing awareness of the role of personality characteristics in athletic success, sport psychological support systems (i.e., counseling, training, and coaching) have become increasingly relevant in the context of youth promotion in soccer. Therefore, psychological diagnostics of personality characteristics can serve as an important foundation for the optimization of such sport psychological work (Beckmann & Kellmann, 2008).

However, as part of the talent identification and development process in soccer, previous research has emphasized that personality characteristics should not be used to identify and select talented players. Psychological diagnostics assessing such characteristics have not been validated appropriately for this purpose (Morris, 2000). Furthermore, individual characteristics, especially when assessed in preselected groups, are expected to explain only minor proportions of complex performance (Ackerman, 2014). In contrast, psychological diagnostics can be applied as part of the talent development process to identify players' strengths and weaknesses (Williams & Reilly, 2000). Accordingly, coaches and sport psychologists can then help talented players to develop adequate levels in these particular characteristics. In this regard, it is necessary to ensure that the assessment of the relevant personality characteristics is scientifically sound.

For this purpose, psychological diagnostics were implemented at the regional DFB competence centers. These diagnostics considered the above-mentioned four attributes of talent in sport. (1) From the psychological perspective, expanding on the multidimensional understanding of talent, personality can also be regarded as a multifaceted construct (Baltes, Lindenberger, & Staudinger, 2006). Therefore, it seems beneficial to consider a wide range of personality characteristics because various facets may differ in terms of their relevance to success in soccer. Based on this multifaceted approach within the psychological talent dimension, the diagnostics assessed personality characteristics that were assigned to the areas of motivation, volition, self-referential cognition, and emotion. (2) To assess these characteristics, German versions of established self-report questionnaires were used following soccer-specific and age-appropriate adaptations. (3) Because of the dynamic nature of talent,

the psychological diagnostics were conducted across longitudinal sections from the U12 to U14 age classes to provide information about the development of personality characteristics over time. In terms of an important transition in the developmental course, this research project particularly considered the key period between the DFB talent development program (U12–U15) and the elite promotion program (U16–U19). In the later stage, the most talented of all individuals playing soccer in Germany are selected for professional clubs' youth academies. (4) Regarding the prospective view of the talent question, psychological personality characteristics are considered to be particularly important for the players' developmental potential because characteristics such as motivation and volition facilitate learning, training and competition (Abbott & Collins, 2004; Williams & Reilly, 2000).

The present dissertation

The primary aim of the present dissertation was to systematically examine the relevance of psychological personality characteristics in talented soccer players. The main focus was placed on the prognostic values of the characteristics for soccer success to provide an empirical basis for the application of psychological diagnostics in the context of youth promotion programs. The previous sport science literature suggests a *stepwise procedure* to examine the prognostic relevance of such potential predictors in talent research (Hohmann, 2009, pp. 27-30). The model of Gabler and Ruoff (1979) includes the following steps: 1. Search for potential predictors based on literature reviews and coach interviews; 2. Development of measurement instruments to assess potential predictors; 3. Examination of the relationships between predictors and performance criteria; 4. Cross-validation of relationships identified in the previous step. Expanding on this model, Singer (1981) and Seidel (2005) added the determination of an appropriate performance criterion and the provision of standard values as additional steps in this procedure. Finally, Hohmann (2009) emphasized the need to consider the predictors' stabilities as a precondition of the predictions. This postulation of various steps is consistent with the psychological literature on the accuracy of prognoses. For example, Nolting and

Paulus (1999) considered selection, assessment, stability, and prognostic value to be the key issues in the prognostic process.

Regarding this stepwise procedure, the present dissertation comprised the following three consecutive empirical studies that addressed various aspects of sport psychological talent research:

(1) Feichtinger, P., & Höner, O. (2014). Psychological diagnostics in the talent development program of the German Football Association: Psychometric properties of an Internet-based test battery. *Sportwissenschaft [German Journal of Sport Sciences]*, *44*(4), 203-213. doi: 10.1007/s12662-014-0341-0

(2) Feichtinger, P., & Höner, O. (2015). Talented football players' development of achievement motives, volitional components, and self-referential cognitions: A longitudinal study. *European Journal of Sport Science*. Advance online publication. doi: 10.1080/17461391.2015.1051134

(3) Höner, O., & Feichtinger, P. (2015). *Psychological predictors of soccer talent: Empirical relationship of personality characteristics with current and future performance*. Submitted for publication.

In addition to these publications in peer-reviewed journals, various aspects of the present dissertation have been presented at national and international conferences that focused on sport science and/or sport psychology, and scientific and practically-oriented audiences (cf. References, for the complete list). The presentations held by this doctoral candidate are listed below:

- Feichtinger, P., Ulitsch, A. & Höner, O. (2012). Psychologische Diagnostik im DFB-Talentförderprogramm: Evaluation der Implementierung einer Online-Testbatterie. In C. T. Jansen, C. Baumgart, M. W. Hoppe & J. Freiwald (Hrsg.), *Trainingswissenschaftliche, geschlechtsspezifische und medizinische Aspekte des Hochleistungsfußballs – Beiträge und Analysen zum Fußballsport XVIII* (S. 201-207). Hamburg: Czwalina.
- Feichtinger, P. & Höner, O. (2012). Psychologische Diagnostik im DFB-Talentförderprogramm: Differentiell-Persönlichkeitspsychologische Aspekte. In M. Wegner, J.-P. Brückner & S. Kratzenstein (Hrsg.), *Sportpsychologische Kompetenz und Verantwortung* (S. 68). Hamburg: Czwalina.
- Feichtinger, P. & Höner, O. (2012). Psychological assessment in the talent development program of the German Football Association (DFB): Aspects of personality and differential psychology. *Abstract Book of the 4th Biennial Conference on the Economics and Psychology of Football* (p. 14). Heidelberg, Germany.
- Feichtinger, P., & Höner, O. (2013). Stabilität und Veränderung psychologischer Persönlichkeitsmerkmale bei Nachwuchsleistungsfußballern. In F. Mees, M. Gruber & A. Woll (Hrsg.), *Sportwissenschaft grenzenlos?!* (S. 251). Hamburg: Czwalina.
- Feichtinger, P., & Höner, O. (2014). Stability and change of personality characteristics in youth soccer. *Journal of Sport & Exercise Psychology*, *36*, S87. Paper presented at the 2014 Conference of the North American Society for the Psychology of Sport and Physical Activity (NASPSPA), Minneapolis, Minnesota, USA.
- Feichtinger, P. (2014). Zusammenhänge psychologischer Persönlichkeitsmerkmale mit objektiv erfassten und subjektiv eingeschätzten Leistungskriterien im Nachwuchsfußball. In M. Lames, O. Kolbinger, M. Siegle & D.

Link (Hrsg.), *Fußball in Forschung und Lehre – Beiträge und Analysen zum Fußballsport XVX* (S. 170-175). Hamburg: Czwalina.

- Feichtinger, P. & Höner, O. (2015). Relationship of personality characteristics with current and future performance criteria in talented soccer players. In R. Seiler & O. Schmid (Eds.), *Sport psychology - Theories and applications for performance, health and humanity* (p. 46). 14th European Congress of Sport Psychology, Bern, Switzerland.

The present synopsis of this dissertation is structured as follows. Chapter II provides a detailed integration of the general research question into the corresponding theoretical background and empirical state of research. This information may aid the understanding of the rationale behind the selection of the previously mentioned personality facets and further describes the specific characteristics and the underlying psychological questionnaires. In Chapter III, the stepwise procedure is specified with respect to the present dissertation's research question and the three empirical studies are inserted. Chapter IV provides a comprehensive discussion that summarizes the main results of the present dissertation and relates these findings to previous research. Furthermore, this work identified avenues for future research and highlighted conclusions for sport psychological work in the context of talent identification and development.

II Theoretical background and the empirical state of research

Relationship between personality and performance in soccer

The present dissertation considers psychological personality characteristics as potential talent predictors, which leads to a debate about the associations of such characteristics with performance in soccer. The relationship between personality and sport behavior is one of the most popular topics in sport psychology (Singer, 2000; Vealey, 2002). Specifically, the association between personality characteristics and athletic performance has been intensively examined in sport personality research (Conzelmann, 2009). A review by Morris (2000) that focused on soccer revealed two main trends in the scientific literature.

First, a shift from research with elite adults toward adolescent talent identification and development work was observed. Initially, *adult personality research* examined the relationship between personality and soccer performance by analyzing the psychological qualities of elite adult players compared with their less successful counterparts. The underlying assumption was that the personality characteristics that are recognized to be relevant for success in adulthood could be used to identify and develop talented soccer players. Subsequently, however, an increase in the interest in *talent research* occurred; i.e., sport scientists and psychologists began to directly study talented soccer players. This approach assumes that the adolescents who display characteristics associated with success will become elite adult players in the future. One possible reason for this change in focus may be the need of soccer practitioners to identify the most talented players as early as possible to direct them to a systematic development process (Williams & Reilly, 2000).

A second trend appeared in the selected characteristics that were considered within this research. The early studies focused on *general personality traits* (e.g., extraversion, neuroticism). Trait characteristics are defined as relatively broad dispositions to certain types of behavior that are believed to be stable over time and consistent across situations (Roberts, 2009; Stemmler, Hagemann, Amelang,

& Bartussek, 2010). This approach was typically based on such measures as the 16 Personality Factor Questionnaire (Cattell, 1966) and the Eysenck Personality Inventory (Eysenck & Eysenck, 1975), which claim to assess an individual's whole personality. However, as demonstrated by Morris (2000), no clear relationships have been found between these characteristics and success in soccer. In addition to methodological deficiencies (e.g., small sample sizes, varying definitions of 'success'), the focus on relatively broad personality traits has been regarded as the main reason for the inconsistent findings and led to the conclusion that no evidence exists that distinguishable personality profiles of successful soccer players actually exist.

Due to the weak state of the evidence regarding the relationship between personality and performance in soccer, subsequent research increasingly used *psychological state variables.* Here, the basic assumption was that personal and situational factors interact with each other and that this interaction produces current states. It has been suggested that such states represent better predictors of athletic performance compared with traits (Conzelmann, 2009). This approach included state-derived measures of anxiety and self-confidence (e.g., the Competitive State Anxiety Inventory; Martens, Burton, Vealey, Bump, & Smith, 1990) and psychological skills such as goal-setting, imagery, and performance evaluation (Abbott & Collins, 2004). Although these measures have been more successful than the broad trait approaches in discriminating between players of different performance levels (Durand-Bush & Salmela, 2001; Gould, Dieffenbach, & Moffett, 2002), the use of state variables, which can change from day to day or from hour to hour, does not provide a strong indication of typical behavior (Morris, 2000). Therefore, the utility of this approach for examining the relationship between personality and soccer performance must be questioned.

Consequently, recent research has focused on *specific trait-based personality characteristics*, including, for example, sport-specific measures of trait-anxiety and achievement motives. Compared with state variables, specific personality traits are considered to be more stable over time and across situations. In contrast to the general trait approaches that claim to capture a person's whole personality

across a set of relatively broad traits, specific personality variables focus on single aspects of personality that are hypothesized to be important for performance. Given these trends in sport personality research, the present dissertation is most related to talent identification and development work that examines the relevance of specific personality characteristics for success in youth soccer. Because such an approach only captures single aspects of the whole athletic personality, a theoretical basis for the selection of the relevant personality characteristics is needed. In this regard, models of giftedness research, the psychological processes underlying sport behavior, and the current empirical state of research can serve as a framework.

General models of giftedness research as a theoretical framework

General models of giftedness research, such as the Differentiated Model of Giftedness and Talent (DMGT 2.0; Gagné, 2010) and the Munich Model of Giftedness (MMG; Heller & Perleth, 2008), provide a valuable conceptual foundation. Although originally developed for educational research, these theoretical approaches have been recently applied in the sport context (Figure 2; Hohmann, 2009; Vaeyens et al., 2008). Both models share the assumption that the presence of talent necessarily implies the possession of outstanding aptitudes, which are partially the product of genetic factors. In this context, the DMGT distinguishes between giftedness (i.e., untrained and spontaneously expressed natural abilities) and talent (i.e., systematically developed competencies), whereas the MMG uses these two terms as synonyms. Regardless of whether this distinction is made, giftedness or talent is conceptualized as a multidimensional construct that is expressed in various ability domains (e.g., intellectual, creative, social, and psychomotor). Such abilities can manifest themselves in many different achievement areas (e.g., academics, arts, and sports). Regarding the dynamic nature of talent, the developmental process is described as the transformation of an individual's potential into performance in a particular area. This relationship between potential and performance is influenced by so-

called “moderators” (MMG) or “catalysts” (DMGT). That is, intrapersonal (e.g., physical and psychological) and environmental (e.g., cultural and family) factors facilitate (or hinder) the talent development process.

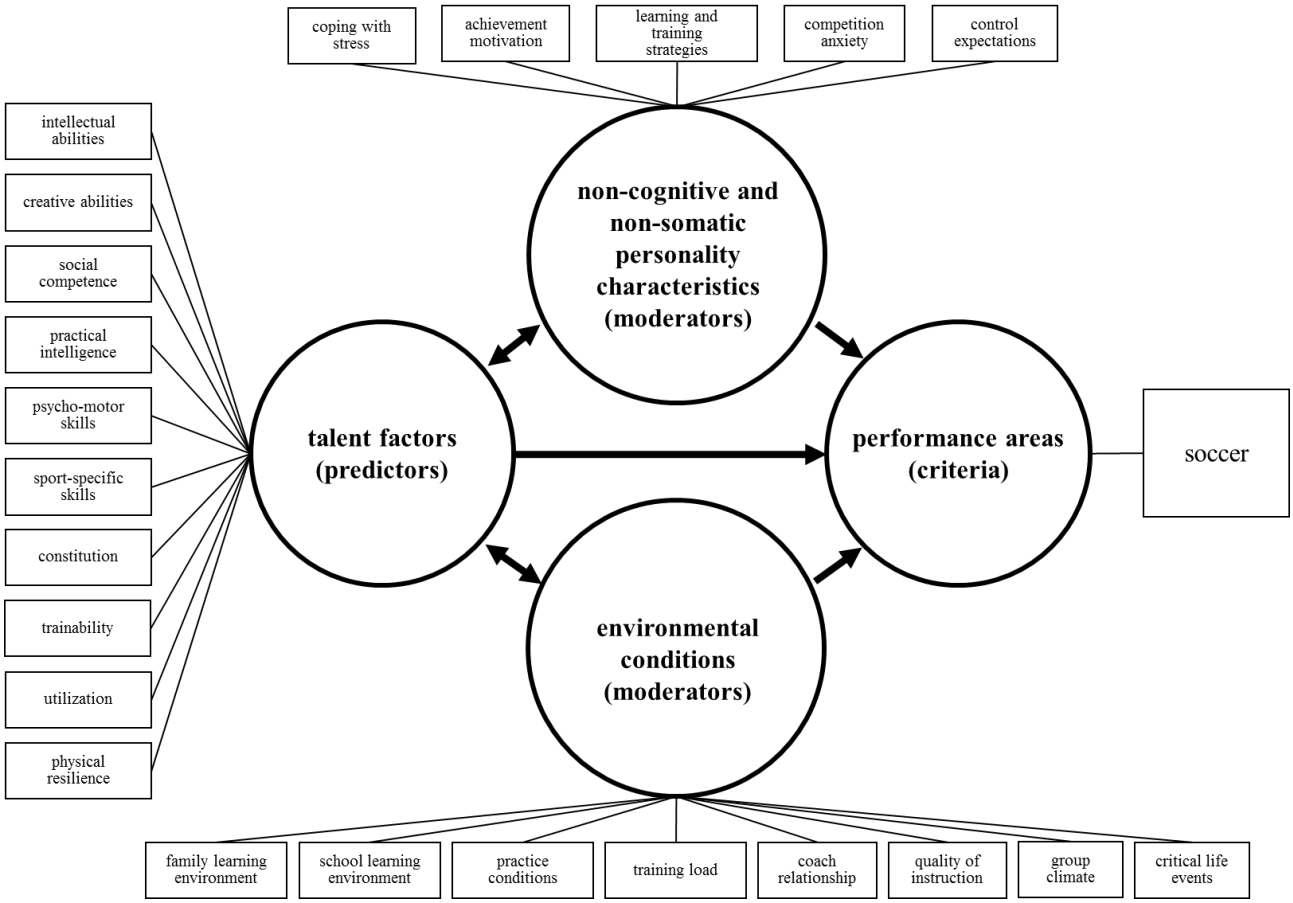

Figure 2. Modified version of the Munich Model of Giftedness (Heller & Perleth, 2008) based on the sport-specific adaptation by Hohmann (2009, p. 311).

Within the personal factors, both models also consider specific psychological personality characteristics that are primarily assigned to the areas of motivation (e.g., achievement motives), volition (e.g., effort), self-referential cognition (e.g., self-concept), and emotion (e.g., anxiety). In addition to the moderating effects suggested by the DMGT and MMG models, the nature of the relationship between personality characteristics and athletic performance has been discussed diversely in previous talent research. First, these characteristics are supposed to have an immediate influence on performance in terms of talent or ability factors. In this sense, Baker and Horton (2004) consider personality characteristics to be primary factors. Second, these characteristics are addressed as mediating factors

that determine the frequency and persistence of athletes' training volume (Abbott & Collins, 2004). However, only a few empirical studies have focused on the nature of this relationship (for further discussion using the example of achievement motives see Zuber & Conzelmann, 2014).

Specific psychological personality characteristics underlying sport behavior

The specific personality characteristics, as they are addressed in models of giftedness research, correspond to the psychological constructs that are regarded to be key psychological processes underlying athletic behaviors (cf. Conzelmann, Hänsel, & Höner, 2013). From a sport psychological perspective – in addition to motor skills – motivational, volitional, cognitive, and emotional aspects contribute to successful or less successful actions in the context of sport (Figure 3). These characteristics can be further differentiated based on psychological theories, which has led to specific personality characteristics that are considered relevant to athletic success. Although such psychological processes always result from interactions between situational and personal factors, the present dissertation exclusively focused on personal dispositions due to the trait-based approach in sport talent research.

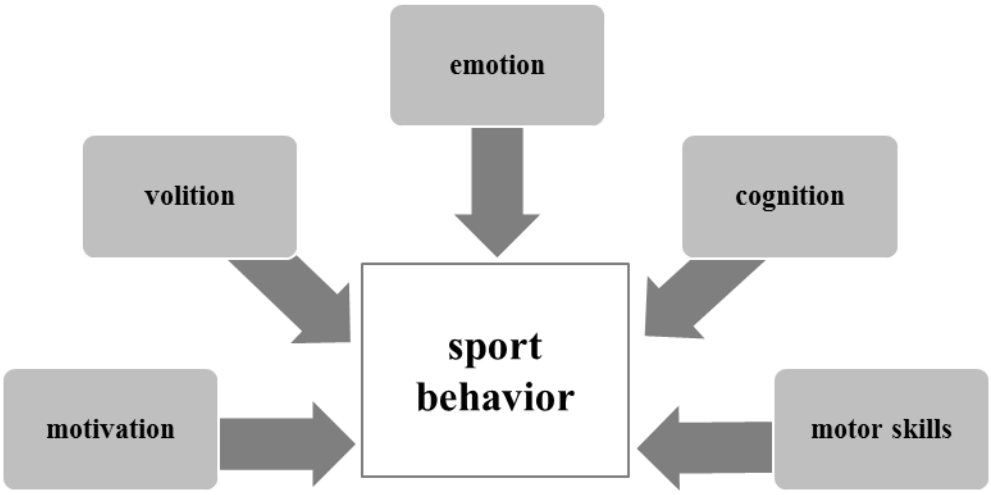

Figure 3. Psychological processes underlying sport behavior (adapted from Höner, 2012).

Because personality characteristics are commonly assessed using self-report questionnaires, the underlying psychological measures also need to be addressed. For German-speaking areas, an initiative of the German Federal Institute for Sports Science and individual groups of researchers developed a series of sport-specific measurement instruments that address (achievement) motivation, volitional components, (self-referential) cognition, and competition anxiety.

(Achievement) Motivation

Motivation refers to all processes that initiate and maintain goal-oriented behaviors (Mook, 1987; Rudolph, 2009). From a sport psychological perspective, achievement motivation is particularly regarded as an essential factor for athletic success (Kämpfe, Höner, & Willimczik, 2014; Schneider, Bös, & Rieder, 1993). In this regard, achievement motives and motivational orientations are considered to be important personal dispositions. Elliot and Church's hierarchical model of approach and avoidance achievement motivation (1997) attempts to integrate these two constructs (Figure 4). In this model, motivational orientations are regarded as manifestations of the underlying achievement motives. Therefore, the effects of motive dispositions on achievement outcomes are viewed as indirect, whereas motivational orientations are presumed to be direct determinants of achievement behavior.

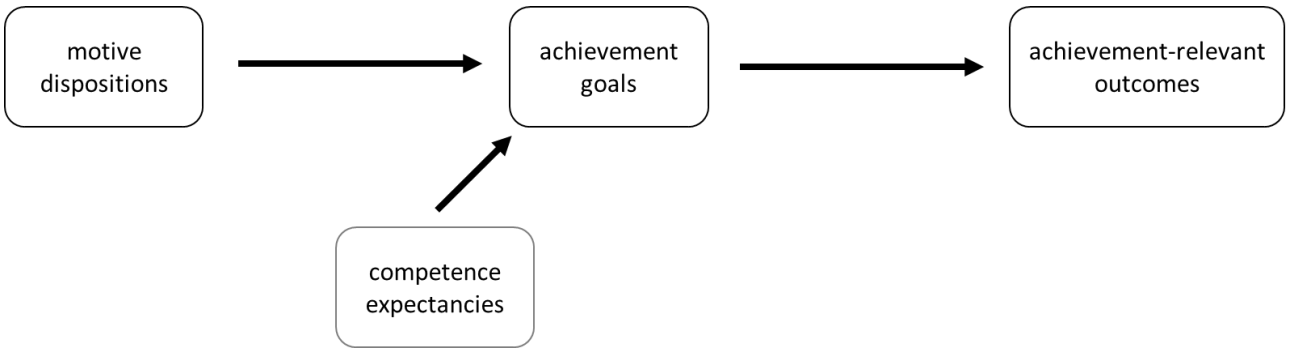

Figure 4. A hierarchical model of approach and avoidance achievement motivation (adapted from Elliot & Church, 1997).

Achievement motives are considered to be person-specific dispositions that provide information about how individuals perceive and evaluate achievement situations. In Atkinson's risk-taking theory (1957), the two 'classical' motive components of hope for success and fear of failure are distinguished. Success-motivated people tend to approach achievement situations, whereas failure-motivated individuals tend to avoid such situations. *Motivational orientations* provide information about the criteria that individuals use to define success and judge their level of ability. In this regard, achievement goal theory (Nicholls, 1984, 1989) assumes that the demonstration of ability is the primary aim of individuals in achievement contexts. Specifically, this theory distinguishes between two dispositional goal orientations. Task-oriented individuals feel successful when they master a task, learn a new skill, and/or improve their performance (i.e., individual and objective standards of comparison). In contrast, ego-oriented people evaluate success in terms of performing better than others (i.e., social standards of comparison).

To assess motivational characteristics in sport, the 'Achievement Motives Scale Sport' by Wenhold, Elbe, and Beckmann (2009a) is used to assess the two motive components of hope for success and fear of failure. To measure motivational orientations, researchers have developed several self-report questionnaires. Most notably, the 'Task and Ego Orientation in Sport Questionnaire' (TEOSQ; Rethorst & Wehrmann, 1998) and the 'Sport Orientation Questionnaire' (SOQ; Elbe, Wenhold, & Beckmann, 2009) are applied. The TEOSQ captures both of the above-mentioned goal orientations (task and ego), whereas the SOQ distinguishes between three different achievement orientations (competition, win, and goal). Specifically, the latter discriminates between competition and win orientation within the ego-oriented disposition, whereas goal orientation is thought to be equivalent to the task-oriented component. Furthermore, the 'Sports-related Achievement Motivation Test' (Frintrup & Schuler, 2007) is widely used to assess various dimensions of achievement motivation, such as aspiration level and competitive attitude.

Volitional components

Volition refers to all processes of planning and initiating intentions, maintaining actions, and overcoming barriers (Höner, 2005). This definition suggests a clear distinction between motivation (goal identification) and volition (goal achievement). Previous research has emphasized the relevance of *volitional components* to the attainment of success in sport (Beckmann, Fröhlich, & Elbe, 2009; Höner & Willimczik, 1998). Particularly, volition is thought to be important for realizing long and intense training loads during the course of an athletic career (Elbe, Szymanski, & Beckmann, 2005).

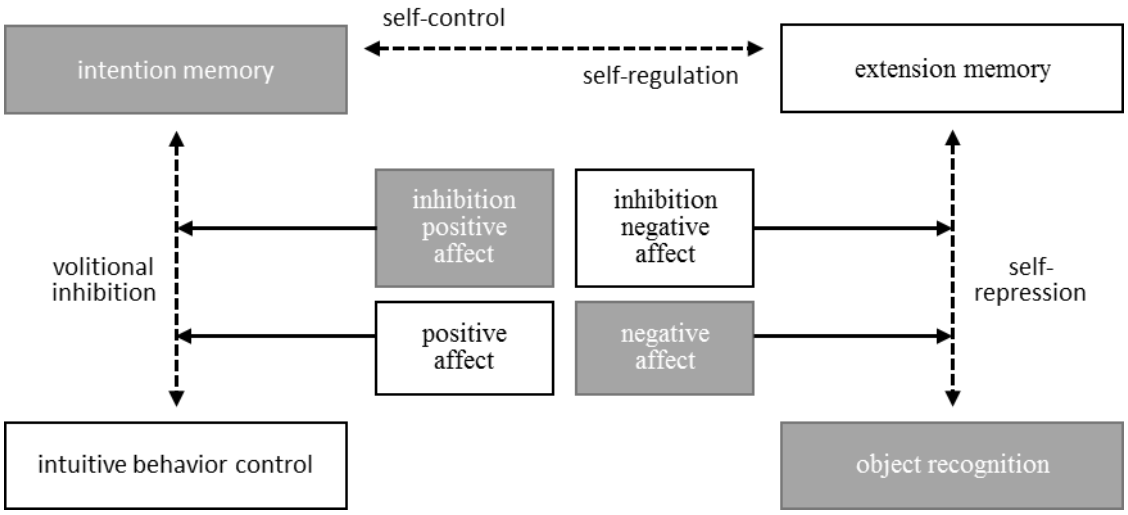

Figure 5. Modified version of the Personality Systems Interaction Theory (Kuhl, 2000) adapted from Wenhold, Elbe, and Beckmann (2009b).

