

Let's Focus on our Students

Personal Characteristics Determining Student Motivation in Physical Education

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Summary

The overriding aim of school is to educate students. Besides imparting knowledge, students' personality development and as a consequence thereof the ability to shape life in society are elementary components of education in the school context. Within educational learning processes, students' personality represents a goal of education but also a prerequisite for teaching processes. Teaching prerequisites are largely determined by the actors in the lessons: students and teachers. In order to teach authentically but also targeted, teachers should consider and analyze their own as well as their students' personal requirements. Personal requirements become important when linking the subject of the lesson, i.e., the pupil, with the object, i.e., the learning content, and thus to do justice to categorical education and pursue holistic education. Holistic education moreover includes bodily education, which in the school context is subject to and achieved in physical education in particular.

Physical education aims to educate students to and through sports. This twofold aim on the one hand ideally initiates extracurricular and, at best, lifelong physical activity and, on the other hand supports students' personality development. In order to fulfill physical education's aim and make educational learning processes as sustainable as possible, students should be intrinsically motivated to engage in school physical education lessons. Since the development of motivation can be attributed not only to situational but also to personal factors, this dissertation deals with students' personal characteristics related to motivation in physical education. The main aim is to describe the student as key actor in school physical education comprehensively. In addition, the thesis subordinately aims to describe and analyze the physical education teacher representing an additional prerequisite for teaching processes.

For this purpose, first, students' personality has been considered as part of students' personal requirements and the research area on student personality in physical education has been presented in the form of a scoping review. The review showed that students' personality in physical education is subject to empirical investigations. The studies' underlying personality understandings, research questions, and results were diverse. Further, personality understandings were inconsistent across studies with most studies following trait theory. The included studies investigated relationships between students' personality and either (a) students' achievement in physical education, (b) students' psychological determinants of physical education participation (e.g., motivation, anxiety), or (c) school sports interventions.

The scoping review provided basis for the design of the subsequent empirical study, which analyzed the expression of the following general and sports-specific student characteristics in the physical education context: *general personality traits*, *physical self-concept*, *achievement motive*, *motives to be physically active*, and *sports interest*. Further, differences between groups of students were analyzed.

The theoretical as well as empirical work was simultaneously realized on the teacher side. Findings have been discussed in terms of their contribution to the research area and their implementation in teaching practice as well as in physical education teacher education or professional training. Further, results on the student as well as the teacher side and accompanied implementation possibilities can impact e.g., health aspects of society. Targeted PE teaching, which aims to address students more specifically and tailor lessons to their personal characteristics, supports students' meaning finding in sports. This in turn increases the chances of extracurricular, lifelong physical activity, which essentially contributes to a healthy lifestyle. The thesis concludes with an outlook on subsequent research possibilities concerning the thesis' work as well as the associated project *SuM PLuS – Physical Education and Motivation: Teachers' and Students' Person-Related Factors as Determinants of Student Motivation* – within which this thesis is embedded.

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List of Abbreviations

ANOVA	Analysis of Variance
DSLVL	Deutscher Sportlehrerverband (German Physical Education Teacher Association)
MANOVA	Multivariate Analysis of Variance
PE	Physical Education
<i>SuM PLS</i>	Sportunterricht und Motivation: Personbezogene Faktoren von LehrerInnen und SchülerInnen als Determinanten der Schülermotivation (<i>Physical Education and Motivation: Teachers' and Students' Person-Related Factors as Determinants of Student Motivation</i>)

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1 General Introduction

Physical education (PE) is part of the obligatory school curriculum. Due to its focus on physical development, PE contributes essentially to students' holistic education in school. PE aims to educate students *to and through sports*. This dual mandate implies PE's intention to motivate students for lifelong engagement in physical activities. By this, PE contributes essentially to the development of a healthy lifestyle, which has become increasingly important: Only 26 percent of children in Germany fulfill the World Health Organization's (2020) recommendations of daily 60 minutes moderate- to vigorous-intensity physical activity.

PE is subject to the paradox that sports as object of instruction is hardly suitable for schools' institutional structure (Prohl, 2010a). The integration of sports into schools and the associated alienation of purposeless sports into a postulate of censorship may contribute to the frequently occurring disinclination about the subject PE. PE teachers in their lessons face problems such as listless, fearful, or aggressive students (Caravaca & Romero Ramos, 2018; Simonton & Garn, 2019). Learner heterogeneity and associated differing perceptions of PE are amongst the biggest challenges for PE teachers. They need to address all students in their lessons – challenging already motivated students while simultaneously promoting unmotivated students. Research has shown a significant decrease of motivation for sports in general and in PE in particular within adolescence (Dishman et al., 2018; Knisel et al., 2009; Ntoumanis et al., 2009).

Factors influencing motivation can be divided into situational and personal factors (Heckhausen & Heckhausen, 2018). In order to describe these factors, PE as setting as well as its key players have to be examined. Teaching in general and by this PE teaching in particular is typically described and analyzed by three components: teacher, students and lesson content. This tripartite is also known as teaching's *didactic triangle* (Meyer, 2017).

The characterization of lesson content has undergone a change along with the reformation of school curricula since the turn of the century. In reformed curricula, lesson content has experienced an opening away from predefined examples towards competencies, which learners have to acquire. This change, on the one hand indicates the orientation towards the learners. On the other hand, the shift towards competencies challenges teachers. Within this new gained opening and by this flexibility, teachers have to design adequate teaching units, which bring learners

to acquire the demanded competencies. Therefore, the presentation of the lesson content must be adapted to the learning group as well as the teacher's personal and professional requirements. Similar to students, PE teachers offer starting points for targeted instruction, e.g., by describing and analyzing their requirements. Therefore, this dissertation thesis explicitly focuses on students and teachers in the PE context.

Hattie (2009, 2018) in his meta-analysis showed that students' individual requirements greatly affect their learning success. When planning lessons, teachers should consider the composition of their learners' individual requirements and respond to them while teaching (Katsiyannis et al., 2000). Teachers by this aim to address students adequately and support their individual development within the educational mandate. Besides the relevance of students' requirements, Hattie's meta-analysis highlighted the teacher as relevant factor for learning success. Therefore, teachers' requirements are elementary component of successful teaching.

The goal is to know students' and teachers' requirements and to make them tangible as determinants of student motivation. For this purpose, first, previous research has been analyzed and findings have been compiled theoretically. Second, within the project *Sportunterricht und Motivation: Personbezogene Faktoren von Lehrern und Schülern als Determinanten der Schülermotivation/Physical Education and Motivation: Person-related Factors of Teachers and Students as Determinants of Student Motivation (SuM PLuS)*, students' and teachers' characteristics in the PE context have been empirically examined and by this a comprehensive description of PE's key players has been delivered.

This dissertation thesis contains four publications published under peer-review procedures. Two publications examine students in the PE context, two publications examine PE teachers.

- 1) Kirch, A., Schnitzius, M., Mess, F., & Spengler, S. (2019). Who Are Our Students? Understanding Students' Personality for Refined and Targeted Physical Education. A Scoping Review. *Frontiers in Sports and Active Living*, 1(31). doi:10.3389/fspor.2019.00031
- 2) Kirch, A., Schnitzius, M., Spengler, S., Blaschke, S., & Mess, F. (2020). Knowing Students' Characteristics: Opportunities to adapt Physical Education Teaching. *Frontiers in Psychology*. doi: 10.3389/fpsyg.2021.619944 (Accepted)

- 3) Schnitzius, M., Kirch, A., Mess, F., & Spengler, S. (2019). Inside Out: A Scoping Review on the Physical Education Teacher's Personality. *Frontiers in Psychology*, 10(2510). doi:10.3389/fpsyg.2019.02510
- 4) Schnitzius, M., Kirch, A., Spengler, S., Blaschke, S., & Mess, F. (2020). What makes a physical education teacher? Person-related factors for physical education development. (Under review)

This dissertation thesis primarily focuses on students in PE – Article 1 and 2 in first authorship. A parallel doctoral thesis focuses on the PE teacher. This work is included in this dissertation thesis as well – Article 3 and 4 in co-authorship. By looking at PE's two key players – students and teachers – a comprehensive picture with possible interrelationships arises. The gained insights have been put into practice. Under the guiding idea of PE's dual mandate, the findings thereby contribute to targeted *education to sports and education through sports*.

2 Background

2.1 Education as Essential Task of School

Considering school laws of Germany's different and educationally politically independent federal states, it becomes obvious that educating students depicts the overarching mission of schools. Schools hereby act between the conflicting priorities of education on the one hand and knowledge transfer on the other hand. Here the processes of qualification, allocation, socialization, and provision of peers, which constitute schools' social functions (Siebertz-Reckzeh & Hofmann, 2017), have an effect.

In German, there are two terminologies for the term education: *Erziehung* and *Bildung*. They differ in their semantic meaning: *Erziehung* describes processes initiated from the outside whereas *Bildung* takes place internally driven by *Erziehung*. Consequently, *Bildung* is seen as intention and goal of *Erziehung*. In the following, the German terminologies – *Erziehung* and *Bildung* – are used if the distinction between the two processes is important, if not, this thesis uses the term education.

Erziehung, derived from *irziohan* (to pull out) and *educare* (to raise, feed, educate) (Bibliographisches Institut, 2014) generally means targeted influencing of younger people's behavior by older people (Hörner et al., 2010). According to Brezinka (1990), *Erziehung* and more precisely the educator's (social) behavior aims to promote learners' psychological dispositions. The verb *to educate* has transitive character and thus includes an educator. This creates an externally controlled normative educational relationship, characterized by norms of the older generation, which are passed on to the younger generation.

Bildung, on the other hand, is derived from *erudition* (from the raw state and beyond) (Raithel et al., 2007) and implies the approbation of knowledge and skills aiming to acquire a cultivated lifestyle for oneself (Hörner et al., 2010). The term primarily refers to the cognitive area and, in comparison to the educational process, does not have a normative component, but rather implies a more reflective character (Hörner et al., 2010). *Bildung* as opposed to *Erziehung* describes a lifelong task and by this is close to the English terminology *lifelong education*.

The task of education internationally defined as the *Right to Education* (UN General Assembly, 1948). Article 26 of the *Human Rights* on the one hand states

that everyone has the right to education and on the other hand states that "education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms" (UN General Assembly, 1948, p. 2). The Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany (2018) describes the implementation of *Bildung* and *Erziehung* in schools as accompanying students in perceiving themselves, developing their personality and learning to live in the community. Every child should be supported in the best possible way.

Wilhelm von Humboldt decisively coined the development of the concept education. In his concept of education, he turned away from the matter at hand and shifted the attention to the human being. His understanding of education placed special importance to the individual. External constraints should be reduced and self-education, the formation of one's own personality, should take place. With this understanding, education that consciously aims at personality formation emerged in the spirit of neuhumanism (Hörner et al., 2010). In the center was the human being with the possibility of self-development – developing a reflective and versatile personality of its own (Raithel et al., 2009). Political interests or social usefulness played a subordinate role (Hörner et al., 2010).

The concept of education was further influenced by Wolfgang Klafki. In his understanding of education, Klafki managed to bring together the previously opposing educational theories – material and formal education. Material education theories took the object as a point of reference and started from the educational content (Klafki, 1975). Formal theories of education, on the other hand, took the subject as their point of reference and started from the learner (Klafki, 1975). Klafki (1975) paired the two theories and thus developed a new understanding of categorical education. In this new understanding, object and subject references are intertwined so that education has become an experienced encounter between content and student (Haug, 2000).

2.2 Education as Driver of Children's and Adolescents' Development

Education mainly takes place in childhood and adolescence. Educational processes are shaped by the development of children and adolescents. Development refers to relatively persistent intra-individual changes in experience and behavior over time (Trautner, 1992). Development inevitably happens automatically through endogenous and exogenous factors (Lohaus & Vierhaus, 2019) whereas education describes conscious, intentional processes (Siebertz-Reckzeh & Hofmann, 2017). As education consciously contributes to the development of a person, mostly children and adolescents, it can be seen as driver of development (McCowan, 2019). Development is described by two fundamental processes: learning and maturation. Maturation refers to the emergence of a behavioral trait due to inherited dispositions. Inherited dispositions in turn, as mentioned above, can be influenced by education (Brezinka, 1990). Maturation is a targeted and irreversible process controlled by hereditary factors (Metzinger, 2018). Therefore, the maturation process forms an important basis for learning.

Learning is a process which, based on experiences, leads to relatively permanent changes in behavior or behavioral potential (Bodenmann et al., 2016). Learning and maturation interact with and depend on each other. Certain learning processes presuppose functional maturity and are realized through learners' interaction with the environment (Metzinger, 2018). Both learners and the environment, play active roles here.

In the development process of a person, both the individual as well as the corresponding social or material environment, change. In this process, developmental strands are in reciprocal relationship to each other. Here too, development differs from education. Education includes a hierarchical relationship between educator and educated person (Brezinka, 1990). In contrast, learners' development is influenced by the involved educators (e.g., teachers, parents). Additionally, the interaction between educators and learner is influenced by the learner's continuous development (Lohaus & Vierhaus, 2019).

Developmental psychology differentiates between varying developmental dimensions. In addition to the overall developmental status, the development of individual areas can be recorded: cognitive (thinking, perception, problem solving, memory), motor (gross and fine motor skills), and social (interaction, communication,

adoption of perspective) development (Fernandez, 2014; Lohaus & Vierhaus, 2019). The abovementioned areas have certain requirements and tasks that need to be mastered in the course of life through change, adaptation, or reorientation. Developmental psychology in this context speaks of developmental tasks that children and adolescents have to master (Schiefelbein & McGinn, 2017). Social development is particularly important in mastering the developmental tasks according to Havighurst (1981). Young people encounter tasks such as building up a circle of friends, accepting one's own physical appearance or separating from the parental home. These developmental tasks are distinct from the abovementioned educational processes. Education aims to achieve a certain image, which in the German school context is specified by subject-related educational standards. These standards describe competencies, which education tries to achieve. These competencies can in contrast to personality development as part of learners' holistic education, be measured. While education is considered as fundamental task of schools, personality development is an elementary developmental task that is, among other things, mainly mastered in the school context.

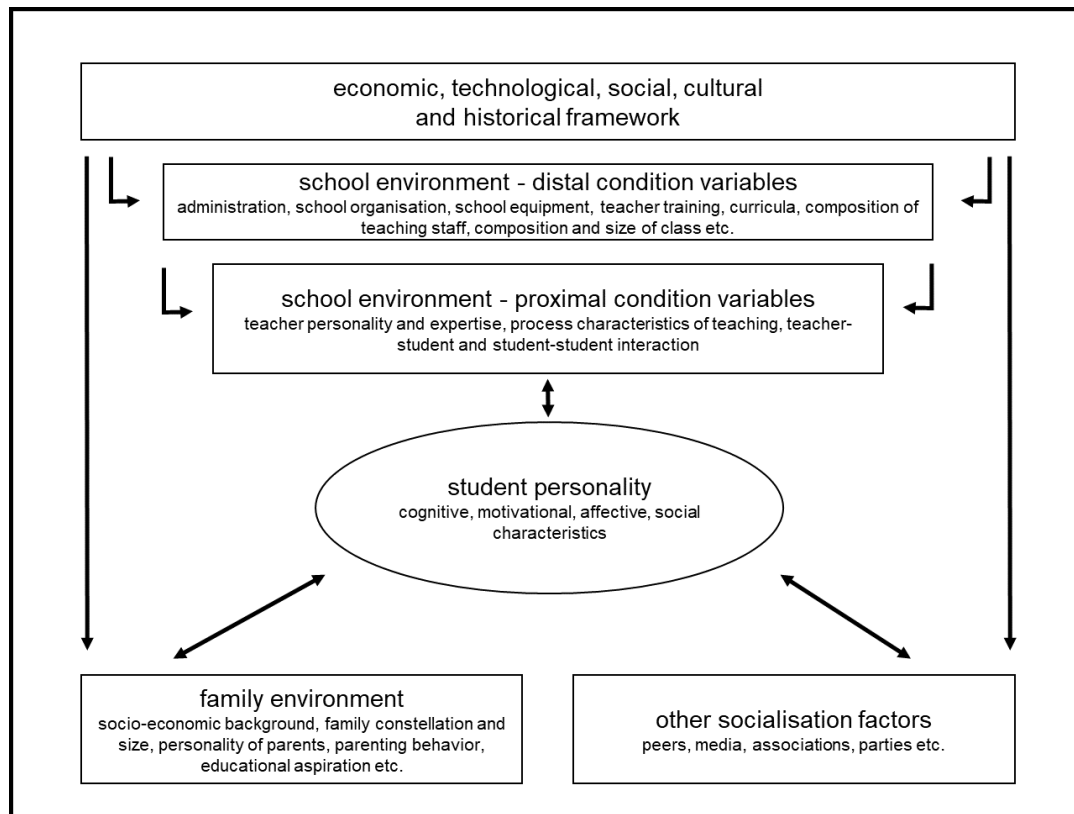
2.3 Children's and Adolescents' Personality Development

Adolescents are confronted with the task of developing their own personality. This can include accepting or forming personality in interaction with the environment. Within socialization processes, young people find themselves in a dichotomy between individual development of their own personality and integration into adult society. The emergence and development of the individual's personality is thus set against material and social environments mediated by society. With up to 20,000 hours that children and adolescents in Germany spend in school during their school career (Haug, 2000), school represents an important social context of development alongside parental home and extracurricular leisure time (Horstkemper & Tillmann, 2008). Determinants of academic personality development are manifold. Influencing factors are therefore difficult to grasp (Siebertz-Reckzeh & Hofmann, 2017). Effectiveness models of schools' socialization conditions originate from different approaches and make use of sociological, pedagogical-psychological, or cognitive as well as motivational psychological considerations (Brühwiler et al., 2017; Götz et al., 2010). The goal is the formation of the individual into a subject capable of acting in society (Heitmeyer & Hurrelmann, 1992). The development and transformation of the human personality is in the center of socialization processes. The framework

model of school personality development makes conditional factors of school socialization tangible (see Figure 1).

Figure 1

Framework Model of School Personality Development



Note. Adapted from Siebertz-Reckzeh & Hofmann (2017)

According to the *framework model of school personality development*, the student is in direct exchange with the near environment (e.g., family, peers, teacher), which is embedded in distal developmental environments (school, society). The framework of the living space is formed by active confrontations (including perception, interpretation, design) with the aforementioned instances, so that personality development can take place within this framework.

2.4 Making use of Personality for Individual Development

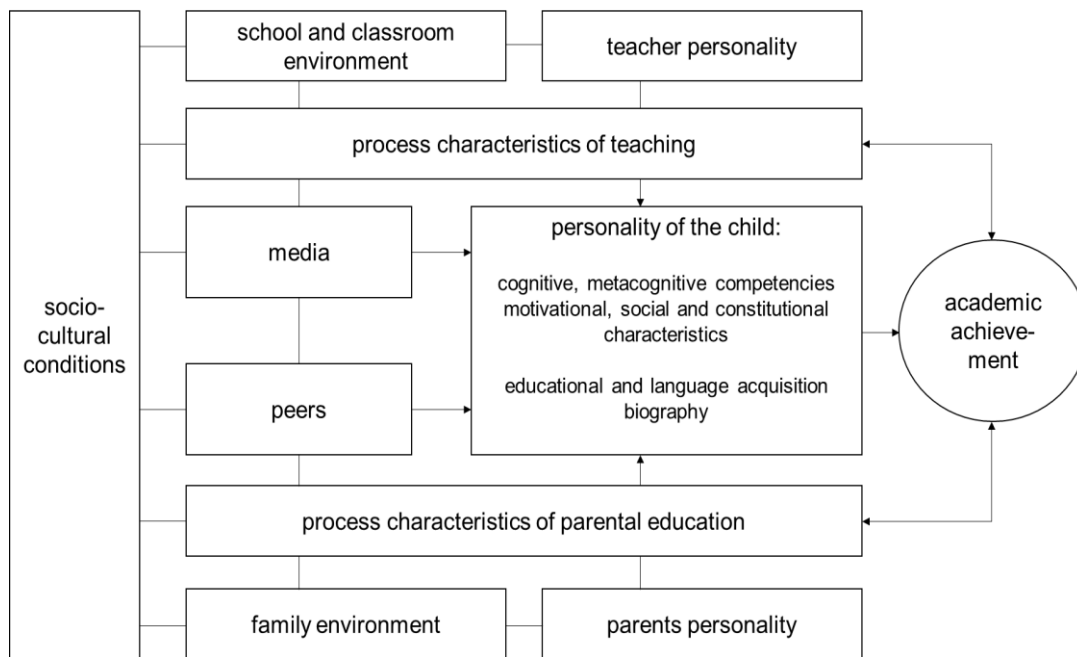
In order to analyze personality development processes, it is necessary to explain what exactly is meant by the term personality. Without referring to individual psychological theories, Funder (2016, p. 5) defines a person's personality as "characteristic patterns of thought, emotion, and behavior, together with the psychological mechanisms -- hidden or not -- behind these patterns". The term personality is characterized by different approaches and therefore represents a multi-faceted construct (Ellis et al., 2009). In personality research, the trait approach has become established and dominates the current field of research (Berger, 2020). Hereby, personality is often defined as a person's unique structure of relatively stable traits (Guilford, 1971). In the course of time, trait theoretical models have evolved into the *five factor model*, with the dimensions *openness, conscientiousness, extraversion, agreeableness, neuroticism*. The *five factor model* currently is the most common and widely used model of personality structure (Soto et al., 2015).

Considering school processes, personality is not only the result of socialization processes, but also regarded as individual prerequisite. Personality characteristics are consistent and stable in the medium term across different situations in which people generally differ from each other. They further influence experience and actions (Neyer & Asendorpf, 2018). Accordingly, they are a) decisive for school learning processes and despite their psychological anchoring, b) interesting for educational sciences. Student characteristics are not only important for long-term effects regarding successful personality development but also in the short-term relevant for teaching-learning processes (Seidel & Shavelson, 2007). Personality research has shown an influence of student personality on student outcomes, such as well-being, emotions, or academic achievement (O'Connor & Paunonen, 2007; Poropat, 2009; Richardson et al., 2012). Thus, students' personality plays a crucial role in their school experiences (Matthews et al., 2006). Helmke (2017) illustrates

the abovementioned relationships in his model of determinants of academic achievement and describes student personality as decisive and central predictor (see Figure 2).

Figure 2

Conditional Factors Macro Model of Academic Achievement



Note. Adapted from Helmke (2017)

Helmke's (2017) model (see Figure 2) shows the same influencing variables as Siebertz-Reckzeh and Hofmann's (2017) model (see Figure 1). In both models, students' personality, influenced by media, peers, parental home and teaching process characteristics, plays a central role. Helmke (2017) highlights the determinants' influence on school performance and differentiates between process characteristics of teaching and teacher personality. Teacher personality in turn, together with school environment, influences the process characteristics. Students' personality included cognitive competencies as well as motivational, social, constitutional, and affective characteristics (Helmke, 2017). Personality in the educational context is considered wide and includes psychological constructs that stem from different personality approaches (Ellis et al., 2009). According to Donat et al. (2017), personality constructs that are directly and indirectly important for student achievement are based on justice experiences, goal orientation, ability self-concept, and self-efficacy expectations.

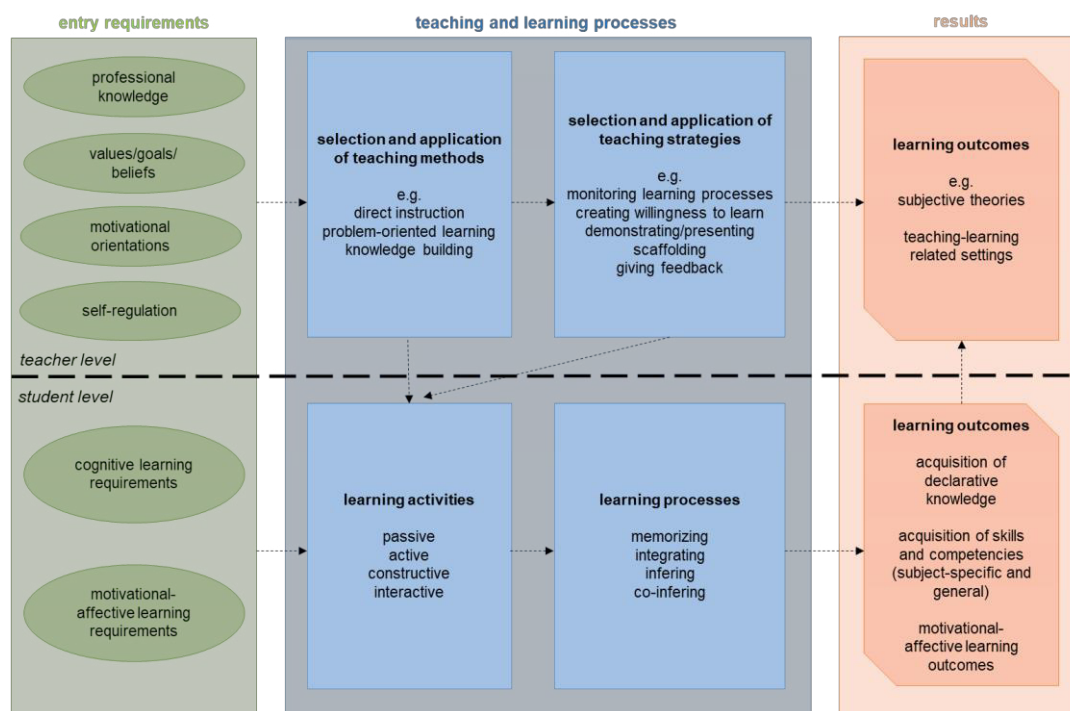
2.5 Students' Requirements as Reference Point for Teaching

Linnenbrink-Garcia et al. (2012) emphasize the importance of knowing student characteristics due to their central role in student learning. When planning and conducting lessons, teachers have to consider a variety of decision-making conditions that influence their subsequent actions. In addition to the context, students' behavior as well as students' requirements (e.g., characteristics, personality traits, work attitude) and the teacher's cognitions and emotions (e.g., anger, good mood, stress) are among the decisions to be considered (Dann & Haag, 2017).

Figure 1 and 2 have shown that student personality in its various dimensions is influenced by different factors. The following model breaks down the term student personality (see Figure 3).

Figure 3

Conceptual Framework Model for Analysing and Promoting Teaching and Learning Processes



Note. Adapted from Kollar & Fischer (2019)

Here, students' cognitive and motivational-affective learning requirements are considered as initial requirements of the teaching-learning process. By this, students' personality receives an even more elementary role as central component of lesson design (planning, implementation, reflection). Thus, teachers need to know their students' entry requirements and take them into account when teaching. Seidel et al. (2020) have described the necessity of student prerequisite analyses by teachers, because students' requirements significantly influence students' behavior and actions. Heitzmann et al. (2019) and Kunter et al. (2013) have described the recognition of students' requirements as key component of teachers' professional competencies. The necessary diagnostic competence in this process is an essential component of teachers' professional competencies in Baumert and Kunter's (2006) model. It allows identifying entry requirements and adapting teaching processes accordingly.

Kollar and Fischer (2019) have included Baumert and Kunter's (2006) understanding in their framework model (see Figure 3) on the teacher side and illustrate that, in addition to students' requirements, teachers' entry requirements are also decisive for teaching and learning processes and accompanied results. Thus, in addition to students' entry requirements, the teacher's entry requirements are essential,

especially at the beginning of a teaching-learning process. Figure 1 and Figure 2's presentation of the teacher's personality, is construed in Figure 3 as teachers' professional competencies.

2.6 Teachers' Requirements as Reference Point for Teaching

According to Oehmig (2013), teacher behavior is the concrete expression of the filter of personality and role perception. Kunter, Baumert, et al. (2011) illustrate factors of effective teaching behavior in the abovementioned professional competence model of teachers. The authors describe professional competence as composition of teachers' professional knowledge, value commitments, beliefs, goals, motivational orientations and, self-regulation skills. Personal characteristics determine all factors of teachers' professional competence. On a cognitive level, they account for professional knowledge. On a non-cognitive level, they account for value commitments, beliefs, goals, motivational orientations, and self-regulation skills. Teacher personal characteristics are commonly described by the term teacher personality. Mayr (2014) understands teacher personality as synergy of *general personality traits* and *general interests* as well as more variable and context-specific motivational characteristics. Teacher personality is relevant e.g., for behavior, success, and well-being in the teaching profession (e.g., Mayr & Neuweg, 2006; Schaufeli et al., 2009; Swann & Bosson, 2010). For a long time, researchers aimed to identify the ideal teacher personality or positive character traits for the teaching profession. However, correlations to positive teaching and learning outcomes in accompanied research were weak. Research has so far been unable to identify universal characteristics of good or successful teachers (Terhart, 2009). Weinert and Helmke (1997) stated that there is no one ideal teacher personality with a certain personality structure, but rather several diversely varying ones. Teacher effectiveness can vary across many different dimensions (Kell, 2019). Therefore, different teacher personalities can be equally successful (Weinert & Helmke, 1996). In the sense of humanistic teacher personalities (Dubs, 2009), teachers should develop their own teacher personality and by targeted teaching behavior support learners in all areas individually and sustainably. Teachers here profit from knowing learners' characteristics precisely.

2.7 Personal Requirements for Targeted Teaching and Learning

A large part of teachers' effectiveness depends on their knowledge and understanding of the student (Savage et al., 2012). Further, student orientation and individual teaching rank among quality characteristics (Helmke, 2017) or quality criteria of good teaching (Meyer, 2017). In consequence, teachers need to consider student characteristics when planning and carrying out lessons (Huber & Seidel, 2018).

In individual teaching, the question of what is feasible naturally arises. As learners are typically taught in groups, heterogeneity, which is particularly expressed in the form of inter-individual differences in learning requirements, depicts a prevailing challenge (Helmke, 2017). Heterogeneity in class is a topic of major importance in educational research and practice (Decristan et al., 2017). Already Weinert (1997) acknowledged heterogeneity as major educational problem. However, disregarding individual requirements is a danger to the quality of teaching as well as students' learning growth (Helmke, 2017). Helmke (2017) as well as Klauer and Leutner (2012) emphasize the importance of making teaching as compatible as possible with students' heterogeneous learning conditions. The class creates the setting, which influences lesson design and success (Helmke, 2017). Context entails that not all results of teaching research can be applied to all age groups and school subjects without further ado. Educationalists therefore speak of context-specificity (Helmke, 2017). In addition to sociocultural conditions, three elementary contexts can be distinguished: age level, educational career, and subject. Aspired competencies differ according to different contexts. Teaching behavior therefore must be adapted depending on e.g., age level or school type.

In the sense of the *didactic triangle*, PE's lesson content must be designed in line with students' as well as teachers' requirements in order to a) impart new knowledge and generate new skills as well as abilities of the learners in a targeted manner and b) promote learners' personality development (Hofer, 2014). By this, teaching follows the principles of holistic education. Considering content, situational interest might e.g., trigger personal interest depending on the presentation of the lesson content (Hofer, 2014). Accordingly, content design should allow personality development as well as cognitive development. In the school context, the subjects art, music, and PE in particular emphasize the opportunities for personality development within the subject (Autorengruppe Bildungsberichterstattung, 2012; DSLV et

al., 2019). With regard to a holistic education, PE occupies a special position because of its unique orientation towards the physical (Kohl & Cook, 2013). According to Klafki (2001), bodily education – which is realized in PE – is an indispensable dimension of general education. Consequently, holistic education can only take place with the aid of PE.

In order to describe students' as well as teachers' requirements in the PE context, the subject's special features plus accompanied potential for personality development have to be considered and will be pointed out in the next section.

2.8 Requirements of Physical Education

PE's goal and related potential is illustrated by its dual mission (*Doppelauftrag*). On the one hand, PE aims to introduce students to the culture of movement, play, and sports and thus to promote their ability to act in sports – *education to sports* (Kurz, 2008). On the other hand, PE aims to promote students' development in a comprehensive and holistic way – *education through sports* (Kurz, 2008).

2.8.1 Education Through Sports

The Worldwide Survey of School Physical Education (North Western Counties Physical Education Association, 2014) also lists health-related fitness, motor skills, active lifestyle and, personal as well as social development within PE's themes or aims among international curriculums. Personal development as part of students' general development is part of PE's mandate, which in its second component calls for developmental support through movement, play, and sports. In addition to developmental processes that school and teaching in general entail, PE exceptionally promotes a) cognitive, b) social, c) emotional (Education Through Sports), and d) motor development (Education to Sports).

Cognitive development (a) occurs as sports and physical activity have positive effects on the cognitive performance of children and adolescents (Gallotta et al., 2015; Hillman et al., 2008; Jansen, 2014; Pesce et al., 2009; Winter et al., 2007). This includes memory, perception, attention, thought, and decision-making processes (Janssen & Laatz, 2017).

Social development (b) is achieved by PE's promotion of numerous social processes, which require social competencies, such as responsibility, leadership, cooperation, meeting people, and making friends, communicating, as well as behaving

prosocially (Opstoel et al., 2019). Bähr (2009) and Kleindienst-Cachay (2000) distinguish three basic dimensions of social acting – *understanding, cooperation, and competition* – that come into play in PE. *Communication* takes place on a linguistic level when students discuss and agree as well as on a physical level when students play with each other and communicate non-verbally. *Cooperation* is encouraged as PE's lesson content mostly involves student collaboration and mutual support (e.g., in sports games or acrobatics). *Competition* is particularly important in rivalry. Rivalry's inherent teamwork and interaction requires fairness, consideration, and refraining from egoistic actions.

Emotional development (c) occurs through physical exercises' positive effect on stress, depression, or anxiety (Salmon, 2001). When doing sports, unpleasant thoughts disappear. The brain has to concentrate on the execution of the movement in order to make it most effective. As a result, both body and brain, experience relaxation. In addition, fears can be overcome or the ability to stand by them can be developed in PE (Kurz, 2008).

2.8.2 Education to Sports

The continuation or differentiation of students' motor development (d) is part of the dual mission's demand *education to sports* and thus provides an inner-sporting justification of PE. In PE, the culture of *movement, play, and sports* should be exploited as comprehensively as possible so that sporting skills are acquired and students are enabled to be active outside school as well as attribute *movement, play, and sports* a personal meaning (Faber et al., 2007). PE is the only setting that provides compulsory access to sports for all children. By motivating students to be physically active, the subject thereby contributes essentially to fulfilling WHO's (2020) abovementioned requirements. In PE, it is important to address different content areas in such a way that teaching creates rewarding relationships between students and the subject PE. The fit between subject and object needs to be considered when planning lessons (Glötzl, 2001). Klafki (2001) designates movement competence as educational dimension and thus attributes PE a special function within general education. In this context, the qualifications of self-determination, co-determination and solidarity come into play, which also essentially contribute to general education (Prohl, 2010a).

Overall, PE offers good opportunities for promoting individual development (Neuber, 2008). PE's comprehensive mandate results in the obligation to meet pedagogical demands as well as the subject's diversity through targeted support in PE.

Similar to teaching in general, individuality comes into play. Learning processes are therefore not only important for physical activity, but also contribute to holistic personality development and value education within PE. The predominant concept of educational PE favors principles such as experience and action orientation, reflection, understanding, and value orientation (Neuber, 2007). This calls for opening PE, which implies offering more opportunities for participation and partial self-organization of lessons by students. The pedagogical guiding idea behind opening PE emphasizes the demand of orienting teaching towards students' lifeworld. PE offerings need to be more clearly oriented towards the addressees, their interests, needs, and possibilities. This in turn requires the knowledge of students' requirements (Albert, 2017). Thus, PE should adequately address students. By this, joy of movement as well as motivation to engage in meaningful lifelong sports activities can be conveyed. The statement of the Bavarian State Ministry of Education and Cultural Affairs (2020) explains PE's significance by its possibilities to motivate for out-of-school sports activities as well as to convey the positive impact of sports activities on the individual. In this context, motivation is a key aspect of PE. Especially the emphasis on lifelong meaningful physical activity highlights that PE has to motivate students in such a manner that a lasting intrinsic motivation, which affects out-of-school participation, is achieved.

The degree to which teaching offerings consider students' interests, needs, and possibilities influences their motivational regulation within PE (Grassinger et al., 2019). This is decisive for how intensively students deal with the subject matter and how sustainable learning processes are (Grassinger et al., 2019; Krapp, 2000; Wang, 2017). The following section therefore describes the role of motivation in the learning process at school in general as well as in PE in particular.

2.9 The Importance of Motivation in School Learning Processes

Motivation can generally be defined as the energy to act (Fowler, 2019). Learners are motivated when they want to achieve something and thus a certain behavior serves a purpose. This intention is realized in a future state (Deci & Ryan, 1993). Rheinberg (2006) describes the targeted situation as positively evaluated goal state. With regard to learning situations, Schlag (2013) takes up Rheinberg's (2006) definition and creates a transition from pure motivation to learning motivation. According to Schlag (2013), learning is easier when the motivation is right, which

should give teachers reason to reflect on their students' motivation and, if possible influence it. Hattie's (2009, 2018) meta-analysis also highlights the positive effect of learner motivation on learning performance. Schlag (2013) highlights the development and promotion of willingness to learn and perform as central task of schools. In contrast to tangible knowledge transfer, promoting or maintaining student motivation represents a requirement that is difficult to grasp (Schlag, 2013).

In this regard, *self-determination theory* (Ryan & Deci, 2000) offers commonly applied starting points. Free from compulsion, students' motivation to learn and perform should be developed through the development of their willingness to make an effort. The higher the degree of self-determination, the more persistent, successful and sustainable learning is (Thomas & Müller, 2015). With regard to the degree of self-determination, different forms of motivation can be distinguished, as defined in the framework of self-determination theory. Intrinsically motivated learning activities are performed of pure pleasure and/or interest. The counterpart of intrinsic motivation is extrinsic motivation. Extrinsically motivated learning is usually performed because of an external source of motivation that causes the behavior to be performed (Ryan & Deci, 2000). The expression of extrinsic motivation lies on a continuum of varying degrees. Externally regulated motivation obtains the lowest degree of self-determination (Ryan & Deci, 2000). Learning behavior that is performed for reward or to avoid punishment is considered externally regulated (Ryan & Deci, 2000). In introjected regulation, the individual exerts the pressure. Introjected learning behavior is performed e.g., to satisfy inner values like pride but also to avoid shame or guilt (Ryan & Deci, 2000). In identified regulation, learning behavior is carried out because realizing it appears important to the student and is not caused by other people. The student can identify with the goals and values of the behavior and has integrated them into the individual self-concept (Ryan & Deci, 2000). The most self-regulated type of extrinsic motivation is integrated regulation (Ryan & Deci, 2000). It is the result of the integration of goals, norms, and strategies of action with which learners identify themselves and which have been integrated into their coherent self-concept. Amotivation has no regulation. Amotivation is characterized by the fact that the intention to perform a behavior is not present. Amotivated students do not show learning behavior at all or show learning behavior without any intention (Ryan & Deci, 2000).

Motivation in general is considered as product of person and situation (Heckhausen & Heckhausen, 2018). Accordingly, personal and situational factors

can be distinguished. Personal factors, including dispositional characteristics, explain why people behave in the same way across different situations, but differ from others within these. Motivation is thus – in addition to situation-specific incentives – also attributed to stable characteristics anchored in the individual person. In these characteristics, individuals differ across different situations and with a certain temporal stability from other individuals (Heckhausen & Heckhausen, 2018). On the one hand, individual motivational dispositions are consistent across situational opportunities and time. On the other hand, motivation refers to specific tasks, contents, or activities. Motivation therefore also contains an area-specific component (Rost & Sparfeldt, 2017). Hirschfeld et al. (2004) distinguish between general and context-specific trait motivation to describe persistent motivation. In terms of construct-specificity, a mid-level of specificity with respect to context is therefore recommended (Vandewalle, 1997) – e.g., the PE context. This should support predicting behavior, which typically occurs in a specific context, in a best possible way (Hirschfeld et al., 2004).

Regarding PE, it has already been shown that intrinsic motivation predicts positive learning outcomes: Ferrer-Caja and Weiss (2000) e.g., have shown that intrinsic motivation directly predicts effort and persistence. Furthermore, intrinsic motivation predicts students' concentration level (Ntoumanis, 2005; Standage et al., 2005), positive affect (happiness) (Standage et al., 2005), intention to take part in leisure-time physical activity (Standage, Duda, & Ntoumanis, 2003), or physical activities after their school career (Ntoumanis, 2001). Intrinsic motivation can thus be seen as indicator of successful teaching, which, by fulfilling PE's dual mission, affects students' lifelong physical activity. In order to describe the context-specific personal factors of motivation, the following section describes various student characteristics as requirements for lesson planning and determinants of motivation in PE.

2.10 Student Characteristics as Determinants of Motivation in Physical Education

Considering individual requirements also in the PE context contributes to target-group-oriented teaching, which derives pedagogically justified measures and targeted assistance for development (Bräutigam, 2003). Thus, especially *education through sports* in the sense of holistic personality development (Prohl & Ratzmann, 2018) can be taken into account. Further, the promotion of (self-) education in PE

(Laging & Kuhn, 2018) can be supported. In order to describe students' personal characteristics in the PE context as accurately as possible and with high relevance for practice, transcontextual factors as well as PE-specific or sports-specific factors are relevant.

As discussed in Section 2.5, students' personality is typically included in pre-requisite analyses of teaching. The term personality in the educational context follows a broad understanding and includes various constructs. In order to show the relevance of the constructs for the PE context, their connection to motivation in sports in general or PE in particular will be highlighted in the following.

General personality traits are often understood as stable individual differences over time and situation, which explain thoughts, behavior, and emotions (Hogan et al., 1996). Due to their context-independence, their functioning is relevant for PE processes. *General personality traits* are e.g., positively related to student achievement in or attitudes towards PE (Hayes, 2017), enjoyment (Lodewyk & Gao, 2018), or anxiety (Lodewyk, 2018). Further, relationships between students' personality traits and their motivation to learn and perform in PE have been shown. Following Erpič et al. (2005), students scoring lower on *agreeableness* or higher on *neuroticism* e.g., are less motivated in PE.

Students' self-concept describes an explicit part of the person in addition to predominantly implicit personality traits. One part of the self-concept, which is closely related to physical activity and thus to PE, is the *physical self-concept* (Babic et al., 2014). *Physical self-concept* comprises dimensions that, on the one hand convey an image of one's own physical appearance and, on the other hand one's own athletic abilities (deJonge et al., 2019). Additionally, students' *physical self-concept* is positively related to motivation in PE (Murcia, 2012). In contrast, an image of incompetence and low *physical self-concept* can lead to a lack of motivation (Ryan & Deci, 2007).

