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Cumulative Dissertation

Motivation and Performances of Student-Athletes in Dual Careers

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Hamburg, November 2023

to the

Universität Hamburg

Faculty of Psychology and Movement Science

Institute of Movement Science

in fulfilment of the requirements

for the degree of Doctor of Philosophy (Dr. phil.)

Examination Board

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Place and Date of the Viva Examination

Universität Hamburg, 7th March 2024

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List of Abbreviations

SAAMS	Student-Athletes' Academic and Athletic Motivation Survey
SAMSAQ	Student-Athletes Motivation Toward Sport and Academics Questionnaire

1 Introduction

Ever since ancient times, humans have competed in athletic contexts to compare their athletic skills. Possibly the most famous athletic competition are the Olympic games. The ancient Olympic games took place more than two thousand years ago. Winners in ancient times did not, however, win a gold medal and money, but received other benefits such as meals at public expense, tax exemptions, or full civil rights (Finley & Pleket, 1976). Thus, having won the Olympic games once, there was no need for athletes to follow a further career after the termination of their athletic career to support themselves. Nowadays, athletes have to prepare for a career outside of their athletic career. Winning the Olympic games or other prominent athletic competitions does not guarantee sufficient financial support to live off the prize money for the rest of one's life, at least not in European contexts. Therefore, athletes have to prepare for a life after the termination or an unplanned drop out of their athletic career. In Europe, athletes have to fulfil compulsory school education and most athletes continue further education after their compulsory education. The combination of this academic career with the athletic career simultaneously is known as a dual career (EU Expert Group "Education and Training in Sport", 2012).

Various research fields have been identified in the broader field of dual career research (Capranica et al., 2022; Guidotti et al., 2015; Stambulova & Wylleman, 2019; Vidal-Vilaplana et al., 2022). A review has shown that Europe is the main research focus on this reality revealing diverse dual career research topics such as dual career support, talent development, and career transitions (Vidal-Vilaplana et al., 2022). Athletes who are active in a dual career are often referred to as student-athletes as they are students in school or higher education and athletes in elite sports simultaneously. Student-athletes generally fulfil four criteria: They (1) train in sports with the aim of improving their athletic performances, (2) participate in sport competitions, (3) are formally registered as a competitor at a local, regional, or national sport federation, and (4) have sport training and competition as one of their major activities or focus of personal interest (Araújo & Scharhag, 2016). In terms of role understanding as a student-athlete, Snyder (1985) has identified four role types. The scholar-athlete is highly committed to his/her academic and athletic role. In contrast, the nonscholar-nonathlete shows a low commitment to his/her academic and athletic role. Besides these two extreme role understandings, the pure scholar is highly committed to school but exhibits a low commitment to athletics whereas the pure athlete shows the exact opposite commitment. Studies have

identified the need to support these student-athletes to allow them to successfully overcome the dual challenges of role understanding and commitment. Facing these challenges allows the student-athletes to follow a successful dual career (Bosscher & Rycke, 2017; Brustio et al., 2020; Condello et al., 2019; R. Fuchs et al., 2005; Niehues et al., 2022).

The political support of European countries for dual careers has been categorised into four types: state-centric regulation, state as sponsor/facilitator, national sporting federations/institutes as intermediary, and laisser-faire/no formal structures (Aquilina & Henry, 2010). The authors have specified Germany, for example, into the second type where the state serves as a sponsor or facilitator. In these cases, the state promotes formal agreements to ensure that student-athletes' needs in dual careers are met by their athletic and academic surroundings. Therefore, German student-athletes receive political support from their state whereas Italian and Slovenian student-athletes, for example, do not. There are no structured measures in these countries and student-athletes have to rely on individually negotiated agreements between their educational and athletic institutions. In the European context, student-athletes receive different support structures from their countries although all student-athletes face similar challenges. Further research in the field of dual career support is urgently needed to explore the needs of student-athletes and provide adequate support services to allow for a successful dual career.

In comparison to other dual career research topics, pedagogical and psychological topics have been considered least when dual careers of student-athletes have been explored revealing a lack of research on interpersonal factors related to dual careers (Guidotti et al., 2015). Although pedagogy and psychology are two different disciplines in sport science, these disciplines are strongly connected. Sport pedagogy deals with the relationship between education and sports, and the psychological aspects of education are often neglected (Gerber, 2016). Therefore, this dissertation will also focus on the psychological side of sport pedagogy. In this sense, research in terms of pedagogical and psychological aspects of dual careers has to be intensified.

Stambulova and Wylleman (2019) focused on the psychology of athletes' dual careers. In these careers, student-athletes are faced with the challenges of combining their educational and sporting careers as well as other careers such as their social and personal development. These challenges include, among others, limited financial support, performing well in academics and athletics simultaneously, developing personal resources and competence for coping with dual career demands, as well as building and maintaining relationships with significant others

(Brandt et al., 2017; Brown et al., 2015; Debois et al., 2015; Ekengren et al., 2020; Ryba et al., 2015; Ryba et al., 2017; Sorkkila et al., 2018). As a result, these challenges have an impact on the psychological development of student-athletes which have not yet been explored in detail. Therefore, further research fields in dual career research have been suggested including intensified research on student-athletes' mental health, developing support programmes to assist dual careers, and developing research on younger student-athletes (Stambulova & Wylleman, 2019). Clancy et al. (2016) suggested further investigating the role of motivation concerning mental health. Moreover, "[...] a limited validity and reliability of large-scale psychometric instruments for studying [dual career] motivations in European student-athletes emerged, which calls for the development of tools adapted to specific cultural contexts" (Guidotti et al., 2015, p. 12f). In terms of effective support programmes, personal-level variables such as training load could be explored (Clancy et al., 2016) as research has shown that increased training hours lead to higher experiences of conflict between education and sport (Grassinger et al., 2023). Lastly, the focus of dual career research should also be drawn to younger student-athletes, for example, those in primary and secondary school (Park et al., 2015; Stambulova & Wylleman, 2019).

To address these research gaps, the present dissertation will focus on evaluating academic and athletic motivation as well as the performances of student-athletes in upper secondary school. Due to reasons of physical proximity, the dissertation will be set in a German context. Previous research on dual careers in Germany has oftentimes focused on exploring structures and different pathways of dual careers. Alfermann (2000), for example, dealt with the development and termination of athletic careers whereas Borggrefe and Cachay (2012) investigated the support of predetermined structures and organisation for athletes in elite sports. Further studies have turned to a more personal and pedagogical side of dual careers. Wartenberg et al. (2014) evaluated the academic performances of student-athletes by investigating their school grades whereas Elbe et al. (2005) focused on personal sensitivities by exploring their athletic achievement motive. Other studies with German adolescent student-athletes have explored the conflicts between sport, education, and leisure time (Grassinger et al., 2023). However, no study established a link between personal sensitivities, such as motivation, and performance. This absence of studies highlights the need for action in terms of investigating the feelings and experiences of German adolescent student-athletes for a successful dual career.

The present dissertation will follow up on this research gap by focussing on three main objectives. For each objective, at least one publication has been prepared that explores the respective objective in more depth. Each of these publications holds its own specific aims which are described in more detail in the respective publication (Niehues et al., 2021, 2022, 2023a, 2023b). The dissertation will focus on:

(1) investigating the academic and athletic performances of student-athletes aged 15 to 19 in dual careers,
(2) exploring dual career motivation including athletic and academic motivation in dual careers, and
(3) examining the impact of adolescent student-athletes' athletic and academic motivation on academic and athletic performances and vice versa.

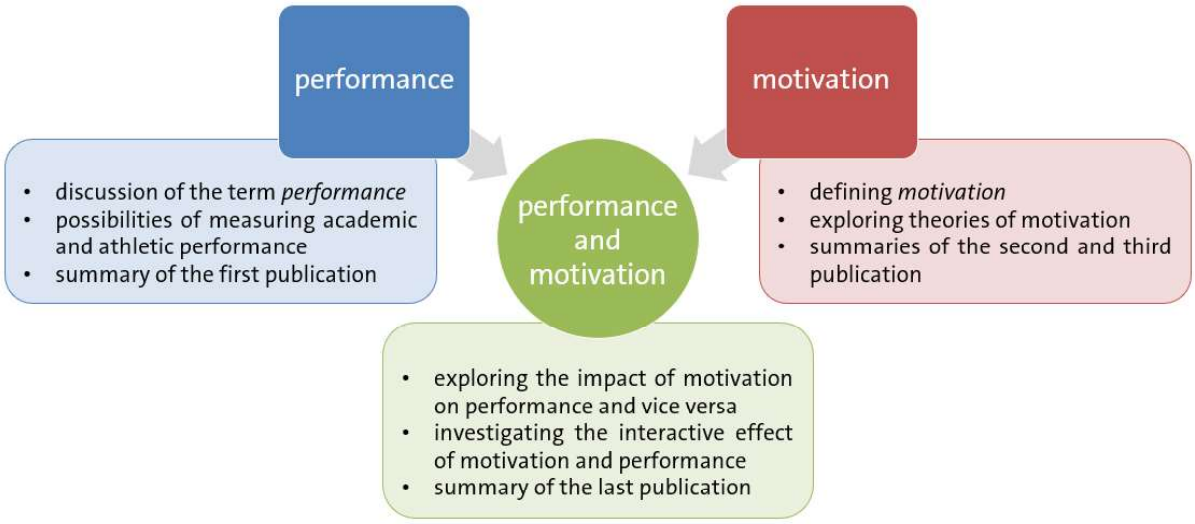

Fig. 1. Main aspects to be discussed in the main body.

Before the objectives will be pursued, a theoretical frame of reference needs to be established. To do so, several existing dual career frameworks are discussed followed by adapting these frameworks for the present dissertation. This adaptation forms the basis for the three objectives and will be referred to repeatedly throughout this dissertation. The main body focuses on the three main aspects of this dissertation: (1) performance, (2) motivation, as well as (3) performance and motivation. These three aspects form three chapters discussing their relation to dual careers as highlighted in figure 1. The results of all four publications are placed into a greater context in the discussion. The publications are debated in light of recent study findings. Following the discussion, the dissertation will close with prospects on how future dual career research in terms of academic and athletic motivation as well as performances can be shaped.

2 Dual Careers – A Theoretical Frame of References

Dual career research has increased over the last decades where one aim was to provide optimal support services for student-athletes to complete a successful academic and athletic career (Vidal-Vilaplana et al., 2022). Although a theoretical underpinning is needed for this dissertation as well as for research within dual careers, these underpinnings are scarce. There have been attempts to model the dual career of student-athletes (Baur, 1998; Cartigny et al., 2021; Wylleman & Lavallee, 2003). Each model seems to lack critical aspects of a dual career. These lacks will be highlighted and discussed in the following subchapters. Most importantly, however, these models do not meet the requirements of a theoretical frame of reference needed for this dissertation. Since the dissertation deals with performances and motivation in dual careers from a pedagogical point of view and how these two aspects affect the form of dual careers, the theoretical frame needs to (1) identify diverse forms and foci of dual career pathways and (2) consider developmental, sociological, as well as psychological aspects of dual careers over a life course with specific relation to adolescence. These aspects are needed as motivation and performance play a crucial role in dual career pathways while simultaneously affecting student-athletes' development (Cartigny et al., 2021; Clancy et al., 2016). In the following subchapters, three theoretical models within dual career research will be briefly explained and discussed concerning the two requirements mentioned above. Finally, a new model will be presented which serves as a theoretical frame of reference for this dissertation.

2.1 A Holistic Approach to Dual Careers – The Transition Model

The term dual career suggests that student-athletes master developmental requirements on two levels: the academic and athletic level. However, student-athletes have to fulfil more requirements on other levels which has been recognised by several theorists (Baur, 1998; Ryba et al., 2017; Wylleman & Lavallee, 2003; Wylleman & Reints, 2010). These levels can include developmental aspects that every person faces in today's society. Development is known as an action-mediated, reciprocal interaction between a person and the environment. Due to this understanding, development can only be understood as personality development in social contexts (Baur & Burrmann, 2009). The holistic approach combines the diverse developmental aspects by expanding the understanding of dual careers beyond the academic and athletic level. This approach includes biographical, historical, as well as cultural aspects which play an important part in student-athletes' development. Thus, understanding athletes as a whole person is the essence of this approach (Wylleman & Lavallee, 2003). In terms of this

whole-person understanding, research has shown that depending on the developmental level younger athletes focus on sports and identify more with their athletic role whereas older athletes tend to keep a balance between their athletic and academic demands (C. Ryan, 2015; Settles et al., 2002; Steele et al., 2020).

The lifespan model by Wylleman and Lavallee (2003) attempts to outline all developmental aspects and transitions athletes face in their dual careers. The model has been used by several researchers to underpin their research findings (Aquilina, 2013; Niehues et al., 2023a; Ryba et al., 2017). As elite sport performance lasts for a period of five to ten years (Wylleman & Reints, 2010), termination of the athletic career is inevitable. The termination has been recognised in the model, as it concludes with the termination of the elite athletic career when athletes reach the age of about 25 to 30 years depending on the type of sport. According to the authors, the model reflects the concurrent, interactive, and reciprocal nature of athletes' development by taking transitions on diverse levels into account. The model includes the developmental approach by viewing the whole career, on the one hand, as well as the holistic approach by viewing student-athletes as the whole person, on the other hand.

"A transition generally results from one or a combination of events [...] that are perceived by the athlete to bring about personal and social disequilibria" (Wylleman & Lavallee, 2003, p. 509). Transitions can be determined by different factors including age and structural or organisational characteristics such as the school system. Theorists differentiate between normative and non-normative transitions (Wylleman & Reints, 2010). Normative transitions are predictable and anticipated, for example, the transition from primary to secondary school whereas non-normative transitions are more or less unpredicted and involuntary. An example of a non-normative transition is a serious injury that leads to a dropout of elite sports. The lifespan model only considers normative transitions. By ignoring non-normative transitions, a vast majority of student-athletes' dual careers are not depicted in the model including those student-athletes who terminated their athletic career due to these transitions. The normative transitions are described on four levels including the athletic level, psychological level, psycho-social level, as well as the academic/vocational level. The developmental stages of the athletic level result from Bloom's (1985) three stages of development (initiation, development, and mastery/perfection). With regards to the psychological level, several developmental stages have been identified including Erikson's (1963) developmental stages, Piaget's (1971) stages of cognitive development, and Havinghurst's (1973) developmental tasks over the lifespan. Due to

reasons of simplicity, Wylleman and Lavallee (2003) opted for the juridical definitions of childhood, adolescence, and adulthood which differ depending on the student-athletes' country of origin. On a psycho-social level, the authors identify relevant attachment figures such as family, friends, peers, coaches, and teachers that influence student-athletes' development significantly in the specific stages. These assumptions are somewhat generalised as the impact significant others have on student-athletes is subjective. Lastly, the developmental stages on the academic/vocational level are determined by the educational system in each country.

The lifespan model indicates that not all student-athletes face the same transitions at equal times. These differences are particularly true when viewing dual careers from different cultural backgrounds. Ryba et al. (2017) have adapted the model for the Finnish context and included a fifth layer known as financial resources. This additional layer emphasises the importance of financial support for the continuation of a dual career. Ekengren et al. (2020) have gone so far as to adopt the lifespan model to a particular type of sport namely handball in Sweden. When adapting the model to the German context, the lifespan model is fairly similar to the Finnish model (Ryba et al., 2017). Differences can particularly be found for academic/vocational development as these developments are heavily influenced by the educational system and political decision-making within the countries. For the German model, after spending four or six years in primary school depending on the federal state, students transition into secondary school. After ten compulsory school years, students can decide whether they would like to attend upper secondary school to receive their entrance qualification for higher education and pursue an academic career or complete vocational training after school (Brenner, 2006). For reasons of convenience, the explanation of the German educational system has been simplified. As the present dissertation focuses on student-athletes aged 15 to 19, these student-athletes face transitions on all levels as indicated by the red square in figure 2.

The lifespan model gives an overview concerning the developmental aspects of dual careers. However, the model ignores non-normative tasks. Sociological aspects of dual careers are only marginally considered. Moreover, different pathways of dual careers such as the focus on an athletic or academic career or both careers equally are not reflected. No explanation is given on how each level influences the other levels and vice versa. Lastly, the model ignores the requirements and resources student-athletes have for completing a successful dual career and how these requirements and resources influence the transitions.

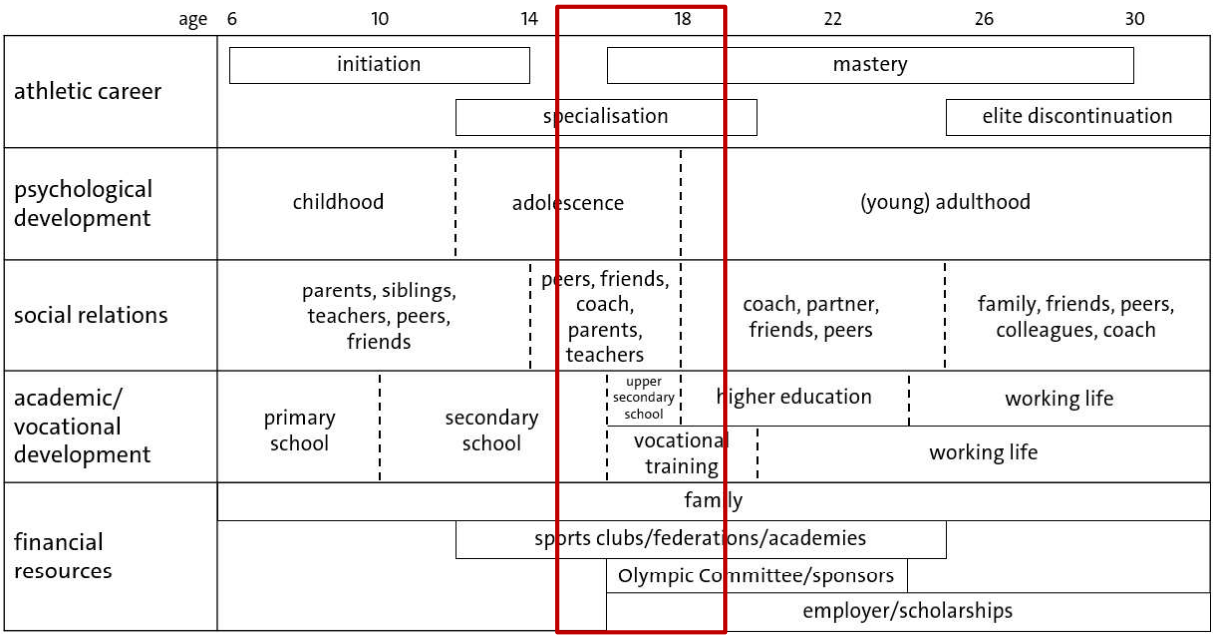

Fig. 2. The lifespan model adapted to the German context (modified according to Ryba et al., 2017).

2.2 The Life Course Perspectives on Dual Careers

Since the lifespan model is not originally German, a German model might be more suitable as a theoretical frame of reference for this dissertation. Several models and theories exist in an attempt to explain the developments in an athletic context. In contrast to the lifespan model, most German models incorporate aspects of development as well as socialisation into a theoretical frame. Socialisation can be defined as the development of personalities in reciprocal dependence on the social and material development mediated by society. Sociological research answers questions on how humans can be educated as a subject who is capable of acting in the present society (Baur & Burrmann, 2009). Most of these models and theories, however, focus on (elite) athletic development and socialisation. Hence, these models tend to touch upon other life contexts such as education only marginally.

Concerning aspects of development and socialisation, Baur (1988) put forth the concept of body and movement careers (Körper- und Bewegungskarrieren). With this concept, the author combines the research programme regarding the domain as well as motor development in social contexts. The domain focuses on the contextual problem of the research programme whereas motor development in social contexts sets the conceptual frame (Baur & Burrmann, 2009). The concept of body and movement careers was designed to highlight that bodily as well as motor development is, generally speaking, understood as a transactional development in social contexts. As a result, the connection of socio-theoretical and development-psychological approaches is inevitable (Baur & Burrmann, 2009). The body and movement career incorporates

developmental aspects as it compromises the entire development of the body and movements in a life course in contrast to athletic careers which focus on sport-related developments only (Baur, 1988). At the same time, the body and movement career is a societally performed social construct and, thus, includes aspects of socialisation in its essence (Baur, 1988).

To look at the body and movement career from a holistic point of view, Baur (1988) suggested incorporating this career into the concepts of lifestyle (Lebensführung) and life course (Lebenslauf). The lifestyle is characterised by the daily practical organisation of one's life to coordinate the requirements of each life sphere (Baur, 1998). This synchronic concept is to be expanded by the diachronic concept of the life course. The latter includes the daily lifestyle retro- and prospectively due to the changing requirements and constellations of all life spheres over a life span (Baur, 1998). The concepts of lifestyle and life course are understood as interactional concepts. An individual will use personal and social resources to master the requirements posed in different life spheres in a daily lifestyle over a life course. In this way, Bauer (1996) creates an iterative heuristic frame providing the possibility to theoretically differentiate elements and complex developmental conceptions which may then be examined empirically and vice versa.

This heuristic frame can be seen in Baur's (1998) model for the lifestyle and life course. His model is oriented towards Helmke's (2007) Angebots-Nutzungs-Modell which has been translated into "opportunity-use-model" (Zierer & Seel, 2012), "supply-use-model" (Seidel, 2015), or "utilisation-of-learning-opportunities-model" (Kiemer, 2017). As the researchers cannot agree on a translation and the two antecedents of the model are viewed as requirements and resources in the context of this dissertation, the model will be referred to as the requirement-resource model in this dissertation. On the one hand, the model provides the requirements one has to master in all life spheres. On the other hand, the personal and social resources needed to meet the requirements are put forth by the model. Individuals face these requirements and resources in their daily lifestyle. By managing these two aspects daily, the life course of an individual is designed. With regards to the dual career, Baur (1998) highlights the requirements and resources of elite sport which include the organisational structures of elite sport in Germany, the training and competition requirements, the time spent for elite sport, the psycho-physical strains, and the support of coaches. Research has shown that, in terms of their lifestyle, athletes tend to focus more on their athletic than their academic careers (C. Ryan, 2015). However, the prioritisation of the athletic career over the academic career or vice versa is not addressed in Baur's (1998) model.

The model addresses resources and requirements on the academic and individual level, but the author seems to neglect these in comparison to the elite sport. Academic requirements can include the time spent on school work, the academic performance pressure, as well as the expectations of parents. Baur (1998) explains the social resources in terms of the elite sports system as the resources originate from the timely relief when student-athletes attend boarding schools with sporting facilities close by, the financial support when student-athletes are part of a squad, and the academic support when student-athletes attend elite sport schools by receiving extra tuition or the exemption from school for important athletic events. The fact that the resources originate from the elite sport context only according to Baur (1998) highlights his neglect of careers outside of the athletic context.

In contrast to Wylleman and Lavallee (2003), Baur (1998) includes aspects of development and socialisation into his model providing an integrated approach to the lifestyle and life course of student-athletes. By using a requirement-resource model, the author indicates the influences requirements and resources in all life spheres can have on the lifestyle and life course of dual careers. However, Baur (1998) seems to ignore important developmental and sociological steps student-athletes take in their dual careers such as transitions in elite sport or education as well as developing relationships with new coaches or teammates. The prioritisation of the athletic or academic career is confined in the model.

2.3 Chances, Challenges, and Choices – Different Dual Career Pathways

The two previous models were developed based on assumptions and experiences made by theorists. As Baur (1996) highlighted in his iterative heuristic, a theoretical model can also be generated based on empirical findings. A method where the theory is inductively generated from data is the grounded theory method put forth by Glaser and Strauss (1967). This method aims to develop a higher level of understanding of a specific phenomenon.

Cartigny et al. (2021) have used the grounded theory method to generate a model for the dual careers of student-athletes. The researchers interviewed 17 individuals based on a life-story approach. The grounded theory method was conducted iteratively. A fluctuation between inductive data collection and deductive understanding of previous literature is, therefore, natural. As a theoretical basis for the grounded theory of dual career pathways, the career transition theory (Stambulova, 2003), the identity theory (Stryker & Burke, 2000), as well as athletic development theories (Wylleman et al., 2013) have been considered.

The grounded theory of dual career pathways shows three pathways within a dual career. The sporting pathway is characterised by an increased focus on sports and a reduced commitment to academic/vocational training (Cartigny et al., 2021). This focus results in an educational gap where student-athletes are unable to achieve their vocational or academic career goals. This pathway is equivalent to Snyder's (1985) pure athlete. In contrast, student-athletes following the educational/vocational pathways prioritise education and reduce their commitment to sporting goals (Cartigny et al., 2021). The critical point of choosing this pathway often occurs when educational transitions occur (Wylleman & Lavallee, 2003). Student-athletes reduce their engagement or drop out of their elite sport due to talent, education, or financial barriers. This focus results in a sporting gap where student-athletes are unable to achieve their athletic goals. In contrast to the sporting pathway, education cannot be entirely neglected as student-athletes need some sort of educational qualification as a form of retirement planning (Geranisova & Ronkainen, 2014). The educational/vocational pathway is identical to Snyder's (1985) pure scholar-athlete. Lastly, the dual career pathway takes the simultaneous developments in athletic and academic careers into consideration. Student-athletes following this pathway achieve both educational and sporting goals (Cartigny et al., 2021). Brief periods where one career pathway is prioritised over the other can occur but ultimately result in a balance. Flexible life choices result in a successful dual career life course. Student-athletes in dual career pathways can be compared to Snyder's (1985) scholar-athlete. Contrary to the findings by Cartigny et al. (2021), Ryba et al. (2017) identified three different career styles where the contrapuntal style is similar to the dual career pathway and the monophonic career style shows similarities to the sporting and the academic/vocational career style. The dissonant career style which is described as an "athlete style of career construction characterized by sport and education forming a discordant relationship that is seemingly impossible to integrate into personal meaning structure" (Ryba et al., 2017, p. 135) was not found in Cartigny's et al. (2021) model.

The lifestyle and life course concept put forth by Cartigny et al. (2021) has the advantage of being open to career choices. Moreover, the model does not neglect dropouts of elite sports or the prioritisation of one career over the other. However, the impacts of requirements and resources on dual career pathways are not clear, and non-linear developments of dual careers are not considered. Furthermore, no information on the decisions for or against a dual career (i.e. requirements and resources) is given. Hence, the impact of sociological and psychological aspects is unclear. Lastly, developmental phases are not clarified in the model.

2.4 How Do We Go From Here?

Previous theories and models of dual careers showed strengths and weaknesses. The transition model by Wylleman and Lavallee (2003) provides an overview of all developmental aspects of dual careers highlighting the holistic approach to understanding dual careers. Baur's (1998) requirement-resource model expands beyond developmental aspects including sociological aspects by incorporating requirements and resources in a daily lifestyle into a life course design. Unfortunately, these two models consider dual careers only in their optimal form where life choices regarding academic and athletic goals are equally distributed. However, this optimal form is not true for most student-athletes (Ramis et al., 2023). Hence, the grounded theory of dual career pathways provides a more diverse picture of dual careers by indicating three pathways: the academic, the athletic, and the dual career pathway (Cartigny et al., 2021).

Since none of the models contains the relevant information needed for the theoretical frame of reference for this dissertation, a new model for dual careers needs to be created (see fig. 3). Due to the recognition of diverse career pathways, the grounded theory of dual career pathways by Cartigny et al. (2021) serves as a basis for the new model. This model, however, neglects severe developmental, sociological, as well as psychological aspects. Hence, the developmental aspects in terms of the academic and athletic career as put forth by Wylleman and Lavallee (2003) were added to the x- and y-axis respectively. To add sociological and psychological aspects of dual careers to the new model, requirements and resources as suggested by Baur (1998) were enclosed in the new model. These requirements and resources were categorised according to Ryba's et al. (2017) levels and the contents of these two categories were expanded as well as simplified. Individual and social resources as suggested by Baur (1998) were summarised into one category for reasons of simplicity. However, the requirements and resources do not only influence the student-athletes' development in dual careers, but they also influence each other. This influential direction is indicated by the arrow pointing in both directions. Lastly, the arrows indicating the development of student-athletes will be represented by a double helix – the DNA of dual careers. This double helix highlights the interactive effect of the academic and athletic career as well as further careers such as the social career which are concealed in the helix due to the focus of this model on the athletic and academic career. Based on the double helix form, the new model will be called the DNA of dual careers model and is shown in figure 3.