The individual components that represent volition are described in Kuhl's theory of Personality Systems Interactions (Kuhl, 2000, 2001; for a brief overview, see Wenhold, Elbe, & Beckmann, 2009b). This theory (Figure 5) proposes four cognitive systems (i.e., intention memory, intuitive behavior control, extension memory, and object recognition), which interact dynamically with each other. The activation of these four systems is modulated by the regulation of positive and negative affect. Regarding the ability to regulate affect, Kuhl (1983) distinguishes between action and state orientation. Action-oriented individuals tend to focus on action-relevant information in a given situation, whereas state-oriented people have persistent thoughts about future, present and past aspects.

The ability to regulate affect is greater in individuals with high action orientation compared to high state orientation (Kuhl, 2006). Taking this information into account, interactions between the four cognitive systems are considered to be specific processes of volition, which are further divided into self-regulation and self-control as volitional skills and volitional inhibition and self-repression as volitional deficits.

In the field of volition, the self-report questionnaire 'Volitional Components in Sport' (VCS) by Wenhold, Elbe, and Beckmann (2009c) is used to assess volitional skills (self-optimization) and deficits (self-impediment, lack of initiation, and loss of focus). Self-optimization represents an athlete's ability to activate volitional strategies that aid the pursuit of goals and implementation of actions. This subscale corresponds to both of the components self-regulation and self-control. High self-impediment indicates that the realization of actions is affected by negative thoughts and emotions; thus, this subscale is equivalent to the component of self-repression. The subscales lack of initiation and loss of focus correspond to volitional inhibition. Individuals with high lack of initiation have few strategies to initiate and execute actions in sport. A high loss of focus value suggests that an athlete is not able to hide disturbing thoughts to focus on the current action. Regarding the ability to regulate affect, the 'Sport-specific Action Orientation Questionnaire' (Beckmann & Wenhold, 2009) is applied to measure action and state orientation in the following three different phases: after failure, while planning and choosing actions, and in the course of executing actions.

(Self-referential) Cognition

Self-referential cognition refers to a person's subjective knowledge about himself or herself. In the context of sport, the physical self-concept and self-efficacy can be regarded as particularly important factors that influence athletic performance. *Self-concept* is defined by how a person perceives and evaluates himself or herself, including the person's attributes and who and what the self is (Baumeister, 1999). Shavelson, Hubner, and Stanton (1976) proposed a multifaceted, hierarchical model of self-concept (Figure 6). These authors differentiate general self-concept into academic and

non-academic self-concepts. The latter is further divided into social, emotional and physical components. Physical self-concept is considered to be the aspect of general self-concept that comprises any self-referential information that refers to a person's own body. In this regard, Marsh and Redmayne (1994) differentiated the subareas of physical appearance and general physical ability, and the latter was further divided into the specific abilities of strength, balance, endurance, and flexibility.

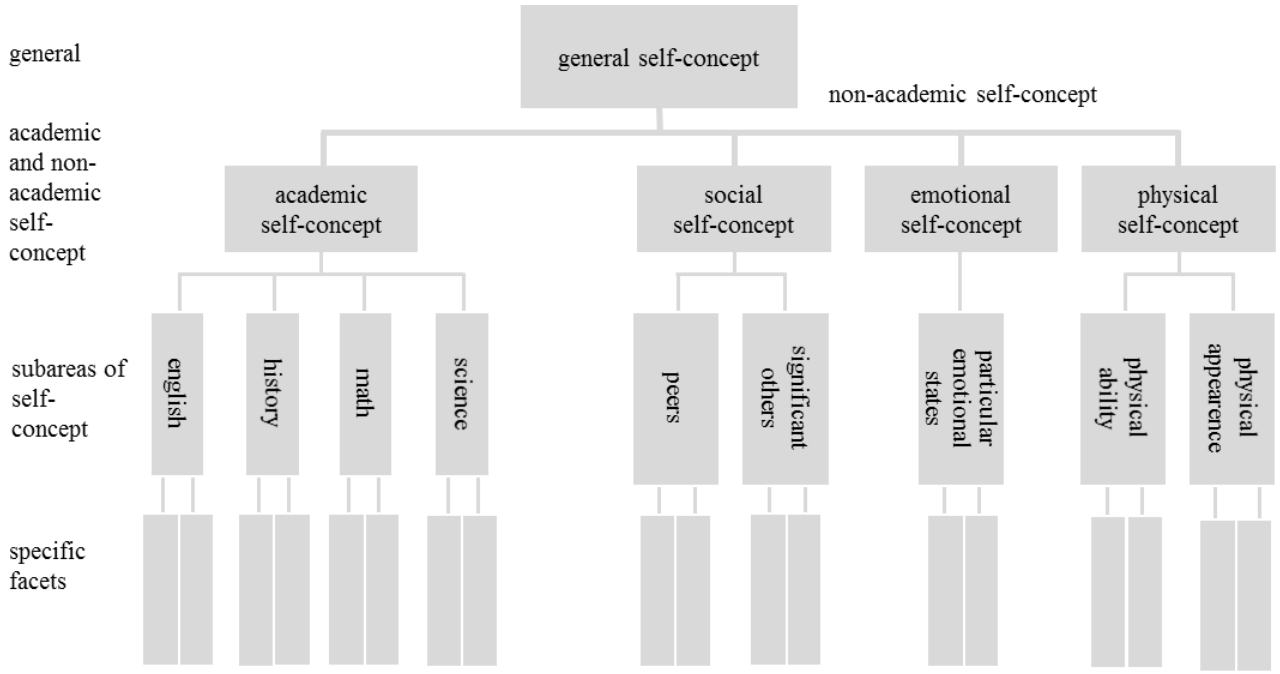

Figure 6. Multifaceted, hierarchical model of self-concept (adapted from Shavelson, Hubner, & Stanton, 1976).

Self-efficacy is defined as a person's belief in his or her own capabilities to succeed in specific situations, particularly when this person is faced with unfamiliar and difficult challenges (Bandura, 1997; Fuchs & Schwarzer, 1994). This psychological construct is based on Bandura's social-cognitive theory (1986). Self-efficacy is theorized to influence the activities individuals choose to approach, how much effort they expend on such activities and the degree to which they are persistent even in difficult situations (Bandura, 1997; Moritz & Feltz, 2000).

To assess self-referential cognition, Stiller, Würth, and Alfermann (2004) developed the 'Physical Self-Concept Scales' (PSC) to capture the self-concept subdimensions of strength, balance, endurance, flexibility, and speed as well as the superior areas of general physical ability and physical appearance. Based on the assumption of domain-specific self-efficacy (Bandura, 2006), numerous psychological questionnaires exist that assess sport-specific self-efficacy (e.g., Wilhelm, Büsch, & Pabst, 2013). In the field of soccer, Gerlach (2004) developed a self-report scale to capture soccer-specific self-efficacy.

Competition anxiety

Emotions are complex psychological states that arise in response to individuals' appraisals of environmental situations and involve three distinct components: a subjective experience, a physiological reaction, and a behavioral response (Cox, 2002; Meyer, Schützwohl, & Reisenzein, 2001). In the context of competitive sport, anxiety is regarded as an important factor that can influence athletic performance (e.g., Raglin & Hanin, 2000). *Competition anxiety* is a current emotional state that is understood as a response to competitive situations that are experienced as threatening (Martens, Vealey, & Burton, 1990).

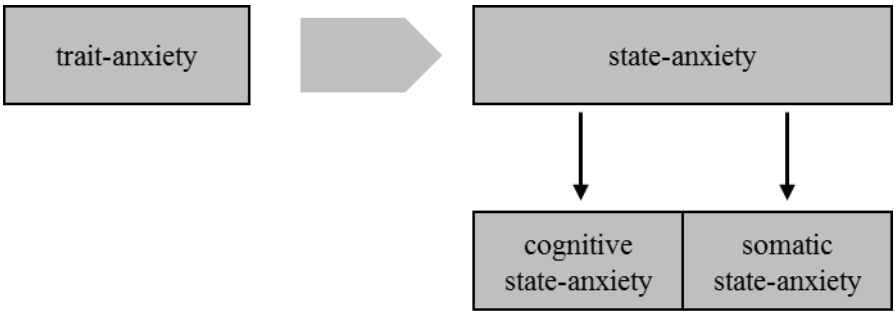

Figure 7. Anxiety model based on Weinberg and Gould (2011, p. 79).

The state-trait anxiety theory (Figure 7; Spielberger, 1966) assumes that state anxiety is influenced by the underlying trait of anxiety, which is defined as the tendency to perceive competitive situations as threatening and to respond to these situations with symptoms of anxiety (Martens,

Vealey, et al., 1990). In this context, it is widely accepted that competition anxiety is a multidimensional construct, which can be divided into somatic and cognitive components (Smith, Smoll, & Schutz, 1990). Somatic anxiety indicates that athletes tend to experience physical symptoms of anxiety, such as muscle tension and cardiac responses. Cognitive anxiety manifests itself primarily in an individual's tendency to experience worrying thoughts, self-doubt, and difficulties in focusing on task-relevant aspects.

To capture the multidimensional trait of competition anxiety, the self-report questionnaire Competition Anxiety Inventory-Trait (CAI-T) by Brand, Ehrlenspiel, and Graf (2009) is commonly used. This questionnaire measures somatic anxiety and two aspects of cognitive anxiety (i.e., worry and concentration disruption).

The empirical state of research

Previous research has examined the relationships of these motivational, volitional, (self-referential) cognitive and emotional personality characteristics with success in soccer. This work attempted to identify the characteristics that discriminate between youth players of different performance levels. A number of studies have provided empirical evidence that psychological characteristics of various personality facets are associated with soccer success (e.g., Reilly, Williams, Nevill, & Franks, 2000; Zuber, Zibung, & Conzelmann, 2015). However, other research has found no significant differences between successful and less successful youth players (e.g., Huijgen, Elferink-Gemser, Lemmink, & Visscher, 2014; Spamer & Coetzee, 2002). Furthermore, some of these studies have reported inconsistent results (Coelho e Silva et al., 2010; Kavussanu, White, Jowett, & England, 2011). Table 1 provides an overview of the various studies. A more detailed description of this research and its findings can be found in Study 3 of the present dissertation (cf. Chapter III).

Table 1. *Empirical state of research*

Reference	**Sample size** (*N*)	**Age group** (years)	**Personality characteristics**	**Design**	**Performance criterion**	**Statistical analyses**	**Significant findings**
Reilly et al. (2000)	31	16	Goal orientation; Competition anxiety & Self-confidence	Cross-sectional	Elite vs. sub-elite	ANOVAs; Stepwise discriminant function analysis	Task & Ego orientation (elite > sub-elite) Somatic anxiety (elite < sub-elite)
Spamer & Coetzee (2002)	37	16	Competition anxiety & Self-confidence	Cross-sectional	Talented vs. less talented	ANOVAs; Stepwise discriminant function analysis	---
Figueiredo et al. (2009)	159	11–15	Goal orientation	Prospective (2 years)	Drop-outs vs. club vs. elite level	MANOVA	---
Toering et al. (2009)	444	11–17	Self-regulation	Cross-sectional	Elite vs. non-elite	Logistic regression analysis	Reflection & Effort (elite > non-elite)
Coelho e Silva et al. (2010)	114	13–14	Goal orientation	Cross-sectional	Regional vs. local	ANOVAs; Stepwise discriminant function analysis	Ego orientation (regional > local)
Kavussanu et al. (2011)	118	12–16	Goal orientation	Cross-sectional	Elite vs. non-elite	MANOVA; ANOVAs	Task orientation (elite > non-elite)
Toering et al. (2012)	256	12–17	Self-regulation	Cross-sectional	International vs. national players	Logistic regression analysis	Reflection (international > national)
Huijgen et al. (2014)	113	16–18	Goal orientation	Prospective (< 1 year)	Selected vs. deselected	MANCOVA, Stepwise discriminant function analysis	---
Zuber & Conzelmann (2014)	140	12	Achievement motive	Prospective (< 1 year)	Rating scale	Structural equation modelling	Hope for success (Positive association with rating)
Zuber et al. (2015)	97	13	Achievement motive & Achievement orientation	Prospective (1 year)	Selected vs. not selected	LICUR analysis	Hope for success; Fear of failure; Win & Goal orientation (selected > not selected)

Note. This overview of the current state of research makes no claim for completeness. The table exclusively addresses aspects of the present research that relate to the previous sections of this dissertation.

Considering the current state of research, the empirical evidence for the relationship between personality characteristics and soccer performance is still not satisfactory. First and foremost, it remains difficult to determine which characteristics are more or less relevant for success in soccer because the individual studies differ considerably in terms of their specific features. For example, although most of this work has used sufficiently large numbers of participants, some research is limited by small sample sizes (e.g., Spamer & Coetzee, 2002). Additionally, previous studies have demonstrated large variations in the examined age groups. Because the relationships of personality characteristics with soccer performance may differ depending on the stage of development (Reilly et al., 2000), the findings that address similar characteristics in different age classes are only comparable to a limited extent. Past studies have also varied in terms of their selection of personality characteristics employed in the corresponding research. Only the motivational construct of goal orientation has been repeatedly examined by various scholars. Furthermore, the definitions of 'success' differ across the research. Some studies have compared players who were already highly differentiated in their competition level (e.g., Kavussanu et al., 2011), whereas others have contrasted top players with players who were close to the top level, but not the best (e.g., Huijgen et al., 2014). Finally, previous studies have used a variety of uni- and multivariate statistical approaches (i.e., (M)ANOVA, discriminant and regression analysis, structural equation models, and LICUR analysis), which also makes it difficult to compare the individual findings. Consequently, it seems beneficial to consider a wide range of personality characteristics within the same research design. This approach provides comparative information about the relevance of different personality characteristics to success in soccer.

III Empirical studies

A stepwise procedure to examine the prognostic value of personality characteristics

Accounting for the theoretical background and the empirical state of the research, this dissertation examined the relevance of psychological personality characteristics in talented soccer players. Similar to previous prediction models in sport talent research (Hohmann, 2009) and psychology (Nolting & Paulus, 1999), a stepwise procedure was used to examine the prognostic value of these potential predictors of soccer talent. Based on a multidimensional, domain-specific, dynamic, and prospective understanding of talent, this procedure suggests *four steps* that were addressed in three empirical studies as part of the present dissertation:

Step 1: Selection of potentially relevant personality characteristics. Sport psychological talent research must select personality characteristics that are regarded as relevant to soccer performance. Considering the multifaceted understanding of personality, a wide range of characteristics from different personality facets should be considered. Possible search strategies include literature reviews and coach interviews.

Step 2: Validation of the scientifically sound assessment of the personality characteristics. Following the selection of potentially relevant personality characteristics, these characteristics need to be assessed on the basis of scientifically sound psychological diagnostics. These diagnostics should consider the context within the specific sport because domain-specific measurement instruments may lead to the explanation of more of the variance in the youth players' behaviors. Personality characteristics are typically captured using self-report questionnaires that are required to demonstrate satisfactory psychometric properties. Sufficient reliability can provide essential information about the accuracy of the questionnaires, and the meaningful interpretation of results requires validity. Additionally, socially desirable responding is an important issue in the field of psychological diagnostics.

Step 3: Examination of the development of the personality characteristics over time. Sport psychological talent research must analyze the development of personality characteristics over time. Considering the dynamic nature of talent, the analysis of the stabilities and changes in the characteristics contributes important insight into this field. Specifically, a characteristic's differential stability is thought to be an important prerequisite for predicting performance. Differential stability reflects the extent to which the relative ordering of individuals in a given characteristic changes over time.

Step 4: Analysis of the relationships between personality characteristics and performance criteria. Finally, it is possible to analyze the relationships between personality characteristics and success in soccer. In this regard, cross-sectional analyses should examine the characteristics' associations with current performance to provide empirical information about the psychological qualities of more and less talented soccer players. With respect to the prospective view of the talent question, further analyses need to address the characteristics' prognostic value for future performance level.

Study 1: Selection and assessment of personality characteristics

Feichtinger, P., & Höner, O. (2014). Psychological diagnostics in the talent development program of the German Football Association: Psychometric properties of an Internet-based test battery. This is the authors accepted manuscript of an article published in *Sportwissenschaft [German Journal of Sport Sciences]*, *44*(4), 203-213. doi: 10.1007/s12662-014-0341-0. The manuscript is used as part of this dissertation with the permission of Springer.

Abstract

The present study analyzes whether a multifaceted, football-specific and age-appropriate, Internet-based test battery in the talent development program of the German Football Association has acceptable psychometric properties in terms of reliability and validity. Additionally, the manuscript examines if this survey is affected by socially desirable responding (SDR). The study sample consists of male players within the U12 to U15 age groups. The psychological diagnostics capture personality characteristics assigned to motivation, volition, self-referential cognition, and emotion. A consistency analysis shows satisfying statistical values of Cronbach's alpha, average inter-item correlation and corrected item-total correlation coefficients. Valid relationships between the psychological constructs were found. For the purpose of criterion validation, the comparison between a subgroup that was selected to a higher performance level and the total group of players illustrates the personality characteristics' relationship with football performance. A comparison between an anonymous and personalized group as well as correlation of SDR scales with the psychological tests does reveal small effects of social desirability that should be further considered. These findings demonstrate a scientifically sound assessment of the personality characteristics within talented football players. Further research on the characteristics' stability and prognostic power is needed to apply these diagnostics in order to support youth development in football.

Keywords: Soccer, personality, survey, reliability, validity

Introduction

An increase in financial pressure and competition has led to a greater importance of youth development in professional sports clubs and associations (Vaeyens et al., 2013). The fundamental challenges of youth development in football include "the process of recognizing current participants with the potential to become elite players" (talent identification; Williams & Reilly, 2000, p. 658) and "providing the most appropriate learning environment to realize this potential" (talent development; Vaeyens et al., 2008, p. 703). Differentiation between an athlete's adolescent performance level and the potential for progression is important in this context (Abbott & Collins, 2004; Vaeyens et al., 2008). However, the talent identification and development (TID) process is highly complicated due to the complex nature of talent in football (Vaeyens et al., 2013; Williams & Reilly, 2000). A lack of clearly defined and objectively measurable characteristics fails to answer "What are the current qualities of a youth player?" (adolescent performance level) and "Is a youth player in possession of the essential requirements for succeeding at an elite level?" (potential for progression).

A sports science-based support can provide important insight into performance- and development-related characteristics (Cobley et al., 2012). Williams and colleagues (Williams & Franks, 1998; Williams & Reilly, 2000) describe potential predictors of football talent and discriminate between physiological (e.g., aerobic capacity), physical (e.g., height), sociological (e.g., parental support), and psychological factors. The authors differentiate psychological characteristics that include motor/technical skills (e.g., speed, dribbling), perceptual-cognitive factors (e.g., attention, anticipation, decision making), and personality characteristics (e.g., self-confidence, motivation). The present research focuses on psychological personality characteristics which have been recognized to play an important role for success in football (Morris, 2000).

Current sports science literature suggests a stepwise approach to examine the prognostic value of such potential predictors (Hohmann, 2009, pp. 27-30). In the present context, first of all, talent research must select personality characteristics which are regarded as relevant to football performance.

Second, these characteristics need to be assessed on the basis of scientifically sound psychological diagnostics. Third, talent research must analyze the development of personality characteristics. In particular, the characteristics' differential stability over time is supposed to be an important prerequisite for predicting performance (Hohmann, 2009). In a final step, it is possible to analyze the relationship between personality characteristics and football performance. Since the primary aim of TID is to identify and develop youth players who have the highest probability of adult success (Vaeyens et al., 2008), talent research needs to examine the long-term prognostic power of predictors. Against this background, based on the selection of potentially relevant personality characteristics by Ulitsch, Feichtinger, and Höner (2010), the present study focuses on the characteristics' scientifically sound assessment.

Psychological personality characteristics in talent research

With respect to the relevance of psychological predictors in talent research, previous work has addressed the relationship between personality characteristics and performance, and the nature of this relationship. As for the latter, the influence of psychological predictors on athletic performance and performance development can be illustrated by general models of giftedness research (see Vaeyens et al., 2013), such as the Differentiated Model of Giftedness and Talent (DMGT; Gagné, 2000) or the Munich Model of Giftedness (MMG; Heller & Perleth, 2008). These theoretical approaches include personality characteristics primarily assigned to the areas of motivation (e.g., motives), volition (e.g., will-power), self-referential cognition (e.g., self-awareness), and emotion (e.g., anxiety), and both models distinguish different modes of functioning. On the one hand, psychological characteristics are supposed to have an immediate influence on performance in terms of talent or ability factors. In this sense, Baker and Horton (2004) consider personality characteristics to be primary factors. On the other hand, psychological characteristics may affect the relationship between talent factors and performance similar to moderators or catalysts. According to a sport-specific adaption of the MMG model by Hohmann (2009), personality characteristics are regarded as moderators. However, only a

few empirical studies have focused on the nature of this relationship (for further discussion using the example of achievement motives see Zuber & Conzelmann, 2014). More research has been conducted to analyze whether any relationship between personality characteristics and athletic performance exists. A number of cross-sectional and longitudinal studies found empirical evidence that aspects of motivation (e.g., goal orientation; Coelho e Silva et al., 2010), volition (e.g., self-regulation; Toering, Elferink-Gemser, Jordet, & Visscher, 2009), self-referential cognition (e.g., self-concept; Cervelló, Escartí, & Guzmán, 2007) and emotion (e.g., competition anxiety; Reilly et al., 2000) significantly differ between youth athletes of different performance levels (e.g., elite vs. non-elite, selected vs. not selected).

For at least two reasons, the state of research concerning the relationship between psychological personality characteristics and performance is still not satisfactory. First, some empirical studies revealed inconsistent results. For example, Reilly et al. (2000) compared goal orientation of elite and sub-elite youth football players aged 15 to 16 years and found a significant difference in task orientation. In contrast, a study by Figueiredo, Gonçalves, Coelho e Silva, and Malina (2009) showed that goal orientation did not differ significantly among youth football players aged 11‑14 years who were classified as dropouts and club or elite players two years later. Such inconsistent findings may be related to a variety of weaknesses in past research, including sampling procedures, definitions of performance level and research designs (Morris, 2000; Williams & Reilly, 2000). Therefore, more research is needed to determine which personality characteristics are actually relevant for success in football. Second, recent empirical studies considered several (physical, physiological, sociological, and psychological) characteristics due to the multidimensional nature of talent (Abbott & Collins, 2004; Williams & Reilly, 2000). Yet most of this work included only one or two personality characteristics. In contrast, personality is considered to be a multifaceted construct (Kämpfe et al., 2014), and various facets may differ with respect to their relevance for athletic success. Additionally, there is a lack of empirical evidence regarding the interplay between such multifaceted characteristics. In

conclusion, it seems beneficial to consider a wide range of psychological personality characteristics for research purposes.

Against this background, Ulitsch et al. (2010), who evaluated the characteristics' importance specifically for football performance, presented a number of potentially relevant predictors to experts in science and football. On this basis, the present research considers psychological personality characteristics that are assigned to the above mentioned areas of motivation (achievement motive, goal orientations), volition (volitional components), self-referential cognition (physical self-concept, self-efficacy), and emotion (competition anxiety).

Assessment of psychological personality characteristics

Personality characteristics are usually assessed using self-report questionnaires which need to demonstrate satisfactory psychometric properties to assure a scientifically sound assessment. Sufficient reliability can provide essential information about the accuracy of the test instruments, and the meaningful interpretation of test results requires validity. Several years ago, sport psychological diagnostics of personality characteristics in German-speaking countries were not satisfactory (e.g., Elbe et al., 2009). Few German-language questionnaires were formulated specifically for the area of sport, and these questionnaires did not undergo sufficient evaluation of their psychometric properties.

In this context, an initiative of the German Federal Institute for Sports Science and individual groups of researchers developed a series of sport psychological questionnaires.[1] The Achievement Motives Scale-Sport (Fragebogen zum Leistungsmotiv im Sport, AMS-S) by Wenhold et al. (2009a), the German translation of the Sport Orientation Questionnaire (Fragebogen zur Leistungsorientierung im Sport, SOQD) by Elbe et al. (2009) and the German version of the Task and Ego Orientation in Sport Questionnaire (Fragebogen zur Messung der Zielorientierung im Sport, TEOSQ-D) by Rethorst

[1] Most of these test scales base on English-language measuring instruments: see Gjesme and Nygard (1970); Gill and Deeter (1988); Duda (1992); Kuhl and Fuhrmann (1998); Marsh and Redmayne (1994); Smith et al. (1990).

and Wehrmann (1998) are used to measure motivation. The questionnaire measuring volitional components (Volitionale Komponenten im Sport, VKS) by Wenhold et al. (2009c) is applied to measure volition. Self-referential cognitions are assessed based on the questionnaires measuring physical self-concept (Fragebogen zur Messung des physischen Selbstkonzepts, PSK) by Stiller et al. (2004) and self-efficacy in football (Selbstwirksamkeitserwartung im Fußball, SWE-FU) by Gerlach (2004). The Competition Anxiety Inventory Trait (Wettkampf-Angst-Inventar-Trait, WAI-T) by Brand et al. (2009) is notably used to capture emotional aspects.

Hence, reliable and valid self-report questionnaires surveying the above-mentioned personality characteristics assigned to motivation, volition, self-referential cognition, and emotion are now available in German-speaking countries. Nevertheless, there is a need for further improvement to apply these questionnaires within talent research in football. First, the majority of these questionnaires were designed for sport in general and make no distinction between youth and adult athletes. In accordance with Beckmann, Elbe, and Seidel (2008, p. 265) psychological diagnostics of personality characteristics need to consider the context within a specific sport. With more specific assessment, more accurate predictions of athletic performance are possible (Elbe et al., 2003). However, there is a lack of such domain-specific questionnaires in German-speaking countries.

Second, analysis of the questionnaires' psychometric properties was usually performed on samples with great heterogeneity in performance level, sport, and age range. On the one hand, this is an important requirement for practical application to use these test instruments in many sports with different kinds of athletes. On the other hand, it is unclear whether psychometric properties remain sufficient if the questionnaires are applied within a homogenous population such as talented football players (Traub & Rowley, 1991, p. 43).

Third, socially desirable responding (SDR) is an important issue in the field of psychological diagnostics. According to Paulhus (1998), the tendency to give self-reports that are positively biased (self-deceptive enhancement) and the deliberate self-presentation (impression management) are two

major components of social desirability. However, such effects of SDR have not yet been satisfactorily examined for most of the above-mentioned test instruments. In particular, the application of self-report questionnaires within the context of TID requires an analysis of SDR, because – unlike the anonymous use of personality data in research – personal information (e.g., name) needs to be recorded for practical purposes. Hence, it might be plausible that participants are interested in achieving a particularly "good" test result in order to be further promoted.

Objectives of the study

The present research was conducted with youth players in the talent development program of the German Football Association (Deutscher Fusball-Bund, DFB), which includes the under 12 to under 15 (U12‑U15) age groups. At this basic level, the German TID program promotes approximately 14,000 players (i.e., the top 4 % of all eligible players in this age range) at 366 regional DFB competence centers (Schott, 2011). To assess the above mentioned personality characteristics assigned to the areas of motivation, volition, self-referential cognition and emotion, the already established test instruments were used in a football-specific and age-appropriate adaptation (items' wording). A test battery was constructed based on the different individual questionnaires, and the diagnostics were implemented as an Internet-based survey.