Additionally, it is assumed that the *achievement motive* is decisive for how students approach a task, whether they seek success or avoid failure, regardless of the situational incentives (Streso, 2015). It is also assumed that other person-related variables and teaching conditions have a moderating function (Streso, 2015). With regard to PE and students' *achievement motive*, Streso (2015) examined the relationship between students' *achievement motive* and performance in PE on the one hand as well as the relationship to other personality variables such as willingness to make an effort and subject-specific interest on the other hand. Streso (2015) found that a high degree of the *achievement motive* is associated with e.g., good grades

in PE, physical activity in leisure time or well-being, as well as willingness to make an effort, and subject-specific interest (Streso, 2015).

Motives to be physically active play a decisive role in sports behavior (Gut et al., 2019). They are considered as triggers for physical activity in general (Lehnert et al., 2011). This knowledge influences the design of sports offerings by e.g., tailoring them to the target group (Lehnert et al., 2011) and thus increases the offerings' fit to individual preferences. Antunes et al. (2018) and Gunnell et al. (2014) have shown that satisfying sports-related motives has a positive effect on well-being and thus contributes to sports participation and to a healthy lifestyle. *Motives to be physically active* as captured by Lehnert et al. (2011), Gut et al. (2019), Molanorouzi et al. (2015), or Kueh et al. (2017) can also be applied to PE and represent a central benchmark for specifically designing and conducting PE's lesson content. Gut et al. (2019) therefore developed the operationalization of the *motives to be physically active* for adolescence and young adulthood. PE's pedagogical perspectives, which are an elementary component of German PE curricula (Kurz, 2004), highlight the relevance of *motives to be physically active* in the PE context.

Interest is also considered decisive for the development of intrinsic motivation and maintenance of lifelong learning (Krapp, 2000). Individual interest, which must be distinguished from situational interest, can be regarded as relatively stable characteristic of a person over time (Schneider, 2008) and should be taken into account as primary motivator in learning tasks in PE (Chen & Ennis, 2004). However, interest in school subjects is declining noticeably in secondary school, also in regard to PE (Ntoumanis et al., 2009). With the onset of puberty, identity-relevant individual interests are formed and areas of interest that do not fit into one's own self-concept are excluded (Kramer & Spangler, 2019). In relation to PE, Gogoll (2010) describes the influence of interest on female students' learning in the sense that learning is considered to be more self-determined, voluntarily more frequent and voluntarily more thoroughly as well as more sustainable (Gogoll, 2010). Learning is more self-determined because the learner perceives the examination of the content as meaningful and enriching, although the lessons are compulsory. Students learn more voluntarily because they want to deal with the content or learn more about it and therefore put in more effort. They learn more thoroughly because they want to understand and master the content. Furthermore, learning is more sustainable when learners apply what they have learnt in PE outside of school in order to pursue their own interests (Gogoll, 2010). Therefore, *sports interest* enables students to make sus-

tainable use of what they have learnt in PE also in extracurricular, and, at best, life-long sporting activities. Gogoll (2010) recommends supporting them in such a way that they can build up an intrinsic motivation to learn based on self-determination and interest.

The theoretical part presented here shows the relevance of considering both student and teacher requirements for teaching in order to make PE teaching as adequate and targeted as possible and thus fulfil school's educational mission. The presented characteristics aim to describe the student in general and in relation to the PE context. Students' personal requirements play an important role in school processes: a) for the design of lessons, and b) as outcome in terms of personality development. The theoretical background described above allows drawing conclusions about the current state of research and by this the topic's relevance as well as the need for more research.

2.11 State of Research

Individual requirements of students and teachers were considered in research on teaching PE. For example, Babic et al. (2014) investigated children's and adolescents' physical self-concept and possible connections to physical activity and potential moderators. Here, too, the aim was to describe students and show possible correlations to teaching outcomes such as motivation (Jackson-Kersey & Spray, 2013) or physical fitness (Guérin et al., 2004). Studies mostly followed a variable-oriented approach examining single variables and partial aspects of requirements related to motivation. A person-oriented approach in contrast attempts to capture the individual person and takes a holistic and dynamic view. In a person-oriented approach, the individual is viewed as a whole (Magnusson, 1983). Huber and Seidel (2018) explain that different characteristics are interrelated so that their interplay is essential too. Research on the constructs' different areas is typically relatively unconnected (Dalbert & Stöber, 2008).

The fact that various characteristics of students have proven their relevance for student motivation in PE justifies a joint examination. This allows identifying and analyzing several starting points to influence student motivation. Further, it brings different areas of characteristics together and highlights the independent meaning of different personality traits (Dalbert & Stöber, 2008). Hanssen-Doose et al. (2018)

have also recommended to address students' characteristics in PE. Moreover, personality as multi-faceted construct (Johnson & Christensen, 2017) does not have a clear understanding and operationalization in the specific context of PE. With regard to personality characteristics' fundamental, context-independent and time-stable nature (Asendorpf & Neyer, 2012), it is not comprehensively explained how personality comes into play in PE. In order to assess the potential of personality and personality development as well as knowledge of it more precisely, an overview of how personality has been understood so far and which connections personality traits have with PE-relevant aspects would be desirable.

Student-teacher interaction plays a decisive role for successful teaching (Bauer, 2017; Hattie, 2018). Both key players must be considered when describing or analyzing this interplay. A joint consideration of student and teacher perspective has been part of research on teaching in general, less so in research on teaching PE specifically. With regard to students' attitudes, Silverman (2017) concludes that simultaneously examining student and teacher attitudes can be beneficial to help teachers enjoy their work and promote student learning in PE. Comprehensive descriptions of PE are generally rare in this field of research (Hanssen-Doose et al., 2018). Research on teaching PE with a focus on health criticizes the lack of considering students' perspective on PE's processes (Hanssen-Doose et al., 2018). Hanssen-Doose et al. (2018) suggest for future research to supplement students' inside view with an outside view (e.g., teacher or parent view).

Quantitative research approaches in empirical educational research mostly consider the micro-level of teaching processes and neglect the meso-level of school and instructional development (Bauer, 2017). Moreover, most of the abovementioned studies only include a small sample that is limited to a specific study group, e.g., one age group or school type. A large-scale study focusing on students' as well as teachers' personal characteristics in PE assessing different genders, age groups, school types, and geographical regions is lacking both in Germany and in international research. A large-scale study allows analyzing different groups and describing them in comparison to each other and thus addressing individual groups more specifically. Abovementioned research gaps concerning a comprehensive description of students' and teachers' personal characteristics in PE, and thus considering both key players in the teaching process, has led to the following research aims.

2.12 Aims of the Studies

In order to contribute to empirical educational research in general and PE's further development in particular, a study on the meso-level of research on teaching was carried out. The overriding aim was to analyze the person student as determinant of student motivation in PE. The study aimed to describe and analyze students' requirements in the PE context. Additionally, the study considered the PE teacher in order to comprehensively depict the subject's key players.

In order to better understand the construct personality and its meaning in the PE context, a literature review of studies investigating students' personality in PE is provided. The aim was to capture personality understandings in international research on teaching PE. To analyze their application and operationalization, pursued personality approaches, and applied personality inventories as well as research questions and associated results are presented (see Article 1). This article intended to provide a better overview and classification of the current state of research. The results have influenced the design of the thesis' empirical part.

In a next step, a self-executed study has examined student characteristics relevant to student motivation. In order to comprehensively describe the student in the PE context, general characteristics such as *general personality traits* as well as sports-specific characteristics such as *physical self-concept*, *achievement motive*, *motives to be physically active*, and *sports interest* have been collectively examined. For this purpose, a large-scale, Germany-wide study covering different regions, genders, age groups, and school types was realized. In order to draw conclusions about different groups of pupils and concretize the description, differences with regard to gender, class level or school type (see Article 2) were examined.

The subordinate aims of this dissertation thesis refer to the PE teacher. In order to summarize the state of research on the PE teacher's personality in PE and create an understanding of the concept of personality in PE research, an overview of different understandings of the PE teacher's personality has been provided. For this purpose, applied personality approaches, characteristics, and applied inventories have been analyzed. These have provided information about personality's correlates with teaching outcomes and by this possible impact on educational outcomes (see Article 3). Based on this, the PE teacher has been described as holistically as possible. For this purpose, general as well as vocational-specific motivational characteristics were included in a self-executed study. This aggregated examination of teacher personal characteristics served to provide a comprehensive picture of the

PE teacher. Additionally, gender, age, and school type differences were analyzed in order to enhance the description and allow more targeted statements about different groups of PE teachers (see Article 4).

3 Methods

Educational research aims to gain knowledge of educational processes. The German Education Council (1974) assumes that many tasks affecting educational research can only be solved by bringing together different research approaches. For this reason, educational research draws on theoretical as well as methodological suggestions from various disciplines, especially psychology or sociology (Reinders, 2015a). Educational research is therefore interdisciplinary. In addition, educational research is characterized by its problem orientation (Gräsel, 2011). Its purpose is to gain scientific insights in order to contribute to the analysis and improvement of the educational system. Another characteristic of educational research is the use of empirical research methods (Gräsel, 2011). Empirical educational research limits the object of investigation to sections of social reality, i.e., learning and educational processes

In order to find appropriate research approaches, the first step in the selection of methods is to decide whether research questions can be answered from the literature or have to be dealt with empirically. From a theoretical point of view, normative pedagogy considers a subject's desired state and thereby takes into account different norms (e.g., social, individual). To gain knowledge, normative pedagogy draws on hermeneutics (Jung, 2018). By means of text analyses, new insights are generated from already existing literature and thus the prevailing understanding of knowledge is further developed (Jung, 2018). Individual personality characteristics of students and the teacher in the PE context have already been investigated in individual studies. Nevertheless, an overview of the studies' results was missing. Therefore, a hermeneutic approach was applied and a literature review realized at first.

A literature review's research design can be determined according to the subject under investigation. This may depend on the purpose of the review, the type of studies included, the research question, the phenomenon under investigation and the underlying intention (Booth et al., 2016). However, all types of literature reviews base on explicit research methodologies (Jesson et al., 2011) and pursue concrete research questions that are answered with the help of the literature in order to generate new insights (Al-Nawas et al., 2010). Systematic reviews summarize quantitative studies in order to make a statement about the effectiveness of a method by bringing together all available evidence. The systematic approach further allows identifying existing research gaps. High quality of included studies is ensured by

typically only considering randomized controlled trials (RCTs) in the analysis (Sturma et al., 2016). Meta-analyses, on the other hand, combine the results of individual studies into an overall result, which creates a total evidence base (Khan & Kunz, 2004). Similar to systematic reviews, meta-analyses aim to show evidence and assess effectiveness. On the contrary, scoping reviews provide a quick overview of existing literature (Arksey & O'Malley, 2005). In contrast to systematic reviews and meta-analyses, scoping reviews also include grey or unpublished literature (Sturma et al., 2016). While systematic reviews require a larger number of publications, ideally RCT, scoping reviews are also suitable for less established research areas (Sturma et al., 2016). In addition to the three mentioned approaches, there are other types of literature reviews that focus e.g., on interventions (realist review), qualitative research (metasynthesis, metasummary, metaethography), research traditions (metanarrative review), combinations of different methods (integrative review), or contexts outside the actual research content (metaempirical review) (Sturma et al., 2016).

For this dissertation, it was possible to generate a research overview of at least partial aspects of the research topic of students' or teachers' personal characteristics and based on this derive consequences for subsequent empirical work (Booth et al., 2016). Scoping reviews provide a broad picture of existing literature in a wide research field and aim to identify relevant literature from a field of research to be explored (Booth, Sutton, & Papaioannou, 2016). The indications and suggested purposes (identify the types of available evidence in a given field; clarify key concepts/definitions in the literature; examine how research is conducted on a certain topic or field; identify and analyze knowledge gaps) (Munn et al., 2018) have influenced the choice of this type of review. The search strategy was explicit, transparent, and realized by two independent reviewers (Munn et al., 2018). Within the data extraction process, reviewers used data extraction forms (Munn et al., 2018). Thus, the search strategy and data extraction of a scoping review follows a systematic approach that is not mandatory for traditional literature reviews (Munn et al., 2018). In addition, other literature sources and accompanied search strategies e.g., reference lists, author, and key journal search, were applied in order to cover the field of interest as broadly as possible. The reported outcomes were categorized regarding framework conditions and a thematic analysis, which explicitly addressed the review's research questions and provided an elaborated analysis. Besides reviewing literature, educational research follows empirical approaches to answer research questions (Newman & Gough, 2020). The empirical-analytical pedagogy draws its conclusions from collected data.

The decision for either a qualitative or quantitative approach in the empirical part of the dissertation based on different factors. Within this decision, differences in ways of philosophy and anthropology, research questions, and objectives, response strategies, and thought logics, characteristics of the results as well as research and work processes (Wichmann, 2019) of the research approaches, were taken into account.

With regard to their philosophy and their anthropology, quantitative approaches tend to be oriented more towards a scientific approach based on positivism (Creswell & Creswell, 2018). According to this approach, human behavior arises from stimulus-response schemes and can therefore be investigated and explained by objective, value-neutral researchers. In contrast to this stands interpretivism to which qualitative research refers (Creswell & Creswell, 2018). According to interpretivism, human beings and thus the principles and research methods applied differ from nature. Therefore, non-standardized, meaningful methods are applied (Wichmann, 2019).

The decision for either quantitative or qualitative methods can further be derived from different question types of research questions (what, why, and how questions) (Wichmann, 2019) or different objectives of research projects (describe, explain and understand, predict, change) (Wichmann, 2019). Both approaches typically aim to describe, but with different meanings – in quantitative research as preceding step and in qualitative research as basis for subsequent interpretations (Wichmann, 2019). While a quantitative approach is appropriate for descriptive objectives, understanding approaches tend to work qualitatively. Research projects aiming to prewise, typically apply quantitative methods, while research projects aiming to change a phenomenon or human behavior can involve both, quantitative and qualitative approaches.

Response strategies to the underlying research question can be divided into deductive and inductive approaches. Deductive approaches derive the specific from the general. This underlying logic of thinking couples deductive approaches to quantitative procedures. Inductive procedures infer the general from individual cases. They can be designed both quantitative- or qualitative-inductively. Inductive procedures further encounter the research subject and the views of the participants usually very open. In addition, quantitative and qualitative research approaches differ in terms of results that emerge from them. While quantitative approaches map regularities in human behavior and produce generalizable, repeatable, and comparable

results, qualitative approaches do not consider elements of a phenomenon in isolation, but as a whole in the respective context.

The decision regarding the methods therefore arose from the abovementioned considerations. The methods of empirical educational research include questionnaires, test procedures, experiments, interviews, and observations. While behavior is usually recorded through observation, experiments, or individual persons and their biographies are recorded through interviews, questionnaires are particularly suitable for recording characteristics that can be measured in a survey (Reinders, 2015b). These topics usually focus on the assessment of oneself, one's environment or one's attitudes towards oneself or facts. Self-assessment using standardized questionnaires is the most widely used method in personality research. Due to the strong involvement of the ego in self-assessment, it is possible to obtain information from a person about e.g., thoughts, feelings, and motives that are not accessible through external assessment (Stemmler et al., 2016).

The characteristics derived from the literature are relatively stable properties that can be recorded by objective, value-neutral research. In order to represent the characteristics of students and teachers, a deductive approach, which serves to describe these characteristics throughout Germany, was chosen. The recorded variables were described in a first step and then compared to previous studies – not necessarily in the PE context. Further, possible relationships between different variables were analyzed. The intended results described regularities in human behavior and have thus been generalizable, repeatable as well as comparable. Taking the abovementioned points into account, a quantitative approach was derived for the empirical part of the dissertation.

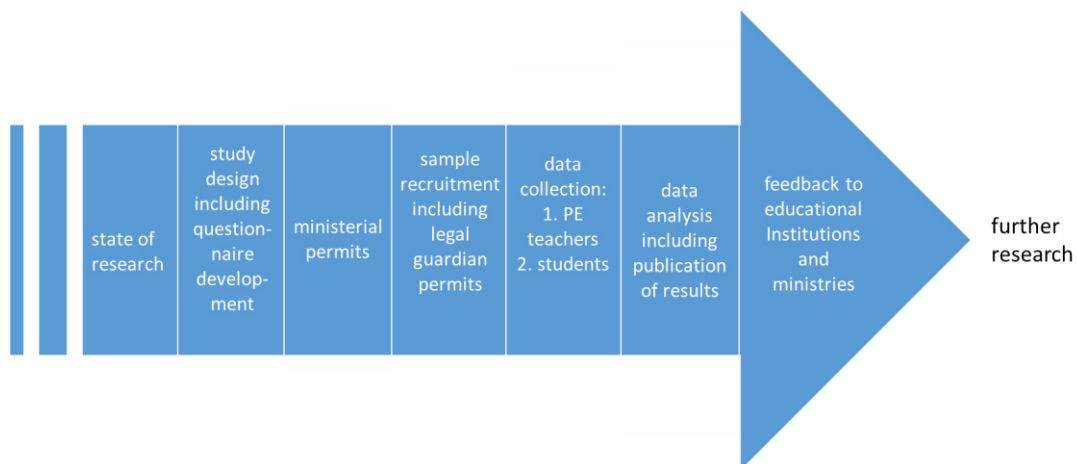
In order to describe the student in PE as comprehensively and context-specifically as possible, general as well as sports-specific characteristics were recorded. Individual student characteristics' role in student learning is multifarious because the different characteristics are interrelated (Huber & Seidel, 2018). When considering a variable- or person-centered approach, it should be borne in mind that the variable-centered approach serves to place individual characteristics in relation to an outcome. However, the individual with its specific characteristic configuration is neglected. The person-centered approach has the potential to complement the variable-centered approach and to describe the individual as a whole. To do justice to student characteristics' diversity, educational research must look beyond variable-centered methodology (Huber & Seidel, 2018). Since the constructs to be inquired about are mainly characteristics of a population and refer explicitly to one's own

person, self-assessment by means of a questionnaire was the most suitable and economic approach for large samples as in the conducted survey.

3.1 Project Design

SuM PLoS was a Germany-wide project carried out in cooperation with the Deutscher Sportlehrerverband/German Physical Education Teacher Association (DSLTV). Figure 4 shows the process of the project.

Figure 4
SuM PLoS Project Plan



SuM PLuS comprised a cross-sectional quantitative questionnaire survey of PE teachers and their students. Participating PE teachers were recruited via DSLV and partners, personal contacts, social media, local press, and educational institutions. After participation, PE teachers could additionally register for the student survey of the study. Their task was to pass on the questionnaire to their students. PE teachers received the student study material including a standardized instruction. Students filled out the questionnaire in class. The questionnaire could be completed online or in paper form. The processing time was about 25 minutes. Data collection took place from April to December 2018. For the survey in schools, permissions were obtained from 12 German federal states. Participating teachers and students as well as legal guardians were informed about content, scope, method as well as data protection regulations of the survey. Participation was voluntary. Student participation only took place with the written consent of a parent or guardian.

3.2 Sample

In total, 1,740 students (58.1% female, $M = 14.39 \pm 1.44$ years) from class levels seven to ten participated in the student survey. Figure 5 shows the distribution of the student sample differentiated by class levels and genders. Students attended one of the following secondary school types: lower secondary school, where students finish with an intermediate school-leaving certificate; higher secondary school, where students finish with a higher education entrance qualification; comprehensive secondary school, combining different educational paths, where students finish with either of the two aforementioned qualifications. Figure 6 shows the distribution of the student sample differentiated by school types.

Figure 5
Student Sample – Class and Gender Distribution

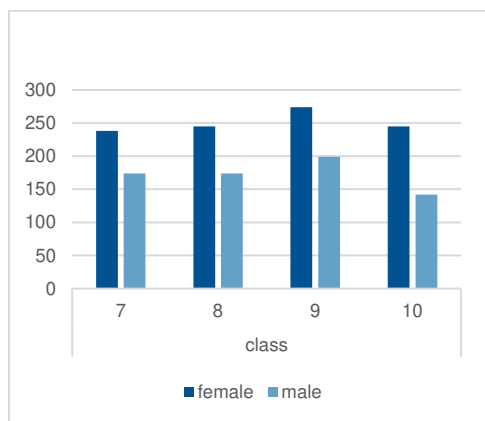
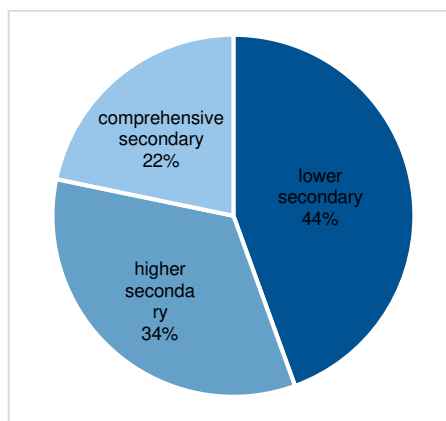


Figure 6
Student Sample – School Type Distribution



In total, 1,163 PE teachers (61.9% female, $M = 43.16 \pm 10.8$ years) took part in the teacher survey. Figure 7 shows the distribution of the teacher sample differentiated by age groups and genders. Participating PE teachers taught at one of the following school types: primary school, secondary school (higher, lower, comprehensive), special school, or vocational school. Figure 8 shows the distribution of the teacher sample differentiated by school types.

Figure 7
Teacher Sample – Age Group and Gender Distribution

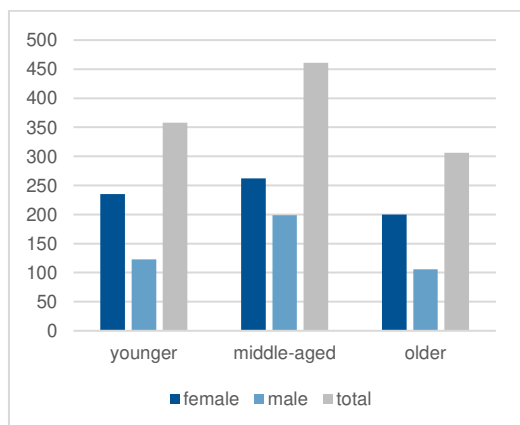
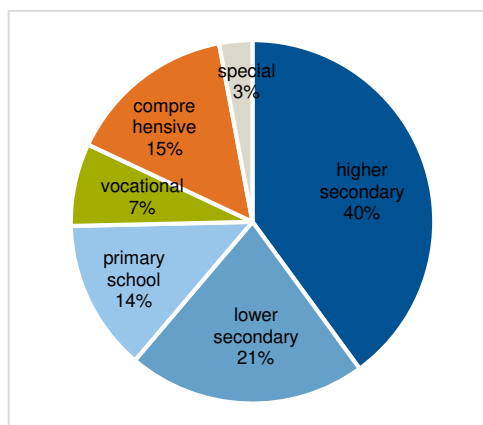


Figure 8
Teacher Sample – School Type Distribution



3.3 Measurements

Table 1 and Table 2 highlight *SuM PLuS*' questionnaire content and accompanied scales.

Table 1
Variables of the Student Questionnaire

Category	Content	Reference
Sociodemographic data	Gender* Age Grade* School type* Federal state Migration background Height Weight	(Schenk et al., 2006)
Personal characteristics*	Personality traits	BFI-KJ (Kupper et al., 2019)
	Physical self-concept	(Braun et al., 2018)
	Achievement motive	Adapted from AMS-Sport (Herrmann et al., 2014)
	Motives to be physically active	BMZI-JEFA (Gut et al., 2019)
	Sports interest	Sportinteresse (Gogoll, 2010)
Physical education participation and perception	Motivational regulation in learning situations	SMR-L (Thomas & Müller, 2015)
	Perceived basic needs support	Wahrgenommene Befriedigung der Psychologischen Grundbedürfnisse (Prenzel et al., 2001)
General information regarding PE	PE days / week PE lessons / week satisfaction with amount of PE PE grade	
Sports club activity	Membership Practiced sports Training sessions/week Training duration/week Seasonality	MoMo-AFB (Jekauc et al., 2014)

Note. * Variables marked are part of the dissertation thesis.

Table 2*Variables of the Teacher Questionnaire*

Category	Content	Reference	
Sociodemographic data	Gender* Age* Recruitment source DSLVL membership PE teaching qualification Teaching status Federal state School type* Taught subjects PE teaching experience PE teaching extent Height Weight		
Personal characteristics*	Personality traits	BFI-2S (Rammstedt et al., 2018)	
	General interests	AIS (Bergmann et al., 2015)	
	Motivational characteristics	Teacher self-efficacy Teacher enthusiasm	STSE (Pfitzner-Eden et al., 2014) ENTH (Kunter, Frenzel, et al., 2011)
		Teacher interests	LIS (Schiefele et al., 2013)
Occupational well-being	Teaching satisfaction	Berufszufriedenheit (Merz, 1979)	
	Work engagement	UWES (Schaufeli & Bakker, 2004)	
	General health status	1 Item within SF-12 (Ware et al., 1996)	
	General well-being	WHO-5 (WHO, 1998)	
Physical activeness	Physical activity	Adapted from MoMo-AFB (Jekauc et al., 2014)	
	Motives to be physically active	BMZI (Schmid et al., 2018)	
Teaching behavior	Provided basic needs support	Befriedigung der Psychologischen Grundbedürfnisse (Prenzel et al., 2001)	

Note. * Variables marked are part of the dissertation thesis

3.4 Statistical Analysis

Considering the empirical study and accompanied publications (see Articles 2 and 4), this dissertation thesis' statistical analyses has included descriptive as well as inferential analyses. In data preparation for descriptive analyses, individual variables were compared on univariate observational level. Missing values were excluded pairwise (Pigott, 2001). Pairwise exclusion is a frequently applied procedure for handling missing values including higher amounts of values compared to list wise data exclusion (Berchtold, 2019). Descriptive analyses were undertaken for the total sample in order to provide an overarching picture of PE teachers' and students' manifestations in the different personal characteristics as well as for groups (genders, age groups/class levels, school types) individually in order to concretise the description.

– The following lines of chapter 3.4 are also part of Melina Schnitzius' dissertation thesis chapter 2.2.3, as the two dissertation thesis were developed in collaboration within the research project SuM PLuS –

Considering data analysis specifically, in order to investigate differences between groups and by this describe groups in more detail, variance analyses were applied. Variance analyses in comparison to pairwise mean differences analyses consider more than two groups. Further, within multifactorial procedures, multivariate analysis of variance (MANOVA) specifically considers several independent variables and by this allows to detect possible interaction effects between independent variables (Field, 2009). The decision for appropriate variance analyses procedures depends on the number of analysed variables. MANOVA includes more than one dependent variable and further allows to examine differences across multiple dependent variables, whereas univariate analysis of variance (ANOVA) is the simplest form of data analysis considering only one dependent variable (Backhaus et al., 2018). Using MANOVA it was possible to investigate group differences across different student or teacher personal characteristics and thus detect if groups differed in the combination of dependent variables.

In data preparation for inferential analyses, missing values were excluded list wise. Applied MANOVAs therefore only included complete cases (Graham, 2012). Due to low percentage of missing completely at random values, list wise exclusion was considered sufficient for this sample as the procedure leads to a reasonably small loss of power in multivariate analyses (van Ginkel et al., 2020). Further, within MANOVA assumption testing, linearity, equality of covariance matrices and absence of multicollinearity were checked in the resulting sample in order to ensure the quality of the data (Pituch & Stevens, 2016). Multicollinearity testing further influenced the decision for the amount of applied MANOVA models in order to prevent distortions in MANOVA test statistics and

obtain most valid results within the chosen aggregated examination of personal characteristics on the teacher and the student side.

MANOVA allows considering correlations between variables (Woisetschläger et al., 2007), which in this study represented a decisive advantage of this procedure over other variance analyses procedures, such as several ANOVAs. Correlations between dependent variables within one MANOVA model were checked to fall in the suggested range of .2 to .9. On the teacher side, this procedure resulted in three MANOVA models: general personality traits, general interests, and motivational characteristics. On the student side, this procedure resulted in four MANOVA models for each multivariate dependent variable: *general personality traits*, *physical self-concept*, *achievement motive*, and *motives to be physically active*.

To illustrate the practical relevance of significant MANOVA results, eta-squared was presented as it calculates error square in variance analyses with more than two mean values (Cohen, 1988). In order to detect if groups differed in all or several selected dependent variables, follow-up ANOVAs for personal characteristics individually were applied. Due to unbalanced data in the respective sample, sums of squares were calculated adaptively following Fox's (2016) recommendations for ANOVA modelling. Discriminant analyses as alternative multivariate approach in contrast to follow-up ANOVAs examine the dependence of one grouping variable on the feature variable and by this aim to detect linear combinations of the dependent variables discriminating the groups (Field, 2009). Discriminant analyses are typically applied when predicting group affiliations (Backhaus et al., 2018) and were therefore not suitable in the underlying empirical study. Furthermore, in sports and exercise (Barton et al., 2016) as well as educational sciences (Smith et al., 2019), discriminant analyses have rarely been used whereas the chosen procedure of follow-up ANOVAs has been an approved method. In line with these arguments, Bray and Maxwell (1982) support univariate post hoc tests following MANOVA.

Subsequent pair-wise comparisons of significant results allow to determine the location of detected differences (Backhaus et al., 2018). Stepwise pairwise comparisons lead to alpha error accumulation, which can be avoided by the use of post hoc tests. Post hoc tests can be divided into a) pairwise multiple comparisons, which check mean differences of all possible pairs of groups for statistical significance, and b) range tests, which try to form homogeneous subgroups that do not differ from each other. Test procedures differ according to the assumption of variance homogeneity, the equality of group sizes as well as the test's conservative nature in general (Werner, 1997). REGWQ or Tukey e.g., have good power but require equal sample sizes and similar population variances. Bonferroni however is generally more conservative but guarantees control over alpha mistake

accumulation (Field, 2009). DTK Pairwise Multiple Comparison Test is designed to handle unequal variance and sample sizes (Dunnett, 1980) and therefore was chosen in this empirical study. Confidence intervals were used to display probable ranges of group differences and gave further insight into the strength and direction of reported effects (du Prel et al., 2009).

4 Results

This section presents the articles written as part of the cumulative dissertation. The section contains the articles' abstracts, author contributions as well as reprints of the complete articles. All articles have been published under the Open Access Creative Commons Attribution License (CC-BY), which permits the use, distribution, and reproduction of material from published articles if the original authors and sources are cited.

4.1 Article 1

Authors: Kirch, A., Schnitzius, M., Mess, F., and Spengler, S.

Title: Who Are Our Students? Understanding Students' Personality for Refined and Targeted Physical Education. A Scoping Review.

Journal: Frontiers in Sports and Active Living

Doi: 10.3389/fspor.2019.00031

Abstract:

Students' personality is an essential component in order to plan and teach PE lessons according to students' individual needs. Additionally, personality formation in general is part of the educational mandate and student personality development specifically is considered as an elementary goal of PE. Although student personality is a central topic in the PE context, the state of research, especially regarding the underlying personality understandings, is diverse and hard to capture. Therefore, this scoping review aims to (I) describe the underlying personality understandings and (II) analyze research questions and results of studies examining students' personality in PE. We conducted a scoping review. Eleven databases were chosen because of their specification within the field of education, sports and health sciences. We included references if they empirically examined students' personality in PE and were published in German or English. Twenty-four studies were included in the review. Fifteen of the included studies were cross-sectional, nine longitudinal. Regarding aim I), the underlying personality understandings were inconsistent

across the studies but most of the studies followed trait theory. Considering aim II), the included studies investigated relationships between students' personality and either (a) students' achievement in PE, (b) students' psychological determinants of PE participation (e.g., motivation, anxiety), or (c) a school sports intervention. Results indicated that e.g., extraverted students tend to enjoy PE more and obtain less anxiety in PE. The review showed that students' personality in PE is empirically examined but the studies' underlying personality understandings, research questions and results are diverse. Findings highlight that PE contributes to students' personality development. Additionally, the review showed that results of personality research in PE context can be used in order to teach PE in a student-centered way (e.g., by deducing the detected relationships considering extraversion) and by this support students' lifelong physical activity. Further and targeted research in this field can help PE teachers to tailor their teaching to their students' needs. This increases the chances to achieve PE's two main goals—"educating to sports (e.g., personality-aligned lessons addressing different motives)" and "educating through sports (e.g., personality development)" in the long term.

Contribution:

Alina Kirch is the first and corresponding author of Article 1. Alina Kirch together with Melina Schnitzius, Sarah Spengler, and Filip Mess conceived and designed the study. Alina Kirch and Melina Schnitzius performed the literature search and study selection process. Alina Kirch analyzed the data and wrote most of the manuscript with contributions from Melina Schnitzius as well as Sarah Spengler and Filip Mess. All authors approved the final version of the manuscript.



Who Are Our Students? Understanding Students' Personality for Refined and Targeted Physical Education. A Scoping Review

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Students' personality is an essential component in order to plan and teach physical education (PE) lessons according to students' individual needs. Additionally, personality formation in general is part of the educational mandate and student personality development specifically is considered as an elementary goal of PE. Although student personality is a central topic in the PE context, the state of research, especially regarding the underlying personality understandings, is diverse and hard to capture. Therefore, this scoping review aims to (I) describe the underlying personality understandings and (II) analyze research questions and results of studies examining students' personality in PE. We conducted a scoping review. Eleven databases were chosen because of their specification within the field of education, sports and health sciences. We included references if they empirically examined students' personality in PE and were published in German or English. Twenty-four studies were included in the review. Fifteen of the included studies were cross-sectional, nine longitudinal. Regarding aim I), the underlying personality understandings were inconsistent across the studies but most of the studies followed trait theory. Considering aim II), the included studies investigated relationships between students' personality and either (a) students' achievement in PE, (b) students' psychological determinants of PE participation (e.g., motivation, anxiety), or (c) a school sports intervention. Results indicated that e.g., extraverted students tend to enjoy PE more and obtain less anxiety in PE. The review showed that students' personality in PE is empirically examined but the studies' underlying personality understandings, research questions and results are diverse. Findings highlight that PE contributes to students' personality development. Additionally, the review showed that results of personality research in PE context can be used in order to teach PE in a student-centered way (e.g., by deducing the detected relationships considering *extraversion*) and by this support students' lifelong physical activity. Further and targeted research in this field can help PE teachers to tailor their teaching to their students' needs. This increases the chances to achieve PE's two main goals—“*educating to sports (e.g., personality-aligned lessons addressing different motives)*” and “*educating through sports (e.g., personality development)*” in the long term.

Keywords: personality, students, physical education, school sports, teaching, scoping review

INTRODUCTION

Physical education (PE) fulfills an outstanding role within the school curriculum. PE is the only subject in which children are physically active (Penney and Jess, 2004). Even more distinguishing is the fact that PE is the only context in which all school-aged children experience instructed physical activities in the course of their lives (Tammelin et al., 2016). PE is therefore the only sure opportunity to get everyone on the move and convey the importance and chances of physical activity for a healthy life (Kohl and Cook, 2013). This opportunity and the associated goal in its core is internationally prevalent in PE's central assignment (Sallis and McKenzie, 1991; Pühse and Gerber, 2005; Scheid and Prohl, 2012). In Germany, PE's central assignment is typically characterized by two main goals (Scheid and Prohl, 2012): (1) Prepare and motivate students for a physically active lifestyle. In this regard, children need to explore different kinds of sports, acquire an appropriate range of movement skills and by this find their individual motives to be physically active in and outside school. PE supports discovering the personal meaning of physical activity and at the same time promotes the understanding and knowledge of various aspects of movement. Students by this develop the capacity to act on one's own and apply these competencies to a purposeful use of their leisure time and ideally lifelong physical activeness. PE has evolved to become a content area with diverse aims that facilitate the holistic—physical, social, emotional, and intellectual—development of children (NASPE, 2004). Part (2) of PE's central assignment therefore includes the goal of empowering students' personal development. In this regard, curricula claim that PE contributes to children's development in different facets, such as formatting and developing positive personal, social or emotional qualities.

The Importance of Students' Personality in School

Students are in the focus of both abovementioned goals. PE's allocated educational mandate therefore implies the necessity to consider the learner in teaching processes such as lesson planning and implementation. In the general educational context, learners' individual needs are a central factor regarding their learning processes (Jurik et al., 2015). Knowing learners' individual needs in order to adapt teaching processes includes knowing the learners' personality. Personality formation is a central factor of the educational mandate which accounts for considering students' personality in teaching and research. Personality research in school showed a pervasive influence of personality traits on student outcomes such as students' well-being, emotional states or academic performance (O'Connor and Paunonen, 2007; Poropat, 2009; Richardson et al., 2012). According to O'Connor and Paunonen (2007) students' personality traits (Big Five) predict their academic performance in two different ways: (1) Via behavioral tendencies affecting habits (Rothstein et al., 1994) and (2) via students' willingness to perform (Furnham and Chamorro-Premuzic, 2004). O'Connor and Paunonen (2007) results further indicated the increasing importance of personality traits' influence compared to cognitive

abilities' influence on academic performance when students become older (Furnham et al., 2003). In summary, students' personality plays a significant role in shaping their educational experiences (Matthews et al., 2006).

Understanding Personality

In order to examine the importance and impact of students' personality in particular contexts, it is essential to conceive the underlying understandings of personality. Personality is a broad term describing a multifaceted construct (Johnson and Christensen, 2017). General personality research differentiates between seven major approaches of personality psychology: Psychoanalytic (i.e., Freud, 1940), neo-psychoanalytic (i.e., Adler, 1930; Jung, 1958), humanistic (i.e., Maslow, 1970; Rogers, 1972) emphasizing a self-actualizing tendency, behavioral (i.e., Watson, 1930; Skinner, 1972), biological (i.e., Sheldon, 1963; Cloninger, 1999), cognitive (i.e., Bandura and Walters, 1963; Ellis et al., 2009), and trait psychological (i.e., Cattell, 1946; Eysenck and Eysenck, 1969). In general personality research the trait approach became prevalent over time. Personality is therefore often defined as a person's unique structure of relatively stable traits (Guilford, 1971).

In order to interpret and compare the results of different studies following personality's trait theory, it is essential to know the different trait models' origin, their development and individual composition. In the course of time, some models have significantly influenced the development process of trait theory in general. Even if the models' origin varies, the chosen dimensions mostly display great relationships (Gerbing and Tuley, 1991; Goldberg and Rosolack, 1994). Initial trait psychological models are based on a lexical approach describing personality in multiple adjectives. Cattell (1946) derived 16 source traits inherent in every person. Cattell's 16 primary factors are categorized in 5 s stratum source traits (Cattell, 1956; Rossier et al., 2004). The dimensions warmth, liveliness, social boldness, privateness, and self-reliance are summarized in the factor extraversion. The dimensions emotional stability, vigilance, apprehension, and tension are subordinate to anxiety. Tough-mindedness is a combination of warmth, sensitivity, abstractedness and openness to change. Independence unites the dimensions dominance, social boldness, vigilance, and openness to change. Self-control includes the dimensions liveliness, rule-consciousness, abstractedness, and perfectionism (Cattell, 1956; Rossier et al., 2004). Cattell's (1946) model became a standard personality measure in about 1970. At about the same time, Eysenck and Eysenck's (1969) model which, contrary to Cattell's, describes personality in broad, abstract terms, was developed. Eysenck focused more on biological traits and revealed two major dimensions: Introversion vs. extraversion and emotional stability vs. emotional instability. Later he added the third dimension psychoticism (Eysenck, 1976). Eysenck (1984) stated that his and Cattell's (1946) model should not be seen as contradictory but rather as complementary and mutually supportive. An analysis estimating the two models' comparability confirmed the equivalence of the factors anxiety and neuroticism as well as the equivalence of the models' extraversion factors (McKenzie, 1988). At the end of the 20th century, McCrae and Costa (1987) as

well as Goldberg (1990) developed two similar models, which differed mainly in their mode of formation. While Goldberg (1990) pursued a lexical approach and developed the model of the Big 5, McCrae and Costa (1987) empirically analyzed personality questionnaires and by the means of factor analysis developed their five-factor model. Both models unite roughly the same five personality dimensions: Openness to experience, conscientiousness, extraversion, agreeableness and neuroticism. The five-factor model is currently the most prevalent model in personality research in general in order to describe personality holistically and superseded the aforementioned models (Cattell, 1946; Eysenck and Eysenck, 1969). The similarity between Cattell's global scales and the five-factor model was confirmed too. The two models share four of the five global dimensions. Only the dimension agreeableness is not represented in Cattell's 16 PF (Rossier et al., 2004). Due to the content-related similarity between different trait models, results of studies based on these models are to a certain extent comparable.

Considering Students' Personality in PE

This knowledge on personality research's development and its current orientation is essential for further investigating students' personality specifically in PE context. As previously mentioned, numerous relationships between students' personality and learning outcomes have been ascertained in the general educational context. It seems logical that the detected relationships—examined on this general level—also exist on a more specific level, e.g., considering PE particularly. Due to the fact that the PE context particularly creates incentives and opportunities contributing to students' personality development (Kohl and Cook, 2013), examining relationships between students' personality and learning outcomes in PE becomes important. Even though research has demonstrated that students' personality is related to various factors influencing academic performance (Komaraju et al., 2011) and PE's allocated mandate postulates students' personality development (Scheid and Prohl, 2012), research considering students' personality in PE has been very rare so far. Most studies investigate only single aspects related to personality, such as students' attitudes toward or perceptions of PE (e.g., Harwood et al., 2015; Kretschmann, 2015; Silverman, 2017). In order to capture the complex construct of personality and by this its impact on students' physical activity and their personality development, it is insufficient to only describe individual components of students' personality (Asendorpf and Teubel, 2009). Asendorpf and Teubel (2009) therefore claim to examine students' personality following an integrative perspective within the context of a holistic personality development. This fosters a better understanding of PE specific outcomes such as students' motor performance, achievement motivation and the development of personal, social, or emotional competencies. Holistically understanding students' personality allows to identify and address students' needs—part one of PE's main goals (“educating to sports”)—and provides links for students' personality development—part two of PE's main goals (“educating through sports”) (Sallis and McKenzie, 1991; Siedentop, 2009; Scheid and Prohl, 2012).

A review article of existing literature examining students' personality in PE would be beneficial to summarize findings and by this ideally highlight the potential of personality research in the PE context. Due to diverse personality understandings, different research questions and investigated correlates within studies, the identification of relevant literature is challenging. Hence, a broad approach is essential in order to capture all relevant texts. A review of this kind—considering students' personality in PE following a wide approach to provide an overview of the existing literature on a general level—does not yet exist. Review articles in PE context are mostly concerned with PE teachers—often focusing on their education (Scheuer, 2019) or teaching methods (Lander et al., 2017). Review articles, considering the students in PE, typically focus on specific questions concerning students' personal characteristics and within this individual aspects such as self-concept or achievement motivation, rather than the students' personality in a broad sense (Kretschmann, 2015; Ang and Yubing, 2017; Silverman, 2017). The latter approach is more common in general educational research. Here studies conclude with promising results, e.g., detecting a relationship between students' personality and academic performance (O'Connor and Paunonen, 2007).