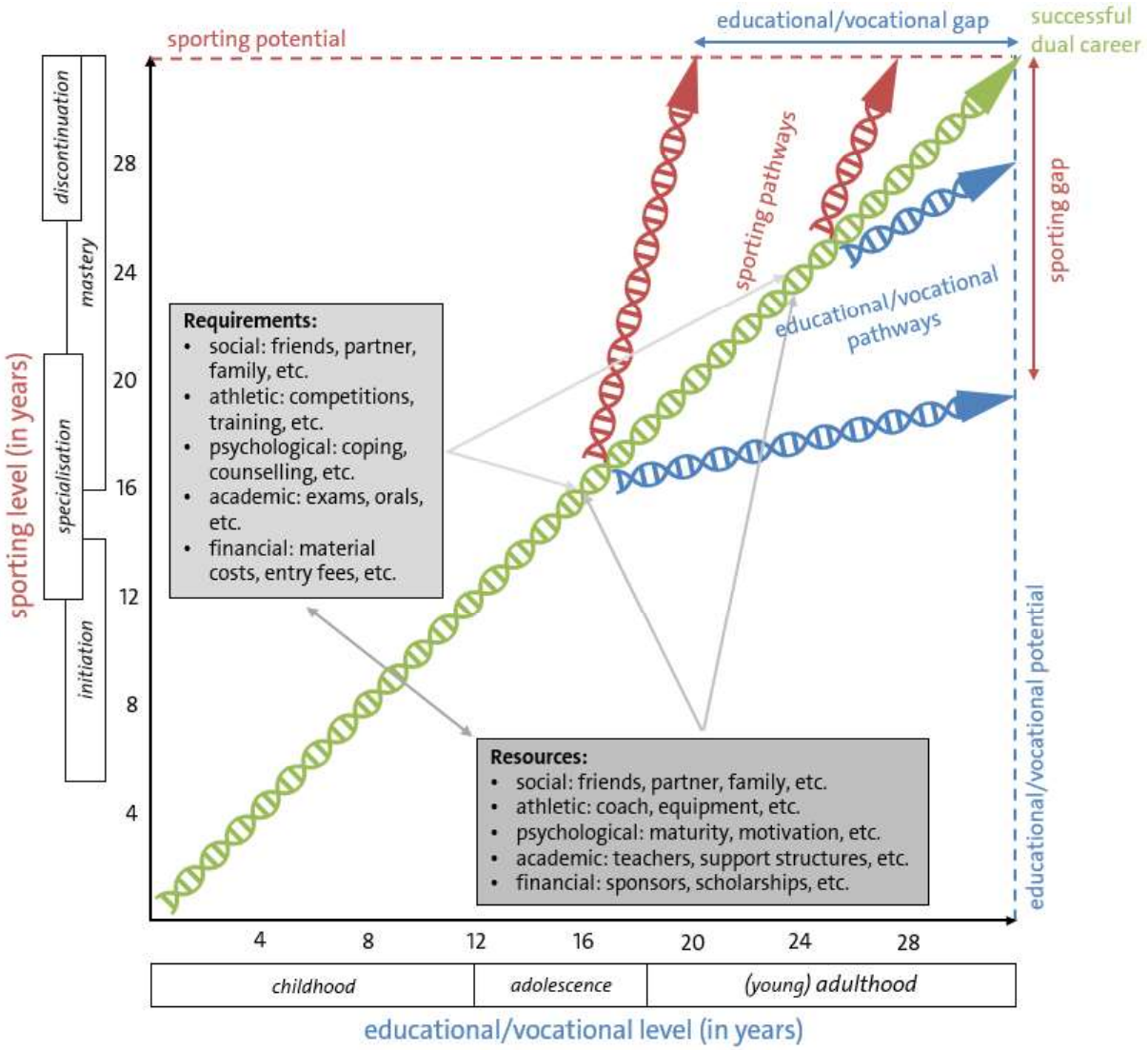

Fig. 3. The DNA of dual careers model.

Due to the complex nature of dual careers, the new model will not be able to depict all aspects of student-athletes' dual careers. However, the model can serve as a theoretical construct for the purpose of this dissertation as it fulfils the two requirements identified beforehand. One weakness of the new model is the arrows of the requirements and resources pointed toward the developmental line. These arrows' directions seem as if the requirements and resources only influence developments at certain points in time. However, there is a continuous influence and interaction between the requirements and resources as well as the development of student-athletes. Moreover, it seems that only developments in the academic and athletic career are important. Although the double helix attempts to solve this problem, a more dimensional model would be needed to depict further developments such as the social careers that run parallel to the athletic and academic careers.

Although the new model has some weaknesses, the strengths conceal these weaknesses. The new model is the first attempt to incorporate developmental, sociological, and psychological aspects of dual careers into one model while simultaneously considering diverse career pathways. Therefore, the new model is more realistic as it considers not only normative transitions but also includes non-normative transitions. Student-athletes who drop out of elite sport or who terminate their athletic career are considered by this model. Moreover, this model indicates the challenges student-athletes face during and after the termination of their athletic career. With the aid of the new model, sensitive periods can be identified based on the transitions marked on the two axes which helps researchers to identify potential research interests and practitioners to support student-athletes, particularly during these periods. One of these sensitive periods occurs after the compulsory school years at the age of about 16-18 years when student-athletes simultaneously transition from adolescent to adult elite sport. Student-athletes in these sensitive periods are more vulnerable to demotivation and weak performances due to the diverse developmental transitions influencing their career choices.

The model highlights that career choices can be negatively and positively influenced by several aspects, for example, motivation as well as athletic and academic performances. The influence of these aspects on dual careers is even stronger during sensitive periods. For instance, one can assume that highly motivated student-athletes in the academic and athletic context are more willing to put effort into their dual career. Thus, they can complete a successful dual career as indicated by the green double helix arrow (Settles et al., 2002; Snyder, 1985). High motivation in sensitive periods might protect student-athletes from rejecting either their athletic or their academic career goals. However, if student-athletes are motivated by one career (athletic or academic) only, they might choose one career over the other, particularly during sensitive periods as highlighted by the red and blue double helix arrows (Brustio et al., 2020; P. X. Fuchs et al., 2016; Lopez de Subijana et al., 2015; Stambulova et al., 2015; Steele et al., 2020). This choice will influence the educational/vocational career after the termination of their athletic career leaving gaps for either the sporting or the educational goal (Cartigny et al., 2021; Waud & Weese, 2023). Hence, it is important to support and guide student-athletes motivationally, particularly during these sensitive periods. In addition, dual career motivation can influence academic and athletic performance and vice versa. If student-athletes are highly motivated to perform well at competitions and receive good grades in school, it can be assumed that the energy they use to achieve these goals will probably end in satisfactory performances (Healy et al., 2016). These

performances, in turn, will further fuel their dual career motivation. In contrast, if student-athletes are demotivated in their dual career or demotivated for either their athletic or academic career, this might lead to failures in their academic and/or athletic performances. In turn, their bad performances can lead to further demotivation, particularly during sensitive periods, which then leads to dropouts from one of their careers (academic or athletic).

The interaction of motivation and performance has been briefly highlighted (indicated by the arrow between the two grey boxes in the DNA of dual careers model). Focussing on performance only, the results of competitions and grades can greatly influence career choices, particularly during sensitive periods (Cartigny et al., 2021). One can assume that excellent performances in sports and academics result in a willingness to put all efforts into maintaining these performances which may result in a successful dual career (highlighted by the green double helix arrow). Excellent performances in both areas might protect student-athletes from prioritising one career over the other, particularly during sensitive periods. In contrast, if the performances are only excellent in sports or academics, student-athletes might engage in one career more actively neglecting the requirements of the other career (indicated by the red and blue double helix arrows). This neglect might lead to choosing one career over the other.

2.5 Concluding Remarks on the Theoretical Frame of References

Previous discussions regarding the new model have primarily focused on motivation and performance in a dual career. Other factors can influence the development of dual career pathways, for instance, personal, social, structural, and financial support (Thompson et al., 2022). Due to the focus of this dissertation, these factors will not be considered further.

In conclusion, existing models and theories in dual career research were insufficient to serve as a theoretical frame of reference for this dissertation. The new model incorporates developmental, sociological, and psychological aspects as well as different pathways in dual careers which gives room for further analyses concerning aspects of dual career performance and motivation. Performances and motivation can have a significant impact on dual career pathways as proposed by the model, particularly during sensitive periods such as adolescence. Therefore, dual career performances and motivation are of major interest in the field of dual career research and will be explored in more depth in the following chapters.

3 Academic and Athletic Performances Among Adolescent Student-Athletes

As highlighted in the previous chapter, performances play an important role when deciding for or against a dual career (Brettschneider, 1999; Cartigny et al., 2021). For example, if a student-athlete performs poorly in a competition, he/she might not be able to make the squad. Not being part of a squad might result in reduced access to financial or athletic support such as additional and/or individual training, psychological counselling, or psychologists. Similar effects can be found in the academic career. If a student-athlete is unable to achieve the grades needed to access higher education, he/she might not be able to work in the field he/she wants to. Hence, performances in the athletic and academic contexts will be discussed hereinafter. After defining the term performance, the following subchapters will focus on research findings regarding student-athletes' performances in the academic and athletic contexts and how these performances can be measured. Lastly, the first publication of this dissertation will be summarised.

3.1 Performances, Achievements, Accomplishments?

Attempting to define performances is rather challenging. In the German language, there is one term that clearly describes the result that is achieved after performing a task by using all skills and competence acquired previously. This term is Leistung. In a rather mechanical definition of this term, Leistung can said to be the product resulting from work and time (Buytendijk, 1956). This definition would translate into the English term power. However, when speaking of Leistung in an athletic and academic context, power is an unsuitable translation. Other terms that describe the German term Leistung are performance, achievement, or accomplishment. Merriam-Webster (n.d.c) defines performance as either "the execution of an action" or "the fulfilment of a claim, promise, or request". In this sense, the term performance is finite as it does not include the process of how the performance was achieved. In contrast, the terms achievement and accomplishment are rather infinite and process-oriented. Achievement is described as "the act of achieving something", "a result gained by effort", or "the quality and quantity of a student's work" (Merriam-Webster, n.d.b). The term accomplishment is even more precise than the term achievement as it focuses on the qualities, skills, and abilities of a person by being defined as "a quality or ability equipping one for society" or "a special skill or ability acquired by training or practice" (Merriam-Webster, n.d.a). In sum, all these English terms describe one nuance of the German term Leistung. For reasons of simplicity, the English term

performance will be used in this dissertation to describe the results that student-athletes achieve in an academic or athletic context by demonstrating the skills and abilities that they have acquired through rigorous training and hard work.

3.2 Performances in an Athletic Context

The challenge of defining these terms is even more difficult in an athletic context. Athletic performance is often equated with reaching sporting goals such as placing first in a competition or becoming faster, higher, or stronger following the Olympic motto (Brewer et al., 1993). Several factors play into achieving peak performances such as power, strength, and speed (Duggan et al., 2022). At first glance, it seems that athletic performance is easily understood. Looking at the magnitude of athletic performances from various perspectives offers a different picture. Clearly, athletic performance can easily be defined and judged for some types of sports such as swimming or track and field where the performance is based on time, height, or length. However, for other types of sports, athletic performance is more difficult to judge for example in artistic gymnastics or figure skating. Moreover, this dissertation does not look into motor skills or competence that can be produced by athletes, but more importantly, focuses on elite performances (i.e. in competitions or elite training). In line with the previously made definition, athletic performance can be understood as the results athletes produce when using the skills and abilities they have previously acquired through rigorous training.

Athletic performances are one of the main factors for talent identification and talent development (Peterson et al., 2022). Studies have shown that over time athletes drop out of elite sports which is natural due to the selective nature of elite sports (Peterson et al., 2022). Besides injury reasons, one major reason for dropping out of elite sports is that athletes are unable to maintain or increase their athletic performance. Hence, these athletes cannot progress further in the organisational structures of elite sports. In the past, numerous studies have been conducted to identify factors that can positively or negatively influence athletic performance. Most of these studies can be allocated to the research field of medical, training, or nutritional sciences (Duggan et al., 2022; Fitton Davies et al., 2022; Schroeder, 2022). As this dissertation focuses on the psychological and pedagogical aspects of dual careers, studies in these research fields will not be discussed further. Studies focussing on psychological aspects of athletic performance found that team cohesion, motivational intensity, the association with the coach, athletic identity, and self-confidence positively influence athletic performance (Eganov et al., 2021; Gavala-González et al., 2019; Javed et al., 2022; Waud & Weese, 2023). Negative effects on

athletic performance have often been associated with negative emotions such as acute psychological and chronic stress (Gavala-González et al., 2019; Rano et al., 2019; Sorkkila et al., 2018) and its dependence on mental health (Eganov et al., 2021; Waud & Weese, 2023). These negative emotions can be triggered by certain incidents such as losing a competition or experiencing an injury which can, in turn, lead to athletic burnout (Sorkkila et al., 2020). To improve athletic performances, coaches should promote positive emotions among athletes and provide psychological support (Eganov et al., 2021; Sorkkila et al., 2018).

3.3 Measuring Athletic Performances

To be able to identify factors that positively or negatively influence athletic performance, a method of measuring these performances needs to be established. Measuring athletic performance seems to be easy at first. Standardised tests can be used to assess the strengths of muscles or the ability to perform a specific skill in a period such as skipping with a rope. However, this dissertation focuses on performances in elite sports with a focus on the output, i.e. performing in competitions or reaching a squad level. Therefore, other factors need to be considered to measure athletic performance in elite sports.

A subjective measure of athletic performance has been put forth by Peterson et al. (2022). Student-athletes have been questioned about their goals for elite effort and athletic performance was measured based on achieving these goals. This method demonstrates advantages by considering the student-athletes' age and type of sports. However, this method is not objective and difficult to use in comparative analyses. A more objective method is the measuring of standardised features such as the time taken to complete a race (Rano et al., 2019). With the intent to compare athletic performances across different types of sports, this measure seems to be unsuitable as time is not decisive concerning athletic performances in all types of sports. Eganov et al. (2021) used the time athletes spent on their training as an indicator of athletic performance since it can be assumed that the more time an athlete spends on training, the better he/she performs athletically. Moreover, this type of measurement focuses more on athletes' developmental processes and ignores bad days at competitions or measurement points in time. However, one needs to consider that athletes active in team sports train less than athletes in individual sports simply because the coordination of training hours is more complex (Condello et al., 2019). Therefore, the time spent on training presents only a limited measure of athletic performance. Another indicator of athletic performance in elite sports can be the squad level of an athlete (Javed et al., 2022). The squad level indicates that the athlete is one of the best

athletes in the region or nation in the specific type of sport at a certain age. Thus, this measure takes several aspects into account when determining athletic performance. Nevertheless, depending on the type of sport, athletes make a squad at different ages due to reaching peak performances at different age levels (Longo et al., 2016). For example, gymnasts reach their peak performances earlier than football players. Hence, when comparing the athletic performances of same-aged athletes across different types of sports, the squad level might not be the best indicator of athletic performance. Finally, the placing in a competition can be considered as an indicator of athletic performance as this type of measure allows an objective view of the performance in relation to other athletes in the same age group and type of sport. However, this measure is similarly problematic since the placing needs to be set in relation to the field of participants. For instance, the team placing in a handball world championship with 32 teams participating in total cannot be directly compared to an individual's placing in a marathon of more than 3000 participants.

As a result, there is not one clear indicator of athletic performance in elite sports as more than one factor provides information on the athletic performance of student-athletes, particularly when comparing student-athletes across different types of sports by simultaneously considering the athletes' age. Nevertheless, the suggested measures can be used as an initial indicator of athletic performance. In future research, several factors should be considered when evaluating student-athletes' athletic performance.

3.4 Performances in an Academic Context

When speaking about research in an academic context, the meta-study conducted by Hattie (2008) is probably the most prominent study on how academic performances are influenced by different factors such as exercise and relaxation, motivation or self-concept. However, several terms describe the output students produce based on their school work such as learning outcomes or academic achievements (Hattie, 2008). These terms highlight the difficulty of finding a universal definition for the term school performances. In line with the definition of performance by Merriam-Webster (n.d.c), school performance is the fulfilment of requirements in school and the execution of specific tasks such as exams, presentations, or assignments. School performances are not the only term that can be used in this context. Academic performance, for example, is a broader term that includes performances not only in primary or secondary school but also in higher education.

Since the target group of this dissertation are student-athletes, findings concerning school performances of student-athletes will be discussed only. Few studies concerning school performances have been conducted with this target group (Grimit, 2014; Huml et al., 2019; Storm & Eske, 2022), although student-athletes face severe academic challenges (Grassinger et al., 2023; Huml et al., 2019). A third of the student-athletes questioned claimed that their grades would be better if they did not participate in elite sports, and more than 40% answered that they would not participate in elite sports if it were proven that athletics negatively affected academics (Grimit, 2014). However, the majority of student-athletes would still participate in elite sports even if this participation would have negative effects on their academic career. Hence, it can be assumed that there is more to following a dual career than just good grades. Storm and Eske (2022) found that there is a transfer of expertise from elite sports to academics which suggests that there is no negative effect of elite sport participation on school performances. The researchers even highlighted that this transfer of expertise has a positive effect on grades. The dual career pathway has given them the discipline and skills to achieve well academically (Storm & Eske, 2022). These findings, however, need to be treated with caution as the researchers pointed out that the dual career support programmes have a compensating effect on the student-athletes in terms of their school performances. In other words, the student-athletes would not be as successful in school had they not been given support from their educational and athletic institutions.

Therefore, it is interesting to compare the school performances of student-athletes with regular students who do not compete in elite sports. Several studies have been conducted regarding this research topic (Emrich et al., 2009; Jonker et al., 2009; Kehne et al., 2018; van Rens et al., 2015; Wartenberg et al., 2014). The findings of these studies are diverse. Jonker et al. (2009) found that student-athletes perform better in the academic context than their peers at regular schools. Other studies showed that there are no differences regarding the school performances of student-athletes and students at regular schools (Kehne et al., 2018; Wartenberg et al., 2014). However, some findings indicate that students who are not active in elite sports outperform their student-athletic peers (Emrich et al., 2009; van Rens et al., 2015). Consequently, further studies are needed to evaluate the influence of participating in elite sports on school performance. Moreover, there are no comparative findings regarding student-athletes' school performances when attending sport schools versus when attending regular schools while simultaneously participating in elite sports.

3.5 Measuring Academic Performances

As the definition of the term school performance is not universally valid, the measurement of these performances is equally challenging. This challenge poses one reason why the findings regarding the academic performances of student-athletes versus regular students are so inconsistent.

There are several possibilities to evaluate school performance. The easiest method to measure school performance is probably considering the grades students receive from their teachers (Kehne et al., 2018; Storm & Eske, 2022; Wartenberg et al., 2014). The grades can be obtained by either questioning the students in a self-assessment questionnaire or by receiving the school reports from the teachers whereby the latter method presents a more reliable way of obtainment. Although this method seems fairly easy and simultaneously fairly objective (York et al., 2015), previous studies have shown that grading can be biased (Malouff & Thorsteinsson, 2016). This bias is often based on the teachers' perception of his/her students including the students' ethical background, education-related deficiencies, and poor quality of prior performance. Thus, when evaluating school performance, one should always take this consideration into account. Since considering the grades only would be a narrow perspective, other methods of measuring school performances have been explored.

Hirschmann (2016), for example, evaluated school performance by questioning the students how satisfied they were with their grades. By using this method, the researcher considered other factors such as the influence of self-perception and efforts put into receiving good grades. A disadvantage of this method is the fact that the satisfaction with grades is highly subjective and difficult to compare and generalise. Other studies have chosen to evaluate academic performance based on the career choices students made after leaving school such as vocational training or higher education (Jonker et al., 2009; Storm & Eske, 2022; van Rens et al., 2015). This method allows a longitudinal and developmental perspective on academic performances since the developments and decisions of student-athletes after compulsory school are taken into consideration. Nevertheless, the career pathway might not be an optimal method for evaluating academic performance since students can decide to complete vocational training out of interest although they possess the competence and qualifications for higher education. In this way, career pathways are a subjective matter of evaluating academic performance as they are primarily based on students' choices and not necessarily on qualifications.

An objective method for inquiring about academic performance are academic performance tests. Several tests can be used as a method (York et al., 2015). One suggested method is a standardised testing procedure to determine the learning outcomes of students. Due to the standardised procedure, results are objectively assessed. Moreover, the usability is broad and concrete in that the results can be compared to the results of other groups. Nevertheless, this procedure results in a narrowness of the applicability as certain tests can only be used by certain target groups. Moreover, these tests ignore developmental and process aspects of learning. Taking the identified advantages and disadvantages of the diverse types of measuring academic performance into account, the academic performance tests are the most objective measure to compare and contrast school performances of groups within the same age and cultural group. Nevertheless, the shortcomings of this testing method need to be kept in mind.

3.6 Summary of Publication I

Niehues, M., Gerlach, E., Wendeborn, T., & Sallen, J. (2022). Successful in sports but worse in school? Adolescent student-athletes' development of scholastic performances. *Frontiers in Education, 7*, Article 946284. http://dx.doi.org/10.22028/D291-38138

The full article can be found in Appendix I (pp. XXVII-XLI).

As highlighted above, measuring school performance is challenging. School performance tests are the most objective method of obtaining school performance. By evaluating the school performances of student-athletes, the effectiveness of support services provided for this group can be investigated. The first publication of this dissertation deals with the evaluation of dual career support services for student-athletes by examining their school performances.

The study is designed longitudinally and quasi-experimentally aiming to evaluate the development of school performances among upper secondary school students. Besides obtaining school performance through standardised assessments in the subject English, grade points in this subject are also considered. In total, 159 students (54.4% female) at regular comprehensive schools and elite sport schools participated in the study. The students completed a questionnaire regarding their English grades as well as the TOEFL ITP® Level 1 test at the beginning and end of their upper secondary school education. The sample was split into three groups based on the following criteria: (1) students' athletic engagement, (2) school-type attendance, and (3) usage of dual career support services. Repeated measurement analyses of variance were chosen to evaluate the impact of the three previously mentioned criteria as well as the interactive effects of these criteria on the development of school performances.

The results indicate that the development of the English performance level differs among the six groups. Students at comprehensive schools demonstrate better results and significantly better development of English performance levels than student-athletes at elite sport schools. Moreover, the student-athletes participating in dual career support programmes do not develop better English performance levels than student-athletes without additional support. The findings concerning the dropouts are inconsistent. No definite answer can be given to the question of whether dropouts develop better English performance levels than student-athletes who remain active in elite sports. In conclusion, the study suggests that dual career support services are needed to assist student-athletes with high academic and athletic demands to complete a successful dual career. Further studies should focus on evaluating the difference in the usefulness of these support services.

Authors' Contributions

Jeffrey Sallen, Erin Gerlach, and Thomas Wendeborn were the principal investigators of the third-party research project where the data stem from. Jeffrey Sallen and Erin Gerlach were mainly responsible for the overall conception and design of this study. Maike Niehues took the lead in the conception of the manuscript, the statistical analysis, and in writing of the manuscript. Jeffrey Sallen acted as the supervisor of the project. In addition, Jeffrey Sallen organised the study samples and led the data acquisition. Maike Niehues, Jeffrey Sallen, and Erin Gerlach made substantial contributions to the analysis and interpretation of data. The manuscript was developed, revised, and approved to be published by all authors.

3.7 Concluding Remarks on Academic and Athletic Performances

The publication has highlighted the worse development of academic performances by student-athletes in comparison to students who are not active in elite sports. As a result, additional support for student-athletes is inevitable to guide them through a successful dual career. Regarding the DNA of dual careers model (fig. 3), excellent academic and athletic performances may impact the choice of pathways. If student-athletes perform well in both contexts, they might stick to a dual career pathway. If student-athletes perform better in school, they might prioritise academia over athletics leaving a sporting gap. Vice versa, if student-athletes show better athletic performances, they might choose the athletic over the academic pathway leaving an educational/vocational gap. As a result, teachers and coaches are required to support their student-athletes in achieving excellent academic and athletic performances and promote a dual career pathway.

4 Motivation Among Adolescent Student-Athletes

Besides performances, academic and athletic motivation of student-athletes in dual careers is considered by this dissertation. The DNA of dual careers model highlighted the influence of motivation on dual career pathways. If student-athletes are motivated to complete academic and athletic training, that they will presumably choose a dual career pathway that allows them to transition into working life easily after terminating their athletic career. It can also be assumed that student-athletes are more motivated for either school or sports. Therefore, they might choose one of the career pathways over the other, particularly during sensitive periods. In the following subchapters, motivation will be defined followed by a discussion on different approaches to understanding motivation. A focus will be set on the expectancy-value theory as this framework is the only theoretical basis used for evaluating dual career motivation (Aunola et al., 2018; Gaston, 2002). Moreover, possibilities of measuring motivation in academic and athletic as well as dual career contexts will be discussed. This chapter will close with summaries of the two publications related to dual career motivation which are part of this dissertation.

4.1 What is Motivation?

Motivation is a term commonly used to describe a decision made for or against a task. However, the attempt to explain or define motivation is exceedingly challenging. This challenge exists because motivation can be viewed from various disciplines within sport science. Motivation is commonly a research field of sport psychology as this field seeks to optimise the performance and well-being of individuals active in high-performance, leisure, and health sports by exploring developmental, social, and psychological aspects in diverse athletic settings. However, this dissertation is located in the research field of sport pedagogy. The connection between sport pedagogy and psychology has been highlighted by the AIESEP position statement regarding the definition of the field sport pedagogy. The position statement emphasised that this research field “is an interdisciplinary area of study centred on learners and learning in physical activity settings” (Armour, 2012, p. 2). In this sense, sport pedagogy is located where education and sports interconnect, also focusing on the psychological aspects of education in athletic settings. Therefore, this dissertation contributes to the gap in educational psychology within sport science by viewing motivation from a psychological as well as pedagogical perspective.

Generally, motivation can be described as the efforts and aspirations of an individual regarding a desirable task outcome. There are several tendencies within motivation research. Due to the focus of this dissertation on performances and achievements within academic and athletic

motivation, explications regarding motivation will be based on theories within achievement motivation. In terms of this focus, a differentiation needs to be made between achievement motivation and performance-motivated behaviour. Achievement motivation is the precondition for precisely this behaviour whereas performance-motivated behaviour aims at the achievement of a specific quality standard in different life spheres (Brandstätter et al., 2018). With relation to academic or athletic motivation, performance-motivated behaviour is the aspiration to be part of the national squad or the efforts to achieve outstanding grades in school. In this understanding of motivation, a person conducts specific tasks he/she expects to lead to the desired outcome. After the performance, a positive value is attributed to the outcome or the task itself. These assumptions are supported by the expectancy-value framework (see chapter 4.2 for more detail). This framework is of major importance as it does not only attribute value to the outcome but also to the task.

In contrast to the term motive, motivation is the activated orientation of the current life towards a positively rated target state (Rheinberg & Vollmeyer, 2019). In other words, motivation describes the state of a person at a specific point in time whereby this state can be seen as a continuous process that is, among other things, caused by a motive. While motivation is an alterable status, motives are highly generalised characteristics that remain stable over a specific period. Motives are the behavioural dispositions directed towards a generalised objective (Erdmann & Amesberger, 2008). Hence, motives influence the current motivation but do not present the only cause variable. Rheinberg and Vollmeyer (2019) present a baseline model of motivation psychology. This model assumes that besides motives other situational factors influence motivation. These situational factors are incentives that are congruent, and the motivation structures of a person result in the current motivation. The motivation, foremost, and not the motive influences the behaviour of a person. Therefore, instruments measuring motivational behaviour need to focus on the current motivation and not on motives. Another nuance of motivation is described by the term commitment. Commitments are the motivational forces behind stability and persistence (Scanlan et al., 1993). The authors identified five determinants of commitment: enjoyment, involvement alternatives, personal investment, social constraints, and involvement opportunities. Studies have used this understanding of motivation to measure athletic and academic commitment (O'Neil et al., 2021; Scanlan et al., 1993). However, to measure motivational behaviour, commitment is not a suitable framework.

4.2 The Expectancy-Value Framework

Previous explanations highlighted that there are inappropriate constructs for measuring motivation in elite sports and dual careers. An appropriate theory is the expectancy-value framework put forth by Wigfield and Eccles (2000) as it has already been used in other dual career motivation measurement instruments (Aunola et al., 2018; Gaston, 2002). This framework will be explored further and compared to other relevant theories such as the self-determination theory (R. M. Ryan & Deci, 2000), the self-efficacy theory (Bandura, 1977), and the goal orientation (Elliott & Dweck, 1988).

The central assumption of all achievement motivation theories is that the incentive for a task originates from the enjoyment of the task itself and/or from the self-assessed motivation for success or failure (Brandstätter et al., 2018). It needs to be highlighted that the motivation comes down to the affective experience of the task. The expected values of task alternatives and the probability of being able to perform the task are related to expectancy-value theories (Urhahne, 2008). Atkinson's (1957) choice-under-risk model is one of the expectancy-value theories. He assumes that a person chooses his/her tasks following the success incentive and the success probability by identifying two motives: the achievement motive (probability of success) and the avoidance motive (avoidance of failure). The expectancy-value framework put forth by Wigfield and Eccles (2000) is based on this assumption. The authors suggest that there are expectations regarding the successful performance of the task, on the one hand, and values attached to these tasks (task values), on the other hand. In sum, these two dimensions result in two sides of the same coin: the motivation to complete a task. The authors argue that the expectations can be differentiated into long- and short-term expectancies. The short-term and current expectancies are called ability beliefs. Expectancies directed towards the future are named expectations. These two sub-dimensions are summarised into one main dimension ability/expectation (Eccles et al., 2005). According to Wigfield and Eccles (1992), the task values are categorised into four sub-dimensions: attainment value, intrinsic value, utility value, and cost. These values can be defined as follows:

(1) attainment value: "the importance of doing well on a given task"
(2) intrinsic value: "the enjoyment one gains from doing the task",
(3) utility value: "how a task fits into an individual's future plans", and
(4) cost: "how the decision to engage in one activity limits access to other activities" (Wigfield & Eccles, 2000, p. 72).