Against this background, the current study examines the self-report questionnaires' psychometric properties specifically for the population of talented football players to assure a scientifically sound assessment. Therefore, it was analyzed whether the psychological test instruments show acceptable internal consistencies, even in the youngest age group U12 (*Objective 1*). Furthermore, the plausibility of the test scales' relationships and their criterion validity was examined (*Objective 2*). Plausible results should reveal a higher connection between construct related scales (convergent validity) and a lower connection between scales that assess different personality facets (divergent validity). In addition, mean values of a subgroup that was selected to a superior performance level were expected to be higher in positive connoted and lower in negative connoted constructs compared with the total

group of competence center players. Finally, the analysis considered whether the psychological diagnostics in the German football TID program are affected by SDR (*Objective 3*). It was hypothesized that a personalized group is more likely to be affected by SDR; therefore, these players should have significantly higher values in "positive" constructs and lower values in "negative" characteristics in comparison to an anonymous group. Additionally, correlations between SDR scales and psychological scales were analyzed. Higher correlations in the direction of a positive self-report imply a greater level of SDR.

Method

Samples and procedures

Data from two different samples were used to achieve these objectives. As part of a preliminary study the Sample 1 survey was conducted from March 9 to April 19, 2009. Altogether, Sample 1 consisted of 439 male competence center players within the age range U12 to U15 (M = 12.3 years, SD = 1.2) from the Westphalia regional association. Due to the large quantity of test scales, participants were randomized to one of six test blocks, and a single player only had to answer one part of the overall questionnaire. Thus, the number of cases varies between 55 and 74 participants, depending on the test.

As part of the first nationwide implementation of the psychological survey within the German football TID program, Sample 2 test data were collected in two different test periods (fall 2010: November 15 to December 12; spring 2011: May 16 to June 12). Therefore, the entire test battery was divided into two blocks of tests so that the participants did not have to answer all the questionnaires at once. Each block was associated with one test period (fall 2010; spring 2011). Sample 2 consisted of 1701 (fall 2010) and 1804 (spring 2011) male competence center players in the U12 age group (fall 2010: M = 11.4 years, SD = 0.28; spring 2011: M = 11.9 years, SD = 0.28) from all over Germany. A total of 828 U12 players participated in both of the two test periods.

The general sampling goal was collection of all data in the respective population (i.e., about 550 male players in Westphalia and about 4000 male players throughout Germany). After completion of the survey period, data were adjusted (including deletion of incomplete data and duplicate cases, selection by gender and year of birth), and participation was 79 % (Sample 1), 43 %, and 45 % (Sample 2). Such response rates are considered as satisfactory in the context of Internet-based surveys (Tuten, Urban, & Bosnjak, 2002).

The survey was executed as an Internet-based questionnaire (EFS survey software 6.0‑8.0). The competence center coaches received both an informational email at the beginning of a test period and an informational letter, which they forwarded to the players. The content of the players' letter included information regarding the aim, content, and implementation of the survey and an Internet link and password. Players could participate at any time from any Internet-connected computer within a time frame of 4‑6 weeks. Questionnaire completion took an average of 25 min (*SD* = 11).

The implementation of the psychological diagnostics was based on a previous version of the Declaration of Helsinki by the World Medical Association, and the research was approved by the scientific board of the DFB and the Ethics Department of the Faculty of Behavioral and Cultural Studies at the University of Heidelberg. As part of the data privacy policy, the players were informed that participation in the survey is voluntary, all data are stored anonymously for scientific purposes, and only employees of the German football TID program have insight into these data. Additionally, all players' parents provided informed consent to record and use data for scientific research.

Measures

The multifaceted, football-specific and age-appropriate, Internet-based test battery (seven tests, 17 scales and 144 items) was used to assess the above-mentioned characteristics assigned to the areas of motivation, volition, self-referential cognition, and emotion. The questionnaire AMS-S (Wenhold et al., 2009a) captures two components of achievement motivation: hope for success and fear of failure. SOQ-D (Elbe et al., 2009) and TEOSQ-D (Rethorst & Wehrmann, 1998) assess motivational

orientations in sport and provide information about the criteria that athletes use to evaluate their athletic performance. SOQ-D distinguishes between competition-, win-, and goal orientation. TEOSQ-D differentiates between task- and ego-orientation. VKS (Wenhold et al., 2009c) was constructed to assess skills (self-optimization) and deficits (self-impediment, lack of initiation, or loss of focus) in the field volition. PSK Scales (Stiller et al., 2004) capture the physical self-concept in terms of a subjective perception of an athlete's own physical abilities. The present Internet-based test battery assesses the physical self-concept with regard to the motor performance tests of the German football TID program (Höner, Votteler, Schmid, Schultz, & Roth, 2015) that measure football-specific motor/technical skills, such as speed, agility, dribbling, ball control, and shooting (e.g., "Ich kann schneller sprinten als die meisten Fusballer in meinem Alter"; I can sprint faster than most football players who are my age). Additionally, based on the original test's subscale "general athleticism" a scale assessing general football-specific physical self-concept was included (e.g., "Ich bin besser im Fußball als die meisten meiner Mitspieler"; I play football better than most of my teammates). SWE (Gerlach, 2004) captures self-efficacy as the subjective belief that one is able to perform a certain action on the basis of one's own abilities. WAI-T (Brand et al., 2009) measures the trait of anxiety to capture an athlete's tendency to respond with fear in competitive situations. Competition anxiety manifests itself as somatic anxiety, worry, and concentration disruption.

To evaluate the effects of SDR, the German version of the Balanced Inventory of Desirable Responding (BIDR-D) by Musch, Brockhaus, and Bröder (2002) was added to the test battery. This two-factor inventory assesses the already mentioned components of social desirability: self-deceptive enhancement (SDE) and impression management (IM).

Table 2. *Research design*

Test periods	2009 (March 9 to April 19)	2010 (November 15 to December 12)	2011 (May 16 to June 12)
Participants	Sample 1 (U12-U15; *N* = 439)	Sample 2 (U12; *N* = 1701)	Sample 2 (U12; *N* = 1804)
Measures	6 test blocks (Randomization to one part of the test battery)	1st half of the test battery (AMS-S, SOQ-D, VKS)	2nd half of the test battery (TEOSQ-D, PSK, SWE-FU, WAI-T)
Objectives	SDR (Personalized vs. anonymous)	Reliability (Internal consistency) Validity (Characteristics' relationships, criterion validity) SDR (Correlation with test scales)	

Research design

In Table 2, the research design of the present study is summarized by relating the three objectives to the different test periods, samples and measures. Primarily to address Objective 1 and 2, the psychological test data from Sample 2 were collected during the two above mentioned test periods (fall 2010; spring 2011). The method of known groups (Schnell, Hill, & Esser, 2011) was used as criterion validation. This approach expects to find differences in the membership of certain groups, which is used as the criterion. Therefore, a subgroup of Sample 2 participants who had been selected for the Bavaria, Westphalia, and Wuerttemberg regional association representative teams in the subsequent season 2011/12 was compared with the total group of U12 competence center players. Assuming that the representative players have on average a higher performance level, it was examined whether these performance differences can also be observed in the psychological personality characteristics.

For Objective 3, the participants of Sample 1 were randomly assigned to one of two conditions with different instructions. The first group received the instruction that the survey would be anonymous, while the other group had to specify their full name and date of birth. Additionally, the BIDR-D data of Sample 2 were used to analyze the effects of SDR.

Data analysis

All analyses in this study were conducted with IBM SPSS Statistics 21. The tests were differently scaled, so all mean values were transformed to the range [0, 1] for the purpose of comparison. The significance level was set at $\alpha = .05$. Relevant results should reveal small ($d = 0.20$, $r = .10$) to medium ($d = 0.50$, $r = .30$) effect sizes (Cohen, 1992).

The internal consistency (Cronbach's alpha, average inter-item correlations and corrected item-total correlation coefficients) of the test scales was calculated to analyze the reliability of the personality tests. Alpha coefficients $\geq .70$, average inter-item correlations between .20 and .40, and corrected item-total correlation coefficients $\geq .30$ were considered to be acceptable (Bortz & Döring, 2006).

With regard to the factor structure of the test battery, bivariate inter-correlations between the psychological scales were calculated to obtain a first impression of the characteristics' relationships. Subsequently, an exploratory principal component analysis with varimax rotation was conducted at the level of scales. Based on different statistical criteria to determine the number of factors (e.g., Kaiser criterion and Scree test), solutions with different numbers of factors were considered, and the "best" solution for a single structure was selected. Loadings ≥ .50 are considered as relevant and assigned to the corresponding factors (Backhaus, Erichson, Plinke, & Weiber, 2011). For the purpose of criterion validation, one-tailed one-sample t-tests were performed to analyze whether the average scale scores of the regional associations' representative players are significantly different from the total group of U12 competence center players.

One-tailed t-tests for independent samples were performed to statistically analyze the comparison between the anonymous and personalized group. Product-moment correlations of BIDR-D with the psychological test scales were examined to further consider the SDR effects.

Results

Reliability

The indices of reliability are shown in Table 3. Overall, a satisfying internal consistency (Cronbach's alpha, average inter-item correlations and corrected item-total correlation coefficients) resulted. With the exception of AMS hope for success (α = .69), VKS self-impediment (α = .64), and WAIT concentration disruption (α = .59), alpha coefficients were above α = .70. For average inter-item correlations, 10 of 17 scales are within the range of acceptance, and all the other scales are slightly beyond the range ($.17 \leq r_{ii} \leq .50$). With the exception of VKS self-impediment (2 of 9 items; $r_{it,\,corr}$ = .11 and .26) and SWE self-efficacy (1 of 11 items; $r_{it,\,corr}$ = .25), all test scales included items with acceptable corrected item-total correlations, and the deletion of the deficient items did not lead to a relevant improvement of the scales' internal consistency.

Table 3. *Internal consistency of the psychological test scales*

Personality Facet	**Construct (Test)**	**Scale (valence)**	**Original Scale's α**	**Items**	**Internal Consistency**			
					N	**α**	r_{ii}	$r_{it,\ corr}$ (Min-Max)
Motivation	Achievement Motive (AMS-S)	hope for success (+)	.89	5	1701	.69	.31	.40-.49
		fear of failure (–)	.89	5	1701	.72	.34	.46-.50
	Achievement Orientation (SOQ-D)	competition orientation (+)	.95	13	1701	.85	.32	.42-.59
		win orientation (+)	.82	6	1701	.82	.43	.45-.69
		goal orientation (+)	.81	6	1701	.75	.35	.41-.58
	Goal Orientation (TEOSQ-D)	task orientation (+)	.73	7	1804	.76	.32	.38-.55
		ego orientation (+)	.87	6	1804	.84	.46	.52-.66
Volition	Volitional Components (VKS)	self-optimization (+)	.92	29	1701	.90	.25	.37-.47
		self-impediment (–)	.76	9	1701	.64	.17	.11-.45
		lack of initiation (–)	.87	13	1701	.84	.29	.33-.56
		loss of focus (–)	.83	9	1701	.82	.33	.35-.65
(self-referential) Cognition	Physical Self-Concept (PSK)	general self-concept (+)	.84	6	1804	.74	.32	.30-.58
		specific self-concept (+)	---	5	1804	.83	.50	.55-.74
	Self-Efficacy (SWE-FU)	self-efficacy (+)	.73	11	1804	.75	.23	.25-.46
Emotion	Competition Anxiety (WAI-T)	somatic anxiety (–)	.81	4	1804	.77	.46	.54-.63
		worry (–)	.83	4	1804	.76	.44	.50-.59
		concentration disruption (–)	.71	4	1804	.59	.28	.33-.44

Note. α = Cronbach's alpha; r_{ii} = average inter-item correlations; r_{it} = corrected item-total correlations.

Validity

The inter-correlations between the psychological test scales are illustrated in Table 4. Higher correlations were found between construct-related scales (convergent validity), and lower correlations existed between scales assessing different personality facets (divergent validity). For example, a positive relationship resulted between PSK and SWE-FU in the area of self-referential cognition. Similarly, aspects of motivation (AMS-S, SOQ-D, TEOSQ-D), volition (VKS), and various facets of competition anxiety (WAI-T) could be assigned to plausible groups of characteristics.

As part of the exploratory principal component analysis, five extracted factors explain 66.04 % of the total variance. The resulting factor structure is shown in Table 5. Thus, achievement motives and volitional components were assigned to one common factor [Factor 1 (F1) explained variance: 19.88 %]. The various motivational orientations loaded on two different factors (F2: 14.44 %, F5: 6.80 %). The test scales assessing physical self-concept and self-efficacy loaded on a common factor (F3: 13.74 %), and the various facets of competition anxiety loaded on a different factor (F4: 11.18 %).

To compare the subgroup of 98 (fall 2010) and 110 (spring 2011) players who had been selected for the regional association representative teams with the total group of U12 competence center players, the statistical values of the one-sample t-tests are illustrated in Table 5. In general, plausible mean differences resulted for all psychological constructs. For example, selected players on average showed a greater hope for success and less fear of failure, as well as higher values in VKS self-optimization and lower values in VKS self-impediment. Equivalent results could be observed for the other test scales. In more detail, the two groups differed statistically significant in the psychological scales ($-5.23 \leq t \leq 5.67$; $p < .05$; $0.17 \leq d \leq 0.47$) with the exception of TEOSQ task orientation and TEOSQ ego-orientation ($t = 1.67$ and $t = -0.47$; $p = .05$ and $p = .32$; $d = 0.11$ and $d = -0.06$).

Table 4. *Inter-correlations between the psychological test scales*

Scale	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. AMS hope for success	--	-.47*	.18*	.46*	.37*	.28*	.04	.61*	-.23*	-.50*	-.42*	.31*	.25*	.31*	-.16*	-.27*	-.22*
2. AMS fear of failure		--	-.03	-.35*	-.23*	-.17*	.01	-.50*	.46*	.57*	.44*	-.26*	-.18*	-.36*	.27*	.37*	.27*
3. SOQ win orientation			--	.51*	.40*	.11*	.22*	.27*	.06*	-.15*	-.18*	.19*	.16*	.13*	.02	.01	-.07*
4. SOQ competition orientation				--	.69*	.29*	.18*	.66*	-.19*	-.48*	-.44*	.38*	.31*	.36*	-.14*	-.21*	-.20*
5. SOQ goal orientation					--	.27*	.09*	.57*	-.06*	-.35*	-.31*	.25*	.18*	.28*	-.07*	-.11*	-.12*
6. TEOSQ task orientation						--	.03	.39*	-.10*	-.26*	-.17*	.25*	.23*	.36*	-.09*	-.21*	-.18*
7. TEOSQ ego orientation							--	.04	.07*	.02	< .01	.20*	.17*	.07*	.04	.04	.05*
8. VKS self-optimization								--	-.35*	-.70*	-.61*	.42*	.34*	.47*	-.21*	-.35*	-.31*
9. VKS self-impediment									--	.52*	.46*	-.18*	-.12*	-.22*	.19*	.34*	.23*
10. VKS lack of initiation										--	.69*	-.34*	-.27*	-.43*	.27*	.39*	.33*
11. VKS loss of focus											--	-.26*	-.21*	-.33*	.18*	.26*	.34*
12. PSK (general)												--	.60*	.55*	-.19*	-.31*	-.21*
13. PSK (specific)													--	.39*	-.16*	-.26*	-.17*
14. SWE (self-efficacy)														--	-.24*	-.45*	-.34*
15. WAIT somatic anxiety															--	.50*	.30*
16. WAIT worry																--	.44*
17. WAIT concentration disruption																	--

Note. *= significant.

Table 5. *Factor loadings and results of the one-sample t-test as part of the criterion validation*

Personality Facet	Construct (Test)	Scale	Factor structure					One-sample t-test					
			1	2	3	4	5	RA *M* (*SD*)	CC *M* (*SD*)	*t*	*df*	*p*	*d*
Motivation	Achievement Motive (AMS-S)	hope for success (+)	**-.58**	.30	.20	-.03	.18	.82 (.14)	.76 (.16)	4.30	97	< .05*	0.40
		fear of failure (–)	**.70**	-.06	-.09	.24	<.01	.19 (.16)	.22 (.16)	-1.78	97	< .05*	-0.19
	Achievement Orientation (SOQ-D)	competition orientation (+)	-.33	**.78**	.22	-.09	.05	.92 (.07)	.89 (.09)	4.37	97	< .05*	0.37
		win orientation (+)	.03	**.79**	.08	<.01	-.17	.83 (.13)	.80 (.15)	1.86	97	< .05*	0.21
		goal orientation (+)	-.19	**.78**	.07	-.03	.19	.92 (.07)	.89 (.10)	4.27	97	< .05*	0.35
	Goal Orientation (TEOSQ-D)	task orientation (+)	-.07	.23	.37	-.09	**.66**	.88 (.09)	.87 (.10)	1.67	109	.05	0.11
		ego orientation (+)	.10	.25	.45	.04	**-.62**	.57 (.17)	.58 (.18)	-0.47	109	.32	-0.06
Volition	Volitional Components (VKS)	self-optimization (+)	**-.66**	.47	.25	-.12	.24	.83 (.10)	.80 (.10)	3.14	97	< .05*	0.30
		self-impediment (–)	**.72**	.23	-.06	.16	.03	.32 (.15)	.37 (.14)	-3.01	97	< .05*	-0.34
		lack of initiation (–)	**.81**	-.20	-.16	.20	-.09	.14 (.12)	.17 (.12)	-2.55	97	< .05*	-0.25
		loss of focus (–)	**.73**	-.23	-.08	.11	-.03	.09 (.12)	.13 (.13)	-3.22	97	< .05*	-0.32
(self-referential) Cognition	Physical Self-Concept (PSK)	general self-concept (+)	-.21	.14	**.82**	-.14	.02	.88 (.08)	.84 (.09)	5.67	109	< .05*	0.47
		specific self-concept (+)	-.14	.09	**.79**	-.08	-.02	.77 (.15)	.71 (.16)	4.33	109	< .05*	0.39
	Self-Efficacy (SWE-FU)	self-efficacy (+)	-.23	.15	**.62**	-.37	.30	.88 (.07)	.85 (.08)	4.00	109	< .05*	0.40
Emotion	Competition Anxiety (WAI-T)	somatic anxiety (–)	.13	-.05	.02	**.83**	.13	.40 (.15)	.43 (.15)	-1.81	109	< .05*	-0.20
		worry (–)	.27	.04	-.30	**.72**	-.10	.36 (.12)	.42 (.15)	-5,23	109	< .05*	-0.44
		concentration disruption (–)	.20	-.07	.16	**.60**	-.23	.34 (.11)	.36 (.12)	-1.82	109	< .05*	-0.17
Eigenvalue			3.38	2.46	2.34	1.90	1.16						
Explained Variance %			19.88	14.44	13.7	11.18	6.80						

Note. Factor loadings > 0.50 are in boldface. CC = competence center players; RA = players of the regional association representative teams; *= significant.

Table 6. *Effects of socially desirable responding*

Personality Facet	Construct (Test)	Scale (valence)	Mean comparison test						BIDR-D correlations			
			pers.	anonym.					SDE		IM	
			M(*SD*)	*M*(*SD*)	*t*	*df*	*p*	*d*	*N*	r_{xy}	*N*	r_{xy}
Motivation	Achievement Motive (AMS-S)	hope for success (+)	.77 (.17)	.79 (.16)	-0.47	61	.32	-0.12	1701	.25*	828	.12*
		fear of failure (–)	.21 (.20)	.20 (.17)	0.19	61	.43	0.05	1701	-.33*	828	-.23*
	Achievement Orientation (SOQ-D)	competition orientation (+)	.86 (.09)	.84 (.15)	0.62	72	.27	0.14	1701	.18*	828	.08*
		win orientation (+)	.81 (.15)	.82 (.16)	-0.32	72	.38	-0.08	1701	.04	828	-.05
		goal orientation (+)	.87 (.13)	.83 (.17)	1.19	72	.12	0.27	1701	.13*	828	.08*
	Goal Orientation (TEOSQ-D)	task orientation (+)	---	---	---	---	---	---	828	.13*	1804	.20*
		ego orientation (+)	---	---	---	---	---	---	828	.05	1804	-.14*
Volition	Volitional Components (VKS)	self-optimization (+)	.79 (.13)	.74 (.14)	1.44	66	.08	0.35	1701	.29*	828	.24*
		self-impediment (–)	.42 (.15)	.46 (.15)	-0.89	66	.19	-0.22	1701	-.28*	828	-.21*
		lack of initiation (–)	.18 (.11)	.25 (.18)	-1.93	66	< .05*	-0.48	1701	-.32*	828	-.29*
		loss of focus (–)	.30 (.10)	.32 (.13)	-0.71	66	.24	-0.18	1701	-.29*	828	-.24*
(self-referential) Cognition	Physical Self-Concept (PSK)	general self-concept (+)	---	---	---	---	---	---	828	.18*	1804	.11*
		specific self-concept (+)	---	---	---	---	---	---	828	.11*	1804	.12*
	Self-Efficacy (SWE-FU)	self-efficacy (+)	.86 (.10)	.86 (.09)	0.20	53	.42	0.05	828	.21*	1804	.19*
Emotion	Competition Anxiety (WAI-T)	somatic anxiety (–)	.49 (.17)	.50 (.19)	-0.29	70	.39	-0.07	828	-.15*	1804	-.20*
		worry (–)	.48 (.18)	.51 (.16)	-0.79	70	.22	-0.19	828	-.19*	1804	-.25*
		concentration disruption (–)	.38 (.12)	.42 (.12)	-1.64	70	.06	-0.39	828	-.20*	1804	-.28*

Note. pers. = personalized group of players; anonym. = anonymous group of players; SDE = self-deceptive enhancement; IM = impression management; *= significant.

Socially desirable responding

To examine the effects of SDR (Table 6), the comparison between the anonymous and personalized group in Sample 1 revealed no significant differences in the psychological scales ($-1.64 \leq t \leq 1.44$; $.06 \leq p \leq .43$) with the exception of VKS lack of initiation ($t = -1.93$; $p = .03$). The Cohen's $|d| < 0.20$ could be observed for 8 of 13 test scales.[2] Only SOQ goal orientation ($d = 0.27$), VKS self-optimization ($d = 0.35$), VKS self-impediment ($d = -0.22$), VKS lack of initiation ($d = -0.48$), and WAIT concentration disruption ($d = -0.39$) reached small to medium effect sizes. Predominantly, the personalized group showed higher mean values in the "positive" constructs and lower mean values in the "negative" characteristics, although these differences were not statistically significant in most cases. AMS hope for success, AMS fear of failure, and SOQ win orientation exclusively revealed a reverse pattern of results. With respect to further effects of SDR, BIDR-D correlations with the psychological test scales were generally low ($|r| < .30$). Only the relationships between SDE and AMS fear of failure ($r = -.33$) as well as VKS lack of initiation ($r = -.32$) showed medium effect sizes. All correlations, except from SOQ win orientation and TEOSQ ego orientation, were in the direction of a positive self-report.

Discussion

The aim of the present study was to analyze whether multifaceted, football-specific and age-appropriate, Internet-based psychological diagnostics in the DFB talent development program show acceptable psychometric properties in terms of reliability and validity. Additionally, the study examined if the applied self-report questionnaires are affected by SDR.

A consistency analysis (*Objective 1*) revealed that application of the psychological personality questionnaires to a sample of talented football players leads to reliable data. In most cases, the

[2] TEOSQ-D and PSK were not used in Sample 1. These test scales were added at a later stage of the test battery's development.

Cronbach‘s α was slightly lower compared with the original tests (Table 3). Notably, this research only considered U12 players, and inclusion of higher age groups may foster even greater understanding of the questions and a higher reliability. Furthermore, no test-retest reliability has been calculated specifically for the sample of U12 players due to the chosen research design. Future studies should consider test-retest correlations to obtain more information about the questionnaires’ accuracy within a sample of talented football players. Previous research referring to the original scales showed satisfactory test-retest coefficients (e.g., AMS hope for success: r_{tt} = .71 and AMS fear of failure: r_{tt} = .69; Wenhold et al., 2009a).

Consideration of the characteristics’ relationships (*Objective 2*) revealed valid inter-correlations between the psychological scales, and the personality constructs were plausibly bundled using an exploratory factor analysis. For example, similar relationships between achievement motive (AMS-S) and motivational orientations (SOQ-D, TEOSQ-D) were found by Elbe, Wenhold, and Müller (2005). AMS hope for success showed positive, medium-sized correlations with motivational orientations, whereas AMS fear of failure was negatively correlated. Furthermore, the relatively high correlations between AMS-S and VKS are notable, and the corresponding scales consequently loaded on one common factor. Despite the theoretical proximity between motivation and volition, it is surprising that these two constructs could not be more clearly separated from each other. Nevertheless, these results indicate that U12 players are able to plausibly answer the questionnaires. Despite the young age of the players, the underlying psychological constructs can be adequately assessed with the test instruments.

The results of the comparison between the regional associations’ representative players and the total group of U12 competence center players illustrated the relation of the psychological personality characteristics to the level of performance in football. Throughout the results, the representative players revealed higher values in the positive connoted constructs and lower values in the negative connoted characteristics. Due to the homogeneity of the sample, the differences between those two

groups were small in magnitude. Yet relevant effect sizes could be observed in every single psychological construct apart from goal orientation (TEOSQ-D). As a consequence, these results provide evidence for the questionnaires' criterion validity in the context of talent research. Additionally, these findings are consistent with empirical results concerning the original test scales. For example, Wenhold et al. (2009c) showed that VKS could be used to differentiate between more and less skilled athletes. Similarly, the results regarding TEOSQ-D did match other empirical studies (Huijgen et al., 2014), revealing that goal orientation did not differ among selected and deselected football players. However, the findings referring to goal orientation are not consistent, as mentioned above (e.g., Reilly et al., 2000).

Consideration of SDR effects (*Objective 3*) did not detect any serious faking tendencies among the competence center players. The comparison between the anonymous and personalized group and the results of the BIDR-D scales did not reveal large distortive effects. Similar empirical results can be found in the field of personnel selection. A number of studies showed that faking good answers is not a major problem in psychological diagnostics (Ones & Viswesvaran, 1998; Rees & Metcalfe, 2003). Nevertheless, scale values, effect sizes and correlations are small but do exist in the German football TID program. Therefore, the distortive influence of SDR should be considered in further analysis since SDR was rarely addressed in the context of sport psychological talent research. For example, one alternative explanation for the absence of serious SDR effects suggests that these young players do not know how to fake-good the items (i.e., low face validity). Further studies could use faking instructions to rule out this possible explanation (e.g., Martin, Bowen, & Hunt, 2002). Other empirical evidence in the general field of psychological diagnostics revealed that administration modes (paper-pencil vs. computer- or Internet-based) can impact the extent of SDR (Booth-Kewley, Edwards, & Rosenfeld, 1992; Risko, Quilty, & Oakman, 2006).