In the specific field of PE, reviewing the literature considering students' personality following a broad approach has not been conducted so far. Therefore, the aim of our review was to provide an overview of studies proclaiming to assess students' personality in PE. More precisely, we intended to (I) describe the underlying personality understandings by analyzing the pursued personality approach and applied personality inventories and (II) depict the studies' research questions and associated results by analyzing investigated variables, relationships or outcomes.

METHODS

Scoping reviews are especially helpful in order to provide a broad picture of existing literature in a wide research field (Booth et al., 2016), such as personality research. Due to the fact that personality research is carried out in various contexts and due to the existence of diverse personality understandings, we decided to conduct a scoping review.

Selection Criteria

We were interested in investigating the students' (*sample*) needs, more specifically their general requirements regarding their personality (*content*). Further, we were specifically interested in studies examining these needs in PE (*context*). Therefore, we had to predefine our inclusion criteria, which also formed the basis of the search term in the three following categories: (1) Study focused on personality or rather proclaimed to assess personality; (2) sample under consideration comprised primary or secondary school students; (3) study was carried out during PE lessons or in school sports contexts. Category (1) was searched on title-abstract-keyword level in order to make sure that personality was the key issue in the text. The reference had to focus on personality or at least mention it as variable or outcome. Category (2) and (3) were searched on full-text level and included synonyms for students and various school sports contexts. Additionally,

the publication language had to be English or German. The publication period was not limited and all publication types were considered, which is in line with Arksey and O'Malley's (2005) methodological guidelines of scoping studies.

Search and Review Process

Based on Arksey and O'Malley's (2005) recommendations, the search strategy comprises four sequential steps: (1) Initial electronic database search; (2) key journal search of the included studies; (3) reference list search of the included studies; (4) manual author search of authors of the included studies. Considering the aforementioned principles the following search terms were used in the database search (in the following exemplary for the database Scopus): (TITLE-ABS-KEY ((persönlichkeit* OR personalit* OR schülerpersönlichkeit*)) AND ALL ((schüler* OR kinde* OR jugend* OR student* OR pupil* OR schoolchild* OR scholar* OR kid* OR child* OR youth* OR learner* OR adolescen* OR teen* OR youngster*)) AND ALL ((sportunterricht* OR schulsport* OR bewegungserziehung* OR bewegungsunterricht* OR leibeserziehung* OR leibesübung* OR "physical education" OR "gym* class*" OR "school sport*" OR "physical training"))) AND (LIMIT-TO (LANGUAGE, "English") OR LIMIT-TO (LANGUAGE, "German")). In total, 11 databases were searched: Education Source, ERIC, PsychARTICLES, PsycINFO, PSYINDEX, PubMed, Scopus, SocINDEX, SPOLIT, SportDiscus and Web of Science. The databases were chosen because of their specification in the field of education, sports and health sciences. The first search was realized on February 6th 2017. An update search to ensure the review's topicality was implemented on June 27th 2018. The first and second author functioned as two independent reviewers and fulfilled the screening process—first on title and afterwards on abstract level, independently deciding whether the reference should be included or not. References were excluded if not published in English or German, not empirical, not examining students, not in school setting and not investigating personality. In case of uncertainty (e.g., missing information, unsure about sample) the references were reassessed in the next step. Conflicts were discussed and solved collaboratively. We did not exclude studies due to quality reasons in order to examine the whole body of literature and by this be in line with the scoping review's methodological standards (Arksey and O'Malley, 2005). Last, full-texts were screened considering the same criteria as mentioned above.

The journals *Research Quarterly* and *sportunterricht* frequently appeared as publication source of the included studies. The manual key journal search was therefore applied to these two journals. Furthermore, the reference lists of all included studies were screened and all therein potentially relevant references had to pass the aforementioned screening process. As a final step, the included studies authors' research activities were investigated by entering the authors' names in the abovementioned databases and additionally checking their profiles and publication lists. If relevant research on students' personality in school sports contexts was detected, the publications were considered for potential inclusion and

again had to run the screening process. **Figure 1** summarizes the search and review process.

Data Extraction and Analysis

In order to guide the data extraction stage, a data charting form in table format was created. The two reviewers first independently extracted the relevant information and filled in the table. Second, the two reviewers compared and discussed their tables, removed conflicts and joined the two tables to the final table. Subsequently, the variables under investigation in the included studies were extracted and grouped thematically. Further, results within these thematically similar groups were compared (within group comparison). For this purpose, the reviewers examined the possible comparability of the different applied inventories within a group. If a comparison was possible, e.g., due to a similar personality understanding pursued in the studies under investigation, the reviewers checked for replicability of the individually examined relationships among the studies.

Following Richards et al. (2017) as well as Arksey and O'Malley (2005) the results of the abovementioned data extraction and analysis step are presented in two formats. First, the results are summarized in table format (**Table 1**). **Table 1** presents the pertinent information of the included studies. In addition to each study's framework conditions, the table includes the study's aim, underlying personality understanding (approach and applied inventory) and main results. **Table 1** therefore provides a clear and compact presentation of answers to the review's research questions. Second, the results are provided in the running text, divided into framework conditions (author, year, origin, publication type, and sample) and a thematic analysis which explicitly addresses the review's research questions and provides an elaborated analysis.

RESULTS

Figure 1 summarizes the search and review process, differentiating between the initial and the update search. Both searches in total yielded 3,963 references. After removing duplicates, screening titles and abstracts 91 full-texts were examined. Twenty-three references fulfilled all inclusion criteria and were therefore considered for analysis. One additional reference was included via the reference list search. The author and key journal search did not yield any additional reference. In total, 24 references were included in the review.

Framework Conditions of the Included Studies

Most of the studies ($n = 18$) were implemented in Europe, eight thereof in Germany (Seitz and Bäuml, 1972; Dunkerbeck and Prenner, 1976; Gabler, 1976; Friedrich, 1978; Bachleitner-Hofmann, 1986; Willimczik, 1986; Westhoff, 1989; Klein, 2017) and three in the United Kingdom (Kerr, 1978; Williams and Eston, 1986; Hayes, 2017). Five studies originated from Canada or the United States of America (Blanchard, 1946; Tillman, 1965; Wilson, 1969; Lodewyk, 2018; Lodewyk and Gao, 2018). The remaining studies originated from Austria, Croatia, Czech Republic, Israel, Poland, Romania and Slovenia.

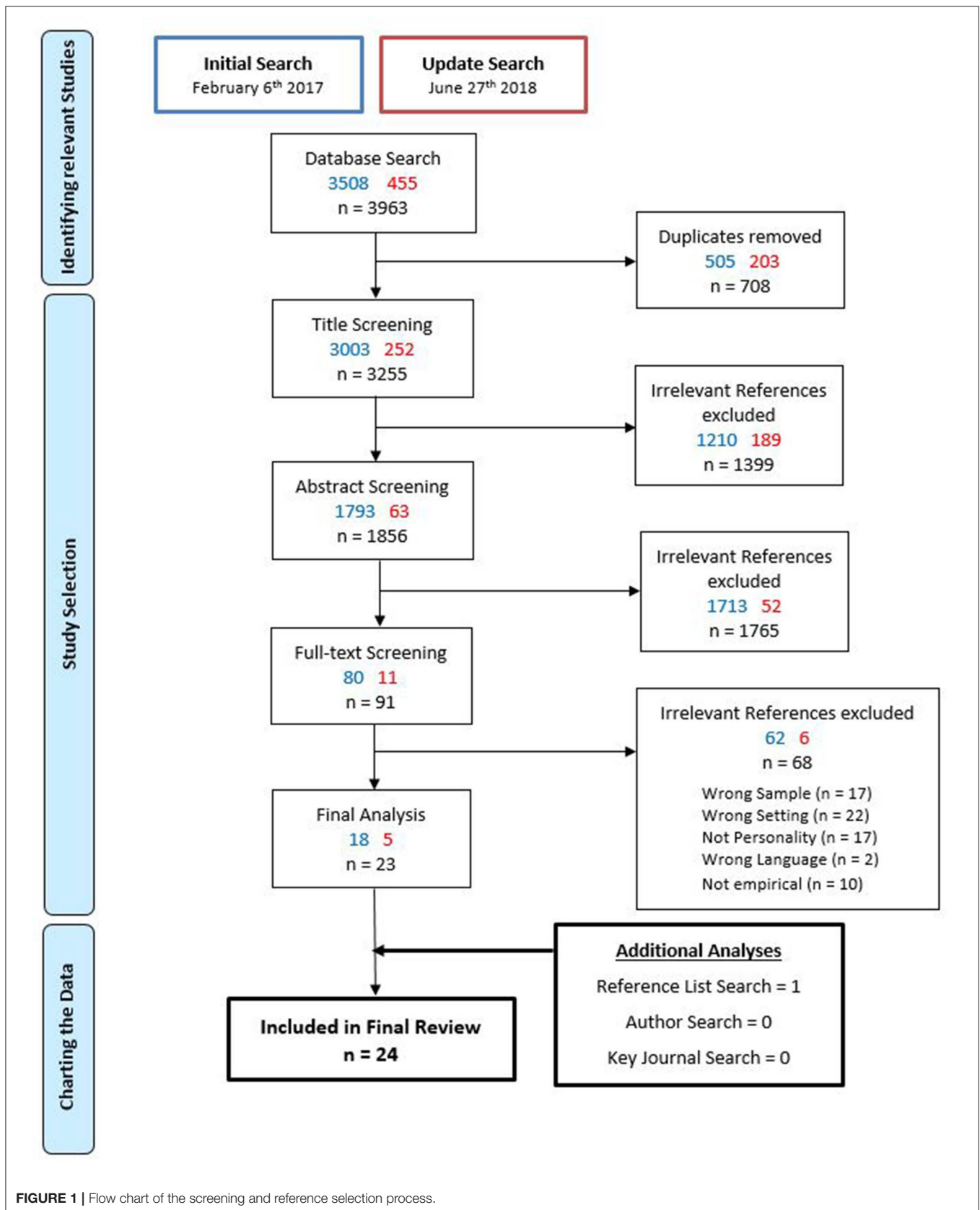


FIGURE 1 | Flow chart of the screening and reference selection process.

TABLE 1 | Included studies' framework conditions, aim, personality understanding, and main results.

Framework conditions		Aim	Personality understanding		Main results
Author (Year) Origin—Publication Type: <i>Journal Name</i>	Sample		Personality approach	Personality inventory	
CROSS-SECTIONAL STUDIES					
Culjak and Mlačić (2014) Croatia—Journal Article: <i>Croatian Journal of Education</i>	100 students (59 m; 41 f); grade 1 and 2 high school (age 16–17)	Relationships between personality and success (good grade) in PE	Big five model of personality (Goldberg, 1990)	Questionnaire: IPIP100 (Mlacic and Goldberg, 2007)	- Personality is related to success in PE - Students' success was positively related to conscientiousness and emotional stability (in girls) and negatively to extraversion (in boys)
Dunkerbeck and Prenner (1976) Germany—Book Section	50 PE teachers	Proof and analysis of implicit personality theories in PE context	Implicit personality theories; stereotypes	1) Free description of "the underperforming student" 2) Characterization within given dimensions	Implicit theories of PE teachers contain four dimensions to describe personality of students: physical abilities and conditions; PE expectations; sociability and interactive recognition; behavior
Ercic et al. (2005) Slovenia—Journal Article: <i>International Journal of Physical Education</i>	1,025 students; grade 5 and 7 primary school & 1 and 3 secondary school (age 11–18)	Relationships between students' personality traits and (a) attitudes toward PE and (b) motivation for PE	Big five model of personality (Goldberg, 1990), ATEAQ (Ercic et al., 2005)	Questionnaire: B5P-C (Little and Wanner, 1998)	a) Students scoring higher in conscientiousness show more positive attitudes toward PE b) Students scoring lower in agreeableness and higher in neuroticism are less motivated in PE
Friedrich (1978) Germany—Journal Article: <i>International journal of physical education</i>	523 students (257 m; 266 f); high school (age Ø 12.5)	Relationships between personality and achievement (good grade) in PE	Two-factor model (Eysenck and Eysenck, 1969)	Questionnaire: Hanes KJ (Bugge and Baumgärtel, 1975)	Students scoring higher in extraversion show better PE grades
Guszkowska and Rychta (2007) Poland—Journal Article: <i>Human Movement</i>	455 students (213 m; 242 f); high school (age 15–17)	Relationships between personality and students' (a) physical fitness and (b) gender-related diversification	Five-factor model (McCrae and Costa, 1987) 16 PF (Cattell, 1946)	Questionnaires: FCB-TI (Zawadzki and Strelau, 1997); polish version of NEO-FFI (Zawadzki, 1998); polish version of HSPQ (Rychta and Guszkowska, 2000)	a) Personality traits are poorly correlated with the adolescents' physical fitness b) Predictors of physical fitness are different in boys and girls. In boys: extraversion is positively correlated with the total fitness score, agreeableness is correlated with agility, trunk muscle strength and suppleness; trunk muscle strength and suppleness also with conscientiousness. None of these correlations are shown in girls
Hayes (2017) UK—Journal Article: <i>Research Papers in Education</i>	296 students (150 m; 146 f); primary school (age 5–11)	Analysis of factors responsible for negative attitudes toward PE	Personality part of "Personal factors" (variable + intrinsic)	Semi-structured interview	Identified factors: lack of self-efficacy, a lack of perceived autonomy, family and peer factors and individual physical and personality factors are decisive for negative attitudes toward PE
Kerr (1978) UK—Journal Article: <i>British Journal of Physical Education</i>	165 students (97 m; 68 f); grammar school (age 11–12)	Relationships between personality variables and physical ball skills	Personality = mind and body (physical, intellectual, social and emotional) 16 PF (Cattell, 1946) Two-factor model (Eysenck and Eysenck, 1969)	Questionnaires: JEPI (Eysenck, 1965); HSPQ (Hundleby and Cattell, 1968)	Students with good physical ball skills score higher in warmth, emotional stability, dominance, liveliness and extraversion and score lower in sensitivity, social boldness and apprehension or introversion
Klein (2017) Germany—Journal Article: <i>sports</i>	1,399 students (707 m; 692 f); grade 7 (age Ø 12.9) and 10 (age Ø 15.8)	Relationships between physical self-concept and general personality traits	Big five model of personality (Goldberg, 1990)	Questionnaire: NEO-FFI (McCrae and Costa, 1992)	Students scoring higher in neuroticism assess their own physical attractiveness and own athleticism lower

(Continued)

TABLE 1 | Continued

Framework conditions		Aim	Personality understanding		Main results
Author (Year) Origin—Publication Type: Journal Name	Sample		Personality approach	Personality inventory	
Lodewyk and Gao (2018) USA/Canada—Journal Article: <i>International Journal of Sport and Exercise Psychology</i>	319 students (162 m; 157 f); grade 9 and 10 high school	Relationships between personality traits and (a) enjoyment and (b) effort in PE as a function of gender	HEXACO model (Ashton and Lee, 2007)	Questionnaire: HEXACO-PI-R (Lee and Ashton, 2004)	a) Students with lower openness to experience and higher extraversion show higher enjoyment and by this effort in PE b) Boys: honesty-humility shows a stronger relationship to effort via enjoyment compared to girls Girls: agreeableness shows a stronger relationship to effort via enjoyment compared to boys
Lodewyk (2018) Canada—Journal Article: <i>Educational Psychology</i>	316 students (161 m; 155 f); grade 9 and 10	Relationships between personality and (a) anxiety (b) self-efficacy, and (c) intentions to exercise as a function of gender	HEXACO model (Ashton and Lee, 2007)	Questionnaire: HEXACO-PI-R (Lee and Ashton, 2004)	Students scoring higher in extraversion show (a) lower anxiety and (b) higher self-efficacy and (c) higher intentions to exercise (f/m); Students scoring higher in openness to experience show higher anxiety (f/m) and lower self-efficacy (f)
Seitz and Bäumler (1972) Germany—Book Section	70 students (m); grade 6 (age 11–13)	Relationships between personality traits and motor performance	16PF (Cattell, 1973)	Questionnaire: CPQ (Porter and Cattell, 1963)	Students scoring higher in personality dimensions (motor activity, optimistic unconcern and distance to authority) show better results in motor performance (flexibility or movement coordination)
Westhoff (1989) Germany—Journal Article: <i>Sportunterricht</i>	31 students (15 m; 16 f); grade 7 (age 12–13)	Relationships between personality and volleyball-specific abilities	3 non-motor variables: Students' interest on PE, concept of own abilities, anxiety of social consequences	Questionnaires: assessing non-motor variables	- Students with higher volleyball- specific abilities show higher content-specific interests and higher sports-specific concept of own abilities - Weak relationship between volleyball-specific abilities and anxiety
Williams and Eston (1986) UK—Journal Article: <i>Physical Education Review</i>	30 students (m) (age Ø 16)	Relationships between personality and (a) exercise intensity and (b) perception of exertion	Two-factor model (Eysenck and Eysenck, 1969)	Questionnaire: JEPI (Eysenck, 1965)	No relationship between personality (measured via extraversion) and (a) exercise intensity or (b) perception of exertion
Willimczik (1986) Germany—Journal Article: <i>Sportunterricht</i>	73 students (37 m; 36 f); grade 8 middle school (age Ø 16)	Relationships between different internal conditions and motor learning abilities	Personality traits = cognitive psychological construct (concept of own abilities, achievement motivation, attributions, anxiety)	Questionnaires: concept of own abilities (Meyer, 1984); achievement motivation (Schmalt, 1976); attributions (Weiner and Reisenzein, 1984); anxiety	Students scoring higher in the dimension concept of personal abilities show higher learning abilities
Wilson (1969) USA—Journal Article: <i>Research Quarterly</i>	154 students; high school	Relationships between selected personality factors and motor performance	16 PF (Cattell, 1946) Temperament (Guilford, 1971)	Questionnaires: 16 PFQ (Cattell and Eber, 1962); GZTS (Guilford et al., 1949)	Negative relationship between self-reliance and motor performance
LONGITUDINAL STUDIES					
Bachleitner-Hofmann (1986) Germany—Series	89 students (age 14–19)	Influence of more PE on personality	Lexical trait model (Fahrenberg et al., 1978) + self-concept (Sack, 1980) + attitudes (Kenyon, 1968)	Questionnaires: FPI (Fahrenberg et al., 1978); EWL (Sack, 1975, 1980); ATPA-D (Kenyon, 1968)	T0: Sports class students score higher in sports-specific achievement orientation (attitudes) T1: Sports class students are more inhibited and reserved (traits)

(Continued)

TABLE 1 | Continued

Framework conditions		Aim	Personality understanding		Main results
Author (Year) Origin—Publication Type: Journal Name	Sample		Personality approach	Personality inventory	
Blanchard (1946) USA—Journal Article: <i>Research Quarterly</i>	164 students; grade 8–11 high school	1) Whether or not personality traits are continuous in development 2) Whether boys or girls show greater development in personality traits over a 2 year period	Personality = integrated total of traits possessed by an individual	Questionnaire: BFRS (Blanchard, 1936)	1) Continuous growth in character and personality traits with each succeeding grade level 2) Development of wholesome character and personality traits in girls is overall greater than in boys
Gabler (1976) Germany—Edited Book	254 students (age 12–13 and 15–16)	Influence of sports class participation on the development of specific personality traits	16PF (Cattell, 1973), achievement motivation as independent part of personality + interests and attitudes	Questionnaires: HSPQ (Cattell, 1973); TAT (Heckhausen, 1974)	T0: Only one significant difference between sports class students and regular class students in the dimension perfectionism T1: Dominance increased significantly in sports class students compared to regular class students
Geron (1981) Israel—Conference Proceedings	395 professional junior student athletes; junior high school (age 11–12)	Influence of sports class participation on psychological characteristics	Personality characteristics: anxiety, locus of control and reactions to frustration	Questionnaires: Trait/State Anxiety Test (Spielberger et al., 1984); TALOC (Milgram and Milgram, 1975); Picture Frustration Test (Rosenzweig, 1944)	T0: Sports class students score higher in aggression, need persistence and obstacle dominance; regular class students are characterized more conformist and ego defensive T1: Sports class students change and score higher in locus of control and reaction to frustration
Krejci (1993) Czech- Republic—Journal Article: <i>Social Science International</i>	247 students (127 m; 120 f); grade 3, 5, and 7 elementary school (age 9–13)	Psychological development of students and the possibility of forming their personality in the process of PE	Two-factor model (Eysenck and Eysenck, 1969)	Questionnaire: EPI (Krallova, 1971)	T0: No differences among the initial measurement T1: Students in the intervention group score higher in extraversion, especially boys
Mijaica (2017) Romania—Conference Proceedings	2 classes; grade 9 and 10 college (age 15–17)	Influence of a specialized curriculum on the development of personality traits	Five personality directions: leadership; managing conflicting situations; preventing conflicting situations; fair-play; sports disciplines	Systematic observation method (Epuran, 2005)	Intervention group shows a significantly higher development in terms of target skill acquisition (solving conflict situations, fair-play, leadership) compared to control group
Tillman (1965) USA—Journal Article: <i>Research Quarterly</i>	386 students; junior and senior high school	Influence of a physical fitness program on selected personality traits	16 PF (Cattell, 1946) Social behavior (Allport and Allport, 1928) Preference Record (Kuder, 1950)	Questionnaires: A.S. reaction study (Allport and Allport, 1928); 16 PFQ (Cattell and Eber, 1962)	Experimental group only differs in one personality dimension (vocational interest: clerical) compared to control group
Schubert (1973) Austria —Dissertation	185 students (f); grade 5 and 6 sports school	Influence of more PE on students' personality traits	Parts of personality: self-criticism/- control,/- confidence, initiative, contact, anxiety, satisfaction with parental home, and school	Questionnaire: SPQ (Zrzavy, 1960)	No differences between sports class students and regular class students in grade 6 Differences regarding satisfaction in school in grade 5: sports class students are more satisfied in general school than non-sports class students

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TABLE 1 | Continued

Framework conditions		Aim	Personality understanding		Main results
Author (Year) Origin—Publication Type: Journal Name	Sample		Personality approach	Personality inventory	
Zupancic and Justin (1998) Slovenia—Journal Article: <i>Educational Research and Evaluation</i>	62 professional junior student athletes; grade 2 grammar school (age 16–17)	Impact of sports classes on personality development	16PF (Cattell, 1973)	Questionnaires: polish version of 16 PFQ (Lamovec, 1975); profile index of emotion (Plutchik and Kellerman, 1974)	T0: High performing sports class students are more achievement oriented, have a stronger ego, behave more spontaneously, are less demanding and less depressed than regular class students T1: High performing sports class students undergo more changes in personality traits compared to regular class students—increased dominance, ego strength, surgency, sophistication or decreased anxiety, and depressed moods in high performing sports class students

The included studies were published between 1946 and 2018, inclusive. Nine studies thereof were conducted before 1980, seven between 1980 and 2000 and eight after 2000. Seventeen studies were published in 14 different journals (10 thereof peer-reviewed). Four studies were published as books or chapters in an edited book, two studies were published within conference proceedings and one study was a dissertation. Dunkerbeck and Prenner (1976) asked 50 PE teachers to describe their students' personality. In the remaining 23 studies participants were students between 5 and 19 years. Most of the studies investigated teenaged students between 14 and 17 years. The number of participants in all studies ranged from 30 to 1,399. Eight studies observed <100 participants, 14 studies examined between 100 and 600 participants and two studies recruited more than 1,000 participating students. Fifteen of the included studies were cross-sectional studies, nine longitudinal. Longitudinal studies lasted from 6 months to 5 years.

Personality Understanding of the Included Studies

The studies followed different understandings of personality. Most of the studies ($n = 17$) followed trait theory and either applied the 16 PF model of Cattell (1946) ($n = 8$), the two- or three-factor model of Eysenck (1981) ($n = 4$), or the five-factor model of McCrae and Costa (1992) ($n = 5$). Four studies (Tillman, 1965; Wilson, 1969; Kerr, 1978; Guszowska and Rychta, 2007) united different personality approaches in their research. Others ($n = 8$) understood personality as an interaction of several factors, such as self-feelings, feelings toward others, anxiety, locus of control, or reactions to frustration (Blanchard, 1946; Schubert, 1973; Dunkerbeck and Prenner, 1976; Geron, 1981; Willimczik, 1986; Westhoff, 1989; Hayes, 2017; Mijaica, 2017).

The included studies used different methods to operationalize personality. The majority ($n = 21$) used questionnaires to assess

quantitative data and applied 19 different inventories. One study (Mijaica, 2017) used assessment sheets (Epuran, 2005) in order to systematically observe specific behavior indicating students' personality traits. Two studies (Dunkerbeck and Prenner, 1976; Hayes, 2017) applied a semi-structured interview or free descriptions to capture qualitative information.

Research Questions and Results of the Included Studies

The studies can be classified into three thematically coherent groups: Two groups depict cross-sectional studies and one group unites all longitudinal studies. One group of cross-sectional studies focused on the relationships between students' personality and their achievement in PE. The remaining cross-sectional studies examined relationships between students' personality and students' psychological determinants of PE participation e.g., motivation in PE or attitudes toward PE. All of the longitudinal studies investigated the influence of a school sports intervention on students' personality or rather their personality development.

Relationships Between Students' Personality Traits and Achievement in PE

Ten of the cross-sectional studies (Wilson, 1969; Seitz and Bäumler, 1972; Dunkerbeck and Prenner, 1976; Friedrich, 1978; Kerr, 1978; Williams and Eston, 1986; Willimczik, 1986; Westhoff, 1989; Guszowska and Rychta, 2007; Culjak and Mlačić, 2014) focused on the relationships between students' personality traits and their achievement in PE.

Two studies examined the relationship between students' personality traits and their PE grade (Friedrich, 1978; Culjak and Mlačić, 2014). Culjak and Mlačić (2014) showed relationships between Goldberg's conscientiousness, extraversion and emotional stability and better grades and therefore success in PE. These relationships were different for male and female students. Male students' (16–17 years) success was positively

related to conscientiousness and negatively to extraversion. Female students' (16–17 years) success was positively related to conscientiousness and emotional stability. In Friedrich's (1978) study, extraverted students (12 years) achieved better grades in PE.

Six studies (Wilson, 1969; Seitz and Bäumlner, 1972; Dunkerbeck and Prenner, 1976; Kerr, 1978; Williams and Eston, 1986; Guskowska and Rychta, 2007) analyzed the relationship between students' personality traits and their motor performance in PE. All studies except one (Williams and Eston, 1986) described a clear relationship between personality traits and different aspects of motor performance. Kerr (1978) showed that ball skills performance was positively related to Cattell's (1946) personality characteristics warmth, emotional stability, dominance, liveliness and Eysenck's dimension extraversion, but negatively related to Cattell's (1946) sensitivity, social boldness and apprehension as well as to Eysenck's (1981) introversion. Wilson (1969) found a negative correlation between Cattell's (1946) self-reliance and motor performance. Students (11–13 years) scoring higher in Seitz and Bäumlner's (1972) personality dimensions motor activity, optimistic unconcern and distance to authority showed better results in flexibility and movement coordination (Seitz and Bäumlner, 1972). Dunkerbeck and Prenner (1976) showed differences between high performing and low performing students regarding their personality and behavior assessed by the PE teacher. According to the interviewed PE teachers, low-performing students were shyer, more timid, and less social (Dunkerbeck and Prenner, 1976). Boys (15–17 years) in Guskowska and Rychta's (2007) study obtained a greater number of significant correlations between personality and motor performance than peer girls. Extraversion e.g., was positively correlated with boys' total fitness score. In addition, agreeableness was positively correlated with agility, trunk muscle strength and suppleness; trunk muscle strength and suppleness also with conscientiousness. None of these correlations were found for girls. Williams and Eston (1986) did not detect any relationship between personality—measured only via extraversion—and fitness or effort perception.

The remaining two studies (Willimczik, 1986; Westhoff, 1989) in this group focused on the relationship between students' personality traits and motor learning abilities. Both studies described the concept of personal abilities within their personality understanding and showed a positive relationship to higher learning abilities (12–13 years; 16 years, respectively). Apart from that, the studies revealed only few significant results. The relationship between interest in PE and student performance in PE e.g., was significant for boys and girls. Anxiety about social consequences was more prominent in girls and negatively related to their motor learning abilities (Westhoff, 1989). Boys scoring higher in hope for success performed better. Girls performed better when scoring lower in fear of failure (Willimczik, 1986).

Relationships Between Students' Personality and Their Psychological Determinants of PE Participation

All five cross-sectional studies in this group (Erpic et al., 2005; Hayes, 2017; Klein, 2017; Lodewyk, 2018; Lodewyk and Gao, 2018) investigated and detected relationships between students'

personality traits and several psychological determinants of PE participation. Erpic et al. (2005) examined the relationships between students' personality traits and their motivation in and attitudes toward PE. Students (11–18 years) scoring higher in conscientiousness show more positive attitudes toward PE. Students achieving higher scores in neuroticism and lower scores in agreeableness are less motivated in PE. Erpic et al. (2005) concluded that personality traits are related to students' motivation to learn and to perform in PE classes. Klein (2017) analyzed the relationship between general personality traits and physical self-concept. A high score in neuroticism was related to a lower assessment of physical attractiveness and athleticism. A weaker but positive correlation was shown between extraversion and athleticism. Hayes (2017) investigated the development of negative attitudes toward PE with the aid of a semi-structured interview and identified personality as one developmental factor. Due to the fact that the impact of students' personality traits on their enjoyment and engagement in PE is difficult to assess, Hayes (2017) suggested to consider personality-related predictors of PE enjoyment and engagement instead e.g., resilience, intrinsic motivation, and confidence. Lodewyk and Gao (2018) focused on the relationships between students' (14–15 years) personality traits and various outcomes such as enjoyment and effort in PE. By means of a proposed model, they showed that lower openness to experience and higher extraversion are related to a higher level of enjoyment. Further a higher level of enjoyment is related to a higher level of effort. In a second study, Lodewyk (2018) investigated the relationships between personality traits and anxiety, self-efficacy and intentions to exercise. This study showed that higher extraversion is associated with lower anxiety, higher self-efficacy, and a higher level of intentions to exercise in both males and females (14–15 years). Furthermore, higher openness to experience is associated with raised anxiety and lowered self-efficacy in females.

Influence of a School Sports Intervention on Personality

Five of the longitudinal studies analyzed personality differences between students participating in sports classes (receiving a higher amount of PE per week) and students participating in regular classes. Sports class students in Schubert's study (Schubert, 1973) received four additional PE lessons per week. The remaining four studies did not specify the amount of additional PE. In two of the studies, students of sports classes were professional junior athletes (Geron, 1981; Zupancic and Justin, 1998). These studies aimed at identifying potential personality differences between high performing student athletes and regular class students (t0 and t1) as well as at examining their personality development (t1). Zupancic and Justin (1998) showed that sports class students (16–17 years) were more natural, spontaneous and undemanding whereas regular class students were more propulsive and intellectual with a self-interested attitude in the initial measurement. In addition, sports class students were more practically oriented, conformist and more worried about everyday necessities, but able to stay calmer in crucial situations (autia-praxernia). Furthermore, sports class students were more controlled over emotions, showed more

discipline and a higher self-esteem (integration) (Zupancic and Justin, 1998). Geron (1981) showed initial personality differences in the dimension of reaction to frustration. Sports class students (11–12 years) scored higher in aggression, need persistence and obstacle dominance whereas regular class students were characterized as more conformist and ego defensive (Geron, 1981). Furthermore, Geron (1981) highlighted initial differences between sports class students and regular class students regarding their personality structure. Compared to regular class students, sports class students' motor skills and behavioral characteristics depended less on their socio-economic status. Comparing data of the first and second measurement point within the groups, both studies emphasized that sports class students' personality traits changed more or rather developed into contradictory directions compared to regular class students. In Zupancic and Justin's study (Zupancic and Justin, 1998), sports class students dropped on the deprivation and on the anxiety scale, whereas in the regular class group the mean score for deprivation increased over the 2 years. The initial differences between the two groups regarding the dimensions autia-praxernia and integration were no longer significant. In addition, sports class students increased their score in their ego strength, dominance, surgency as well as their score in sophistication. Regular class students obtained an insignificant increase in the same dimensions (Zupancic and Justin, 1998). Geron (1981) concluded that sports class students had changed in the dimensions locus of control and reaction to frustration after 1 year. A positive development was highlighted for sticking to rules, working within a framework, self-control, and perseverance. The authors did not report a change among the regular class students.

Three studies investigated sports class students who signed up for sports classes but were not professional athletes (Schubert, 1973; Gabler, 1976; Bachleitner-Hofmann, 1986). Sports class students (14–19 years) in Bachleitner-Hofmann's (1986) study scored higher in sports-specific achievement orientation which he declared as part of their personality. In two studies, the first data assessment took place after a 1 year participation in the sports class (Schubert, 1973; Gabler, 1976). Schubert (1973) did not detect personality differences between the intervention and the control group enrolled in regular classes. Gabler (1976) only found one significant difference in the dimension perfectionism. Thus, students in sports classes are less concerned and show less self-discipline regarding social norms than students in regular classes. Comparing the two groups at the second measurement point, in Gabler's study (Gabler, 1976) differences in perfectionism were still present. Changes between the first and second assessment were similar for both groups, except for dominance, which increased significantly in sports class students but not in regular class students. The other two studies also detected only few significant differences with e.g., sports class students being more inhibited and reserved (Bachleitner-Hofmann, 1986) and more satisfied in school (Schubert, 1973) than regular class students.

The nine longitudinal studies investigated the influence of a school sports intervention on students' personality, either through specific sports programs (different didactical alignment and structuring of PE lessons) or by participation in sports

classes (receiving a higher amount of PE per week). Four studies (Blanchard, 1946; Tillman, 1965; Krejci, 1993; Mijaica, 2017) focused on the influence of specific PE programs on students' personality or personality development. One study (Blanchard, 1946) did not consider a control group. Blanchard (1946) investigated boys and girls (grade 8–11) from PE classes and analyzed differences between the sexes. During the intervention, students experienced various sports (boys: football, basketball, gym classes; girls: basketball, volleyball, shuffleboard, soft ball, gym classes). This study detected the greatest gain over time in the dimensions ethical social qualities (truthful, fair) and qualities of efficiency (dependable, trustworthy). Overall, gains in girls were greater than in boys. Tillman (1965), Krejci (1993), and Mijaica (2017) examined the impact of a specific PE program (intervention group) on students' personality traits compared to regular PE (control group). Krejci (1993) and Mijaica (2017) detected changes in personality traits within the intervention group and in comparison to the control group. Students (9–13 years) in Krejci's (1993) intervention group experienced PE lessons that emphasized social learning by implementing special games or adapting PE teacher behavior. After the intervention, students in the intervention group scored higher in extraversion, especially boys and depicted more positive attitudes toward PE (Krejci, 1993). Students (15–17 years) in the intervention group—experiencing personality development supportive units characterized by an array of games, targeting at educational objectives, values and attitudes—showed a significantly greater development of targeted skills (e.g., leadership, problem-solving, fair-play), typifying personality development (Mijaica, 2017). Tillman (1965) followed a special study design with a first study phase in which male junior and senior high school students were classified into two groups based on their results in a physical fitness test (lower 15% vs. upper 15%). Between these groups he found significant personality differences (upper 15% more dominant, extraverted and socially oriented). In a second study phase he divided the lower 15 percent in an intervention and a control group, with the intervention group receiving 9 months strenuous physical fitness training instead of regular PE. After the intervention, the intervention group scored significantly higher in physical fitness but only in one (clerical interest) out of 28 personality dimensions.

DISCUSSION

The aim of the review was to give an overview of the literature dealing with students' personality in PE. The underlying personality understandings of the included studies are inconsistent in general. More recent studies though exhibit greater consistency. The research field investigates relationships between students' personality and (a) students' achievement in PE or between students' personality and (b) their psychological determinants of PE participation or (c) the influence of a school sports intervention on students' personality. Relationships regarding personality were found in all three groups—(a), (b), and (c). The following discussion is divided into two

parts: (1) Discussion of personality understandings and (2) Discussion of research questions and results—separately for (a), (b), and (c).

Discussion of Personality Understandings of the Included Studies

Among the included studies, three models are predominant to approximate the understanding of personality: The models of Cattell (1946), Eysenck (1981), McCrae and Costa (1987). The fact that all three models follow personality's trait approach (John et al., 2008), signalizes this approach as the leading paradigm in students' personality research in PE. Following the trait approach is very common in general personality research (Novikova, 2013) as well. Using trait psychological models in the educational context is less common—because of the focus on learning theories—but nonetheless existent in educational studies. O'Connor and Paunonen (2007) and Poropat (2009) in their studies for example made use of the trait approach in order to analyze relationships between students' personality traits and their academic performance.

Most of the elder studies (1946–1986) (Tillman, 1965; Wilson, 1969; Seitz and Bäumlner, 1972; Gabler, 1976; Kerr, 1978; Bachleitner-Hofmann, 1986) follow the 16PF model of Cattell (1946). Studies between 1978 and 1993 (Friedrich, 1978; Kerr, 1978; Williams and Eston, 1986; Krejci, 1993) primarily use Eysenck's (1981) model of personality. Using the five-factor model (McCrae and Costa, 1987) or its further development, e.g., the HEXACO-model (Honesty-humility, Emotionality, eXtraversion, Agreeableness, Conscientiousness, Openness to experience) (Lee and Ashton, 2004), is more frequent in recent studies (2005–2018) (Erpic et al., 2005; Guszowska and Rychta, 2007; Culjak and Mlačić, 2014; Klein, 2017; Lodewyk, 2018; Lodewyk and Gao, 2018). This is in line with the five-factor model's dominance in contemporary psychology in the last two decades (McCrae, 2001; Rammstedt et al., 2012). The abovementioned trajectory can also be retrieved in general personality research, beginning with Cattell's model, followed by Eysenck's model to McCrae and Costa's five-factor model of personality. Considering the included studies in our review, all three models—Cattell (1946), Eysenck (1981), McCrae and Costa (1987)—are deployed in each of the three groups with the five-factor model being primarily used in studies investigating students' personality in relation to their psychological determinants of PE participation. Although the three models are predominant in the reviewed studies, some of the researchers created or assorted and by this examined their own understanding of personality (Blanchard, 1946; Schubert, 1973; Dunkerbeck and Prenner, 1976; Geron, 1981; Willimczik, 1986; Westhoff, 1989; Hayes, 2017; Mijaica, 2017). This holds true even in recent studies where the trait approach had become dominant and widely accepted. Even if the trait approach is generally accepted, the results of our review signify that in addition to following the trait approach, other facets of personality are implied in PE research. Several researchers expand their underlying understanding of personality by examining other person-related facets such as self, interests

or achievement motivation (Gabler, 1976; Bachleitner-Hofmann, 1986; Willimczik, 1986; Erpic et al., 2005).

In our review, all studies following the trait approach use questionnaires to measure personality. Questionnaires therefore can be seen as methodology of choice when operationalizing personality within a clear underlying personality understanding. It is remarkable that even if the majority of the included studies follow the trait approach, 19 different inventories are used to measure personality. A possible reason might be that during the trait approach's development many different inventories were created and used in personality research relative to the respective research aim or sample under investigation. Comparing results of studies that apply similar inventories, is—due to the similar development and background of the models—possible, but requires a careful and often time-consuming comparative analysis. Three of the included studies (Dunkerbeck and Prenner, 1976; Hayes, 2017; Mijaica, 2017) collected qualitative data and applied their own understandings of personality instead of following an established personality approach. Therefore, these results are only content-wise comparable among themselves or to other studies in the review.

Discussion of Research Questions and Results of the Included Studies

Studies Investigating the Relationships Between Students' Personality Traits and Achievement

Nine out of ten studies found relationships between students' personality and their achievement in PE. Similar findings could also be retrieved in other settings, e.g., in competitive sports. In their review Allen and Laborde (2014) e.g., analyzed contemporary studies to find evidences for personality traits as precursors to athletic success in terms of sports performance. They concluded that athletic success in competition and participation in physical activity could be predicted by personality traits (Allen and Laborde, 2014). Studies investigating the relationships between students' personality traits and achievement in PE operationalized achievement differently. This fact had to be considered while discussing the studies' results.

Studies in our review revealed that extraversion is notably related to students' PE grade. The direction of the relationship is diverse though among the studies: Friedrich (1978) detects a positive relationship whereas Culjak and Mlačić (2014) indicate a negative relationship. This might be caused by the long period of time between the studies and the concomitant change in the education system as well as by the different cultures in which the two studies were conducted. Furthermore, there is no uniform picture regarding grading practice, which might explain why each study consults different criteria to compose students' PE grade. In order to find out whether extraversion has a positive or negative influence on students' PE grade, the grade's composition needs to be determined and other influencing factors (such as the teacher or the students' performance) must be monitored. Similar to Culjak and Mlačić's (2014) detected positive relationships between girls' emotional stability and their PE grade, Steca et al. (2018) showed that successful athletes obtain higher emotional stability than less successful athletes.

Additionally, conscientiousness is in the included studies of our review positively related to students' PE grade, which is in line with general educational research where conscientiousness is considered a crucial non-cognitive determinant of school grades (Dumfart and Neubauer, 2016).

Students' performance measured by fitness or ability tests is also positively related to extraversion - independent of the chosen methodology: Either when measured by Cattell's warmth and liveliness (Kerr, 1978), Cattell's self-reliance (Wilson, 1969), Eysenck's extraversion (Kerr, 1978) or as highlighted in Seitz and Bäuml's (1972) and Dunkerbeck and Prenner's (1976) findings. Similar findings are known from research considering leisure time physical activity or competitive sports (Shariati and Bakhtiari, 2011). Shariati and Bakhtiari (2011) indicate that athletes scored higher in extraversion than non-athletes. This is in line with research showing that more extraverted individuals are also more energetic (Terracciano et al., 2013) which is also supported by findings that extraverted individuals tend to exercise more in their free time and therefore probably perform better (Rhodes and Smith, 2006). These explanations emphasize selection processes in sports whereas the assumption that sports promote extraversion supports the impact of socialization processes. According to Gerlach (2008), it can be assumed that selection processes first pave the way for sports or physical activity, in which adolescents then experience a corresponding socialization.

Besides extraversion, Dunkerbeck and Prenner (1976) as well as Guszowska and Rychta (2007) report relationships between performance and conscientiousness by measuring conscientiousness directly or describing high performing students as hard-working and ambitious—characteristics that accompany conscientiousness (McCrae and Costa, 1987). In general educational research, out of all five personality dimensions conscientiousness is most strongly and consistently associated with academic performance. This dominant relationship cannot be found when considering PE specifically. A possible explanation might be that other subjects are more closely linked to academic performance than PE: The PE grade consists of e.g., motoric, social, cognitive components, whereas other subjects' grades depict usually a purely cognitive achievement (Roth et al., 2015). Kerr (1978) with his results on Cattell's dimensions emotional stability and apprehension shows that neuroticism is negatively associated with students' performance in PE. Guszowska and Rychta's (2007) results support this relationship for boys. Same is known for successful athletes showing higher emotional stability than less successful athletes or non-athletes (Steca et al., 2018). Accordingly, emotional stability benefits good performance in various contexts, not only in school PE.