The working group conducted several studies regarding this framework (Eccles et al., 2005; Eccles et al., 1993; Rodriguez et al., 2003; Wigfield & Eccles, 2000). These studies resulted in a concrete naming of the task values: importance, interest, usefulness, and cost. Interestingly, the task value cost was not used in any of the studies. Hence, further research is needed to examine the task value cost.

Although the expectancy-value framework seems to present an appropriate model for measuring motivation in athletic and academic contexts, weaknesses need to be considered. The framework assumes that a person has some sort of, mostly positive, expectations concerning the task. Failures related to the tasks are mostly neglected. Moreover, incentives related to the tasks in the sense of a challenge are ignored in this model since only the interest, importance, usefulness, and cost are considered. Nevertheless, the task itself can be seen as a challenge and, thus, presents an incentive for completing the task. Moreover, all studies of the working group are based on intrinsic motivation (Eccles et al., 2005; Eccles et al., 1993; Rodriguez et al., 2003; Wigfield & Eccles, 2000). External incentives are not considered with the task values.

As there are several attempts to frame motivation into a theory, one motivation theory naturally overlaps with other theories. The expectancy-value framework (Wigfield & Eccles, 2000) demonstrates severe similarities with the self-determination theory (R. M. Ryan & Deci, 2000). The self-determination theory assumes that motivation is to be placed on a scale from intrinsic motivation to amotivation whereby extrinsic motivation is placed in the middle of the scale. The construct of intrinsic motivation is described as the "natural inclination toward assimilation, mastery, spontaneous interest, and exploration that is so essential to cognitive and social development and that represents a principle source of enjoyment and vitality throughout life" (R. M. Ryan & Deci, 2000, p. 70). At the other end of the scale, amotivation is understood as the absence of volition. Extrinsic motivation can be defined as the "actions prompted by an external force or regulation" (Cook & Artino, 2016, p. 1010). R. M. Ryan and Deci (2000) explain the increase of intrinsic motivation and the simultaneous decrease of amotivation or extrinsic motivation with the increase of the basic psychological needs which are composed of relatedness, competence, and autonomy. Overlapping between this theory and the expectancy-value framework can be found in several places. For example, task values of the expectancy-value framework can occur in the intrinsic as well as extrinsic motivation of the self-determination theory. Another example can be found in the ability/expectancy dimension of the expectancy-value framework. As this dimension describes the current and future competence of

a successful completion of a task, parallels can be drawn to the basic psychological need competence in the self-determination theory. Irvine (2018, p. 11) presents the similarities of the self-determination theory and the expectancy-value framework on a diagram where "[c]ompetence lies on the expectancy side of the axis, while autonomy is one value side of the axis, [...]". Kröhler and Berti (2014) used the sport- and movement-related self-concordance-scale (sport- und bewegungsbezogene Selbstkonkordanz-Skala) to measure self-concordance among elite athletes which is based on the self-determination theory. The authors found that elite athletes do not differentiate between the gradations of intrinsic, integrated, identified, introjected, and external motivation, but perceived only two extremes, namely the intrinsic and extrinsic motivation. Hence, the expectancy-value framework seems to be a more reliable framework when it comes to measuring motivation among elite student-athletes than the self-determination theory.

Besides overlapping with the self-determination theory, further overlapping can be found between the expectancy-value framework and the self-efficacy theory (Bandura, 1977). One reason for their similarities can be found in the origin as both theories are part of the achievement motivation theories. The basic assumption of the self-efficacy theory is constituted in the belief that one person can complete a task. "Self-efficacy is a judgement of one's capability to learn or perform at a specified level" (Cook & Artino, 2016, p. 999). It is important to consider the differences between the self-efficacy expectations and the outcome expectations. The outcome expectations show the belief that a specific result will be achieved based on a specific action. Therefore, it can be assumed that a person demonstrates a certain self-efficacy that influences his/her behaviour. Within self-efficacy expectations, Bandura (1977) differentiates between four categories: performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal. Based on these assumptions, self-efficacy has a high degree of overlapping with constructs that are directed toward success expectations such as within the expectancy-value framework. Similarities can particularly be found for the dimension ability/expectancy. Nevertheless, differences are obvious in terms of dynamics and context-specificity. Although the expectancy-value framework and self-efficacy are theoretically different constructs, students do not perceive this difference (Meece et al., 1990). Therefore, when measuring dual career motivation, researchers need to be aware of the closeness of these two constructs.

Lastly, the overlapping between goal orientation and the expectancy-value framework can be identified based on the fact that goal orientation is also a prominent achievement motivation theory (Elliott & Dweck, 1988). This understanding of motivation assumes that a person performs a task because he/she seeks a specific goal (performance-approach goal) or avoids a task because he/she seeks to avoid the result of the task (performance-avoidance goal). Within the frame of goals or goal orientation, several theories will not be explained further in this dissertation. All theories of goal orientation have in common that their focus lies on the goal of a task. The task itself is supplanted. Nevertheless, the overlap between the task values in the expectancy-value framework and the goals directed towards a task in the goal orientation theory is obvious. Several studies have been conducted based on goal orientation or goal motives concerning dual careers (Healy et al., 2016), academics (Arens & Watermann, 2021), and athletics (Kröhler & Berti, 2014; Seelig & Fuchs, 2006; Sheldon & Elliot, 1999). Although goal orientation focuses on the task's goal, self-concordance according to Sheldon and Elliot (1999) as one representative of goal orientation discusses how the goals coincide with the interests and values of a person (R. Fuchs et al., 2005). Hence, when measuring dual career motivation, one needs to consider the interconnection of task values and the goals associated with this/these task(s) (values).

4.3 Measuring Motivation in the Athletic and Academic Contexts

As pointed out above, there are several theories and models as well as overlapping between these theories that serve as an explanation of how we understand motivation. Naturally, there are numerous ways to measure motivation. Clancy et al. (2017) pointed out that the most commonly used form of measuring motivation in sports is the self-assessment questionnaire (e.g. Gaston-Gayles, 2004; Martin, 2001). These questionnaires are primarily analysed quantitatively. Other measurement forms include interviews or observations which can be analysed qualitatively (Frühauf et al., 2017; Keegan et al., 2014). The quantitative and qualitative research methods present advantages and disadvantages. As it is intended to question about 300 student-athletes, a questionnaire analysed quantitatively seems to be the most suitable option for this dissertation.

Measuring motivation in an academic context is rather difficult as the research foci can be diverse. Several instruments have been developed to measure academic motivation in a specific context, i.e. in a particular subject (Eccles et al., 1993; Meece et al., 1990; Rodriguez et al., 2003). However, it is challenging to measure motivation for school itself. Martin (2001) suggested

measuring motivation for school by using the Student Motivation Scale. This scale attempts to combine several theoretical considerations which he categorises into boosters and guzzlers. Other studies use facilitators and barriers as a categorisation (Gavala-González et al., 2019). Boosters are factors that enhance motivation and achievement behaviours such as self-belief, persistence, and values. In contrast, guzzlers reduce motivation and achievement behaviours, for example, anxiety, avoidance, and self-sabotage. This scale aims to measure students' motivation and academic resilience. Martin (2001) showed that boosters are significantly correlated with achievement. This scale has such a complex theoretical background that it is unsuitable to measure academic motivation among student-athletes. A more focused scale was put forth by Vallerand et al. (1992). Their Academic Motivation Scale is based on the self-determination theory by R. M. Ryan and Deci (2000). This scale operationalises motivation as the underlying "why" factor of behaviour and focuses on the perceived reasons for engaging in an activity (Vallerand et al., 1992). In comparison to other instruments, the Academic Motivation Scale "assesses several types of motivation in a multidimensional fashion" (Vallerand et al., 1992, p. 1016) by exploring amotivation, extrinsic regulation, introjected regulation, identified regulation, and intrinsic motivation. However, this instrument is short in explaining the driving forces behind intrinsic and extrinsic motivation. Moreover, elite athletes only perceive the two extremes of intrinsic and extrinsic motivation (Kröhler & Berti, 2014). Simons et al. (1999) were one of the first researchers to explore academic motivation among student-athletes. Self-worthy theory served as a theoretical foundation for the construction of the instrument resulting in 300 items. The researchers identified four motivational types: success-oriented, overstrivers, failure avoiders, and failure acceptors. In sum, there are several possibilities for measuring academic motivation. Therefore, measuring motivation in an athletic context will be discussed to identify appropriate measurement instruments for dual career settings.

In comparison to an academic context, measuring motivation in an elite athletic context seems to be less complex. This simplicity might be because the research focus is clearly identified, in this case, elite sport motivation. Clancy et al. (2017) give an overview of the most prominent instruments used to measure motivation in sports. In an athletic context, some motivational theories are more prominent than others when choosing a theoretical foundation for a measurement instrument. The self-determination theory, for example, framed the Sport Motivation Scale by Pelletier et al. (1995) which is also used by other researchers (Sheehan et al., 2018). The scale was constructed parallel to the Academic Motivation Scale by Vallerand et al.

(1992) and provides insides into the understanding of athletic amotivation, extrinsic motivation, and intrinsic motivation among student-athletes. However, the scale has been heavily criticised as the results of the validity and reliability analyses did not meet statistical standards (Lonsdale et al., 2014). Therefore, other theoretical frames need to be considered.

Several instruments exist that measure motivation in athletic and academic contexts separately. However, to date, there are only two instruments that measure academic and athletic motivation among student-athletes simultaneously. Both instruments used the expectancy-value framework as a theoretical basis for construction. Aunola et al. (2018) conducted a longitudinal analysis among lower and upper-secondary school student-athletes to explore task values for sport and school work. They found that student-athletes with lower academic task values showed lower aspirations for their academic career, and student-athletes with lower athletic task values showed lower aspirations for their athletic career. Gaston-Gayles (2002, 2004, 2005) conducted a cross-sectional analysis among student-athletes in higher education using the Student-Athletes Motivation Toward Sport and Academics Questionnaire (SAMSAQ). The expectancy-value framework served as a conceptual framework for the SAMSAQ, but self-efficacy theory and attribution theory were also considered (Gaston-Gayles, 2005). The researcher identified three factors of dual career motivation: student athletic motivation, career athletic motivation, and academic motivation. The SAMSAQ seems to be the most prominent instrument to measure motivation in a dual career setting as it has been adapted for student-athletes in several countries across the globe (Lupo et al., 2015; Park et al., 2015; Quinaud et al., 2021).

4.4 Summary of Publication II

Niehues, M., Gerlach, E., & Sallen, J. (2021). Measuring dual career motivation among German student-athletes using the Student Athletes' Motivation Toward Sports and Academics Questionnaire. *German Journal of Exercise and Sport Research, 51*, 378-383. https://doi.org/10.1007/s12662-021-00723-9

The full article can be found in Appendix II (pp. XLII-XLVIII).

Since the SAMSAQ seems to be suitable for measuring dual career motivation in cross-cultural contexts, Niehues et al. (2021) attempted to adapt this instrument for German student-athletes in upper secondary school. The adaptation and translation process followed guidelines by Brandl-Bredenbeck (2005) to guarantee functional, cultural, linguistic, and conceptual equivalence. A sample of 208 student-athletes (52.4% females, mean age = 17,4 years) at three

German Elite Sport Schools participated in the study. In the first part of the study, the SAMSAQ was adapted to the German context and tested with the student-athletes. The second part of the study followed the revision of the initial adaptation of the SAMSAQ for the German context.

A series of exploratory factor analyses were conducted aiming to reproduce the three-factor structure of the SAMSAQ (Gaston-Gayles, 2004). However, no exploratory factor analysis resulted in the desired outcome as they failed to meet the statistical thresholds. The factor loadings favoured a two-factor model although this model did not meet the thresholds either. Nevertheless, this result would be in line with Gaston-Gayles' (2005) initial assumption that the SAMSAQ constitutes two subscales: an academic and an athletic motivation subscale.

There are several reasons for the deviations between the original and target SAMSAQ factor structures. The target group of the original SAMSAQ were student-athletes in higher education whereas the German sample consisted of student-athletes in secondary school. Moreover, the cultural background was different as the SAMSAQ was designed for the US-American context and the adaptation was intended for German settings. However, different career assistant programmes and structural organisations of dual careers exist in both countries to support their student-athletes. Lastly, the theoretical background of the instrument is not clear as several motivation theories have influenced the construction of the SAMSAQ. Hence, a new instrument needs to be developed to assess dual career motivation of student-athletes in upper secondary school. When constructing a new instrument, the theoretical background as well as the cultural background need to be considered.

Authors' Contributions

Maike Niehues and Jeffrey Sallen were mainly responsible for the overall conception and design of this study. Maike Niehues took the lead in adapting the SAMSAQ, in the statistical analysis, and in writing the manuscript. Jeffrey Sallen acted as the supervisor of the project. In addition, Jeffrey Sallen organised the study sample, led the data acquisition, and supported the adaptation of SAMSAQ. Erin Gerlach and Jeffrey Sallen were the principal investigators of the third-party research project where the data stem from. All three authors made substantial contributions to the analysis and interpretation of data. The manuscript was developed, revised, and approved to be published by all three authors.

4.5 Development and Conception of the Student-Athletes' Academic and Athletic Motivation Survey (SAAMS)

Since the adaptation and translation of the SAMSAQ to the German context was unsuccessful, a new instrument had to be developed. This instrument is called the Student-Athletes' Academic and Athletic Motivation Survey (SAAMS). Considerations regarding the construction of this new instrument will be briefly described below referring to the theoretical frame of the SAAMS, other instruments measuring dual career motivation, as well as the wording and construction of the SAAMS.

As a theoretical basis, the expectancy-value framework was chosen for the construction of the SAAMS. Other motivation theories as used by Gaston-Gayles (2005) have been ignored. For the new instrument, at least three items had to be constructed for each sub-dimension due to reasons of statistical evaluation. The decision to use this framework is based on the focus of this framework as well as the weakness of other theories as described in chapter 4.2. Nevertheless, overlapping between motivation theories needs to be considered. Items related to the dimension ability/expectation can show similarities to the self-efficacy theory. As these similarities are, however, not perceived by the student-athletes, no additional preventive steps need to be taken. The dimension task values can show relations to the self-determination and goal orientation theory. When constructing the new instrument, it was aimed to word the items of the task values with a focus on intrinsic motivation. This focus was chosen as studies have shown that intrinsic motivation leads to positive effects on behaviour persistence, well-being, performance, and self-worth (Kilpatrick et al., 2002; Standage et al., 2012; Sun & Chen, 2010). Moreover, connections to tasks associated with goal orientation were avoided.

Besides the overlapping of motivation theories, other instruments measuring dual career motivation need to be considered to ensure deviation from the SAAMS. Although numerous instruments measure motivation in an (elite) athletic context (e.g. Duda, 1989; Elbe, 2004; Elbe et al., 2005; Olofsson et al., 2008), there are only two instruments that measure athletic and academic motivation simultaneously. The SAMSAQ (Gaston, 2002; Gaston-Gayles, 2004, 2005) does not apply to German student-athletes in upper secondary school (Niehues et al., 2021). Aunola et al. (2018) present an instrument that measures task values in academic and athletic contexts. As only task values are measured, this instrument does not measure motivation fully as assumed by Wigfield and Eccles (2000).

Therefore, the new instrument had to be developed for student-athletes in a dual career by considering the athletic and academic context simultaneously. The wording of the items chosen for the SAAMS is primarily based on the items of the SAMSAQ as this is the only instrument that considers academic and athletic motivation simultaneously. However, there is no intention to reproduce this measurement instrument as the reproduction has proven to fail (Niehues et al., 2021). The aim was to have a strong orientation towards the expectancy-value framework to provide a clear theoretical foundation. Therefore, the wording of the SAMSAQ was adapted to the expectancy-value framework and adjusted to the athletic as well as academic context creating item pairs. The new instrument SAAMS consists of these items (see Niehues et al., 2023b, for detailed information).

4.6 Summary of Publication III

Niehues, M., Sallen, J., & Gerlach, E. (2023b). Student-Athletes' Academic and Athletic Motivation Scale (SAAMS) for adolescents in secondary school: Development, evaluation, and psychometric properties. *German Journal of Exercise and Sport Research. https://doi.org/10.1007/s12662-023-00921-7*

The full article can be found in Appendix III (pp. XLIX-LIX).

The SAAMS was developed and evaluated in a standardised procedure put forth by Boateng et al. (2018) which included three phases: item development, scale development, and scale evaluation. The SAAMS was intended to replicate the structure of the expectancy-value framework with the six factors ability beliefs, expectancies, importance, interest, usefulness, and cost. The initial version was tested with 346 student-athletes (47.7%, mean age = 17.3 years) and analysed using exploratory factor analyses. As the results of the exploratory factor analyses were not satisfactory – a six-factor structure was not replicated – the initial version was revised. The revised version was tested with 497 student-athletes (42.9% females, mean age = 17.0 years). To evaluate the revised and final version of the SAAMS, confirmatory factor analyses were used.

Several models were tested with the best result for a six-factor model. Hence, the structure of the expectancy-value framework was confirmed for the SAAMS using confirmatory factor analyses. Moreover, tests of validity and reliability verified the findings of the factor analyses. These tests were conducted to confirm the suitability of the SAAMS to measure athletic and academic motivation among German student-athletes in secondary school.

The SAAMS is suitable for an extensive range of research and practical applications. For example, the scale can be used for talent identification and selection when making decisions about the access to and provision of support services. Moreover, the SAAMS can be used to guide student-athletes through a successful dual career and document their longitudinal development. Documenting the status of student-athletes' motivation allows researchers to identify optimal motivation profiles for a successful dual career.

Authors' Contributions

All authors were responsible for the study's conception and design. Jeffrey Sallen acted as the initiator and supervisor of the study. Jeffrey Sallen organised sample 1 and led the data acquisition for the first study part. Maike Niehues organised sample 2 and led the data acquisition for the second study part. Maike Niehues took the lead in developing the SAAMS and in writing the manuscript. All authors made substantial contributions to the data analysis and interpretation. The manuscript was developed, revised, and approved to be published by all three authors.

4.7 Concluding Remarks on Academic and Athletic Motivation

The publications highlighted that a new instrument measuring dual career motivation among adolescent student-athletes had to be developed. The SAAMS was evaluated against the background of the expectancy-value framework and factor analyses confirmed a successful development. In a next step, the usefulness and applications of this instrument need to be explored. With regards to the DNA of dual careers model, it can be deduced that student-athletes who are equally motivated for their academic and athletic career can pursue a dual career pathway. If student-athletes prioritise one pathway over the other, additional resources and support services might be needed to motivate them for both pathways, increase their academic and athletic performance, and, thus, promote a dual career pathway. In the DNA of dual careers model, the academic and athletic motivation a student-athlete possesses can be seen as a resource for a successful dual career. Their dual career motivation can be measured by the SAAMS.

5 Performances and Motivation in a Dual Career

Previous chapters highlighted the role of athletic and academic motivation as well as performance within a dual career. The DNA of dual careers model suggests that there is an interactive effect between dual career performance and motivation. Within the model, motivation is understood as a resource to complete a successful dual career whereas performance serves as a requirement. The interactive effect of this resource and this requirement needs to be investigated. In the following, it will be discussed how academic performance and motivation are related. The same relationship will be explored in the athletic context. Finally, the relationships within academic and athletic contexts will be brought together. The chapter will close with a summary of this dissertation's final publication.

5.1 Relations Between Academic Performances and Motivation

The relationship between academic performance and motivation has been investigated in depth for students in secondary school (Brew et al., 2021) as well as for students in higher education (Afzal et al., 2010). As the target group of this dissertation are students in secondary school, the discussion on the relationship between academic performance and motivation will focus on this age group.

When exploring the influence of academic motivation on academic performance of students in secondary school, several motivation theories have been used as a theoretical framework as highlighted in chapter 4 of this dissertation. Elias et al. (2011) have found that the strongest predictors of academic performance in end-year examinations of students in secondary school are the future time perspective, self-efficacy, expectancy values, self-determination, and mastery goal. These findings suggest that numerous motivational variables can predict academic performance. Martin (2001) contributed to this finding by identifying three booster thoughts and two booster behaviours which positively influence academic performance including self-belief. Similar results were found for German students in upper secondary school which suggested that the ability self-concept was the strongest predictor of academic performance (Steinmayr et al., 2019). Sun and Chen (2010) found a positive impact of intrinsic motivation on in-class activity which can lead to better academic performances. Another construct that is closely related to motivation is the identification with a specific role (Eccles, 2009). Woodruff and Schallert (2008) called the interdependence between motivation and identity "motivational sense of self". Research has shown that the development of an academic identity is positively related to career outcomes, career readiness, sport-related competitiveness,

goal orientation, and win orientation (Brewer et al., 1993; Steele et al., 2020). Hence, several motivational variables will be considered when discussing the relationship between academic performance and motivation.

There have been different approaches to investigating the influence of academic motivation on performance. On the one hand, some studies explore the direct influence of academic motivation on performance, for example, by conducting multiple regression analyses (Elias et al., 2011; Steinmayr et al., 2019). On the other hand, studies have examined this influence indirectly by performing structural equation modelling (Fortier et al., 1995; Green et al., 2012). Independent of the investigation approaches, all studies generally found a positive relationship between academic motivation and performance. It has been highlighted that installing an "inner drive" (Elias et al., 2011, p. 1186) and believing in own competencies (Steinmayr et al., 2019) are the best options for enhancing students' academic performances through increasing motivation. The studies using multiple regression analyses highlighted the process of academic motivation affecting performance. Green et al. (2012) emphasised that motivation predicted positive attitudes toward school. These attitudes had a positive effect on class participation and homework completion which, in turn, led to positive academic performances. Fortier et al. (1995) highlighted that perceived academic competence positively influences autonomous motivation which had a positive impact on academic performance. Based on these findings, it can be summarised that academic motivation positively influences students' academic performances. However, the aspects that appear within the process of motivation influencing performance have not yet been identified in detail. Moreover, it seems that only the influence of academic motivation on performance has been explored and not vice versa. Nevertheless, it can be assumed that good academic performance can positively impact motivation which is also highlighted by the DNA of dual careers model (see fig. 3). The interactive effect of academic motivation and performance has yet to be explored in further investigations.

The impact of academic motivation on performance among students has been explored intensively. However, the focus on the target group of student-athletes regarding this research topic is scarce. Some studies have investigated the relationship between academic motivation and academic performances of student-athletes but conducted these studies with student-athletes in higher education (Carter, 2012; Fortes et al., 2010; Raabe et al., 2022; Simons et al., 1999). The only study that uses student-athletes in school as a sample for investigating the interaction of motivation and performance in a broader sense is the study by Aunola et al. (2018).

The researchers investigated the influence of task value patterns on career aspirations. Other forms of exploring academic motivation among student-athletes include basic psychological needs as well as academic commitment (O'Neil et al., 2021; Raabe et al., 2022). According to Carter (2012), academic self-efficacy is the strongest single predictor of academic performance among student-athletes. In general, the studies found that high academic motivation in student-athletes positively influences their academic performances. For example, findings indicated that student-athletes who showed a low academically motivated pattern were less likely to aim for a university career (Aunola et al., 2018). Although studies on academic performance and motivation have been conducted with student-athletes, these studies mainly focus on student-athletes in higher education. Further studies are needed to investigate the relationship between adolescent student-athletes' academic performances and motivation. The results can be useful to identify potential risks of a dropout of their athletic career in favour of an academic career.

5.2 Relations Between Athletic Performances and Motivation

The positive effects of academic motivation on performance have been highlighted above. Attention will now be drawn towards the athletic context. Since the target group of this dissertation are student-athletes, findings regarding this target group will be the focus of the following discussion.

Similar to academic motivation, athletic motivation has been explored on several levels when investigating the impact on athletic performance such as the self-determination theory (Gillet et al., 2009), commitment to sport (O'Neil et al., 2021), or the expectancy-value framework (Aunola et al., 2018). Moreover, athletic identity has been investigated with regard to athletic performance (Brewer et al., 1993; Steele et al., 2020) indicating a positive association between identity and performance (Waud & Weese, 2023). Nichols et al. (2019) identified that the different frameworks including the mindset, personal growth, as well as experience have positive attributes towards athletic performance. In addition, self-determined motivation has a positive impact on physical activity and sport performance (Gillet et al., 2009; Kilpatrick et al., 2002; Standage et al., 2012; Sun & Chen, 2010). Other studies found that hope for success as one of the achievement motives is a positive indicator of talent among German 13-year football players and should be fostered among adolescent athletes to promote athletic talent (Zuber & Conzelmann, 2014). In terms of the three basic psychological needs, student-athletes' in team sports feel that their relatedness has a direct impact on the team's performance (Raabe et al.,

2022). Besides relatedness, other studies explored further psychological needs among student-athletes. These studies found a positive relationship between the satisfaction of these needs and sport commitment (Alesi et al., 2019; O'Neil et al., 2021) as well as athletic performance (Gillet et al., 2009; Haraldsen et al., 2020; Hodge et al., 2009). When viewing athletic performance in a broader sense namely in career aspirations, student-athletes with low sport motivation patterns were less likely to make sport their professional career (Aunola et al., 2018; Ramis et al., 2023). In general, these findings indicate that athletic motivation has a positive impact on athletic performance. So far, no study has been conducted regarding the effect of athletic performance on motivation. The DNA of dual careers model suggests that there is an interactive effect of motivation and performance. For example, it can be assumed that if an athlete performs well in a competition, this positive result will boost his/her motivation. Therefore, the interactive effect of athletic motivation and performance should be explored in further studies. These studies are urgently needed to identify potential needs of support which will aid student-athletes in following a successful dual career.

5.3 Dual Career Performances and Motivation

The DNA of dual careers model emphasises the importance of academic and athletic performance and motivation in a dual career. The previous chapters outlined the effect of academic and athletic motivation on performance. Unfortunately, there seem to be no findings regarding the influence of academic and athletic performances on dual career motivation although it can be assumed that there is indeed an impact. Hence, this chapter will focus on discussing the effect of dual career motivation on performance. Moreover, studies exploring the interactive effect of academic motivation on athletic motivation and of athletic motivation on academic performance are scarce. Viljaranta et al. (2023), for instance, only explored the interactive effect of academic motivation on athletic motivation and vice versa highlighting that student-athletes who reported higher task values for school also placed higher task values on sports. Due to the scarcity of literature on interactive effects, only assumptions can be made based on research findings regarding academic and athletic performance as well as motivation.

First, the effects of dual career motivation on athletic and academic performances will be discussed against the background of the DNA of dual careers model. The double helix representing the successful dual career pathway highlights that there is a balance between the requirement and resources within a dual career (see fig. 3). Regarding motivation and performance, it can be assumed that if student-athletes experience balanced success in their

academic and athletic career, their motivation for or against either of these careers will stay balanced. This balance will aid student-athletes in experiencing a successful dual career. Nevertheless, studies have emphasised that conflicts between sport and school result in higher academic perceived stress than athletic perceived stress (Grassinger et al., 2023). This higher perception of academic stress can also explain why Ramis et al. (2023, p. 9) found that motivational profiles "are increasingly drifting away from a balanced dual career logic". As a result, it can be assumed that other factors contribute to a successful dual career such as coaches or financial support (Capranica et al., 2022; Condello et al., 2019; Robnik et al., 2021; C. Ryan, 2015). Thompson et al. (2022) categorised the impacts of sport schools on dual careers into three groups: positive impacts, inconclusive impacts, and negative impacts. The research group found motivation as well as academic and athletic success to be inconclusive impacts which highlights that these factors can have positive as well as negative effects on a successful dual career. As a consequence, a balance between the resources and requirements is optimal for dual career development, although this balance does not necessarily mean that student-athletes have to spend equal amounts of energy on both careers (Aquilina, 2013). Moreover, research has found that those student-athletes who show a strong balanced commitment to sport and school yield the most optimal academic, athletic, and general life outcomes (O'Neil et al., 2021). In addition, pursuing goals in sport and academics simultaneously resulted in a facilitation of the athletic and academic goals (Healy et al., 2016). In terms of identity, Settles et al. (2002) highlighted that student-athletes perceived high levels of well-being when they viewed their roles as students and as athletes separately. Thus, it can be deduced that student-athletes need to find their own balance which can vary depending on the requirements and resources available to them as highlighted by the DNA of dual careers model.

Second, the effects of dual career motivation on athletic performance will be discussed. Assumed effects are highlighted by the double helixes in the DNA of dual careers model. For instance, student-athletes experience a sporting gap if they decide to focus on their academic pathway. The prioritisation of the athletic career can be heavily influenced by academic and athletic motivation (Ramis et al., 2023). For example, females and athletes with lower competitive levels or sports with low professionalisation identify more with their academic role as they fear that they are unable to provide for themselves once their athletic career terminates (Brustio et al., 2020; P. X. Fuchs et al., 2016; Lopez de Subijana et al., 2015; Ramis et al., 2023; Seabrook Rowles, 2015; Stambulova et al., 2015; Steele et al., 2020; Viljaranta et al., 2023). This identification might

lead to lower athletic motivation. Due to their lower athletic motivation, it can be assumed that these student-athletes' athletic performances are worse than males or athletes in sports with high professionalisation such as football or golf and, thus, turn towards an academic career. Moreover, research has shown "[...] that lack of motivation is associated with high levels of sport burnout symptoms [...]" (Sorkkila et al., 2020, p. 2) which, in turn, can lead to elite sport dropout. In contrast, high indicators of academic and athletic motivation can have a positive effect on athletic performances as student-athletes with this motivation pattern are more likely to be accepted at sport schools (Aunola et al., 2018). With additional athletic support from their sport school, these student-athletes can develop better in terms of their athletic career.