In summary, against the background of a stepwise strategy to examine the prognostic value of potential predictors, the present study considered psychological personality characteristics assigned

to the areas of motivation, volition, self-referential cognition, and emotion (Ulitsch et al., 2010). As for the selection of predictors, two weaknesses in the current research need to be addressed. First, even such a multifaceted approach only considers certain aspects of personality. Several other potentially relevant characteristics were not taken into account. For example, further studies focused on broader concepts like the Big Five personality traits (Allen, Greenlees, & Jones, 2013) or mental toughness (Gerber, 2011). Additionally, some empirical research analyzed young athletes' mental skills (Macnamara & Collins, 2013). Second, the selection of potential predictors was not based upon a theoretical model of personality that addresses multifaceted characteristics, and their relations to athletic performance. Although there are psychological theories concerning the individual personality facets (e.g., achievement motive; Atkinson, 1957), no such model seems to exist in the current literature. Against this background, the current study chose a rather exploratory approach that leads to preliminary results concerning the role of personality characteristics in talented football players.

With respect to the assessment of personality characteristics in the German football TID program, the present research used football-specific and age-appropriate psychological diagnostics. In comparison to the above-mentioned established questionnaires, such specific diagnostics may lead to a higher explanation of variance within talented football players' behavior, even if the consequence is that corresponding findings cannot be transferred to other sports (generality-specificity dilemma; Beckmann et al., 2008, p. 265). Similarly, sport psychological research increasingly applied domain-specific approaches. For example, Elferink-Gemser, Visscher, Richart, and Lemmink (2004) as well as Wilhelm et al. (2013) developed sport-game-specific questionnaires to assess different personality facets. Against this background, the results of the current study demonstrated a scientifically sound assessment of the personality characteristics within talented football players. The diagnostics showed satisfactory psychometric properties in terms of reliability and validity. Furthermore, preliminary evidence regarding the effects of SDR was found.

In addition to these findings, future research needs to examine the personality characteristics' development since, for example, differential stability is regarded as an important prerequisite for predicting performance. So far, only a few studies have addressed the stability and change of such characteristics in talented youth athletes (Elbe, Szymanski, et al., 2005; Hohmann, 2009). Furthermore, prospective studies must analyze the long-term prognostic power of personality characteristics regarding adult success. Except for a few studies (e.g., Van Yperen, 2009), such work is completely lacking in sport psychological talent research. In addition, based on a multifaceted approach, future research should analyze the interplay between personality characteristics. An analysis of the characteristics' combination may provide more precise information about the prognostic relevance of the individual personality facets.

Based on the state of research to date, psychological personality characteristics should not be used for the purpose of talent identification. Against the background of the present study, this can be explained by the lack of empirical findings concerning the development of these personality characteristics and their unexplained long-term prognostic power for future success. Nevertheless, psychological diagnostics can be applied as part of the talent development process. The results of the present study confirmed that a scientifically sound assessment of the personality characteristics' current value is possible. Thus, such personality data could be used to support the individual players' sport psychological coaching and training.

Study 2: Development of personality characteristics over time

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Abstract

Adolescence is regarded as a key developmental phase in the course of talented football players' careers. The present study focuses on early adolescent players' development of achievement motives, volitional components, and self-referential cognitions. Based on the multidimensional and dynamic nature of talent, the development of multifaceted personality characteristics is an important issue in the context of sports talent research. According to previous findings in psychology, personality characteristics' development is defined by both stability and change, and the current study analyses four different types: differential stability (I), mean-level change (II), individual-level change (III), and structural stability (IV). The sample consists of 151 male players in the talent development programme of the German Football Association. Psychological diagnostics of the personality characteristics are implemented across longitudinal sections over a time period of three seasons, from the U12 to U14 age classes. The results reveal that the personality characteristics show (I) moderate test–retest correlations over one-year intervals ($.43 \leq r_{tt} \leq .62$), and lower coefficients for a two-year period ($.26 \leq r_{tt} \leq .53$). (II) Most of the personality characteristics' mean values differ significantly across the age classes with small effect sizes ($.01 \leq \eta_G^2 \leq .03$). (III) Only minor individual-level changes in the football players' development are found. (IV) The personality characteristics' associations within a two-factor structure do not stay invariant over time. From the results of the present study, conclusions are drawn regarding the talent identification and development process.

Keywords: Soccer, psychology, personality, stability, change

Introduction

The primary aim of youth development programmes in football is to identify and develop talented players with the greatest potential to succeed at an elite level (Vaeyens et al., 2008). However, the identification and development process is difficult because talent is an extremely complex concept (Vaeyens et al., 2013). From the perspective of sports *talent research*, (1) multidimensional characteristics are required to become an elite player (Williams & Reilly, 2000) and (2) performance and its underlying characteristics change over time due to the dynamic nature of talent (Abbott & Collins, 2004).

With regard to the *multidimensional* understanding of talent, recent empirical research has considered a wide range of physical, physiological, sociological, and psychological characteristics and examined their relationship with football performance (e.g., Figueiredo et al., 2009). These studies provide insight into the importance of different domains (e.g. motor skills and personality) for athletic success. Nevertheless, such a broad approach can only address a limited number of characteristics within the individual dimensions, although these are regarded as multifaceted constructs as well. With a few exceptions (e.g., Huijgen et al., 2014), most of this work included only one or two psychological personality characteristics. In contrast, it seems beneficial to consider multifaceted personality characteristics so that sports talent research can analyse the characteristics' associations. Taking this into account, the present study exclusively focuses on personality characteristics, which have been recognized to play an important role in football performance (Morris, 2000).

General models of giftedness research such as the Differentiated Model of Giftedness and Talent (DMGT; Gagné, 2010) provide a valuable theoretical foundation concerning the relevance of psychological characteristics for football success (Mills, Butt, Maynard, & Harwood, 2012; Vaeyens et al., 2013). The DMGT considers motivation, volition, and self-awareness (i.e. self-referential cognition) as major intrapersonal catalysts that facilitate or hinder the talent development process. Recent studies found empirical evidence that achievement motives (Zuber & Conzelmann, 2014), volitional

components (e.g. self-regulation; Toering et al., 2009), and self-referential cognitions (e.g. self-confidence; Reilly et al., 2000) are associated with football performance level.

Based on the *dynamic* nature of talent, it must be taken into account that the development of talented football players primarily takes place during adolescence, a key developmental phase in which many changes occur. With regard to the lifespan theory in developmental psychology (Baltes et al., 2006), multifaceted personality characteristics may not only change over time, but they also might develop multi-directionally. In line with this, Fisher (2008, p. 127) identified a growing emphasis on the need to take a more developmental view in sports talent research. However, so far, only a few studies have addressed this issue by analyzing the above-mentioned personality characteristics in samples of talented youth athletes. Hohmann (2009) reported that motivational and volitional characteristics (i.e. achievement motivation and action control) in male youth athletes (age range between 11 and 18 years) revealed test–retest correlations over two-year intervals around r_{tt} = .50–.70. Elbe et al. (2003) and Elbe, Szymanski, et al. (2005) found that sport-specific achievement motives and volitional components (self-optimisation and self-impediment) only showed marginal group-level changes in young athletes aged 12–16.

Due to the lack of studies examining personality characteristics' development in talented youth athletes, reference to *research in developmental psychology* seems to be beneficial. Most psychological studies in developmental research are based on trait theories (e.g. Big Five; McCrae & John, 1992). Empirical findings revealed that personality traits are relatively stable over time, but that such characteristics are also subject to change (Specht, Egloff, & Schmukle, 2011). In this regard, previous research examined different types of stability and change (e.g. De Fruyt et al., 2006; Roberts, Wood, & Caspi, 2008), and the present study focuses on four definitions of these two concepts: Differential stability describes the degree to which inter-individual differences in personality characteristics remain invariant over time; mean-level change refers to the extent to which the average level of a population changes; individual-level change describes to what degree individuals vary in the amount of

intra-individual change; structural stability refers to the invariance of correlational patterns among a range of personality characteristics over time.

The conceptualisation of personality characteristics' development in terms of such different types of stability and change also contributes important insight for sports *talent research*. First, differential stability reflects the extent to which the relative ordering of individuals in a given characteristic changes over time, and therefore this aspect is regarded as a prerequisite for predicting behaviour (e.g. performance; Hohmann, 2009). Second, consideration of mean-level change provides relevant information on how talented athletes' characteristics develop in general (Vaeyens et al., 2013). Third, the examination of individual-level change is of particular interest because talent research *per se* focuses on individual differences (Ackerman, 2014). Such change analyses are important to better understand the development of talented athletes in terms of variations across age classes and the potential effectiveness of sport psychological interventions. Finally, if sports talent research intends to consider the relationship between multifaceted personality characteristics and performance, then structural stability contributes insights into the complex interplay among the individual characteristics over time. Moreover, supposing that the characteristics' associations may change, then their combined predictive value for athletic success may be different depending on the age group (Reilly et al., 2000). In this context, the present study focuses on the development of achievement motives, volitional components, and self-referential cognitions in talented football players during early adolescence. For this purpose, the above-mentioned four types of stability and change were analysed: differential stability (I), mean-level change (II), individual-level change (III), and structural stability (IV).

Method

Sample and design

The present study was conducted with players in the talent development programme of the German Football Association (Deutscher Fußball-Bund, DFB). The participants were among the top 4%

of all eligible German players in the under 12 to under 14 (U12–U14) age classes. Psychological diagnostics of personality characteristics were implemented across longitudinal sections over a time period of three seasons, from 2010/11 to 2012/13. All of the characteristics were assessed once per season at intervals of one year. The initial study sample consisted of 828 male football players (M_{age} = 11.51, SD_{age} = 0.27 years). All of these players participated in the psychological diagnostics that were carried out in the U12 during the season 2010/11. A subsample of 151 players (M_{age} = 11.50, SD_{age} = 0.27 years), who additionally attended the psychological diagnostics conducted in the 2011/12 and 2012/13 seasons, was used to analyse the personality characteristics' development from U12 to U14.

Measures

The psychological diagnostics in the DFB talent development programme capture achievement motives, volitional components, and self-referential cognitions. To assess these characteristics, the German versions of already established self-report questionnaires were used in a football-specific and age-appropriate adaptation (items' wording). The questionnaires were implemented as an Internet-based survey, and the individual scales demonstrated satisfactory psychometric properties in terms of reliability and validity (Feichtinger & Höner, 2014). The short scale of the "Achievement Motives Scale-Sport" by Wenhold et al. (2009a) was used to measure the two motive components: hope for success and fear of failure. The questionnaire "Volitional Components in Sport" by Wenhold et al. (2009c) was applied to assess volitional skills (self-optimisation) and deficits (self-impediment, lack of initiation and loss of focus). Feichtinger and Höner (2014) found rather weak internal consistency of the football-specific subscale self-impediment (Cronbach's alpha α = .64; average inter-item correlation r_{ii} = .17) and comparatively high correlations of the subscale lack of initiation with the remaining scales. Therefore, the two scales were excluded from the present analyses. The "Physical Self-Concept Scales" by Stiller et al. (2004) capture the subjective perception of an athlete's own physical abilities. The present Internet-based survey assessed the physical self-concept with regard to

the motor performance tests in the DFB talent development programme (Höner et al., 2015) that measure football-specific motor skills, such as speed, agility, dribbling, ball control, and shooting (e.g. "I can sprint faster than most football players who are my age"). In addition, based on the original questionnaire's subscale "general athleticism", a scale assessing the general football-specific physical self-concept was included (e.g. "I play football better than most of my teammates"). The questionnaire "Self-efficacy in Football" by Gerlach (2004) captures the subjective belief that one is able to perform a certain action on the basis of one's own abilities.

Procedures

The psychological diagnostics in the DFB talent development programme were executed with the EFS Internet-based survey software 6.0−9.1. All of the participants received an informational letter that included information regarding the aim, content, and implementation of the survey as well as an Internet link and password. Players could participate at any time from any Internet-connected computer within a time frame of six weeks. The implementation of the psychological diagnostics was based on the former version of the Declaration of Helsinki by the World Medical Association, and the research was approved by the scientific board of the DFB and the Ethics Department of the Faculty of Economics and Social Sciences at the University of Tübingen. As part of the data privacy policy, the players were informed that participation in the survey was voluntary, all data would be stored anonymously for scientific purposes, and only employees of the DFB talent development programme's scientific support would have access to the data. In addition, all players' parents provided informed consent to record and use data for scientific research.

Data analysis

Statistical analyses in this study were conducted with SPSS Statistics 21 (IBM) and Mplus 5.2.1 (Muthén & Muthén). The self-report questionnaires were differently scaled; so all scales' scores were transformed to the range [0, 1] for the purpose of comparison. The significance level was set at $\alpha = .05$. As part of a *preliminary drop-out analysis*, a MANOVA was performed to determine whether

the scales' mean values differ between the subsample of 151 players used to examine the personality characteristics' development ("participants") and the remaining 677 players who were excluded from the longitudinal analyses ("drop-outs"). The multivariate mean comparison test revealed a non-significant difference between the two groups (F = 1.94; p = .06), which implies that no systematic sample selection effect occurred. This result corresponds to the multiple reasons for players' dropping-out of the longitudinal diagnostics, such as deselection from the DFB talent development programme (e.g. due to coaches' decisions), selection for a higher performance level (e.g. scouted by youth academies), or non-attendance due to personal causes (e.g. players' decisions not to continue participating).

One-year and two-year *differential stabilities* (I) were analysed by calculating the scales' test–retest correlations for the time intervals U12–U13, U13–U14, and U12–U14. Repeated-measures ANOVAs were conducted to examine whether significant *mean-level changes* (II) took place across the age classes U12 to U14. Whenever the assumption of sphericity was violated, a correction of the degrees of freedom according to Greenhouse-Geisser was carried out. Generalised eta squared (Bakeman, 2005) was calculated as the effect size, with $.01 \leq \eta_G^2 < .06$ as small, $.06 \leq \eta_G^2 < .14$ as medium, and $\eta_G^2 \geq .14$ as large effects (Cohen, 1988). A *post hoc* analysis computed paired sample *t*-tests to examine differences between the individual age classes as well as the characteristics' change pattern in terms of increase or decrease.

Individual-level change (III) was analysed over the two-year interval from U12 to U14. For this purpose, the participants were classified as having decreased, increased, or unchanged scores by using the Reliable Change Index (RCI; Jacobson & Truax, 1991): $RCI = (x_2 - x_1) / s_{diff}$, where x_1 and x_2 represent a player's scale scores at Time 1 and 2, respectively; s_{diff} is the standard error of differences between the two scores which can be computed using the standard error of measurement: $s_{\mathrm{diff}} = \sqrt{2(s_E)^2}$, with $s_E = s_1\sqrt{1 - r_{xx}}$. RCI scores within the interval [−1.96, 1.96] would be expected if no

reliable change had occurred, whereas values outside this interval implied a reliable decrease or increase. In accordance with Roberts, Caspi, and Moffitt (2001), the study further examined whether significant differences occurred in the course of individuals' development. Hence, it was analysed whether the observed distribution of RCI scores deviated from a random change pattern (i.e. 2.5% each reliably decrease and increase, 95% remain the same) by using chi-square tests.

With regard to the personality characteristics' associations, an EFA examining a wide range of characteristics assigned to the areas of motivation, volition, self-referential cognition, and emotion by Feichtinger and Höner (2014) revealed that achievement motives and volitional components were assigned to one common factor ("MoVo"), and the self-referential cognitions (physical self-concept and self-efficacy) were loaded on a different factor ("SeCo"). In a preliminary step of the current study, the scales' assignment to the factors was cross-validated using a CFA with the initial sample of 828 players, and the study's seven scales were applied. The two-factor structure (Figure 8a) showed satisfactory fit indices in the U12 ($\chi^2 = 62.83$, $p < .05$; CFI = .98; TLI = .96; RMSEA = .07; SRMR = .05). Based on this result, the present research examined the personality characteristics' *structural stability* (IV) by computing two additional CFAs in the U13 and U14 age classes using the subsample of 151 participants. Acceptable fit indices of the two-factor structure imply invariance of the personality characteristics' associations over time. For the analysis of the model fit, common conventions were used (acceptable fit indices are close to .05 for RMSEA/SRMR and close to .95 for CFI/TLI; Schumacker & Lomax, 2010).

Results

Table 7 illustrates the results concerning the personality characteristics' differential stabilities and mean-level changes. In general, moderate *differential stabilities* (I) were found for both one-year test–retest intervals from U12–U13 ($.43 \leq r_{tt} \leq .58$) and from U13–U14 ($.44 \leq r_{tt} \leq .62$). The stability coefficients for the two-year period between U12 and U14 were considerably smaller ($.26 \leq r_{tt} \leq .53$).

Table 7. *Differential stability and mean-level change*

Characteristics	Scales	Items	α	*N*	Differential stability r_{tt} U12-U13	Differential stability r_{tt} U13-U14	Differential stability r_{tt} U12-U14	Mean-level change *M* (*SD*) U12	Mean-level change *M* (*SD*) U13	Mean-level change *M* (*SD*) U14	*F*	η^2_G	Post-hoc
Achievement Motives	Hope for success	5	.69	151	.43	.57	.26	0.80 (0.16)	0.77 (0.17)	0.76 (0.17)	3.47*	.01	U12>U14
	Fear of failure	5	.72	151	.51	.44	.31	0.21 (0.15)	0.14 (0.14)	0.18 (0.15)	13.13*	.03	U12>U13; U13<U14
Volitional Components	Self-optimisation	29	.90	151	.58	.59	.53	0.82 (0.11)	0.84 (0.11)	0.81 (0.11)	6.19*	.01	U13>U14
	Loss of focus	9	.82	151	.53	.50	.29	0.11 (0.12)	0.09 (0.12)	0.12 (0.14)	4.65*	.01	U13<U14
Physical Self-Concept	General self-concept	6	.74	151	.52	.53	.38	0.86 (0.09)	0.86 (0.09)	0.85 (0.10)	0.83		
	Specific self-concept	5	.83	151	.51	.62	.39	0.75 (0.15)	0.74 (0.13)	0.71 (0.13)	7.10*	.02	U13>U14; U12>U14
Self-Efficacy	Self-efficacy	11	.75	151	.57	.60	.48	0.88 (0.08)	0.88 (0.08)	0.87 (0.09)	2.53		

Note. α = Cronbach's alpha (taken from Feichtinger & Höner, 2014); Post-hoc = Significant mean differences (based on paired sample t-tests); * = $p < .05$.

With regard to the individual characteristics, hope for success and fear of failure revealed, in parts, low one-year test–retest correlations, which also resulted in small two-year stabilities. Self-optimisation and self-efficacy consistently showed satisfactory differential stabilities, and the other characteristics (loss of focus, general, and specific self-concept) revealed minor two-year stabilities.

In addition, significant *mean-level changes* (II) across the U12–U14 age classes with small effect sizes ($3.47 \leq F \leq 13.13$; $p < .05$; $.01 \leq \eta^2_G \leq .03$) were found for all of the scales, except for the general self-concept ($F = 0.83$; $p = .43$) and self-efficacy ($F = 2.53$; $p = .08$). The post hoc analysis revealed that significant differences in the majority of the characteristics occurred between the U13 and U14 age classes. Additionally, the positive connoted personality characteristics' average level tended to decrease (hope for success, self-optimisation, and specific self-concept). In contrast, both negative connoted characteristics showed a different change pattern. The volitional deficit loss of focus tendentially increased, and fear of failure did not show any clear trend.

Table 8 outlines the frequency distributions of the RCI values and the results of the chi-square tests with regard to the personality characteristics' *individual-level change* (III) over the two-year interval from U12 to U14. No reliable change occurred for 91.39–96.03% of the participants, depending on the personality characteristics. A small minority of the players showed a reliable decrease (0.66–5.96%) or increase (0.66–4.64%). Except for self-efficacy ($\chi^2 = 7.45$; $p < .05$), all of the scales showed non-significant chi-square values ($0.43 \leq \chi^2 \leq 3.60$; $p > .05$), indicating that the frequency distributions did not significantly deviate from a random change pattern. The significant deviations from the average level in self-efficacy were mainly due to the larger number of players who decreased in this particular characteristic.

Table 8. *Frequency distributions of the RCI values and results of the chi-square tests*

Scales	*N*	**Reliable decrease** RCI < -1.96 f_o (%)	**No reliable change** -1.96 ≤ RCI ≤ 1.96 f_o (%)	**Reliable increase** RCI > 1.96 f_o (%)	$\chi^2_{df=2}$
Hope for success	151	6 (3.97)	142 (94.04)	3 (1.99)	1.49
Fear of failure	151	6 (3.97)	144 (95.36)	1 (0.66)	3.35
Self-optimisation	151	7 (4.64)	141 (93.38)	3 (1.99)	2.96
Loss of focus	151	2 (1.32)	142 (94.04)	7 (4.64)	3.60
General self-concept	151	4 (2.65)	142 (94.04)	5 (3.31)	0.43
Specific self-concept	151	1 (0.66)	145 (96.03)	5 (3.31)	2.45
Self-efficacy	151	9 (5.96)	138 (91.39)	4 (2.65)	7.45*
f_e		3.78 (2.50)	143.45 (95.00)	3.78 (2.50)	

Note. RCI = Reliable Change Index; f_o = observed frequency, f_e = expected frequency; * = $p < .05$.

The analysis of *structural stability* (IV; Figure 8b) revealed non-satisfactory fit indices in the U13 (χ^2 = 39.99, p < .05; CFI = .93; TLI = .88; RMSEA = .12; SRMR = .07) and acceptable indices in the U14 (χ^2 = 35.04, p < .05; CFI = .95; TLI = .92; RMSEA = .11; SRMR = .05). These results imply that the personality characteristics' associations are not invariant over time. In line with this, the findings showed increasing inter-correlations between the two latent factors (r_{U12} = .57; r_{U13} = .70; r_{U14} = .76). Furthermore, the relevance of fear of failure increased within the factor "MoVo" (β_{U12} = −.59; β_{U13} = −.58; β_{U14} = −.72), and a growing relevance of self-efficacy within the factor "SeCo" was observed (β_{U12} = .70; β_{U13} = .73; β_{U14} = .79).

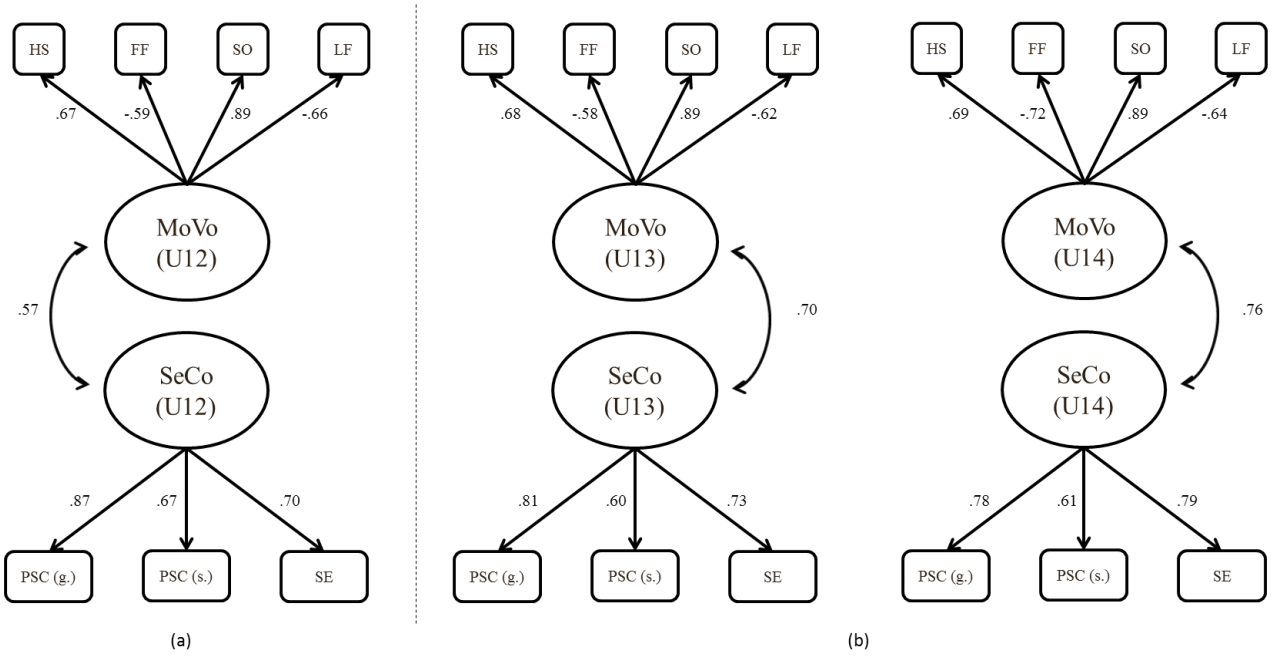

Figure 8. CFAs (a) to cross-validate a two-factor structure (see Feichtinger & Höner, 2014) in the U12 age class and (b) to analyse the structural stability across the U13 and U14 age classes. MoVo = Factor 1: achievement motives & volitional components; SeCo = Factor 2: self-referential cognitions; HS = Hope for success; FF = Fear of failure; SO = Self-optimisation; LF = Loss of focus; PSC (g.) = General physical self-concept; PSC (s.) = Specific physical self-concept; SE = Self-efficacy.

Discussion

The current study focused on the development of achievement motives, volitional components, and self-referential cognitions in talented football players during early adolescence. In accordance with research in developmental psychology, the study analysed four different types of stability and change. First, the personality characteristics showed moderate *differential stabilities* (I) over one-year test–retest intervals and lower coefficients for the two-year period. These results imply that, to a certain degree, the relative ordering of individuals in such characteristics changes over time. With regard to other sport-specific research with male athletes of a similar age range, the study revealed smaller test–retest correlations (two-year correlations around .50–.70 for achievement motivation and action control; Hohmann, 2009). One possible explanation for the different level of stability could be that the present study examined a sample of all talented football players and that minor variances within such a homogenous group may have led to relatively small test–retest correlations. In line with this, Höner et al. (2015) examined the development of motor skills within the same population of football players in the DFB talent development programme. Referring to this study, the extent of the personality characteristics' differential stability is comparable to one-year test–retest correlations of technical skills, such as ball control (r_{tt} = .49) and dribbling (r_{tt} = .62), but lower than speed abilities, such as a 20 m sprint (r_{tt} = .71).

Furthermore, the differential stabilities computed in the current study are rather conservative estimates because the coefficients might still be attenuated by effects of measurement error or unreliability (Watson, 2004). In this context, Feichtinger and Höner (2014) showed that application of the above-mentioned self-report questionnaires to a sample of talented football players led to satisfactory internal consistencies (e.g. Cronbach's alpha; Table 7). However, no test–retest reliability has been calculated for this specific population due to the chosen design (i.e. assessment of the personality characteristics at intervals of one year). Based on such reliability coefficients, Nunnally and Bernstein (2010) recommend correcting test–retest correlations in longitudinal analyses for measurement error

or unreliability. Corrected stability coefficients tend to be notably higher (Ardelt, 2000). Nevertheless, the current study intentionally considered the uncorrected estimates because only those coefficients provide relevant information about the differential stability of the personality characteristics assessed by self-report questionnaires as they are actually applied with talented football players.