In summary, relationships between students' achievement in PE and their personality are partly comparable to results of studies in leisure sports or general educational research. Considering extraversion and conscientiousness however, contradictory relationships became apparent. This fact underlines PE's above-mentioned specific demands regarding students' performance in comparison to other school subjects.

Studies Investigating the Relationships Between Students' Personality and Their Psychological Determinants of PE Participation

Due to the fact that the students' psychological determinants of PE participation differ among the analyzed studies, the highlighted relationships are barely comparable. Considering the different determinants—motivation (Erpic et al., 2005), self-concept (Klein, 2017), attitudes to PE (Hayes, 2017), enjoyment (Lodewyk and Gao, 2018), anxiety, self-efficacy, and intentions to exercise (Lodewyk, 2018)—findings from general educational research are similar: Students' personality—commonly measured by inventories based on personality's trait approach, similar to the studies in our review—is related to students' academic (intrinsic) motivation (Komarraju et al., 2009), self-concept (Pilarska, 2018), attitudes toward school (Heaven et al., 2002), enjoyment in life (Cheng and Furnham, 2003) as well as test-anxiety (Chamorro-Premuzic et al., 2008), self-efficacy (Caprara et al., 2011), and exercise intentions (Rhodes et al., 2003). The fact that the relationships detected in PE context coincide with relationships detected in general educational context underlines personality's important role in education.

In the analyzed studies extraversion is positively related to a positive physical self-concept (Klein, 2017), a high score in PE enjoyment (Lodewyk, 2018), high self-efficacy, positive intentions to exercise and low anxiety (Lodewyk, 2018). Similar relationships were found in the general educational context for extraversion and general self-esteem (Pilarska, 2018), life enjoyment (Cheng and Furnham, 2003), and high intentions to exercise (Rhodes et al., 2003). One explanation for the strong relationships in PE context shown in our review might be that PE demands social interaction and cooperation more than other subjects. Extraverted students feel more comfortable because they are more sociable and seek the company of others. This is in line with the aforementioned assumption that extraverted people are more physically active (Rhodes and Smith, 2006), perform better and therefore possibly feel more comfortable when exercising. However, the question that remains unanswered is whether these findings are actually PE specific or whether they are attributable to and domain-specific for sporting activities in general.

Regarding conscientiousness, the analyzed studies in our review only report relationships with positive attitudes toward PE whereas studies in other subjects emphasize conscientiousness as strong predictor of further inner facets such as motivation, self-efficacy, self-control and self-esteem (e.g., Heaven et al., 2002; Komarraju et al., 2009; Caprara et al., 2011; Pilarska, 2018). A possible explanation for the diminished relationship with conscientiousness might be the weak link between PE and academic performance. In other subjects, variables such as motivation or self-efficacy act as mediators within the strong relationship between conscientiousness and academic performance. Compared to other school subjects, academic performance's role is less significant in PE (Roth et al., 2015). This might be reason for the weaker relationship between conscientiousness and e.g., motivation, self-concept and enjoyment in PE.

In addition, our review shows interesting relationships between students' psychological determinants of PE participation and openness to experience which is negatively related to enjoyment (Lodewyk and Gao, 2018) and self-efficacy and positively related to anxiety (Lodewyk, 2018). Contradictory to the studies' results of our review (Ercic et al., 2005; Lodewyk, 2018; Lodewyk and Gao, 2018), openness to experience is in other contexts positively related to learning motivation (Hazrati-Viari et al., 2012; Wahyu Ariani, 2013), positively associated with enjoyment (Lindenberg, 2001), positively related to academic self-efficacy (Sánchez-Cardona et al., 2012), and unrelated to anxiety (Kotov et al., 2010).

These contrary results again underline the fact that PE compared to other subjects demands different student abilities. In PE the demanded abilities are less associated with intellectual performance e.g., PE teachers still often use teacher-centered instructional styles (Byra, 2006; Pfitzner, 2014), which go along with a clear and predetermined lesson structure. Further, PE often focusses on student performance (Rink, 2013) and therefore does not necessarily address openness to experience. People scoring high in openness to experience are described as aesthetic appreciating, inquisitive, creative and unconventional (Lee and Ashton, 2004). They enjoy to educate themselves in the intellectual, artistic and historical fields—closely associated with learning environments (Moshagen et al., 2014). This could explain why openness shows different relationships in other school contexts, e.g., students who are intellectually curious are more likely to enjoy learning (Tempelaar et al., 2007; Komaraju et al., 2009). PE in contradiction might be rather unpopular for students who score high in openness and are therefore more inclined toward learning situations. A new teaching style and alternative forms of teaching—e.g., experiential learning, genetic learning or generally student-centered, inductive and participatory teaching—might produce different results.

To summarize, the analyzed studies in our review describe several relationships between students' general personality traits and psychological determinants of PE participation. The findings in our review compared to findings in general educational research emphasize PE's unique role in the curriculum—being the only subject demanding and developing cognitive, social as well as physical competencies. PE challenges different needs whereby determinants such as physical self-worth or anxiety become important.

Studies Investigating the Influence of a School Sports Intervention on Students' Personality

Interesting and discussable are the differences between high performing student athletes in sports classes and regular class students e.g., regarding Cattell's dimensions autia-praxernia and integration (Geron, 1981; Zupancic and Justin, 1998), which are mainly associated with conscientiousness: High performing student athletes score higher in conscientiousness (Zupancic and Justin, 1998). Studies in other contexts detect similar relationships. Athletes or physically active people score higher in the dimension conscientiousness (Rhodes and Smith, 2006; Malinauskas et al., 2014). Results differ regarding the level of professionalism: Athletes competing at a higher level score

higher in conscientiousness than athletes competing at a lower level (Allen et al., 2011). Self-discipline and organization are prerequisites of a physically active lifestyle (Rhodes and Smith, 2006; Gallagher et al., 2013) encouraging conscientiousness, which possibly explains the abovementioned finding. However, the reviewed studies do not answer the question whether high performing athletes differ because of the sports they practice or due to the fact that they are generally different. The effect of selection processes as well as socialization processes seems to occur, as was shown in studies considering students' self-concept (Brettschneider, 2002; Stiller and Alfermann, 2005; Gerlach, 2008). The development process of high performing student athletes and regular class students also differs, which in turn may indicate that sports influences personality development. It remains unclear though, whether different processes of personality development are caused by sports class enrollment merely or probably more likely by performing competitive sports. The assumption that competitive sports may have a significant influence is supported by studies investigating the influence of competitive sports on adolescents' personality development (Conzelmann, 2001) as well as by the fact that studies in our review which examine sports classes but not high performing athletes reveal only minor differences in terms of personality development. Students interested in sports or practicing more sports do not seem to be different *per se* or differ considerably in their personality development. However, the personality of students in sports classes considering high performing student athletes develops differently.

This result is also detectable in studies examining special PE programs. It has to be mentioned though that observed changes are rare and only detected by individual studies. Regarding extraversion, Krejci (1993) found an increase of extraversion in the intervention group similar to the results in high performing student athletes (Zupancic and Justin, 1998). Similar results were also found for general physical activity, where extraversion was identified as determinant of physical activity (Rhodes and Smith, 2006). Reasons for the higher scores can be the necessity to cooperate with others or to assert oneself in competition—both typical situations in PE. Zupancic and Justin (1998) assumed that sports class students undergo more extensive life experiences through training and competing in various environments and thus extraversion is promoted. In addition, Costa et al. (2005) and Pocnet et al. (2013) declared biological and cognitive processes responsible for increased extraversion in physically active people. Physical activity can reduce e.g., disease burden, cognitive decline, and risk of depression associated with low scores in extraversion (Costa et al., 2005; Pocnet et al., 2013). Contrary to increased conscientiousness in high performing athletes (Zupancic and Justin, 1998), the other reviewed studies do not show an increase in conscientiousness. Gabler (1976) even highlighted a decrease in Cattell's (1956) dimensions perfectionism and rule-consciousness associated with the second-order factor self-control which complies with conscientiousness (Rossier et al., 2004). According to this, sports class students are less conscientious than regular class students. This insight again supports the assumption that competitive sports may be decisive for personality development, possibly

due to the concomitant participation in competitions and athletes' high motivation and willingness to perform. The missing relationship regarding non-high performing sports class students might be caused by PE's contextual peculiarity, as physical activity is part of the school curriculum and thus compulsory for students. Unlike professional athletes, students do not need to motivate themselves to be physically active and discipline themselves to be successful. This might be a reason why the analyzed intervention studies do not reveal an increased score for conscientiousness.

The results show that PE can only to a certain extent influence students' personality. This result is legitimate, as PE rather aims at supporting students' personality development than changing personalities. The assumption is supported by Tillman (1965) study in our review, where a 9-month fitness training program led to almost no changes in personality traits. In addition, the association seems to depend on many factors, including e.g., PE's curriculum or structuring. According to the studies in our review, which report hardly any changes (Tillman, 1965; Schubert, 1973), it can be assumed that PE's pedagogical alignment has a greater impact on personality development than physical activity itself. In order to test whether and to what extent PE can support personality development, it is necessary to implement a specifically designed intervention.

Relevance of Personality Research in PE

The findings of our review indicate that personality research can be used to teach PE in a student-centered way and by this support students' uptake of leisure time physical activity and the development of an active lifestyle—one of PE's two main goals ("educating to sports"). In order to achieve *education to sports*, PE teachers need to know students' motives to be physically active and teach PE in a varied, multi-perspective way. In view of the fact that certain general personality traits are also related to various psychological determinants of PE participation, knowing students' personality can help teachers to align PE lessons to students' needs. Our review e.g., reveals a negative relationship between neuroticism and motivation in PE (Erpic et al., 2005) and between neuroticism and PE grade (Culjak and Mlačić, 2014). Girls scoring low in neuroticism e.g., receive better grades in PE than girls scoring high in neuroticism. People scoring high in neuroticism generally are more fraught, anxious, worried, concerned, nervous, plaintive, and with self-doubt (Ostendorf and Angleitner, 2004). All these characteristics are rather unfavorable for enjoying a great number of typical PE situations where a determined task has to be fulfilled, often in new and insecurely experienced settings. Therefore, in order to engage emotionally instable students in PE e.g., the teacher has to provide tasks that satisfy the students' personality traits. The PE teacher e.g., can apply open forms of learning where students can participate in lesson decisions and freely choose from a variety of learning materials and activities. By this, the students try themselves out in activities they feel comfortable with doing and/or control their own working pace even in less secure situations avoiding the emergence of anxiety and insecurity. Further, reflecting on what has been learned, taking into account one's own emotional state, can contribute to making an initially

uncomfortable task profitable and fearless in the future. The assessment of one's own level of proficiency and the subsequent personal objectives allow for an individual orientation and encourage the learner to achieve realistic and satisfactory goals. This orientation promotes the students' autonomy and competence experience and by this contributes to the satisfaction of their basic needs, which can increase their motivation (Ryan and Deci, 2017). Furthermore, attention to individual learning progress can reduce students' experience of stress and thus anxiety. This is in line with the recommendation to apply self-referenced grading in addition to criterion-referenced grading when assessing students' performance in PE (Jaitner, 2013). Considering students' personality already in lesson preparation is in line with widespread planning models for PE. Döhring and Gissel (2016) e.g., attribute students' prerequisites a crucial role in the teacher's planning of PE lessons. Students' needs and personalities have to be considered in order to carry out PE lessons as smooth and individual as possible and by this ideally reach all students.

With regard to PE's second main goal ("educating through sports"), findings of our review indicate that PE contributes to students' personality development. Several of the analyzed studies (Blanchard, 1946; Geron, 1981; Mijaica, 2017) concluded that personality traits are affected and primarily desirable traits are stimulated by participating in PE classes. However, the interventions' effects are rather small, which seems to be evident considering that PE represents only a fraction of children's everyday lives and considering that non-cognitive personality traits—examined in the analyzed studies—are relatively stable. Even in the studies with younger participants, where a less stable personality is assumed (Neyer and Asendorpf, 2018), only limited changes can be observed. Considering students' age in general, no discussable trends can be depicted in the included studies. This might be due to the studies' diverse methodologies and research aims though. Examining personality facets with a higher variability, e.g., facets of the self (Shavelson et al., 1976; Gore and Cross, 2011), is probably more suitable in intervention studies. These studies though were not included in our review, as they did not explicitly claim to assess personality. Variable personality facets, e.g., hierarchal lower-order self-concept facets should be considered in didactic concepts specifically addressing students' personality development. As a result, PE must follow targeted and pedagogically oriented concepts in order to develop students' personality and by this achieve its main goals.

CONCLUSION

Our scoping review showed that research on the students' personality in PE exists, but the studies' underlying personality understandings, research questions and results are diverse. Due to the fact that the term personality was approached very broadly and we explicitly searched for this term, only studies that actually contain the term were included. Studies investigating single facets of personality without claiming to assess personality were therefore excluded. Literature reviews including several terms

related to personality could provide information about further interesting relationships. Moreover, it has to be mentioned that due to feasibility reasons only German and English studies were included. Including studies published in further languages, could possibly increase the final number of included studies and provide insights into further international findings.

In addition to the aforementioned short section on ideas for further research resulting from our review's limitations, the following section will make use of the review's results and associated strengths to provide concrete practical ideas and further research opportunities. In order to explicitly highlight teaching opportunities and support PE teachers, ideas to make use of the students' personality, explicitly address students' personality or determine the specific influence of PE on students' personality development, further studies are needed:

- 1) Even though only studies proclaiming to assess personality were included, promising relationships between individual personality facets (e.g., interests) and learning outcomes (e.g., performance in PE) became visible when the examined facets were part of the studies' personality understanding. Therefore, a closer look at the relationships between further personality facets (e.g., self-concept, motives) and other desirable outcomes of PE (e.g., motivation, enjoyment, and achievement) would be desirable. Due to the fact, that 16 of the included 24 studies are more than 20 years old and therefore older than the existence of the nowadays widely accepted five-factor model, they display a rather inconsistent understanding of personality. For future research, high-quality studies following a clearly defined understanding of personality and applying reliable inventories should be carried out. This allows to compare results and by this receive empirical evidence.
- 2) It would also be interesting, to further examine the relationships between students' personality and their motives to be physically active. This knowledge allows to provide specific recommendations for PE in general and PE teaching specifically. Knowing e.g., if extraverted students are more competition- or fitness-oriented can help PE teachers to plan and structure their lessons but also to adapt their behavior when teaching in order to reach the students' diverse motives to be physically active and by this motivate them for PE in the short term and ideally for a physically active lifestyle in the long term.
- 3) However, it is not realistic that a PE teacher knows and considers the personality or the motives of each individual student. Further research is therefore needed to

identify compositions of personality traits that are particularly important for PE enjoyment and achievement. A suitable way to further reduce complexity could be to identify typical personality patterns. Considering specific groups or types of students in PE rather than considering each individual may therefore facilitate PE planning and teaching. Müller et al. (2013) and Burrmann (2015) have already implemented similar approaches. The authors identified typical sub-groups that differ in their self-concept or in their perception of PE, respectively. Burrmann (2015) concluded that further research regarding students' personality types could be beneficial in order to realize student-centered teaching and by this promote PE's two main goals—"educating to sports" and "educating through sports."

- 4) Besides intensifying research that addresses students' personality by explicit and adapted teaching, interventions aiming at students' personality development raise hope for future research. It seems to be promising to target interventions at specific and individual personality facets (e.g., anxiety, self-confidence). The more the interventions' content corresponds to the examined facets, the more likely the intervention influences the facets under examination and by this the students' personality (Conzelmann et al., 2011). Teaching methods explicitly promoting students' personal development such as problem-based learning or experiential learning already exist and might be worth considering and utilizing in such targeted interventions.

By providing the abovementioned practical opportunities but also further research ideas for PE, we aimed at deepening and specifying the results of our review in order to increase the chances of achieving PE's main goals in the long term.

AUTHOR CONTRIBUTIONS

AK, MS, FM, and SS conceived and designed the study. AK and MS performed the literature search and study selection process. AK, MS, and SS performed the final analysis process. AK wrote the paper with substantial contributions from MS as well as SS and FM. All authors approved the final version of the manuscript.

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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.

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4.2 Article 2

Authors: Kirch, A., Schnitzius, M., Blaschke, S., Spengler, S., and Mess, F.

Title: Knowing Students' Characteristics: Opportunities to adapt Physical Education Teaching.

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Abstract:

PE aims to convey the joy of exercise and by this educate students to lifelong physical activeness. Student motivation in PE decreases during the school career. This study therefore comprehensively analyses student characteristics determining motivation in PE: *general personality traits, physical self-concept, achievement motive, motives to be physically active* and *sports interest*. This contribution aims to describe students' prerequisites in the PE context by using an aggregated assessment of the abovementioned general plus sports-specific characteristics and to detect gender, class and school type differences. In total, 1,740 German secondary school students (58.1% female, $M = 14.39$ years) participate in a cross-sectional questionnaire survey. Descriptive analyses and between subjects MANOVAs followed by univariate ANOVAs with pairwise multiple comparison tests are applied. Gender explains the largest proportion of variance across all characteristics. Regarding individual dimensions, genders differed on 12, grades on four and school types on 11 out of 19 dimensions. PE teachers must adapt teaching to different gender dispositions. In general, group differences ascribe special meaning to student perception and teaching behavior. Findings are discussed in terms of their contribution to the research area and their implementation in teaching practice as well as in PE teacher education or professional training, e.g., aligned teaching methods, arranged learning atmospheres or adjusted content design of PE lessons.

Contribution:

Alina Kirch is the first and corresponding author of Article 2. Alina Kirch together with Melina Schnitzius, Sarah Spengler, and Filip Mess conceived and designed the study. Alina Kirch together with Simon Blaschke and Melina Schnitzius analyzed the data. Alina Kirch with the support of Melina Schnitzius interpreted the study's findings. Alina Kirch wrote most of the manuscript. All authors contributed to the manuscript's revision, read, and approved the submitted version.



Knowing Students' Characteristics: Opportunities to Adapt Physical Education Teaching

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Physical Education (PE) aims to convey the joy of exercise and by this educate students to lifelong physical activeness. Student motivation in PE decreases during the school career. This study therefore comprehensively analyzes student characteristics determining motivation in PE: *General Personality Traits*, *Physical Self-Concept*, *Achievement Motive*, *Motives to be physically active*, and *Sports Interest*. This contribution aims to describe students' prerequisites in the PE context by using an aggregated assessment of the abovementioned general plus sport specific characteristics and to detect gender, class, and school type differences. In total, 1,740 German secondary school students (58.1% female, $M = 14.39$ years) participate in a cross-sectional questionnaire survey. Descriptive analyses and between subjects MANOVAs followed by univariate ANOVAs with pairwise multiple comparison tests are applied. Gender explains the largest proportion of variance across all characteristics. Regarding individual dimensions, genders differed on 12, grades on two and school types on 11 out of 19 dimensions. PE teachers must adapt teaching to different gender dispositions. In general, group differences ascribe special meaning to student perception and teaching behavior. Findings are discussed in terms of their contribution to the research area and their implementation in teaching practice as well as in PE teacher education or professional training, e.g., aligned teaching methods, arranged learning atmospheres, or adjusted content design of PE lessons.

Keywords: student characteristics, secondary school, physical education, personality, physical self concept, motivation, interest, motives

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INTRODUCTION

Physical Education (PE) aims to educate students to lifelong engagement in physical activities and to live a healthy lifestyle. Compulsory school PE reaches all school-aged children and promotes physical activity by offering possibilities to exploit the *movement, games and sports* culture, and at the same time personally develop into a competent, literate, and enthusiastic sports person through experiencing *movement, games, and sports* (Siedentop, 2002, 2009; Kurz, 2008; Farias and Hastie, 2016). PE's aim in general and PE's lesson content in particular therefore entail lifelong personal as well as societal relevance.

PE teachers strive to develop and maintain students' enthusiasm for the subject PE but also for physical activity in general, ideally resulting in a state of intrinsic motivation (Rheinberg and Vollmeyer, 2019). This is important as research has shown that physical activity in general (Dumith et al., 2011; Dishman et al., 2018) and motivation for sports (Knisel et al., 2009) decrease from childhood to adolescence—being especially low in teenage years. Reasons provided relate to sexual

maturity (Dumith et al., 2011) or to a change and shift of interests away from physical activity in the course of adolescence (Marques and Gaspar de Matos, 2014). Consequently, only 26% of German adolescents (Finger et al., 2018) fulfill the World Health Organization's (2018) recommendations of 60 min daily moderate- to vigorous-intensity physical activity. Further, the World Health Organization (2020) reported an increasing amount of overweight and obese children. Considering these facts, PE's role of transferring knowledge about and enthusiasm for an active and healthy lifestyle becomes more and more important. The Sport Education Model (Siedentop et al., 2020) is a commonly followed approach aiming to provide students with authentic experiences and by this, gain motivation within PE. By taking on roles within learning experiences, students develop personally and internalize the idea of sport.

PE has to highlight different physical activity capabilities and allow students to experience a multifaceted *movement, games, and sports* culture in order to find their individually preferred activity. Students make use of and experience PE's movement offers differently though. PE lessons therefore require an adequate design, which addresses each student appropriately (Powell and Kusuma-Powell, 2011). It is therefore essential to investigate student characteristics in the PE context.

Scientifically examining student characteristics for targeted and sustainable learning processes in school has been prevalent in general educational research (e.g., Drachler and Kirschner, 2011; Powell and Kusuma-Powell, 2011). Researchers have typically focused on single characteristics (e.g., Personality Traits or Self-Concept) and examined their relationship to, e.g., students' motivation to learn. Also in the PE context, researchers have examined the relationship between single characteristics and student motivation. In order to meet PE's specific peculiarities and requirements with its accompanied inherent experiences, an examination needs to consider not only general but also sport specific characteristics (Beni et al., 2017). Our study therefore addresses the following five characteristics:

- (I) *General Personality Traits* as stable individual differences over time and situation, which explain thoughts, behavior, and emotions (Hogan et al., 1996). The five-factor model describes personality in five dimensions (*Conscientiousness, Openness, Extraversion, Agreeableness, Neuroticism*) and has proven its empirical validity in personality research (Rammstedt et al., 2018). Komarraju and Karau (2005) as well as Ljubin-Golub et al. (2019), e.g., have highlighted the relationship between students' non-cognitive personality traits and their motivation to learn. Relationships between students' personality traits and their motivation to learn, and perform in the lesson have also been shown for PE specifically.
- (II) *Physical Self-Concept* as sport specific characteristic is an important mediator for physical activity (Jackson-Kersey and Spray, 2013) and motor abilities (Jekauc et al., 2017). Additionally, students' *Physical Self-Concept* is positively related to motivation in PE (Murcia, 2012). The overarching facets of the *Physical Self-Concept* (Braun et al., 2018) can be categorized as *Sports Competence, Physical Self-Esteem*, and *Global Self-Worth*.
- (III) *Achievement Motive*, classified into *Hope for Success* and *Fear of Failure*, has intensively been researched in motivational psychology (Rheinberg, 2006) but also offers links for school-based learning (Urhahne, 2008). Students' *Achievement Motive*, e.g., correlates with their learning performance (Tanaka and Yamauchi, 2000) and learning behavior (Schmalt, 2003). With regard to PE, success-oriented students are more willing to exert themselves and reveal greater subject interest than students with a tendency to avoid failure (Streso, 2015).
- (IV) *Motives to be physically active* are considered as triggers for physical activity in general (Lehnert et al., 2011). This knowledge influences the design of sport offerings by e.g., tailoring them to the target group (Lehnert et al., 2011), and thus increases the offerings' fit to individual preferences, outside school but also in school PE. Following Gut et al.'s (2019), Kueh et al.'s (2017), or Lehnert et al.'s (2011) understanding, *Motives to be physically active* represent a central benchmark for specifically designing and conducting PE's lesson content. Gut et al. (2019) ascertain the following *Motives to be physically active: Contact, Competition/Performance, Distraction/Catharsis, Body/Appearance, Health, Fitness, Aesthetics, and Risk/Challenge*. In German PE, *Motives to be physically active* have found their way into the curriculum as pedagogical perspectives (Neumann and Balz, 2004) and by this, decisively influence teaching behavior.
- (V) Interest is also considered decisive for the development of intrinsic motivation in learning situations (Krapp, 2010), as well as in PE in particular aiming to motivate students sustainably. Adolescence is an important period of life's personal interest development (Hofer, 2010; Hoff et al., 2018). Otundo and Garn (2019) highlighted that situational interest as well as need support provided by the PE teacher predicted students' personal interest. If students' learning and performance in PE is driven by their personal *Sports Interest*, learning processes are considered to be more self-determined, voluntarily more frequent, and thorough as well as more sustainable (Gogoll, 2010).

As highlighted, the abovementioned five characteristics—general *Personality Traits* and sport-specific *Physical Self-Concept, Achievement Motive, Motives to be physically active* as well as *Sports Interest*—have already been individually examined. A collective examination is missing but necessary in order to describe students' holistically and derive targeted teaching strategies, which trigger student's motivation in PE. Furthermore, relationships between individual characteristics can be examined.

Further, most of the abovementioned studies only examine small samples restricted to a certain study group, e.g., one age group or school type. A large-scale study covering different grades, school types, and geographical regions is missing in Germany as well as in international research. Such a study will provide (a) a detailed picture by describing students profoundly, and (b) a basis for classing the results with existing research.

Due to different student dispositions, it is essential to compare groups of students, e.g., different genders, grades, and school types. This allows identifying differences, which can become

significant in practice and help PE teachers to address students appropriately. Differences in students' characteristics in the PE context between genders, grades, or school types have not been analyzed so far. This knowledge though would affect PE teachers in schools and offer possibilities for PE teacher education at university, e.g., target group-oriented teaching from the outset.

In order to draw reliable and valid conclusions regarding a profound knowledge of students in PE, student characteristics—general *Personality Traits* and sport specific *Physical Self-Concept*, *Achievement Motive*, *Motives to be physically active* as well as *Sports Interest*—have to be examined collectively, region-wide across different grades and school types. It is hypothesized that different student groups can be distinctly described by their manifestations in the characteristics. Therefore, this paper aims to comprehensively, in a large Germany-wide sample (a) describe students in the PE context by general and sport specific characteristics triggering motivation, and (b) find out whether characteristics differ with regard to gender, grade, or school type.

MATERIALS AND METHODS

Study Design

The student survey on which this article bases was part of the study *SuM PLuS*. *SuM PLuS* was a Germany-wide study carried out in cooperation with DSLV. It comprised a cross-sectional quantitative questionnaire survey of PE teachers and their students. Participating PE teachers were recruited via DSLV and partners, personal contacts, social media, local press, and educational institutions. After participation, PE teachers could additionally register for the student survey of the study. PE teachers received the student survey material including a standardized instruction. Students took 15 to 20 min to complete the questionnaire in class—online (17.3%) or via paper-pencil (82.7%). Data collection took place from April to December 2018. In total, 40.8% of the questionnaires sent out in paper form were returned. The responsible ministries or school authorities of each participating federal state examined ethical and data protection regulations and approved the study. In addition, schools' administration and a respective legal guardian provided their written consent. Furthermore, the study followed the Declaration of Helsinki. Participation was voluntary and participants could withdraw their consent at any time during the examination.

Sample

In total, 1,740 secondary school students (58.1% female, $M = 14.39 \pm 1.44$ years) from 12 German federal states took part in the study. School types were categorized as follows: (1) lower secondary school ($n = 830$), where students finish with an intermediate school-leaving certificate; (2) higher secondary school ($n = 753$), where students finish with a higher education entrance qualification; (3) comprehensive secondary school (n

$= 500$), combining different educational paths, where students finish with either of the two aforementioned qualifications (Maaz et al., 2008).

Measurements

Students' characteristics were measured via the following five instruments: *Personality Traits* via BFI-K KJ (Kupper et al., 2019), *Physical Self-Concept* via (Braun et al., 2018), *Achievement Motive* via AMS-Sport (Herrmann et al., 2014) derived from Elbe et al. (2005), *Motives to be physically active* via BMZI-JFEA (Gut et al., 2019), and *Sports Interest* via *Sports Interest* (Gogoll, 2010) derived from Kunter et al. (2002). All instruments were validated in samples similar to *SuM PLuS* sample and obtained satisfactory test quality criteria (Table 1). Besides student characteristics, the questionnaire included sociodemographic data such as gender, grade, and school type.

Statistical Analyses

In the data screening process, accuracy, missing values, and outliers were checked. In descriptive analyses, missing values were excluded case wise. In inferential analyses, 337 participants were excluded list wise due to missing values (Graham, 2009). A total of 1,376 participants remained in the final sample meeting the assumptions for linearity, equality of covariance matrices and absence of multicollinearity (Pituch and Stevens, 2016). Between subjects multivariate analysis of variances (MANOVA) was conducted with independent variables gender (female, male), grade (7, 8, 9, 10), and school type (lower secondary school, higher secondary school, comprehensive secondary school) predicting dependent variables *Personality Traits* (I), *Physical Self Concept* (II), *Achievement Motive* (III), and *Motives to be physically active* (IV). One-dimensional *Sports Interest* (V) was considered in univariate analyses of variance (ANOVA). If MANOVA showed significant results, univariate ANOVAs and, in case of significance, follow-up post hoc tests (Huberty and Morris, 1989) were conducted.

Univariate ANOVAs were used to examine individual dependent variable contributions of the scales' dimensions: (I) *Conscientiousness*, *Openness*, *Extraversion*, *Agreeableness*, *Neuroticism*, (II) *Sports Competence*, *Physical Self-Esteem*, *Global Physical Self-Concept*, (III) *Hope for Success*, *Fear of Failure*, (IV) *Contact*, *Competition/Performance*, *Distraction/Catharsis*, *Body/Appearance*, *Health*, *Fitness*, *Aesthetics*, *Risk/Challenge*, and (V) *Sports Interest*. Due to unbalanced data, sums of squares were calculated adaptively following Fox's (2016) recommendations for ANOVA modeling. Last, p -adjusted Dunnett–Tukey–Kramer (DTK) (Li, 2012). Pairwise Multiple Comparison Tests were applied in order to show differences between independent variables. RStudio was used (Version 1.2.5033, RStudio Inc., Boston, USA) for data analysis.

RESULTS

Overview of Student Characteristics

The following section describes students by their manifestations in the five chosen characteristics. Table 2 shows the sample's score

Abbreviations: SuM PLuS, Sportunterricht und Motivation: Personbezogene Faktoren von LehrerInnen und SchülerInnen als Determinanten der Schülermotivation/Physical Education and Motivation: Teachers' and Students' Person-Related Factors as Determinants of Student Motivation; DSLV, Deutscher Sportlehrerverband/German PE teacher association.

TABLE 1 | Applied scales to measure students' characteristics in physical education (PE).

Construct	Inventory	References	Subscales (items per scale/subscale)	Cronbachs α	Introductory question "Sample Item" rating level
(I) Personality traits	BFI-K KJ (Short version of the big five inventory for children and adolescents)	Kupper et al., 2019	Conscientiousness (6) Openness (6) Extraversion (3) Agreeableness (6) Neuroticism (5)	0.69 0.76 0.90 0.63 0.71	How do you assess yourself and your behavior in everyday life? "I get nervous easily" 5 point scale from 1 = strongly disagree to 5 = strongly agree
(II) Physical Self-Concept	PSDQ-S (Short version of the physical self-description questionnaire)	Braun et al., 2018	Sports competence (3) Physical self-esteem (3) Global physical self-concept (5)	0.87 0.94 0.80	How do you rate yourself and your abilities in general as well as in sports? "Most things I do, I do well" 6 point scale from 1 = strongly disagree to 6 = strongly agree
(III) Achievement Motive	AMS-Sport (achievement motive scale-sport)	Herrmann et al. (2014) derived from Elbe et al. (2005)	Hope for success (5) Fear of failure (4)	0.91 0.87	How do you feel when you are faced with a task in sports? "I enjoy athletic tasks in Physical Education that are slightly difficult for me" 4 point scale from 1 = not right to 4 = totally right
(IV) Motives to be physically active	BMZI-JFEA (the bernese motive and goal inventory for adolescence and young adulthood)	Gut et al., 2019	Contact (5) Competition/performance (3) Distraction/catharsis (4) Body/appearance (3) Health (3) Fitness (3) Aesthetics (2) Risk/challenge (3)	0.87 0.68 0.84 0.85 0.77 0.81 0.67 0.71	Why do you engage in sports in your free time or why would you engage in sports? "To do something in a group" 5 point scale from 1 = strongly disagree to 5 = strongly agree
(V) Sports interest	Sports interest	Gogoll (2010) derived from Kunter et al. (2002)	Sports Interest (3)	0.81	What do you think about sports? "Sport is important to me" 4 point scale from 1 = strongly disagree to 4 = strongly agree

(*M*, *SD*) in total and differentiated by gender, grade as well as school type.

Hope for Success, Competition/Performance, Risk/Challenge, and Sports Interest.

Gender, Grade, and School Type Differences

This section reports differences between students' gender, grade, and school type. **Table 3** shows significant differences ($p < 0.05$) in the respective variables, with effect sizes (η^2) and *post hoc* results between different groups (CI). MANOVA analyses revealed small to large effects (Cohen, 1988) whereas ANOVAs only showed significant differences with small effects.

Gender Differences

According to **Table 3**, statistically significant main effects of gender occurred in *Personality Traits* [$F_{(5, 1,348)} = 25.05, p < 0.001, \eta^2 = 0.09$], *Physical Self-Concept* [$F_{(3, 1,350)} = 22.69, p < 0.001, \eta^2 = 0.05$], *Achievement Motive* [$F_{(2, 1,351)} = 21.66, p < 0.001, \eta^2 = 0.03$], and *Motives to be physically active* [$F_{(8, 1,345)} = 28.17, p < 0.001, \eta^2 = 0.14$]. The multivariate η^2 implied that 3–14% of multivariate variance of the dependent variables was associated with gender. Univariate analyses yielded significant differences between boys and girls in 12 dimensions. Girls scored significantly higher on *Conscientiousness, Openness, Neuroticism, and Fear of Failure* whereas boys scored higher on *Extraversion, Sports Competence, Physical Self-Esteem, Global Self-Worth,*

Grade Differences

Statistically significant main effects of grade were found on *Physical Self-Concept* [$F_{(9, 4,056)} = 2.98, p = 0.002, \eta^2 = 0.02$] and *Motives to be physically active* [$F_{(24, 4,041)} = 4.04, p < 0.001, \eta^2 = 0.07$]. The multivariate η^2 implied that two to seven percent of multivariate variance of the dependent variables was associated with grade. Univariate analyses yielded significant differences between grades in *Global Self-Worth* and *Distraction/Catharsis*. Only the DTK-Test for *Distraction/Catharsis* revealed significant group differences and showed that older students (grades 9 and 10) scored higher than younger students (grades 7 and 8).

School Type Differences

Statistically significant main effects of school type were found in *Personality Traits* [$F_{(10, 2,698)} = 5.23, p = 0.001, \eta^2 = 0.04$], *Physical Self-Concept* [$F_{(6, 2,702)} = 4.57, p < 0.001, \eta^2 = 0.02$], *Achievement Motive* [$F_{(4, 2,704)} = 3.72, p = 0.005, \eta^2 = 0.01$], and *Motives to be physically active* [$F_{(16, 2,692)} = 5.28, p < 0.001, \eta^2 = 0.06$]. The multivariate η^2 implied that one to six percent of multivariate variance of the dependent variables was associated with school type. Univariate analyses yielded significant differences between school types on *Openness*, where higher secondary school students scored higher than lower

TABLE 2 | Overview of student characteristics—total, gender, grade, and school type.

Variable	Total	Gender		Grade				School Type		
		Female	Male	7	8	9	10	Lower	Higher	Comprehensive
	<i>N</i> = 1,740	<i>n</i> = 1,011	<i>n</i> = 701	<i>n</i> = 424	<i>n</i> = 430	<i>n</i> = 486	<i>n</i> = 400	<i>n</i> = 747	<i>n</i> = 581	<i>n</i> = 375
	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>
(I) Personality Traits										
Conscientiousness	3.52 ± 0.77	3.57 ± 0.75	3.45 ± 0.81	3.54 ± 0.79	3.47 ± 0.82	3.53 ± 0.76	3.53 ± 0.73	3.48 ± 0.79	3.58 ± 0.74	3.50 ± 0.78
Openness	3.46 ± 0.63	3.49 ± 0.62	3.41 ± 0.65	3.36 ± 0.65	3.42 ± 0.66	3.49 ± 0.63	3.57 ± 0.57	3.38 ± 0.66	3.57 ± 0.59	3.44 ± 0.63
Extraversion	3.40 ± 1.33	3.31 ± 1.36	3.53 ± 1.29	3.37 ± 1.36	3.50 ± 1.30	3.41 ± 1.33	3.29 ± 1.35	3.36 ± 1.37	3.52 ± 1.27	3.30 ± 1.36
Agreeableness	3.73 ± 0.67	3.72 ± 0.70	3.73 ± 0.64	3.75 ± 0.72	3.73 ± 0.68	3.74 ± 0.63	3.69 ± 0.67	3.62 ± 0.72	3.85 ± 0.61	3.75 ± 0.63
Neuroticism	2.71 ± 0.82	2.89 ± 0.81	2.46 ± 0.77	2.66 ± 0.82	2.71 ± 0.80	2.70 ± 0.82	2.80 ± 0.84	2.80 ± 0.83	2.58 ± 0.80	2.75 ± 0.81
(II) Physical Self-Concept										
Sports competence	4.50 ± 1.08	4.32 ± 1.06	4.75 ± 1.06	4.46 ± 1.15	4.55 ± 1.07	4.53 ± 1.04	4.43 ± 1.10	4.35 ± 1.10	4.66 ± 1.02	4.54 ± 1.11
Physical self-esteem	4.28 ± 1.38	4.06 ± 1.45	4.61 ± 1.20	4.38 ± 1.41	4.24 ± 1.44	4.32 ± 1.31	4.20 ± 1.36	4.09 ± 1.44	4.53 ± 1.27	4.29 ± 1.35
Global self-worth	4.59 ± 0.89	4.50 ± 0.92	4.74 ± 0.82	4.51 ± 0.96	4.53 ± 0.92	4.65 ± 0.83	4.66 ± 0.84	4.45 ± 0.90	4.75 ± 0.86	4.65 ± 0.85
(III) Achievement Motive										
Hope for success	2.75 ± 0.80	2.63 ± 0.81	2.91 ± 0.75	2.77 ± 0.83	2.74 ± 0.79	2.74 ± 0.78	2.73 ± 0.79	2.63 ± 0.84	2.87 ± 0.74	2.79 ± 0.75
Fear of failure	1.89 ± 0.78	1.99 ± 0.80	1.75 ± 0.73	1.87 ± 0.81	1.94 ± 0.79	1.86 ± 0.75	1.91 ± 0.78	1.95 ± 0.81	1.81 ± 0.76	1.90 ± 0.75
(IV) Motives to be physically active										
Contact	2.87 ± 1.24	2.71 ± 1.24	3.10 ± 1.21	3.10 ± 1.32	2.83 ± 1.17	2.81 ± 1.27	2.79 ± 1.19	2.61 ± 1.26	3.14 ± 1.15	2.97 ± 1.25
Competition/ performance	2.83 ± 1.14	2.54 ± 1.04	3.25 ± 1.15	2.80 ± 1.16	2.83 ± 1.08	2.79 ± 1.15	2.91 ± 1.18	2.67 ± 1.16	3.03 ± 1.10	2.85 ± 1.12
Distraction/ catharsis	2.99 ± 1.23	3.02 ± 1.25	2.95 ± 1.21	2.72 ± 1.23	2.84 ± 1.20	3.09 ± 1.27	3.27 ± 1.13	2.84 ± 1.27	3.10 ± 1.16	3.11 ± 1.23
Body/ appearance	2.99 ± 1.36	3.16 ± 1.38	2.75 ± 1.28	2.92 ± 1.39	2.95 ± 1.40	3.00 ± 1.34	3.10 ± 1.29	3.17 ± 1.39	2.80 ± 1.29	2.94 ± 1.34
Health	3.12 ± 1.18	3.10 ± 1.19	3.14 ± 1.18	3.00 ± 1.26	3.06 ± 1.19	3.13 ± 1.20	3.27 ± 1.06	3.14 ± 1.23	3.04 ± 1.14	3.19 ± 1.16
Fitness	3.96 ± 1.01	3.94 ± 1.02	4.00 ± 1.00	3.80 ± 1.12	4.02 ± 0.97	3.97 ± 1.05	4.05 ± 0.87	3.89 ± 1.08	3.98 ± 0.95	4.07 ± 0.96
Aesthetics	2.84 ± 1.23	2.80 ± 1.23	2.89 ± 1.24	2.95 ± 1.27	2.84 ± 1.24	2.77 ± 1.26	2.82 ± 1.16	2.73 ± 1.26	2.98 ± 1.18	2.84 ± 1.24
Risk/ challenge	2.73 ± 1.13	2.53 ± 1.09	3.01 ± 1.12	2.79 ± 1.20	2.68 ± 1.06	2.76 ± 1.18	2.68 ± 1.05	2.66 ± 1.20	2.74 ± 1.04	2.84 ± 1.09
(V) Sports Interest										
Sports interest	3.10 ± 0.76	3.01 ± 0.77	3.23 ± 0.72	3.04 ± 0.79	3.11 ± 0.72	3.11 ± 0.74	3.12 ± 0.78	2.93 ± 0.78	3.27 ± 0.69	3.16 ± 0.73

Number of participants [in total (*N*); in different groups (*n*); means (*M*) and standard deviations (*SD*).

secondary school and comprehensive school students. Further, differences occurred for *Agreeableness*, *Sports Competence*, *Global Self-Worth*, *Hope for Success*, *Contact*, and *Sports Interest* where higher secondary school and comprehensive school students scored higher than lower secondary school students. Further, higher secondary school students scored higher on *Openness* and *Physical Self-Esteem*, and lower on *Neuroticism* than comprehensive school and lower secondary school students.

Interaction Effects

Interaction effects were calculated to check if groups influenced each other. An interaction effect of gender and school type [$F_{(16, 2,692)} = 2.49, p = 0.001, \eta^2 = 0.03$] as well as of grade and school type [$F_{(48, 8,100)} = 1.49, p = 0.016, \eta^2 = 0.05$] was found on *Motives to be physically active*. Univariate analyses showed no further interaction of individual *Motives to be physically active*. Therefore, the interaction effect can be ignored and subsequently no further post hoc tests exploring the interaction were undertaken.