Lastly, the effects of dual career motivation on academic performance will be discussed. As proposed by the DNA of dual careers model, student-athletes might experience an educational and/or vocational gap if their focus on their athletic career is higher than on their academic career. Student-athletes with higher motivation in the athletic context tend to neglect their academic requirements (Cartigny et al., 2021) and are, thus, less likely to plan for post-athletic career opportunities (Waud & Weese, 2023). As a result, it can be assumed that their academic performance is negatively affected by their athletic motivation. Therefore, these student-athletes decide to prioritise their athletic career over their academic career. Besides exploring academic and athletic motivation separately, Aunola et al. (2018) investigated dual career motivation simultaneously and found that student-athletes with high indicators of dual career motivation were more likely to plan for a higher education career. Hence, it can be assumed that dual career motivation has a positive effect on academic performance. This assumption supports the need to foster dual career aspirations among student-athletes.

5.4 Summary of Publication IV

Niehues, M., Gerlach, E., & Sallen, J. (2023a). *Student-athletes' perception of basic psychological need support in sports and school? Cross-sectional and longitudinal perspectives using a cluster-analytical approach* [Manuscript submitted for publication]. Arbeitsbereich für Bewegungs- und Sportpädagogik, Universität Hamburg.

The manuscript has been submitted for publication.

The DNA of dual careers model referenced the interactive effect of dual carer motivation and performance (fig. 3). However, there are hardly any studies that explore academic and athletic motivation and performance as well as their interactive effect. The fourth study within this

dissertation aims to contribute to this lack of research by investigating dual career profiles based on the perceived basic psychological needs support. A sample of 236 student-athletes (47.5% females, mean age = 16.3 years) participated in the study. The data analysis followed a cross-sectional as well as longitudinal analysis.

The cluster analysis which was based on the student-athletes' academic and athletic perceived basic psychological needs support resulted in five groups. One group were positive thinkers which consisted of student-athletes who demonstrated high results for their perceived support of basic psychological needs in the academic and athletic domain. The easy-goers were those student-athletes who demonstrated medium results for their academic and athletic perceived support in terms of their basic psychological needs. The socials showed a high perceived support for their academic and athletic relatedness. There was also one group that showed higher results in the athletic perceived support of basic psychological needs (sporties) and one group with higher results in the academic domain (learners).

These five profiles were then examined cross-sectionally in relation to student-athletes' academic and athletic performances as well as characteristics using analyses of variance. The findings indicated that the five groups differed regarding their academic and athletic personal characteristics. However, the five groups showed no differences in terms of their academic and athletic performances.

In the longitudinal analyses, repeated measurement analyses of variance were conducted to explore the development of these five groups. These analyses highlighted that the groups developed indifferently in terms of their academic and athletic personal characteristics and performances. An exception was found for the grade in Physical Education.

Authors' Contributions

Jeffrey Sallen and Erin Gerlach were the principal investigators of the third-party research project where the data stem from. Jeffrey Sallen and Erin Gerlach were mainly responsible for the overall conception and design of this study. Maike Niehues took the lead in the conception of the manuscript, in the statistical analysis, and in writing the manuscript. Jeffrey Sallen acted as the supervisor of the project. In addition, Jeffrey Sallen organised the study samples and led the data acquisition. All authors made substantial contributions to the analysis and interpretation of data. The manuscript was developed, revised, and approved to be published by all authors.

5.5 Concluding Remarks on Performances and Motivation in Dual Careers

Previous research showed that academic and athletic motivation can have positive and negative effects on academic and athletic performance. However, the interactive effect of academic and athletic motivation on academic and athletic performance and vice versa has scarcely been investigated although the DNA of dual careers model proposes an effect. The publication (Niehues et al., 2023) showed that there are some effects between academic and athletic motivation, performance, and personal characteristics, but the impacts on each other are not clear yet. Future research should focus on these interactive effects to identify factors that lead to and prevent sporting as well as educational gaps, possibly using the SAAMS (Niehues et al., 2023). These identified factors can help researchers and practitioners in preparing and supporting student-athletes for a dual career pathway.

6 Discussion and Conclusion

6.1 Summary

The present dissertation aimed to explore the academic and athletic motivation, performance, as well as their interactive effects among adolescent student-athletes in dual careers. For this purpose, the dissertation followed the three objectives that have been mentioned above:

(1) investigating the academic and athletic performances of student-athletes in dual careers,
(2) exploring dual career motivation including athletic and academic motivation, and
(3) examining the impact of student-athletes' athletic and academic motivation on academic and athletic performance and vice versa.

In dual career research, several theoretical foundations have been suggested to illustrate transitions in dual careers, different pathways, as well as a life course approach to dual careers (Baur, 1998; Cartigny et al., 2021; Wylleman & Lavallee, 2003). However, none of these models was able to depict a dual career in an integrated approach. Therefore, a new model, the DNA of dual careers model, was designed (see fig. 3). This model integrates transitions as well as different pathways in dual careers and demonstrates the impact of different requirements and resources on dual career pathways. Within these requirements and resources, academic and athletic motivation as well as performance can be understood as integral parts which either facilitate or impede successful dual careers.

Previous research has shown that there are several instruments for measuring academic (Emrich et al., 2009; Kehne et al., 2018; van Rens et al., 2015; Wartenberg et al., 2014) and athletic performances (Eganov et al., 2021; Javed et al., 2022; Peterson et al., 2022; Rano et al., 2019). All studies indicate factors that influence athletic performance (Eganov et al., 2021; Javed et al., 2022) and that athletic performance is an indicator of talent identification and development in dual careers (Peterson et al., 2022). Regarding academic performance in dual careers, findings are inconclusive which was highlighted by Niehues' et al. (2022) findings. Some studies found that student-athletes perform better academically than their peers (Jonker et al., 2009) whereas other studies found the contrary (Emrich et al., 2009; van Rens et al., 2015).

In terms of academic and athletic motivation, several measurement instruments and theoretical frameworks have been put forth in the two research fields respectively (Allmer, 1973; Elbe et al., 2005; Martin, 2001; Pelletier et al., 1995; Seelig & Fuchs, 2006; Simons et al., 1999). However, only

two studies so far examined academic and athletic motivation simultaneously in a dual career context (Aunola et al., 2018; Gaston, 2002). Gaston (2002) measured academic and athletic motivation among student-athletes in higher education. The measurement instrument proposed in this study is not suitable for student-athletes in secondary school (Niehues et al., 2021). In contrast, Aunola et al. (2018) explored dual career motivation among student-athletes in school by using the expectancy-value framework. Unfortunately, the research group only considered the task values and rejected the idea of expectancies within the framework. Hence, Niehues et al. (2023) developed the SAAMS to explore the dual career task values as well as expectancies among student-athletes in upper secondary school.

Due to previously made remarks, it can be assumed that academic and athletic motivation as well as performance influence dual careers. The DNA of dual careers model underlines this assumption and even suggests an interactive effect of motivation and performance. However, this interactive effect has yet to be proven as previous studies only confirm the impacts of academic (Carter, 2012; Fortes et al., 2010; Raabe et al., 2022; Simons et al., 1999) and athletic motivation (Gillet et al., 2009; Haraldsen et al., 2020; Hodge et al., 2009) on performances. These studies found that high academic and athletic motivation generally has a positive influence on academic and athletic performances. Niehues et al. (2023) were first to explore the interactive effects of academic and athletic motivation as well as performances.

6.2 Discussion

Although several studies have been conducted in the research field of motivation and performance in dual careers, there are still some blind spots that have to be investigated further. Some of these blind spots have been clarified by the publications within this dissertation. The results of these publications will be discussed in the following subchapters with reference to other findings by addressing the (1) theoretical underpinnings, (2) the measurement instruments and the data analysis, as well as (3) the results of each publication.

6.2.1 Performances Among Adolescent Student-Athletes

Theoretical Underpinnings

In terms of transitions concerning academic and athletic performances, Wylleman and Lavallee (2003) suggested that student-athletes in upper secondary school face severe changes in this age group. On the athletic level, student-athletes are on the verge of transitioning into adult elite sports which poses an additional challenge to improving their athletic performance significantly. Similarly, student-athletes in this age group prepare for either an academic or vocational career

after their compulsory school education. This preparation challenges student-athletes to perform well academically to be able to attend university, for example. Cartigny et al. (2021) suggested that student-athletes at this point in their dual career make their first decision of prioritising one career over the other or making efforts to combine both careers. By fusing the academic and athletic demands/transitions in the DNA of dual careers model, the sensitive phase at this stage becomes obvious. In terms of supporting student-athletes in this phase, sport schools as well as sport federations have developed several support services (P. X. Fuchs et al., 2016). One support service has been developed uniquely for German student-athletes at one particular sport school and is known as the "Additives Abitur" (Sallen & Gerlach, 2020). This programme allows student-athletes to expand their Abitur by one and in some cases by two years as well as distributing the final Abitur exams over a course of three to four years.

The Measurement Instrument

The study by Niehues et al. (2022) used standardised scholastic assessments as well as self-reported grades as measures to evaluate the successfulness of the support programme "Additives Abitur". Using both measures allows for a more objective and diverse evaluation (see also chapter 3.5). The evaluation of the scholastic performance's development is based on these two assessments. By considering the development, the evaluation of the performances as well as the support programme is not only oriented towards a product but also the process as a focus on product orientation for the assessment of scholastic performances only has been heavily criticised (Erdmann, 2008).

Results of the Publication

Within the evaluative study, the impact of different characteristics on the development of student-athletes' academic performances has been examined. These characteristics included the school type (sport school versus regular school), athletic engagement (active in elite sport versus inactive in elite sport), and Abitur choice (regular Abitur versus Additives Abitur). The scores of the student-athletes in the standardised scholastic assessments stayed below recommendations which is in line with previous assumptions that student-athletes are unable to achieve similar academic performances as non-athletes at regular schools (Emrich et al., 2009; van Rens et al., 2015). Student-athletes' academic performances at sport schools developed worse than non-athletes' performances at regular schools which is contrary to previous findings by Jonker et al. (2009) but in line with findings by Emrich et al. (2009) and van Rens et al. (2015).

Moreover, athletic engagement can have an impact on academic performance, but findings regarding this aspect are diverse. Some findings suggested that there are no differences between student-athletes' and non-athletes' academic performances (Kehne et al., 2018; Wartenberg et al., 2014). However, these studies assessed academic performances by using the grades as a measurement device only. Niehues' et al. (2022) findings regarding the grades and the standardised scholastic assessments were partly contradictory. This contradiction highlights the assumption that grades are not an objective indicator of academic performance (Malouff & Thorsteinsson, 2016). As standardised scholastic assessments are more objective, it seems wrong to assume that there are no differences between these two student groups' academic performances. Further studies are needed to verify whether student-athletes and non-athletes perform differently in terms of their academic career as the study by Niehues et al. (2022) only considers the performances in the subject English. Academic performances should not only be measured by using the grades in different subjects but also by conducting standardised performance tests to avoid biases. Moreover, it is surprising that no study so far evaluated the effect of attending a regular versus a sport school on student-athletes' academic performances.

Lastly, no significant differences were found in student-athletes' academic performances who took the regular Abitur versus those who took the Additives Abitur. The usefulness of support services for adolescent student-athletes such as the Additives Abitur needs to be explored further as most studies concerning support services have been conducted with student-athletes in higher education (Brustio et al., 2020; P. X. Fuchs et al., 2016; McKenna & Dunstan-Lewis, 2004). Nyberg et al. (2022) conducted a retrospective study among student-athletes to explore the effectiveness of attending dual-career sport schools as these schools provide diverse support services for student-athletes. The researchers found no significant relationship between attending these schools and their sporting success nor their advancement to higher education. The findings regarding the academic performances were supported by Sallen et al. (2023) who highlighted that the school performances of student-athletes were not related to the choice of dual career support services. However, the researchers found that student-athletes who use more support services invest more time in athletic training, are more likely to participate in high-ranking competitions, and are more often members of an athletic elite squad. Hence, the impact of these support services on academic and athletic performances has not yet been clarified. Moreover, these support services might have a positive impact on student-athletes' general well-being and/or health. These impacts should be explored in further studies.

The present study (Niehues et al., 2022) highlighted the importance of promoting academic success among student-athletes in dual careers. The authors showed that student-athletes are unable to perform on the same level academically as non-athletes. In the future, further support services need to be developed and evaluated to promote a successful dual career pathway. Moreover, this study only focused on the evaluation of academic performance development. There is still no knowledge of the development of athletic performances, partly because these performances are difficult to measure objectively and reliably (see chapter 3.3).

6.2.2 Motivation Among Adolescent Student-Athletes

Theoretical Underpinnings

Motivation has been identified as a resource for a successful dual career in the DNA of dual careers model (fig. 3). Several motivational theories have been used to explore motivation in an academic and athletic context respectively. However, when measuring dual career motivation, the expectancy-value framework by Wigfield and Eccles (2000) is the only framework that has been used (Aunola et al., 2018; Gaston, 2002). Due to the advantages of this framework for the academic and athletic contexts as highlighted in chapter 4.2, this framework will be used as a theoretical underpinning for exploring dual career motivation.

The Original Measurement Instrument and Its Results

In a first attempt (Niehues et al., 2021), the SAMSAQ proposed by Gaston (2002) was adapted to the German context and prepared for student-athletes in upper secondary school. Although recommendations regarding the adaptation process have been followed (Brandl-Bredenbeck, 2005), the German version of the SAMSAQ was not able to reproduce the three-factor structure (Gaston, 2002). The original research as well as further adaptations identified three factors: academic motivation, student athletic motivation, and career athletic motivation (Lupo et al., 2015; Park et al., 2015; Quinaud et al., 2021). Kerstajn and Topic (2017) even go so far as to identify career athletic motivation as dual career motivation. This interpretation might be the key reason why the SAMSAQ is not adaptable to German adolescent student-athletes. The instrument aims to depict motivation among student-athletes who have already made decisions for or against their academic or athletic career by attending higher education and simultaneously engaging in elite sports. In contrast, German student-athletes in upper secondary school did not have to make harsh decisions yet regarding their dual career at the point in time of being questioned as their schools allowed them to combine both careers from an early age. Nevertheless, motivation is a key aspect of performing well in sports (Clancy et al., 2017) and should be investigated among

student-athletes in secondary school (Park et al., 2015; Stambulova & Wylleman, 2019). Hence, an instrument needs to be developed that measures academic and athletic motivation among adolescent student-athletes in dual careers.

The Newly Developed Measurement Instrument and Its Results

Such an instrument was developed by Niehues et al. (2023). The SAAMS is strongly directed towards the expectancy-value framework to avoid a mixture of theoretical underpinnings (Eccles et al., 1993). Eccles et al. (1993) already used the framework successfully in a school and sport context. Moreover, Aunola et al. (2018) and Gaston (2002) used this framework in a dual career context. Therefore, the expectancy-value framework is a suitable theoretical framework for the SAAMS. As Gaston-Gayles (2005) initially aimed for a two-factor structure with her SAMSAQ, the SAAMS measured motivation in two contexts: the academic and the athletic context. The results of the confirmatory factor analyses verified the measurement of motivation in the academic and athletic context. In addition, the analyses emphasised the six-factor structure that has been proposed by the six dimensions in the expectancy-value framework. Moreover, tests of reliability and validity confirmed the adequacy of the SAAMS. When comparing the statistical results of the SAAMS, one can argue that the SAAMS provides a more stable instrument for measuring dual career motivation. Gaston-Gayles (2005) declared a successful implementation based on good internal consistency and acceptable factor loadings in the exploratory factor analysis and an RMSEA value of .069. No further fit indices have been discussed. Aunola et al. (2018) only provided Cronbach alpha reliabilities ranging from .72 to .86. The study by Niehues et al. (2023) provides a more detailed evaluation procedure of the SAAMS with better statistical results (e.g. RMSEA = .048, Cronbach alpha reliabilities ranging from .74 to .89). Thus, a successful implementation of the SAAMS can be deduced.

Results of the Publications

The present studies regarding motivation in dual careers provided a possibility of measuring motivation among adolescent German student-athletes (Niehues et al., 2021; Niehues et al., 2023). The usability and applicability of the SAAMS have yet to be established. Further studies in international contexts could explore whether the SAAMS applies to adolescent student-athletes in other countries as recent studies have done with the SAMSAQ (Lupo et al., 2015; Park et al., 2015; Quinaud et al., 2021). Moreover, the SAAMS could be applied in practical settings, for example, in talent identification or the evaluation of adequate dual career support services. In research settings, the SAAMS can potentially be used by documenting longitudinal

developments of student-athletes' dual career motivation. Considering previous assumptions made for academic and athletic performances, it would be interesting to explore how athletic and academic motivation impact performances and vice versa by using the SAAMS.

6.2.3 Performances and Motivation in Dual Careers

Theoretical Underpinnings

The DNA of dual careers model suggests that academic and athletic motivation and performance have an impact on dual career pathways. Moreover, the model assumes that there is an interactive effect between motivation and performance. Other theoretical frameworks emphasise the impacts of motivation and performances on dual careers by highlighting academic and athletic performance transitions (Wylleman & Lavallee, 2003), performance gaps (Cartigny et al., 2021), as well as motivation resources and performance requirements (Baur, 1998). Previous studies have focused on the impact of student-athletes' academic motivation on academic performance (Carter, 2012; Fortes et al., 2010; Simons et al., 1999) as well as athletic motivation on athletic performance (Alesi et al., 2019; Gillet et al., 2009; Haraldsen et al., 2020; Hodge et al., 2009; Nichols et al., 2019; Zuber & Conzelmann, 2014). As no study so far investigated the interactive effects of academic and athletic motivation on performance, Niehues et al. (2023) aimed to explore student-athletes' dual career motivation profiles in relation to athletic and academic performances as well as personal characteristics.

The Data Analysis

To provide a broader picture of performance indicators, academic performances have been measured by the grade point average and by the time student-athletes spend on their school work. Athletic performance was measured by the grade in Physical Education, the time spend on training, and student-athletes' squad level. Although it would be favourable to combine these performance indicators into one variable, due to reasons of complexity the performance indicators have been analysed separately. Further studies should explore possibilities of measuring dual career performances, particularly for athletic performances. Motivation in the academic and athletic context has been measured based on the self-determination theory following Klieme et al. (2005-2006). The researchers proposed an instrument that captures the academic and athletic perceived basic psychological need support climate. Hence, motivational personality traits of student-athletes have not been investigated. Future studies exploring the interactive effect of academic and athletic motivation and performance should focus on these personality traits, for example by using the SAAMS (Niehues et al., 2023).

Results of the Publication

The results of the motivational profiles' investigation are in line with previous findings indicating a profile with high and medium perceptions of basic psychological needs support (Earl et al., 2019; Ng et al., 2016; Raabe et al., 2022). However, further profiles were found which is probably because the profiles have been established based on two life contexts. These profiles included one group of student-athletes with high perceptions of basic psychological needs support for the athletic context (sporties) and one group with high perceptions of academic support (learners). One further group showed high perceptions of the basic psychological need relatedness. Interestingly, this group consisted mainly of student-athletes active in team sports. Hence, it can be assumed that due to their type of sport, these student-athletes experience exceptionally high support from their teammates. Other studies found profiles with a generally low perception of basic psychological needs which was not replicated by the present study (Haraldsen et al., 2020; Raabe et al., 2022). The absence of this replication can be because student-athletes perceive basic psychological needs on a medium or high level in at least one life context.

Previous studies suggested that academic and athletic motivation positively impact performance (Fortier et al., 1995; Gillet et al., 2009; Green et al., 2012; Haraldsen et al., 2020; Hodge et al., 2009; Kilpatrick et al., 2002; Martin, 2001; Standage et al., 2012; Steinmayr et al., 2019). This finding was not replicated in the cross-sectional part of the study possibly because the performance indicators are not be sufficient to provide a full picture of student-athletes' academic and athletic performances. Arguably, performances also include personal characteristics such as self-concept or career satisfaction. This positive relation was found for the profiles which is in line with the assumption that motivation correlates positively to well-being (Stenling et al., 2015).

Similar results were found in the longitudinal analyses. Although the development of personal characteristics in relation to the motivational profiles was more significant than for the performances, the only significantly different development between the profiles was found for the grade in Physical Education. This finding suggests that the motivational profiles do neither impact general well-being nor performances longitudinally. Nevertheless, the developmental tendencies indicated that there might be some sort of impact as the learners' academic personal characteristics developed better whereas the sporties showed a better development for their athletic personal characteristics. It seems that the interactive effect of academic and athletic motivation and performances has not yet been fully uncovered.

The present study regarding the impact of student-athletes' academic and athletic motivation profiles on performances and personal characteristics provided new insights into dual career motivation research as it is first in identifying motivational profiles by considering the athletic and academic context simultaneously. In general, it can be argued that student-athletes' motivation can predict general well-being but not performance although the results of the longitudinal analysis limit this proposal. Nevertheless, multiple studies have suggested a positive impact of motivation on performance. Hence, it would be interesting to investigate in more depth whether the positive impact of motivation on general well-being influences a positive impact of well-being on performances, possibly in multiple regression analysis and by using different measurement instruments for assessing motivation and performance.

6.3 Conclusion and Prospects

The present dissertation provided an overview of diverse research topics within the field of dual career research from a sport pedagogical point of view including academic and athletic motivation as well as performance. Findings showed that student-athletes' development of academic performances differs based on their athletic engagement and their usage of support services. In terms of motivation, a new instrument has been developed that measures academic and athletic motivation of student-athletes in upper secondary school. Lastly, the interactive effect of academic and athletic motivation on performance has been investigated. Findings suggested that motivational profiles can be a predictor of general well-being in the athletic and academic context but not of athletic and academic performances.

All publications within this dissertation highlighted that further research is needed to fully understand the impacts of motivation and performance on dual careers as well as the impact of motivation on performance and vice versa (Niehues et al., 2021, 2023; Niehues et al., 2022; Niehues et al., 2023). The impacts of motivation and performance on dual career pathways have been discussed in detail and fed into the DNA of dual careers model. The findings of this dissertation's publications as well as other research emphasised that motivation can positively and negatively impact dual career pathways (Baron-Thiene & Alfermann, 2015; Brew et al., 2021; Cartigny et al., 2021; Thompson et al., 2022). Based on these findings, assumptions can be made towards dual career pathways. If student-athletes are motivated positively for their academic and athletic career, they tend to follow a dual career pathway. If student-athletes prioritise one of the pathways over the other, they tend to focus on the prioritised pathways. These assumptions need to be confirmed by further studies, possibly using the SAAMS.

In terms of dual career pathways, assumptions can be made for academic and athletic performances. Performing well in academics and sports allows student-athletes to follow a dual career pathway. However, if student-athletes struggle to perform well in either of the contexts, they might prioritise one pathway over the other. Reasons for the prioritisation might be the insecurities awaiting after the termination of the athletic career or the lack of financial, personal, or social support (Brettschneider, 1999; Ekengren et al., 2020; McKenna & Dunstan-Lewis, 2004; Stambulova & Wylleman, 2019). As other studies highlighted that motivation impacts performance, promoting motivation among student-athletes in dual careers seems sensible. One possibility for promoting motivation is to provide dual career support services to keep student-athletes within dual career pathways. In turn, the engagement in support services will allow student-athletes to perform better academically and athletically. One can argue that their performances will then again influence their motivation. However, this assumption still needs to be verified. In general, researchers and practitioners should focus their research and decision-making on ways that allow student-athletes to

(1) balance their motivation for an academic and athletic career by providing guidance for a successful dual career pathway,
(2) make room for the development of other pathways such as a personal or family life,
(3) develop, sustain, and maximise their well-being and performances in the academic and athletic field, and
(4) plan for a life after the termination of their elite athletic career.

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Summary

Since the EU guidelines on dual careers of athletes were published in 2012, research in this field has increased, particularly in European countries. Research topics include, for instance, dual career motivation and performances of student-athletes. Motivation among student-athletes in higher education has been explored in depth. However, the target group of student-athletes in school has not been given much attention. Moreover, in a dual career student-athletes are compelled to perform well academically and athletically. Extraordinary performances in an athletic context are essential for placing in (inter)national competitions. Excellent academic performances are indispensable for a professional career after the termination of the athletic career.

The predicament of combining both careers successfully is captured by the DNA of dual careers model within this dissertation. The model highlights the effects various requirements and resources can have on a successful dual career. If one of the careers is prioritised over the other for a longer period, this decision might lead to a sporting or educational/vocational gap depending on the prioritisation. If there is a balance between both careers, student-athletes can follow a successful dual career. To guide student-athletes through a successful dual career, various measures can be taken such as providing dual career support programmes.

In a first publication, this dissertation aims to evaluate such a support programme named “Additives Abitur” by investigating the effects of three criteria on the development of scholastic performances. The criteria include the school type (sport school versus regular school), the athletic engagement (elite performers versus non-elite performers), and the type of Abitur (regular Abitur versus Additives Abitur). Standardised scholastic performance tests are conducted at the beginning and end of upper secondary school education with 159 students at three German sport schools and three regular schools. Repeated-measurement analyses are run to explore the effects of the three previously mentioned criteria. Findings indicate that the developments of the scholastic performances differ for the school type but not for the type of Abitur. The findings regarding the athletic engagement are inconclusive.

As the DNA of dual careers model categorises performances as a requirement for dual careers, resources should also be considered. One of these resources is the dual career motivation which is addressed by the second and third publication within this dissertation. In a first step, a well-established instrument to measure academic and athletic motivation is adapted for German student-athletes in upper secondary school. In total, 208 student-athletes are questioned using

the adapted version of the Student Athletes' Motivation Toward Sports and Academics Questionnaire (SAMSAQ). The findings of the exploratory factor analyses are unable to reproduce the original factor structure of the SAMSAQ. Hence, a new measurement instrument has to be developed which captures dual career motivation among German student-athletes in upper secondary school. The Student-Athletes' Academic and Athletic Motivation Survey (SAAMS) is proposed in the third publication based on the expectancy-value framework. The SAAMS is tested with a total of 843 student-athletes in two sub-studies. Exploratory and confirmatory factor analyses are conducted to evaluate whether the SAAMS can reproduce the structure of the expectancy-value framework. Findings indicate a successful design of the instrument based on the framework as the factor structure is reproduced by the factor analyses.

The last publication of this dissertation aims to blend the previous publications by combining research on dual career motivation and performance. A total of 236 student-athletes are questioned about the perceptions of basic psychological needs support in an athletic and academic context. In a first step, motivational profiles are investigated using cluster analyses based on these perceptions. Secondly, these profiles are explored in relation to their academic and athletic performances as well as personal characteristics by using analyses of variance. Findings indicate that the profiles differ in terms of their personal characteristics but not their performances. Lastly, repeated-measurement analyses of variance to explore the developments of the personal characteristics and performances among these profiles result in indifferent developments except for the grade in Physical Education.

In conclusion, the dissertation provides a more in-depth view of academic and athletic motivation and performances of student-athletes in upper secondary school. The findings of the four publications indicate that more research is needed to explore the usefulness of dual career support services, the impact of motivation on performances and vice versa, as well as the applicability of the SAAMS in practical and research settings such as talent identification or dual career counselling.

Zusammenfassung

Seit der Publikation der EU Richtlinien für Athlet:innen im Jahre 2012 hat die duale Karriere Forschung, insbesondere im europäischen Raum, zugenommen. Forschungsschwerpunkte sind unter anderem Motivation und Leistung. Die Motivation von studierenden Athlet:innen wurde bereits tiefgreifend untersucht. Der Zielgruppe von Schülerathlet:innen wurde hingegen wenig Aufmerksamkeit geschenkt. Diese müssen sowohl schulisch als auch sportlich außerordentlich gute Leistungen erbringen. Herausragende athletische Leistungen werden benötigt, um bei (inter)nationalen Wettkämpfen mithalten zu können. Für eine berufliche Karriere nach Beendigung der sportlichen Laufbahn sind exzellente akademische Leistungen unverzichtbar.

Die Doppelbelastung in der dualen Karriere ist mithilfe des DNA of dual careers Modell aufgezeigt. Wenn eine der beiden Karriere für einen längeren Zeitraum priorisiert wird, kann dies eine sportliche bzw. Bildungslücke hinterlassen, je nach Priorisierung. Wenn zwischen den beiden Karrieren eine Ausgewogenheit besteht, können Schülerathlet:innen eine erfolgreiche duale Karriere verfolgen. Um Schülerathlet:innen durch eine erfolgreiche duale Karriere zu begleiten, können diverse Maßnahmen ergriffen werden.