The present research further revealed small, but in most cases, significant *mean-level changes* (II) of the personality characteristics in talented football players across the U12–U14 age classes. The relatively small fluctuations in the characteristics' average level indicate that no major developmental effects (e.g. due to puberty influences) occur during early adolescence in such a homogenous group. Corresponding to these findings, Elbe et al. (2003) and Elbe, Szymanski, et al. (2005) examined the development of sport-specific achievement motivation and volitional components, and their results showed only marginal group-level changes in youth athletes aged 12–16. In addition, the present research revealed results concerning the personality characteristics' change patterns. Most of the characteristics showed significant differences between the U13 and U14 age classes, rather than from U12–U13. This may indicate that the effects of puberty, leading to a substantial developmental change, first begin to take effect during the later time period. Furthermore, the individual characteristics developed multi-directionally across the course of early adolescence. The positive connoted characteristics tended to decrease, whereas, for example, the volitional deficit loss of focus tendentially increased. This finding might be related to a more competitive environment in the later age classes of the DFB talent development programme. Because players compare their own ability with others in their immediate environment, the individuals' self-ratings are associated with their fellow players' performance level. Such reference-group effects are well researched in educational contexts. For example, Trautwein, Gerlach, and Lüdtke (2008) demonstrated that students with the same ability levels had higher physical self-concepts when they were in a class with low average ability than in a class with high average ability.

Concerning *individual-level change* (III), the present study revealed that the vast majority of the talented football players did not show any reliable change in their personality characteristics across the U12–U14 age classes. These findings correspond to the relatively small mean-level changes. The slight amount of players whose characteristics increased or decreased reliably could be ascribed to random deviations. Significant differences in the course of individuals' development were exclusively found in self-efficacy due to a larger number of players who decreased in this characteristic. These fluctuations were masked in the respective mean-level analysis in which no significant change occurred across the U12–U14 age classes. Individual-level change has rarely been addressed in previous research focusing on talented athletes. However, the small variations in intra-individual change detected in the present study differ from research in developmental psychology that has found evidence of reliable individual differences in personality change during adolescence (Roberts et al., 2008). Possible explanations for the different findings may be the high homogeneity of the present sample, the limited study period of two years, or the types of personality traits considered in the current study. Hence, future empirical studies need to take greater account of individual-level change, especially because individual differences are of major interest in the context of talent research (Ackerman, 2014).

Analysing *structural stability* (IV), the results indicate that the personality characteristics' associations within the two latent factors "MoVo" and "SeCo" did not stay invariant across the U12–U14 age classes. Both the correlations among the individual characteristics as well as the relationship between the underlying factors change over time. In contrast to other research in developmental psychology (Roberts et al., 2008), the current study exclusively considered the scales' loadings on latent factors. The individual scales' measurement equivalence (Allemand, Steiger, & Hill, 2013), another important aspect of structural stability, was not addressed in the present research. In the future, sports talent research should consider this issue to examine whether the same construct is being measured

in the same way across different age classes. Such analyses contribute important insight into the stability of individual characteristics' structure over time, which is particularly relevant with regard to longitudinal diagnostics.

Nevertheless, the present study's findings provide empirical evidence concerning the complex interplay between characteristics within the psychological dimension. In the context of sports talent research, not only may the associations between such characteristics vary depending on the age, but their predictive value for prospective football success may change as well. However, empirical evidence regarding multifaceted personality characteristics' prognostic relevance for performance in football is still lacking. Future studies should analyse the relationship between various personality characteristics and medium-/long-term football success. Furthermore, it will be necessary to extend the range of the examined characteristics (e.g. motor skills) due to the multidimensional nature of talent (Abbott & Collins, 2004). An analysis of multidimensional and multifaceted characteristics' combination may provide more precise information about the prognostic value of individual characteristics.

Regarding the interpretation of the results, several limitations of the current study need to be discussed. First, the present research assessed psychological personality characteristics based on self-reported questionnaires. Therefore, the findings reflect how the self-ratings of talented football players' characteristics develop over time. Future studies should include external ratings (e.g. by coaches) to complement the present results. Second, the sample of the current study is specific in terms of sport (football), sex of the participants (male), and their performance homogeneity (the top 4% of all German players in their age range). Future research should determine whether the study's findings can be generalised to other types of sport, female athletes, and/or players of different performance levels. Third, the study focused on the development of personality characteristics across the U12–U14 age classes. Hence, based on the state of research to date, it is still unclear how talented football players' personality characteristics develop during middle (15–17 years) and late (18–21 years) adolescence.

Previous research in developmental psychology showed, for example, an increasing stabilisation of personality with age, leading to higher differential stabilities (cumulative continuity principle; Roberts et al., 2008). Finally, the present research was the first to analyse four different types of stability and change in talented athletes' personality characteristics. Nevertheless, further developmental aspects need to be addressed due to the various definitions of these two concepts (e.g. the stability of personality patterns within a person over time; De Fruyt et al., 2006). In line with this, Zuber et al. (2015) showed that the motivational patterns of early adolescent football players were stable over a one-year period.

Despite these limitations, the present research provided new insights into the development of achievement motives, volitional components, and self-referential cognitions in talented football players. Following from this, conclusions can be drawn regarding the talent identification and development process. The comparatively low differential stability of the personality characteristics imply that psychological diagnostics intending to analyse inter-individual differences in a group of players should not rely on a single assessment. The present study's findings suggest conducting repeated measures to identify true differences between players. With regard to mean- and individual-level changes, small intra- and inter-individual fluctuations indicate that process diagnostics with the intention to detect intra-individual change should apply test–retest intervals exceeding the one- or two-year periods used in the current study (for an overview regarding dynamic assessment in sport; Schack, 2012). Nevertheless, the significant group-level differences need to be considered when computing reference values for different age classes to ensure a meaningful interpretation of the self-report questionnaires' scale scores. The findings concerning structural stability provide important insights into the complex interplay between achievement motives, volitional components, and self-referential cognitions over time. For example, the relevance of fear of failure for talented football players' motivation and volition tends to increase across the U12–U14 age classes. As a consequence, sport psychological coaching and training could focus on motivational climate interventions to reduce

players' anxiety (e.g. Smith, Smoll, & Cumming, 2007). However, coaches and trainers should bear in mind that deficiencies in one characteristic may be compensated for by strengths in others (compensation phenomenon; Vaeyens et al., 2008).

Study 3: Relationships between personality characteristics and performance criteria

Höner, O., & Feichtinger, P. (2015). Psychological predictors of soccer talent: Empirical relationship of personality characteristics with current and future performance. This is the first manuscript version of an article submitted for publication to *Psychology of Sport and Exercise*.

Abstract

Objectives: This study examined the relationship of talented soccer players' personality characteristics with current and future performance. *Design:* Both a cross-sectional and a prospective design were used. *Method:* The sample consisted of 2,677 U12 players in the German talent development program. Self-report questionnaires captured personality characteristics that were assigned to the areas of motivation, volition, self-referential cognition, and emotion. Current performance was operationalized by a motor score representing speed abilities and technical skills as well as by coaches' subjective ratings (A = highly promotion-worthy, B = promotion-worthy, C = partly promotion-worthy). The level of future performance was assessed by examining whether individuals were selected for professional clubs' youth academies in U16. *Results:* This study revealed that only self-referential cognition had a significant and relevant association with the motor score ($.10 \leq r \leq .37$). The players in the subjectively rated categories significantly differed in 10 of 17 psychological scales ($.01 \leq \eta^2 \leq .03$). In most of the personality characteristics, A-players showed more positively connoted values compared to B- and C-players. Logistic regressions demonstrated that 10 of 17 characteristics explained a significant proportion of players' future success. Players with high dispositions in these characteristics had a greater chance of achieving a higher performance level compared to players with low dispositions ($1.61 \leq OR \leq 2.65$). *Conclusions*: Expanding on previous research, this study enabled comparisons to be made between a wide range of personality characteristics with regard to their relevance for soccer performance, leading to conclusions on talent identification and development.

Keywords: Football, success, prognostic value, talent identification and development

Introduction

Youth development programs in soccer aim to identify and develop talented players who currently perform at a high level and who have the potential to become elite adult players. However, the identification and development process is difficult because current performance and future success are determined by factors from multidimensional talent domains. In addition to physical, physiological, and sociological variables, Williams and Reilly (2000) consider psychological characteristics to be potential predictors of soccer talent. Of these, the authors distinguish between perceptual-cognitive skills and personality. Whereas perceptual-cognitive skills such as anticipation or decision making are regarded as main factors having an immediate effect on performance (Mann, Williams, Ward, & Janelle, 2007), the role of personality is discussed diversely in previous research. Personality characteristics, such as achievement motives, have been addressed as main, mediating or moderating factors with regard to athletic performance (Zuber & Conzelmann, 2014).

General models of giftedness research provide a valuable theoretical foundation concerning the relevance of psychological characteristics for current performance and future success in soccer (Vaeyens et al., 2013). For example, the Model of Giftedness and Talent (Gagné, 2010) or the Munich Model of Giftedness (Heller & Perleth, 2008) includes specific characteristics that are primarily assigned to the areas of motivation (e.g., achievement motives), volition (e.g., effort), self-referential cognition (e.g., self-concept), and emotion (e.g., anxiety). The present study focused on such personality characteristics, which have been recognized to play an important role in soccer success (Morris, 2000). This study examined the relationship of psychological personality characteristics with current objective and subjective performance criteria as well as the prognostic value of the characteristics for players' future performance level.

Empirical evidence from previous research in soccer

Previous empirical studies have applied both cross-sectional and prospective designs to analyze the relationship of motivational, volitional, (self-referential) cognitive and emotional personality

characteristics with success in soccer. Regarding *motivational characteristics*, Coelho e Silva et al. (2010) contrasted regional and local players in the U14 age class and found that local players' ego orientation was significantly lower. However, Kavussanu et al. (2011) demonstrated that differences between elite and non-elite players in the age range of 12 to 16 years were mainly characterized by elite players' significantly higher task orientation. In addition to this cross-sectional research, a prospective study by Figueiredo et al. (2009) showed that youth soccer players aged 11 to 14 years, who were classified two years later as elite players, club players or dropouts, did not show significant differences in either task or ego orientation. Furthermore, a prospective study by Zuber et al. (2015) revealed that talented soccer players in the U14 age class who had high dispositions in achievement orientations (win, goal) and hope for success, as well as low values in fear of failure, were more likely to be selected for the U15 youth national team compared to players with other motivational patterns.

Further studies addressing *volitional characteristics* were conducted by Toering and colleagues. Toering et al. (2009) aimed to identify the aspects of self-regulation that distinguish between elite and non-elite players in the age range of 11 to 17 years. Their findings showed a significant association of reflection and effort with the current performance level. Elite players had higher dispositions in these two characteristics compared to non-elite players. In another study, Toering, Elferink-Gemser, Jordet, Peppinga, and Visscher (2012) examined whether the relationship between self-regulation and current performance could also be found in a group of elite players. For this purpose, the study compared international and national level players aged 12 to 17 years, and revealed that international level players were significantly more likely to have higher values in reflection.

Regarding *self-referential cognition*, in a cross-sectional study, Reilly et al. (2000) demonstrated higher levels of self-confidence in 16-year-old elite players compared to their sub-elite counterparts. A prospective study by Huijgen et al. (2014) did not reveal significant differences in self-confidence between elite youth players aged 16 to 18 years who were selected or deselected at the end of the respective season.

In regard to *emotional characteristics*, the study by Reilly et al. (2000) also examined differences between elite and sub-elite players concerning competition anxiety. Elite players showed a significantly lower intensity of somatic anxiety, whereas the extent of cognitive anxiety did not differ across both groups. Furthermore, Spamer and Coetzee (2002) reported on a cross-sectional study by Badenhorst (1998) that did not reveal any significant differences in somatic and cognitive anxiety between talented and less talented 16-year-old players.

Limitations of the empirical state of research

Considering the empirical state of research, the relationship between psychological personality characteristics and success in soccer requires further examination for several reasons. First of all, previous studies revealed *inconsistent results* (e.g., with regard to goal orientations), which may be explained by various causes. For instance, some of the above reviewed studies are limited by *small sample sizes* (e.g., Reilly et al., 2000; Spamer & Coetzee, 2002). Because individual characteristics, especially when assessed in preselected groups, are expected to explain only minor proportions of complex performance (Ackerman, 2014), reliable studies should be conducted using sufficiently large numbers of participants to increase the probability of detecting such small effects when these effects actually exist (i.e., statistical power). Additionally, the *definition of 'success'* varied across the research. Some of the studies compared players who were already highly differentiated in their competition level (i.e., players in youth academies of professional clubs vs. players on local or school teams; e.g., Kavussanu et al., 2011; Reilly et al., 2000). Other studies contrasted top players with players who were close to the top level, but not the best (e.g., Huijgen et al., 2014; Toering et al., 2012). Because the aim of youth development programs is to identify and develop currently high-performing players who have the greatest potential to succeed at an elite adult level, sport talent research needs to examine homogenous groups of highly talented soccer players to support coaches, associations and all of those involved in the talent identification and development process.

An additional need for research is related to the studies' underlying designs and the selected personality characteristics. With respect to *research design*, cross-sectional studies provided insight into the current psychological qualities of more or less talented soccer players. Future research should continue to analyze this relationship to gain more insight into the association of personality characteristics with current performance. In addition to previous studies that mainly compared players at different competition levels, research should also consider *current performance criteria*, such as objectively assessed motor skills and coaches' subjective ratings. For example, Figueiredo et al. (2009) demonstrated that these measures possess prognostic relevance for individuals' future success. However, such cross-sectional studies will not answer the question of whether favorable personality characteristics facilitate the achievement of higher performance levels or whether playing at higher performance levels leads to more favorable personality characteristics. As a consequence, recent prospective studies began to examine personality characteristics' prognostic value for the future performance level (e.g., Huijgen et al., 2014). Most of this work analyzed this relationship over a maximum of two years, which is a rather short *prognostic period* considering the duration of the talent development process. Thus, future analyses should extend those periods to examine the mid-term or even long-term prognostic value of personality characteristics.

Regarding the multidimensional understanding of talent (Williams & Reilly, 2000), a large part of the research on this topic has considered a wide range of physical, physiological, sociological, and psychological characteristics, examining their relationship with soccer performance. These studies provide important insights into the relevance of the various talent domains. However, such a broad approach can only examine a limited number of characteristics within each domain, although these are regarded to be multifaceted constructs as well (e.g., personality; Baltes et al., 2006). Consistent with this reflection, most of the empirical work included only one or two personality facets, and this research varies considerably with regard to the *selection of characteristics*. Furthermore, all the above-mentioned studies assessed personality characteristics based on self-report questionnaires.

Hence, the analyses always evaluated the relevance of the individual characteristics in combination with the underlying psychological scales' concurrent and prognostic validity. Because past studies also differ concerning their specific features (e.g., sample sizes, definitions of success, research designs), the previous findings are extremely difficult to compare. From a sport psychological perspective, it seems to be beneficial to examine characteristics from various personality facets within the same study design to gain comparative information on the relevance of these personality characteristics for success in soccer.

The present study

The present study examined the relationship between potential psychological talent predictors and success in youth soccer. Expanding on previous research within the psychological talent domain, this study used a multifaceted approach that considered personality characteristics, which were assigned to the aforementioned areas of motivation, volition, self-referential cognition, and emotion. This approach intended to determine the relevance of each characteristic independent of the common variance with the other characteristics. For this purpose, the current study evaluated each characteristic individually (and therefore the underlying psychological scale as well) with regard to its relationship with success in soccer.

Because an individual predictor may represent only a small fraction of complex soccer performance, this study considered a sufficiently large number of participants to detect even such small effects. Additionally, the present research was conducted with a homogenous group of high-performing youth players. All of these players were selected for the talent development program of the German Soccer Association (Deutscher Fußball-Bund, DFB), which promotes approximately 5,000 U12 players belonging to the top 4% of their age class.

In this context, the current study examined the cross-sectional associations of U12 players' personality characteristics with their objectively assessed motor performance (*Objective 1a)* and with

their subjectively rated overall performance (*Objective 1b*). Furthermore, prospective analyses assessed the personality characteristics' prognostic value for future success over a mid-term prediction period of four years from U12 to U16 (*Objective 2*).

Method

Samples and procedures

As the present study considers a wide range of personality characteristics, the collection of psychological data on the U12 age class was divided into two survey periods so that the participants did not have to perform all of the measures at once. The first survey period took place in fall 2010 (November 15 to December 12), and the second was conducted in spring 2011 (May 16 to June 12). Altogether, 2,677 male competence center players participated in at least one of the two surveys. This total sample, with $N_{fall2010}$ = 1,701 (M_{age} = 11.4, SD_{age} = 0.28 years) and $N_{spring2011}$ = 1,804 (M_{age} = 11.9, SD_{age} = 0.28 years), was used to assess the U12 players' success four years later in the U16 age class (*Objective 2*). With regard to the cross-sectional analyses in U12, available data were captured from motor performance tests in the DFB talent development program (Höner et al., 2015) and from coaches' subjective ratings concerning the players' overall performance. This approach led to subsamples of $N_{fall2010}$ = 1,412 and $N_{spring2011}$ = 1,417 (*Objective 1a*) as well as $N_{fall2010}$ = 919 and $N_{spring2011}$ = 987 (*Objective 1b*).

The data collection was based on the former version of the Declaration of Helsinki by the World Medical Association, and the research was approved by the scientific board of the DFB and the Ethics Department of the Faculty of Economics and Social Sciences at the University of Tübingen. As part of the data privacy policy, the players were informed that participation in the survey was voluntary, all of the data would be stored anonymously for scientific purposes, and only employees of the DFB talent development program's scientific support team would have access to the data. Additionally, all players' parents provided informed consent to record and use the data for scientific research.

Measures

Psychological Personality Characteristics

The psychological diagnostics were executed using the EFS Internet-based survey software 6.0–8.0. All of the participants received an informational letter that included the aim, content, and procedure of the survey, as well as an Internet link and password. Players could participate at any time during the two survey periods from any computer with Internet access. To assess their personality characteristics, the German versions of already established self-report questionnaires were used in a soccer-specific and age-appropriate adaptation. A total of seven questionnaires (17 scales; see Table 9) demonstrated satisfactory psychometric properties in terms of reliability and validity (Feichtinger & Höner, 2014).

For assessing motivational characteristics, the short scale of the "Achievement Motives Scale-Sport" (AMS-S) by Wenhold et al. (2009a) was used to measure the two motive components *hope for success* and *fear of failure*. The "Sport Orientation Questionnaire" (SOQ; Elbe et al., 2009) and the "Task and Ego Orientation in Sport Questionnaire" (TEOSQ; Rethorst & Wehrmann, 1998) assess motivational orientations in the context of sport. These scales provide information about the criteria that athletes use to evaluate their own performance. The SOQ distinguishes between three different achievement orientations (*competition*, *win*, and *goal*), whereas the TEOSQ differentiates between two goal orientations (*task* and *ego*). In the area of volition, the questionnaire "Volitional Components in Sport" (VCS) by Wenhold et al. (2009c) was applied to assess volitional skills (*self-optimization*) and deficits (*self-impediment*, *lack of initiation*, and *loss of focus*). To measure self-referential cognition, the "Physical Self-Concept Scales" (PSC) by Stiller et al. (2004) captured the subjective perception of an athlete's own physical abilities. The *specific physical self-concept* was assessed with regard to the motor diagnostics in the DFB talent development program (Höner et al., 2015) that measure soccer-specific motor skills, such as speed, agility, dribbling, ball control, and shooting (e.g., "I can

sprint faster than most soccer players who are my age"). Additionally, based on the original questionnaire's subscale "general athleticism", a scale assessing the *general physical self-concept* was included (e.g., "I play soccer better than most of my teammates"). The questionnaire "Self-Efficacy in Soccer" (SES) by Gerlach (2004) captures the subjective belief that one is able to perform a particular action based on one's own abilities. Regarding the assessment of emotional aspects, the "Competition Anxiety Inventory Trait" (CAI-T; Brand et al., 2009) measured the trait of anxiety to capture an athlete's tendency to respond with fear in competitive situations. Competition anxiety manifests itself as *somatic anxiety*, *worry* and *concentration disruption*.

Based on the theoretical foundation of the individual self-report questionnaires and on previous empirical research (for more details, see Feichtinger & Höner, 2014), nine of the 17 psychological scales represent functional personality characteristics. This aspect implies that higher dispositions in these scales are associated with higher current and future performance. The remaining eight scales (fear of failure, ego orientation, three volitional deficits, and three dimensions of competition anxiety) are regarded as dysfunctional personality characteristics and have a negative relationship with performance criteria. Categorization as functional or dysfunctional characteristics is indicated by a "+" and "-", respectively, in the tables and figures of this article.

Performance Criteria

The *current motor performance* was captured by motor diagnostics in the U12 age class, which comprised five performance tests assessing speed (time for a 20 m sprint), agility and dribbling (time in a slalom course without and with ball), ball control (time for six passes against two opposing impact walls), and shooting (8 shots at various target fields, each rated by the coach with regard to precision and speed). The results of these individual tests were combined into a motor score (for a detailed description of the individual tests and the score's formula, see Höner et al., 2015). This score, when assessed in the U12 age class, possesses satisfactory prognostic validity for future success in middle-to-late adolescence (Höner, Schultz, Schreiner, & Votteler, in press).

The U12 players' *current overall performance* was subjectively rated by their respective competence center coaches. All of these coaches possess the DFB-elite-youth-license (UEFA B-Level) and therefore can be regarded as experts in the context of talent identification and development. The subjective ratings (A = highly promotion-worthy, B = promotion-worthy, C = partly promotion-worthy) were routinely implemented in the DFB talent development program, and in each case, a player was judged by one coach. The ratings' distributions of the two survey periods, fall 2010 and spring 2011, did not differ significantly ($\chi^2 = 0.75$; $p = .69$). The percentage distribution averaged over both periods was 21.49%, 70.26%, and 8.25% for the A, B, and C ratings, respectively.

As the criterion for *future success*, the U12 players' performance level was assessed four years later in the U16 age class by examining whether the individuals were selected for German professional clubs' youth academies to compete at the highest national level (i.e., the best 1% in their age). In total, 143 players from the psychological survey in fall 2010 (8.41%) and 165 players from the survey in spring 2011 (9.15%) were selected for this higher performance level. Thus, the ratio of selected players was similar to another study examining the approximate total population of U12 competence center players from the 1993 to 1997 cohorts (Höner et al., in press), which indicates the representativeness of the present study sample.

Data analysis

Statistical analyses in this study were conducted with SPSS Statistics 22 (IBM). Table 9 displays the descriptive statistics separately for the examined objectives. The respective subsamples did not differ significantly with regard to the psychological measures ($F \geq 1.32$, $p > .25$). The self-report questionnaires were scaled differently, and functional as well as dysfunctional personality characteristics were assessed. For the purpose of comparison, all scales' values were z-transformed, and the scales assessing the dysfunctional characteristics were recoded. Thus, in all z-transformed variables, a positive statistical association with the current and future performance criteria was expected.

Table 9. *Descriptive statistics of the psychological scales for Objective 1a, 1b, and 2*

Personality Facet	Characteristic (Questionnaire)	Scale	No. of Items	α	Response Scale	Objective 1a		Objective 1b		Objective 2	
						N	*M (SD)*	*N*	*M (SD)*	*N*	*M (SD)*
Motivation	Achievement Motives (AMS-S)	Hope for success (+)	5	.69	0 – 3	1412	11.48 (2.37)	919	11.49 (2.36)	1701	11.43 (2.40)
		Fear of failure (-)	5	.72	0 – 3	1412	3.22 (2.36)	919	3.24 (2.35)	1701	3.32 (2.39)
	Achievement Orientation (SOQ)	Competition orientation (+)	13	.85	1 – 5	1412	58.33 (5.61)	919	58.24 (5.77)	1701	58.08 (5.76)
		Win orientation (+)	6	.82	1 – 5	1412	24.19 (4.43)	919	24.22 (4.43)	1701	24.11 (4.45)
		Goal orientation (+)	6	.75	1 – 5	1412	26.83 (2.98)	919	26.80 (2.98)	1701	26.75 (3.94)
	Goal Orientation (TEOSQ)	Task orientation (+)	7	.76	1 – 5	1417	30.60 (3.36)	987	30.45 (3.45)	1804	30.53 (3.33)
		Ego orientation (-)	6	.84	1 – 5	1417	17.57 (5.30)	987	17.30 (5.25)	1804	17.49 (5.26)
Volition	Volitional Components (VCS)	Self-optimization (+)	29	.90	0 – 3	1412	70.17 (9.04)	919	70.23 (8.92)	1701	69.83 (9.10)
		Self-impediment (-)	9	.64	0 – 3	1412	9.82 (3.77)	919	9.84 (3.76)	1701	9.91 (3.77)
		Lack of initiation (-)	13	.84	0 – 3	1412	6.29 (4.69)	919	6.22 (4.53)	1701	6.50 (4.73)
		Loss of focus (-)	9	.82	0 – 3	1412	3.29 (3.40)	919	3.29 (3.36)	1701	3.41 (3.44)
(self-referential) Cognition	Physical Self-Concept (PSC)	General self-concept (+)	6	.74	1 – 4	1417	20.34 (2.14)	987	20.31 (2.12)	1804	20.28 (2.14)
		Specific self-concept (+)	5	.83	1 – 100	1417	357.47 (78.88)	987	354.66 (79.39)	1804	353.91 (80.31)
	Self-Efficacy (SES)	Self-efficacy (+)	11	.75	1 – 4	1417	37.63 (3.60)	987	37.62 (3.60)	1804	37.50 (3.53)
Emotion	Competition Anxiety (CAI-T)	Somatic anxiety (-)	4	.77	0 – 4	1417	6.80 (2.49)	987	6.78 (2.51)	1804	6.80 (2.46)
		Worry (-)	4	.76	0 – 4	1417	6.65 (2.37)	987	6.68 (2.32)	1804	6.71 (2.35)
		Concentration disruption (-)	4	.59	0 – 4	1417	5.73 (1.88)	987	5.71 (1.88)	1804	5.76 (1.88)

Note. + = functional personality characteristics; - = dysfunctional personality characteristics; α = Cronbach's alpha (taken from Feichtinger & Höner, 2014).

As the study focused on the evaluation of each personality characteristic individually, univariate analysis techniques were used to provide information on each characteristic's associations with the performance criteria. To examine the relationship between the U12 players' personality characteristics and current motor performance (*Objective 1a*), product-moment correlations of the psychological scales with the motor score were performed. Furthermore, ANOVAs (and post-hoc Tukey HSD) were computed to analyze the differences between players who were categorized by their coaches as "highly promotion-worthy", "promotion-worthy", or "partly promotion-worthy" (*Objective 1b*). To examine the prognostic value of each personality characteristic in U12 (*Objective 2*), logistic regression analyses were performed using the attainment of the U16 youth academy level as the dependent criterion variable (0 = No; 1 = Yes).