DISCUSSION

The study's first aim was to describe students in the PE context by an aggregated examination of general plus sport specific characteristics triggering motivation in PE. Results are compared with existing research considering individual characteristics, in order to classify and interpret the findings. The study's second aim was to find out whether students characteristics differ with regard to gender, grade, or school type. In order to make use of the abovementioned classification as well as detected group differences, possible implications for PE teaching practice as well as professional training and teacher education are highlighted.

Descriptive Comparisons

The study's results—values as well as order of individual dimensions—considering *Personality Traits* are comparable with national studies using the same scale (Rammstedt and John, 2005; Kupper et al., 2019). *Agreeableness* and *Conscientiousness* values are higher in our sample in comparison to students

TABLE 3 | Significant differences in student characteristics between students' gender, grade, and school type.

Variable	Gender			Grade										School Type ^a						
	P	F	η^2	m/f		p	F	η^2	7/8	7/9	7/10	8/9	8/10	9/10	P	F	η^2	HSS/LSS	CSS/LSS	CSS/HSS
				CI	CI				CI	CI	CI	CI	CI	CI				CI	CI	
(I) Personality traits	<0.001	25.05	0.09											0.001	5.23	0.04				
Conscientiousness	0.005	7.90	0.01	0.20/0.03										0.047	3.06					
Openness	0.006	7.47	0.01	0.15/0.01										<0.001	14.90	0.02	0.1/0.28		0.24/0.03	
Extraversion	0.005	7.96	0.01	0.08/0.36										0.042	3.19					
Agreeableness														<0.001	14.79	0.02	0.13/0.32	0.02/0.24		
Neuroticism	<0.001	85.74	.06	0.51/0.34										0.003	5.96	0.01	0.33/0.10		0.03/0.30	
(II) Physical self-concept	<0.001	22.69	0.05		0.002	2.98	0.02							<0.001	4.57	0.02				
Sports competence	<0.001	46.34	0.03	0.31/0.54										0.001	7.24	0.01	0.16/0.47	0.02/0.38		
Physical self-esteem	<0.001	45.95	0.03	0.41/0.69										<0.001	9.27	0.01	0.24/0.63		0.47/0.02	
Global self-worth	<0.001	19.46	0.01	0.15/0.33	0.027	3.08	0.01							<0.001	11.43	0.02	0.16/0.42	0.05/0.33		
(III) Achievement motive	<0.001	21.66	0.03											0.005	3.72	0.01				
Hope for Success	<0.001	35.72	0.03	0.20/0.37										<0.001	8.17	0.01	0.12/0.35	0.04/0.29		
Fear of Failure	<0.001	27.52	0.02	0.32/0.16										<0.001	5.28	0.06				
(IV) Motives to be physically active	<0.001	28.17	0.14		<0.001	4.04	0.07							<0.001	5.28	0.06				
Contact														<0.001	7.76	0.01	0.35/0.70	0.15/0.56		
Competition/performance	0.020	5.44	.00	0.59/0.83																
Distraction/catharsis					0.026	3.11	0.01	0.13/0.62	0.30/0.80	0.02/0.49	0.20/0.66									
Body/appearance																				
Health																				
Fitness																				
Aesthetics																				
Risk/challenge	<0.001	9.84	0.01	0.36/0.60																
(V) Sports interest																				
Sports interest	<0.001	17.90	0.01	0.14/0.30										<0.001	24.59	0.03	0.24/0.45	0.11/0.35		

Significant differences ($p < 0.05$); F, ratios of variances; (η^2), effect sizes; CI, confidence interval.

^aHSS, Higher Secondary School; LSS, Lower Secondary School; CSS, Comprehensive Secondary School.

in the international context (Culjak and Mlačić, 2014; Iimura and Taku, 2018; Lodewyk, 2018; Lau and Jin, 2019). This is in line with Schmitt et al.'s (2007) study comparing adults' Big Five personality traits across different countries and cultures. Therefore, detected findings in this study could result from educational or cultural differences.

Physical Self-Concept values are comparable to previous studies, which have used the same scale in a sample consisting of teenagers or young adults (Braun et al., 2018). Similar to Braun et al.'s (2018) as well as Stiller and Alfermann's (2007) sample, students obtain the highest score on *Global Self-Worth*. *Global Self-Worth's* score in this study is lower than in Stiller and Alfermann's (2007) older sample. Students' *Sports Competence* values are higher in comparison to students in the international context (Marsh et al., 2002; Guérin et al., 2004; Garn et al., 2019). However, fifth grade students from the USA (Garn et al., 2019) show higher scores than our study's sample. Cultural differences in relation to, e.g., one's self-perception might have influenced this result. It has to be taken into account that younger students often over-estimate themselves (Lan, 2005; Kolovelonis et al., 2013). Further, USA's organization of youth sports culture where all physical activities are typically offered in schools, possibly allows more opportunities to experience various sports easier of access than in Germany where after school sports are commonly outsourced to sports clubs, and where children's experiences often depend on the regional offering and parental support.

The values of *Achievement Motive's* dimensions are comparable to national and international studies (Herrmann et al., 2014; Streso, 2015).

The strongest expression of the *Fitness* motive is in line with the validation sample (Gut et al., 2019) and another study from Germany (Diehl et al., 2018) as well as with studies from Greece (Zervou et al., 2017), Lithuania (Sukys et al., 2019), and Malaysia (Molanorouzi et al., 2015)—all investigating older samples. Only Kilpatrick et al.'s (2003) American sample attributed less importance to the *Fitness* motive than to *Contact*, *Competition/Performance*, *Aesthetics*, or *Risk/Challenge*. This could be due to USA's different design of PE's curriculum emphasizing other motives, e.g., competitive sports games (Shape America, 2014). Another reason might be the fact that the importance of fitness has greatly increased in recent years (Wiklund et al., 2019) while Kilpatrick et al.'s (2003) study dates back several years. *Fitness'* increasing societal relevance points not only to the meaning of the *Fitness* but also the *Health* motive, which in our study obtained the second highest score. Triggering students' meaning assignment to the *Health* motive paves the way to an active and therefore healthy lifestyle.

Regarding *Sports Interest*, Herrmann et al.'s (2014) Swiss student sample (12–15 years) reveals similar *Sports Interest* values as this study's sample. Gogoll's (2010) sample of older students (17–19 years) reveals lower scores than this study's sample indicating that with increasing age not only motivation but also *Sports Interest* decreases. Further, international comparisons are difficult due to the differences in the operationalization of *Sports Interest*.

Investigated Group Differences

The fact that girls score higher on *Neuroticism* than boys coincides with the assumption that girls are less confident and more timid than boys are (Danthony et al., 2019). The tendency of girls' higher *Neuroticism* is in line with earlier studies examining *Personality Traits* (Kupper et al., 2019). Further, girls' lower *Physical Self-Concept* matches previous research (Klomsten et al., 2004; Klein, 2017). Klein (2017) additionally highlighted a relationship between *Personality Traits* and *Physical Self-Concept*. The fact that boys' *Achievement Motive* values lie above girls' is compatible to boys' higher self-evaluated *Physical Self-Concept* and lower *Neuroticism*. This again underlines the fact that boys are more confident and venturesome than girls are (Cárdenas et al., 2012). Gender differences might be traceable to the puberty phase, which is a major life event for adolescents. It is associated with many rapid biological, social, and psychological changes (Patton and Viner, 2007). While girls tend to gain body fat during puberty, boys tend to gain muscle mass favoring their sports activities (Waylen and Wolke, 2004). Accompanied physical self-perception is one key correlate of physical activities, especially for girls (Stuart et al., 2005). This explains why girls' characteristics are less advantageous for participation in PE than boys' characteristics. Due to socialization effects, boys are physically tougher, more autonomous, and emotionally stoic (Amin et al., 2018), which may explain gender differences. Socialization effects may also be the reason for boys' higher *Sports Interest*, as males generally are more active than females (Finger et al., 2017). This further implies that a parent of the same sex has a greater role model function than a parent of a different sex (Brouwer et al., 2018). Boys' higher *Sports Interest* could also be traced back to PE's and extracurricular sports' performance as well as goal orientation which matches boys' pronounced *Risk/Challenge* and *Competition/Performance* motive orientation. This further corresponds to boys' higher *Physical Self-Concept* and more distinct *Hope for Success*.

Main effects of grade on *Physical Self-Concept* cannot be used for practical considerations as univariate and post hoc tests did not reveal significant differences (Chen et al., 2018). Whether *Physical Self-Concept* develops over the school career, cannot be answered in this study, due to the cross-sectional design and sample restriction to grade seven to ten. Additionally, further characteristics influencing student development must be considered.

Higher-grade students' stronger orientation toward *Distraction/Catharsis* can possibly be explained by *Distraction/Catharsis's* stress-compensating alignment. Academic-related stress is a major concern of secondary and tertiary students (Pascoe et al., 2020). Therefore, older students facing ongoing normative stressors may appreciate the stress-compensating function of physical activities and therefore enjoy *Distraction/Catharsis*-oriented lessons.

Differences between lower and higher secondary school students emphasize the fact that teachers in higher secondary schools face different student characteristics than lower secondary school teachers. Whether the reason for the difference lies in school-based, family-related, or societal parameters, e.g.,

cannot be answered in this study. One possible explanation for the detected differences could be the fact that lower secondary school students are less often active in sports clubs (Albert, 2017), and therefore have fewer opportunities to strengthen their *Physical Self-Concept*, train their *Achievement Motive*, or awaken their *Sports Interest*.

Motives to be physically active are among all characteristics the most easily addressable in PE teaching practice. Regarding the investigated independent variables, gender explains the most whereas grade explains the least variance. This suggests that the examined characteristics, especially *Personality Traits*, differ between genders but are quite stable within secondary schooling, representing a shorter life period (Neyer and Asendorpf, 2018).

Implications

Aligned Teaching Methods

PE teachers can make use of the detected differences in student characteristics in order to design and conduct PE lessons, which address students appropriately. The fact that girls are more conscientious than boys could imply that they, e.g., need more time to practice. They are more interested in mastering things with confidence and therefore, e.g., benefit from process-oriented rather than product-oriented performance evaluation. Girls' higher *Openness* implies a higher interest and willingness to engage in new contents and teaching methods. PE teachers could thus find it easier to teach girls when trying to follow a broad and multi-perspective curriculum. Further, PE teachers should pay head to this result when offering new contents or new perspectives to boys, e.g., by proceeding in small steps or by granting co-determination and including students' ideas and desires in the lessons. Here, the Sport Education Model represents a valuable approach by bringing students to take up different perspectives via different roles. Considering the abovementioned stable traits therefore facilitates teaching and allows appropriately addressing students. This in turn ideally arises their intrinsic motivation in PE and by this contributes to PE's overarching aim to establish motivation for lifelong physical activities.

Boys' higher *Extraversion* facilitates teaching competition-oriented tasks and contents. Comparatively low scores on *Agreeableness* and *Openness* in lower secondary school students can be considered when, e.g., applying cooperation tasks, creative teaching concepts or offering unknown lesson content.

Safe Learning Environments

Lower secondary school students' as well as girls' higher level of *Neuroticism* implies that they particularly require safety in PE lessons. Girls' higher *Neuroticism* plays a crucial role in PE. It has been shown that feeling safe in PE is important for students in general (Albert, 2017). Particularly girls in PE require security against risk, injury, or embarrassment (Brown, 2014; Casey et al., 2014). Considering individual learning progress and process, rather than product-oriented teaching approaches, especially during assessment, can take away fear or uncertainty, and promote security as well as a sense of achievement. Additionally, girls' lower *Physical Self-Concept* should be considered when planning and conducting PE lessons. PE teachers need to create

and guarantee a learning setting in which all students feel secure and encounter achievement. Such learning settings allow for valuable experiences, which in turn strengthen students' *Physical Self-Concept* (Schmidt et al., 2013). This can further be promoted by, e.g., considering individual learning progress or applying an optimized feedback culture—e.g., recurring self-, peer-, and teacher evaluation (Conzelmann et al., 2011).

According to PE's educational mandate, students' *Physical Self-Concept* should be maintained or increased in the course of the school career. In order to achieve this aim, PE teachers should be aware that particularly girls and lower secondary school students require *Physical Self-Concept* promotion within safe learning environments.

Lesson Design and Tasks

Considering this study's results, tasks with a medium degree of difficulty suit most students best. This consequently triggers their motivation in PE (Engeser and Rheinberg, 2008). Because of a predominant success orientation, PE teachers should make sure that students receive enough time, even when fulfilling easy tasks, before moving on to more difficult tasks.

Another starting point is *Motives to be physically active*, which give direction to the lesson's content and design. The *Fitness* motive appeals the most to students, regardless of gender, grade, or school type. The topic fitness is less centrally presented in Germany's PE curriculum than, e.g., sports games, and therefore plays a subordinate role when planning and designing PE lessons. Addressing this motive in different PE strands, e.g., in gymnastics as well as in athletics or games, empowers students to take part in extracurricular physical activities. Boys are more likely addressed by performance-, competition-, or risk-oriented situations. Girls might not feel adequately addressed in strongly performance- and competition-oriented PE lessons where they have to assert themselves – which is common in PE though (Erdmann, 2008; Lund and Kirk, 2020). Therefore, PE teachers should focus on the values and the order of different *Motives to be physically active* in order to address both genders and pupils who do not correspond to the predominant motivational orientation. It is e.g., as important for girls as for boys to cope with risk experiences and to feel pleasure in doing so. Boys are perhaps more willing to take risks and exceed their individual level of requirements whereas girls may need a more gradual approach. *Distraction/Catharsis's* stress-compensative function can be used in higher and mixed-gender grades in order to find meaning in sport. As the *Health* motive is stronger pronounced in higher grades, aligning PE lessons toward *Health* might support students' lifelong engagement in physical activities.

Sports Interest also offers potential for PE teaching, especially because of their close link to intrinsic motivation. Considering this study's results, PE teachers should particularly promote *Sports Interest* among girls and lower secondary school students in order to establish the basis for lifelong engagement in physical activities already in adolescence. In line with girls' desire for safe learning environments, PE teachers' need support becomes especially important also to trigger *Sports Interest* among girls.

The fact that numerous gender differences occurred would initially speak for mono-educational PE, as it might be easier to

address students adequately (Hannon and Williams, 2008). Only two *Motives to be physically active*—*Competition/Performance* and *Risk/Challenge*—but all other characteristics except for *Agreeableness* differed between boys and girls. This indicates that in co-educational PE, teaching behavior or teacher-student interactions might be more important than the lessons' content, which is influenced by the choice of pedagogical perspectives, and therefore by its motive orientation. Considering students' personality development within PE's dual function of education to and through sports, co-educational PE offers developmental potentialities (Hill et al., 2012), e.g., raising students' awareness of thoughtfulness and gender equality. Both, a mono-educational and co-educational organization of PE lessons, offers chances but also problems, which have to be taken into account.

CONCLUSION

The presented findings contribute to research as well as PE practice. Students' individual characteristics offer different approaches to influence motivation in PE. The aggregated examination leads to a comprehensive picture of students' in the PE context offering various anchors for targeted teaching.

The study highlights the dimensions' varying manifestation within the examined characteristics. Regarding general characteristics, students show low *Neuroticism* and high *Agreeableness*. Considering sport-specific characteristics, students are rather success-oriented and most attracted by the *Fitness* motive. Further, students obtain high values on *Physical Self-Concept* dimensions as well as on *Sports Interest*. Student groups differ, which allows describing them by the manifestation of the examined characteristics. Gender explains the largest proportion of variance across all characteristics with 12 differing dimensions. School types differ in 11 whereas grades only differ in two dimensions. This indicates the characteristics' relative stability. Predominant differences in *General Personality Traits*, *Physical Self-Concept*, *Achievement Motive*, and *Sports Interest* ascribe special meaning to student perception and teaching behavior in comparison to lesson content, which is reflected by fewer differences in *Motives to be physically active*.

Results can raise PE teachers' awareness of the fact that certain groups of students may experience PE differently and require appropriate addressing. Findings are transferred into recommendations for PE teachers in schools and can further affect PE teachers participating in professional courses or prospective PE teachers in teacher education.

STRENGTHS, LIMITATIONS, AND OUTLOOK

The study's strengths are its nationwide character and its sample size. This was achieved by the support of DSLV and ministerial approvals in the different federal states. Considering several grades and school types makes the study even more meaningful.

The comprehensive understanding of student characteristics provides a wide range of discussable results and implications.

PE teachers registered for and instructed the student survey. This might have influenced students' response behavior trying to please the teacher. Further, no information regarding the exact setting and conditions under which the examination took place can be provided. Students' voluntary participation might have biased the sample. Socio-economic stratification was not considered in order to receive a sample resembling the population. An exact response rate cannot be provided as participants were partly recruited via public advertisement and online participation was possible.

Differences regarding grades and school types are mostly comparable to previous results from studies in Germany investigating characteristics individually. As the examined sample differs from students in other countries, a survey in different countries applying the same survey instrument as in PISA (e.g., OECD, 2019) or HBSC (e.g., Inchley et al., 2016) seems interesting. In addition to analyzing and comparing students' characteristics, one could observe PE teaching and see if applied strategies differ considering cultural specific manifestations of characteristics. This knowledge can contribute to teaching recommendations and possibly have an effect on teaching outcomes, e.g., student motivation or achievement.

In order to decide whether student characteristics develop over the school career, a longitudinal survey—also including primary schools in order to cover students' school career comprehensively, is essential.

As the presented results showed potential patterns and previous studies highlighted relationships between at least some of the investigated characteristics, future work should aim to holistically conceive and describe these relationships by means of students' socio-demographic characteristics. Further, the replication crisis in personality research in combination with occurring small effect sizes, emphasize the need for future studies adopting an accordingly comprehensive approach. Clustering students with similar patterns across the individual characteristics, would reduce the complexity, and by this facilitate additional implications without expecting too much of the individual PE teacher. Easily identifiable and distinguishable student types can help PE teachers to plan and conduct targeted PE lessons, which successfully accomplish PE's educational mandate.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because of educational ministries' permits underlying privacy policies. Requests to access the datasets should be directed to flip.mess@tum.de.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation

and institutional requirements. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

AK, MS, SS, and FM contributed to conception and design of the study. SB, AK, and MS performed the statistical analysis. FM and SS managed and coordinated the responsibility for the research

activity planning and execution. AK wrote the first draft of the manuscript. All authors contributed to the article and approved the submitted version.

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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.

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4.3 Article 3

Authors: Schnitzius, M., Kirch, A., Mess, F., and Spengler, S.

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Abstract:

The teacher's personality in general plays an important role in the educational process. It is often examined in relation to outcome factors on the teacher or student side, e.g., teaching effectiveness or student motivation. PE with its peculiarities and allocated educational mandate particularly demands the personality of the PE teacher. Research considering this group of teachers is sparse, diverse and hard to capture due to different personality understandings. Our review therefore aims at identifying and analyzing underlying personality understandings, research questions and results of studies considering the personality of the PE teacher. We conducted a scoping review. After the screening and additional analyses process, 23 studies were included. Included references had to be empirical, published in German or English and explicitly examine the PE teacher's personality as variable or mention it as outcome factor in school context. All studies are cross-sectional, 22 studies quantitative, one qualitative. Regarding personality understandings, 12 studies follow a trait psychological, six studies a vocational, one study an interpersonal personality understanding. Four studies' personality understanding is not concretely determinable. Considering research questions, three studies aim at identifying the PE teacher's personality in general and do, e.g., not find considerable differences between the PE teacher's and other teacher's personality. Nine studies examine the relationship between the PE teacher's personality and different correlates such as burnout, highlighting, e.g., that female PE teachers' burnout process is less homogeneous than males. Eleven studies examine the PE teacher's personality from an external view and show, e.g., that students of

different age groups perceive the PE teacher's personality differently. Our review offers possible practical implications. By e.g., knowing their personality structure – their inside – , PE teachers can play to their own strengths and make use of their individual personality configuration in order to teach authentically and successfully, i.e., transferring the inside to the outside. Due to partly questionable and fragmentary methodologies of the included studies, results have to be interpreted with caution. More studies considering the PE teacher's personality following a broad personality understanding are needed to include potentially relevant factors for teaching and by this receive evident insights.

Contribution:

Melina Schnitzius is the first and corresponding author of Article 3. Alina Kirch is co-author and contributed to Article 3 as follows. Alina Kirch next to Melina Schnitzius, Sarah Spengler and Filip Mess contributed to the conceptualization of the manuscript. Together with Melina Schnitzius, Alina Kirch performed the literature search and study selection process. Alina Kirch was also involved in the editing process of the manuscript written by Melina Schnitzius. All authors approved the final version of the manuscript.



Inside Out: A Scoping Review on the Physical Education Teacher's Personality

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Keywords: personality, teacher, coach, physical education, school, sports, scoping review, teaching competence

INTRODUCTION

The teacher – one key player in the educational process in school – naturally attracts attention in didactic approaches. The teacher's role – e.g., as one axis in the well-recognized didactic triangle – and by this his general impact within the students' learning process is undisputed. General models of education such as Helmke's (2017) *Utilization of learning opportunities model*, which depict power factors of good lessons, also highlight the teacher's role and among this the teacher's personality and its influence on the quality of lessons. Traditional models of professional teaching competence also include the teacher's personality and make it a priority among other essential factors. Dunkin and Biddle's (1974) internationally well-recognized *Conceptual model of factors influencing teaching and learning*, e.g., attributes the teacher's properties (skills, intelligence, motivations and personality traits) a substantial role among variables predicting lesson and learning success. Considering German educational research, in Baumert and Kunter's (2013) *Model of professional teacher competence* four facets constitute the teacher's ability to perform: motivational orientations, self-regulation, beliefs/values/goals and professional knowledge. Professional teaching practice is seen as result of the coaction of these facets (Baumert and Kunter, 2013). Except for the latter one, personality characteristics play an important role in these facets. Baumert and Kunter's (2013) model allows for the development of professional competence over time, but explicitly highlights the role of relatively stable, implicit factors such as personality characteristics within the professional development process. Personality characteristics influence firstly the uptake of learning opportunities, thereby the teacher's professional competence and finally their professional practice (Kunter et al., 2013a). The teacher's individual personality characteristics therefore are essential for succeeding in teacher education and the teaching career.

Research on the relationship between the teacher's personality and their performance has a particularly long tradition. Succeeding as a teacher encompasses and is often measured by teacher-related factors such as academic success, satisfaction in teaching, teacher well-being or student-related factors such as student motivation or student achievement. General educational research often examines explicitly the relationship between the teacher's personality and the aforementioned *success factors*: On the teacher side, e.g., satisfaction in teaching, teacher burnout, teacher self-efficacy or teacher effectiveness (Mayr, 2011; Djigić et al., 2014; Cramer and Binder, 2015; Perera et al., 2018; Kell, 2019; Kim et al., 2019). On the student side, teacher personality is often analyzed in relation to student motivation or student achievement (Wayne and Youngs, 2003; Hattie, 2009; Jahangiri, 2016; Khalilzadeh and Khodi, 2018; Kim et al., 2018, 2019). Kim et al. (2018) attribute the identification of vital factors of the teacher's personality a promising role for their effectiveness – measured by teaching performance. Knowing about vital personality factors can be beneficial for teaching in general, e.g., for teacher's planning and reflection of lessons – as indicated in the teacher's role in models of lesson planning and evaluation (Döhning and Gissel, 2016). It might also be helpful

for the initial teacher selection or hiring process (Bastian et al., 2017; Kell, 2019).

In order to first understand the role and impact of the teacher's personality for the educational process, the term personality has to be defined and appropriate understandings have to be considered. Such a clear understanding serves as a basis for deriving possible practical implications for teaching or even structural and organizational implications. Following Pervin and Cervone (2008) the term personality refers to “psychological qualities that contribute to an individual's enduring and distinctive patterns of feeling, thinking and behaving.” In order to understand the construct of personality and ensure its comprehensibility, researchers have created models or frameworks. Even though personality psychology still lacks a comprehensive and universal framework for understanding the whole person, Costa and McCrae's *Five Factor Model (FFM)* (Costa and McCrae, 1999) has gained excessive attention (McAdams and Pals, 2006). This prevailing and widely accepted model follows a multidimensional understanding, clustering personality characteristics in the five facets: *Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism (OCEAN)* (John et al., 2008). These factors define a person's personality on a very global level (Rammstedt et al., 2018). The *FFM* is often used interchangeably with the term *Big Five*. The two frameworks are very similar but can be differentiated from each other regarding their origin: the *FFM* has been developed by empirically analyzing personality questionnaires whereas the *Big Five* are based on a lexical approach (Kim et al., 2019) believing that distinguishing characteristics have their origin in natural language use (Goldberg, 1981). Both frameworks share the understanding of personality by the use of five independent and bipolar categories (Rammstedt et al., 2018) and currently dominate personality research. Next to the aforementioned classical trait psychological personality understanding, personality research also borders upon other approaches such as the interactionist understanding. Here personality together with the situation determines an individual's behavior (Swann and Bosson, 2010). This understanding of personality can be considered less static. Moreover, considering personality research focusing on a specific professional group, Holland's (1997) theory and model of vocational personality can be seen as outlasting and prevalent in the occupational context. Holland characterizes people regarding their fit to six different personality types (*Realistic, Investigative, Artistic, Social, Enterprising, Conventional – RIASEC*) and highlights the influence of the environment and by this – similar to the interactionist understanding – developmental possibilities of the worker's personality. Even though originating from different understandings, all exemplary illustrated approaches claim to assess personality. In addition to following traditional and established approaches, further personal facets such as care and enthusiasm are often considered as closely associated or even equated with personality.

Examining the teacher's personality is common practice in general educational research. Göncz (2017) conducted a scoping review and aimed at giving an overview of research activities concerning the teacher's personality and by this

highlighting strategies for educational psychology. Göncz (2017) identified five types of studies classified according to their research questions: Studies of teacher typologies; Studies of teachers' desirable and undesirable features; Studies of teachers' professional behaviors and their influence on students; Studies of teachers' professional identity and Studies of teacher personality within the framework of personality theories (particularly within the *FFM*). In the conclusions Göncz (2017) takes position regarding the merits of the identified groups and proclaims the findings from studies following traditional personality theories "as the best starting point for a more comprehensive psychological theory of teacher personality in educational psychology."

Considering the personality of the physical education teacher (PET), Miethling and Gieß-Stüber (2007) also stated the PET's personality as pivotal point of their professional competence. This becomes especially important in conjunction with physical education (PE)'s allocated educational mandate. PE's mandate postulates (a) to educate the students' physical – e.g., by developing physical fitness and ideally a lifelong engagement in sports and (b) to educate through the physical – e.g., developing students' personality, fostering value imparting and moral education (Sallis and McKenzie, 1991). It is essential that PETs initially reflect their individual prerequisites and potentials (e.g., strengths and weaknesses, personality characteristics) in order to better understand and approach their students. PETs on the one hand have to reflect their own understanding of sports and teach this understanding their students to engage them in sports. On the other hand, PETs have to reflect their own values and then impart these values on their students to educate them beyond the physical. If they manage to fulfill both tasks, they are most likely able to successfully implement PE's aforementioned dual mandate. PETs serve as role models physically and by conveying their own reflected mission statement to their students. How PETs are perceived by their students in this process certainly depends on their personality. Beyond the challenging educational mandate, PETs are faced with further challenges that demand their personalities. The proximity between the PET and their students poses a challenge that requires the PET's personal characteristics. PETs need to address each child's needs, challenge each child at their personal level and create a positive, secure and supportive relationship in a climate where learning can succeed. This is among others achieved by PETs who know their personal qualities, reflect them and convert this process into empathetic, enthusiastic and ideally sustainable teaching. Considering the PET's personality – the *inside* – should therefore receive special attention among personality research in school context. Knowing the teacher's *inside* and transferring this to the *outside* – making it visible – can then support lesson planning and teaching.

Similar to research concerning teachers in general, in studies on the PET's personality the term personality though is construed differently and analyzed in various contexts with different correlates. Contrary to general educational research, a review article summarizing international publications concerning the PET's personality is missing. A review article is necessary though in order to organize the prevailing picture of the understanding of the PET's personality – its definition, characteristics or related

factors –, its correlates and by this its possible impact on educational outcomes. Therefore this review aims at answering the following research question: What are the underlying personality understandings, research questions and results of studies considering the personality of the PET in school?

METHODS

In order to answer the above stated research question, we conducted a scoping review. In 2005 Arksey and O'Malley outlined a first framework for this review approach. Arksey and O'Malley (2005) follow Mays et al.'s (2001) definition – assigning scoping studies the opportunity and task to easily depict a research area's fundamental specifics. They generally attribute scoping studies a comprehensive coverage. Our decision to conduct a scoping review was based on three reasons: First, as preliminary literature searches on the PET's personality revealed that research in this field is diverse and the understanding of personality vague, a scoping review that typically does not try to find an answer to a specific question but summarizes what questions have been asked, seemed to be appropriate (McEvoy et al., 2015; García-Moya et al., 2018). Second, we were interested in the identification of certain characteristics or concepts related to personality and in mapping, reporting or discussing these with finally suggesting practical implications – according to Munn et al. (2018) indications for a scoping review and therefore again supporting our decision. Third, conducting scoping reviews has become more popular in the educational context with a couple of recent perceptive scoping reviews published (e.g., McEvoy et al., 2015; Göncz, 2017; Richards et al., 2017; Sperka and Enright, 2017; Robinson, 2018; Killian et al., 2019).

Our research team consisted of two researchers. We independently passed through the individual phases of the review process following Arksey and O'Malley's (2005) six stages of their methodological framework: (1) Identifying the research question; (2) Identifying relevant studies; (3) Study selection; (4) Charting the data; (5) Collating, summarizing and reporting results; and (6) Consultation. Conflicts were cleared collaboratively after each step.

Stage 1: Identifying the Research Question

Considering Arksey and O'Malley's (2005) possible purposes of a scoping review, our review followed mostly two purposes: *Examine the extent, nature and range of research activity and identify research gaps in the existing research.* Due to the fact that preceding research on the PET's personality revealed inconsistency concerning the understanding and interpretation of personality, we decided to keep our research question relatively wide. We focused on ascertaining what type of empirical literature exists dealing with the personality of the PET in school, which understandings of personality are pursued and which questions are asked considering the personality of the PET in school. In order to capture most interpretations of the ambiguous term personality we did not specify it and decided to follow an open personality understanding. This

allowed for different understandings to be included in our review and by this receive an unaffected and true picture of the existing literature. We deliberately aimed at summarizing literature that either claims to assess personality as a variable or mentions personality as an outcome. Thus, the review's inclusion criteria were the following: content = personality, setting = PE, participants = PETs (personally or via external view), publication language = English or German.

Stage 2: Identifying Relevant Studies

In order to answer the research question we developed the search string, including three main categories: (1) Content: *Personality*; (2) Participants: *PETs*; (3) Setting: *PE*. Aiming at English and German publications, we included both languages in our search string:

(Persönlichkeit* OR personalit* OR Sportlehrerpersönlichkeit*
 OR Lehrerpersönlichkeit*)
 AND
 (Lehrer* OR Sportlehrer* OR
 Turnlehrer* OR Leibeserzieher* OR Bewegungserzieher*
 OR teacher* OR coach* OR instructor*
 OR educator* OR schoolteacher*)
 AND
 (Sportunterricht* OR Schulsport* OR Bewegungsunterricht*
 OR Bewegungserziehung* OR Leibeserziehung*
 OR Leibesübung* OR "school sport*" OR "physical education"
 OR "gym* class*" OR "physical training")

Category 1 (Content) was searched on title/abstract level as personality had to be an essential part in the potentially included text. Category 2 (Participants) and category 3 (Setting) were searched on full-text level. Initially, no restriction regarding the publication date was undertaken. We chose a comprehensive selection of eleven approved databases in the field of school sport research covering English and German texts: Education Source, ERIC, PsychARTICLES, PsycINFO, PSYINDEX, PubMed, Scopus, SocINDEX, SPOLIT, SPORTDiscus, Web of Science. The initial database search was undertaken on February 6th 2017. On June 12th 2018 we fulfilled update search one and on April 11th 2019 update search two.

Stage 3: Study Selection

After removing duplicates, we independently screened the titles. References were excluded if they clearly did not examine PETs (personally or via external view), if the setting clearly was not PE or if the content clearly was not personality. After screening titles, the remaining abstracts were screened. First, we deployed the same exclusion criteria as before. Screening abstracts allowed identifying non-empirical studies, which were excluded. As we aimed at providing a broad picture of the existing literature, we kept our search strategy rather wide and our exclusion criteria

quite soft. If references belonged to editorial works, these were provided and screened for chapters containing empirical studies. Finally, the full-texts of the remaining studies were provided and independently screened applying the same exclusion criteria as before (excluded if: not in English or German, not empirical, not examining PETs, not school setting, not personality). Ultimately, we searched the reference lists of all finally included texts and examined other work of the authors. We screened the authors' websites and publication lists for additional relevant texts and checked for conference presentations and projects. In this process, the same exclusion/inclusion criteria as in the initial search were applied. We created a flow chart which documents the search and reference selection process (see **Figure 1**).

Stage 4: Charting the Data

We independently extracted relevant data from the included texts and collaboratively agreed on a presentation format representing the studies' key information. This step was conducted according to the methodological guideline of the Joanna Briggs Institute (Peters et al., 2015). A table was created which served as the basis for comparing and contrasting the included texts (see **Table 1**).

Stage 5: Collating, Summarizing and Reporting Results

We followed Arksey and O'Malley's (2005) suggestion and divided this part into two different approaches of presenting the charted information: (1) Numerically analyzing the studies' framework conditions and design and (2) Organizing the literature thematically.

RESULTS

Figure 1 documents the search and reference selection process. The initial search yielded 2316 hits: Education Source ($N = 166$), ERIC ($N = 65$), PsychARTICLES ($N = 22$), PsycINFO ($N = 77$), PSYINDEX ($N = 24$), PubMed ($N = 18$), Scopus ($N = 462$), SocINDEX ($N = 70$), SPOLIT ($N = 1148$), SPORTDiscus ($N = 209$), Web of Science ($N = 55$). After removing 270 duplicates, 2046 titles were screened. Six hundred sixty-three references did not meet the inclusion criteria and were excluded. Consequently, 1383 abstracts were screened. Seventy-eight abstracts met all inclusion criteria. The corresponding full-texts were purchased and screened. In this process, 49 studies were excluded, concluding with 29 studies. Three additional studies resulted from update search one.

Fifteen out of these 32 studies were published between 1958 and 1990 (including). No study was published between 1991 and 2005. Seventeen studies were published between 2006 and 2016. Studies before 1991 differed from studies after 2005 regarding the underlying personality understanding (following various theories, e.g., human needs theory, interpersonal theory, situational theory, behavioral theory, trait theory) and consequently assessment methods [e.g., *Edwards Personal Preference Scale* (Edwards, 1959) or *California Psychological Inventory* (Gough, 1957)]. Studies from 2006 onward mostly relied on other, newer personality understandings, as recognized

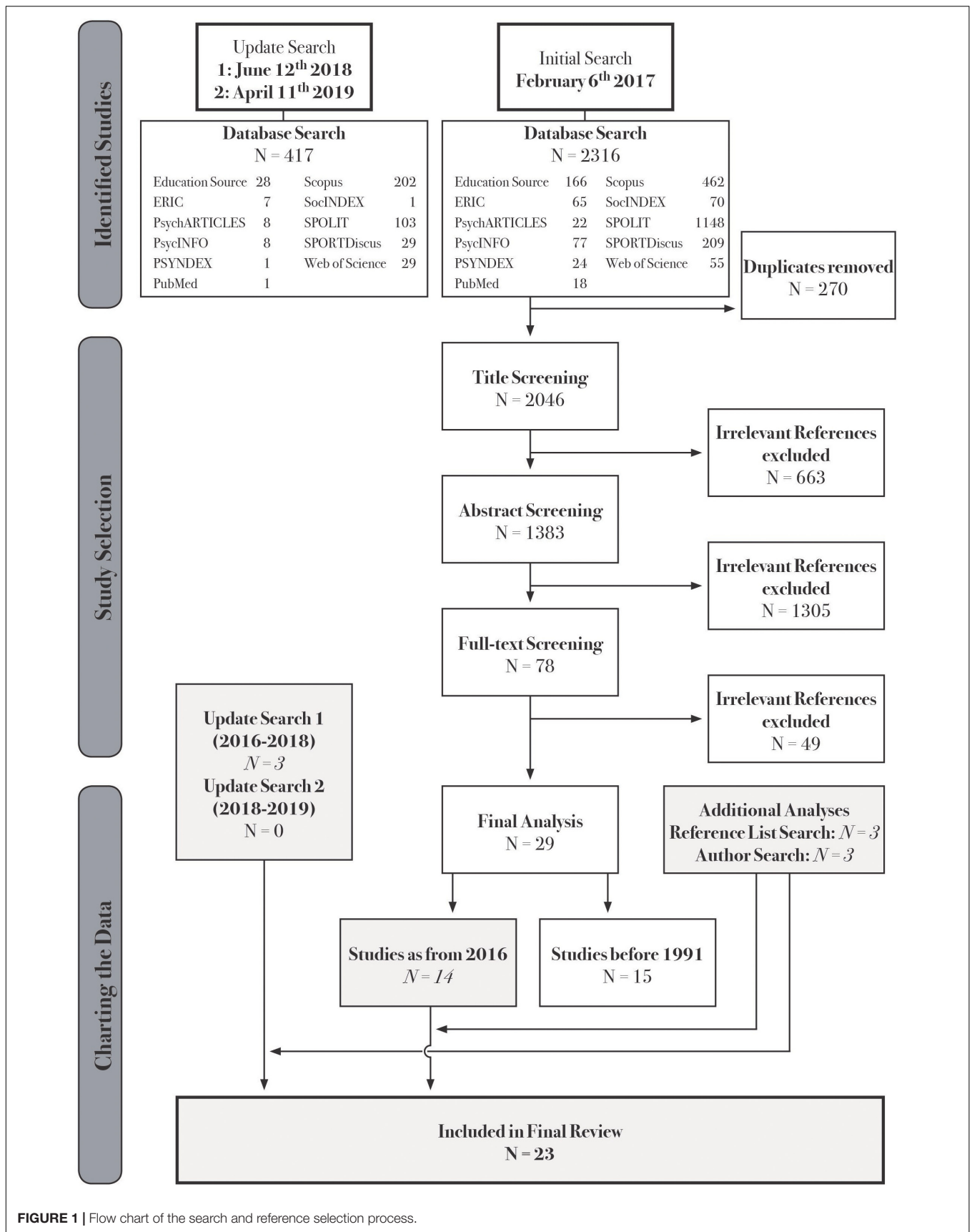


FIGURE 1 | Flow chart of the search and reference selection process.

TABLE 1 | Included studies as from 2006.