Die erste Publikation zielt darauf ab, die Unterstützungsmaßnahme „Additives Abitur“ zu evaluieren, indem die Effekte dreier Kriterien auf die Entwicklung von Schulleistungen untersucht werden. Diese Kriterien umfassen den Schultyp (Eliteschule des Sports versus reguläre Gesamtschule), das leistungssportliche Engagement (Elitesportler:in versus Nicht-Elitesportler:in) und die Abiturform (reguläres Abitur versus Additives Abitur). An drei Eliteschulen des Sports und drei Gesamtschulen werden zu Beginn und zum Ende der gymnasialen Oberstufe mit 159 Schüler:innen jeweils ein Schulleistungstest durchgeführt. Die Effekte der drei zuvor genannten Kriterien werden mittels Varianzanalysen mit Messwiederholung untersucht. Die Ergebnisse deuten auf eine unterschiedliche Entwicklung der Schulleistungen entsprechend des Schultyps hin. Für die Abiturform kann keine unterschiedlichen Entwicklungen zwischen den Schüler:innen festgestellt werden. Die Ergebnisse bezüglich des leistungssportlichen Engagements sind uneindeutig.

Die duale Karriere-Motivation ist Bestandteil der zweiten und dritten Publikation. Zunächst wird ein bereits etabliertes Messinstrument zur Erhebung der akademischen und athletischem Motivation für deutsche Schülerathlet:innen in der gymnasialen Oberstufe angepasst. Insgesamt 208 Schülerathlet:innen beantworten die adaptierte Version des Student Athletes' Motivation Toward Sports and Academics Questionnaires (SAMSAQ). Die Ergebnisse der

exploratorischen Faktorenanalyse können die ursprüngliche Faktorenstruktur des SAMSAQs nicht reproduzieren. Daher muss ein neues Messinstrument entwickelt werden, welches die duale Karriere-Motivation bei deutschen Schülerathlet:innen in der gymnasialen Oberstufe fasst. In der dritten Publikation wird die Student-Athletes' Academic and Athletic Motivation Survey (SAAMS) basierend auf dem Erwartung-mal-Wert-Modell entwickelt. Die Erprobung der SAAMS erfolgt mit insgesamt 843 Schülerathlet:innen in zwei Teilstudien. Exploratorische und konfirmatorische Faktorenanalysen werden durchgeführt, um die Struktur des Erwartung-mal-Wert-Modells zu reproduzieren. Die Ergebnisse der Faktorenanalysen weisen auf eine erfolgreiche Konzeption des Messinstruments hin.

Die letzte Publikation der vorliegenden Dissertation zielt darauf ab, die vorherigen Publikationen zu verbinden, indem die Forschung um die duale Karriere-Motivation und Leistung in einer Publikation verknüpft werde. Insgesamt werden 236 Schülerathlet:innen zur ihrer Wahrnehmung der Unterstützung bezüglich der psychologischen Grundbedürfnisse im schulischen und sportlichen Kontext befragt. In einem ersten Schritt werden diverse Motivationsprofile basierend auf einer Clusteranalyse hinsichtlich dieser Wahrnehmungen untersucht. Daran anknüpfend werden diese Profile im Zusammenhang mit schulischen und sportlichen Leistungen sowie Persönlichkeitscharakteristika mittels Varianzanalyse beleuchtet. Die Ergebnisse weisen darauf hin, dass sich die Motivationsprofile bezüglich der Persönlichkeitscharakteristika unterschieden, nicht jedoch bezüglich ihrer Leistungen. Im letzten Schritt werden Varianzanalysen mit Messwiederholung durchgeführt, um die Entwicklungen von sportlichen und schulischen Leistungen sowie Persönlichkeitscharakteristika zwischen den Motivationsprofilen zu explorieren. Es zeigt sich, dass zwischen den Profilen keine Entwicklungsunterschiede bezüglich der Leistung oder Persönlichkeitscharakteristika bestehen mit der Ausnahme der Note im Fach Sport.

Zusammenfassend lässt sich festhalten, dass die vorliegende Dissertation einen tiefergreifenderen Einblick in die akademische und athletische Motivation sowie Leistung von Schülerathlet:innen in der gymnasialen Oberstufe bietet. Die Ergebnisse der vier Publikationen weisen darauf hin, dass mehr Forschung notwendig ist, um den Nutzen diverser Unterstützungsmaßnahmen, den Einfluss von Motivation auf Leistung und umgekehrt sowie die Anwendbarkeit der SAAMS in praktischen und theoretischen Settings wie zum Beispiel der Talentidentifikation oder der duale Karriere-Beratung zu explorieren.

List of Publications

Langer, W., **Niehues, M.**, Schole, L., Holz, L., & Gerlach, E. (2023). Theorie und Praxis vernetzen: ein Ausschnitt aus der WhatsApp-Chatgruppe des AB Sportpädagogik der Universität Hamburg. *Zephir, 29*(2)/*30*(1), 16-20. https://www.sportwissenschaft.de/fileadmin/img/user_upload/Ze-Phir_Sportpraxis__2022-2_2023-1_.pdf

Niehues, M., Gerlach, E., & Sallen, J. (2021). Measuring dual career motivation among German student-athletes using the Student Athletes' Motivation Toward Sports and Academics Questionnaire. *German Journal of Exercise and Sport Research*, *51*(3), 378–383. https://doi.org/10.1007/s12662-021-00723-9

Niehues, M., Gerlach, E., & Sallen, J. (2023a). *Student-athletes' perception of basic psychological need support in sports and school? Cross-sectional and longitudinal perspectives using a cluster-analytical approach* [Manuscript submitted for publication]. Arbeitsbereich für Bewegungs- und Sportpädagogik, Universität Hamburg.

Niehues, M., Gerlach, E., Wendeborn, T., & Sallen, J. (2022). Successful in sports but worse in school? Adolescent student-athletes' development of scholastic performances. *Frontiers in Education*, *7*, Article 946284, 427. https://doi.org/10.3389/feduc.2022.946284

Niehues, M., Sallen, J., & Gerlach, E. (2023b). Student-Athletes' Academic and Athletic Motivation Scale (SAAMS) for adolescents in secondary school: Development, evaluation, and psychometric properties. *German Journal of Exercise and Sport Research*. https://doi.org/10.1007/s12662-023-00921-7

Niehues, M., & Schole, L. (2022). Tagungsbericht dvs Sektion Sportpädagogik vom 15. bis 18. Juni 2022 in Münster. *sportunterricht, 71*(9), 425-426.

Wälti, M., Sallen, J., Adamakis, M., Ennigkeit, F., Gerlach, E., Heim, C., Jidovtseff, B., Kossyva, I., Labudová, J., Masaryková, D., Mombarg, R., De Sousa Morgado, L., Niederkofler, B., **Niehues, M.**, Onofre, M., Pühse, U., Quitério, A., Scheuer, C., Seelig, H., Vlcek, P., Vrbas, J., & Herrmann, C. (2022). Basic motor competencies of 6- to 8-year-old primary school children in ten European countries: a cross-sectional study on associations with age, sex, BMI and physical activity. *Frontiers in Psychology, 13*, p. 804753. https://doi.org/10.3389/fpsyg.2022.804753

Appendix: Copies of the Publications

The cumulative dissertation is based on the following four publications:

Niehues, M., Gerlach, E., Wendeborn, T., & Sallen, J. (2022). Successful in sports but worse in school? Adolescent student-athletes' development of scholastic performances. *Frontiers in Education*, *7*, Article 946284, 427. https://doi.org/10.3389/feduc.2022.946284

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Niehues, M., Gerlach, E., & Sallen, J. (2021). Measuring dual career motivation among German student-athletes using the Student Athletes' Motivation Toward Sports and Academics Questionnaire. *German Journal of Exercise and Sport Research*, *51*(3), 378–383. https://doi.org/10.1007/s12662-021-00723-9

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Niehues, M., Sallen, J., & Gerlach, E. (2023b). Student-Athletes' Academic and Athletic Motivation Scale (SAAMS) for adolescents in secondary school: Development, evaluation, and psychometric properties. *German Journal of Exercise and Sport Research*. https://doi.org/10.1007/s12662-023-00921-7

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Niehues, M., Gerlach, E., & Sallen, J. (2023a). *Student-athletes' perception of basic psychological need support in sports and school? Cross-sectional and longitudinal perspectives using a cluster-analytical approach* [Manuscript submitted for publication]. Arbeitsbereich für Bewegungs- und Sportpädagogik, Universität Hamburg.

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Appendix I: Copy of Publication I

Niehues, M., Gerlach, E., Wendeborn, T., & Sallen, J. (2022). Successful in sports but worse in school? Adolescent student-athletes' development of scholastic performances. *Frontiers in Education*, *7*, Article 946284, 427. https://doi.org/10.3389/feduc.2022.946284

frontiers | Frontiers in Education

ORIGINAL RESEARCH
published: 24 June 2022
doi: 10.3389/feduc.2022.946284

Successful in Sports but Worse in School? Adolescent Student-Athletes' Development of Scholastic Performances

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Studies have evaluated the effectiveness of dual career (DC) support services among student-athletes by examining scholastic performances. These studies investigated self-reported grades student-athletes or focused on career choices student-athletes made after leaving school. Most of these studies examined scholastic performances cross-sectionally among lower secondary school student-athletes or student-athletes in higher education. The present longitudinal field study in a quasi-experimental design aims to evaluate the development of scholastic performances among upper secondary school students aged 16–19 by using standardized scholastic assessments and grade points in the subject English over a course of 3–4 years. A sample of 159 students (54.4% females) at three German Elite Sport Schools (ESS) and three comprehensive schools participated in the study. The sample was split into six groups according to three criteria: (1) students' athletic engagement, (2) school type attendance, and (3) usage of DC support services in secondary school. Repeated-measurement analyses of variance were conducted in order to evaluate the impact of the three previously mentioned criteria as well as their interaction on the development of scholastic performances. Findings indicated that the development of English performance levels differ among the six groups.

Keywords: school performance, dual career, longitudinal analysis, language competence, elite sport, upper secondary school

OPEN ACCESS

Edited by:
Robbert Smit,
St. Gallen University of Teacher Education, Switzerland

Reviewed by:
Paul Wylleman,
Vrije Universiteit Brussel, Belgium
Laura Capranica,
Foro Italico University of Rome, Italy

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Specialty section:
This article was submitted to Assessment, Testing and Applied Measurement, a section of the journal Frontiers in Education

Received: *17 May 2022*
Accepted: *07 June 2022*
Published: *24 June 2022*

Citation:
Niehues M, Gerlach E, Wendeborn T and Sallen J (2022) Successful in Sports but Worse in School? Adolescent Student-Athletes' Development of Scholastic Performances. Front. Educ. 7:946284. doi: 10.3389/feduc.2022.946284

INTRODUCTION

Various studies (Borggrefe and Cachay, 2012; Stambulova et al., 2015) as well as the European Commission (2012) identified the difficulty of combining an athletic and academic career simultaneously and being successful in both areas. Coping with tasks in these areas is known as a dual career (DC). Experts are concerned that in a DC academic success suffers from the challenges posed by the athletic career (Creutzburg and Scheid, 2014; Huml et al., 2019). Besides individual opportunity costs, expenses made for an athletic career might result in a less successful academic career (Emrich et al., 2009). The comprehensive review by Thompson et al. (2022) highlights that the research on academic success in a DC is inconclusive. Although student-athletes at sport schools receive considerably more support in academia and athletics, student-athletes suffer from missing school and attaining higher education access (Thompson et al., 2022). This

review even identified that there is no positive impact of attending a sport school on academic success. Wylleman and Reints (2010) grasped this holistic approach of understanding DCs with their transition model identifying that athletes transition into several phases on four levels: athletic, psychological, psycho-social, and academic/vocational level. DC support services were introduced to support student-athletes in coping with these personal, academic, and athletic transitions. These DC support services as well as the concept of a student-athlete in a DC differ worldwide (Condello et al., 2019) and across European countries (Morris et al., 2021; Stambulova et al., 2021). The Dual Career Network in Europe currently explores the student-athletes' perception of DC support services and the need to improve and expand these services for example by introducing the possibility of distance learning and individualizing study plans (Capranica et al., 2022). Besides these institutional support services, other individual and social support structures play a crucial role in assisting student-athletes including parents or coaches (Condello et al., 2019). In Germany, Elite Sport Schools (ESSs) are an example of these institutional support services where training and teaching takes place in the same location reducing time needed for traveling between school and training venues (Emrich et al., 2009; Sallen and Gerlach, 2020). In order to become successful in their athletic careers, German adolescent student-athletes have to cope with their athletic and academic demands simultaneously due to educational policies in Germany. The ESSs help student-athletes to combine both areas with diverse support services by increasing the flexibility of the academic requirements, individualizing the academic career, and improving the compatibility of academia and elite sport. However, the research on effectiveness of these DC support services is scarce (Sallen and Gerlach, 2020).

Although studies outside Europe (Purdy et al., 1982; Alahmed et al., 2016) have evaluated DCs and related support services based on academic performances, these studies were conducted with student-athletes in higher education only. It seems that evaluating academic performances among secondary school student-athletes in order to assess the effectiveness of support services is a European phenomenon, particularly in Belgium, the Netherlands, Denmark, and Germany. Most of these European studies have been implemented with student-athletes in lower secondary school (Borchert, 2013; Wartenberg et al., 2014; Kehne et al., 2018). Only a few studies evaluated academic performances among upper secondary school student-athletes (Brettschneider and Klimek, 1998) and most studies conducted in this age group were run retrospectively (Van Rens et al., 2015; Storm and Eske, 2022).

One study (Hirschmann, 2016) evaluated the successfulness of support services using grades of upper secondary school student-athletes in a cross-sectional approach. Hence, there is no knowledge about the development of upper secondary school student-athletes' scholastic performances assessed by standardized test instruments.

The performances in the previously mentioned studies were attained on various levels. Some studies have evaluated the effectiveness of the support services based on the career choices student-athletes made after leaving school including vocational training or higher education (Jonker et al., 2009; Van Rens et al., 2015; Storm and Eske, 2022). Others assessed the implementation of support services based on the student-athletes' grades received in their school report (Wartenberg et al., 2014; Kehne et al., 2018; Storm and Eske, 2022) or the satisfaction with grades (Hirschmann, 2016; Körner et al., 2017). Only self-disclosure on grades, satisfaction with grades, or career path after secondary school were used in order to investigate the effectiveness of support services. Standardized assessments have not yet been applied in this research context.

Findings concerning the academic performance of student-athletes are diverse. Some studies report that ESS student-athletes perform better in academia than their peers at regular schools (Jonker et al., 2009) or at least on the same level (Wartenberg et al., 2014; Kehne et al., 2018; Storm and Eske, 2022). Other studies show contrary results where students at regular schools outperform their peers at ESSs in terms of academic performance (Emrich et al., 2009; Van Rens et al., 2015).

As all grades are self-reported, this reduces the objectivity of school performance evaluations in the previously mentioned studies since grading can be biased (Malouff and Thorsteinsson, 2016). This bias includes irrelevant characteristics for grading such as the students' ethnic backgrounds, education-related deficiencies, and poor quality of prior performance. Moreover, previous studies have highlighted that grades only correlate moderately with the results of scholastic performance tests (Helmke et al., 2008). Hence, it can be argued that grades are not representative of students' actual scholastic competence level.

Assessing students' performances in order to evaluate the success of an educational system or program is the research object of numerous studies such as PISA (OECD, 2019) or DESI (Helmke et al., 2008). In comparison to grades, student performance assessments are more objective and allow a more precise picture of the current competence level. The assessments are supposed to help improve educational systems or programs across the globe. To date, no study has used standardized performance assessments in order to evaluate the effectiveness of support services in ESSs although regular assessments take place on a national level. The assembly of ministers of education of the German federal states have introduced regular assessments of scholastic performances in different grades. One of these assessments is the Abitur. The Abitur is the German general qualification for higher education entrance (e.g. universities) equivalent to the British A-level or United States-American SAT. The Abitur phase lasts 2–3 years for students at comprehensive schools depending on the federal state. In the state of Brandenburg, students at comprehensive schools enter the phase in grade 11 and finish their exams in grade 13. The Abitur allows the teaching staff and the political decision-makers to evaluate the success of their decisions concerning the educational system in each federal state.

In Germany, the subjects German, Mathematics and the First Foreign Language are identified as the three main subjects in all age groups and students taking the Abitur need to complete these subjects. The most prominent choice for the First Foreign Language among German students is English (EACEA, 2012). English is used worldwide as a common language of communication. As Germany is part of the

European Union, this language is imperative in order to be able to communicate in European settings. Hence, learning English in school is essential for German students. When learning foreign languages, students generally receive foreign language competencies in four competence areas. Listening and reading are identified as the receptive competence areas, whereas speaking and writing are productive competence areas (Surkamp and Viebrock, 2018).

In a meta-analysis, Hattie (2009) identified several factors the school is responsible for which can help students to improve their learning success. One factor are the support services provided by the school. ESSs are specialized institutions that support student-athletes actively involved in elite sport to be successful in both their academic and athletic career (Emrich et al., 2009; Borggrefe and Cachay, 2014). Students attending these schools have been selected due to their outstanding athletic performances. As these student-athletes have to fulfill the same requirements as non-student-athletes at comprehensive schools in order to obtain their Abitur, ESSs have developed various DC support services. These services vary in each German federal state and the specific ESS ranging from flexible rescheduling of lessons and exams as well as school-free time slots in the morning to extra lessons for German student-athletes attending ESSs. Some DC support services are state specific such as the integration of competitive sport into the school curriculum in the state of Brandenburg whereas other support services such as the "Additives Abitur" (AA) are available to all ESS in the state, but currently used only by one specific ESS in a trial period. The support program AA allows student-athletes to expand their school education in the Abitur phase by one and in some cases by 2 years as well as distributing the final Abitur exams over a course of 3–4 years (Sallen and Gerlach, 2020). The AA is a unique DC support service that has been implemented in 2011 in the German federal state of Brandenburg at the largest of the three ESSs in that state. An overview of the diverse support services in Germany can be found in **Figure 1**.

One of the present study's aims is to evaluate the effectiveness of this support program. The CIPP model is an internationally used framework for the evaluation of educational institutions and programs (Nevo, 2006) and is in accordance with the quality framework of German educational policies and research activities. The model is an acronym for its four evaluative foci: context, input, process, and product (Stufflebeam, 2003) and is well-known as a model of utilization-of-learning-opportunities in educational research (Seidel, 2014). The present study will focus on product evaluation which identifies the outcomes of the support program (Stufflebeam, 2003) on the basis of a provided structure and input as well as on established processes within a specific DC service system. This evaluative focus assesses the level of success and the effectiveness in reaching the targeted needs of student-athletes.

THE PRESENT STUDY

It has been shown that there is a gap in research regarding the evaluation of the development of scholastic performances among student-athletes since no study so far used a longitudinal design. To our knowledge, no study used standardized performance assessments among upper secondary school student-athletes in order to evaluate their school performances which leads to contrary results regarding the effectiveness of support programs. In order to receive less biased findings, this study is first in using standardized performance assessments in a longitudinal design. In terms of product evaluation (Stufflebeam, 2003) among upper secondary school students, the effect of the following factors and their interactions on the development of scholastic performances will be investigated in order to evaluate the support program AA:

(a) School type (ESS or comprehensive school),
It can be assumed that there is no difference between the development of academic achievements among the different school types. Against the background of the support services provided by the ESS and that these support services are effective, there should be no differences in the development of academic achievements.
(b) Athletic engagement (pre-elite athletes or dropouts/non-athletes), and
Although dropouts do not receive any academic support services, they no longer face athletic constraints and should, hence, be able to focus on their academic success. Therefore, it can be expected that dropouts' academic achievements develop similarly or even better than those of student-athletes.
(c) Abitur choice (regular or AA).
Since student-athletes taking the AA receive more time in order to achieve academic success, it can be anticipated that these student-athletes' academic achievements develop better than those of student-athletes taking the regular Abitur.

MATERIALS AND METHODS

Study Design

By evaluating the outcome of the support program AA, the design of the study is fundamentally oriented toward the CIPP model (Stufflebeam, 2003) focusing on product evaluation. The present investigation is based on a research project which lasted from 2016 to 2021 and evaluated DC support services at ESSs in the German federal state of Brandenburg (Sallen et al., 2019). The underlying longitudinal field study follows a quasi-experimental design. Different groups of students from various schools with different DC support services were accompanied from the beginning to end of their Abitur phase. The students participated in two English tests, one at the beginning of grade 11 and a second test 1–3 months before they completed their Abitur exam in the subject English in either grade 13 or 14. Additionally, the students answered an annual questionnaire.

Measurement Instrument

The English test used in grade 11 assessed the receptive competence area reading in two parts of the English test which is based on an older version of the TOEFL ITP® Level 1 test. The modification has been validated by Trautwein et al. (2010). Part 1 consisted of "Structure and Written Expression" and part 2 of

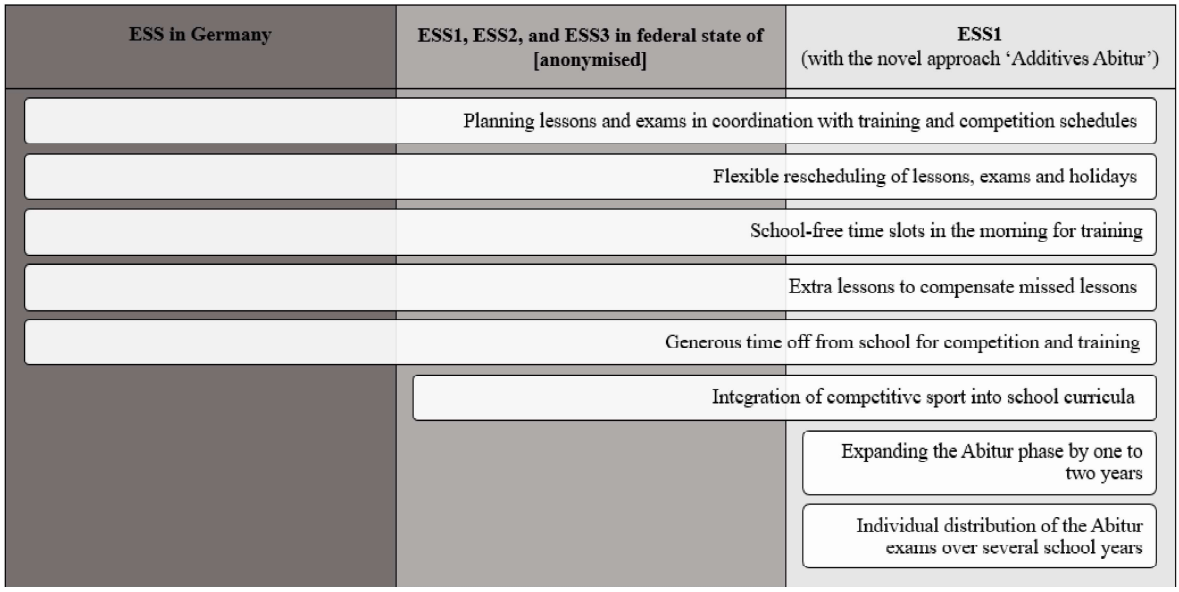

FIGURE 1 | Dual career support services at Elite Sport Schools (ESSs) for student-athletes in Germany, the federal state of Brandenburg, and the ESS1. ESS1, Elite Sport School in the federal state of Brandenburg where the dual career support service "Additives Abitur" was tested.

"Vocabulary and Reading." The English test has been shortened to 35 min and did not include the "Listening" part. The second English test used in grade 13/14 was the TOEFL ITP® Level 1 provided by the Language and Testing Service GmbH (LTS; Berlin, Germany). The TOEFL ITP® Level 1 which lasted 115 min consisted of the same two parts as the English test in grade 11 and this time included "Listening." Both English tests can be considered as standardized as a standard-setting approach was used (Tannenbaum and Baron, 2011).

In order to identify the language proficiency level according to the Common European Framework of References for Languages (CEFR), the scores in each part of the tests as well as the total score can be used (Tannenbaum and Baron, 2011). The scores and the respective CEFR levels can be found in **Table 1**. According to Trautwein et al. (2010), students should have reached at least level B1 when starting their Abitur in grade 11. Level B2 or level C1 should be attained when finishing the Abitur depending on the course choice in the subject English (higher or standard level). Reliability of the TOEFL ITP® was given as the test is commonly used in order to assess English competence levels (Tannenbaum and Baron, 2011).

Besides the English tests, students' English performance levels were measured by the self-reported grades ("What grade did you receive on your last school report in the subject English?"). Moreover, the questionnaire assessed the students' athletic engagement in terms of athletic performances and achievements (e.g., "Are you active in elite sport?").

Data Acquisition and Samples

The English tests and the questionnaires were conducted in self-assessment. During the answering of the tests and the questionnaires, student-athletes were guided and supervised in their schools by test coordinators qualified by LTS. The study was approved by the local school authorities and the ethics committee of the University of Potsdam (Potsdam, Germany). All research procedures were in line with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

A sample of 159 students at three ESSs and three comprehensive schools completed both English tests. All ESSs in the federal state of Brandenburg participated in the study. The ESS1 presents the school where the DC support service AA was provided. The other two ESSs were combined into one group, named ESS2/3, and served as a comparison ESS group to the ESS1. The comprehensive schools were chosen based on the proximity to the institution where the study was prepared. These schools were summed up into one group, named non-student-athletes at comprehensive schools, and served as a comparison group to the ESS groups. For the purpose of the study, the students were divided into six groups. These groups are described in **Table 2**. The groups have not been selected randomly due to selection mechanisms at the respective schools. Groups 1, 2, and 3 present the investigation groups of this study. All students in

TABLE 1 | Levels of the Common European Framework of References for Languages (CEFR) and the respective score values in the TOEFL ITP® (Tannenbaum and Baron, 2011).

CEFR Levels	Structure and Written Expression	Vocabulary and Reading	Total Score
C1 – Proficient User	64	63	627
B2 – Independent User	53	56	543
B1 – Independent User	43	48	460
A2 – Basic User	32	31	337

TABLE 2 | Grouping details of the sample.

		Groups	ESS1	ESS2/3	Comprehensive schools
Investigation groups	Student-athletes	G1	*n* = 34 Additives Abitur* (AA)		
		G2	*n* = 21 regular Abitur		
		G3		*n* = 15 regular Abitur	
Comparison groups	Non-student-athletes	G4	*n* = 40 dropouts**; regular Abitur		
		G5		*n* = 19 dropouts; regular Abitur	
		G6			*n* = 30 regular Abitur

G, groups; ESS, Elite Sport School.
**The Abitur is the German general qualification for higher education entrance which lasts 3 years for students at comprehensive schools who complete their exams in the final year in the German federal state of Brandenburg. The "Additives Abitur" allows student-athletes to expand their Abitur by 1–2 years spreading their final exams over a course of several years.*
***Dropouts refer to those students who were once student-athletes but dropped out of their pre-elite sport due to several reasons.*

these three groups were pre-elite student-athletes with different measures of DC support. Pre-elite student-athletes are young athletes that aspire to become active athletes professionally. Student-athletes in these three groups fulfilled all of the four following criteria concerning active athletes. They (a) train in sports with the aim of improving their athletic performances, (b) participate actively in sport competitions, (c) are formally registered as a competitor at a local, regional, or national sport federation, and (d) have sport training and competition as one of their major activities or focuses of personal interest (Araújo and Scharhag, 2016). Group 1 is the group who completes the AA. This group had a higher athletic engagement in comparison to groups 2 and 3 indicated by a higher squad and competition level as well as a higher scope of training hours per week. In contrast, groups 4, 5, and 6 were the comparison groups. Students in these groups are either dropouts (groups 4 and 5) or were never pre-elite athletes (group 6). Dropouts are students that were once student-athletes but dropped out of pre-elite sports due to several reasons. Detailed sample descriptions on the total sample and the six groups can be found in **Table 3**.

Data Analysis

Descriptive and variance analysis as well as the data for the English test in grade 11 were analyzed with SPSS Statistics (version 26.0, IBM Corp., Armonk, NY, United States). Results of the English test in grade 13/14 were prepared by LTS and provided to the researchers.

The English test in grade 11 had to be adapted to the same scoring system as the provided results of the grade 13/14 English test in order to be able to compare the results and evaluate the English performance development. The points reached in each of the two parts were transferred into scores similar to the procedure conducted by LTS. In part 1 of the grade 11 English test, students were able to reach a maximum of 23 points which had to be equivalent to 68 score points as identified by Trautwein et al. (2010) who also indicated that 0–5 points equal 31 score points. The remaining points (6–23) were distributed equally over the score of 32–68 points were 23 points in the test equal 68 score points. The same procedure of calculating score points was used for the second part of the grade 11 English test, but this time a total of 28 points could be reached which had to be equal to 67 score points (Trautwein et al., 2010). For the total score, both parts of the grade 11 English test presented the same percentage. The calculation was conducted as follows in order to be able to compare the total score of the grade 11 and grade 13/14 English test (Trautwein et al., 2010).

$$\text{Total score of the English test in grade 11} = \frac{(\text{score points part 1} + \text{score points part 2}) \times 100}{2}$$

Since the competence areas Structure and Written Expression and Vocabulary and Reading were tested in both English tests, the development of these parts as well as the development of the total score can be compared.