The significance level for all statistical procedures was set at $\alpha = .05$. Because of the large sample sizes, significance was only considered to be the necessary condition for the existence of a relationship between personality characteristic and soccer performance. For a meaningful interpretation of relevant relations, at least small effect sizes were required as the sufficient condition. Therefore, effect sizes of $r = .10$ and $\eta^2 = .01$ were presupposed for Objective 1a and 1b, respectively (Cohen, 1988, 1992). For the logistic regression analyses, the study provided information on Nagelkerke R^2. Because pseudo r-squared statistics often underestimate the relevance of predictors (Hosmer, Lemeshow, & Sturdivant, 2013), a pragmatic effect size on the basis of categorical odds ratios was determined. For this purpose, the players were categorized as having low ($z < -1$), medium ($|z| \leq 1$), or high ($z > 1$) dispositions in each of the personality characteristics. Using the players with low disposition as a reference group, categorical odds ratios were calculated displaying the relative chances of players with high and medium dispositions for reaching the youth academy level. In this context, the transformation formula $OR = \exp(d*\pi*3^{\wedge(-0,5)})$ was used; $OR \geq 1.44$ was considered to be a small effect size, and $OR \geq 2.48$ was considered to be a medium effect size (these levels correspond to $d \geq .20$ and $d \geq .50$ respectively referring to Borenstein, Hedges, Higgins, & Rothstein, 2009).

Table 10. *Correlations of the psychological scales with the motor score and results of the group comparison test between the subjectively rated categories*

Scales	**Correlations with motor score (Objective 1a)**		**ANOVAs (Objective 1b)**						
	N	r_{xy}	***N***	***M* (*SD*)** A	B	C	***F***	η^2	**Post-hoc**
Hope for success (+)	1412	.06*	919	0.15 (1.00)	0.01 (0.98)	-0.12 (0.97)	2.54		
Fear of failure (–)	1412	.09*	919	0.17 (1.06)	0.01 (0.94)	-0.13 (1.08)	3.24	.01*	
Competition orientation (+)	1412	.06*	919	0.24 (0.92)	-0.04 (1.03)	0.08 (0.90)	6.20	.01*	A>B
Win orientation (+)	1412	.03	919	0.10 (0.95)	-0.01 (1.01)	0.10 (0.94)	1.05		
Goal orientation (+)	1412	.06*	919	0.20 (0.92)	-0.04 (0.99)	0.04 (0.97)	4.25	.01*	A>B
Task orientation (+)	1417	-.02	987	0.03 (1.04)	-0,03 (1.04)	-0.05 (0.93)	0.36		
Ego orientation (–)	1417	.00	987	-0.01 (1.00)	0.05 (1.00)	0.05 (0.96)	0.37		
Self-optimization (+)	1412	.09*	919	0.25 (0.92)	0.00 (0.99)	-0.10 (0.99)	5.81	.01*	A>B, A>C
Self-impediment (–)	1412	.06*	919	0.16 (0.99)	-0.01 (1.00)	-0.07 (0.97)	2.45		
Lack of initiation (–)	1412	.09*	919	0.27 (0.94)	0.03 (0.95)	-0.17 (0.97)	7.18	.02*	A>B, A>C
Loss of focus (–)	1412	.08*	919	0.19 (0.91)	0.01 (0.98)	-0.09 (1.04)	3.23	.01*	
General self-concept (+)	1417	.24*	987	0.32 (0.94)	-0.05 (0.98)	-0.23 (1.08)	14.70	.03*	A>B, A>C
Specific self-concept (+)	1417	.37*	987	0.34 (0.80)	-0.07 (1.02)	-0.23 (0.98)	17.14	.03*	A>B, A>C
Self-efficacy (+)	1417	.10*	987	0.24 (0.94)	-0.01 (1.04)	-0.15 (1.03)	6.21	.01*	A>B, A>C
Somatic anxiety (–)	1417	.04	987	0.07 (1.05)	0.01 (0.99)	-0.11 (1.15)	0.94		
Worry (–)	1417	.07*	987	0.21 (0.90)	-0.03 (0.99)	-0.14 (1.12)	6.20	.01*	A>B, A>C
Concentration disruption (–)	1417	.04	987	0.11 (0.94)	0.00 (1.01)	0.00 (1.07)	1.07		

Note. + = functional personality characteristics; - = dysfunctional personality characteristics; values of the psychological scales are z-transformed and the scales assessing dysfunctional characteristics are recoded (z-values' sum per characteristic are unequal zero, because only players of the respective subsample were considered); A = highly promotion-worthy, B = promotion-worthy, C = partly promotion-worthy; * = $p < .05$; Post-hoc = Significant mean differences (based on post-hoc Tukey HSD).

Considering the statistical analysis techniques and sample sizes of Objective 1a, 1b and 2, the test powers were determined for detecting at least small-sized effects by using G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). The present statistical procedures are characterized by test powers of $\beta \geq .96$, $\beta \geq .78$, and $\beta \geq .98$ for the three objectives.

Results

Relationship of personality characteristics with current motor performance (Objective 1a)

Table 10 presents the associations between the U12 players' (z-transformed and partly recoded) psychological scales and their current motor performance. With the exception of task and ego orientation (showing almost zero correlation $|r| \leq .02$), all of the personality characteristics correlated with the motor score in the expected direction. These correlations were all significant, except for win orientation, somatic anxiety, and concentration disruption. However, only self-referential cognition proved to possess a relevant relationship with the current motor performance. Whereas the associations of self-efficacy and general physical self-concept have to be categorized as small ($r = .10$ and $r = .24$, respectively), the correlation between the specific physical self-concept and the motor score is represented by a medium effect size ($r = .37$).

Associations of personality characteristics with current overall performance (Objective 1b)

The psychological scales' z-values in Table 10 are presented separately for players who were categorized by their coaches as "highly promotion-worthy" (A), "promotion-worthy" (B) or "partly promotion-worthy" (C) with regard to their overall performance. Again, with only a few exceptions (win orientation, ego orientation), the psychological characteristics were associated with the current criterion in the expected direction (i.e., A-players' values were higher than those of C-players). For 10 of the 17 psychological characteristics, ANOVAs identified significant differences between the three groups ($3.23 \leq F \leq 17.14$; $p < .05$). The significant ANOVA results were all accompanied by small effect sizes ($.01 \leq \eta^2 \leq .03$). The post-hoc tests revealed that these differences were mainly caused by the values of the A-players, which were higher than those of the other two groups (the post-

hoc test for fear of failure approached the significance level between A- and C-players, with $p = .05$). No significant differences occurred between B- and C-players.

Relationship between personality characteristics and future success (Objective 2)

The prospective analysis of the personality characteristics' predictive value for future success (Table 11) revealed plausible effects for all of the characteristics in the expected direction (i.e., $b > 0$).

Table 11. *Results of the logistic regression analyses with metric variables*

Scales	***N***	**constant**	***b***	***OR***	**95%-CI for *OR***	R^2_N
Hope for success (+)	1701	-2.42	0.29	1.33	1.11–1.60	.01*
Fear of failure (–)	1701	-2.41	0.22	1.25	1.04–1.50	.01*
Competition orientation (+)	1701	-2.42	0.30	1.35	1.11–1.64	.01*
Win orientation (+)	1701	-2.39	0.11	1.12	0.94–1.33	
Goal orientation (+)	1701	-2.41	0.22	1.24	1.03–1.50	.01*
Task orientation (+)	1804	-2.32	0.22	1.25	1.05–1.48	.01*
Ego orientation (–)	1804	-2.30	0.09	1.09	0.93–1.28	
Self-optimization (+)	1701	-2.41	0.24	1.27	1.06–1.53	.01*
Self-impediment (–)	1701	-2.39	0.10	1.11	0.93–1.32	
Lack of initiation (–)	1701	-2.40	0.16	1.17	0.98–1.41	
Loss of focus (–)	1701	-2.39	0.07	1.07	0.90–1.28	
General self-concept (+)	1804	-2.32	0.22	1.25	1.06–1.47	.01*
Specific self-concept (+)	1804	-2.34	0.34	1.41	1.17–1.69	.02*
Self-efficacy (+)	1804	-2.31	0.20	1.22	1.03–1.44	.01*
Somatic anxiety (–)	1804	-2.30	0.04	1.04	0.89–1.23	
Worry (–)	1804	-2.31	0.22	1.24	1.04–1.48	.01*
Concentration disruption (–)	1804	-2.31	0.15	1.17	0.98–1.39	

+ = functional personality characteristics; - = dysfunctional personality characteristics; values of the psychological scales are z-transformed and the scales assessing dysfunctional characteristics are recoded; * = $p < .05$.

However, two motivational orientation scales (win, ego), all three volitional deficits (self-impediment, lack of initiation, loss of focus), and two dimensions of competition anxiety (somatic anxiety, concentration disruption) failed to meet the significance level ($.08 \leq p \leq .61$). For the remaining 10 of 17 personality characteristics, logistic regression analyses demonstrated significant predictive values. The metric odds ratios varied between $OR = 1.22$ and $OR = 1.41$, indicating that the probability that an individual will attain the U16 youth academy level increases by a factor between 1.22 and 1.41 per standard deviation for a given characteristic assessed in U12. The Nagelkerke R^2 indicated that each of the significant predictors explained 1% of the variance and that only the specific physical self-concept explained a marginally greater proportion of the future performance level ($R^2_N = .02$).

In terms of a pragmatic effect size of the significant predictor variables, Figure 9 displays the categorical odds ratios of players with high and medium dispositions in relation to the group of players having low dispositions. The presented categorical odds ratios are arranged in descending order of the *OR* values for comparing between high and low dispositional players. With regard to the comparison of extreme groups (high vs. low disposition), hope for success, self-optimization, and specific physical self-concept showed medium effect sizes ($2.56 \leq OR \leq 2.65$). The remaining categorical odds ratios can be interpreted as relevant, but small ($1.61 \leq OR \leq 2.45$). Regarding the categorical odds ratios of the group with medium disposition in relation to the group of players having low disposition, the odds ratios – with the exception of goal orientation – were consistently smaller than in the comparison of extreme groups. Nevertheless, hope for success, self-optimization, specific physical self-concept, competition orientation, goal orientation, and task orientation showed small, yet still relevant effect sizes ($1.80 \leq OR \leq 2.44$).

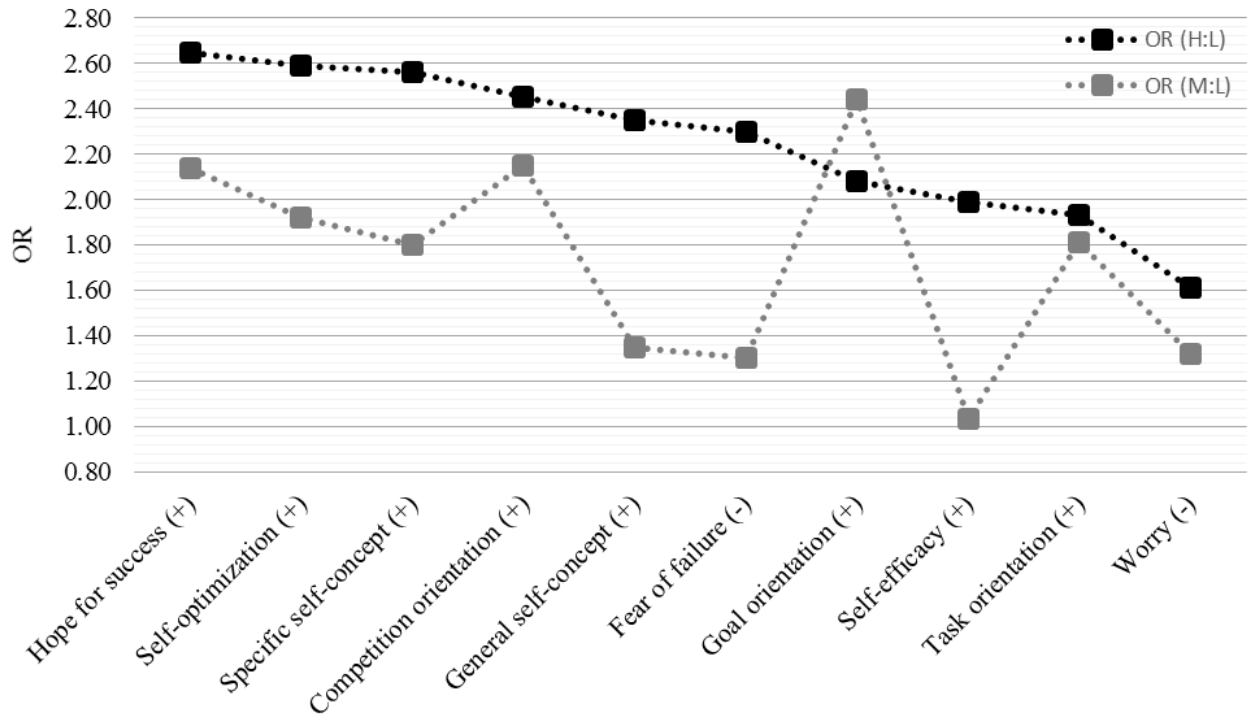

Figure 9. Categorical odds ratios of players with high and medium dispositions in relation to players with low dispositions in the significant predictor variables. OR = odds ratios; OR (H:L) = OR (high vs. low disposition), OR (M:L) = OR (medium vs. low disposition); + = functional personality characteristics; - = dysfunctional personality characteristics; values of the psychological scales are z-transformed and the scales assessing dysfunctional characteristics are recoded.

Discussion

As an extension of previous research regarding the relevance of potential psychological talent predictors for success in youth soccer, the present study enabled comparisons between a wide range of personality characteristics. Furthermore, this study defined success in various ways. Current performance was considered in terms of U12 players' objectively assessed motor skills and their subjectively rated overall capacity. The future performance level was assessed by examining whether these players were selected for a higher performance level in U16.

First, *cross-sectional analyses* provided empirical information on the relationship of psychological personality characteristics with current performance. However, due to the cross-sectional design, it remains unclear whether the effects are caused by socialization or selection processes (e.g.,

Eysenck, Nias, & Cox, 1982). With respect to the associations between the U12 players' personality characteristics and their motor performance (*Objective 1a*), this study revealed that most of the correlations were small in magnitude, indicating that personality and motor skills can be regarded as empirically unrelated talent domains. This finding is important when characteristics from both domains are included in multidimensional research designs to examine their combined prognostic value for success in soccer (cf. multicollinearity in multivariate statistical analyses). An exception to this pattern of results was self-referential cognition, which demonstrated considerably higher associations with motor skills. Regarding the current overall performance (*Objective 1b*), 10 of 17 personality characteristics demonstrated significant relationships with the coaches' subjective ratings. The psychological scales were systematically associated with this performance criterion in the expected direction, which indicates that players who were rated as "highly promotion-worthy" showed more positive connoted values compared to the other players. However, the analyses identified consistently minor differences between the various groups. Only the subjective ratings' relationship with the volitional deficit lack of initiation and the two physical self-concept components tended to be higher.

Furthermore, *prospective analyses* revealed that multiple U12 players' personality characteristics explained a significant proportion of the players' performance level four years later in U16 (*Objective 2*). As expected for talent studies with preselected groups of players (Ackerman, 2014), Nagelkerke R^2 suggests only minor effect sizes. Nevertheless, the present results imply that psychological diagnostics may provide prognostic information about talented soccer players, which goes beyond motor performance tests, because most of the personality characteristics were empirically unrelated to motor skills. Additionally, the categorical odds ratios demonstrated the practical relevance of the prospective results, indicating that the personality characteristics discriminated between players with low, medium, and high dispositions at various levels (i.e., the characteristics' prognostic value varies within the scale range). In regard to the characteristics hope for success, self-optimization, and specific physical self-concept, the underlying scales differentiate between all three categories. Players

with high dispositions in these particular characteristics were more likely to attain the youth academy level compared to the other two groups. However, the relative chance of players with medium dispositions to achieve the higher performance level was still considerably higher than those of players with low dispositions. Similarly, the findings regarding the remaining characteristics provide relevant information on which values are preferable. For some of these characteristics, it is beneficial to belong to the group with high values (fear of failure, general physical self-concept, self-efficacy, and worry), and for other characteristics, it is particularly unfavorable to be in the group with low dispositions (competition, goal, and task orientation).

Overall, the study supports the theoretical assumption that *talent in soccer is multidimensional in nature*. Currently, it has been well accepted that characteristics from multiple talent domains (i.e., physical, physiological, sociological, and psychological factors) are required for success in soccer (Williams & Reilly, 2000). As an extension to this perspective, the present research emphasized the need to consider various facets within the individual talent domains. Particularly, this study demonstrated that a wide range of personality characteristics is associated with current and future success. Furthermore, even the individual personality facets themselves can be regarded as multidimensional. This insight supports the findings of Kämpfe et al. (2014), who showed that the conceptualization of elite athletes' achievement motivation refers to various dimensions focusing on success and failure (hope for success, fear of failure) as well as on individual (task orientation) and social (ego orientation) reference norms.

Based on a *multifaceted approach* within the psychological talent domain, the present study examined personality characteristics assigned to the areas of motivation, volition, self-referential cognition, and emotion. Some of the characteristics were associated with both current performance and future performance levels (i.e., fear of failure, competition and goal orientation, self-optimization, general and specific physical self-concept, self-efficacy, and worry), whereas other characteristics demonstrated either relationships with the current overall performance (i.e., lack of initiation, loss of

focus) or future success (i.e., hope for success, task orientation). By analyzing various characteristics from different personality facets within the same design, this study provided comparative information on the relevance of each characteristic and the underlying psychological scale with regard to success in soccer.

Within the *motivational characteristics*, both components of the achievement motive assessed by the AMS-S were associated with future performance level, in which particularly hope for success was identified as prognostically relevant. In this characteristic, U12 players with high dispositions had a 2.65 times greater chance of becoming youth academy players in relation to individuals with low dispositions (compared to fear of failure: *OR* = 2.30). These results are consistent with those of Zuber and Conzelmann (2014), whose one-year-prospective study revealed a higher prognostic relevance of hope for success compared to fear of failure.

The two goal orientations (i.e., task and ego orientation) assessed via the TEOSQ showed no associations with current performance. However, task orientation was a significant predictor of future success, even though the pragmatic effect sizes of this scale were small compared to the other scales. Previous empirical research showed inconsistent findings, which revealed that sometimes ego orientation (e.g., Coelho e Silva et al., 2010) and another time task orientation (e.g., Kavussanu et al., 2011) was associated with current soccer success. In contrast to the results of the present study, Figueiredo et al. (2009) and Huijgen et al. (2014) did not find significant relationships between task orientation and future performance level. However, these studies used multivariate analysis techniques to examine the combined prognostic value of characteristics from various talent domains, which made the individual findings difficult to compare.

In comparison to the TEOSQ assessing task and ego orientation, the SOQ seems to be more appropriate for assessing motivational orientations in the context of sport talent research. Competition and goal orientation of the SOQ demonstrated relevant associations with current and future perfor-

mance. With regard to the latter, these two scales were characterized by the highest odds ratios between players with medium dispositions and those with low dispositions. Similarly, Zuber et al. (2015) demonstrated associations between achievement orientations (here: win and goal orientation) and prospective performance level. As a consequence, further studies examining motivational orientations in sport talent research might prefer the SOQ over the TEOSQ because both questionnaires have the same theoretical foundation (Skordilis et al., 2001).

Furthermore, the present study provided empirical information on the relevance of *volitional characteristics*. With regard to their prognostic value, self-optimization was more important than all three volitional deficits. This variable was the only prognostically significant VCS scale with relevant pragmatic odds ratios. Concerning the characteristics' relationship with current performance, self-optimization, lack of initiation and loss of focus were associated with coaches' subjective ratings. These findings suggest that coaches categorize players as "highly promotion-worthy" who possess self-regulatory strategies to initiate and execute actions in soccer (i.e., minor values in lack of initiation). This evidence is consistent with a qualitative study by Christensen (2009), which revealed that coaches of national youth soccer teams emphasized the relevance of individuals' psychological qualities (especially volitional components) to discriminate between players of various performance levels. Because players with high values in lack of initiation tend to avoid demanding and difficult actions, this result also corresponds with previous research by Toering et al. (2009), which demonstrated a positive relationship between effort and talented soccer players' current performance level.

The present findings further revealed the relevance of the *self-referential cognitions* physical self-concept and self-efficacy using PSC and SES as the underlying psychological scales. General as well as specific physical self-concept showed the highest associations with current performance in comparison to all of the other characteristics. Particularly, the medium-sized correlation between the motor score and the specific physical self-concept can be explained by the scale's direct reference to motor performance. This finding implies that the self-reported speed abilities and technical skills

represent – to some extent – the players' actual results in the motor diagnostics. Furthermore, high dispositions in the specific and general physical self-concept lead to a greater chance for future success compared to low dispositions. These findings partly differ from previous results in sport talent research. For example, Spamer and Coetzee (2002) did not reveal any significant associations between self-confidence and soccer players' current performance level. Additionally, for example, the study by Huijgen et al. (2014) did not find self-confidence to be a significant predictor of future success. As mentioned previously, the diverging findings may be explained by differences between the individual studies concerning their specific features (e.g., sample sizes and selected psychological scales).

With regard to *emotional characteristics*, the various dimensions of competition anxiety assessed via the CAI-T revealed small associations with success in soccer. Only the cognitive component worry was significantly related to current overall performance and future performance levels. However, the effect sizes were consistently small, and with regard to the characteristic's prognostic value, the pragmatic odds ratio was the lowest in the comparison of extreme groups (high vs. low disposition). In contrast to these results, previous cross-sectional studies (Reilly et al., 2000; Spamer & Coetzee, 2002) did not find any significant association between cognitive anxiety and soccer performance. Overall, these empirical findings suggest that players' tendency to respond with fear in competitive situations seems to not be an appropriate predictor of soccer performance.

Implications for future research

Regarding the interpretation of the results, several limitations of the present study need to be addressed, and – building on this – implications for future research are proposed. First, the *selection of potential psychological predictors* was not based on a theoretical model that considers multifaceted personality characteristics and their relations to performance. Although there are psychological theories concerning the individual facets (e.g., Elliot & Church, 1997; Kuhl, 2000), no such model seems to exist in the current literature. Sport talent research usually refers to heuristic models (e.g., Gagné,

2010; Heller & Perleth, 2008) addressing potential predictors from various talent domains. However, these models usually lack empirically testable hypotheses of the associations between the individual characteristics and particular performance areas. A future research challenge may be the formation of such empirically testable theories. In this regard, the present findings may underpin the development of specific hypotheses with regard to the role of personality characteristics.

Second, the present study adopted a sport psychological perspective and therefore exclusively considered personality characteristics. In the future, it will be necessary to extend the range of examined characteristics (e.g., motor skills) due to the *multidimensional conceptualization of talent* (Williams & Reilly, 2000). A combined analysis of multidimensional characteristics using multivariate analysis techniques may provide further information about the individual characteristics' relationship with success in soccer. For example, the relevance of the self-referential cognitions found in the present study may be mainly caused by players' actual superior motor performance so that the physical self-concept in combination with motor skills would explain a smaller proportion of soccer performance.

Third, the present study used one measurement point in early adolescence to assess individual personality characteristics. However, based on the *dynamic nature of talent* (Abbott & Collins, 2004), performance and its underlying characteristics develop over time. For example, Feichtinger and Höner (2015) demonstrated that personality characteristics' associations in talented soccer players did not stay invariant across the U12 to U14 age classes. Furthermore, not only the associations between the individual characteristics may vary over time but such characteristics' relationship with success in soccer may change as well (Reilly et al., 2000). Therefore, further research needs to examine the relevance of personality characteristics in middle or late adolescence, because the discriminative power of talent predictors may vary depending on the developmental stage at which the characteristics are assessed.

Finally, the current study provided further insight into the personality characteristics' prognostic value over a mid-term *prediction period* of four years. Such an interval could be regarded as relatively long compared to most of the previous research. Moreover, from a practical perspective, the selection process from the DFB competence centers in the professional clubs' youth academies represents an important period of transition in the context of German youth development. However, prospective studies need to analyze the prognostic value of personality characteristics for adult success over long-term periods. Except for a few studies (e.g., Van Yperen, 2009), such work is lacking in psychological research on talented athletes.

Conclusions for talent identification and development

The present study provided empirical evidence for the relationship of talented soccer players' personality characteristics in early adolescence with success in soccer. However, each characteristic explained only a small proportion of the performance criteria. Therefore, psychological diagnostics of personality characteristics should not be used for the purpose of *talent identification* considering the current state of research (Morris, 2000; Unnithan et al., 2012). Nevertheless, such diagnostics provide important information for applied sport psychological work supporting the *talent development* process. As the present study emphasized the relevance of personality characteristics for success in soccer, self-report questionnaires were able to be used to identify players' strengths and weaknesses. Accordingly, coaches and sport psychologists should help talented players develop adequate levels in these particular characteristics, for example, by using motivational climate interventions (e.g., Smoll, Smith, & Cumming, 2007). In this respect, research needs to evaluate the extent to which such interventions affect psychological personality characteristics in talented soccer players.

IV Discussion

General findings from a stepwise procedure

The primary aim of the present dissertation was to systematically analyze the relevance of psychological personality characteristics in talented soccer players. In accordance with previous research in sport science and psychology, this dissertation used a stepwise procedure to examine the prognostic values of the potential predictors for success in soccer. Against the backdrop of a multidimensional, domain-specific, dynamic, and prospective understanding of talent, this procedure comprised the following four steps: (1.) selection of potentially relevant personality characteristics; (2.) validation of the scientifically sound assessment of the personality characteristics; (3.) examination of the development of personality characteristics over time; and (4.) analysis of the relationships between personality characteristics and performance criteria. Based on the results of the three empirical studies that were conducted as part of this dissertation, the general findings on the various aspects of sport talent research can be summarized.

For the purpose of selecting potentially relevant predictors of soccer talent (*Step 1*), Ulitsch et al. (2010) conducted an analysis of the literature on personality characteristics in sport psychological talent research, and these authors selected a wide range of characteristics. Subsequently, the potentially relevant talent predictors were presented to experts in science and soccer, who were tasked with evaluating the importance of these characteristics specifically for soccer performance. Based on this literature analysis and expert survey, the present dissertation selected psychological personality characteristics that were assigned to the areas of motivation (achievement motives and goal orientations), volition (volitional components), self-referential cognition (physical self-concept and self-efficacy) and emotion (competition anxiety).