Author (year) origin	Study design/method sample	Aim	Personality inventory	Personality understanding (representative)	Main results
(I) The PET's personality (N = 3)					
García-Villanueva et al. (2017) Mexico	*cross-sec./quant. *53 PETs (35 m.)	To analyze diff. among PETs in the 4 gender-related pers. scales of <i>IMAFE</i> and work variables sex, age and marital status	quest.: <i>IMAFE</i> (Lara Cantú, 1993) *4 factors: <i>masculinity, femininity, machismo, submission</i> = 60 items associated with pers.	Not determinable → gender-related (pers. part of gender-related characteristics)	*no diff. in the 4 scales proposed by <i>IMAFE</i> in regard to pers. char. and work variables sex, age and marital status in the group of PETs
Hassan et al. (2016) India	*cross-sec./quant. *20 m. PETs, 20 m. OSTs	To measure and compare the <i>Big 5</i> pers. factors among m. PETs and OSTs	quest.: <i>Big 5</i> Pers. Inventory (Buchanan et al., 2005) *5 factors (<i>O, C, E, A, N</i>) = 20 items	Trait psychological – <i>Big 5</i>	*no diff. betw. the <i>Big 5</i> pers. factors among PETs and OSTs (valid for all 5 factors)
Mantu and Montu (2014) India	*cross-sec./quant. *50 m. PETs, 50 m. OSTs	To compare the pers. traits of m. PETs and OSTs	quest.: Eysenck Pers. Quest. (<i>EPQ-R S</i>) (Eysenck et al., 1985) *4 factors: <i>N, E, psychoticism, lying</i> = 48 items	Trait psychological (Eysenck)	*no diff. in the pers. factors (means of all factors) betw. PETs and OSTs *diff. in subc. <i>E</i> betw. PETs & OSTs PETs more extraverted
(II) The PET's personality and correlates (N = 9)					
Arbabisarjou et al. (2016) Iran	*cross-sec./quant. *60 PETs – from boys high schools	To assess the relations. betw. PET's pers. and stud.' individual and social beliefs and activities	quest.: <i>NEO-FFI</i> (McCrae and Costa, 2004) *5 factors: <i>O, C, E, A, N</i> = 60 items	Trait psychological – <i>Big 5</i> (McCrae and Costa)	*relations. betw. pers. aspects of PETs and stud.' beliefs and activities *corr. for <i>E</i> and <i>O</i> ; no corr. for <i>N, A, C</i> * <i>E</i> and <i>O</i> together can predict 0.88% of changes of stud.' beliefs and activities
Brudnik (2007) Poland	*cross-sec./quant. *160 PETs (77 m.) – prim., sec., post-sec.	To define the vocational pers. profile of PETs and examine diff. reg. gender, work environment and school type (state or priv.)	quest.: <i>SDS</i> (Polish version (Lacala et al., 2002) based on Holland (1994) *activities, skills, occupations; double self-evaluation I and II → 6 scales each = 288 items	Vocational (Holland)	*vocational pers. code differs betw. f. (<i>Social Investigative Artistic = SIA</i>) and m. (<i>Social Realistic Enterprising = SRE</i>) PETs *neither work environment nor type of school influences the obtained results
Brudnik (2010) Poland	*cross-sec./quant. *333 OSTs (65 m.) + 62 PETs (29 m.) – 22 sec. schools	To ascertain to what degree work-related stress, self-efficacy, prof. pers. determine burnout in OSTs and verify a hypothesis that PETs burn out in keeping with a prof. specific macro-path	quest.: <i>SDS</i> (Polish version (Lacala et al., 2002) – based on Holland (1994) *see Brudnik (2007)	Vocational (Holland)	*m. PETs exhibit typical burn out process for prof. group *f. PETs burn out less homogenously → macro-paths of m. and f. PETs verified *burnout process OSTs diff. compared to PETs → disciplinary problems as causal, self-efficacy as preventive factor of burnout among OSTs *vocational pers. only slightly impacts burnout process
Demir (2014) Turkey	*cross-sec./quant. *296 PETs (187 m.) – state and priv. sec. schools	To evaluate the relations. betw. pers. traits of PETs in relation to their sports branches and sports types and investigate diff. reg. gender, school type and years of service	quest.: <i>PERI</i> (short form of Sevinç, 2005) *5 factors: <i>O, responsibility, E, compatibility, emotional stability</i> = 25 items	Trait psychological	*no diff. betw. PETs' pers. traits and sports branches, sports types, gender, school type and years of service
Demir (2015a) Turkey	*cross-sec./quant. *92 volunteer PETs (59 m.) – state and priv. sec. or high schools	To examine the relations. betw. PPC of PETs and gender, school type, school level, years of service and sports branches	quest.: <i>PET PPC scale</i> (adapted to PETs by Demir (2012) from Büyüknacar (2008) *4 subc.: <i>prof. enthusiasm/dedication; respect for human dignity/justice; stimulating interaction; reflective interaction</i> = 60 items	Vocational	*PETs see their PPC "completely adequate" → mean scores of <i>respect for human dignity/justice</i> subc. lower than other subcomponents *gender, years of service, sports branches: no diff. *school type: diff. → priv. school PETs score higher on PPC *school level: diff. in <i>stimulating interactions and reflective interactions</i> (high school PETs score higher on PPC)

(Continued)

TABLE 1 | Continued

Author (year) origin	Study design/method sample	Aim	Personality inventory	Personality understanding (representative)	Main results
Demir (2015b) Turkey	*cross-sec./quant. *92 PETs (59 m.) – state and priv. sec. and high schools	To evaluate the relations. betw. pers. traits of PETs and their sports branches, sports types	quest.: <i>PERI</i> (short form of Sevinç, 2005) *see Demir (2014)	Trait psychological	*sports branches: corr. only in terms of <i>emotional stability and compatibility domains</i> → e.g., racket sports and handball players <i>emotionally more stable</i> than gymnasts → e.g., basketball and defense sport players more <i>compatible</i> than swimmers *sports types: no diff.
Hosein Razavi et al. (2012) Iran	*cross-sec./quant. *162 PETs	To examine if entrepreneurial organizational culture is related to PETs' entrepreneurial pers. char.	No information	Vocational	*neg. corr. betw. <i>creative innovation, cooperation, tolerance of creative talents</i> (parts of entrepreneurial organizational culture) and PETs' entrepreneurial pers. char. *pos. corr. betw. <i>organizational risk-taking, open communication</i> and PETs' entrepreneurial pers. char.
Makhmutova et al. (2017) Russia	*cross-sec./quant. *64 PETs – general educational schools (37 high (= qualified) and 27 low-ranking)	To explore the specifics of mental burnouts in the context of pers. development of the PETs versus their prof. competency levels	quest.: <i>Cattell's 16 Pers. Factor</i> (Form C of 16PF) (Cattell et al., 1993) *105 items	Trait psychological (Cattell)	*PETs higher on intellectual development less satisfied with work conditions → more likely to burnout *highly prof. teachers with highest practical experience = most prone to mental burnouts *qualified PETs exhibit higher rates in the subs. <i>reasoning and emotional stability</i>
Maryam et al. (2017) Iraq	*cross-sec./quant. *250 PETs (140 m.)	To examine the relations. betw. (a) burnout and mental health, (b) burnout and pers. traits among PETs	quest.: <i>NEO-PI-R</i> (Costa and McCrae, 1992) *5 factors: <i>O, C, E, A, N</i> = 240 items	Trait psychological – <i>Big 5</i> (McCrae and Costa)	<i>mental health, E, O, A</i> = relevant for burnout process *neg. corr. betw. burnout subs. and <i>mental health, E, O</i> and <i>A</i> *pos. corr. betw. burnout subs. and <i>N</i>
(III) The PET's personality from an external view (N = 11)					
Brandl-Bredenbeck (2006) Germany	*cross-sec./quant. *8863 stud. – different school levels – <i>SPRINT</i> , (Brettschneider, 2006)	To examine stud.' attitudes toward PETs	quest.: 2 inventories *semantic differential evaluating PETs = subject- and pers. related: 14 adj. pairs *PET care = 13 items	Not determinable → generally speaking behavioral + aspect of care	*stud. in general evaluate their PETs pos. → PETs perceived as <i>self-confident, caring, friendly</i> *stud. age diff.: younger stud. evaluate more pos. *PET age diff.: younger PETs are evaluated better
Demir (2015c) Turkey	*cross-sec./quant. *1254 stud. - 9th, 10th, 11th grade – 17 schools (16 state, 1 priv.)	To examine how PPC of PETs is perceived by 9th, 10th, and 11th grade stud.	quest.: <i>PET PPCS-Student</i> [adapted to PETs by Demir (2012) from Büyüknacar (2008)] *4 subc.: <i>prof. enthusiasm/dedication; respect for human dignity/justice; stimulating interaction and reflective interaction</i> = 60 items	Vocational	*gender: diff. only in some subc. → <i>prof. enthusiasm/dedication</i> and <i>motivational interaction</i> : girls more satisfied than boys; <i>reflective interaction</i> : vice versa) *school type: diff. → priv. school more satisfied *class: diff. betw. 9th, 10th, 11th graders for all subc. → 9th graders evaluate PETs' PPC most pos.

(Continued)

TABLE 1 | Continued

Author (year) origin	Study design/method sample	Aim	Personality inventory	Personality understanding (representative)	Main results
Lauritsalo et al. (2015) Finland	*cross-sec./quant. *Finnish stud. communicating in internet forums (356 messages from 9 forums)	To examine what kinds of extrinsic factors underlie opinions expressed in internet discussion forums on experiences of PE: what is the role of the PET, class environment, curriculum and assessment in these opinions?	messages taken from internet discussion forums analyzed by qualitative content analysis	Not determinable generally speaking behavioral	*6 extrinsic factors identified: PET's pers./behavior = strongest factor containing most statements (40% = 163 messages); 2 nd = class environment (24%), 3 rd = curriculum (16%), 4 th = assessment (9%), facilities & equipment (8%), out-of-school influence and other factors (3%) *mostly neg. statements and strong feelings of compulsion, humiliation in most opinions (PETs seen as not supportive) 61% of messages in neg. category; 8% pos.; 31% both pos. and neg.
Senn et al. (2017) Austria	*cross-sec./quant. *122 stud. (87 m.) – year 12, 13 and uni. stud.	To examine how pers. char. and competencies of PETs influence stud. motivation in PE and indicate diff. reg. gender and sportiness	quest.: self-dev. (NN) *complex 1: imp. of social behavior (PET to stud.) *complex 2: PET achievement orientation	Not determinable → generally speaking behavioral	*PETs' social-emotional pers. char. and competencies = imp. for stud. motivation *gender diff. → PETs realizing stud. fear = more imp. for girls *partly diff. for sportiness → e.g., <i>achievement orientation</i> and <i>strict grading</i> more imp. for sporty/active kids
Demir (2016) Turkey	*cross-sec./quant. *1421 stud. (728 m.) – 6th-8th grade – public and priv. schools	To examine the PPC of PETs as evaluated by stud. and to investigate diff. based on stud.' gender, school type and class	quest.: <i>PET PPCS-Student</i> [adapted to PETs by Demir (2012) from Büyüknacar (2008)] *see Demir (2015c)	Vocational	*PPC highest average points: "She/he cares that honesty and trust form the basis of our communication at school" = evaluated as "completely adequate" *PPC lowest average points: "She/he does not criticize a student who exhibits negative behavior in front of the class" = evaluated as "partly adequate" *gender: diff. only for <i>motivational interaction</i> → girls more satisfied than boys *school type: diff. in all subc. betw. state and priv. school stud. → priv. school stud. in general more satisfied with PPC *class: diff. in all subc. → 7th graders more satisfied with PETs' PPC than 6th and 8th graders

(Continued)

TABLE 1 | Continued

Author (year) origin	Study design/method sample	Aim	Personality inventory	Personality understanding (representative)	Main results
Georgiev (2016) Bulgaria	*cross-sec./quant. *76 stud. (30 m.) – 5th, 6th, 7th grade – sec. school	To reveal stud.' attitudes toward the prof.-personal qualities and interpersonal char. of the PET pers. and examine if there are diff. reg. the stud.' age, gender or sports participation	quest.: <i>Test of T. Leary</i> (Leary, 2004) and self-dev. quest. (stud.' attitudes toward PETs' prof. personal qualities) *16 variables of interpersonal interaction (8 dimensions) *prof. personal qualities: 3 scales (<i>knowledge, skills, personal qualities</i>) = 26 items	Interpersonal	Preferences about PETs' char.* <i>hyper-affiliating</i> <i>pers.</i> = highest degree of manifestation; 2nd = <i>autocratic</i> <i>pers.</i> ; lowest two = <i>humiliated</i> and <i>suspicious</i> pers. → PETs should be <i>benevolent, cooperative, helpful,</i> <i>showing empathy, strict and uncompromising enough</i> in organization and control during PE classes *gender: no diff. *age: diff. → desire for communication, understanding, cooperation with PET increases with stud.' age <u>Attitudes toward PETs' prof. personal qualities</u> → PETs should be interested in stud.' problems, maintain a closer interpersonal distance, socialize, advise, support, help *age diff. → 5th class stud. place higher imp. on PETs' personal qualities than 7th class stud. *gender diff. → boys place less imp. on PETs' skills *sports participation diff. → active kids place higher imp. on PETs' personal qualities than kids not engaged in sports
Szczepanski (2012) Poland	*cross-sec./quant. *312 PETs and 600 OSTs – prim. and sec. schools	To analyze differences reg. opinions on distinguishing char. of PETs perceived by PETs themselves and by OSTs	quest.: self-dev. (NN) *13 examined attributes - social distinguishing features (in PETs opinion) – self- and peer assessment	Trait psychological	*PETs assess pos. image attributes (e.g., <i>cheerful</i> <i>lifestyle, O, honesty, immediacy, pos. thinking</i>) higher than OSTs *PETs proclaim <i>organizational ability, dynamic actions</i> and <i>cheerful pers.</i> distinguishing char./OSTs proclaim <i>PETs'</i> <i>outfit, dynamic actions, cheerful pers.</i>
Voll (2006) Germany	*cross-sec./quant. *976 stud. – year 8–10 – sec. schools	To examine stud.' expectations toward their PET and to create a competence profile of an effective PET and examine diff. reg. stud.' grade, school environment, school level, gender	quest.: self-dev. (NN) concerning PETs' prof. competence/skills and char. (pers.: <i>fairness, understanding, partner, role</i> <i>model, assertiveness</i>)	Trait psychological	Competence profile of stud. needs oriented PET: <i>prof.</i> <i>expertise; great repertory; sporty; empathy;</i> <i>methodical-didactical skills; pedagogical charm;</i> <i>autogenesis companion; sport ethos; creator; sensitivity</i> <i>for needs</i> *several diff. mostly betw. grade 8 and 9, urban and rural schools, sec. and vocational schools; only diff. reg. gender for <i>responding to stud.</i> → more imp. for m.

(Continued)

TABLE 1 | Continued

Author (year) origin	Study design/method sample	Aim	Personality inventory	Personality understanding (representative)	Main results
Zalech (2011a) Poland	*cross-sec./quant. *763 stud. (279 m.) – 2 senior high schools	To determine what features of PETs are most undesirable according to high school stud. and indicate if gender, grade or school affect selection of individual features	self-dev. (NN) diagnostic survey – quest. technique (semi open) *participants identify 3 char. a PET should not have *similar to Zalech (2011b)	Trait psychological	*most undesirable features: quick temper (65%); severity (50%); unreliability/moodiness (37/34%) *gender and grade: various 2nd and 3rd order interactions → e.g., girls in grade I chose <i>strict</i> more often than boys; boys were more displeased at the PET's <i>indecision</i> (independent of grade) → boys e.g., indicate <i>submissive</i> and <i>indulgence</i> ; girls e.g., <i>being moody</i> and <i>quick-tempered</i> as undesirable features *school: no diff.
Zalech (2011b) Poland	*cross-sec./quant. *744 stud. (273 m.) – 1st, 2nd, 3rd year – comprehensive upper-sec. school	To define what pers. traits, according to upper-sec. stud. are most significant in a PET and indicate if school, gender, year differentiate the choices	Diagnostic survey – quest. technique (semi open); self-dev. (NN) *participants identify 3 distinguishing pos. traits a PET should have → selection from 12 diff. adj. plus option to add 1 feature	Trait psychological	*top 4 no gender diff.: <i>understanding</i> (53.5%), <i>fairness</i> (47.3%), <i>patience</i> (39.3%), <i>sense of humor</i> (39.3%); only order differs *least indicated: <i>caring</i> (6.1%)/ <i>other traits</i> (3.5%) *variable interdependency (2nd and 3rd order interactions)
Zalech and Rutkowska (2014) Poland	*cross-sec./quant. *22 PETs, 22 OSTs, 22 final-year stud. – upper-sec. school	To get to know the image of PETs seen by themselves and compare it with school community's perception	quest.: ACL-37 (Gough and Heilbrun, 2012) *300 adj. *participants choose fitting adj.	Trait psychological (Gough and Heilbrun)	*diff. betw. PETs' & others' view → PETs perceive themselves in a more pos. manner (mark more favorable than non-favorable adj.) → 2 adj. most frequently associated with image of PETs by all groups: <i>active</i> and <i>energetic</i> → 6 most selected adj. (<i>open-minded</i> , <i>willing to cooperate</i> , <i>active</i> , <i>healthy</i> , <i>hard-working</i> , <i>skillful</i>) all pos. connoted

Study Design/Method Sample: cross-sec., cross-sectional; m., male; OST, Other Subject Teacher; PET, Physical Education Teacher; prim., primary; priv., private; quant., quantitative; sec., secondary; stud., students; uni., university. *Aim:* betw., between; char., characteristics; diff., difference(s); m., male; OST, Other Subject Teacher; pers., personality; PET, Physical Education Teacher; PPC, Professional Personality Competence; priv., private; prof., profession(al); reg., regarding; relations., relationship(s); sec., secondary; stud., student(s). *Personality Inventory:* adj., adjectives; char., characteristics; diff., difference(s); imp., important(s); pers., personality; PET, Physical Education Teacher; pos., positive(s); prof., profession(al); quest., questionnaire; self-dev., self-developed; stud., student(s); subc., subcomponent(s); O, Openness; C, Conscientiousness; E, Extraversion; A, Agreeableness; N, Neuroticism. *Main Results:* adj., adjectives; betw., between; char., characteristics; corr., correlation(s); diff., difference(s); f., female; imp., important(s); m., male; OST, Other Subject Teacher; PE, physical education; neg., negative; pers., personality; PET, Physical Education Teacher; pos., positive(s); priv., private; prof., profession(al); PPC, Professional Personality Competence; relations., relationship(s); stud., student(s); subc., subcomponent(s); subs., subscale(s); O, Openness; C, Conscientiousness; E, Extraversion; A, Agreeableness; N, Neuroticism.

personality concepts as well as assessment instruments emerged in the late 1980s and subsequent years [e.g., emergence of Costa and McCrae's work and the publication of the first version of the *NEO-PI* (Costa and McCrae, 1985) or advancement of Holland's *Self Directed Search* assessing vocational interests (Holland, 1994)]. Due to this gap in the literature and the mentioned content-related considerations, a comprehensive thematic presentation was exclusively done for studies published after 2005. However, in order to also give an overview of the older studies, we included the data and results of the 15 studies published between 1958 and 1990 in the supplementary section of this paper (see **Supplementary Table 1**). In the additional analyses step of the 17 included studies we deliberately checked not only for publications as from 2006 but also for publications in the years between 1991 and 2005. This process resulted in further six studies – all published later than 2005. In total, 23 studies were included in our final review. **Table 1** provides a summary of the 23 finally included studies.

Framework Conditions and Study Design

Sixteen different first authors published the 23 included studies, 15 thereof in the last 5 years. Ten studies could be allocated to the Middle East (including India) (Hosein Razavi et al., 2012; Demir, 2014, 2015a,b,c, 2016; Mantu and Montu, 2014; Arbabisarjou et al., 2016; Hassan et al., 2016; Maryam et al., 2017), eight to Eastern Europe (Brudnik, 2007, 2010; Zalech, 2011a,b; Szczepanski, 2012; Zalech and Rutkowska, 2014; Georgiev, 2016; Makhmutova et al., 2017), four to Western/Northern Europe (Brandl-Bredenbeck, 2006; Voll, 2006; Lauritsalo et al., 2015; Senn et al., 2017) and one to North America (García-Villanueva et al., 2017). All studies followed a cross-sectional study design. Twenty-two studies chose a quantitative, one study (Lauritsalo et al., 2015) a qualitative approach. Test persons were either PETs themselves ($N = 14$), teachers of other subjects (in the following abbreviated as OST = other subject teacher) ($N = 5$) or students ($N = 10$) evaluating PETs' personality from an external view. Sample size varied between 20 and 312 for PETs, 20 and 600 for OSTs, 22 and 8863 for students. In order to assess personality the included studies used 19 different inventories – seven of which being well-recognized as personality inventories [*NEO-FFI* (McCrae and Costa, 2004); *NEO-PI-R* (Costa and McCrae, 1992); *SDS Polish Version* (Holland, 1997; Lacala et al., 2002); *EPQR-S* (Eysenck et al., 1985; Pourghaz et al., 2016); *ACL* (Gough and Heilbrun, 2012); *16PF Form C* of Russian version (Fetiskin et al., 2002) adapted from (Cattell et al., 1993); *Test of T Leary* (Leary, 2004) ($N = 8$)]. Six studies each either made use of less-recognized inventories or designed their own questionnaire according to the study's needs.

Personality Understanding, Research Questions and Results

As research questions of the analyzed studies are diverse, the presentation of the underlying personality understanding, research questions and results will be divided into three

thematically coherent categories: (I) *The PET's personality* – studies with their main focus explicitly on the identification of the PET's personality ($N = 3$); (II) *The PET's personality and correlates* – studies examining the PET's personality in relation to another variable ($N = 9$); (III) *The PET's personality from an external view* – studies interested in a non-PET view on the PET's personality ($N = 11$). Within the categories according to the formulated three foci of the review's research question, the studies' underlying personality understanding together with their research questions and the studies' results will be presented separately.

The PET's Personality

In this category researchers are explicitly interested in the PET's personality. In all three studies (Mantu and Montu, 2014; Hassan et al., 2016; García-Villanueva et al., 2017) personality is approached as universal and comprehensive. Mantu and Montu (2014) and Hassan et al. (2016) both intend to compare the personality characteristics of PETs with those of OSTs. They follow a trait psychological approach of personality. García-Villanueva et al.'s (2017) study follows a special understanding of the PET's personality in the subject area of gender studies. The study's primary aim is to analyze differences regarding sex, age and marital status among PETs in the four gender-related scales (*masculinity, femininity, machismo, submission*) considering personality characteristics.

Mantu and Montu (2014) conclude that there are no significant differences between the personality factors of PETs and OSTs considering the overall score. Solely when analyzing the individual factors, Mantu and Montu (2014) state that PETs are more *extraverted* than OSTs. Hassan et al. (2016) do not find any statistically significant differences in the individual *Big Five* factors of PETs and OSTs – *extraversion* and *conscientiousness* are most strongly pronounced in both teacher groups. García-Villanueva et al. (2017) do not find any statistically significant differences in the relationships of the four gender-related personality scales and the variables sex, age and marital status.

The PET's Personality and Correlates

The nine studies that are assigned to this category state the relationship between the PET's personality and one or more correlates as their main objective. Three of these studies examine the relationship between the PET's personality and burnout (Brudnik, 2010; Makhmutova et al., 2017; Maryam et al., 2017). Brudnik (2010) speaks of vocational personality, Makhmutova et al. (2017) of personality development within a trait psychological approach and Maryam et al. (2017) of personality traits in general. All three also assess additional aspects such as self-concept or mental health. Demir's three studies in this category (Demir, 2014, 2015a,b) aim at examining the relationship between PETs' personality traits and their sports branches (e.g., football, swimming, gymnastics) and sports type (team sports vs. individual sports). In two of the studies (Demir, 2014, 2015a) he also examines the PET's gender, school type (private vs. public schools) [in 2015a also school level (secondary vs. high schools)] and years of service in relation to the PET's personality. In two studies (Demir, 2014, 2015b) he follows a trait

psychological understanding of personality. In his third study (Demir, 2015a) he speaks of professional personality competence and by this identifies the PET's vocational personality. Brudnik (2007) follows Holland's tradition which understands vocational interests as personality characteristics and therefore also establishes a work-related peculiarity of personality. Similar to Demir's studies she examines the relationship between the PET's vocational personality and gender, type of school and work environment. Hosein Razavi et al. (2012) and Arbabisarjou et al. (2016) examine the relationship between PET's personality traits and students' individual and social behavior or the entrepreneurial organizational culture, respectively. Arbabisarjou et al. (2016) follow a trait psychological understanding of personality whereas Hosein Razavi et al. (2012) speak of entrepreneurial personality characteristics and therefore follow a vocational approach.

Studies examining the PET's personality in relation to burnout all focus on different analyses and therefore conclude with multifaceted results. Brudnik (2010) finds that PET's gender is related to the burnout path – male PETs burnout following a particular path whereas female PETs burnout less uniformly. Further, Brudnik (2010) finds out that self-efficacy – which is often seen as part of the personality – serves as preventive factor of burnout for OSTs. The degree of the PET's personality matching the profession (SDS; Holland, 1994) only slightly affects the burnout path. Makhmutova et al. (2017) highlight the fact that PETs scoring higher on the intellectual development level [*Scale B of Cattell's 16PF* (Cattell et al., 1993) – reasoning] are less satisfied with their work conditions and by this more likely to burnout. Qualified PETs – graduated in PE – exhibit significantly higher rates in the subscales *reasoning* and *emotional stability* compared to non-qualified PETs (Makhmutova et al., 2017). According to Maryam et al. (2017) when considering the *Big Five* personality factors only *neuroticism* shows a positive correlation with PETs' burnout development (via the burnout indicator *emotional exhaustion*).

Demir's results in his methodologically similar studies are contradictory. In his study from Demir (2015b) he does not detect a correlation between the PET's sports type (individual sports vs. team sports) but examines significant correlations between two personality sub dimensions (*emotional stability* and *compatibility*) and the PET's sports branches. Racket sports and handball players are *emotionally more stable* than gymnasts. Basketball and defense sport players are more *compatible* than swimmers. In his earlier study from 2014 he does not find any significant differences between PETs' personality and their sports branch, sports type or the other examined correlates (gender, years of service, school type). In his study from 2015a he detects differences in PET's vocational personality regarding the school type and school level the PETs teach in, but not regarding their gender. PETs in private schools and high schools are more competent regarding their professional personality than their colleagues in public schools or secondary schools. Brudnik (2007) finds a difference between male and female PETs' vocational personality code. *Social, Investigative, Artistic (SIA)* summarizes females' vocational personality whereas *Social, Realistic, Enterprising (SRE)* is the male equivalent. She cannot

show a relationship between the vocational personality and work environment or school type.

Hosein Razavi et al. (2012) and Arbabisarjou et al. (2016) both find significant correlations between at least some personality sub dimensions and their examined correlates. Arbabisarjou et al. (2016) only report correlations without mentioning directions of these. The sub dimensions *extraversion* and *openness* of the PET's personality have a significant relationship with the students' beliefs and activities (Arbabisarjou et al., 2016). Hosein Razavi et al. (2012) find that three of the six components of entrepreneurial organizational culture (*creative innovation, cooperation* and *tolerance of creative talents*) obtain a negative correlation and two components (*organizational risk-taking* and *open communication*) a positive correlation with the PET's entrepreneurial personality characteristics.

The PET's Personality From an External View

Category III consists of studies that aim at receiving an external view on the PET's personality. The eleven studies in this category examine OSTs and students as members of the school community. The category can be divided into three thematically coherent groups: (1) *Studies generally describing the PET's personality*; (2) *Studies obtaining attitudes of/opinions toward PET's personality*; (3) *Studies describing "the ideal PET."* Three studies each can be assigned to group (1) (Zalech and Rutkowska, 2014; Lauritsalo et al., 2015; Senn et al., 2017) and (3) (Voll, 2006; Zalech, 2011a,b). Five studies belong to group (2) (Brandl-Bredenbeck, 2006; Szczepanski, 2012; Demir, 2015c, 2016; Georgiev, 2016).

In group (1), Zalech and Rutkowska (2014) compare the image of the PET from the PET's own perspective with students' and colleagues' descriptions. Senn et al. (2017) are interested in the relationship of PET's personality characteristics with students' motivation in PE, solely considering the students' view. Lauritsalo et al. (2015) aim at collecting an unbiased overview of students' attitudes toward school PE in Finland by collecting messages from chat protocols in internet discussion forums. Lauritsalo et al. (2015) do not mention the PET's personality in their aim but as an outcome factor – together with the PET's behavior. Lauritsalo et al. (2015) and Senn et al. (2017) closely associate PET's personality with behavior whereas Zalech and Rutkowska (2014) follow a trait psychological approach. In group (2) Brandl-Bredenbeck (2006), Demir (2015c, 2016), and Georgiev (2016) aim at obtaining the students' attitudes toward their PETs. Georgiev (2016) follows Leary's (Leary, 2004) theory of interpersonal interaction in order to assess personality. Demir (2015c, 2016) speaks of teachers' professional personality and therefore follows a vocational personality standpoint. Brandl-Bredenbeck (2006) speaks of personality in general closely related to behavior and supplements this general approach by examining the PET's care as additional personality aspect. Szczepanski (2012) also asks for opinions on the PET's personality but compares PETs' and OSTs' views, explicitly speaking of image or identity and therefore being in line with trait theory. The authors in group (3) – Voll (2006) and Zalech (2011a,b) – explicitly ask for the ideal (or not ideal, Zalech, 2011a) PET and all follow a trait psychological approach of personality.

In Zalech and Rutkowska's (2014) study PETs evaluate themselves more positively than their colleagues (OSTs) or students. OSTs and students describe the PETs as e.g., less patient, less hard-working and less intellectual compared to PETs' views. In total, PETs mark more favorable than non-favorable adjectives when describing their personality with a choice of given adjectives. The three groups are in agreement with each other regarding the most characteristic identity attributes of PETs – all mentioning active and energetic (Zalech and Rutkowska, 2014). Senn et al. (2017) detect differences regarding the students' gender and sportiness when assessing the role of the PET's personality for their motivation in PE. Girls put more emphasis on the skill that the PET realizes their fears and sporty kids choose different attributes as important for their motivation (e.g., achievement orientation and strict grading) compared to less sporty kids. Lauritsalo et al. (2015) detect more negative, not empathetic statements regarding the PET's personality than positive ones. Students describe PETs as not supportive, accompanied by strong feelings of compulsion and humiliation (Lauritsalo et al., 2015). In total, in this study 40 percent of the analyzed messages contain statements regarding the PET's personality or behavior – making this facet the dominant outcome variable.

Georgiev (2016) finds out that younger students put more emphasis on PETs' caring behavior and interest in their problems than older ones. The desire for communication, understanding and cooperation with the PET increases with the students' age. In Szczepanski's (2012) study, PETs rate positive image attributes (e.g., *cheerful lifestyle, openness, honesty, immediacy, and positive thinking*) of themselves higher than their colleagues (OSTs). The biggest difference occurs for the personality characteristic *organizational ability*. Considering the PETs' opinion, the top three characteristics, which distinguish them from their colleagues, are *organizational ability, dynamic actions* and *cheerful personality*. OSTs mention the PETs' *clothing style* as the strongest distinguishing feature followed by *dynamic actions* and *cheerful personality*. Demir (2015c, 2016) is again represented with two studies in this category, both obtaining students' attitudes toward their PET's professional personality competence. Demir (2016) finds significant gender differences for one subcomponent (*motivational interaction*) only – girls being more satisfied with their PET's *motivational interaction* than boys. In his earlier study (Demir, 2015c) he finds differences for three subcomponents – *motivational interaction, professional enthusiasm/dedication, and reflective interaction*, – girls being more satisfied with the first two and boys with the last subcomponent. Demir (2015c) also highlights the fact that younger students – grade nine and ten students – and students of private schools are more satisfied with their PET's professional personality competence compared to grade 11 students and counterparts in public schools (school type differences also in Demir, 2016). In Brandl-Bredenbeck's (2006) study PETs are perceived as *self-confident, caring* and *friendly* by their students. In total, he speaks of a positive evaluation. Younger PETs receive a better evaluation than older PETs.

Zalech (2011b) detects *understanding, fairness, patience, and sense of humor* as the four most desired attributes of a PET.

He does not find any differences regarding the students' gender. In his study asking for the most undesired features of a PET (2011a) though the choice differs significantly between girls and boys. Boys e.g., indicate *submissive* and *indulgence* as undesirable features, whereas girls, e.g., indicate *being moody* as well as *quick-tempered*. Zalech (2011b) also finds a second-order interaction between gender and grade of students with girls in grade one for example choosing *strict* significantly more often as most undesired feature than boys in the same grade. Schools though do not have a significant impact on the choice. Voll (2006) finds out that students in grade eight generally put more emphasis on all examined personality characteristics (*fairness, understanding, being a partner, being a role model, assertiveness*) than their counterparts in grade nine. Voll (2006) also detects differences regarding school type or level. Students in urban schools, e.g., put more emphasis on the PET's *fairness* than their counterparts in rural schools. Further, students in vocational schools put more emphasis on the PET's *assertiveness* than Realschule (German middle school) students.

DISCUSSION

Our review aimed at summarizing the status of research concerning the personality of the PET. After the screening process 23 studies were included. The chosen methodology of a scoping review – following a rather broad approach with soft exclusion criteria – tried to make sure that all studies coming within our aim (*Summarizing empirical studies – their underlying personality understanding, research questions and results – considering the personality of the PET*) were included in the final review. Other scoping studies in our field that can be considered as balanced, analyze a similar number of studies [e.g., Richards et al., 2017 ($N = 20$); Sperka and Enright, 2017 ($N = 31$); Robinson, 2018 ($N = 30$); Killian et al., 2019 ($N = 24$)] and conclude with promising results, partly providing practical implications and indications for future research. Due to the studies' heterogeneity, results are hard to synthesize and compare among each other or with our results. All 23 in our review analyzed studies were cross-sectional, all but one quantitative. The underlying personality understanding but also the research questions and results of the included studies varied enormously and by this supported the assumption that the research field is wide and construed differently.

Discussion of Framework Conditions and Study Design

Twenty of the 23 included studies were published in 2010 or later – fifteen thereof between 2014 and 2017. Therefore, we can speak of an increasing research interest with regard to the PET's personality in the last years. This might be caused by Hattie's (2009) world-renowned meta-analysis stating the teacher's personality as one essential factor of successful learning. Considering the origin of the included studies, it is surprising that 18 studies originate from the Middle East or Eastern Europe. This might be due to political changes at around this time or probably in consequence of the PISA study's results in 2000

and subsequent survey times. The studies' sample size varied distinctly. For eight studies it seems difficult to generalize findings due to small sample sizes (Mantu and Montu, 2014; Demir, 2015a,b; Arbabisarjou et al., 2016; Georgiev, 2016; Hassan et al., 2016; García-Villanueva et al., 2017; Makhmutova et al., 2017).

Discussion of Personality Understanding, Research Questions and Results

The amount of different inventories used to assess personality ($N = 19$) emphasizes the assumption of a prevailing diversity among the different approaches to personality. Only five studies (Demir, 2014, 2015b; Arbabisarjou et al., 2016; Hassan et al., 2016; Maryam et al., 2017) used a *Five Factor* inventory and by this follow the *Five Factor* structure of personality (Costa and McCrae, 1999). Considering the fact that in general – not teaching context specific – personality research the *Five Factor* understanding of personality predominates the research area (John et al., 2008; Göncz, 2017), this number here can be considered rather small. Also only six studies followed a vocational approach of personality. This number was expected to be greater due to the chosen profession specific context.

In the following, the studies' research questions and results will be discussed separately, following the same three-part structure as before.

The PET's Personality

Interestingly, the personality between PETs and OSTs does not differ considerably according to the two studies approaching this question (Mantu and Montu, 2014; Hassan et al., 2016). Solely considering the factor *extraversion*, the PETs score significantly higher than OSTs, signifying that they are more extraverted. This becomes interesting and relevant when considering Kim et al.'s (2019) results that out of the *Big Five* domains, *extraversion* obtained the strongest association with the teacher's effectiveness and by this can be seen as favorable characteristic. Mantu and Montu's (2014) result that PETs are more *extraverted* than OSTs hinders that they particularly can positively influence their students' learning process. Due to the fact that only two of the included studies dealt with this topic, the implications have to be treated with caution though. García-Villanueva et al.'s (2017) study clearly stands out when comparing personality understanding and research questions. The content of this study can be considered as stand-alone among the others. Also in general educational research we could not find an equivalent study (*inter alia* Göncz, 2017).

The PET's Personality and Correlates

PETs' burnout risk is clearly the dominant correlate among the included studies. Considering the publication dates of the included studies in our review, the fact that it is still only examined in three studies is in line with burnout research's development in the last decade. Teacher burnout research gained popularity at the turn of the millennium (Krause, 2003). In this time, as a result of empirical investigations, the widely known assumption that teachers obtain stress and strain levels higher than workers in other professions emerged (Maslach et al., 1996;

Schaufeli and Enzmann, 1998; Schaarschmidt, 2004, 2005). Nowadays though after a decade of intensive research on this topic, work-related well-being is often approached from a positive perspective considering resources instead of demands and by this e.g., examining positive motivational processes and psychological states such as work engagement instead of burnout (Schaufeli et al., 2009). This is in line with psychology's orientation toward a *Positive Psychology* starting around the turn of the millennium (Schaufeli et al., 2009). Interestingly, the few included studies on this topic in our review, even though published later than 2006 follow the traditional understanding of burnout and conclude with a relationship between PETs' personality factors and their burnout level. As the results have shown, the amount and exact manifestation is unclear though. The orientation toward burnout might be explicable with our review's focus examining PET's personality. This orientation and therefore the relationship between teacher burnout and personality is also a common research topic in recent general educational research, especially when examining indicators for professional success. Cramer and Binder (2015) and Kim et al. (2019) examined the relationship between *Big Five* personality characteristics and burnout among teachers in general and conclude with similar results: high scores on *neuroticism* solidly indicate an increased burnout risk and low scores on *extraversion* and *conscientiousness* seem to indicate at least partly a reduced burnout risk. This is in line with Maryam et al.'s (2017) results – the only study in our review that analyses the relationship between PET burnout and *Big Five* personality characteristics. In comparison to studies considering teachers in general, the topic seems to be rather understudied for PETs. Research considering the PET's stress though – without linking it to personality and rather connecting it to their health – has gained popularity in recent years. Brandt (2019) highlights this fact in his dissertation summarizing quantitative and qualitative studies examining the PET's health. He concludes that PETs obtain rather high stress levels and are health wise more vulnerable than OSTs.

Demir (2014, 2015a,b) concentrates his research on the relationship between the PET's personality and the PETs' sporting practice – a focus area which does not receive a lot of attention in previous studies. It becomes interesting in the discussion on how much practical education PETs should receive at university, how comprehensive this should be and concomitant which sporting competencies should be condition for entering a teaching degree. In previous research it was only the overall picture of the PET's sportiness (Messing, 1979) that received attention whereas Demir (2015b) goes into detail and differentiates in terms of the particular practiced sport – sorted by branch and type. Due to the fact that his results are contradictory this approach does not raise hope for practical implications though.

Only one study (Arbabisarjou et al., 2016) examines the relationship of the PET's personality and students' actual behavior in the lesson and by this links the PET's personality to student participation and motivation in PE. This link is common in general educational research. Kunter et al. (2013b) for example revealed positive effects of the teacher's personality (in this particular case enthusiasm) on instructional quality and by this on student outcomes, such as motivation or achievement.

Wayne and Youngs (2003) pursued this relationship in a literature review also concluding with the fact that certain teacher characteristics foster student achievement. Arbabisarjou et al.'s (2016) results are especially interesting when following educational research's assumption that the teacher influences student motivation and learning success (Hattie, 2009; Erpic, 2013; Kim et al., 2019). Considering Arbabisarjou et al.'s (2016) results, the personality factors *extraversion* and *openness* should therefore receive attention when considering student participation and motivation in PE, e.g., in teacher education or lesson planning. Arbabisarjou et al. (2016) raise the awareness for the right amount of interpersonal relations, creativity and flexibility when teaching. Even though the variability of the personality characteristics is rather small, knowing the individual manifestation, such as being overly *extraverted* and *open*, can help teachers in order to motivate students when deliberately playing to their own strengths. Conversely, less *extraverted* or less *open* teachers need to be presented with or find other strategies in order to ensure their students' motivation. Senn et al.'s (2017) study (category three) runs in a similar direction but only works with one variable (students' attitudes). Other than that, to the best of our knowledge, this explicit and interesting relationship has not been examined in PE context so far.

Brudnik (2007) and Demir (2015a) both following predominantly a vocational approach, conclude with contradictory results – no gender differences regarding PET's vocational personality in Demir's study but in Brudnik's; no differences regarding context factors in Brudnik's study but in Demir's. This might be explicable with their interpretation of vocational personality. Brudnik (2007) follows Holland's (1994) understanding asking for *preferred activities*, *possessed skills* and *professional preferences* whereas Demir's (2015a) scale includes the self-evaluation of *professional enthusiasm*, *respect for human dignity* and *interactional components (reflective and stimulating)* and by this partly follows an interactive approach within the vocational understanding. Demir's (2015a) decision to ascertain enthusiasm is again in line with modern general educational research's understanding of the teacher's professional competence (e.g., Baumert and Kunter, 2011) including a broad understanding of the term personality. Teacher enthusiasm in general educational research is often examined in relation to student outcomes such as motivation. Keller et al. (2013) suggested a *personal trait like enthusiasm understanding* within an integrated model of teacher enthusiasm and by this highlighted the relationship to and importance of personality characteristics.

The PET's Personality From an External View

With 11 studies in this category, examining an external view of the PET's personality can clearly be seen as a methodological peculiarity among the included studies. Connelly and Hulsheger (2012) were able to show that external observers have a clearer view on a person's personality and are therefore able to provide a certain depth of personality information. Further, Dinger et al. (2014) comparing self and observer reports of personality functioning conclude that the combination of both views was most efficient and should therefore be considered in future

research. Observer reports certainly add essential information and offer possibilities for incorporating bordering approaches upon personality.

Brandl-Bredenbeck (2006) incorporates the PET's care estimated by students as part of the PET's personality. This understanding borders upon Self-Determination-Theory (SDT) (Deci and Ryan, 2002) – considering the PET's care as part of SDT's factor relatedness. Interestingly, research focusing on the teacher's care – often in relation to student engagement (Nie and Lau, 2009) or student motivation (Thompson, 2010; Bieg et al., 2011) – is mostly located in general educational research. Especially in PE context though where PET's relationship closeness to students automatically receives importance, caring aspects seem to be influential. Brandl-Bredenbeck's (2006) approach of examining PET's care could be interesting, especially for researchers linking PET's personality with students' personality and further with their learning motivation.

Five studies aim at receiving attitudes/opinions toward the PET's (personality) which is also a common research aim in general educational research (Göncz, 2017). Interesting is also group three's focus – *the ideal PET*. Receiving attitudes/opinions toward the teacher and looking upon the ideal teacher are also visible strategies in the configuration of prevailing didactical concepts. Concretizations among these are e.g., obtaining students' attitudes toward their teacher as basis for further decisions when planning lessons or when teaching (e.g., making use of the methodology *student reflection* in order to influence students affectively, Cavilla, 2017). Additionally the focus area raises the predominant question if there is such a thing as the ideal teacher or the good and desired educator personality (Weinert and Helmke, 1996). Studies in category three in our review acknowledge the fact that students are valuable evaluators of their PE lessons (e.g., Brandl-Bredenbeck, 2006; Voll, 2006) and by this also their PET. They deliberately ask for desired or undesired character features (e.g., Zalech, 2011a,b) and believe that this information and empirical evidence can serve as a base for student-centered and adapted teaching. Amongst this content-related salience, category three comprises the only qualitative study (Lauritsalo et al., 2015) which follows a rather modern and in this research field unprecedented approach – screening internet chat forums. The approach itself certainly is exciting as it does not face typical problems that occur in questionnaire surveys, e.g., limited options to answer or drifting to the center when answering and therefore produces “relatively authentic natural data” (Holtz et al., 2012). It is necessary though to check if adolescents in chat forums really venture their personal opinions or the desired opinion of their friends.

The results regarding the PET's appearance – considered here as part of their personality (e.g., in Szczepanski, 2012; Zalech and Rutkowska, 2014) – resemble the common belief that PETs represent special personalities and can be distinguished from OSTs. It opens up questions and ideas for career advice for instance. Interestingly, the PETs evaluate themselves in a more positive light than their colleagues. This might be due to a generally higher evaluation of oneself by e.g., faking answers in order to appear socially better (Sjöberg, 2015) or because PETs in general possibly come off differently compared to OSTs such

as Mantu and Montu's (2014) results hint for the personality factor *extraversion*.

Overall, it is noticeable that when examining students, most studies also distinguish between the students' gender, the grade they are in and the school they attend. Senn et al. (2017), connecting the PET's personality to students' motivation, directly ask for motivation enhancing personality characteristics and detect gender and age differences between girls' and boys' perception. In addition, girls and boys in Voll's (2006), Zalech's (2011b), and Demir's (2015c) studies assess different PET personality characteristics as important and desirable. Consequently, when teaching single-sex groups of students it might be easier for the PET to satisfy the students' expectations and perform suitable for the taught group. In line with previous general educational research (e.g., Samdal et al., 1998) is the fact that younger students seem to be more satisfied with their teacher. Even though younger students compared to older students in general tend to be more satisfied with school and the teacher (Samdal et al., 1998), the studies' results could predict the need for raising the awareness of the topic *PET personality* especially in the area of secondary school teaching and concomitant teacher education as elder students seem to be more particular. Knowing their personality characteristics could therefore be beneficial for PETs in order to succeed when teaching this age group. It allows PETs again to play to their own strengths or deliberately focus on different motivational approaches detached from their personality. Another dominant result covers differences regarding the visited school (type and level) – both on the teacher and the student side. School type (private vs. public) but also school level (e.g., middle school, higher level secondary school, vocational school) affect the evaluation of the PET's personality (e.g., Voll, 2006; Demir, 2015c). This presages the possibility of a voluntary personality examination serving as assistance in the decision for a school-specific teaching degree program. Some states in Germany (Nordrhein-Westfalen, Baden-Württemberg and Rheinland-Pfalz) and the teachers colleges in Austria e.g., use CCT (Bergmann et al., n.d.) a web-based consulting tool, including the examination of personality characteristics. This tool serves as assistance in the decision process for students entering a teaching degree program.

Lauritsalo et al.'s (2015) study is the only one among the included studies that in general speaks of a rather negative image the students assign their PETs. Again, the chosen methodology can affect the results as e.g., group pressure could have led to the dominance of negative statements. This might be due to the users' tendency to make more extreme and more offensive statements on the internet (Williams et al., 2002). All other studies that examine the students' image of the PET's personality conclude with a positive picture.