In a pre-analysis, a Pearson's correlation was conducted using the self-reported English grade points in grade 11 and 13/14 as well as the scores of Listening, Structure and Written Expression, Vocabulary and Reading, and total scores in the English tests. A positive correlation between grade points and test results was expected since German grade points in upper secondary school are given from 0 (insufficient) to 15 (very good).

In the main analysis, repeated-measures analysis of variance (RM-ANOVA) was conducted with the six groups for Structure and Written Expression, Vocabulary and Reading, the total score, and the grade points in order to evaluate the development of all groups' English performances in the Abitur phase indicating overall different developments among the groups. In order to evaluate the significant findings of the overall analysis concerning the development of students' performances, *post hoc* two-group RM-ANOVAS were conducted in three further steps in consideration of the following characteristics: pre-elite student-athletes vs. dropouts, non-student-athletes vs. ESS students, and student-athletes with AA vs. student-athletes without AA. All four analytical steps are described in detail in **Figure 2**.

A cut point of $p \leq 0.05$ was used in order to identify significant effects. Due to the exploratory nature of the study and in line with (Cohen, 1988), the effect size η^2 was interpreted as small ($0.01 \leq \eta^2 \leq 0.06$), medium ($0.6 < \eta^2 \leq 0.14$), and large ($\eta^2 \geq 0.14$).

RESULTS

Pre-analysis

Contrary to previous findings (Helmke et al., 2008), the results of the correlation indicate a strong positive correlation between the Structure and Written Expression, Vocabulary and Reading, and the total score of the grade 11 English test with the grade

TABLE 3 | Description of samples with students in grade 13/14.

	Total Sample (*N* = 159)	G1 (*n* = 34)	G2 (*n* = 21)	G3 (*n* = 15)	G4 (*n* = 40)	G5 (*n* = 19)	G6 (*n* = 30)
Age (years)	***M* (*SD*)**	***M* (*SD*)**	***M* (*SD*)**	***M* (*SD*)**	***M* (*SD*)**	***M* (*SD*)**	***M* (*SD*)**
At grade 11 English test	16.2 (0.57)	16.2 (0.57)	16.2 (0.54)	16.6 (0.83)	16.2 (0.50)	16.4 (0.50)	16.0 (0.48)
At grade 13/14 English test	18.5 (0.57)	18.5 (0.62)	18.5 (0.51)	18.4 (0.83)	18.5 (0.51)	18.7 (0.56)	18.5 (0.51)
Gender	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**
Male	73 (45.6)	19 (55.9)	8 (38.1)	9 (60.0)	13 (32.5)	9 (47.4)	15 (50.0)
Female	86 (54.4)	15 (44.1)	13 (61.9)	6 (40.0)	27 (67.5)	10 (52.6)	15 (50.0)
Elite squad level	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**
No squad level	128 (80.5)	11 (32.3)	18 (85.7)	10 (66.7)	40 (100)	19 (100)	30 (100)
Federal squad	9 (5.7)	6 (17.6)	1 (4.8)	2 (13.3)	0 (0)	0 (0)	0 (0)
Junior squad 2	3 (0.2)	2 (5.9)	0 (0)	1 (6.7)	0 (0)	0 (0)	0 (0)
Junior squad 1	10 (6.3)	6 (17.6)	2 (9.5)	2 (13.3)	0 (0)	0 (0)	0 (0)
Pre-olympic/perspective squad	8 (5.0)	8 (23.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Olympic squad	1 (0.0)	1 (2.9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Competition level	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**
International level	30 (18.9)	19 (55.9)	8 (38.1)	3 (20.0)	0 (0)	0 (0)	0 (0)
National level	18 (11.3)	6 (17.6)	8 (38.1)	4 (26.7)	0 (0)	0 (0)	0 (0)
Regional level	9 (5.7)	0 (0)	2 (9.5)	7 (46.7)	0 (0)	0 (0)	0 (0)
No level/anonymous	102 (64.2)	9 (26.5)	3 (14.3)	1 (6.7)	40 (100)	19 (100)	30 (100)
Scope of training	***M* (*SD*)**	***M* (*SD*)**	***M* (*SD*)**	***M* (*SD*)**	***M* (*SD*)**	***M* (*SD*)**	***M* (*SD*)**
In minutes per week	419.9 (526.9)	1,184.5 (348.7)	902.3 (273.9)	751.1 (184.6)	0 (0)	0 (0)	0 (0)
Groups of Olympic sport disciplines	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**
Endurance sports[a]	19 (11.9)	14 (41.2)	4 (19)	1 (6.7)	0 (0)	0 (0)	0 (0)
Team sports/sports games[b]	24 (15.1)	0 (0)	12 (57.1)	12 (80.0)	0 (0)	0 (0)	0 (0)
Strength and speed-strength sports[c]	8 (5.0)	5 (14.7)	2 (9.5)	1 (6.7)	0 (0)	0 (0)	0 (0)
Combat sports[d]	14 (8.8)	10 (29.4)	3 (14.3)	1 (6.7)	0 (0)	0 (0)	0 (0)
Multi-discipline sports[e]	5 (3.1)	5 (14.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

G1, student-athletes with Additives Abitur at Elite Sport School 1; G2, student-athletes without Additives Abitur at Elite Sport School 1; G3, student-athletes without Additives Abitur at Elite Sport School 2/3; G4, dropouts at Elite Sport School 1; G5, dropouts at Elite Sport School 2/3; G6, non-student-athletes at comprehensive schools.

[a]*e.g., canoeing, running, rowing, swimming, cycling;* [b]*e.g., handball, football, volleyball, water polo;* [c]*e.g., weightlifting, athletics (sprinting, jumping, throwing, shot put);* [d]*e.g., judo, boxing, wrestling;* [e]*e.g., triathlon, decathlon, modern pentathlon.*

points in grade 11, $r = 0.52$, $r = 0.60$, and $r = 0.62$ respectively ($ps < 0.001$). In addition, a strong positive correlation was found for Listening, Structure and Written Expression, Vocabulary and Reading, and the total score in the grade 13/14 English test when correlated with the grade points in grade 13/14, $r = 0.56$, $r = 0.66$, $r = 0.61$, and $r = 0.65$ respectively ($ps < 0.001$).

Main Analysis

The descriptive results can be found in **Table 4** as well as **Figures 3–5**. All results concerning the evaluation of the grade points and the results of the *post hoc* two-group RM-ANOVAs can be found in the electronic supplement. All tables and figures in the supplements are marked by an Supplementary before the respective number.

Step 1: The findings indicate a different development of English test results between the six groups for Structure and Written Expression, Vocabulary and Reading, and the total score as well as the grade points (**Table 4**, **Supplementary Table 1**, **Figures 3–5**, and **Supplementary Figure 1**). English performances in Structure and Written Expression developed better than in Vocabulary and Reading for all groups.

Step 2: The impact of ESS attendance on the development of English performances was evaluated in consideration of the athletic engagement and Abitur choice by comparing the ESS groups to the comprehensive school group individually (**Table 5** and **Supplementary Tables 2–6**). Contrary to the initial expectation, the findings indicate that students attending an ESS (groups 1–5) achieved worse test results over time for Structure and Written Expression, Vocabulary and Reading, and the total score than non-student-athletes at comprehensive schools (group 6). Moreover, the development of the English test results was better for non-student-athletes since all results showed a significant difference and a high η^2 in terms of the interaction effect compared to ESS students. Dropouts attending the ESS2/3 (group 5) present an exception to this trend. Nevertheless, their English test results remained below those of non-student-athletes. The developmental results of the grade points did not differ between ESS and non-student-athletes apart for the grade point development between student-athletes at ESS2/3 (group 3) and non-student-athletes with a better development for the non-student-athletes.

Step 3: The impact of athletic engagement was evaluated in consideration of the individual school by comparing group 2 to

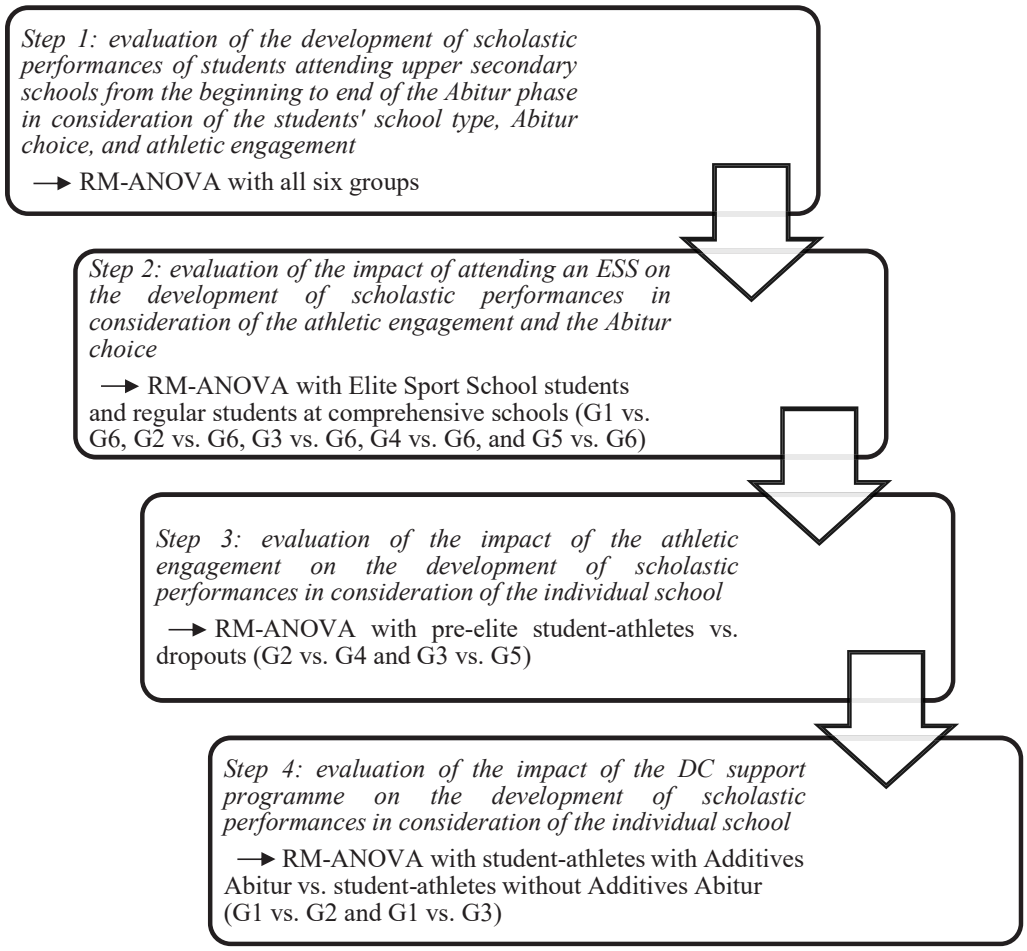

FIGURE 2 | Steps conducted in the data analysis. RM-ANOVA, repeated-measures analysis of variance; G1, student-athletes with Additives Abitur at Elite Sport School 1; G2, student-athletes without Additives Abitur at Elite Sport School 1; G3, student-athletes without Additives Abitur at Elite Sport School 2/3; G4, dropouts at Elite Sport School 1; G5, dropouts at Elite Sport School 2/3; G6, non-student-athletes at comprehensive schools.

group 4 and group 3 to group 5 (**Table 5** and **Supplementary Tables 7**, **8**). In line with the initial assumption, there was no statistically significant interaction effect for the development of English test results or grade points of student-athletes without AA (groups 2 and 3) and dropouts at the ESSs (groups 4 and 5). However, when comparing the individual schools, there were contrary findings in the English test results demonstrated by the high effect sizes. At the ESS1, English test results developed better for the student-athletes without AA (group 2) than for the dropouts (group 4). In contrast, students' test results at ESS2/3 developed better for dropouts (group 5) than for the student-athletes (group 3).

Step 4: In terms of evaluating the product of the DC support service AA as per CIPP model (Stufflebeam, 2003), the impact of the support service on English performance development was investigated by comparing groups 2 and 3 to group 1 individually (**Table 5** and **Supplementary Tables 9**, **10**). The findings did not meet the initial assumptions as they indicate that there was no significantly different development of English test results between student-athletes with and without AA. Nevertheless, student-athletes with AA (group 1) performed better in the English test than student-athletes without AA (groups 2 and 3) in grade 11 and 13/14 (**Figures 3–5**). In terms of the grade points, student-athletes at ESS1 (group 1 and 2) showed a similar development of grade points. However, student-athletes' grade points at ESS2/3 (group 3) developed significantly worse than student-athletes' with AA.

DISCUSSION

The present study investigated the development of English performances of German students at ESSs and comprehensive schools by using standardized scholastic assessments in the subject English for the first time. In order to assess the outcome and effectiveness of the support program AA, the study focused on the product evaluation of the CIPP model (Stufflebeam, 2003). The study found that there is a significantly different development of academic achievements between the ESS groups and the comprehensive school group.

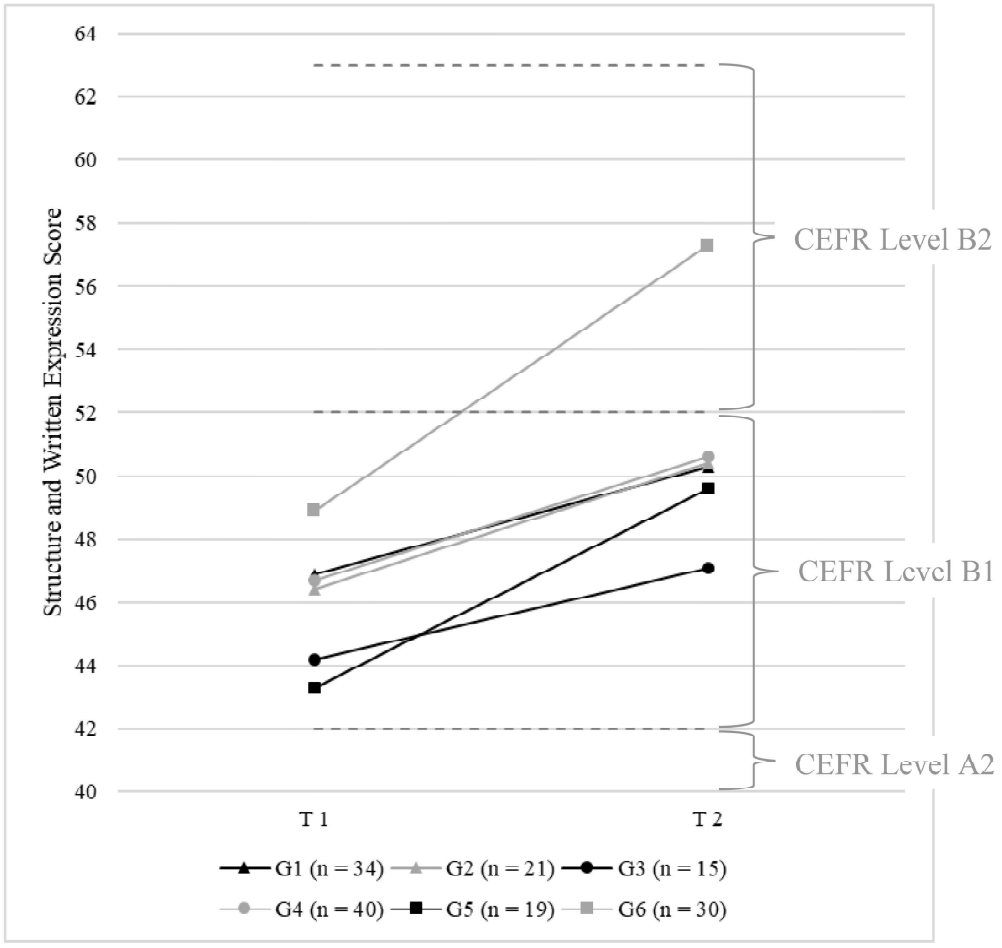

FIGURE 4 | Development of the English skills in the competence area "Structure and Written Expression" (from 31 = worst result to 68 = best result). T, Time of Measurement; G1, student-athletes with Additives Abitur at Elite Sport School 1; G2, student-athletes without Additives Abitur at Elite Sport School 1; G3, student-athletes without Additives Abitur at Elite Sport School 2/3; G4, dropouts at Elite Sport School 1; G5, dropouts at Elite Sport School 2/3; G6, non-student-athletes at comprehensive schools; CEFR, Common European Framework of References for Languages.

scholastic performances depending on the individual school with its teachers, coaches and local framing conditions. Moreover, individual support systems like parents or friends can have an impact on the academic development of student-athletes and dropouts (Condello et al., 2019). Thus, policy makers should investigate the general conditions at each ESS and aim to compare the effectiveness of each ESS on the DC development of student-athletes.

In the final analytical step, the impact and outcome of the DC support service AA was evaluated following the CIPP model (Stufflebeam, 2003). Contrary to the initial assumptions, the findings indicated that the support service AA does not have a remarkable impact on the development of English test results. Nevertheless, the mean scores in all parts and the total score are always higher for student-athletes with AA than for student-athletes without AA which indicates a small selection effect at the entrance of the Abitur phase. At the same time, student-athletes with AA demonstrated a higher athletic engagement as emphasized by their higher squad level, higher competition level, as well as a higher scope of training hours per week. In addition, all student-athletes with AA were athletes in individual sports (e.g., judo, athletics, etc.) who reach their peak performance earlier in their athletic career than team sport athletes (Longo et al., 2016). Consequently, it could be argued that the support service AA allows student-athletes to achieve academic results similar to those of their peers at ESSs although they are confronted with higher demands posed by their athletic career. Hence, the support service AA seems to be successful as it can absorb some of the additional demands posed by the DC (Sallen and Gerlach, 2020). As a result, athletic demands interfered less with academic tasks (Storm and Eske, 2022). Additionally, the support service in the present study allowed student-athletes with AA to receive more similar results to their peers at comprehensive schools which has previously been defined as problematic (Thompson et al., 2022). However, the support service AA seems to be selective as it only allows athletes in individual sports to participate. This selection mechanism might be due to the fact that athletes in team sports have less

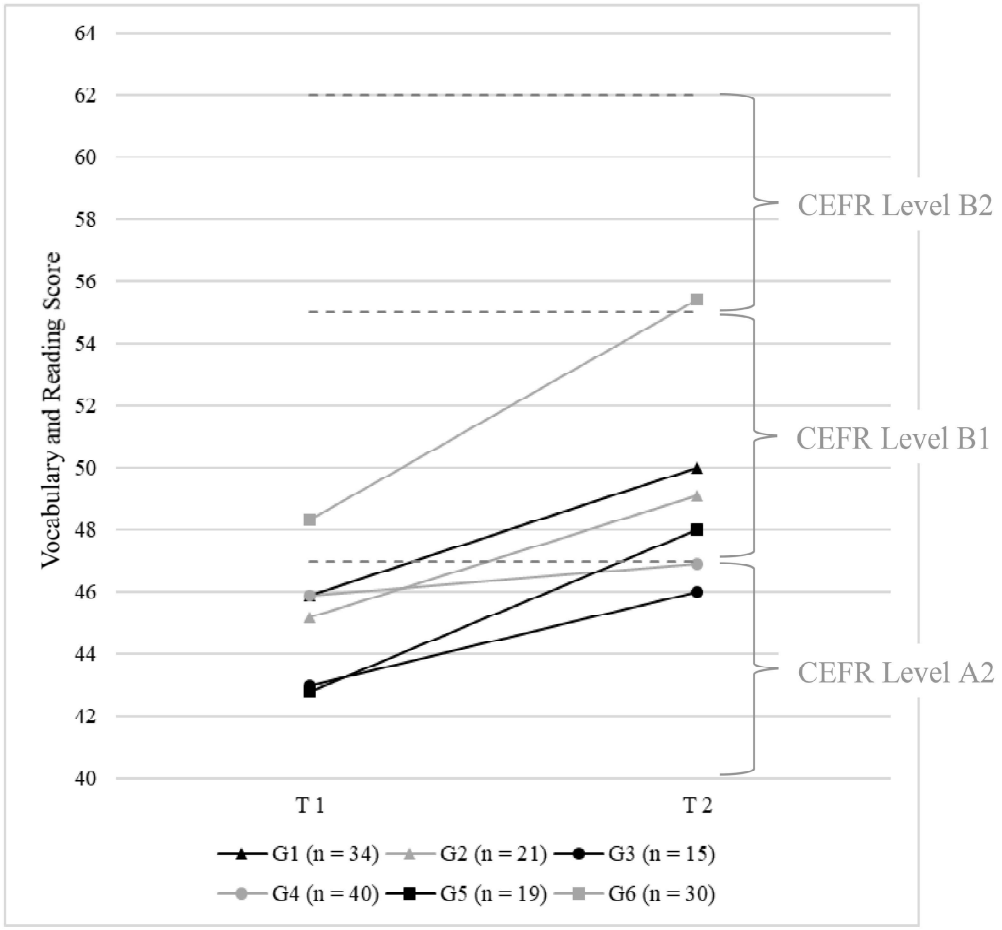

FIGURE 5 | Development of the English skills in the competence area "Vocabulary and Reading" (from 31 = worst result to 67 = best result). T, Time of Measurement; G1, student-athletes with Additives Abitur at Elite Sport School 1; G2, student-athletes without Additives Abitur at Elite Sport School 1; G3, student-athletes without Additives Abitur at Elite Sport School 2/3; G4, dropouts at Elite Sport School 1; G5, dropouts at Elite Sport School 2/3; G6, non-student-athletes at comprehensive schools; CEFR, Common European Framework of References for Languages.

flexibility to change and deviate from training intensity and hours than those in individual sports. Hence, the selective mechanism of the AA should be investigated in further studies. Emrich et al. (2009) as well as Storm and Eske (2022) identified further successful support services and DC programs which aid students in combining their athletic and academic careers. It would be interesting to evaluate whether the concrete usage of these diverse support services and the ones identified in **Figure 1** have an impact on the development of scholastic performances of pre-elite student-athletes (Sallen and Gerlach, 2020).

Finally, the results concerning the grade points need to be discussed. Interestingly, non-student-athletes at comprehensive schools achieve only a medium grade point average in comparison to ESS students although their results in the English tests are significantly better. This contradiction highlights that in order to receive a realistic picture of the students' competence levels scholastic performance assessments need to be evaluated as grades are not a reliable indicator of actual competence levels. Moreover, policy makers should take note that grading in schools should be treated with more caution in order to offer fair and equal opportunities to all students independent of their school type (ESS vs. comprehensive schools) and athletic engagement.

Strength of the present study can be found in the unique and novel study design. The quasi-experimental design with six differentiated groups facilitates a greater insight into the contexts and developments of student-athletes' scholastic performances. Furthermore, the study is the first one to evaluate the scholastic performances longitudinally and prospectively among pre-elite upper secondary school student-athletes using standardized school performance tests. This study design allows a new perspective on the academic developments of pre-elite student-athletes as this form of assessment prevents biases. Although the study's sample size seems small at first, the overall sample of student-athletes is restricted due to its elite nature. Keeping the elite context in mind, the sample size is in fact quite large.

Besides these strengths, limitations of the present study should be considered. On the one hand, "Listening" was absent in the first English test and the total score was calculated

TABLE 5 | Extract of **Supplementary Tables 2–10** in the electronic supplements presenting the *post hoc* two group interaction effects (Group × Time) of the RM-ANOVAs for the total score in the English tests.

	RM-ANOVA				
Groups	***F***	***df*1**	***df*2**	***p*-value**	**part. η^2**
Step 2: impact of school type					
G1 vs. G6	14.5	1	62	< 0.001	0.19
G2 vs. G6	9.0	1	49	0.004	0.16
G3 vs. G6	10.4	1	43	0.002	0.20
G4 vs. G6	23.6	1	68	< 0.001	0.26
G5 vs. G6	1.8	1	47	0.181	0.04
Step 3: impact of athletic engagement					
G2 vs. G4	2.1	1	59	0.157	0.03
G3 vs. G5	4.0	1	32	0.054	0.11
Step 4: impact of Abitur choice					
G1 vs. G2	0.1	1	53	0.808	0.00
G1 vs. G3	0.1	1	47	0.891	0.00

G1, student-athletes with Additives Abitur at Elite Sport School 1; G2, student-athletes without Additives Abitur at Elite Sport School 1; G3, student-athletes without Additives Abitur at Elite Sport School 2/3; G4, dropouts at Elite Sport School 1; G5, dropouts at Elite Sport School 2/3; G6, non-student-athletes at comprehensive schools; RM-ANOVA, Repeated-Measures Analysis of Variance.

without this part. This total score calculation might lead to a slight deviation when comparing the total score of the first English test to the second. On the other hand, both tests assessed receptive competence areas only. As the foreign language competencies consist of the receptive and productive competence area, the study limits the assessment of the foreign language competence to one competence area. Moreover, some variables could not be controlled for due to the naturally small sample size of student-athletes. This absent control might lead to a distortion of the results. Lastly, this study focuses on the product evaluation of the CIPP model (Stufflebeam, 2003) and takes the other three evaluation foci for granted. Consequently, other studies should focus on more than output aspects in terms of the CIPP model by analyzing diverse aspects in evaluating scholastic competences including subjective satisfaction, perceived stress levels, engagement in sport, or personality indicators in order to obtain a holistic picture of the effectiveness of DC services such as the AA.

CONCLUSION

In conclusion, the present study is the first one which evaluates the development of scholastic performances among student-athletes in upper secondary schools using standardized scholastic tests and grade points simultaneously against the background of the CIPP model (Stufflebeam, 2003). The findings highlight that besides grade points the results of standardized tests need to be considered when evaluating scholastic performances at ESSs as the grade points are not fully congruent with the test results. Moreover, findings of the present study indicate that the present DC support program AA is unable in supporting student-athletes to reach similar academic successes in the subject English as non-student-athletes at comprehensive schools. This shortness highlights that student-athletes need further support in their academic careers as their athletic demands interfere with the development of their scholastic performances. However, the study also indicates that the student-athletes with AA achieve more similar academic performances to non-student-athletes than student-athletes without AA even though they invest more time in their sport. Hence, further DC support services need to be developed and scientifically evaluated in order to offer similar academic opportunities to student-athletes as their peers at comprehensive schools by increasing the flexibility of academic requirements, individualizing the academic career, and improving the compatibility of academia and elite sport. Further research on DC support services could, for example, focus on evaluating the academic and athletic achievements as well as stress perception and well-being of student-athletes simultaneously or by investigating the differences in the usefulness of the services. Furthermore, future studies should focus on different developments among athletes in team vs. individual sports.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because the dataset is restricted due to sensitive data. Requests to access the dataset should be directed to the authors.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the University of Potsdam and the Ministry of Education, Youth and Sport of the Federal State of Brandenburg (Germany). Written informed consent to participate in this study was provided by the participants or their legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

JS, EG, and TW were the principal investigators of the third party research project were the data stem from. JS and EG were mainly responsible for the overall conception and design of this study. MN took lead in the conception of the manuscript, the statistical analysis, and in writing the manuscript. JS organized the study samples and led the data acquisition. MN, JS, and EG made substantial contributions to the analysis and interpretation of data. All authors developed, revised, and approved the manuscript to be published.

FUNDING

This work was jointly supported by the German Ministry Federal Institute of Sport Science (grant number 071102/16-21) and the Ministry of Education, Youth and Sport of the Federal State of Brandenburg (Germany).

ACKNOWLEDGMENTS

We would like to thank Lucas Schole (Institute of Human Movement Sciences, University of Hamburg, Hamburg, Germany) for his support in collecting and preparing the data for the in-depth analysis. We would also like to express our thanks to Language and Testing Service (Ltd.) for providing comparative data of the Go4Goal! English language competition. We would also further like to thank Ulrich Trautwein and his working group for providing the grade 11 English test.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2022.946284/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Appendix II: Copy of Publication II

Niehues, M., Gerlach, E., & Sallen, J. (2021). Measuring dual career motivation among German student-athletes using the Student Athletes' Motivation Toward Sports and Academics Questionnaire. *German Journal of Exercise and Sport Research*, *51*(3), 378–383. https://doi.org/10.1007/s12662-021-00723-9

Brief Communication

Ger J Exerc Sport Res
https://doi.org/10.1007/s12662-021-00723-9
Received: 9 February 2021
Accepted: 4 May 2021

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Measuring dual career motivation among German student-athletes using the Student Athletes' Motivation Toward Sports and Academics Questionnaire

Challenges and failures of linguistic and cultural adaptations

Supplementary Information

The online version of this article (https://doi.org/10.1007/s12662-021-00723-9) contains supplementary material, which is available to authorized users.

Introduction

In 2013, the European Commission highlighted the necessity of supporting student-athletes in identifying their motivation as an essential criterion for a successful dual career (DC) (European Commission, 2013). Although numerous studies deal with athletic motivation in DCs (Clancy, Herring, MacIntyre, & Campbell, 2016), few investigate athletic and academic motivation simultaneously. The Student Athletes' Motivation toward Sports and Academics Questionnaire (SAMSAQ) is the most prominent instrument in this research area (Gaston-Gayles, 2004, 2005). The instrument aims "to measure student athletes' motivation toward sports and academics using an expectancy-value framework" (Gaston-Gayles, 2005, p. 320). Besides this framework, Gaston-Gayles (2005) included self-efficacy and attribution theory in the instrument's construction. The SAMSAQ comprises 30 items directed at US student-athletes in higher education aiming for two subscales: academic and athletic motivation. However, statistical analysis resulted in three subscales: student athletic (SAM), career athletic (CAM), and academic (AM) motivation. All items were rated in self-assessment on a six-point Likert scale. Gaston-Gayles (2005) declared a successful implementation based on good internal consistency and acceptable factor loadings in the exploratory factor analysis (EFA) and an RMSEA value of 0.069. No further fit indices have been discussed.