Regarding the scientifically sound assessment of these characteristics (*Step 2*), this dissertation used the German versions of established sport-specific questionnaires. Although these questionnaires

have been widely applied in sport psychological practice and research, for the purpose of the present dissertation the individual scales were further modified in terms of soccer-specific and age-appropriate adaptations. Due to the domain-specific understanding of talent, these psychological diagnostics may lead to explanation of greater amounts of variance in the behaviors of youth soccer players. Regarding the implementation of these diagnostics, Study 1 demonstrated the satisfactory psychometric properties of the modified scales even in the U12 age class. A consistency analysis revealed that application of the self-report questionnaires led to the acquisition of reliable data from talented soccer players. Consideration of the various characteristics' associations, and comparisons between players at different performance levels, provided evidence for the questionnaires' construct and criterion validity. Furthermore, Study 1 revealed existent but small effects of socially desirable responding among youth soccer players. Overall, these findings indicated that even 11- and 12-years-old individuals are able to plausibly answer the various psychological scales. Despite the participants' young ages, the psychological personality characteristics could be adequately assessed with self-report questionnaires.

Considering the development over time (*Step 3*), Study 2 provided important insights into the stabilities and changes of psychological personality characteristics in the early adolescent soccer players. The comparatively low observed differential stabilities implied that, to a certain degree, the relative orderings of the individuals in these characteristics changed over time. Because this aspect of stability is regarded as an important prerequisite for predicting performance, it may be expected that these relatively low test-retest correlations limited the characteristics' predictive values for success in soccer. Furthermore, the longitudinal analyses revealed only small mean- and individual-level changes in the talented soccer players' personality characteristics. These findings indicate that the characteristics' group level changed only to a small extent and that the individual players did not differ much in terms of intra-individual changes. Therefore, no major developmental effects (e.g. effects due to the influence of puberty) seemed to occur in these personality characteristics during

early adolescence. Based on a multifaceted approach, Study 2 further provided empirical evidence concerning the complex interplay between various personality characteristics. Analysis of structural stability revealed that the individual characteristics' associations did not remain invariant over time. One consequence for sport talent research of this finding is that the associations between these characteristics vary with age, and prognostic values for success in soccer may also change.

Finally, Study 3 demonstrated the relationships of personality characteristics with success in soccer (*Step 4*). Cross-sectional analyses provided empirical information about the associations of the U12 soccer players' personality characteristics with their current performances. Whereas most of the characteristics exhibited weak relationships with motor performance, a wide range of personality characteristics showed small but relevant associations with the players' overall performance as subjectively rated by their coaches. On one hand, these findings indicate that personality and motor skills can be regarded as empirically unrelated talent domains. On the other hand, the relationship with coaches' subjective ratings demonstrated the relevance of personality characteristics to current soccer performance. Furthermore, Study 3 provided insight into the characteristics' prognostic values for future success. Prospective analyses revealed that the U12 players' personality characteristics explained significant proportions of the variance in the players' performance levels four years later in the U16 age class. Although the explained variance was small in magnitude, these findings imply that personality characteristics may provide prognostic information about talented soccer players that extends beyond motor performance because the majority of these personality facets were not associated with motor skills.

Specific findings based on a multifaceted approach

Based on a multifaceted approach within the psychological talent dimension, the present dissertation examined personality characteristics that were assigned to the areas of motivation, volition, self-referential cognition, and emotion. By analyzing various characteristics from different personal-

ity facets, this dissertation provided comparative information on each characteristic and the underlying psychological scale. Furthermore, the chosen stepwise procedure led to a more differentiated interpretation of the findings regarding the relevance of the individual characteristics to success in soccer.

Among the motivational characteristics, both of the 'classical' components of the *achievement motive* (hope for success and fear of failure) could be adequately assessed. The underlying AMS-S scales demonstrated satisfactory internal consistencies. However, of all of the characteristics considered, fear of failure exhibited the strongest association with socially desirable responding, which indicates that the players who give positively biased self-reports tended to report less failure-motivated behaviors. This finding warrants further consideration, particularly because such distortive effects have not yet been satisfactorily examined in sport psychological research. Furthermore, hope for success was positively associated with performance, and fear of failure was negatively related to success in soccer. These empirical findings are in line with previous research (for an overview, see Gabler, 2004) that revealed that the athletes with high dispositions toward hope for success demonstrated more functional behaviors (e.g., realistic goal setting, more endurance and effort, and self-serving attributions) compared with the individuals with high fear of failure values. Additionally, consistent with Zuber and Conzelmann (2014), the present findings revealed a greater prognostic relevance of hope for success compared with fear of failure. All of these relationships with soccer performance were observed despite the findings that both components of the achievement motive exhibited rather low differential stabilities. Because this aspect of stability is regarded as a prerequisite for predicting performance (Hohmann, 2009), the low test-retest correlations may have reduced the prognostic values of these characteristics.

Regarding *motivational orientations*, both of the questionnaires used in the present dissertation (the TEOSQ and SOQ) demonstrated good reliability coefficients. Cross-sectional analyses further revealed that the two goal orientations (i.e., task and ego orientation) did not exhibit any associations

with current performance. However, task orientation was a significant predictor of future success, albeit the prognostic relevance was small compared with the other characteristics. In this context, previous empirical research has revealed inconsistent results that do not permit precise conclusions about the role of goal orientations in soccer performance (e.g., Coelho e Silva et al., 2010; Kavussanu et al., 2011). Consequently, the SOQ seems to be more appropriate for the assessment of motivational orientations in the context of sport talent research. The SOQ subscales of competition and goal orientation revealed relevant associations with current and future performance. Similarly, Zuber et al. (2015) demonstrated associations of achievement orientations (here: win and goal orientation) and prospective performance level.

Furthermore, the present dissertation provided empirical information about the relevance of *volitional components*. Regarding their prognostic value, the volitional skill of self-optimization was more important than any of the three volitional deficits (i.e., self-impediment, lack of initiation, and loss of focus). Self-optimization was the only prognostically significant VCS scale with relevant predictive power. This result may be related to the finding that self-optimization consistently exhibited satisfactory differential stabilities across one- and two-year periods, whereas, for example, loss of focus revealed minimal two-year stability. Regarding the characteristics' relationships with current performance, self-optimization, lack of initiation, and loss of focus were associated with the coaches' subjective ratings. The absence of empirical evidence on the relationship between self-impediment and performance may be attributed to the underlying scale's lack of internal consistency, whereas all of the other scales demonstrated satisfactory Cronbach's alpha values. Specifically, the present analyses revealed that the coaches categorize the players who possess self-regulatory strategies to initiate and execute actions in soccer (i.e., minor values in lack of initiation values) as "highly promotion-worthy". Because players with high lack of initiation values tend to avoid demanding and difficult actions, this result corresponds with previous research by Toering et al. (2009) that demonstrated a positive relationship between effort and the current performance level of talented soccer players.

Overall, these cross-sectional findings are consistent with those of a qualitative study by Christensen (2009) that revealed that coaches of national youth soccer teams emphasize the relevance of individuals' psychological qualities (particularly volitional components) to discriminate between the players of various performance levels.

The present dissertation further demonstrated the relevance of self-referential cognition in talented soccer players. The psychological questionnaires that assessed *physical self-concept* (PSC) and *self-efficacy* (SES) revealed satisfactory internal consistencies. Furthermore, the individual characteristics exhibited relatively high one-year and moderate two-year differential stabilities compared with the other characteristics, which can be regarded as satisfying the prerequisite for predicting behavior. Regarding the relationship between self-referential cognition and performance, the cross-sectional analyses found that among all of the characteristics considered, physical self-concept and self-efficacy exhibited the strongest association with current motor skills. Additionally, general and specific physical self-concept exhibited the strongest relationships with the subjectively rated current overall performance. Regarding the characteristics' prognostic relevance, high specific and general physical self-concept values led to a greater chance for future success compared with low values. These findings differ partially from previous results in sport talent research. For example, Spamer and Coetzee (2002) did not identify any significant associations between self-confidence and soccer players' current performance levels. Additionally, a study by Huijgen et al. (2014) did not find self-confidence as a significant predictor of future success.

Regarding emotional characteristics, the trait of *competition anxiety* was adequately assessed via the CAI-T on which only the subscale of concentration disruption exhibited an insufficient Cronbach's alpha coefficient. Regarding the characteristics' relationship with success in soccer, the various anxiety dimensions revealed small associations. Only the cognitive component of worry was significantly related with current overall performance and future performance level, although the extents of these relationships were consistently small. In contrast to these results, previous studies

(Reilly et al., 2000; Spamer & Coetzee, 2002) have not found any significant association between cognitive anxiety and soccer performance. In conclusion, these empirical findings suggest that players' tendencies to respond with fear in competitive situations do not seem to be an appropriate predictor of success in soccer.

Implications for future talent research

Against the background of a stepwise procedure, the present dissertation provided new insights into the relevance of psychological personality characteristics in talented soccer players. Regarding the interpretation of these findings, several limitations of this dissertation need to be addressed, and building on this – implications for future talent research can be proposed. First, the *selection of potentially relevant personality characteristics* was not based on a theoretical model that considers multifaceted personality characteristics and their relations to performance. Although there are psychological theories concerning the individual facets (e.g., Kuhl, 2000; Spielberger, 1966), no such model seems to exist in the current literature. A future research challenge may be the formation of empirically testable theories. In this regard, the present findings may underpin the development of specific hypotheses regarding the role of personality characteristics. Furthermore, the present dissertation adopted a sport psychological perspective and therefore exclusively considered personality characteristics. In the future, it will be necessary to extend the range of examined characteristics (e.g., motor skills) due to the multidimensional conceptualization of talent (Williams & Reilly, 2000). Analyses of combinations of multidimensional characteristics may provide more precise information about the relevance of individual characteristics.

With respect to the *personality characteristics' scientifically sound assessment*, the present dissertation used soccer-specific and age-appropriate self-report questionnaires. On one hand, such specific diagnostics may prove to be more sensitive than general personality inventories in discriminating between players of different performance levels (Morris, 2000). Similarly, various sport psychological researchers have applied domain-specific approaches (e.g., Elferink-Gemser et al., 2004; Wilhelm

et al., 2013). On the other hand, the psychological personality characteristics were assessed based on self-report measures. Therefore, the present findings reflect how the self-ratings of talented soccer players' personality characteristics develop over time and relate to success in soccer. Future studies could include external ratings of the players' personality characteristics (e.g., from the coaches or sport psychologists) so that the empirical analyses will benefit from the advantages of both of the methodical approaches to approximate the true values of the characteristics.

Based on the dynamic nature of talent (Abbott & Collins, 2004), the present dissertation provided valuable information about the *development of youth soccer players' personality characteristics*. Specifically, the longitudinal analyses focused on the stabilities and changes of these characteristics in early adolescence. Therefore, based on the current state of research, it remains unclear how talented soccer players' personality characteristics develop during middle (15–17 years) and late (18–21 years) adolescence. Furthermore, in this developmental course, talented soccer players must successfully manage several key transitions. For example, within the German youth promotion system, the period between the DFB talent development program (U12–U15) and the elite promotion program (U16–U19) and the transition from youth soccer to the professional adult level have been identified as important transition phases (Höner & Feichtinger, 2011). From a sport psychological perspective, talent research should aim to identify personality characteristics that lead to successful transitions at key stages. As a prerequisite for further insights in this area, future studies need to use longitudinal designs to monitor talented soccer players as they progress through various stages across the developmental process (Holt, 2008; Huijgen et al., 2014). Because the requirements of such longitudinal research would be enormous (i.e., costs and time), a combination of cross-sectional and longitudinal methods into sequential designs should be considered (e.g., Schaie, 1965).

Regarding the *personality characteristics' relationships with soccer performance*, the present dissertation provided insight into the prognostic values of these characteristics over a mid-term prediction period of four years. This interval could be regarded as relatively long compared with most of

the previous research. However, prospective studies need to analyze the prognostic values of personality characteristics for adult success over long-term periods. With the exception of a few studies (e.g., Van Yperen, 2009), such work is lacking in psychological research on talented athletes. Furthermore, based on the multidimensional understanding of talent, future studies should examine the interplay between individual personality characteristics and the constructs from different talent dimensions. A combined analysis of multidimensional and multifaceted characteristics using multivariate analysis techniques may provide additional information about the relationships of the individual characteristics with success in soccer. However, based on the dynamic nature of talent, the discriminative power of talent predictors may vary depending on the developmental stage at which the characteristics are assessed (Reilly et al., 2000; Vaeyens et al., 2006). Therefore, further research needs to examine the relevance of personality characteristics at different stages of the youth development process. Furthermore, long-term predictions based on single assessments are regarded to be unreliable (Abbott & Collins, 2002; Vaeyens et al., 2008). In this regard, Hohmann (2004) considers the development of performance characteristics across multiple measurement points to be a better predictor of future success.

Implications for talent identification and development

Despite these limitations and the need for more sport psychological talent research, the three empirical studies that were conducted as a part of this dissertation provided an empirical basis for the application of psychological diagnostics in the context of youth promotion in soccer. Study 1 confirmed that scientifically sound assessments of the current values of personality characteristics are possible. Building on this finding, Study 2 revealed insights into the development of these characteristics over time. Finally, Study 3 provided information about the relationship of personality characteristics of talented soccer players and their current and future performances. These findings lead to implications for the talent identification and development process.

Based on the current state of research, psychological diagnostics of personality characteristics should not be used for the purpose of *talent identification* (Morris, 2000; Unnithan et al., 2012). Currently, there is no empirical basis for identifying more or less talented soccer players using self-report questionnaires. Against the background of the present dissertation, this finding can be explained by various reasons. First, compared to motor performance tests, psychological diagnostics are susceptible to socially desirable responding. Although only small effects of social desirability were found in the present analyses, such distortive influences need to be considered when self-report questionnaires are applied. Specifically, in the context of talent development programs, it seems plausible that participants are interested in achieving particularly 'good' results to be further promoted. Additionally, the longitudinal analyses in this dissertation revealed comparatively low differential stabilities of the personality characteristics, which implied that diagnostics that intend to analyze inter-individual differences in a group of players should not rely on single assessments. The present dissertation's findings suggest that repeated measures should be conducted to identify true differences between players. However, the changes in the relative orderings of the individuals in given personality characteristics, have limiting effects on the prognostic value of psychological diagnostics for the behavior of youth soccer players. Furthermore, the present dissertation revealed that individual personality characteristics explained only small proportions of the variance in soccer performance; thus, the largest portion of the inter-individual differences remained unexposed. Generally, one has to be careful in interpreting the results of individuals based on the application of single measurement instruments. Coaches and trainers should keep in mind that deficiencies in one characteristic may be compensated for by strengths in others (compensation phenomenon; Vaeyens et al., 2008).

Nevertheless, the psychological diagnostics provide important information for applied sport psychological work supporting the *talent development* process. As the present dissertation provided an empirical basis for the application of self-report questionnaires, these psychological scales can be used to identify players' strengths and weaknesses. Accordingly, coaches and sport psychologists

should help talented players to develop adequate levels in these particular characteristics, for example, by using motivational climate interventions (e.g., Smoll et al., 2007). In this respect, further research needs to evaluate the extent to which such interventions affect the psychological personality characteristics in talented soccer players. Moreover, based on this dissertation's empirical findings, the psychological diagnostics have been implemented in youth academies of German professional clubs. In the 2015/16 season, 28 clubs participated in this Internet-based survey. In contrast to the purely scientific consideration at the DFB competence centers, the youth academies also received individual feedback about their players' results on the psychological questionnaires. These results can be used to support the increasingly important sport psychological work with talented soccer players. In this manner, the present dissertation may, at least to some extent, contribute to the future success of the German youth promotion system.

References

Abbott, A., & Collins, D. (2002). A theoretical and empirical analysis of a 'state of the art' talent identification model. *High Ability Studies, 13*(2), 157-178. doi: 10.1080/1359813022000048798

Abbott, A., & Collins, D. (2004). Eliminating the dichotomy between theory and practice in talent identification and development: Considering the role of psychology. *Journal of Sports Sciences, 22*(5), 395-408.

Ackerman, P. (2014). Nonsense, common sense, and science of expert performance: Talent and individual differences. *Intelligence, 45*, 6-17. doi: 10.1016/j.intell.2013.04.009

Allemand, M., Steiger, A. E., & Hill, P. L. (2013). Stability of personality traits in adulthood: Mechanisms and implications. *GeroPsych: The Journal of Gerontopsychology and Geriatric Psychiatry, 26*(1), 5-13. doi: 10.1024/1662-9647/a000080

Allen, M. S., Greenlees, I., & Jones, M. (2013). Personality in sport: A comprehensive review. *International Review of Sport and Exercise Psychology, 6*(1), 184-208. doi: 10.1080/1750984X.2013.769614

Ardelt, M. (2000). Still stable after all these years? Personality stability theory revisited. *Social Psychology Quarterly, 63*(4), 392-405.

Atkinson, J. W. (1957). Motivational determinants of risk-taking behavior. *Psychological Review, 64*(6, Pt.1), 359-372. doi: 10.1037/h0043445

Backhaus, K., Erichson, B., Plinke, W., & Weiber, R. (2011). *Multivariate Analysemethoden [Multivariate methods of analysis]*. Berlin: Springer.

Badenhorst, E. (1998). *'n Keuringsmodel vir talentidentifisering by 16-jarige sokkerspelers [A selection model for talent identification in 16-year-old soccer players]*. (Dissertation), University of Potchefstroom, Potchefstroom, South Africa.

Bakeman, R. (2005). Recommended effect size statistics for repeated measures designs. *Behavior Research Methods, 37*(3), 379-384. doi: 10.3758/BF03192707

Baker, J., & Horton, S. (2004). A review of primary and secondary influences on sport expertise. *High Ability Studies, 15*(2), 211-228. doi: 10.1080/1359813042000314781

Baltes, P. B., Lindenberger, U., & Staudinger, U. M. (2006). Lifespan theory in developmental psychology. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology* (pp. 569-664). Hoboken, NJ: Wiley.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ, US: Prentice-Hall, Inc.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY, US: W H Freeman/Times Books/ Henry Holt & Co.

Bandura, A. (2006). Guide for constructing self-efficacy scales. In F. Pajares & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (Vol. 5, pp. 307-337). Greenwich, CT: Information Age Publishing.

Baumeister, R. F. (1999). Self-concept, self-esteem, and identity. In V. J. Derlega, B. A. Winstead, W. H. Jones, V. J. Derlega, B. A. Winstead & W. H. Jones (Eds.), *Personality: Contemporary theory and research (2nd ed.).* (pp. 339-375). Chicago, IL, US: Nelson-Hall Publishers.

Beckmann, J., Elbe, A.-M., & Seidel, I. (2008). Talent und Talententwicklung [Talent and talent development]. In J. Beckmann & M. Kellmann (Eds.), *Anwendungen der Sportpsychologie* (pp. 257-309). Göttingen: Hogrefe.

Beckmann, J., Fröhlich, S. M., & Elbe, A.-M. (2009). Motivation und Volition [Motivation and volition]. In W. Schlicht & B. Strauß (Eds.), *Grundlagen der Sportpsychologie* (pp. 511-562). Göttingen: Hogrefe.

Beckmann, J., & Kellmann, M. (2008). Sportpsychologische Praxis: Von der Diagnostik zu Training und Intervention [Sport psychology practice: From diagnosis to training and intervention]. In J. Beckmann & M. Kellmann (Eds.), *Anwendungen der Sportpsychologie* (pp. 1-39). Göttingen: Hogrefe.

Beckmann, J., & Wenhold, F. (2009). *Handlungsorientierung im Sport (HOSP), Manual. [Action orientation in sport, Manual]*. Köln: Sport und Buch Strauß.

Bloom, B. S. (Ed.). (1985). *Developing talent in young people*. New York: Ballantine Book.

Booth-Kewley, S., Edwards, J. E., & Rosenfeld, P. (1992). Impression management, social desirability, and computer administration of attitude questionnaires: Does the computer make a difference? *Journal of Applied Psychology, 77*(4), 562-566. doi: 10.1037/0021-9010.77.4.562

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). Converting among effect sizes. In M. Borenstein, L. V. Hedges, J. P. T. Higgins & H. R. Rothstein (Eds.), *Introduction to metaanalysis* (pp. 45-49). Chichester, UK: John Wiley & Sons, Ltd.

Bortz, J., & Döring, N. (2006). *Forschungsmethoden und Evaluation für Human- und Sozialwissenschaftler [Research methods and evaluation for social scientists]*. Heidelberg: Springer-Medizin-Verl.

Brand, R., Ehrlenspiel, F., & Graf, K. (2009). *Das Wettkampf-Angst-Inventar (WAI) [Competition Anxiety Inventory (CAI)]*. Köln: Sportverlag Strauss.

Cattell, R. B. (1966). *The scientific analysis of personality* (2. ed.). Chicago: Aldine Pr.

Cervelló, E., Escartí, A., & Guzmán, J. (2007). Youth sport dropout from the achievement goal theory. *Psicothema, 19*(1), 65-71.

Christensen, M. K. (2009). 'An eye for talent': Talent identification and the 'practical sense' of top-level soccer coaches. *Sociology of Sport Journal, 26*(3), 365-382.

Cobley, S., Schorer, J., & Baker, J. (2012). Identification and development of sport talent: A brief introduction to a growing field of research and practice. In J. Baker, S. Cobley & J. Schorer (Eds.), *Talent Identification and Development in Sport - International Perspectives* (pp. 1-10). London: Routledge Chapman & Hall.

Coelho e Silva, M., Figueiredo, A., Simôes, F., Seabra, A., Natal, A., Vaeyens, R., . . . Malina, R. (2010). Discrimination of U-14 soccer players by level and position. *International Journal of Sports Medicine, 31*(11), 790-796. doi: 10.1055/s-0030-1263139

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155-159. doi: 10.1037/0033-2909.112.1.155

Conzelmann, A. (2009). Differentielle Sportpsychologie - Sport und Persönlichkeit [Differential sport psychology - Sport and personality]. In W. Schlicht & B. Strauß (Eds.), *Grundlagen der Sportpsychologie* (pp. 375-439). Göttingen: Hogrefe.

Conzelmann, A., Hänsel, F., & Höner, O. (2013). Individuum und Handeln - Sportpsychologie [Individual and action - Sport psychology]. In A. Güllich & M. Krüger (Eds.), *Sport: Das Lehrbuch für das Sportstudium* (1 ed., pp. 270-335). Berlin Heidelberg: Springer Spektrum.

Cox, R. H. (2002). *Sport psychology: Concepts and applications* (5 ed.). New York: McGraw-Hill.

Daniel, J. (2014). *The DFB talent development concept.* Paper presented at the UEFA Study Group Scheme, Season 2013/14, Nürnberg, Germany.

De Fruyt, F., Bartels, M., Van Leeuwen, K. G., De Clercq, B., Decuyper, M., & Mervielde, I. (2006). Five types of personality continuity in childhood and adolescence. *Journal of Personality and Social Psychology, 91*(3), 538-552. doi: 10.1037/0022-3514.91.3.538

Duda, J. L. (1992). Motivation in sport settings: A goal perspective approach. In C. G. Roberts (Ed.), *Motivation in Sport and Exercise* (pp. 57-91). Champaign, IL: Human Kinetics.

Durand-Bush, N., & Salmela, J. H. (2001). The development of talent in sport. In R. N. Singer, H. A. Hausenblas & C. Janelle (Eds.), *Handbook of Sport Psychology* (2nd ed., pp. 269-289). New York: John Wiley.

Elbe, A.-M., Beckmann, J., & Szymanski, B. (2003). Entwicklung der allgemeinen und sportspezifischen Leistungsmotivation von Sportschüler/-innen. [Development of the general and sport-specific achievement motivation in young elite athletes]. *Psychologie und Sport, 10*(4), 134-143.

Elbe, A.-M., Szymanski, B., & Beckmann, J. (2005). The development of volition in young elite athletes. *Psychology of Sport and Exercise, 6*(5), 559-569. doi: 10.1016/j.psychsport.2004.07.004

Elbe, A.-M., Wenhold, F., & Beckmann, J. (2009). *Leistungsorientierung im Sport (SOQ) [Achievement orientation in sport (SOQ)]*. Köln: Sportverlag Strauss.

Elbe, A.-M., Wenhold, F., & Müller, D. (2005). Zur Reliabilität und Validität der Achievement Motives Scale-Sport: Ein Instrument zur Bestimmung des sportspezifischen Leistungsmotivs. [Reliability and validity of the Achievement Motives Scale-Sport: An instrument for the measurement of sport-specific achievement motivation]. *Zeitschrift für Sportpsychologie, 12*(2), 57-68. doi: 10.1026/1612-5010.12.2.57

Elferink-Gemser, M. T., Visscher, C., Richart, H., & Lemmink, K. A. P. M. (2004). Development of the Tactical Skills Inventory For Sports. *Perceptual and Motor Skills, 99*(3,Part1), 883-895. doi: 10.2466/PMS.99.7.883-895

Elliot, A. J., & Church, M. A. (1997). A hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology, 72*(1), 218-232. doi: 10.1037/0022-3514.72.1.218

Eysenck, H. J., & Eysenck, S. B. G. (1975). *Manual of the Eysenck Personality Questionnaire*. Kent: Hodder & Stoughton.

Eysenck, H. J., Nias, D. K. B., & Cox, D. N. (1982). Sport and personality. *Advances in Behaviour Research and Therapy, 4*(1), 1-56. doi: 10.1016/0146-6402(82)90004-2

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191.

Feichtinger, P., & Höner, O. (2014). Psychological diagnostics in the talent development program of the German Football Association: Psychometric properties of an Internet-based test battery. *Sportwissenschaft [German Journal of Sport Sciences], 44*(4), 203-213. doi: 10.1007/s12662-014-0341-0

Feichtinger, P., & Höner, O. (2015). Talented football players' development of achievement motives, volitional components, and self-referential cognitions: A longitudinal study. *European Journal of Sport Science,* Advance online publication. doi: 10.1080/17461391.2015.1051134

Figueiredo, A. J., Gonçalves, C. E., Coelho e Silva, M. J., & Malina, R. M. (2009). Characteristics of youth soccer players who drop out, persist or move up. *Journal of Sports Sciences, 27*(9), 883-891. doi: 10.1080/02640410902946469

Fisher, R. (2008). Education and talent identification and development in sport. In R. Fisher & R. Bailey (Eds.), *Talent identification and development - The search for sporting excellence* (pp. 123-140). Berlin: ICSSPE.

Frintrup, A., & Schuler, H. (2007). *Sportbezogener Leistungsmotivationstest - Manual [Sports-related Achievement Motivation Test - Manual]*. Göttingen: Hogrefe.

Fuchs, R., & Schwarzer, R. (1994). Selbstwirksamkeit zur sportlichen Aktivität: Reliabilität und Validität eines neuen Meßinstruments. [Self-efficacy toward physical exercise: Reliability and validity of a new instrument]. *Zeitschrift für Differentielle und Diagnostische Psychologie, 15*(3), 141-154.

Gabler, H. (2004). Motivationale Aspekte sportlicher Handlungen [Motivational aspects of sportive actions]. In H. Gabler, J. R. Nitsch, R. Singer & J. Munzert (Eds.), *Einführung in die Sportpsychologie : Teil 1: Grundthemen* (pp. 197-245). Schorndorf: Hofmann.