IMPLICATIONS

In total, the results reflect the included studies' diverse methodological approaches and aims. This is also in line with general educational research's findings concerning the topic *teacher personality*. Göncz's (2017) five types of teacher

personality studies – (1) Teacher typologies; (2) Studies of teachers' desirable and undesirable features; (3) Studies of teachers' professional behaviors and their influence on students; (4) Studies of teachers' professional identities and (5) Studies of teacher personality within the framework of personality theories – can also be retrieved in our results. Type (1) *Teacher typologies* though is represented the least with only Brudnik (2007) speaking of teacher vocational personality codes and by this in the broadest sense also typologies. Even though not included in our review, Bräutigam (1999) can be seen as exemplary and popular study among PETs, examining students' opinions concerning the *bad PET* and concluding with PET's behavior typologies. He does not speak of personality, neither in his methodology nor in his outcomes and therefore was not included in our review, but the methodology of creating typologies and by this tangible results, seems promising and has obtained acceptance. Identifying typologies is a common and convenient approach especially when trying to derive practical implications and therefore should be considered in future research examining PETs' personality.

Göncz's (2017) type (2) *Studies of teachers' desirable and undesirable features* mostly implies other-reports, in his review as well as in our review. Kim et al. (2018) highlight possibilities and strengths of other-reports in this research field specifically as well and concluded with stronger associations between other-reports of teacher personality and outcomes (teacher effectiveness and burnout) than self-reports. Other-reports as mentioned before therefore seem to be a promising approach when examining the PET's personality and deriving practical implications.

Göncz (2017) addresses the partially low methodological quality in this field. We can support this assumption considering the included studies' methodological quality in our review. The number of participants, e.g., is often even adduced by the authors themselves as limiting factor, reducing their study to a case study (e.g., Brudnik, 2010). Demir's sample sizes vary enormously. He e.g., compares data from 1148 students from public schools with data from 273 students from private schools (Demir, 2016). In other studies the description of the undertaken methodological approach and the presentation of results are even unclear and partly contradictory and therefore have to be interpreted with caution (e.g., Hosein Razavi et al., 2012).

In total, we can speak of insufficient evidence in total and therefore suggest a cautious application of the aforementioned results and discussed issues, especially when considering the implication into teaching practice. We can align ourselves with Göncz (2017) when advising to follow the traditional personality models (e.g., *Five Factor* understanding) in order to ensure high methodological quality and a uniform foundation for educational research and valuable comparisons. Kim et al. (2018) focus specifically on the *Big Five* and conclude with valuable results for the evaluation of teaching. All *Big Five* domains except for *agreeableness* obtained a positive association with e.g., teacher effectiveness. They as well highlight the need for common, universal descriptors in teacher personality research and associated dissemination. This can especially be helpful for the abovementioned situations where PETs can play to their

own strengths and make use of their individual personality configuration in order to teach successfully.

LIMITATIONS

We decided to keep our understanding of personality as wide as possible in order to include all relevant studies and in order to answer the formulated research question. Therefore, the included studies had to actually measure personality as a variable or mention personality as an outcome. We acknowledge the fact that this procedure might have eliminated interesting studies that examine similar, related variables without mentioning personality explicitly. We also acknowledge the fact that by limiting our review to English and German publications – due to feasibility reasons – we might have lost relevant and interesting literature published in other languages.

CONCLUSION

In conclusion, results of the included studies differ significantly, are partly contradictory and partially exhibit major methodological shortcomings. Considering the underlying personality understanding, most studies ($N = 12$) follow a trait psychological understanding of personality. Six studies follow a vocational and one study an interpersonal personality understanding. The remaining four studies' underlying personality understanding is not concretely determinable but three out of the four studies are oriented toward an interactionist/behavioral view (see **Table 1**). The identification of these three prevailing orientations with the dominance of the *FFM* implies a rather consolidated orientation of the research field. Overall, this picture is congruent with general educational research's orientation toward a mostly trait psychological understanding. Due to the fact that the vocational as well as the interactionist/behavioral approach yields interesting results we suggest following a rather wide approach of personality. Within this wide approach it is advisable though to also follow generally accepted approaches of personality in order to compare results and to facilitate the creation of practical implications. Alongside the idea of including various facets of personality in promising research, the compilation of different viewpoints, especially when aiming at the impact of the PET's personality on student-related aspects, seems promising.

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Considering examined correlates in relation to the PET's personality, the two-part alignment prevalent in general education research mentioned in the introduction – personality in relation to student-related or teacher-related factors, mostly *success outcomes* – cannot be replicated in our review. Studies in our review mostly examine the relationship between the PET's personality and correlates of sociodemographic nature (e.g., gender, age). The promising results in general educational research and the significance which general educational research and teacher competence models attribute to the teacher's personality, leads to the conclusion that examining the PET's personality in relation to the aforementioned *success outcomes* should receive more attention and therefore be considered in future research.

AUTHOR CONTRIBUTIONS

MS, AK, SS, and FM conceived and designed the study. MS and AK performed the literature search and study selection process. MS, SS, and AK performed the final analysis process. MS wrote the manuscript with substantial contributions from AK, SS, and FM. All authors approved the final version of the manuscript.

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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.

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4.4 Article 4

Authors: Schnitzius, M., Kirch, A., Blaschke, S., Spengler, S., and Mess, F.

Title: What makes a physical education teacher? Person-related factors for physical education development.

Note: Article 4 includes comparable analysis to Article 2 on the student side and is still under review in the *British Journal of Educational Psychology*

Abstract:

Background. The physical education (PE) teacher is a decisive factor for PE development and teaching. Reflecting on and making the best possible use of the PE teachers' personal resources positively influence teacher effectiveness and student achievement. This requires a comprehensive analysis of PE teachers' personal characteristics. **Aims.** Consequently, this study aimed to describe PE teachers by using an aggregated examination of PE teachers' synergistic personal characteristics and analysing gender, age, and school type differences. **Sample.** 1,163 German PE teachers (61.9% female; M = 43.16 10.8 years) from six different school types participated in the study. **Methods.** Participants completed self-report questionnaires assessing PE teachers' General Personality Traits, General Interests, and Motivational Characteristics (Teacher Self-Efficacy, Enthusiasm, and Interests). Descriptive analyses, between subjects MANOVAs, and univariate ANOVAs with pairwise multiple comparison tests were applied. **Results.** Multivariate gender differences occurred for General Personality Traits ($\eta^2 = .04$), General Interests ($\eta^2 = .07$), and Motivational Characteristics ($\eta^2 = .03$); age differences for General Personality Traits ($g^2 = .03$); school type differences for General Personality Traits ($\eta^2 = .05$); and Motivational Characteristics ($\eta^2 = .11$). Considering individual dimensions, gender revealed most univariate differences, especially in General Personality Traits and General Interests. School types revealed most univariate differences in Motivational Characteristics. **Conclusion.** The educational personnel can (1) make use of the PE teachers' general stable factors by aligning teaching accordingly, for example considering teachers' gender and (2) specifically foster PE teacher personal development regarding Motivational Characteristics by, for example adapting teacher education or professional training to the particular school type.

Contribution:

Melina Schnitzius is the first and corresponding author of Article 4. Alina Kirch is co-author and contributed to Article 4 as follows. Alina Kirch next to Melina Schnitzius, Sarah Spengler and Filip Mess contributed to the conceptualization of the manuscript. Together with Melina Schnitzius and Simon Blaschke, Alina Kirch contributed to data analyses. Alina Kirch contributed to the interpretation of the study's findings. Alina Kirch was also involved in the editing process of the manuscript written by Melina Schnitzius. All authors approved the final version of the manuscript.



What makes a physical education teacher? Personal characteristics for physical education development

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Background. The physical education (PE) teacher is a decisive factor for PE development and teaching. Reflecting on and making the best possible use of the PE teachers' personal resources positively influence teacher effectiveness and student achievement. This requires a comprehensive analysis of PE teachers' personal characteristics.

Aims. Consequently, this study aimed to describe PE teachers by using an aggregated examination of PE teachers' synergistic personal characteristics and analysing gender, age, and school type differences.

Sample. 1,163 German PE teachers (61.9% female; $M = 43.16 \pm 10.8$ years) from six different school types participated in the study.

Methods. Participants completed self-report questionnaires assessing PE teachers' *General Personality Traits*, *General Interests*, and *Motivational Characteristics* (*Teacher Self-Efficacy*, *Enthusiasm*, and *Interests*). Descriptive analyses, between subjects MANOVAs, and univariate ANOVAs with pairwise multiple comparison tests were applied.

Results. Multivariate gender differences occurred for *General Personality Traits* ($\eta^2 = .04$), *General Interests* ($\eta^2 = .07$), and *Motivational Characteristics* ($\eta^2 = .03$); age differences for *General Personality Traits* ($\eta^2 = .03$); school type differences for *General Personality Traits* ($\eta^2 = .05$); and *Motivational Characteristics* ($\eta^2 = .11$). Considering individual dimensions, gender revealed most univariate differences, especially in *General Personality Traits* and *General Interests*. School types revealed most univariate differences in *Motivational Characteristics*.

Conclusion. The educational personnel can (1) make use of the PE teachers' general stable factors by aligning teaching accordingly, for example considering teachers' gender and (2) specifically foster PE teacher personal development regarding *Motivational Characteristics* by, for example adapting teacher education or professional training to the particular school type.

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Physical education (PE) is the only setting in which all school-aged children experience instructed physical activity. In order to meet students' needs and motives to be physically active, PE ideally provides various movement experiences covering different strands, which are presented with different emphases (Kurz, 2000). By this, PE aims to (1) educate students to sports, to prepare and motivate them for a lifelong active lifestyle and (2) educate students through sports, to contribute, for example to students' personal development, and by this to the general educational mandate (Hardman, Routen, & Tones, 2014; KMK, 2019; Kurz, 2008). In order to fulfil this aim and responsibility within ongoing socio-cultural changes including sports culture (Horne, 2013), the PE context requires continuous development based on empirical findings (Lund, 2015; Naul & Scheuer, 2020). Often empirically examined determining factors concerning PE's development are the following four didactical components: (1) contextual factors such as facilities, (2) the lessons' content, typically pre-defined by PE's curriculum, (3) the students as target group, and (4) the PE teacher as the main agent holding the threads together and guiding didactical decisions (Scherler, 2004). Considering the PE teacher seems particularly relevant as: (1) PE's unique opportunities and contextual peculiarities demand a lot from the PE teacher, for example empathetic behaviour in interactions with heterogeneous groups of students. (2) Among the four abovementioned determining factors, the PE teacher is probably the most easily accessible and developable factor, for example in teacher education or teacher professional training where PE teachers strive for continuous personal as well as professional development. (3) General educational research has shown the relevance of the teacher and his or her personality in the educational process in general and in regard to learning outcomes in particular, for example the teacher's positive influence on student achievement (Hattie, 2009). Student achievement in turn is further a typical measure of teacher effectiveness (Kim, Jörg, & Klassen, 2019).

The teacher's role and accompanied chances and challenges regarding his or her effectiveness as a measure of job performance (Gordon, Kane, & Staiger, 2006) are, for example illustrated in the *Utilization of Learning Opportunities Model* (Helmke, 2017), the *Model of Professional Teaching Competence* (Baumert & Kunter, 2013) or the *Multilevel Supply-use Model of Student Learning* (Brühwiler & Blatchford, 2011). The abovementioned models explicitly address the teacher's personality as essential component of teaching. Kim et al.'s (2019) meta-analysis confirmed this understanding. They further proclaim to identify vital factors of the teacher's personality. Mayr (2014) has examined relevant person-related factors which led him to a definition of the teacher's personality. He proclaims the synergy of relatively stable *General Personality Traits* and *General Interests* as well as less stable *Motivational Characteristics* as essential components of the teacher's personality. Mayr's (2014) understanding follows an encompassing view and by this serves as starting point to identify characteristics of vital factors of the teacher's personality.

First, *General Personality Traits* are typically understood as five lexically derived domains – *Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness* (Big Five) – used to describe a person's general personality (John, Donahue, & Kentle, 1991; John, Naumann, & Soto, 2008). The Big Five are commonly studied in the occupational context, for example as influencing factors of mood (Berkovich & Eyal, 2019) or as predictors of job performance and consequently applied in job selection processes, also within the teaching profession (Kim et al., 2019). *Extraversion, Conscientiousness, and Openness* positively correlate with teacher effectiveness (Kim et al., 2019) or job satisfaction (Ranasinghe & Kottawatta, 2016) and negatively with

burnout (Kim et al., 2019). *Conscientiousness* is also positively associated with teachers' retention (Bastian, McCord, Marks, & Carpenter, 2017). Contrarily, *Neuroticism* and *Agreeableness* are considered as less favourable for the teaching profession. *Neuroticism* negatively impacts teachers' mood (Berkovich & Eyal, 2019) or promotes burnout (Cramer & Binder, 2015), and *Agreeableness* negatively impacts teacher effectiveness as well as student achievement (Kell, 2019).

Second, *General Interests* are typically understood and measured within Holland's (1994) RIASEC theory stating that people search for vocational environments suiting their abilities and interests. A fit between environment and interest is beneficial for staying in the teaching profession (Swanson, 2012). Holland classified six interest orientations – *Realistic*, *Investigative*, *Artistic*, *Social*, *Enterprising*, and *Conventional* (RIASEC) – and located the teaching profession in the *Social* sector. Consequently, people deciding for and flourishing in the teaching profession typically obtain a pronounced *Social* (S) interest. *General Personality Traits* and *General Interests* are relatively stable, which allows describing a teacher's inherent characteristics and make use of them when teaching by considering, for example their relationships to student outcomes.

Third, *Motivational Characteristics* are understood as profession- and situation-specific developable facets (Baumert & Kunter, 2011). Studies examining teacher *Motivational Characteristics*, which positively influence learning outcomes, have shown the importance of the following three facets: *Teacher Self-Efficacy* (Pfitzner-Eden, Thiel, & Horsley, 2014), *Teacher Enthusiasm* (Kunter, Frenzel, Nagy, Baumert, & Pekrun, 2011), and *Teacher Vocational Interests* (Schiefele, Streblov, & Retelsdorf, 2013).

Research has shown a positive relationship between *Teacher Self-Efficacy* and teacher effectiveness as well as student achievement (Caprara, Barbaranelli, Steca, & Malone, 2006; Hoy & Spero, 2005; Klassen & Chiu, 2010; Klassen & Tze, 2014; Skaalvik & Skaalvik, 2007; Zee & Koomen, 2016). Several studies (Klassen & Chiu, 2010; Klassen, Tze, Betts, & Gordon, 2011; Pfitzner-Eden et al., 2014) have proven a three-factor structure of *Teacher Self-Efficacy*, consisting of teachers' competence in *Instructional Strategies*, *Classroom Management*, and *Student Engagement*. Teachers' competence in *Instructional Strategies*, for example positively correlates with academic adjustment (Zee & Koomen, 2016). Teachers' *Classroom Management* competence positively affects students' adaptive academic development (Lazarides, Buchholz, & Rubach, 2018) and teachers' psychological well-being (Zee & Koomen, 2016).

Teacher Enthusiasm shows positive relationships with, for example teacher effectiveness and student achievement (Kunter, Klusmann, et al., 2013), or students' eagerness to learn (Bleck, 2018). Studies often distinguish between *Subject* and *Teaching Enthusiasm* (Kunter et al., 2011) and have shown positive relationships especially between *Teaching Enthusiasm* and teachers' occupational well-being (Kunter et al., 2011), classroom management competence (Bleck, 2018), instructional quality (Kunter et al., 2008), and student enjoyment (Kunter, Baumert, et al., 2013).

Teacher Vocational Interests have also shown positive relationships with instructional strategies (Schiefele & Schaffner, 2015). Schiefele et al., (2013) have revealed a three-factor structure distinguishing between *Subject*, *Didactic*, and *Educational Interests* and highlighted that teachers' *Educational Interests*, for example are related to student motivation (Schiefele & Schaffner, 2015). On the teacher side, Schiefele and Schaffner (2015) have shown that *Didactic* and *Educational Interests* are negatively related to burnout.

The research on *Teacher Self-Efficacy*, *Teacher Enthusiasm*, and *Teacher Vocational Interests* in relation to learning success outcomes on the teacher and the student side, as

well as their proven complementary interrelationships, supports their joint inclusion as *Motivational Characteristics* in Mayr's (2014) understanding of the teacher's personality, which can be applied to the PE setting and PE teachers' personality specifically.

So far, studies have only examined the factors individually. However, following Mayr (2014), an aggregated and holistic examination of the teacher's personality would be desirable in order to comprehensively describe the teacher's personality and show possible relationships between the factors. This knowledge can be used in teachers' professional development starting with student–teacher recruitment and education, which influence teacher effectiveness (Darling-Hammond, 2017). Mayr's (2012) supply–use model of teacher education explains how teachers achieve and develop professional competence and by this effectiveness. In Mayr's (2012) model, which follows a multifaceted understanding of teacher competence, teacher personality contributes to teachers' professional development process and consequently affects teaching behaviour as well as well-being.

The model further highlights the context dependency of the development process. The abovementioned studies examining individual aspects of the teacher's personality have mostly considered the school context in general or a classroom-based school subject in particular. PE takes on a special role within the school curriculum. It differs substantially from traditionally classroom-based school subjects, for example considering its context, content, or teacher–student interaction processes, which consequently poses special challenges to teachers (Schweer, 2017) and by this PE teacher education. The abovementioned context specificity along with PE's peculiarities speak for (1) analysing the PE teacher in the PE context specifically and (2) considering the subject's peculiarities and demands when interpreting findings on teachers' personal characteristics in order to concretize the description of PE teachers and deduce PE-specific teaching strategies, also on teacher education level.

Physical education teachers themselves, teacher educators, or education politicians benefit from knowing the configuration and relationships of PE teachers' personal characteristics. Reflecting on and making the best possible use of existing personal resources allows to align teacher education accordingly or specifically foster development processes. This requires a detailed description of PE teachers' personal characteristics. Further differentiating between genders, age groups, and school types enhances the description and allows deducing even more detailed implications for PE research and teaching. Consequently, our study aims to describe PE teachers by using an aggregated examination of personal characteristics and analysing gender, age, and school type differences.

Methods

Study design

The project [ANONYMIZED] was conducted in cooperation with [ANONYMIZED] and focused on student motivation in school PE. [ANONYMIZED] analysed person-related factors of PE teachers and students relevant for PE teaching in general and student motivation in particular. [ANONYMIZED] encompassed a quantitative, cross-sectional study, including a teacher and student self-report questionnaire survey. [ANONYMIZED] examined PE teachers of all school types ($N = 1,163/61.9\%$ female/ $M = 43.16 \pm 10.8$ years) and secondary school students from classes seven to ten ($N = 1,740/58.1\%$ female/ $M = 14.39 \pm 1.44$ years) [ANONYMIZED]-wide from April

2018 to March 2019. Participant recruitment took place via the [ANONYMIZED] and its partners, educational institutions, social media, personal contacts, and local press. The responsible educational ministries in each participating [ANONYMIZED] had approved the study. All participants provided their informed written consent. All governmental rules on data privacy and protection as well as the ethical principles of the Declaration of Helsinki were respected. This paper focuses on the teacher data.

Participants

Physical education teachers with teaching experience between 0 and 45 years ($M = 14.42 \pm 10.41$ years) were considered for the analysis. 62.7% were recruited via the [ANONYMIZED], 21.6% via educational institutions (e.g. colleagues or schools' management), 7.9% via social media, 6.1% via personal contacts and 1.8% via local press. Regarding participation format, 70.9% participated online, 29.1% via paper-pencil. The analysed PE teachers were divided into three different age groups (younger: 20–34 years; $M = 31.01 \pm 0.78$ years; 27.8%/middle-aged: 35–49 years; $M = 43.19 \pm 4.51$ years; 42.3%/older: 50–65 years; $M = 57.25 \pm 4.15$ years; 29.9%) and six different school types (primary: 13.4%/lower secondary: 21.1%/comprehensive secondary: 15.1%/higher secondary: 40.1%/special: 2.9%/vocational: 7.4%). Each participant could clearly be assigned to one group.

Measures

PE teachers' personal characteristics were examined using five different validated scales. Table 1 provides a detailed description of the five scales regarding their characteristics and internal consistency. Additionally, we assessed socio-demographic data: gender, age (year/month of birth), and school type (considering the present teaching position). Following Openheimer, Meyvis, and Davidenko's (2009) guidelines, we included two attention checks and one instructional manipulation check in the questionnaire.

Data analysis

First, in order to provide a descriptive overview of PE teachers' personal characteristics in the different subgroups, we calculated means and standard deviations of the PE teachers' *General Personality Traits*, *General Interests*, and *Motivational Characteristics* for gender, age, and school type and excluded missing values case wise. Second, in order to investigate whether PE teachers' *General Personality Traits*, *General Interests*, and *Motivational Characteristics* (dependent variables) differed between genders, age groups, and school types (independent variables), we conducted multivariate analysis of variance (MANOVA) functions for each of the aforementioned dimensions. Prior to the analysis, we checked MANOVA assumptions by applying Pituch and Stevens's (2016) guidelines and excluded missing values list-wise (Graham, 2009). If MANOVA models yielded significant results, we calculated follow-up univariate analyses of variance (ANOVAs) for each subscale individually (Huberty & Morris, 1989). We corrected for unbalanced data following Fox's (2016) recommendations and used Dunnett–Tukey–Kramer (Dunnett, 1980) pairwise multiple comparisons as post-hoc tests to investigate group differences on the factor variables. To quantify the findings' magnitude, we calculated effect sizes (η^2) – .01 representing a small, .06 a moderate, and .14 a large effect

Table 1. Measures: PE teachers' personal characteristics

Inventory	Authors (year)	Dimensions (items per dimension)	Cronbachs α	Rating levels	Sample item
General Personality Traits					
Big Five Inventory-2-Short	Rammstedt et al. (2018)	Openness (6) Conscientiousness (6) Extraversion (6) Agreeableness (6) Neuroticism (6)	.67 .75 .67 .63 .77	1 'Strongly disagree' – 5 'Strongly agree'	I am outgoing, sociable
General Interests					
General Interest Scale	Bergmann, Eder, and Mayr (2016)	Realistic (1) Investigative (1) Artistic (1) Social (1) Enterprising (1) Conventional (1)		1 'I am not at all interested in/I really don't like doing ...' – 9 'I am totally interested in/I totally like doing ...'	Realistic, e.g. working with machines or devices ...
Motivational Characteristics					
Scale for Teacher Self-Efficacy	Pfitzner-Eden et al. (2014)	Instructional Strategies (4) Classroom Management (4) Student Engagement (4)	.77 .86 .79	1 'Not at all certain I can do' – 9 'Absolutely certain I can do'	... being able to motivate students that show little interest in class I enjoy teaching
Teacher Enthusiasm Scale	Kunter et al. (2011)	Teaching Enthusiasm (5) Subject Enthusiasm (5)	.90 .82	1 'Strongly disagree' – 4 'Strongly agree'	
Vocational Teacher Interests Scale	Schiefele et al. (2013)	Subject Interest (6) Didactic Interest (5) Educational Interest (4)	.76 .76 .79	1 'Not at all true' – 4 'Very true'	I am especially interested in educational aspects of the teaching profession

(Cohen, 1988) – as well as 95% confidence intervals (95% CI). RStudio (Version 1.2.5033, RStudio Inc., Boston, MA, USA) was used for data analysis.

Results

Descriptive overview

Table 2 highlights descriptive statistics ($M \pm SD$) of the analysed variables in order to fulfil our research aim of describing PE teachers by an aggregated examination of their personal characteristics.

Gender, age, and school type differences

Table 3 shows gender, age, and school type differences in order to enrich the description. The conducted MANOVAs – *General Personality Traits*, *General Interests*, and *Motivational Characteristics* – revealed statistically significant differences with small to moderate effects. Follow-up ANOVAs only showed significant differences with small effects.

Gender differences

Gender differences occurred in all MANOVA models: 3–7% of multivariate variance of *General Personality Traits*, *General Interests*, and *Motivational Characteristics* was associated with gender. Univariate differences occurred in four dimensions of *General Personality Traits*, five dimensions of *General Interests*, and three dimensions of *Motivational Characteristics*. Female PE teachers scored higher than male PE teachers on *Extraversion* (95% CI [−0.16, −0.02]), *Agreeableness* (95% CI [−0.18, −0.06]), *Conscientiousness* (95% CI [−0.27, −0.11]), and *Neuroticism* (95% CI [−0.34, −0.19]). Regarding *General Interests*, *Realistic* (R) (95% CI [0.90, 1.56]) and *Investigative* (I) (95% CI [0.14, 0.69]) tasks appealed to males more than females, *Artistic* (A) (95% CI [−1.32, −0.72]) and *Social* (S) (95% CI [−0.85, −0.45]) tasks vice versa. Considering *Motivational Characteristics*, males felt more competent in *Classroom Management* (95% CI [0.11, 0.41]), whereas females showed higher *Didactic* (95% CI [−0.25, −0.11]) and *Educational Interest* (95% CI [−0.25, −0.10]).

Age differences

Age differences occurred only for *General Personality Traits*: 3% of multivariate variance of *General Personality Traits* was associated with age. Univariate differences occurred in two dimensions of *General Personality Traits*. Younger PE teachers were significantly more agreeable than middle-aged (95% CI [−0.23, −0.07]) and older PE teachers (95% CI [−0.23, −0.05]) but significantly less open than middle-aged (95% CI [0.02, 0.24]) and older PE teachers (95% CI [0.12, 0.37]).

School type differences

School type differences occurred for *General Personality Traits* and *Motivational Characteristics*: 5–11% of multivariate variance of *General Personality Traits* and *Motivational Characteristics* was associated with school type. Univariate differences

Table 2. Means and standard deviations of PE teachers' personal characteristics for genders, age groups, and school types

	Gender		Age					School type				
	Total N = 1,163	Female n = 720	Male n = 436	Younger n = 313	Middle-aged n = 477	Older n = 337	Primary n = 150	Lower Secondary n = 237	Comprehensive secondary n = 169	Higher Secondary n = 449	Special n = 33	Vocational n = 83
General Personality Traits												
Extraversion	3.68 ± 0.55	3.71 ± 0.56	3.62 ± 0.53	3.70 ± 0.56	3.66 ± 0.55	3.68 ± 0.55	3.63 ± 0.57	3.75 ± 0.58	3.65 ± 0.51	3.69 ± 0.56	3.52 ± 0.45	3.62 ± 0.48
Agreeableness	4.05 ± 0.47	4.10 ± 0.45	3.98 ± 0.48	4.15 ± 0.45	4.00 ± 0.46	4.01 ± 0.47	4.10 ± 0.44	4.03 ± 0.43	4.01 ± 0.48	4.08 ± 0.48	4.23 ± 0.35	3.92 ± 0.50
Conscientiousness	3.97 ± 0.60	4.04 ± 0.58	3.86 ± 0.61	3.95 ± 0.63	3.94 ± 0.60	4.06 ± 0.54	3.96 ± 0.59	4.02 ± 0.60	3.79 ± 0.61	4.04 ± 0.58	3.94 ± 0.65	3.92 ± 0.60
Neuroticism	2.23 ± 0.60	2.32 ± 0.58	2.06 ± 0.58	2.23 ± 0.57	2.24 ± 0.62	2.19 ± 0.59	2.33 ± 0.58	2.25 ± 0.58	2.25 ± 0.62	2.17 ± 0.59	2.06 ± 0.55	2.23 ± 0.66
Openness	3.57 ± 0.63	3.60 ± 0.62	3.53 ± 0.64	3.46 ± 0.64	3.59 ± 0.61	3.70 ± 0.62	3.55 ± 0.65	3.56 ± 0.60	3.51 ± 0.65	3.63 ± 0.64	3.74 ± 0.64	3.46 ± 0.56
General Interests												
Realistic	5.22 ± 2.58	4.76 ± 2.55	5.99 ± 2.45	5.12 ± 2.52	5.26 ± 2.61	5.26 ± 2.62	4.65 ± 2.55	5.19 ± 2.48	5.22 ± 2.63	5.30 ± 2.62	6.15 ± 2.36	5.61 ± 2.56
Investigative	5.33 ± 2.13	5.18 ± 2.15	5.59 ± 2.06	5.39 ± 2.11	5.30 ± 2.12	5.30 ± 2.16	4.97 ± 2.18	4.88 ± 2.09	5.37 ± 2.08	5.66 ± 2.09	5.31 ± 2.15	5.48 ± 2.11
Artistic	5.53 ± 2.32	5.91 ± 2.24	4.89 ± 2.33	5.45 ± 2.32	5.62 ± 2.32	5.51 ± 2.34	5.88 ± 2.16	5.38 ± 2.33	5.37 ± 2.40	5.70 ± 2.30	5.27 ± 2.29	4.78 ± 2.44
Social	7.47 ± 1.43	7.71 ± 1.29	7.06 ± 1.55	7.69 ± 1.33	7.38 ± 1.44	7.33 ± 1.51	7.65 ± 1.29	7.40 ± 1.45	7.49 ± 1.27	7.45 ± 1.49	7.73 ± 1.66	7.27 ± 1.53
Enterprising	6.84 ± 1.83	6.92 ± 1.80	6.71 ± 1.88	6.88 ± 1.76	6.75 ± 1.89	6.93 ± 1.83	6.66 ± 1.84	6.84 ± 1.89	6.79 ± 1.78	6.91 ± 1.85	6.92 ± 2.08	6.90 ± 1.55
Conventional	5.34 ± 2.29	5.38 ± 2.32	5.26 ± 2.24	5.63 ± 2.31	5.17 ± 2.28	5.23 ± 2.24	4.88 ± 2.25	5.21 ± 2.39	5.22 ± 2.22	5.63 ± 2.23	5.35 ± 2.15	5.33 ± 2.48
Motivational Characteristics												
Teacher Self-Efficacy												
Instructional Strategies	7.10 ± 0.95	7.11 ± 0.95	7.07 ± 0.94	7.00 ± 0.90	7.10 ± 0.99	7.21 ± 0.92	7.17 ± 0.93	7.17 ± 0.95	6.94 ± 0.96	7.09 ± 0.90	7.44 ± 1.13	7.00 ± 1.06
Classroom Management	7.11 ± 1.18	7.01 ± 1.19	7.28 ± 1.13	7.05 ± 1.13	7.10 ± 1.22	7.21 ± 1.16	7.12 ± 1.13	7.26 ± 1.16	6.85 ± 1.23	7.16 ± 1.14	7.10 ± 0.99	6.94 ± 1.41
Student Engagement	6.63 ± 1.06	6.67 ± 1.06	6.58 ± 1.07	6.62 ± 0.98	6.59 ± 1.05	6.72 ± 1.18	6.99 ± 0.97	6.57 ± 1.16	6.46 ± 1.01	6.61 ± 1.03	6.98 ± 1.15	6.47 ± 1.04
Teacher Enthusiasm												
Teaching Enthusiasm	3.50 ± 0.46	3.52 ± 0.46	3.46 ± 0.47	3.57 ± 0.41	3.47 ± 0.49	3.45 ± 0.48	3.61 ± 0.39	3.44 ± 0.51	3.47 ± 0.48	3.51 ± 0.45	3.54 ± 0.54	3.39 ± 0.41
Subject Enthusiasm	3.37 ± 0.48	3.38 ± 0.48	3.36 ± 0.47	3.43 ± 0.43	3.34 ± 0.50	3.34 ± 0.49	3.33 ± 0.48	3.31 ± 0.50	3.39 ± 0.48	3.42 ± 0.44	3.22 ± 0.58	3.36 ± 0.51
Teacher Interests												
Subject Interest	3.40 ± 0.43	3.40 ± 0.44	3.39 ± 0.41	3.43 ± 0.39	3.38 ± 0.45	3.39 ± 0.45	3.35 ± 0.44	3.37 ± 0.42	3.39 ± 0.39	3.45 ± 0.43	3.19 ± 0.57	3.34 ± 0.43
Didactic Interest	3.11 ± 0.55	3.18 ± 0.54	3.00 ± 0.54	3.12 ± 0.54	3.11 ± 0.55	3.12 ± 0.55	3.12 ± 0.48	3.07 ± 0.53	3.05 ± 0.55	3.15 ± 0.57	3.06 ± 0.55	3.01 ± 0.53
Educational Interest	3.17 ± 0.54	3.23 ± 0.51	3.06 ± 0.57	3.15 ± 0.52	3.12 ± 0.57	3.26 ± 0.51	3.33 ± 0.47	3.18 ± 0.54	3.12 ± 0.56	3.12 ± 0.54	3.48 ± 0.49	3.06 ± 0.59

Table 3. Gender, age, and school type differences of PE teachers' personal characteristics

	Gender			Age			School type				
	p	η^2	F	Post-hoc	p	η^2	F	p	η^2	F	Post-hoc
General Personality Traits	.006	.04	7.56		.006	.03	2.78	.004	.05	1.92	
Extraversion	.016	.01	5.87	f > m							
Agreeableness	.001	.01	10.82	f > m	<.001	.02	9.56	.026	.01	2.55	s > v
Conscientiousness	<.001	.02	18.21	f > m				.005	.02	3.41	ls > cs hs > cs
Neuroticism	<.001	.04	44.16	f > m	<.001	.02	10.72				
Openness											
General Interests	<.001	.07	11.97								
Realistic	<.001	.04	44.89	m > f							
Investigative	.005	.01	7.88	m > f							
Artistic	<.001	.04	37.95	f > m							
Social	<.001	.05	46.04	f > m							
Enterprising	.041	.00									
Conventional											
Motivational Characteristics	<.001	.03	3.75					<.001	.11	2.53	
Teacher Self-Efficacy											
Instructional Strategies											
Classroom Management	<.001	.02	14.80	m > f				.005	.02	3.35	ls > cs
Student Engagement								<.001	.03	4.85	p > ls p > cs p > hs p > v
Teacher Enthusiasm											
Teaching Enthusiasm								.017	.01	2.78	p > ls p > v

Continued

Table 3. (Continued)

	Gender		Age		School type	
	p	η^2	p	η^2	p	η^2
		F	Post-hoc		F	Post-hoc
Subject Enthusiasm						
Teacher Interests						
Subject Interest	<.001	.02	18.03	f > m	.010	.00
Didactic Interest	<.001	.02	17.59	f > m	<.001	.03
Educational Interest						5.48
						p > cs
						p > hs
						p > v
						s > ls
						s > cs
						s > hs
						s > v

Note. $p < .05$ = significant differences; η^2 = effect sizes; F = ratios of variances; Post-hoc = results of pairwise multiple comparisons.
 cs = comprehensive secondary; f = female; hs = higher secondary; ls = lower secondary; m = male; m-a = middle-aged; o = older; p = primary; s = special;
 v = vocational; y = younger.

occurred in two dimensions of *General Personality Traits* and five dimensions of *Motivational Characteristics*. PE teachers in special schools were significantly more agreeable than PE teachers in vocational schools (95% CI [0.05, 0.58]). Lower (95% CI [-0.41, -0.03]) and higher secondary school PE teachers (95% CI [-0.42, -0.08]) were significantly more conscientious than colleagues in comprehensive secondary school. Lower secondary school PE teachers felt more competent in *Classroom Management* compared to comprehensive secondary school PE teachers (95% CI [-0.79, -0.04]). Primary school PE teachers felt more competent in *Student Engagement* in comparison to lower secondary (95% CI [0.08, 0.75]), comprehensive secondary (95% CI [-0.87, -0.19]), higher secondary (95% CI [0.09, 0.65]), and vocational school PE teachers (95% CI [0.32, 0.16]). Primary school PE teachers revealed significantly more *Teaching Enthusiasm* than lower secondary (95% CI [0.03, 0.31]) and vocational school colleagues (95% CI [-0.40, -0.05]). Primary school PE teachers revealed more *Educational Interest* than comprehensive secondary (95% CI [-0.38, -0.03]), higher secondary (95% CI [0.07, 0.35]), and vocational school PE teachers (95% CI [-0.51, -0.03]). Special school PE teachers were more interested in educational aspects in comparison to comprehensive secondary (95% CI [0.01, 0.61]), lower secondary (95% CI [0.04, 0.69]), higher secondary (95% CI [0.08, 0.65]), and vocational school colleagues (95% CI [0.08, 0.77]).

Overall, gender showed multivariate differences in all MANOVA models whereas age only showed multivariate differences in one model. Considering the individual factors' dimensions, gender revealed the most univariate differences, especially considering *General Personality Traits* and *General Interests*. School types however revealed the most univariate differences in *Motivational Characteristics*.

Discussion

Our aim was to describe PE teachers by their configuration of personal characteristics and accompanied gender, age, and school type differences. Results indicate that PE teachers are rather agreeable but little neurotic. They are mostly interested in *Social* and *Entrepreneurial* tasks, feel especially competent in *Instructional Strategies* and *Classroom Management*, are very enthusiastic regarding their profession, and interested in the subject PE. Genders differed distinctly, especially considering rather stable *General Personality Traits* and *General Interests*. Age groups revealed the least differences whereas PE teachers of different school types differed especially in less stable *Motivational Characteristics*. PE teachers' configuration of personal characteristics.

General Personality Traits

Physical education teachers in our sample reveal higher scores on *Extraversion*, *Agreeableness*, and *Conscientiousness* and lower scores on *Neuroticism* and *Openness* in comparison to a [ANONYMIZED] population norm sample (Rammstedt, Danner, Soto, & John, 2018). In comparison to teacher samples from the United States (Rockoff, Jacob, Kane, & Staiger, 2011), Australia (Kim, Dar-Nimrod, & MacCann, 2017), and Serbia (Djigic, 2018), our PE teacher sample obtains similar scores on *Extraversion*, *Agreeableness*, and *Conscientiousness* but lower scores on *Neuroticism* and *Openness*. Aware of the fact that cultural differences might have an impact on the results, these comparisons indicate that teachers in general obtain a teacher-specific configuration of the Big Five personality traits *Extraversion*, *Agreeableness*, and *Conscientiousness*. PE teachers in particular stand out

due to their lower *Neuroticism* and *Openness*. Low *Neuroticism* is often understood as emotional stability, which has been shown to correlate negatively with teacher mood (Berkovich & Eyal, 2019), teacher burnout, and positively with, for example teacher effectiveness, student achievement (Kell, 2019), or student performance self-efficacy (Kim et al., 2017). Emotional stability in turn indicates teaching behaviour that conveys security, facilitates establishing trust, and obtains higher stress resistance (John et al., 2008; Mount, Barrick, & Stewart, 1998). Emotional stability seems particularly relevant in PE lessons, for example because of diverse learning environments with often unclear outcomes, which require intensive interaction or trust between teachers and students. Further, higher stress resistance might be conducive to adapt to PE's context conditions, for example implying increased noise levels or voice impact (König, 2008).

The detected gender differences and accompanied effects across the five domains are in line with previous research and considered typical (Rammstedt, Kemper, Klein, Beierlein, & Kovaleva, 2013; Weisberg, Deyoung, & Hirsh, 2011). Female PE teachers' higher *Extraversion* and *Conscientiousness* indicate on the one hand that they might be especially attracted to the teaching profession and prone to perform well in the educational context. Especially *Extraversion* and *Conscientiousness* have been shown to positively influence their own (Kim et al., 2019; Scheepers, Lombarts, van Aken, Heineman, & Arah, 2014) as well as their students' performance (Kokkinos, Panayiotou, & Davazoglou, 2005). On the other hand, female PE teachers might put more time, effort, and because of their higher *Agreeableness* also emotions into their professional routine. Further, female PE teachers are less satisfied with, for example resources, recognition at work, capabilities as well as their quality of work (Mäkelä, 2014). Consequently, female PE teachers' pronounced emotionality, lower satisfaction with personal competencies and higher *Neuroticism*, seems to indicate a higher burnout risk (Kim et al., 2019; Zawadzka, Kościelniak, & Zalewska, 2018).

Younger PE teachers' higher score on *Agreeableness* and middle-aged as well as older PE teachers' higher scores on *Openness* are contrary to age differences detected in earlier studies with a German and an English population norm sample (Donnellan & Lucas, 2008). Younger PE teachers appear more empathetic, thoughtful, and trustful in comparison to their older colleagues, which in turn seem to be more aesthetically sensitive, curious, and creative. PE's contextual requirements and accompanied personal demands, which potentially develop with teaching experience, might explain differences on *Agreeableness*. Lower *Openness* scores, in our sample in general and among young PE teachers in particular, might be explicable with the items' phrasing, following a Big Five typical narrow consideration of *Openness* – embracing aesthetic sensitivity, intellectual curiosity, and creative imagination. PE teachers, in comparison to other professions, might less embody this intellectually oriented *Openness* understanding. Overall, we found very few significant age as well as school type differences. This speaks again for a PE teacher-specific configuration of *General Personality Traits*, which is unaffected by their setting specialization and characterizes them as distinct group of teachers that requires targeted consideration.

General Interests

Our sample obtains a *SEA* interest profile (Holland, 1966) and therefore strongest interest in *Social* (S) followed by *Enterprising* (E) and *Artistic* (A) tasks. This differs only slightly from the *SAE* profile, which has been shown, for example in the teacher take out of Holland's (1966) original sample, Bergmann's (2003) Austrian primary school teacher–

student sample, Swanson's (2008, 2012) samples of language teachers in the United States and Canada as well as Kaub, Karbach, Spinath, and Brünken's (2016) arts and language teacher sample in Germany. The *SAE* profile is typical for the teaching profession. Pronounced interest in *Social* (S), *Enterprising* (E), and *Artistic* (A) tasks is further positively related to teachers' efficacy and retention (Swanson, 2012). Klassen et al., (2018) identified organization – in Holland's (1966) interest theory depicted in the *Enterprising* (E) domain – as universally essential non-cognitive teacher attribute. *Enterprising* (E) interests are beneficial for a teacher's task to lead and bring students to achieve set goals within the educational mandate. Our sample's pronounced *Enterprising* (E) interest within their *SEA* profile speaks for their effectiveness, retention, and by this, lower burnout risk, which again seems favourable considering PE's inherent context conditions. The *Enterprising* (E) interest might particularly suit PE's subject speciality and accompanied requirements, for example high level of organization, management, and supervision.

Female PE teachers' higher scores on *Social* (S) and *Artistic* (A) suggest that – similar to their results on the Big Five – considering their personality they are more inclined to the teaching profession with its typical *SAE* profile than male PE teachers (*SEI* profile) are. Females in turn might flourish more in this environment. Males' higher interest in *Realistic* (R) and *Investigative* (I) tasks implies their interest in teaching practical–technical or investigative-oriented lesson units. The detected differences within our PE teacher sample might explain the predominance of female teachers in primary school (UNESCO Institute for Statistics, 2020), where educational and social, but also artistic and creative tasks are more in the focus than, for example technical or knowledge related investigative tasks.