Following its successful implementation, the SAMSAQ has been frequently translated (Fortes, Rodrigues, & Tchantchane, 2010; Guidotti et al., 2013; Kerstajn & Topic, 2017; Lupo et al., 2015; Park & Lee, 2015; Quinaud, Fernandes, Goncalves, & Carvalho, 2019). The Italian working group added nine items replacing those inapplicable to Italian student-athletes (Guidotti & Capranica, 2013). This expanded 39-item version was used in a pan-European study (Lupo et al., 2015). The factor structure of the Italian and European SAMSAQ differ in comparison to the original SAMSAQ (see electronic supplements). Lupo et al. (2015) claimed a successful implementation of the SAMSAQ-EU based on confirmatory factor analysis, although not all fit indices exceeded commonly known thresholds (see "Data acquisition and samples" section).

Based on the SAMSAQ's appropriateness for European countries, this instrument seems suitable for the German context, since no instrument measures DC motivation among German student-athletes. Moreover, instruments measuring DC motivation in adolescent student-athletes depicting DC developments and transitions have been repeatedly demanded (Park & Lee, 2015; Stambulova & Wylleman, 2019). The present investigation documents the unsuccessful attempt to adapt and evaluate a German SAMSAQ pre-version. The study aimed to (1) adapt the SAMSAQ for the German context and adolescent student-athletes in secondary Elite Sport Schools (ESS), and (2) evaluate this adapted pre-version with two subsamples using a multistaged statistical procedure.

Published online: 18 June 2021

Table 1 Description of samples with student-athletes in Olympic sports

	Total sample (*N* = 208)	Subsample 1 (*N* = 76)	Subsample 2 (*N* = 132)
Age (years)	***M* (*SD*)**	***M* (*SD*)**	***M* (*SD*)**
	17.42 (1.36)	16.05 (0.51)	18.21 (1.04)
Gender	***n* (%)**	***n* (%)**	***n* (%)**
Male	99 (47.6)	30 (39.5)	69 (52.3)
Female	109 (52.4)	46 (60.5)	63 (47.7)
Elite squad level	***n* (%)**	***n* (%)**	***n* (%)**
A & B squad (international level)	8 (3.8)	0 (0.0)	8 (6.1)
C squad (national level)	16 (7.7)	5 (6.6)	11 (8.3)
D/C squad (regional level)	35 (16.8)	14 (18.4)	21 (15.9)
D squad (regional level)	44 (21.2)	26 (34.2)	18 (13.6)
No squad level	105 (50.5)	31 (40.8)	74 (56.1)
Groups of Olympic sport disciplines	***n* (%)**	***n* (%)**	***n* (%)**
Endurance sports	49 (23.6)	20 (26.3)	29 (22.0)
Team sports/sports games	67 (32.2)	29 (38.2)	38 (28.8)
Strength and speed-strength sports	29 (14.0)	9 (11.8)	20 (15.2)
Combat sports	34 (16.3)	8 (10.5)	26 (19.7)
Multidiscipline sports	10 (4.8)	4 (5.3)	6 (4.5)
Others/anonymous	19 (9.2)	6 (7.9)	13 (9.9)

M mean, *SD* standard deviation

Materials and methodology

Study design

This investigation was split into two parts with two substages each. Part one demonstrates the SAMSAQ-EU's adaption to the German context and evaluation using EFA in a structural–relational approach. The factor structure was explored in two substages, removing items based on previously determined criteria (see "Data acquisition and samples" section). Due to unsatisfactory results, the first pre-version was revised in the second part and evaluated in two substages using EFA.

Procedure for translating and adapting the SAMSAQ

Although back-translations have been identified as the gold standard in translating instruments, this method was inappropriate for this adaptation. The method "ignores cultural aspects … and exclusively focuses on the actual content of the items" (Iliescu, 2017, p. 375). Moreover, the SAMSAQ had to be adapted to adolescent student-athletes. Hence, a guided forward translation approach with parallel translations was applied. Two native German-speaking researchers who are cultural and linguistic experts after having studied in various English-speaking countries translated the instrument independently. The translation process followed the guidelines put forth by Iliescu (2017).

To ensure that the validity was upheld between the original and target versions, equivalences were needed (Iliescu, 2017). Brandl-Bredenbeck (2005) formulated four equivalences. The translated German pre-version was reviewed for these equivalences to verify that the same quality was achieved in the adaptation process. The functional equivalence was mostly upheld. Both cultural backgrounds see achievement motivation theory as an essential one among theories of human behaviour (Elbe, 2019; Gill & Williams, 2008; Urhahne, 2008). Although the linguistic meaning of achievement and the German translation *Leistung* are not equivalent, both cultures use similar definitions of the theory. Therefore, conceptual equivalence was mostly maintained. Linguistic equivalence was confirmed following Iliescu's (2017) recommendations. The sample equivalence was limited. Although the German participants were in a DC, they were younger in comparison to other studies using the SAMSAQ.

After evaluating the first pre-version's results, the factor structure replication was identified as unsuccessful. Three main issues were determined. In avoidance of (1) ceiling effects, extreme formulations were used (e.g. item 3). (2) The mixture of motivational aspects from different theory traditions (expectancy-value, goal, self-efficacy, etc.) was problematic. Therefore, all items were formulated according to expectancy-value theory (e.g. item 6). (3) The blending of academic and athletic aspects required items to be split into two (e.g. items 36a and 36b), and items 40 and 41 were added as counterparts to existing items. Inevitably, these changes led to linguistic and semantic adaptations. Nevertheless, equivalence was maintained. This revision process resulted in the second German SAMSAQ pre-version. Both German pre-versions were added to the electronic supplements.

Data acquisition and samples

Student-athletes answered the SAMSAQ in self-assessment in their schools. Participation was voluntary. The first acquisition was conducted in 2017 (subsample 1), the second in 2019 (subsample 2). All participants were transitioning from the developmental to the mastery stage in terms of their athletic careers. The sample details are described in **Table 1**.

The study was approved by the local school ministries and the ethics committee of the University of Potsdam (Germany). All research procedures were in line with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Data analysis

SPSS Statistics (version 26.0; IBM Corp., Armonk, NY, USA) was used to process the data and perform descriptive analyses. EFA with oblique rotation

(GEOMIN) was conducted with Mplus (version 8.4; Muthén & Muthén, Los Angeles, CA, USA). The number of factors was limited to two to four, following Gaston-Gayles' (2005) procedure. The first adapted pre-version was analysed using subsample 1 in the first part of the statistical analysis with two substages. The second part of the study consisting of two substages followed the analysis of the revised pre-version using subsample 2.

In substage 1.1, fit indices were calculated for two- to four-factor models. Thresholds of Standardized Root Mean Square Residual (SRMR) ≤ 0.05, Comparative Fit Index (CFI) ≥ 0.95, and Root Mean Square Error of Approximation (RMSEA) ≤ 0.08 indicated good model fits (Hooper, Coughlan, & Mullen, 2008). High η^2 values and degrees of freedom referred to poor models.

In substage 1.2, factor loadings were retrieved. Items not loading on any factor were removed based on the following three aspects: (1) each factor was comprised of at least five items; (2) if an item loaded on a single factor, the loading had to be ≥ 0.40; and (3) if an item loaded on more than one factor, a 0.32 acceptability threshold was set for the values (Costello & Osborne, 2005). After removal, fit indices and factor loadings were calculated and models were compared.

Substages 2.1 to 2.2 constituted the second part of the statistical analysis based on the revised pre-version. The last two substages resembled the same procedures as described in substages 1.1 and 1.2.

The data set included 0.2% missing values. Participants with missing values were excluded from the analysis.

Results

Table 2 lists the results of the study's first part with models 1.1 to 1.2. The EFA did not produce a meaningful solution for a three- or four-factor model. In substage 1.1, model 1.1.a was inacceptable, since CFI, RMSEA, and SRMR did not meet the thresholds. Substage 1.2 considered the factor loadings. After removing all nontarget loading items, the model still did not present good fits.

Abstract

Ger J Exerc Sport Res https://doi.org/10.1007/s12662-021-00723-9

M. Niehues · E. Gerlach · J. Sallen

Measuring dual career motivation among German student-athletes using the Student Athletes' Motivation Toward Sports and Academics Questionnaire. Challenges and failures of linguistic and cultural adaptations

Abstract

With the 2012 EU guidelines on dual careers (DC), DC research gained increasing awareness in Europe focussing particularly on student-athletes' motivation. The Student Athletes' Motivation toward Sports and Academics Questionnaire (SAMSAQ), arguably the most prominent instrument in this research area, has been used in various cross-cultural studies assessing DC motivation. The present investigation contributes to the cross-cultural discourse aiming to (1) adapt the SAMSAQ for the German context and adolescent secondary school student-athletes, and (2) evaluate the German pre-version. A sample of 208 student-athletes (52.4% females, mean age = 17.4 years, 49.5% at squad level) at three German Elite Sport Schools participated in the study. The investigation was split into two parts. First, the SAMSAQ was adapted to the German context and tested. In the second part, the first pre-version was revised. A series of exploratory factor analyses were applied to verify the factor structure of both German SAMSAQ pre-versions. Eight different factor models based on item removal were compared. Neither model demonstrated good results for the replication of previous findings or a meaningful solution in terms of content. Reasons for the deviations between the original and target SAMSAQ factor structures can be found in the different target groups and the culturally different approaches to career assistant programmes as well as in the theoretical background of the instrument. Since neither model was identified as acceptable, the findings indicate that a new instrument needs to be developed for assessing student-athletes' DC motivation along their pathways in different cross-cultural contexts.

Keywords

SAMSAQ · Factor-analysis · Expectancy-value · Translation · Cross-culture · Elite sport

Following the revision, fit indices were calculated for models 2.1 to 2.2 in the second part of the study (Table 2). In substage 2.1 (models 2.1.a–c), the RSMEA value identified models 2.1.b and 2.1.c as good, with model 2.1.c showing the better fit. The SRMR value was good for model 2.1.c. Substage 2.2 (models 2.2.a–c) considered the factor loadings of the models by removing all nonloading items, but no model met the CFI value threshold. Model 2.2.c fits best according to the SRMR and RMSEA values. Even after removing nontarget loading items, no model was identified as most suitable.

Discussion

The results indicated the unsuccessful cross-cultural adaptation of the SAMSAQ to the German context. No model met the standards for a suitable instrument. Overall, fit indices and factor loadings were better for the revised pre-version. The factor loadings (see electronic supplements) favoured a two-factor model, which is in line with Gaston-Gayles' (2005) assumption that the SAMSAQ constitutes two subscales. The three-factor model as suggested by the US, Italian, and European SAMSAQ models was not reproduced with the German pre-version. The subscales SAM and CAM could not be differentiated, suggesting only one subscale for athletic motivation in the German pre-version possibly due to a younger target group. A four-factor model in the German pre-version was best suitable according to the fit indices. However, four factors were incoherent, since one factor would have comprised one item only. Consequently, no model proved to be satisfactory.

There are several reasons for these unsatisfactory results. Firstly, to maintain conceptual equivalence, a guided forward translation was chosen as opposed to a back-translation because the

Table 2 Statistical values for all factor models based on the exploratory factor analysis (EFA) of the German SAMSAQ versions

	Model	Analysis	CFI	RMSEA	SRMR	η^2 value	Degrees of freedom	*p*-Value	Explanation of measures taken
Part 1	1.1.a	EFA 2-factor (39 items)	0.515	0.150	0.088	1794.24	664	<0.001	Stage 1.1: EFA with the first German pre-version using subsample 1
	1.2.a	EFA 2-factor (31 items)	0.528	0.182	0.084	1417.37	404	<0.001	Stage 1.2: EFA with the first German pre-version using subsample 1, removing items 6, 9, 11, 16, 18, 31, 37, and 38
Part 2	2.1.a	EFA 2-factor (44 items)	0.770	0.095	0.065	1881.73	859	<0.001	Stage 2.1: EFA with the revised German pre-version using subsample 2
	2.1.b	EFA 3-factor (44 items)	0.848	0.079	0.051	1495.24	817	<0.001	
	2.1.c	EFA 4-factor (44 items)	0.877	0.073	0.044	1325.67	776	<0.001	
	2.2.a	EFA 2-factor (36 items)	0.812	0.102	0.058	1237.92	559	<0.001	Stage 2.2: EFA with the revised German pre-version using subsample 2, removing items 10, 17, 18, 21, 29, 31, 37a, and 37b
	2.2.b	EFA 3-factor (36 items)	0.895	0.079	0.044	905.65	525	<0.001	
	2.2.c	EFA 4-factor (36 items)	0.924	0.069	0.036	765.92	492	<0.001	

CFI Comparative Fit Index, *RMSEA* Root Mean Square Error of Approximation, *SRMR* Standardized Root Mean Square Residual

focus was on psychological significance instead of linguistic meaning (Iliescu, 2017). This focus was particularly important, since the SAMSAQ had to be adapted to a different cultural context and the age group of secondary school student-athletes. Nevertheless, the absent back-translation might have led to other results than in previous studies using the SAMSAQ. Despite this absence, equivalences between the original and target versions were predominantly present, ensuring the validity of the adapted instrument (Brandl-Bredenbeck, 2005; Iliescu, 2017).

Secondly, cultural differences need to be discussed. In the US, elite sports development is delegated to sport organisations (Sparvero, Chalip, & Green, 2008), whereas the German government acts as a facilitator for sports development (Aquilina & Henry, 2010). Consequently, German student-athletes are supported by governmental structures. The absence of tuition fees required for German higher education does not create an urgency to win a scholarship, and academic demands interfere with athletic perspectives (Conzelmann & Nagel, 2003), explaining why the AM subscale was depicted well in the German pre-version. US student-athletes are highly motivated toward sports to gain scholarships for higher education (Simons, Van Rheenen, & Convington, 1999). Hence, it is not surprising that the US version separated the SAM and CAM subscales, whereas the German pre-version favoured one combined athletic motivation subscale. Different DC policies appear even within Europe. For example, the Italian policies are described as "laisser faire" (Aquilina & Henry, 2010). Arguably, certain motivational structures cannot be verified in every country due to cultural differences and DC support policies (Lupo et al., 2015).

Thirdly, the theoretical background of the SAMSAQ played a crucial role. Brandl-Bredenbeck (2005) specifies that cross-cultural comparison must be theory-guided. Since the SAMSAQ is based on various motivational patterns, the theoretical basis seems vague and ambiguous. The revised German pre-version that was solely based on the expectancy-value framework yielded better results. Arguably, combining different motivational frameworks carries the risk of limiting the cross-cultural usage of an instrument.

Lastly, the German student-athletes were younger than in all other samples. The age difference and the specific context of an ESS might explain why the German student-athletes did not differentiate between the SAM and CAM subscales, ruling out the possibility of reproducing the original three-factor structure.

Despite the unsuccessful adaptation, the German pre-version contributes significantly to cross-cultural DC motivation research. The present study is the only investigation to date attempting to use a DC motivation instrument in the German context, adding value to other contexts and informing the international discourse. Moreover, the study is the first to assess the SAMSAQ focussing on adolescent student-athletes. Understanding motivation patterns in critical developmental stages is imperative for empirical background knowledge, supporting student-athletes in DC decision-making processes, and providing appropriate support measures (Wylleman & Reints, 2010).

Besides these strengths, limitations should be considered. The sample size may not be sufficient to replicate the factor structure. However, de Winter, Dodou, and Wieringa, (2009, p. 168) argue that when the data are conditioned well, "EFA can yield reliable solutions for sample sizes well below 50". High factor loadings, a low number of factors, and a high number of variables are present in the current study. Moreover, only half of the German student-athletes were at squad level. Nevertheless, the sample quality was not restricted as an absent squad level does not provide reliable information on whether the student-

athletes are (pre-)elite (Güllich & Cobley, 2017). All students attending an ESS strive for a squad level, since sports federations nominated these student-athletes for a DC at the ESS.

Conclusion

The results showed that the German adaptation for adolescent student-athletes was unsuccessful. Nevertheless, the study contributes to cross-cultural research in demonstrating that what works well in one culture may not be suitable to another (Stambulova & Alfermann, 2009). Hence, a new instrument is required to measure academic and athletic motivation among adolescent student-athletes. This instrument is urgently needed to understand the motivational patterns in DC transitions across cultures. Based on this understanding, guidance for transitions in the academic and athletic settings, as well as support measures for adolescent student-athletes, can be developed. Thus, it is recommended to (1) specify a theoretical basis for an instrument that measures motivation especially in DC transitions, and (2) develop an instrument measuring DC motivation in secondary school student-athletes.

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Funding. This work was jointly supported by German Federal Institute of Sport Science (grant number 071102/16-21) and Ministry of Education, Youth and Sport of the Federal State of Brandenburg (Germany).

Funding. Open Access funding enabled and organized by Projekt DEAL.

Declarations

Conflict of interest. M. Niehues, E. Gerlach and J. Sallen declare that they have no competing interests.

The study was approved by the local school ministries and the ethics committee of the University of Potsdam (Germany). All research procedures were in line with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Appendix III: Copy of Publication III

Niehues, M., Sallen, J., & Gerlach, E. (2023). Student-Athletes' Academic and Athletic Motivation Scale (SAAMS) for adolescents in secondary school: Development, evaluation, and psychometric properties. *German Journal of Exercise and Sport Research*. https://doi.org/10.1007/s12662-023-00921-7

Main Article

Ger J Exerc Sport Res
https://doi.org/10.1007/s12662-023-00921-7
Received: 28 February 2023
Accepted: 1 November 2023

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Student–Athletes' Academic and Athletic Motivation Scale (SAAMS) for adolescents in secondary school: development, evaluation, and psychometric properties

Supplementary Information

The online version of this article (https://doi.org/10.1007/s12662-023-00921-7) contains supplementary material, which is available to authorised users.

Introduction

Various countries and institutions have identified the necessity to support students who pursue an athletic career in order to guide them in simultaneously coping with the athletic and academic challenges in their daily life. The combination of the athletic and academic career is known as a dual career (DC; Stambulova, Engström, Franck, Linner, & Lindahl, 2015). Considering the DC from a holistic perspective, student–athletes face developmental tasks in other life domains in addition to their academic and athletic careers (Ryba, Stambulova, Selänne, Aunola, & Nurmi, 2017; Wylleman, Reints, & De Knop, 2013). Hence, student–athletes need guidance in their DCs (Sallen & Gerlach, 2020). The EU guidelines highlighted that the academic career must be equally supported in order to continue with the DC (EU Expert Group, 2012). This equal support concurrently demands a balanced motivation between the two life domains. In the past, research concerning DCs has often focused on student–athletes in higher education (Aquilina & Henry, 2010; Gaston-Gayles, 2004; Lupo et al., 2015). Thus, DC research among student–athletes in adolescent elite sport needs to be enhanced.

Motivation is one of the most prominent aspects in DC research (Guidotti, Cortis, & Capranica, 2015) as researchers have identified motivation as one of the key aspects in facilitating a successful DC. Previous research on DC motivation involved a variety of theoretical approaches (Clancy, Herring, MacIntyre, & Campbell, 2016; Guidotti et al., 2015). Although self-determination theory has been extensively referred to in academic and athletic contexts (Vallerand, Pelletier, Briere, & Senecal, 1992; Pelletier et al., 1995), Kröhler and Berti (2014) found that the self-determination theory is unsuitable for measuring motivation among elite athletes since they do not differentiate between the gradations of intrinsic, integrated, identified, introjected, and external motivation, but perceive only two extremes. Moreover, an athletic career demonstrates a voluntary pathway that presents a more internally motivated stimulus in comparison to the obligatory academic career.

The dominant theoretical approach of DC motivation, when academic and athletic motivation is measured simultaneously, is the expectancy–value framework (EVF) by Eccles and colleagues (1993). The EVF is illustrated in the electronic supplement (Fig. S1). Wigfield and Eccles (2000) proposed two main dimensions in their framework. One dimension is called "expectancy," which contains the short-term and present sub-dimension *ability beliefs* as well as the long-term sub-dimension *expectations* for the future. The other dimension is known as "task values" and constitutes the sub-dimensions *attainment value* (importance), *intrinsic value* (interest), *utility value* (usefulness), and *cost* (Wigfield & Eccles, 2000). Gaston-Gayles (2004) as well as Aunola et al. (2018) are the only researchers having measured DC motivation among student–athletes by using this framework. The US-American Student–Athletes Motivation Toward Sports and Academics Questionnaire (SAMSAQ, Gaston-Gayles, 2004) developed for athletes in higher education has been adapted to various cultural contexts such as Europe, Asia, and South America (Lupo et al., 2015;

The authors Maike Niehues and Jeffrey Sallen are principal investigators, corresponding authors and share co-first authorship.

Published online: 13 December 2023

Park & Lee, 2015; Quinaud et al., 2021), but it relies on a mixture of diverse motivation theories including EVF, self-efficacy, and attribution theory. Aunola et al. (2018) only explore task values and, thus, only consider one part of the EVF. Hence, an instrument that measures DC motivation based on one theoretical framework is lacking.

Moreover, no instrument exists that measures DC motivation among student–athletes in secondary school. Park and Lee (2015) as well as Stambulova and Wylleman (2019) specifically request an instrument that investigates academic and athletic motivation among younger student–athletes. Niehues and colleagues (2021) have shown that a translated and adapted version of the SAMSAQ is inappropriate for adolescent student–athletes. Therefore, a new DC motivation measurement instrument needs to be developed. This instrument is urgently needed as there is a noticeable research gap for the target group of adolescent student–athletes regarding DC motivation based on a lack of appropriate DC motivation measurement instruments for student–athletes in school.

In terms of construct validity, previous research has used constructs including passion, identity, and chronic stress that have been shown to be empirically related to motivation. For instance, passion and motivation are theoretical constructs with a substantial overlap of their contents. Empirical studies show that a high motivation quality (intrinsic, autonomous, learning goal, and task orientation) is related to a high expression of non-obsessive passion (Chamorro, Torregrosa, Sánchez, García Calvo, & León, 2016; Fredricks, Alfeld, & Eccles, 2010; Moeller, 2013). Furthermore, the identification with the academic and athletic role has been associated with academic and athletic motivation (Fernandes, Moreira, & Goncalves, 2019; Love & Rufer, 2021; Steele, van Rens, & Ashley, 2020). Eccles (2009, p. 81) even mentioned, "that the motivational aspects of identity and identity formation processes […] are directly related to [the] sociocultural expectancy-value model of motivated behavioral choices" indicating a positive relationship between identity and motivation. Lastly, the decrease or absence of motivation or motivation quality is often associated with burnout, dropout, and chronic stress. The current state of research supports this thesis of a negative relation between motivation and chronic stress in the academic and athletic context (Gustafsson, Madigan, & Lundkvist, 2018; Pascoe, Hetrick, & Parker, 2019; Sorkkila, Ryba, Selänne, & Aunola, 2018).

As suitable instruments to measure motivation in academic and athletic contexts among adolescent student–athletes are scarce, the present study (1) developed a scale that focuses on student–athletes' academic and athletic motivation in upper secondary school and (2) evaluated this scale by exploring the psychometric properties. The development and evaluation of this scale is needed for practical as well as research settings. Practical settings include DC counselling in selecting appropriate support measures and educational paths for student–athletes as well as psychological support in order to identify mental health problems and prevent chronic stress (Sallen, Hemming, & Richartz, 2018a). In DC research, instruments measuring DC motivation can be useful for exploring relationships between motivation, health, and performance indicators in the athletic and academic domains.

Methodology and results

The process of development and evaluation of the scale was divided into two parts. Part 1 presents the development and evaluation of the scale's initial version with sample 1 whereas part 2 focuses on the final version with sample 2. Generally, the methodological approach follows the standardised procedure put forth by Boateng et al. (2018). The three-phase guideline, which is subdivided into nine steps, will be addressed in the following sections. An illustration of these nine steps can be found in the electronic supplement (Fig. S2).

In general, the descriptive statistical analyses were conducted using SPSS (version 26.0, IBM Corp., Armonk, NY, USA). Exploratory (EFA) and confirmatory factor analyses (CFA) as well as correlation analyses were carried out using Mplus (version 8.4; Muthén & Muthén, Los Angeles, CA, USA). Latent variables were used for all correlation calculations. In Mplus, missing data were treated with full information maximum likelihood.

Part 1: Methodological procedure of the initial SAAMS version with sample 1

Phase 1: Item development of the SAAMS

In the first step, relevant domains were identified and items were generated. The self-report Student-Athletes' Academic and Athletic Motivation Scale (SAAMS) has been developed based on the EVF for student–athletes in secondary school. Four items were initially developed for each sub-dimension in the athletic and academic domain and phrased according to examples given in previous studies using this framework (Gaston-Gayles, 2004; Eccles & Wigfield, 1995; Flake, Barron, Hulleman, McCoach, & Welsh, 2015; Wigfield & Eccles, 2000). An exception to this phrasing were the items used for the ability beliefs. These items are identical to the self-concept items developed by Marsh (1990) and adapted by Brettschneider and Klimek (1998). All items were developed domain specifically in order to create item pairings (e.g., "It is important to me to deliver very good results in school" for the academic domain and "It is important to me to deliver very good results in sport" for the athletic domain). The item pairs were worded identically in order to ensure an equal understanding and comparability of the items. All items of the initial scale including an English translation can be found in the electronic supplement (Table S1).

The second step included the exploration of the content validity. Items belonging to the respective sub-dimensions were discussed between the authors who came to a mutual agreement regarding the selection and wording of the items.

Phase 2: Scale development

In order to pre-test the scale in step 3, field pre-testing was chosen in the scale development phase with the initial SAAMS

version. The initial scale was distributed to 346 student–athletes (sample 1) in four German secondary schools in three federal states between February 2020 and November 2021. Afterwards, this scale was analysed and revised resulting in the final SAAMS.

The completion of the scale was supervised by trained personnel. Computer-assisted personal interviewing (CAPI) was chosen as requested by the schools in order to reduce errors associated with data entry and to enable the data collection of a large sample size.

The fourth step included the survey administration and the organisation of the sample. All participants were active in high-performance sport. They (a) train in sports with the aim of improving their athletic performances, (b) participate in sport competitions, (c) are formally registered as a competitor at a local, regional, or national sport federation, and (d) have sport training and competition as one of their major activities or focus of personal interest (Araújo & Scharhag, 2016). Detailed sample descriptions are listed in **Table 1**.

In the fifth step, item reduction analysis was conducted. The initial SAAMS version was investigated for general fit of data by evaluating the mean values and standard deviations of the items, normal distribution, skewness, and kurtosis as well as item difficulty and inter-item correlations.

Step 6 included the extraction of factors for the scale development phase. The initial SAAMS with sample 1 was evaluated using EFA with varimax rotation. Separate EFAs were run for the academic and athletic domain.

Results of the EFA with the initial SAAMS version using sample 1

Factor loadings of separate EFAs without previously defined factors as well as the scree plot for the academic and athletic domain indicated that there should be either four or five factors for the academic and athletic motivation respectively. A six-factor model was initially assumed. However, an EFA run with four, five, and six factors demonstrated the best solution for a five-factor model as these factors can be defined content wise. These models as well as their model fits can be found in the electronic supplement (Tables S3–S6).

Part 2: Methodological procedure of the final SAAMS version with sample 2

Phase 1: Item development of the SAAMS

After the initial scale development phase, the instrument was revised based on results of the EFA. Some items were rejected due to weak factor loadings. These items were reworded in order to replace missing items. Adjustments between the SAAMS versions are displayed in Table S7 (see electronic supplement). In the final version, five items each measured athletic and academic expectation, six items each measured athletic and academic importance as well as interest, three items each measured athletic and academic usefulness, and eight items each measured athletic and academic costs. The items regarding the self-concept remained untouched in the revision process. The items of the final scales as well as an English translation can be found in the electronic supplement (Table S2).

Phase 2: Scale development

In the scale evaluation phase, the final SAAMS was completed by 497 student–athletes (sample 2) in three Austrian and nine German schools in one Austrian and five German federal states between March and July 2022. The initial and final SAAMS version were tested on separate samples. Detailed sample descriptions are listed in **Table 1**. Item reduction analysis was conducted by investigating the final SAAMS version for general fit of data.