Gabler, H., & Ruoff, B. A. (1979). Zum Problem der Talentbestimmung im Sport: Rahmentheoretische Vorüberlegungen. [On the problem of identifying athletic talent]. *Sportwissenschaft, 9*(2), 164-180.

Gagné, F. (2000). Understanding the complex choreography of talent development through DMGT-based analysis. In K. A. Heller, F. J. Mönks, R. J. Sternberg & R. F. Subotnik (Eds.), *International Handbook of Giftedness and Talent* (2 ed., pp. 67-79). Oxford: Pergamon Press.

Gagné, F. (2010). Motivation within the DMGT 2.0 framework. *High Ability Studies, 21*(2), 81-99. doi: 10.1080/13598139.2010.525341

Gerber, M. (2011). Mentale Toughness im Sport [Mental toughness in sport]. *Sportwissenschaft, 41*(4), 283-299. doi: 10.1007/s12662-011-0202-z

Gerlach, E. (2004). Selbstwirksamkeitserwartung im Fußball. Entwicklung eines neuen Messinstruments [Self-efficacy in soccer. Development of a new measuring instrument]. In R. Naul (Ed.), *Nachwuchsförderung im Fußballsport - Neue Wege in Deutschland und Europa* (pp. 212-227). Aachen: Meyer & Meyer.

Gill, D. L., & Deeter, T. E. (1988). Development of the Sport Orientation Questionnaire. *Research Quarterly for Exercise and Sport, 59*, 191-202.

Gjesme, T., & Nygard, R. (1970). *Achievement-related motives: Theoretical considerations and construction of a measuring instrument*. Unpublished Manuscript. University of Oslo.

Gould, D., Dieffenbach, K., & Moffett, A. (2002). Psychological characteristics and their development in Olympic champions. *Journal of Applied Sport Psychology, 14*(3), 172-204. doi: 10.1080/10413200290103482

Heller, K. A., & Perleth, C. (2008). The Munich high ability test battery (MHBT): A multidimensional, multimethod approach. *Psychology Science Quarterly, 50*(2), 173-188.

Hohmann, A. (2004). Scientific aspects of talent development. In H. Ziemainz, A. Rütten & U. Röger (Eds.), *Talent Identification, selection and development. Problems and perspectives.* (pp. 5-28). Butzbach: Afra.

Hohmann, A. (2009). *Entwicklung sportlicher Talente an sportbetonten Schulen: Schwimmen, Leichtathletik, Handball [Development of sports talents at elite sport schools: Swimming, track and field, handball]*. Petersberg: Imhof.

Holt, N. L. (2008). Psychological perspectives on talent identification and development in sport. In R. Fisher & R. Baileys (Eds.), *Talent identification and development - The search for sporting excellence. The multidisciplinary series of physical education and sport science* (Vol. 9, pp. 33-47). London: International Council of Sport ans Physical Education.

Höner, O. (2005). *Entscheidungshandeln im Sportspiel Fußball: Eine Analyse im Lichte der Rubikontheorie [Decision making in the sport game soccer: An analysis in the light of the Rubicon theory]*. Schorndorf: Hofmann.

Höner, O. (2012). Entscheidungshandeln im Fußball: Eine sportpsychologische Betrachtung [Decision making in soccer: A sport psychological consideration]. In BDFL (Ed.), *Neue Trends bei der Euro 2012: Entscheidungskompetenz in Abwehr und Angriff (Internationaler Trainer-Kongress 2012)* (pp. 16-23). Wiesbaden: Dinges & Frick.

Höner, O., & Feichtinger, P. (2011). *Übergangsproblematik im deutschen Fußball. Endbericht zur Pilotstudie: Deskriptive Analyse des Übergangs vom Junioren- in den Senioren- bzw. Profibereich [The transition issue in German soccer. Final report on the pilot study: Descriptive analysis of the transition from junior to senior and professional level]*. Unveröffentlichter Projektbericht, Deutscher Fußball-Bund (DFB).

Höner, O., Schultz, F., Schreiner, R., & Votteler, A. (in press). Prognostic validity of motor diagnostics in the German talent identification and development program. In T. Favero, B.

Drust & B. Dawson (Eds.), *International Research in Science and Soccer II* (pp. 267-276). London: Routledge.

Höner, O., Votteler, A., Schmid, M., Schultz, F., & Roth, K. (2015). Psychometric properties of the motor diagnostics in the German football talent identification and development programme. *Journal of Sports Sciences, 33*(2), 145-159. doi: 10.1080/02640414.2014.928416

Höner, O., & Willimczik, K. (1998). Mit dem Rubikon-Modell über das Handlungsloch: Zum Erklärungswert motivationaler und volitionaler Modellvorstellungen für sportliche Handlungen. [The relevance of the Rubicon model for the explanation of sport actions]. *Psychologie und Sport, 5*(2), 56-68.

Hosmer, D., Lemeshow, S., & Sturdivant, R. (2013). *Applied logistic regression* (3. ed.). New York, NY: John Wiley & Sons.

Huijgen, B. C. H., Elferink-Gemser, M. T., Lemmink, K. A. P. M., & Visscher, C. (2014). Multidimensional performance characteristics in selected and deselected talented soccer players. *European Journal of Sport Science, 14*(1), 2-10.

Jacobson, N. S., & Truax, P. (1991). Clinical significance: A statistical approach to defining meaningful change in psychotherapy research. *Journal of Consulting and Clinical Psychology, 59*(1), 12-19. doi: 10.1037/0022-006X.59.1.12

Joch, W. (2001). *Das sportliche Talent: Talenterkennung, Talentförderung, Talentperspektiven [Athletic talent: Talent detection, talent promotion, talent perspectives]* (4. ed.). Aachen: Meyer & Meyer.

Kämpfe, A., Höner, O., & Willimczik, K. (2014). Multiplicity and development of achievement motivation: A comparative study between German elite athletes with and without a disability. *European Journal of Adapted Physical Activity, 7*(1), 32-48.

Kavussanu, M., White, S. A., Jowett, S., & England, S. (2011). Elite and non-elite male footballers differ in goal orientation and perceptions of parental climate. *International Journal of Sport and Exercise Psychology, 9*(3), 284-290.

Kuhl, J. (1983). *Motivation, Konflikt und Handlungskontrolle [Motivation, conflict, and action control]*. Berlin: Springer.

Kuhl, J. (2000). A functional-design approach to motivation and self-regulation: The dynamics of personality systems interactions. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 111-169). San Diego: Academic Press.

Kuhl, J. (2001). *Motivation und Persönlichkeit: Interaktion psychischer Systeme [Motivation and personality: Interaction of mental systems]*. Göttingen: Hogrefe.

Kuhl, J. (2006). Individuelle Unterschiede in der Selbststeuerung [Individual differences in self-regulation]. In J. Heckhausen & H. Heckhausen (Eds.), *Motivation und Handeln* (pp. 303-324). Berlin: Springer.

Kuhl, J., & Fuhrmann, A. (1998). Decomposing self-regulation and self-control: The Volitional Components Inventory. In J. Heckhausen & C. Dweck (Eds.), *Lifespan perpectives on motivation and control* (pp. 15-99). Hillsdale, NJ: Erlbaum.

Macnamara, A., & Collins, D. (2013). Do mental skills make champions? Examining the discriminant function of the psychological characteristics of developing excellence questionnaire. *Journal of Sports Sciences, 31*(7), 736-744. doi: 10.1080/02640414.2012.747692

Mann, D. T. Y., Williams, A. M., Ward, P., & Janelle, C. M. (2007). Perceptual-cognitive expertise in sport: A meta-analysis. *Journal of Sport & Exercise Psychology, 29*(4), 457-478.

Marsh, H. W., & Redmayne, R. S. (1994). A multidimensional physical self-concept and its relations to multiple components of physical fitness. *Journal of Sport & Exercise Psychology, 16*(1), 43-55.

Martens, R., Burton, D., Vealey, R. S., Bump, L. A., & Smith, D. E. (1990). Development and validation of the Competitive State Anxiety Inventory. In R. Martens, R. S. Vealey & D. Burton (Eds.), *Competitive anxiety in sport* (pp. 117-190). Champaign, IL: Human Kinetics.

Martens, R., Vealey, R. S., & Burton, D. (1990). *Competitive anxiety in sport*. Champaign, IL: Human Kinetics.

Martin, B. A., Bowen, C. C., & Hunt, S. T. (2002). How effective are people at faking on personality questionnaires? *Personality and Individual Differences, 32*(2), 247-256. doi: 10.1016/s0191-8869(01)00021-6

McCrae, R. R., & John, O. P. (1992). An introduction to the five-factor model and its applications. *Journal of Personality, 60*(2), 175-215. doi: 10.1111/j.1467-6494.1992.tb00970.x

Meyer, W.-U., Schützwohl, A., & Reisenzein, R. (2001). *Einführung in die Emotionspsychologie [Introduction to emotion psychology]*. Bern: Huber.

Mills, A., Butt, J., Maynard, I., & Harwood, C. (2012). Identifying factors perceived to influence the development of elite youth football academy players. *Journal of Sports Sciences, 30*(15), 1593-1604. doi: 10.1080/02640414.2012.710753

Mook, D. G. (1987). *Motivation: The organization of action*. New York: Norton.

Moritz, S. E., & Feltz, D. L. (2000). The relation of self-efficacy measures to sport performance: A meta-analytic review. *Research Quarterly for Exercise & Sport, 71*(3), 280.

Morris, T. (2000). Psychological characteristics and talent identification in soccer. *Journal of Sports Sciences, 18*(9), 715-726.

Musch, J., Brockhaus, R., & Bröder, A. (2002). Ein Inventar zur Erfassung von zwei Faktoren sozialer Erwünschtheit. [An inventory for the assessment of two factors of social desirability]. *Diagnostica, 48*(3), 121-129. doi: 10.1026//0012-1924.48.3.121

Nicholls, J. G. (1984). Achievement motivation: Conceptions of ability, subjective experience, task choice, and performance. *Psychological Review, 91*(3), 328-346. doi: 10.1037/0033-295X.91.3.328

Nicholls, J. G. (1989). *The competitive ethos and democratic education*. Cambridge, MA, US: Harvard University Press.

Nolting, H.-P., & Paulus, P. (1999). *Psychologie lernen: eine Einführung und Anleitung [Learning psychology: An introduction and guide]* (10th ed.). Weinheim: Beltz.

Nunnally, J. C., & Bernstein, I. H. (2010). *Psychometric theory* (3. ed.). New Delhi: Tata McGraw-Hill Ed.

Ones, D. S., & Viswesvaran, C. (1998). The effects of social desirability and faking on personality and integrity assessment for personnel selection. *Human Performance, 11*(2/3), 245.

Paulhus, D. L. (1998). *The balanced inventory of desirable responding*. Toronto/Buffalo: Multi-Health Systems.

Raglin, J. S., & Hanin, Y. L. (2000). Competitive anxiety. In Y. L. Hanin & Y. L. Hanin (Eds.), *Emotions in sport.* (pp. 93-111). Champaign, IL, US: Human Kinetics.

Rees, C. J., & Metcalfe, B. (2003). The faking of personality questionnaire results: Who's kidding whom? *Journal of Managerial Psychology, 18*(2), 156-165. doi: 10.1108/02683940310465045

Reilly, T., Williams, A. M., Nevill, A., & Franks, A. (2000). A multidisciplinary approach to talent identification in soccer. *Journal of Sports Sciences, 18*(9), 695-702. doi: 10.1080/02640410050120078

Reilly, T., Williams, A. M., & Richardson, D. (2008). Talent identification and development in football. In R. Fisher (Ed.), *Talent identification and development - the search for sporting excellence* (Vol. 9, pp. 183-199). Berlin: ICSSPE.

Rethorst, S., & Wehrmann, R. (1998). Der TEOSQ-D zur Messung der Zielorientierungen im Sport [TEOSQ-D for the measurement of goal orientation in sport]. In D. Teipel, R. Kemper & D. Heinemann (Eds.), *Sportpsychologische Diagnostik, Prognostik und Intervention.* (pp. 57-63). Köln: bps.

Risko, E. F., Quilty, L. C., & Oakman, J. M. (2006). Socially desirable responding on the web: Investigating the candor hypothesis. *Journal of Personality Assessment, 87*(3), 269-276. doi: 10.1207/s15327752jpa8703_08

Roberts, B. W. (2009). Back to the future: Personality and assessment and personality development. *Journal of Research in Personality, 43*(2), 137-145. doi: 10.1016/j.jrp.2008.12.015

Roberts, B. W., Caspi, A., & Moffitt, T. E. (2001). The kids are alright: Growth and stability in personality development from adolescence to adulthood. *Journal of Personality and Social Psychology, 81*(4), 670-683. doi: 10.1037/0022-3514.81.4.670

Roberts, B. W., Wood, D., & Caspi, A. (2008). The development of personality traits in adulthood. In O. P. John, R. W. Robins & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3. ed., pp. 375-398). New York, NY: Guilford Press.

Rudolph, U. (2009). *Motivationspsychologie kompakt [Motivation psychology compact]*. Weinheim: Beltz PVU.

Schack, T. (2012). Dynamic assessment in sport. In G. Tenenbaum, R. C. Eklund & A. Kamata (Eds.), *Measurement in sport and exercise psychology.* (pp. 91-101). Champaign, IL, US: Human Kinetics.

Schaie, K. W. (1965). A general model for the study of developmental problems. *Psychological Bulletin, 64*(2), 92-107. doi: 10.1037/h0022371

Schneider, W., Bös, K., & Rieder, H. (1993). Leistungsprognose bei jugendlichen Spitzensportlern [Performance prediction in adolescent top-level athletes]. In J. Beckmann, H. Strang & E. Hahn (Eds.), *Aufmerksamkeit und Energetisierung. Facetten von Konzentration und Leistung* (pp. 277-299). Göttingen: Hogrefe.

Schnell, R., Hill, P. B., & Esser, E. (2011). *Methoden der empirischen Sozialforschung [Methods of social research]*. München: Oldenbourg.

Schott, U. (2011). Von der Talentförderung profitieren das A-Team und die Bundesliga [Talent development provides benefits for national team and first league]. *Fußballtraining, 41*(2), 47-51.

Schumacker, R. E., & Lomax, R. G. (2010). *A beginner´s guide to structural equation modeling* (3 ed.). New York, NY: Routledge.

Seidel, I. (2005). *Nachwuchsleistungssportler an Eliteschulen des Sports: Analyse ausgewählter Persönlichkeitsmerkmale in der Leichtathletik, im Handball und im Schwimmen [Youth athletes in elite schools of sport: Analysis of selected personality characteristics in track and field, handball and swimming]*. Köln: Sport und Buch Strauß.

Shavelson, R. J., Hubner, J. J., & Stanton, G. C. (1976). Self-concept: Validation of construct interpretations. *Review of Educational Research, 46*(3), 407-441. doi: 10.2307/1170010

Singer, R. (1981). Allgemeine methodische Probleme der Talentbestimmung im Sport [General methodological problems of identifying athletic talent]. In D. Augustin & N. Müller (Eds.), *Leichtathletiktraining im Spannungsfeld von Wissenschaft und Praxis* (pp. 14-27). Niedernhausen: Schors.

Singer, R. (2000). Sport und Persönlichkeit [Sport and personality] In H. Gabler, J. R. Nitsch & R. Singer (Eds.), *Einführung in die Sportpsychologie. Teil 1 Grundthemen* (pp. 289-336). Schorndorf: Hofmann.

Skordilis, E. K., Koutsouki, D., Asonitou, K., Evans, E., Jensen, B., & Wall, K. (2001). Sport orientations and goal perspectives of wheelchair athletes. *Adapted Physical Activity Quarterly, 18*(3), 304-315.

Smith, R. E., Smoll, F. L., & Cumming, S. P. (2007). Effects of a motivational climate intervention for coaches on young athletes' sport performance anxiety. *Journal of Sport & Exercise Psychology, 29*(1), 39-59.

Smith, R. E., Smoll, F. L., & Schutz, R. W. (1990). Measurement and correlates of sport-specific cognitive and somatic trait anxiety: The Sport Anxiety Scale. *Anxiety Research, 2*(4), 263-280. doi: 10.1080/08917779008248733

Smoll, F. L., Smith, R. E., & Cumming, S. P. (2007). Effects of a motivational climate intervention for coaches on changes in young athletes' achievement goal orientations. *Journal of Clinical Sport Psychology, 1*(1), 23-46.

Spamer, E. J., & Coetzee, M. (2002). Variables which distinguish between talented and less talented participants in youth sport - a comparative study. *Kinesiology, 34*(2), 141-152.

Specht, J., Egloff, B., & Schmukle, S. C. (2011). Stability and change of personality across the life course: The impact of age and major life events on mean-level and rank-order stability of the Big Five. *Journal of Personality and Social Psychology, 101*(4), 862-882. doi: 10.1037/a0024950

Spielberger, C. D. (1966). Theory and research on anxiety. In C. D. Spielberger (Ed.), *Anxiety and behavior* (pp. 3-20). New York: Academic Press.

Stemmler, G., Hagemann, D., Amelang, M., & Bartussek, D. (2010). *Differentielle Psychologie und Persönlichkeitsforschung [Differential psychology and personality research]*. Stuttgart: Kohlhammer.

Stiller, J., Würth, S., & Alfermann, D. (2004). Die Messung des physischen Selbstkonzeptes - Zur Entwicklung der PSK-Skalen für Kinder, Jugendliche und junge Erwachsene. [Assessment of the physical self-concept (PSC) - The development of the PSC scales for children, adolescents, and young adults]. *Zeitschrift für Differentielle und Diagnostische Psychologie, 24*(4), 238-259. doi: 10.1024/0170-1789.25.4.239

Toering, T. T., Elferink-Gemser, M., Jordet, G., Peppinga, G.-J., & Visscher, C. (2012). Self-regulation of learning and performance level of elite youth soccer players. *International Journal of Sport Psychology, 43*(4), 312-325.

Toering, T. T., Elferink-Gemser, M. T., Jordet, G., & Visscher, C. (2009). Self-regulation and performance level of elite and non-elite youth soccer players. *Journal of Sports Sciences, 27*(14), 1509-1517. doi: 10.1080/02640410903369919

Traub, R. E., & Rowley, G. L. (1991). Understanding reliability. *Educational measurement: Issues and practice, 10*, 37-45.

Trautwein, U., Gerlach, E., & Lüdtke, O. (2008). Athletic classmates, physical self-concept, and free-time physical activity: A longitudinal study of frame of reference effects. *Journal of Educational Psychology, 100*(4), 988-1001. doi: 10.1037/0022-0663.100.4.988

Tuten, T., Urban, D. J., & Bosnjak, M. (2002). Internet surveys and data quality – A review. In B. Batinic, U.-D. Reips & M. Bosnjak (Eds.), *Online Social Sciences*. Seattle, WA: Hogrefe & Huber.

Ulitsch, A., Feichtinger, P., & Höner, O. (2010). Entwicklung und testtheoretische Überprüfung einer psychologischen Testbatterie zur Diagnostik von Talentmerkmalen im DFB-Talentförderprogramm. [Development and psychometric analysis of a psychological test battery as diagnostics of talent characteristics in the DFB talent development program]. In O. Höner, R. Schreiner & F. Schultz (Eds.), *Aus- und Fortbildungskonzepte im Fußball – Beiträge und Analysen zum Fußballsport XVII* (pp. 152-158). Hamburg: Czwalina.

Unnithan, V., White, J., Georgiou, A., Iga, J., & Drust, B. (2012). Talent identification in youth soccer. *Journal of Sports Sciences, 30*(15), 1719-1726. doi: 10.1080/02640414.2012.731515

Vaeyens, R., Coehlo e Silva, M., Visscher, C., Philippaerts, R. M., & Williams, A. M. (2013). Identifying young players. In A. M. Williams (Ed.), *Science and soccer: Developing elite performers* (3 ed., pp. 289-306). London: Routledge.

Vaeyens, R., Lenoir, M., Williams, A. M., & Philippaerts, R. M. (2008). Talent identification and development programmes in sport: Current models and future directions. *Sports Medicine, 38*(9), 703-714. doi: 10.2165/00007256-200838090-00001

Vaeyens, R., Malina, R. M., Janssens, M., van Renterghem, B., Bourgois, J., Vrijens, J., & Philippaerts, R. M. (2006). A multidisciplinary selection model for youth soccer: the Ghent Youth Soccer Project. *British Journal of Sports Medicine, 40*(11), 928-934. doi: 10.1136/bjsm.2006.029652

Van Yperen, N. W. (2009). Why some make it and others do not: Identifying psychological factors that predict career success in professional adult soccer. *Sport Psychologist, 23*(3), 317.

Vealey, R. S. (2002). Personality and sport behavior. In T. S. Horn & T. S. Horn (Eds.), *Advances in sport psychology (2nd ed.).* (pp. 43-74). Champaign, IL, US: Human Kinetics.

Watson, D. (2004). Stability versus change, dependability versus error: Issues in the assessment of personality over time. *Journal of Research in Personality, 38*(4), 319-350. doi: 10.1016/j.jrp.2004.03.001

Weinberg, R. S., & Gould, D. (2011). *Foundations of sport and exercise psychology* (5. ed.). Champaign: Human Kinetics.

Wenhold, F., Elbe, A.-M., & Beckmann, J. (2009a). *Fragebogen zum Leistungsmotiv im Sport (AMS-Sport) [Questionnaire assessing achievement motives in sport (AMS-Sport)]*. Köln: Sportverlag Strauss.

Wenhold, F., Elbe, A.-M., & Beckmann, J. (2009b). Testgütekriterien des Fragebogens VKS zur Erfassung volitionaler Komponenten im Sport. [Psychometric properties of the VKS for measuring volitional components in sports]. *Zeitschrift für Sportpsychologie, 16*(3), 91-103. doi: 10.1026/1612-5010.16.3.91

Wenhold, F., Elbe, A.-M., & Beckmann, J. (2009c). *Volitionale Komponenten im Sport (VKS) [Volitional Components in Sport (VCS)]*. Köln: Sportverlag Strauss.

Wilhelm, A., Büsch, D., & Pabst, J. (2013). Sportspielspezifische Wirksamkeitserwartungen im Nachwuchsleistungshandball [Sport-game specific self-efficacy beliefs in handball]. *Zeitschrift für Sportpsychologie, 20*(4), 137-149. doi: 10.1026/1612-5010/a000104

Williams, A. M., & Franks, A. (1998). Talent identification in soccer. *Sports, Exercise and Injury, 4*(4), 159-165.

Williams, A. M., & Reilly, T. (2000). Talent identification and development in soccer. *Journal of Sports Sciences, 18*(9), 657-667.

Zuber, C., & Conzelmann, A. (2014). The impact of the achievement motive on athletic performance in adolescent football players. *European Journal of Sport Science, 14*(5), 475-483. doi: 10.1080/17461391.2013.837513

Zuber, C., Zibung, M., & Conzelmann, A. (2015). Motivational patterns as an instrument for predicting success in promising young football players. *Journal of Sports Sciences, 33*(2), 160-168. doi: 10.1080/02640414.2014.928827

Reference list of project presentations (in chronological order)

Ulitsch, A., Feichtinger, P. & Höner, O. (2010). Entwicklung und testtheoretische Überprüfung einer psychologischen Testbatterie zur Diagnostik von Talentmerkmalen im DFB-Talentförderprogramm [Development and psychometric analysis of a psychological test battery as diagnostics of talent characteristics in the DFB talent development program]. In O. Höner, R. Schreiner & F. Schultz (Hrsg.), *Aus- und Fortbildungskonzepte im Fußball – Beiträge und Analysen zum Fußballsport XVII* (S. 152-158). Hamburg: Czwalina.

Feichtinger, P., Ulitsch, A. & Höner, O. (2012). Psychologische Diagnostik im DFB-Talentförderprogramm: Evaluation der Implementierung einer Online-Testbatterie [Psychological diagnostics in the DFB talent development program: Evaluation of the

implementation of an Internet-based test battery]. In C. T. Jansen, C. Baumgart, M. W. Hoppe & J. Freiwald (Hrsg.), *Trainingswissenschaftliche, geschlechtsspezifische und medizinische Aspekte des Hochleistungsfußballs – Beiträge und Analysen zum Fußballsport XVIII* (S. 201-207). Hamburg: Czwalina.

Feichtinger, P. & Höner, O. (2012). Psychologische Diagnostik im DFB-Talentförderprogramm: Differentiell-Persönlichkeitspsychologische Aspekte [Psychological diagnostics in the DFB talent development program: Aspects of personality and differential psychology]. In M. Wegner, J.-P. Brückner & S. Kratzenstein (Hrsg.), *Sportpsychologische Kompetenz und Verantwortung* (S. 68). Hamburg: Czwalina.

Feichtinger, P. & Höner, O. (2012). Psychological assessment in the talent development program of the German Football Association (DFB): Aspects of personality and differential psychology. *Abstract Book of the 4th Biennial Conference on the Economics and Psychology of Football* (p. 14). Heidelberg, Germany.

Feichtinger, P., & Höner, O. (2013). Stabilität und Veränderung psychologischer Persönlichkeitsmerkmale bei Nachwuchsleistungsfußballern [Stability and change of psychological personality characteristics in youth soccer players]. In F. Mees, M. Gruber & A. Woll (Hrsg.), *Sportwissenschaft grenzenlos?!* (S. 251). Hamburg: Czwalina.

Feichtinger, P., & Höner, O. (2014). Stability and change of personality characteristics in youth soccer. *Journal of Sport & Exercise Psychology, 36, S87*. Paper presented at the 2014 Conference of the North American Society for the Psychology of Sport and Physical Activity (NASPSPA), Minneapolis, Minnesota, USA.

Feichtinger, P. (2014). Zusammenhänge psychologischer Persönlichkeitsmerkmale mit objektiv erfassten und subjektiv eingeschätzten Leistungskriterien im Nachwuchsfußball [Relationships of psychological personality characteristics with objective assessed and subjectively rated performance criteria in youth soccer]. In M. Lames, O. Kolbinger, M. Siegle & D. Link (Hrsg.), *Fußball in Forschung und Lehre – Beiträge und Analysen zum Fußballsport XVX* (S. 170-175). Hamburg: Czwalina.

Höner, O., Feichtinger, P. & Murr, D. (2015). Reaching the youth academy level in German football: The relevance of motor and psychological predictors. In J. Bangsbo & P. Krustrup (Eds.), *The 8th World Congress on Science and Football* (p. 92). Copenhagen, Denmark.

Feichtinger, P. & Höner, O. (2015). Relationship of personality characteristics with current and future performance criteria in talented soccer players. In R. Seiler & O. Schmid (Eds.), *Sport psychology - Theories and applications for performance, health and humanity* (p. 46). 14th European Congress of Sport Psychology, Bern, Switzerland.

Höner, O., Feichtinger, P. & Schultz, F. (2015). *Diagnostics of psychological characteristics in early adolescence: How much information do we gain with regard to talent's future success?* Paper presented at the 2015 Conference of the Association for Applied Sport Psychology (AASP), Indianapolis, Indiana, USA.

Figures

Tables