While Holland's (1966) individual interest dimensions do not differ between age groups in our PE teacher sample, profiles do. Middle-aged and older PE teachers obtain a more teacher-typical interest profile (*SEA*), whereas younger colleagues (*SEC* profile) attribute more interest to *Conventional* (C) tasks (preferring structure and order) than to *Artistic* (A) tasks. Younger PE teachers might feel more secure and benefit from following clear structures (Greenberg & LoBianco, 2019) because of their lack of experience. The fact that individual interest dimensions do not differ between school types matches Brudnik's (2007) results as well as Holland's (1966) theory in general. Holland (1966) broadly defines professional environments: The profession teaching depicts a professional environment and by this attracts people with certain interest orientations, but not the specific school type.

Motivational characteristics

Teacher self-efficacy

Compared to Pfitzner-Eden's (2016) sample of advanced preservice teachers, PE teachers in our sample score higher on *Instructional Strategies* and *Classroom Management* but similar on *Student Engagement*. Our sample's distribution among the three dimensions is in line with Klassen et al.'s (2009) results of teachers from six different countries. Pfitzner-Eden's (2016) and Ma and Cavanagh's (2018) preservice or student–teacher samples however reveal lower values on *Classroom Management* in comparison to *Instructional Strategies* and *Student Engagement*. The fact that student–teacher samples differ from our sample and from other teacher samples, underlines Martin, McCaughtry, Kulinna, and Cothran's (2009) finding that *Teacher Self-Efficacy* is influenced by experience and therefore developable.

The comparisons further point out that over all teacher samples, among the three *Teacher Self-Efficacy* dimensions, teachers feel the least competent regarding *Student Engagement*. Possible reasons could be *Student Engagement's* dependency on the students, which might influence teachers' competence experience and estimation. *Student Engagement* is not so much favoured by experience but by the students' characteristics, for example their motives to be physically active or their motivational alignment. This assumption might also explain accompanied school type differences. Primary school PE teachers, for example feel more competent in *Student Engagement*. They face a student group that is generally easier to please and more motivated towards school or learning in general and school PE or activity in particular (Ntoumanis, Barkoukis, & Thøgersen-Ntoumani, 2009). Therefore, primary school teachers might find it even easier to engage students in their lessons and by this also motivate them for lifelong physical activity – part one of PE's aims.

Further, *Classroom Management* competence is closely related to the promotion of a learning enhancing classroom climate. This in turn positively influences student development (Jennings & Greenberg, 2009) and by this contributes to part two of PE's aims. Our results indicate that *Classroom Management* is more pronounced in males who possibly have a stricter teaching style. *Classroom Management* is further more demanded as well as difficult at comprehensive secondary schools with rather heterogeneous student groups.

Teacher enthusiasm

Our sample's *Subject Enthusiasm* is comparable to Kunter et al.'s (2008) math teacher sample – both samples reveal higher values than Mahler, Großschedl, and Harms's (2017) sample of secondary school biology teachers. Our results speak for PE teachers' generally high affiliation with their subject. This seems to be essential to achieve PE's aims, especially to engage previously non-active students.

Furthermore, our sample's *Teaching Enthusiasm* is similar to German secondary school homeroom teachers' (Aldrup, Klusmann, Lüdtke, Göllner, & Trautwein, 2018) and German preservice teachers' (Holzberger, Kunter, & Philipp, 2016) *Teaching Enthusiasm*. Burić and Moè's (2020) sample of Croatian high-school teachers of different subjects revealed higher *Teaching Enthusiasm* than our sample whereas Kunter, Klusmann, et al., (2013), Kunter et al., (2008) samples of math teachers and Mahler et al.'s (2017) sample of secondary school biology teachers obtained less *Teaching Enthusiasm*. PE teachers' high *Teaching Enthusiasm* might be because of the close interaction with their students, along with students' enthusiasm for the subject in general as well as their excitement during the lesson in particular. After all, PE is still a very popular school subject (Cárcamo, 2012).

Comparing both interest dimensions, our sample, Mahler et al.'s (2017) and Lazarides et al.'s (2018) sample revealed higher scores on *Teaching Enthusiasm* than *Subject Enthusiasm*. Our sample's high *Teaching Enthusiasm* seems beneficial as especially for *Teaching Enthusiasm* positive relationships with student enjoyment (Kunter, Klusmann, et al., 2013) and their learning progress (Kunter et al., 2011) have been shown. Primary school PE teachers obtain especially high *Teaching Enthusiasm*, which matches primary school's focus on educational aspects.

Teacher interests

Our sample's *Subject Interest* is higher than the *Subject Interest* of Schiefele et al.'s (2013) sample of teachers from different school types and Schiefele and Schaffner's (2015) primary school teacher sample. Kunter et al., (2011) described *Subject Interest* as topic-related and therefore, because of curricular requirements, for example less applicable in lesson planning. PE teachers' relatively high interest in the subject PE is a good prerequisite and basis to build on when developing more task-related aspects in the daily teaching routine.

Our sample's *Didactic Interest* is similar to Schiefele et al.'s (2013) sample and Retelsdorf, Butler, Streblov, and Schiefele's (2010) German teacher sample, but lower than the Israeli sample in Retelsdorf et al.'s (2010) sample and Schiefele and Schaffner's (2015) German primary school teacher sample. PE teachers also reveal slightly lower *Educational Interest* in comparison to Schiefele et al.'s (2013) and Schiefele and Schaffner's (2015) sample. Overall, differences to other teacher samples, especially regarding *Didactic* and *Educational Interest* are rather small and indicate a professionally uniform interest configuration with similar values on all three dimensions.

Female PE teachers' higher *Didactic* and *Educational Interest* possibly also explains the higher proportion of women in (1) primary schools (UNESCO Institute for Statistics, 2020), which might suit their interest orientations more than other school types, and (2) voluntary teacher professional training, as they generally strive to develop their competencies. However, male PE teachers might be generally more confident and therefore feel less need for professional development. This assumption matches Mäkelä's (2014) findings highlighting that male PE teachers are more satisfied with, for example their capabilities and quality of work than female colleagues. Primary and special school teachers' distinctly different *Educational Interest* in relation to most of the other school types highlights the schools' special requirements and accompanied tasks, for example the importance of the educational aspect and personal work with the students. This result matches their pronounced *Teaching Enthusiasm* and further implies that special personalities choose to work in these environments – matching their personal needs and professional interests.

Overall, comparisons have highlighted (1) the viability of *Motivational Characteristics* and (2) a rather teaching-specific manifestation with similar results for different teacher groups. In summary, PE teachers of different school types differ more regarding their *Motivational Characteristics* than their *General Personality Traits* and *General Interests*. This underlines the abovementioned assumption that PE teachers, regardless of their school type, on the one hand have a typical constellation of stable general characteristics. On the other hand, they differ regarding *Motivational Characteristics*, which are developable during their career in order to match the chosen professional setting.

Practical implications

1. Making use of what is out there: Personal resources for effective PE teaching

Personality questionnaires in study selection and job application procedures

General Personality Traits, *General Interests*, and *Teacher Enthusiasm* questionnaires can support students' choice of studies. On the one hand, questionnaire results can clarify

their fit with the teaching profession in general. On the other hand, such measurements can guide their decision for a subject specialization within the teaching degree. Particularly, *Subject Enthusiasm's* items adapted to the available subject specialization option (e.g. PE) with a reflection upon the results, can further guide prospective candidates in their decision for a subject. Researchers in Australia and the UK (Bowles, Hattie, Dinham, Scull, & Clinton, 2014; Rose, English, & Finney, 2014) have proposed to include personal characteristics measurements in the teacher application process. Guiding the decision for the teaching profession in order to achieve a fit between the applicants' personal resources and professional demands seems relevant in order to decrease teacher burnout and increase the longevity in the profession. This process further clarifies personal suitability in general and job-related strengths or weaknesses in particular. Guiding the decision for the subject PE or a certain school type seems relevant to increase PE teachers' effectiveness. On a critical side, applying personality questionnaires in student selection processes possibly does not do justice to *General Personality Traits'* culture specificity and by this might imply discrimination (Berkovich & Eyal, 2019). Further, they should probably solely serve as orientation in the light of the fact that there are beneficial configurations of personal characteristics but no ideal teacher personality type (Weinert & Helmke, 1996).

Different gender – different chances for PE?

The amount of gender differences within PE teachers' personal characteristics implies that it is beneficial to adapt teaching to the individual resources. *Agreeableness'* positive impact on student-reported teacher personal support (Kim & MacCann, 2017) can, for example explicitly, be useful in lesson sequences that require teacher–student interactions. Here, male PE teachers could benefit from reflecting consciously on their planned and conducted actions because of their lower *Agreeableness* values. Further, female PE teachers might have to consider their *Conscientiousness* configuration when planning and giving lessons as PE often demands flexibility in teaching. Female PE teachers' higher *Neuroticism* can be an indicator for them to think of (1) how they successfully deal with and prevent work-related stress – also in relation to their higher *Extraversion* – and (2) how they can assure security and trust in their lessons so that their rather low emotional stability does not affect the students' perception in the lesson. Male PE teachers' pronounced *Classroom Management* competence and lower *Extraversion* suggest that they embody less activity but authority. Therefore, they might feel especially comfortable when giving responsibility to their students, for example in student-centred lesson units. Overall, PE teachers should be encouraged to reflect on and make use of their person-related strengths when teaching.

Sharing competencies

Further, PE teachers should be aware of their personality's impact on teaching outcomes and accompanied differences, which our study highlighted. PE teachers have to apply this knowledge successfully in their teaching behaviour and, if possible, share their competencies with colleagues. Teachers with a higher interest in *Realistic* (R) – practical-technical – tasks can support colleagues with different interests and competencies, for example in *Social* (S), *Didactic* and *Educational* aspects, and vice versa. Lower *Neuroticism* and higher *Classroom Management* and accompanied teaching behaviour, which conveys security and trust, speak for competence in teaching risk-oriented lessons.

PE teachers who are less confident in this regard can, for example observe and exchange experiences with colleagues obtaining a more favourable configuration of these dimensions. Additionally, age differences on Big Five *Agreeableness* and *Openness* can be considered when sharing competencies. Younger PE teachers with pronounced *Agreeableness* might feel more competent in teaching student groups which particularly require understanding and gentle behaviour, and share strategies in this regard. Older PE teachers' greater *Openness* may prove beneficial, as they seem especially interested in new ideas both, from colleagues and students, and in turn share this new-gained knowledge. Already Macdonald (1999) has highlighted that PE teachers of different career stages differ and profit from each other: Experienced PE teachers' professional satisfaction, for example can positively affect their colleagues. Mäkelä and Whipp (2015) further highlight the relevance of personal development for successful collaboration between colleagues – for example younger and more experienced PE teachers –, which in turn positively impacts their quality of work-life and by this their satisfaction as well as PE's quality in general. Whipp and Pengelley (2016) support this relevance by showing the influence of collegial mentoring on personal and professional skills of PE teachers of different career stages. By sharing their competencies, PE teachers can play to their strengths and cooperate in order to be successful together but also protect their individual resources.

2. Developing of what is out there: Personal resources for professional progress

Adaptations to PE teacher education

Woods and Lynn (2014) have highlighted the relevance of individual dispositions as well as professional preparation programmes for PE teachers' career progression in general or their professional and personal skills, for example self-efficacy, in particular. *Teacher Self-Efficacy* beliefs can especially be shaped early in a teacher's career and can impact teaching quality at an early stage (Huber, Fruth, Avila-John, & López Ramírez, 2016; Tschannen-Moran & Hoy, 2007). Therefore, especially our results regarding *Teacher Self-Efficacy* can affect PE teacher education at university. The detected gender differences might, for example speak for differentiating between genders in PE teacher education or at least know about differences and include this knowledge in the programme design. PE teacher education could, for example offer *Classroom Management* competence training or stress-coping classes to students who feel the need for further training in this regard. Applicable strategies to practise and improve *Classroom Management* should be made available early in the studies and practised, for example in teaching work experiences in school. This allows to orient the strategies towards the schools' conditions and requirements (Mahler et al., 2017), for example particularly heterogeneous student groups in comprehensive secondary schools. PE teacher education is further the right phase to trigger *Didactic* and *Educational Interest*. Thereunder, teacher educators should aim to offer courses that also attract male students by highlighting the practical relevance of didactical and educational aspects for their teaching career. Detected school type differences confirm the mostly separate training of PE teacher–students specializing in different school types. Further, differences between the examined groups highlight the necessity for PE teacher education as well as professional development programmes to facilitate versatile experiences (O'Sullivan, 2006), which prepare different personalities of PE teachers with diverse experiences for varying student groups. Additionally, it is

important that offered experiences and applied teaching strategies in PE teacher education are based on practical experiences from in-service PE teachers (Richards, Gaudreault, & Woods, 2016) and purposefully implemented in order to actually achieve change within PE student–teachers’ beliefs and actions. This requires curricula, which include the abovementioned strategies, as well as PE teacher educators, which consciously communicate the curricula’s specifications and set an example of successful teaching and learning processes (Mordal-Moen & Green, 2012). Within this, Mordal-Moen and Green (2012) highlight the necessity of coordinating and bringing together the beliefs of PE teacher educators and PE student–teachers. This requires continuous reflection of both key players, responding to, for example socio-cultural changes and by this initiating development. Only if PE teacher educators set their students an example of reflecting personal resources, PE teachers will be motivated to personal as well as professional reflection and development.

Adaptations to PE teacher professional training

During later stages of PE teachers’ careers, professional development offers are often voluntary. Here especially, it is essential to consider PE teachers’ personal characteristics as basis for targeted professional development (O’Sullivan, 2006; Parker, Patton, & Tannehill, 2012) and communicate the necessity to focus on personal development as well as foster ongoing reflection of personal resources in self-study phases or professional training courses. This seems especially important in the light of the fact that insufficient personal as well as professional development is decisive causes to leave the PE teaching profession (Mäkelä & Whipp, 2015). Teacher professional training courses have to include knowledge about and implications of teachers’ personal aspects in addition to content-related or didactic aspects. This supports teacher effectiveness and ideally ensures longevity in the profession. Our results indicate that professional training offerings should cleverly combine didactical and educational with practical contents. PE teachers of different school types should receive school type tailored courses, adapted to the challenges the different contexts pose. PE teacher professional training should therefore aim for a good fit between teachers’ personal characteristics and the school type’s requirements.

Strengths and limitations

[ANONYMIZED] is the only [ANONYMIZED]-wide empirical investigation of school PE in the last decade. Further, the study’s sample size, detailed demographics, and comprehensive examination of PE teachers’ personality represent its strengths. Besides the study’s strengths, we would like to mention its limitations. Thereunder, it cannot be ruled out that there was some unintended bias in the sample with most participants being recruited via the [ANONYMIZED] and therefore being most likely either members of the [ANONYMIZED] or voluntary participants in their professional training programme. Further, participation in the study was voluntary, offered mostly through associations or school administrations such as principals. Therefore, the sample possibly includes a high percentage of PE teachers who are already committed and motivated to contribute to their personal, but also to PE’s general development. Last, due to the variety of advertising channels and the possibility to participate online, we cannot provide a response rate.

Conclusion

Physical education teachers should know their personality – including accompanied job-related strengths or weaknesses – and should continuously reflect on it. Knowledge of what makes a PE teacher is essential for successful teaching. PE teacher educators should also know the PE teachers' personal resources and requirements to specifically design their programme and address development opportunities. Personality-oriented teacher education should cover the first phase of teacher education at universities but also the second or third phase of PE teachers' professional development. The results indicate that not only the PE context seems to be exceptional when compared to classroom-based school subjects, but also the PE teacher seems to obtain a special constellation of characteristics, which favour teaching in this context. PE teachers' gender, or at least their gender-immanent socialization, seems to explain their personality distinctly, especially considering *General Personality Traits* and *General Interests*. Different school types seem to demand and attract special personalities, especially considering developable *Motivational Characteristics*.

General Personality Traits and *General Interests* therefore have a predominantly directional function. Less stable *Motivational Characteristics* particularly offer development opportunities in order to adapt to and fit within the chosen teaching context.

We suggest five focus areas for future research. First, in addition to PE teachers' self-reported data, considering the students' perception of the examined personal characteristics of PE teachers could elaborate the gained picture. Other researchers have also proclaimed to compare both perceptions (Connelly & Hulsheger, 2012; Göncz, 2017; Kim & MacCann, 2017). Further, this could provide an answer to the question of whether the frequently pursued PE teacher allocation – for example female teacher teaching female students – is favourable.

Second, research should consider health outcomes in order to enlarge the existing knowledge and by this achieve a better fit between the person PE teacher and PE's context-specific demands. This fit in turn on the one hand contributes to PE teachers' well-being and consequently to student well-being (Harding et al., 2019). On the other hand, it positively affects student enjoyment as well as achievement (Bajorek, Gulliford, & Taskila, 2014) and by this benefits the achievement of PE's aims.

Third, longitudinal studies would add value to the existing cross-sectional results by showing how, for example *Motivational Characteristics* develop in the course of the teaching career, including teacher education. This is in line with Ernst (2017) as well as Miethling and Krieger (2004), for example who have highlighted the importance of the PE teachers' biography.

Fourth, in addition to the individual consideration of personal characteristics, it would be insightful to see how they interact by, for example applying clustering methods, which detect different PE teacher types. This knowledge expands the understanding of the PE teachers' personality. It might further reduce the complexity of providing implications for all five personal characteristics individually by pooling similar teacher types together. This facilitates concrete practical implementations as PE teachers can, for example assign themselves to a pattern and base their actions on it.

Fifth, we can confirm the opportunity which personal characteristics offer in PE teacher selection or orientation processes and proclaim further research in this regard under the premise of PE's special alignment and context-specific peculiarities.

To sum up, our study has highlighted the need to consider PE teachers' personality in research and has shown options for implementing the gained knowledge in PE teacher education and professional training. We proclaim to consider the two introduced

implication options: (1) *Making use of what is out there*, and (2) *Developing of what is out there*. The suggested future research and implications for teaching will contribute substantially to the scientific community and will help the educational personnel to make use of the formulated *starting points*, which personal characteristics offer for successful PE teaching.

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Conflicts of interest

All authors declare no conflict of interest.

Author contributions

Melina Schnitzius (Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Visualization; Writing – original draft; Writing – review & editing) Alina Kirch (Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Visualization; Writing – review & editing) Sarah Spengler (Conceptualization; Methodology; Project administration; Writing – review & editing) Simon Blaschke (Formal analysis; Writing – review & editing) Filip Mess (Conceptualization; Methodology; Project administration; Supervision; Writing – review & editing).

Data availability statement

Sharing data compromises legal requirements (data protection requirements within the framework of ministerial permits).

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5 Discussion

This dissertation thesis aimed to describe PE's key players, mainly students and subordinately PE teachers. In this regard, Articles 1 and 3 have provided literature reviews of international personality research considering students and teachers in the PE context. Articles 2 and 4 have provided comprehensive pictures of students' and teachers' personal characteristics as essential teaching prerequisites in the PE context by aggregated empirical examinations. This comprehensive theoretical plus empirical consideration contributes to general educational research and PE research. The studies' practical orientation allows deducing practical implications for PE teaching as well PE teacher education and professional training. By this, the study can positively affect society, e.g., considering health behavior.

5.1 Overall Summary and Discussion of the Results

The dissertation thesis describes students' and teachers' requirements in the PE context. The scoping review focusing on students' personality in the PE context (see Article 1) showed that particularly the trait-theoretical understanding of personality is present in personality research considering students in the PE context. This result underlined the aforementioned dominance of the trait-theoretical approach in personality research in general (Berger, 2020). Comparable to research in the general educational context, most studies focused on the relationship between students' personality and their performance. This has highlighted that students' performance is the primary output measure and thus an indicator of successful teaching. However, studies further have shown that general personality traits are related to other characteristics relevant for engaging in PE, such as motivation, attitudes, enjoyment or anxiety. In addition, it was shown that an increased amount of PE or enrollment in PE classes supports students' personality development. As this was only prevalent in some characteristics, PE's possibility to contribute to personality development depends on the examined characteristics and speaks for opening the typically applied narrow understanding of personality. A wide understanding of personality allows deducing and by this identifying stable as well as developable characteristics, which in turn comprehensively affect PE teaching. Stable characteristics offer valuable knowledge of the learners and support teaching decisions prior to as well as within lessons. Developable and context-specific personal characteristics, such as physical self-concept, can be influenced more easily through PE or targeted interventions focusing on

sports and by this particularly offer links for school's as well as PE's allocated aim of student personality development.

Based on the findings of the aforementioned review (see Article 1), the empirical study was developed. The empirical study aimed to describe students holistically (see Article 2). The reviews narrow understanding of personality neglected additional aspects of personality that are potentially developable though. Further, following only a trait-theoretical approach neglected the abovementioned context-specificity. Therefore, the understanding of personality was opened within the thesis' empirical part following a broader approach in line with general educational research (Donat et al., 2017). The student examination therefore included general, rather stable and context-specific, more developable constructs related to student motivation in PE. Examining students' personal characteristics within a student-centered empirical approach follows Seidel and Shavelson's (2007) recommendation to consider student characteristics as well as Hanssen-Doose et al.'s (2018) suggestion to consider students' personal perspective and Helmke's (2017) advice to examine and analyze context-specifically. Article 2 has highlighted the dimensions' varying manifestation within the examined characteristics. Regarding *general personality traits*, students show low *neuroticism* and high *agreeableness*. Considering sports-specific characteristics, students were rather success-oriented and most attracted by the *fitness* motive. Further, students obtained high values on *physical self-concept* dimensions as well as on *sports interest*. Student groups differed, which allowed describing them by the manifestation of the examined characteristics. Gender explained the largest proportion of variance across all characteristics with 12 differing dimensions. School types differed in 11 whereas grades only differed in two dimensions. Practical implementations targeting at PE teachers' education or professional development should emphasize that certain groups of students may require different addressing. Findings have led to recommendations for PE teachers in schools and can further affect PE teachers' education as well as professional training.

The scoping review on the teacher side (see Article 3) showed that, similar to the review on the student side and personality research's general orientation (Berger, 2020), the trait-theoretical understanding of personality has prevailed personality research on PE teaching. Additionally, vocational personality approaches following Holland's (1997) theory of personalities in work environments were applied. Included studies either described PE teachers' personality or analyzed relationships between the PE teacher's personality and different correlates, e.g., burnout. However, it has to be stated that the methodological quality of the included studies was partly questionable. Results in the review as well as derivations from these have therefore been interpreted with caution. Due to the

relatively narrow understanding of personality in the form of the trait-theoretical approach, the review only offered limited recommendations for action, e.g., how PE teachers can use or rather develop their own personality based on the examined characteristics. Included studies mostly followed an implicit understanding of personality, of which participants are only partially aware and which is only limitedly accessible (Herzberg & Roth, 2014).

Therefore, the empirical examination on the teacher side, similar to the student part, has opened the narrow understanding of personality by additionally considering further potentially relevant less stable context-specific motivational characteristics. In line with results on the student side, besides general, context-independent constructs, context-specific and explicit personality constructs were included in the empirical study on the teacher side (see Article 4). This approach has followed Mayr's (2014) understanding of teacher personality, the prevailing consideration of teacher professional competence by Baumert and Kunter (2013) as well as Helmke's (2017) context-specificity. Context-specificity enables an accurate description of the PE teacher's personality and supports practical relevance within the PE context. In addition, PE teachers can be described in relation to their teaching environment or age in order to concretize context-specific recommendations for action. Results allow deducing practical implications with two foci: 1) Results, especially considering general context-independent and rather stable traits, offer opportunities how PE teachers can deliberately use their personality for teaching. 2) Results, especially considering less stable context-specific motivational characteristics, highlight possibilities for individual personality development.

5.2 Contribution to Educational Research

The German Federal Ministry of Education and Research stated 2018 in the *Framework Programme for Empirical Educational Research* the following fields of actions: *improving educational equity – recognizing and developing individual potential –, managing diversity and reinforcing social cohesion, ensuring quality in education, channeling and exploiting technological advances in the education sector* (Federal Ministry of Education and Research, 2018). This dissertation particular does justice to *improving educational equity and ensuring quality in education*.

The *Framework Programme* states the goal to assist each student according to their own requirements through individual support. Therefore, teachers should have good diagnostic competencies. Knowledge considering students' prevailing requirements in PE can help PE teachers to diagnose these more easily.

Quality in education is promoted by transferring the results to different levels of education: Quality within staff level in educational institutions depends significantly on the professionalism of teachers. Here, too, the aim is to examine teachers' requirements as central prerequisite for students' learning success. Components of professional competence are, in turn, diagnostic and subject competencies, but also non-cognitive competencies, which the empirical part of the dissertation focuses on. Beyond the national framework, research foci such as *Students at the Centre* or *Empowered Learning Professionals* are also present in the international context (ACT Government Education, 2018).

In the theoretical part of the dissertation, the focus was limited to the term personality in order to receive clarity about the understanding of the term. With the focus on personality, a traditional psychological field of research was applied in the educational context. Interdisciplinarity as typical feature of empirical educational research thus has provided the opportunity to approach a problem from different perspectives. The scoping reviews conducted in the theoretical part of the thesis showed that the narrow understanding of the concept personality internationally has developed over time into an increasingly uniform understanding. The empirical part considers the approach's acceptance by including trait-theoretical measures within the applied questionnaires on the teacher as well as the student side (see Articles 2 and 4). Therefore, the data provided a basis for comparison with previous and future studies in the educational context.

Following empirical educational research, a broad understanding of personality was applied (Donat et al., 2016) in the dissertation thesis. Based on Kollar and Fischer's (2019) teaching model, students' and teachers' requirements were described context-specifically in order to increase the models' fit for subject-specific teaching in PE. This has broadened the scope of empirical educational research in the research areas *professionalization of teaching staff* as well as *quality of teaching*. The empirical study provided a large data basis for comparative studies, considering for example different cultural contexts or school subjects. The comprehensive character along with the recording of different characteristics has offered numerous options for comparative studies. This large-scale study has the chance to attract attention of empirical educational researchers and receives political perception, especially considering its cooperation with DSLV. Focusing on PE in a large-scale study, which educational ministries in twelve federal states approved, supports PE's representation as meaningful field of research in general as well as PE's role within schools' subject canon.

Methodologically it has been rare to address teachers and students in one study. The presented study has linked the two actors in a large-scale survey and thereby has

increased the complexity of the research project. Further, this provides a more comprehensive picture of factors influencing the educational process.

5.3 Contribution to Physical Education Research

As discipline that strives for a comprehensive investigation of the reality of sports in the school context, PE research draws on various sports science disciplines (Bräutigam, 2008). In addition to the leading disciplines sports pedagogy and sports didactics, sports medicine, training science, and sports psychology influence school sport research. Students and teachers as active subjects in teaching and learning processes are particularly in the focus of sports psychological research questions. In general, student and teacher research has determined two of PE' four research fields: 1) student research, 2) PE teacher research, 3) teaching research, and 4) school development research (Bräutigam, 2008). The contents of the dissertation tie in with student and teacher research.

Highlighting which personality understanding prevails on the student as well as the teacher side, has enriched student as well as teacher research in the PE context. In addition, detected outcomes and connections to personality demonstrated the relevance of the construct in the PE setting. The thesis' empirical part has acknowledged PE's context-specificity by considering general as well as sports-specific characteristics. The comprehensive consideration of different characteristics has followed a holistic approach. Recording different characteristics within the same sample allowed linking the characteristics. Further, the large-scale study allowed specifying characteristics of different groups of students. The descriptive presentation, detected differences and relationships between different variables have formed the basis for future research (see Section 6). The contribution to PE research presented here is concretized in particular by its relevance for practice described in the following section.

5.4 Practical Implications

The practical implications of the thesis' results are divided into implications for PE teaching in schools, implications for educating future PE teachers at universities as well as fully qualified PE teachers in professional training.

5.4.1 Physical Education Teaching Practice

The thesis' findings can raise PE teachers' awareness for their students' and their own characteristics. Knowing students' as well as the own personal requirements can positively affect PE teachers' targeted lesson planning and teaching. Knowing and adequately addressing every single student is hardly realistic in typically heterogeneous student groups. The large-scale study's character though facilitates implications by covering a broad student body. This in turn allows deducing generalized statements applying to different student groups.

Student characteristics such as the orientation towards the *fitness* motive can be used to design PE's lesson content accordingly – e.g., including fitness elements in athletics or ball game oriented lesson sequences – and by this promote *education to sports*. Girls' lower *physical self-concept* – accompanied by lower *achievement motive* as well as higher *neuroticism* values – sensitize to consider or consciously promote these components especially within groups of girls – e.g., ensuring that students feel confident in the lesson and applying sustainable feedback strategies. The study's results therefore concretize lesson planning's initial step considering students' requirements. PE teachers now can more specifically anticipate and include so far only generally defined psychological and social requirements (Döhring & Gissel, 2016). Targeted goal formulation and sustainable feedback for example can strengthen the *physical self-concept* of students', which may have been diagnosed as weak.

PE teachers can be encouraged to apply the gained knowledge of possibilities of personality development within PE. Specifically addressing student characteristics supports the subject's aim. Developable personality constructs are particularly suitable for this purpose. Since targeted interventions obtain the greatest effects, they seem appropriate for fostering students' personality development. Targeted interventions can e.g., include challenging situations and within these encourage self-reflection.

In addition, PE teachers can apply the knowledge of their personal characteristics in lesson planning and teaching to increase their authenticity and by this effectivity. PE teachers with high scores on *neuroticism* probably prefer closed and predictable teaching strategies whereas PE teachers with high *extraversion* possibly enjoy actively involving themselves in the teaching process. If teaching fits the teacher's requirements, lessons will potentially be successful and teacher's occupational stress will be reduced. In order to ensure this, PE teachers should be encouraged to reflect on and classify their own requirements.

5.4.2 Physical Education Teacher Education

Besides PE teaching in schools, results can also affect PE teacher education. Regarding Kunter et al.'s (2011) model, teacher education at university primarily focuses on teachers' professional knowledge and related skills. Further aspects of teachers' professional competence, such as value commitments, beliefs, goals, motivational orientation, and self-regulation skills should be exploited and explicitly addressed. PE teacher education at university can communicate the concretized knowledge of PE-specific requirements and approach accompanied teaching tasks. Seminars e.g., could provide possibilities for identifying personal knowledge and initiating personal development. This can increase the fit with vocational tasks in order to cultivate a teacher personality, which suits oneself and by this enables authentic teaching (Dubs, 2009). Seminars including the identification of student teachers' personal requirements by e.g., offering opportunities to try different teaching styles and find the one that suits one's needs best, could be an option to promote effective teaching behavior.

Further, PE teachers' diagnostic competence (Baumert & Kunter, 2006) can be trained and connected to targeted lesson planning in teacher education seminars such as *Knowing and Using Students' Requirements*. Prospective teachers can e.g., observe students and by this aim to assess their requirements e.g., insecurity or ambition. Consequently, they can transfer this knowledge to teaching decisions and e.g., select or apply specific teaching methods.

It is not without problems to identify different student characteristics, as e.g., *general personality* traits are implicit personality facets, which are not directly observable. Here too, the large-scale character of the study helps to detect general tendencies how student groups differ considering their personal characteristics. PE teachers as well as researchers and teacher educators have to be aware of the fact that within these general tendencies on group level, there are always students who, due to their sociodemographic data, possibly obtain different manifestations of characteristics despite their group affiliation. Therefore, in addition to knowing student characteristics, PE teachers' empathy and flexibility is important.

5.4.3 Physical Education Teacher Professional Training

Results can affect prospective teachers in PE teacher education but also PE teacher professional training. Presentations, handouts, or video clips, which summarize the results and deduced implications, can help to raise awareness for the topic also within different stages of PE teachers' career and, by this, guarantee widespread implications. In professional training workshops, PE teachers can be guided to reflect on students' and

their own characteristics. Subsequently, instructional strategies can be developed that fit the personal teaching style and personal requirements in order to promote student personality development. This further facilitates the multiplication of gained results and accompanied implications. Overall, the results offer numerous possibilities to affect PE practice, PE teacher education as well as professional training.

5.5 Potential Impact on Society

Targeting PE teaching towards students' personality development contributes to students' development into solidary, physically literate individuals (Prohl, 2010b). Teachers, students and parents should be aware of PE's personality-building potential in order to support PE's position within the subject canon. The work emphasizes and raises awareness of this issue.

However, school is only one of youth's lifeworlds. In this lifeworld, PE is typically considered as minor subject within the range of school subjects, which all aim to promote students' personality development following school's general mandate. Personality development can only be measured to a limited extent though (Hofer, 2014). While the curriculum clearly defines targeted competencies (cognitive, motor, social), personality development is not concretized and e.g., specified in regard to students class levels. It is therefore difficult to promote and verify the general goal of personality development in a targeted manner. Rather, purposeful and adapted teaching can affect students' personality development. Within this albeit limited contribution, PE in a unique manner can point out sports' beneficial potential concerning personal development. This in turn again may lead to lifelong physical activity and by this lifelong personal development of students, affecting e.g., their career and role in society.

The dissertation thesis adds strategies to succeed in *education through sports* by PE teaching, which presents PE's lesson content in a way that is appropriate for the target group. Designing PE to meet students' requirements sets the basis for students' meaning finding in sports, which increases the chance that they also find meaning in sports activities outside school. This can lead to physical activity in- and outside school, even without PE's obligatory character (Prohl, 2010a). One approach to counteract the alienation of sports as obligatory phenomenon would be voluntary PE, which in turn enables unconstrained access to sports for everyone. Voluntary PE would accommodate students who distance themselves from sports because of negative experiences and accompanied emotions in PE (Caravaca & Romero Ramos, 2018; Simonton & Garn, 2019). However, the possibility

of voluntary participation would remove the abovementioned specialty of the setting PE that, due to its obligatory nature, reaches all school-aged children and by this provides them with the chance to find their preferred physical activity and meaning in it. Providing students with opportunities to experience the joy of movement counteracts insufficient physical activity levels and alarming sedentary behavior (World Health Organization, 2020).

Therefore, PE can contribute to fulfilling the abovementioned physical activity recommendations for a healthy lifestyle (World Health Organization, 2020). The extent to which PE contributes to a healthy lifestyle among children and young people was investigated by Jaitner et al. (2020). Jaitner et al.'s (2020) analysis of physical activity levels and sedentary time in PE revealed insufficient exercise times during PE lessons. In this regard, students' individual meaning finding becomes especially important, as the allocated amount of PE – in Germany typically weekly two to three 45-minute PE lessons – are not enough to reach WHO's guidelines of daily 60-minute moderate-to-vigorous physical activity (World Health Organization, 2018). It is therefore important to increase the chances of leisure time physical activities by targeted PE teaching in order to prevent undesirable health consequences of an inactive lifestyle. This becomes particularly important for overweight and underweight girls for whom PE is an adequate setting for physical activity-related health promotion compared to girls of normal weight (Jaitner et al., 2020). PE is therefore an indispensable physical activity setting, especially for inactive adolescents who are at risk of health problems. In the long run, students experiencing the joy and meaning of movement at a young age in PE classes are more likely physically active in adulthood (Telama et al., 2014).

Due to the fact that a fundamental change of PE (e.g., considering scope, intensity) is difficult, the design of PE needs adjustments in order to make it effective and purposeful (Jaitner et al., 2020). Under this premise, it seems especially important to know students precisely in order to align lessons more goal- and target group-oriented and thus use PE teaching time efficiently.

On the teacher side, adapting teaching to the teacher's own requirements can reduce stress while teaching and increase the teacher's effectiveness. This in turn can have a positive effect on teacher health and thus prevent common risks such as burnout, which in turn also contributes to society's health. Further, it can reduce attrition in the teaching profession and thus contribute to a functioning education system as part of society. Additionally, healthy teachers exemplifying a healthy lifestyle are more likely to transfer this mindset as well as accompanied actions to their students. Within this role model function, teacher's wellbeing can therefore affect students' and by this society's health.

5.6 Strengths and Limitations

By means of a scoping review and subsequent empirical study, this dissertation thesis concretizes the picture of students' as well as teachers' requirements in the PE context. Regarding the dissertation thesis' structure, the comprehensive review of the research field – personality research in the PE context – provides a solid theoretical basis for the dissertation thesis' empirical part – describing students' and teachers' personal characteristics in PE context.

Regarding study design, examining both key players – students and PE teachers – has rarely been realized so far and allows deducing starting points for targeted PE teaching. A large sample on the student as well as the teacher side has been acquired for the nationwide empirical study including different groups of participants, which can be distinguished by genders, class levels/age groups, and school types. The study considers the relationship to the teaching outcome student motivation by analyzing characteristics, which have proven to be favorable in this regard. The encompassing character of the realized study provides various possibilities for comparison with previous as well as future research.

Regarding practical implications, the resulting comprehensive picture of students and teachers in the PE context enables practical implications on different levels. The results can be used in teaching practice in school, in PE teacher education at university as well as in teacher professional training. Cooperating with DSLV, on the one hand allowed a broad recruitment of test persons. On the other hand, it provides a far-reaching platform for communicating results and implementations. In addition, cooperating with DSLV contributes to the communication and impact of results in society as well as to political acceptance.

Besides this dissertation thesis' strengths, limitations can be identified. Regarding the dissertation thesis' content, opening the search term in the scoping reviews considering students' or teachers' personal characteristics in the PE context and therefore following a wider understanding of personality was initially not feasible because of the term's broadness. Therefore, the search term was narrowed down to the term personality, whereby only an excerpt of students' and teachers' personal characteristics was sighted. Other personality approaches were therefore not explicitly addressed within the reviews' research questions. These approaches partially appeared because of the included studies' alignment in addition to the trait-theoretical approach though. Thus, the theoretical part only partially forms the basis of the empirical study. Media, peers and the parental home

influence students' personality in addition to school processes. However, this work is limited to student-immanent factors and factors from the school's side – more precisely the teacher. In order to be able to derive statements about the desirability of different personal characteristics, relationships to PE teaching outcomes, such as student performance or motivation need to be analyzed in addition to the study's so far mostly descriptive nature.

Regarding data collection, cooperating with the DSLV probably has biased the samples. Students were recruited via participating teachers. PE teachers themselves instructed the student survey, which possibly further biased students' answers. In addition, both student and teacher questionnaires were filled out in a self-reported manner so that misjudgment cannot be ruled out.

6 Outlook

Based on the results presented in the dissertation thesis, further research activities can be identified. These refer either to the already existing data basis or beyond. Both the student and the teacher side provide starting points for future research.

In order to grasp the potential of PE on personality development as indicated in the review, studies with a longitudinal design would be necessary. A longitudinal study would allow statements regarding the development of student characteristics in the course of the school career. A targeted intervention program in PE would provide information about its effect on various characteristics. The empirical part of the dissertation provides basis to focus on different student characteristics (e.g., *achievement motive* or *sports interest*) and different groups of students (boys/girls; different school types), which interventions could target. Intervention studies considering the examined personal characteristics could deepen possibilities for targeted personality development.

Additionally, the comprehensive character and the large sample of the dissertation's empirical part provide a large data base that allows comparisons to other descriptive studies focusing on different school subjects or considering an international context. Future studies adopting an accordingly comprehensive approach would help to replicate the found differences and counteract replication crisis in personality research.

In order to make students' and teachers' characteristics even more accessible and manageable in practice, a categorization into clusters could be helpful. Participants obtaining similar manifestations of personal characteristics can be grouped via cluster analyses. Grouping different students into clusters would facilitate to address the students adequately. The emerging groups can be described by sociodemographic characteristics in order to make them accessible from the outside.

Regarding teachers in the general education context, different types of teachers have already been described. Such types are very popular in practice. PE teacher types have not been described so far, but could help teachers to class their own personality within reflection processes. In conclusion, resulting types of students or teachers offer possibilities to recognize and address PE's key players adequately.

In addition, the study *SuM PLuS* carried out as part of the dissertation provides data to analyze further connections and related implications. Connecting student characteristics with their motivational regulation e.g., can enhance PE teaching. Precisely, it would be interesting to find out whether different student personal characteristics occur within different motivational regulations (e.g., intrinsic, extrinsic) or whether characteristics

vary in their expression. In the same way, teacher characteristics can be related to students' motivational regulation. Following self-determination theory (Ryan & Deci, 2017), the study provides teachers' perceptions of their provided basic psychological needs support and students' perceived basic needs satisfaction. The student and the teacher sample can be matched in order to examine teacher self-reported behavior and student external perception of teacher behavior as well as the relationship to student motivational regulation. It can be examined whether students' personal characteristics are directly related to student motivation or whether a connection can be established via teacher behavior.

7 Conclusion

The main aim of this dissertation thesis was to precisely describe student personal characteristics in the PE context. The subordinated aim was to precisely and comprehensively describe PE teachers' personal characteristics. The descriptions have generated sensitization for students' and teachers' immanent characteristics.

The accompanied knowledge gain in the theoretical part concerning students' and teachers' personality in the PE context, has been linked to studies with different samples as well as to other research areas. The underlying personality understanding and the assessment of general personality traits have shown little differences to other samples.

Following general education research's recommendations, context-independent characteristics have been supplemented by PE-specific characteristics in the empirical part. Thus, PE-specific requirements for lesson planning have been described in order to do justice to PE's contextual peculiarities and position within school's subject canon. Differences between student groups have become apparent regarding genders, school types and less consistent regarding class levels. In the case of PE teachers, genders have differed particularly in their personal characteristics. Fewer differences have occurred between age groups and school types. Detected differences have concretized the key players' description and provided anchors for implications.

The results allow a transfer into PE teaching in schools, PE teacher education at university as well as PE teacher professional training. Approaches highlighting the implementation of the gained knowledge considering PE teachers' and students' personal characteristics have been provided. Approaches deliberately address PE teachers but also PE teacher educators in order to facilitate the implications' impact and sustainability. PE teachers may apply the highlighted knowledge about personal characteristics to lesson planning, teaching as well as reflection on their teaching. In this way, continuous personal and professional development can take place, which encourages recurrent reflection or readjustment and strives for constant targeting of their teaching. The dissertation has intended to stimulate further development of PE teachers' personal characteristics and thus promote PE's development. PE teaching adapted to the teacher's requirements influences the teacher's own well-being during teaching and thus their health. This in turn can positively affect students as well as society.

The dissertation thesis further has intended to highlight PE's potential with regard to student personality development. The implications provide suggestions for possible

courses of action in order to specifically address students and thus support their personality development particularly in the PE context. The targeted approach intends to support the fulfilment of PE's dual mission of educating students to and through sports. By fulfilling this dual mission in PE, students are motivated to be physically active in PE as well as motivated to engage in physical activities outside school, at best lifelong. This goes along with students' personality development in PE as well as continuous personal development outside and after school. The resulting contribution to and chances of a healthy lifestyle as well as development highlight the potential of PE teaching targeting students' personal requirements.

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