Phase 3: Scale evaluation

For the seventh step, dimensionality and measurement invariance were tested for the final SAAMS with sample 2. The tests of dimensionality, also known as factorial validity, were conducted with CFA run for a five- and six-factor solution with the aim of finding the best fitting solution. The CFA for a five-factor solution was conducted based on the results of the EFA with the initial version. In order to replicate the six-factor structure of the EVF, a CFA with a six-factor solution was also run. A maximum likelihood parameter (MLR) estimator was chosen for the data analysis as it provides robust standard errors. Following the results of the CFA, items not loading on any factor (≤ 0.40) or loading on more than two factors (≤ 0.32) were removed ensuring that at least three items represent one factor, following the recommendations by Osborne (2014). Moreover, the selectivity, reliability, and the descriptive data were used in order to determine the items that had to be removed. Items were only

Abstract

Ger J Exerc Sport Res
https://doi.org/10.1007/s12662-023-00921-7
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Student–Athletes' Academic and Athletic Motivation Scale (SAAMS) for adolescents in secondary school: development, evaluation, and psychometric properties

Abstract

Previous dual-career (DC) research focused on measuring student–athletes' motivation in the academic and athletic contexts. Existing measurement instruments are insufficient for adolescent student–athletes and countries with independent education and sport systems. The Student–Athletes' Academic and Athletic Motivation Scale (SAAMS) was developed based on the expectancy–value framework (EVF) with its dimensions *ability beliefs, expectations, importance, interest, usefulness*, and *cost*. The development of the SAAMS followed three phases: (1) item development, (2) scale development, and (3) scale evaluation. The initial version was tested with 346 student–athletes (mean age = 17.3 years; females = 47.7%). A revision phase resulted in a final SAAMS tested with 497 student–athletes (mean age = 17.0 years; females = 42.9%). Exploratory and confirmatory factor analyses were conducted for the evaluation. Several models were tested with the best results for a six-factor model as assumed by the EVF. The SAAMS is suitable for an extensive range of research and practical applications.

Keywords

Dual career · Elite sport · Validation · Confirmatory factor analysis · Education

Table 1 Description of samples with student–athletes

	Total sample of the initial SAAMS (*N* = 346)	Total sample of the final SAAMS (*N* = 497)
Age (years)	*M (SD)*	*M (SD)*
	17.3 (1.4)	17.0 (1.0)
Gender	*n (%)*	*n (%)*
Male	180 (52.0)	282 (56.7)
Female	165 (47.7)	213 (42.9)
Elite squad level	*n (%)*	*n (%)*
A and B squad (international level)	19 (5.5)	31 (6.2)
C squad (national level)	2 (0.0)	100 (20.1)
D/C squad (regional level)	80 (23.1)	61 (12.3)
D squad (regional level)	39 (11.3)	126 (25.4)
Other squad level	116 (33.5)	45 (9.1)
No squad level	90 (26.0)	126 (25.4)
Groups of Olympic sport disciplines	*n (%)*	*n (%)*
Endurance sports[a]	101 (29.2)	80 (16.1)
Team sports/sports games[b]	117 (33.8)	246 (49.5)
Strength and speed–strength sports[c]	43 (12.4)	66 (13.3)
Combat sports[d]	54 (15.6)	31 (6.2)
Artistic composition sports[e]	6 (1.7)	14 (2.8)
Multidiscipline sports[f]	20 (5.8)	35 (7.0)
Others[g]	5 (1.4)	25 (5.1)

[a] e.g., canoeing, running, rowing, swimming
[b] e.g., handball, football, volleyball, water polo
[c] e.g., weightlifting, athletics (sprinting, jumping, throwing, shot put)
[d] e.g., judo, boxing, wrestling
[e] i.e., figure skating, cheerleading
[f] i.e., triathlon, decathlon, modern pentathlon
[g] i.e., equestrian, sport shooting

kept if item pairing for both domains was given. For the interpretation of the model results, Hooper et al. (2008) suggest thresholds of ≤ 0.05 for the standardised root mean square residual (SRMR), ≥ 0.95 for the comparative fit index (CFI), and ≤ 0.08 for the root mean square error of approximation (RMSEA). However, Hu and Bentler (1999) suggest that in complex cases the combination rules should be followed. These rules indicate good fits of models if the CFI is close to 0.95 in combination with the SRMR being close to 0.09 and the RMSEA > 0.05 in combination with the SRMR > 0.06.

In addition to the suggestions by Boateng et al. (2018) concerning the scale evaluation, a multigroup comparison was used in order to investigate whether the final SAAMS is able to equally depict academic and athletic motivation among male and female student–athletes (Brown, 2015). The model fits of the CFA were calculated separately for males and females and compared with the model fits of the configural, metric, and scalar models. The models were calculated in order to test for the best model based on the student–athletes' sex.

The eighth step included the test for reliability for the final SAAMS with sample 2. In order to assess the internal consistency of the SAAMS subdimensions, McDonald's ω was calculated for the six factors replicating the sub-dimensions (Hayes & Coutts, 2020).

Lastly, the final SAAMS with sample 2 had to be tested for validity. Pearson's correlation was used in order to test for convergent and criterion validity. For the convergent validity, the relation between motivation and passion as well as identity was determined. A positive correlation between the athletic motivation measured by the SAAMS and the non-obsessive athletic passion measured by the Com.pass Scale (Moeller, 2013; McDonald's ω = 0.95) was expected. Moreover, a positive correlation was expected between motivation and identity in the academic and athletic contexts. In order to measure student–athletes' identity, the Athletic Identity Measurement Scale (AIMS; Brewer, Van Raalte, & Linder, 1993; AIMS-D, Schmid & Seiler, 2003; McDonald's ω = 0.89) and the Student Identity Measurement Scale (SIMS; Engström, 2011; McDonald's ω = 0.79) were used. Criterion validity was examined by correlating motivation with excessive demands. The latter was measured with an adapted version of the sub-scale "excessive demands for work" in the Trier Inventory for Chronic Stress (TICS; Petrowski et al., 2018; Sallen, Hirschmann, & Herrmann, 2018b) for the academic (McDonald's ω = 0.88) and the athletic context (McDonald's ω = 0.92). Negative correlations between motivation and excessive demands were expected. Moreover, the criterion validity was verified by correlating the time spent for extracurricular school work and competitive training with academic and athletic motivation. For the time spent for training, the mean values of the training hours of student–athletes were used. These mean values were relativised in relation to the sport disciplines indicated in **Table 1**, since Brettschneider (1999) mentioned that the training hours of student–athletes are related to their sport discipline. As motivation is supposed to predict behaviour, a moderate positive correlation was expected.

Results regarding the final SAAMS version with sample 2

The CFAs run in step 7 demonstrated the best solution for a six-factor model. Three items were kept for each factor. All other items were identified as difficult due to their loadings, their selectivity, their descriptive data, as well as a simultaneous comparison between the academic and athletic motivation. The final six-factor

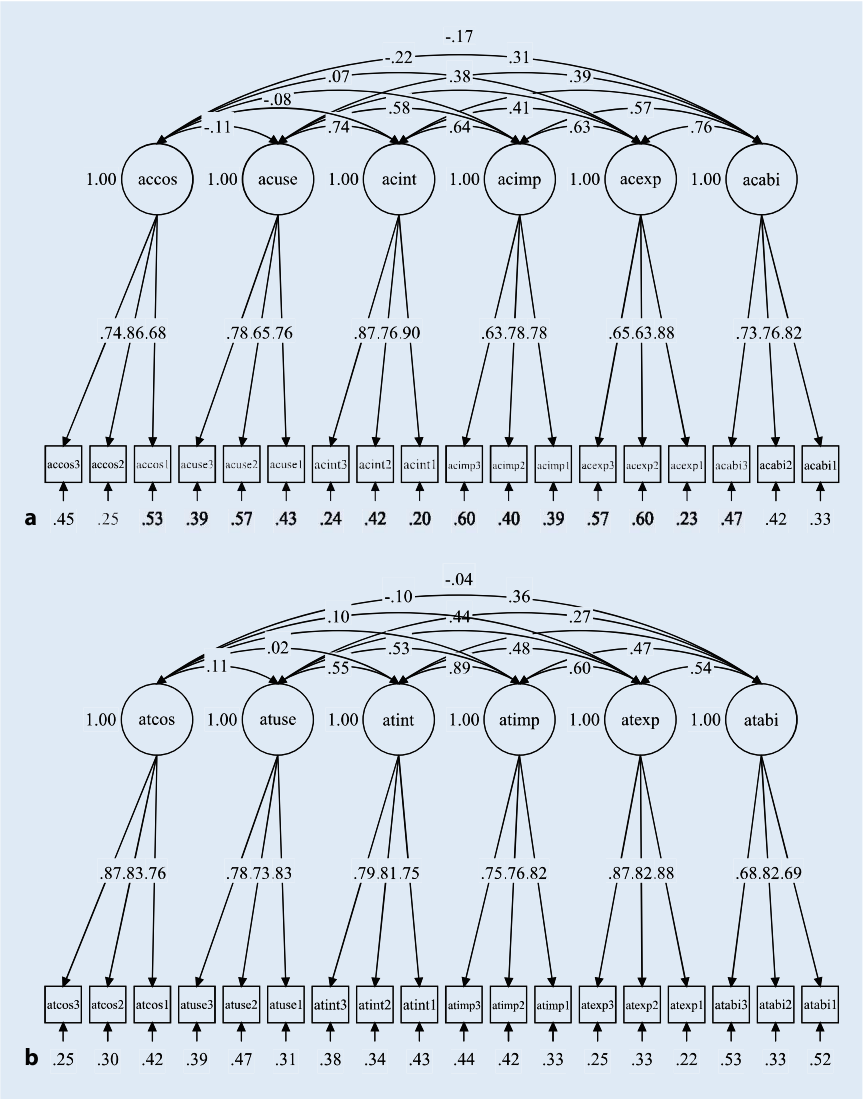

Fig. 1 ▲ Results of the confirmatory factor analysis regarding the final six-factor model for academic (**a**) and athletic (**b**) motivation

model is presented in **Fig. 1**. The five-factor models and their model fits can be found in the electronic supplement (Table S8, Figs. S3 and S4). Subsequently, the academic and athletic domain were summarised in new models (see **Fig. 2**). The model fits of all CFAs are listed in **Table 2**. The testing for measurement invariance resulted in a configural, metric, and scalar model. These model fits are included in **Table 2**.

The McDonald's ω values for all factors representing the sub-dimensions calculated in step 8 in order to test for reliability are displayed in **Fig. 2a**.

Finally, the results of the tests for validity, namely, the correlation analyses, are listed in **Table 3**.

Discussion

The present study aimed to develop a scale that measures academic and athletic motivation among adolescent student–athletes in upper secondary school. For this purpose, the newly developed SAAMS was evaluated following a standardised procedure by Boateng et al. (2018).

In step 6, an EFA with the initial SAAMS version resulted in a five-factor model although a six-factor model was expected in accordance with the EVF (Eccles et al., 1993). The factors replicate the sub-dimensions of the theoretical EVF. Particular problems arose with the item removal in the factors *importance* and *interest*. Moreover, difficulties with the loadings regarding the factor *cost* were identified. Despite these difficulties, the five factors can be interpreted in line with the EVF. Although separate sub-dimensions in the EVF, one factor of the initial SAAMS version constitutes the student–athletes' task values *importance* and *interest*. Previous research (Wigfield & Eccles, 2000) has highlighted that these two factors are closely related, even pointing out that there could be more task values such as happiness or freedom and that the value one places on a task might be influenced by the value that significant others such as parents, teachers, or coaches place on the task. Therefore, it is not surprising that the sub-dimensions *importance* and *interest* are represented by just one factor. Nevertheless, items were reworded and added in the revision process in order to explore further aspects of academic and athletic motivation with particular focus on the sub-dimensions *importance*, *interest*, and *cost*.

Although the EFA of the initial version resulted in a five-factor model, a six-factor model was attempted in the seventh step by testing for dimensionality in order to replicate the EVF. The separate CFAs for the academic and athletic motivation verified the attempted six-factor model as the factor loadings are over 0.60, indicating a fitting model. All model fits meet the thresholds by Hooper et al. (2008) when the models for academic and athletic motivation are calculated separately. In summary, the results of the separate CFAs suggest that a six-factor model is applicable for the final SAAMS. These six factors replicate the originally attempted sub-dimensions: *ability beliefs*, *expectation*, *importance*, *interest*, *usefulness*, and *cost*. Moreover, the six factors for the academic and athletic domain can be combined into one model with second-order factors as to explore motivation across various life domains. The two second-order factors include academic and athletic motivation which clearly indicate that student–athletes are able to differentiate between both domains. Moreover, a model with four second-order factors was calculated with regard to the four dimensions: academic and athletic expectancies as well

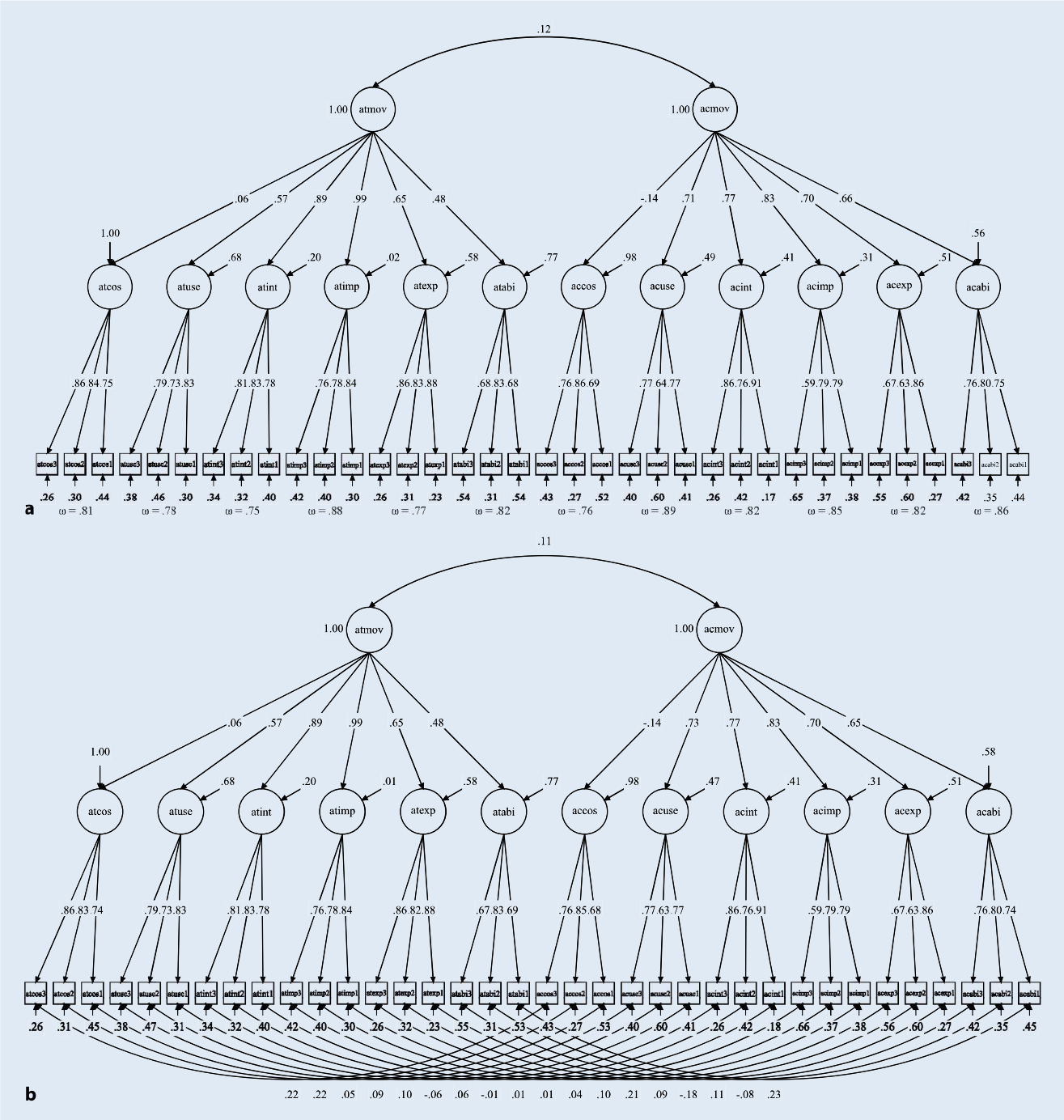

Fig. 2 ▲ Results of four models combing academic and athletic motivation. **a** Domain second-order model of the SAAMS with McDonald's ω for each sub-dimension. **b** Domain second-order model of the SAAMS including item-pairing correlations. **c** Dimension second-order model of the SAAMS. **d** Dimension second-order model of the SAAMS including item-pairing correlations

as academic and athletic task values. Although not all model fits of these second-order models meet the thresholds (Hooper et al., 2008), the combination rule by Hu and Bentler (1999) can be applied highlighting a fit for the model with four dimensions as second-order factors. In addition, the SAAMS was tested for measurement invariance by calculating configural, metric, and scalar models. The model fits of these three models as well as separate models for female and male student–athletes result in similar fits to the original model. Hence, the SAAMS is able to depict academic and athletic motivation between females and males equally.

In the iterative process of receiving the best CFA solution, several items had to be removed. Interestingly, all reverse-worded items were removed although

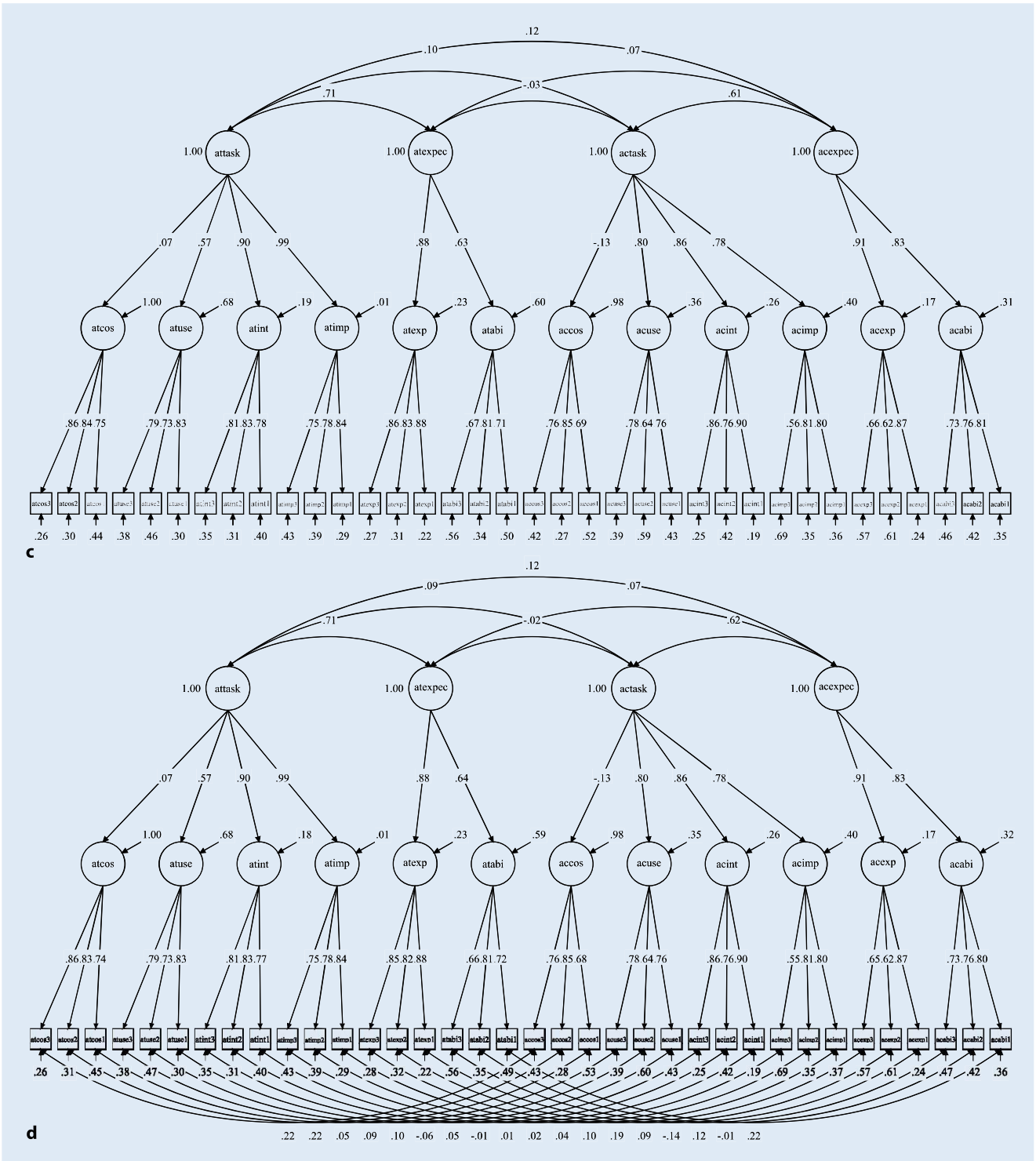

Fig. 2 ▲ (Fortsetzung)

these items aimed to prevent response bias. This removal of reverse-worded items is in line with recent findings that these items do not prevent response bias, but more significantly lead to confusion and inattention (Van Sonderen, Sanderman, & Coyne, 2013).

In step 8, reliability was tested. The McDonald's ω values indicate substantive internal consistency for all factors. This finding emphasises the appropriateness of the SAAMS for measuring academic and athletic motivation among student–athletes in secondary school.

The validity was tested in the last step. The findings regarding the correlations for the convergent and criterion validity are in line with previous assumptions, since positive relationships were found between identity and motivation as well as passion and motivation. In con-

Table 2 Model fits of the six-factor model for the domains of academic and athletic motivation as well as the combined SAAMS model using confirmatory factor analysis for the final SAAMS ($N = 497$)

	CFI	RMSEA	SRMR	χ^2	*df*	*p*
Separate models						
Academic motivation	0.933	0.069	0.047	386.9	120	< 0.001
Athletic motivation	0.962	0.054	0.039	282.6	120	< 0.001
Combined models						
Domain second-order SAAMS	0.892	0.053	0.072	1383.2	581	< 0.001
Domain second-order SAAMS with correlations	0.898	0.052	0.070	1321.4	563	< 0.001
Dimension second-order SAAMS	0.910	0.048	0.066	1245.8	576	< 0.001
Dimension second-order SAAMS with correlations	0.916	0.048	0.065	1187.2	558	< 0.001
Measurement invariance models for sex						
Female student–athletes ($n = 213$)	0.903	0.055	0.054	876.0	528	< 0.001
Male student–athletes ($n = 282$)	0.903	0.054	0.053	959.3	528	< 0.001
Configural model	0.903	0.055	0.054	1837.7	1056	< 0.001
Metric model	0.904	0.054	0.056	1848.8	1080	< 0.001
Scalar model	0.901	0.054	0.057	1897.1	1104	< 0.001

SAAMS Student–athletes' Academic and Athletic Motivation Scale, *df* degrees of freedom, *CFI* comparative fit index, *RMSEA* root mean square error of approximation, *SRMR* standardised root mean square residual

Table 3 Pearson's correlations for academic and athletic motivation as well as academic and athletic identity, excessive demands, athletic passion, and time spent for school work/training ($N = 497$)

	Academic motivation	Athletic motivation
Academic motivation	–	0.14*
Athletic motivation	0.14*	–
Academic context		
Academic identity	0.41**	0.05
Academic excessive demands	–0.63**	–0.06
Time spent for extracurricular school work	0.13**	0.05
Athletic context		
Athletic identity	–0.18**	0.34**
Athletic excessive demands	0.07	–0.22**
Athletic passion	0.24**	0.53**
Time spent for competitive training	0.07	0.12**

*$p < 0.05$, **$p < 0.01$

trast, negative correlations were found between motivation and excessive demands. It is interesting that the impact of the excessive demands seems to be higher for school than for sport. This finding, however, is not surprising as student–athletes are committed to sports voluntarily whereas school is compulsory. Positive, although weak, correlations were found between the time spent for extracurricular school work and academic motivation as well as the time spent for competitive training and athletic motivation. Hence, the correlations indicate a good convergent and criterion validity of the SAAMS.

In general, the results indicate that the SAAMS is appropriate for measuring adolescent student–athletes' academic and athletic motivation. The final SAAMS depicts the theoretical six-dimension model on the empirical level. Moreover, the SAAMS contributes to the discourse of DC research as the scale emphasises the importance of conducting research with student–athletes in secondary schools. In comparison to other instruments measuring DC motivation (Gaston-Gayles, 2004; Aunola et al., 2018), one can argue that the SAAMS is the only instrument that is based on a single theoretical underpinning and yields better statistical results.

The strength of the present study can be found in the novel approach of combining academic and athletic motivation in one scale in order to fully depict DC motivation. Although domain-specific instruments are still disputed, Heckhausen and Heckhause (2018) emphasised that life-domain-specific instruments measuring motivation provide substantial benefits. The SAAMS constitutes such a domain-specific instrument as the scale differentiates between the academic and athletic life context. Moreover, the SAAMS is the first scale constructed specifically for adolescent student–athletes in upper secondary school. In addition, the SAAMS seems to be independent of the specific location and type of sport school as well as the region and educational system, as the SAAMS was conducted in German and Austrian federal states. However, further studies need to investigate the adequacy of the SAAMS for measuring academic and athletic motivation in diverse cultural and educational contexts.

Besides the strength of the study, limitations should be considered. In terms of the method, most steps of the procedure suggested by Boateng et al. (2018) have been followed. However, some minimal deviations can be found. In step 3, the pre-testing of the items was conducted with a large sample rather than a small group in several rounds. Furthermore, as the study aimed to have equal scales for academic and athletic motivation, some items had to be deleted or kept during the EFAs in order to achieve equity, which might have led to a quality reduction in the initial SAAMS. Nevertheless, the CFAs show approval of the final solution with six factors. In order to test for the discriminant validity of the results of the CFAs, further examinations of the SAAMS have to be conducted. Moreover, the SAAMS has not yet been used in a longitudinal study. Future studies should evaluate the scale longitudinally with re-test reliability. Lastly, the items were worded with the aim of being culturally unspecific. This unspecificity seems to be true for the two German-speaking countries involved. However, the cultural specificity needs to be explored further, possibly in multicultural teams.

Conclusion

Previous research regarding DC motivation focused on student–athletes in higher education (Fernandes et al., 2019; Gaston-Gayles, 2004; Lupo et al., 2015; Park & Lee, 2015). The newly developed SAAMS contributes to the discourse of DC motivation research by focusing on adolescent student–athletes in upper secondary school. In light of the EVF, this scale is able to depict adolescent student–athletes' academic and athletic motivation. Based on existing findings, an extensive range of research and practical applications can be suggested for the SAAMS. As the athletic performance is not the only indicator for the participation in DC support services and since motivational aspects should additionally be considered, the SAAMS can possibly be used for talent identification and selection when making decisions about the access to and provision of support services. Another possible practical field of application for this scale is the usage by practitioners such as teachers, coaches, and DC counsellors in order to individually guide student–athletes through a successful DC. Moreover, the SAAMS can potentially be used in practical and research settings by documenting the longitudinal development of student–athletes' academic and athletic motivation. Further applications in research contexts include the description and prediction of DCs with regard to motivation. For example, optimal motivation profiles for a successful DC can be identified using the SAAMS by investigating student–athletes' motivation with regard to academic and athletic achievements, health, burnout, etc.

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Acknowledgements. We would like to thank Prof. Dr. Christopher Heim (Goethe University Frankfurt, Germany), Prof. Dr. Sebastian Ruin (University of Graz, Austria), and Dr. Hagen Wulff (University of Leipzig, Germany) for their support in arranging the contacts at the elite sport schools. Moreover, we would like to thank Christian Andresen, Jan Christmann, Benjamin Corts, Christoph Lahousen, Dominic Ullrich, and Lara Wille for their support in acquiring the participants for the study.

Author Contribution. All authors were responsible for the study conception and design. J. Sallen acted as initiator and supervisor of the study, organised sample 1 and led the data acquisition for the first study part (scale development phase). M. Niehues organised sample 2 and led the data acquisition for the second study part (scale evaluation phase), took lead in developing the SAAMS and in writing the manuscript. All authors made substantial contributions to the data analysis and interpretation. The manuscript was developed, revised, and approved for publication by all authors.

Funding. Open Access funding enabled and organized by Projekt DEAL.

Declarations

Conflict of interest. M. Niehues, J. Sallen and E. Gerlach declare that they have no competing interests.

The study was approved by local school authorities and the ethics committees of the University of Hamburg (approval number: 2022_036; Germany) and the University of Potsdam (approval number: 37/2021; Germany). All research procedures were in line with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

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Appendix IV: Copy of Publication IV

Niehues, M., Gerlach, E., & Sallen, J. (2023a). *Student-athletes' perception of basic psychological need support in sports and school? Cross-sectional and longitudinal perspectives using a cluster-analytical approach* [Manuscript submitted for publication]. Arbeitsbereich für Bewegungs- und Sportpädagogik, Universität Hamburg.

This manuscript has been submitted for publication in a scientific journal. The manuscript has not been accepted for publication at the time of the dissertation's publication and will, thus, not be included in the publication of this dissertation

Declaration of Independence

Hiermit erkläre ich an Eides statt,

1. dass die von mir vorgelegte Dissertation nicht Gegenstand eines anderen Prüfungsverfahrens gewesen oder in einem solchen Verfahren als ungenügend beurteilt worden ist.
2. dass ich die von mir vorgelegte Dissertation selbst verfasst, keine anderen als die angegebenen Quellen und Hilfsmittel benutzt und keine kommerzielle Promotionsberatung in Anspruch genommen habe. Die wörtlich oder inhaltlich übernommenen Stellen habe ich als solche kenntlich gemacht.

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Signatur entfällt aus datenschutzrechtlichen Gründen

Maike Niehues