# University of Trier

Faculty I – Department of Psychology

## Competence-related self-perceptions of psychology students: Structure, measurement, correlates, and differentiation

Dissertation submitted to the University of Trier, Faculty I – Department of Psychology
to obtain the degree of doctor rerum naturalium (Dr. rer. nat.) in Psychology.

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# Danksagung

Eine Dissertationsschrift anzufertigen bedarf viel Durchhaltevermögen, einer gehörigen Portion Selbstwirksamkeitserwartung, aber insbesondere auch viel sozialer Unterstützung. Ich möchte mich daher bei all denjenigen bedanken, die es mir ermöglicht haben, meine Doktorarbeit tatsächlich wie geplant fertigzustellen.

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# Abstract

Educational researchers have intensively investigated students' academic self-concept (ASC) and self-efficacy (SE). Both constructs are part of the competence-related self-perceptions of students and are considered to support students' academic success and their career development in a positive manner (e.g., Abele-Brehm & Stief, 2004; Richardson, Abraham, & Bond, 2012; Schneider & Preckel, 2017). However, there is a lack of basic research on ASC and SE in higher education in general, and in undergraduate psychology courses in particular. Therefore, according to the *within-network* and *between-network* approaches of construct validation (Byrne, 1984), the present dissertation comprises three empirical studies examining the structure (research question 1), measurement (research question 2), correlates (research question 3), and differentiation (research question 4) of ASC and SE in a total sample of $N = 1243$ psychology students. Concerning research question 1, results of confirmatory factor analysis (CFAs) implied that students' ASC and SE are domain-specific in the sense of multidimensionality, but they are also hierarchically structured, with a general factor at the apex according to the nested Marsh/Shavelson model (NMS model, Brunner et al., 2010). Additionally, psychology students' SE to master specific psychological tasks in different areas of psychological application could be described by a 2-dimensional model with six factors according to the *Multitrait-Multimethod* (MTMM)-approach (Campbell & Fiske, 1959). With regard to research question 2, results revealed that the internal structure of ASC and SE could be validly assessed. However, the assessment of psychology students' SE should follow a task-specific measurement strategy. Results of research question 3 further showed that both constructs of psychology students' competence-related self-perceptions were positively correlated to achievement in undergraduate psychology courses if predictor (ASC, SE) corresponded to measurement specificity of the criterion (achievement). Overall, ASC provided substantially stronger relations to achievement compared to SE. Moreover, there was evidence

for negative paths (contrast effects) from achievement in one psychological domain on ASC of another psychological domain as postulated by the *internal/external frame of reference* (I/E) model (Marsh, 1986). Finally, building on research questions 1 to 3 (structure, measurement, and correlates of ASC and SE), psychology students' ASC and SE were be differentiated on an empirical level (research question 4). Implications for future research practices are discussed. Furthermore, practical implications for enhancing ASC and SE in higher education are proposed to support academic achievement and the career development of psychology students.

# Zusammenfassung

Das akademische Selbstkonzept (ASK) und die Selbstwirksamkeitserwartung (SWE) wurden im Bildungskontext bereits intensiv untersucht. Beide Konstrukte sind Bestandteile des kompetenzbezogenen Selbstbildes und es besteht Evidenz, dass ASK und SWE den Lernerfolg von Schülern und Studierenden sowie deren erfolgreiche Laufbahnentwicklung unterstützen (z.B., Abele-Brehm & Stief, 2004; Richardson, Abraham, & Bond, 2012; Schneider & Preckel, 2017). Dennoch fehlt es bislang an empirischer Grundlagenforschung zum ASK und zur SWE im Hochschulkontext im Allgemeinen sowie im Psychologiestudium im Speziellen. Die vorliegende Dissertation untersucht daher im Rahmen dreier empirischer Studien in Anlehnung an die *within-network* und *between-network* Ansätze der Konstruktvalidierung (Byrne, 1984) die Struktur (Forschungsfrage 1), Messung (Forschungsfrage 2), Korrelate (Forschungsfrage 3) und Differenzierung (Forschungsfrage 4) von ASK und SWE bei Psychologiestudieren ($N = 1243$). Konfirmatorische Faktorenanalysen mit Bezug zu Forschungsfrage 1 bestätigten eine multidimensionale und hierarchische Struktur des ASK und der SWE von Psychologiestudierenden, wie im Nested/Marsh Shavelson model (NMS model; Brunner et al., 2010) dargestellt. Zudem ließ sich die SWE von Psychologiestudierenden zur Bewältigung spezifischer psychologischer Aufgaben in verschiedenen psychologischen Anwendungsbereichen durch ein 2-dimensionales Strukturmodell mit sechs Faktoren in Anlehnung an den *Multitrait-Multimethod* (MTMM)-Ansatz (Campbell & Fiske, 1959) abbilden. Mit Bezug zu Forschungsfrage 2 zeigten die Ergebnisse, dass ASK und SWE von Psychologiestudierenden aufbauend auf ihrer Struktur valide gemessen werden können, obgleich zur Erfassung von SWE ein aufgabenbezogener Messzugang gewählt werden sollte. Weiterhin zeigten die Ergebnisse in Hinblick auf Forschungsfrage 3 positive Zusammenhänge beider Konstrukte des kompetenzbezogenen Selbstbildes von Psychologiestudierenden zu deren Leistungen im Psychologiestudium, insofern die Spezifizität von Prädiktor (ASK, SWE)

und Kriterium (Leistung) eine vergleichbare Messebene aufwiesen. Insgesamt wies das ASK im Vergleich zur SWE substantiell höhere Zusammenhänge zu den betrachteten Leistungen auf. Darüber hinaus fand sich Evidenz für negative Effekte (Kontrasteffekte) der Leistung in einer psychologischen Domäne auf das ASK einer anderen psychologischen Domäne, wie im *internal/external frame of reference* (I/E) Modell (Marsh, 1986) beschrieben. Abschließend zeigten die Untersuchungen aufbauend auf Forschungsfrage 1 bis 3 (Struktur, Messung und Korrelate von ASK und SWE), dass ASK und SWE empirisch differenzierbare Konstrukte bei Psychologiestudierenden darstellen (Forschungsfrage 4). Es werden Implikationen für zukünftige Forschungsarbeiten diskutiert. Zudem werden praktische Implikationen abgeleitet, um ASK und SWE im Hochschulkontext zu fördern und damit die Studienleistungen und die Laufbahnentwicklung von Psychologiestudierenden zu unterstützen.

**Index of Publication**

This doctoral thesis is subdivided into six chapters. In Chapter 1, the general rational for the thesis is outlined. In Chapter 2, the theoretical background of the three studies is presented. Chapter 3 includes an original research article, which has been accepted for publication in *Diagnostica*. Chapter 4 contains an original research article, which has been submitted to *Research in Higher Education*, where it is currently under review. Chapter 5 comprises an original research article that is in preparation for submission to the *Journal of Educational Psychology*. Overall, all included articles have been submitted or are in preparation for submission to international and national peer-reviewed journals. Chapter 6 discusses the results of the three articles and their contribution to theory and application.

The author of the present thesis is the first author of all three articles. As it is usually the case in psychological research, research projects cannot be realized without support from co-authors. The following paragraph lists the co-authors of each article. All publications are presented in the accepted, submitted, or prepared form except for minor changes in format and layout.

**Chapter        accepted, submitted or in preparation**

Chapter 3        Peiffer, H., Preckel, F., & Ellwart, T. (accepted for publication). Selbstwirksamkeitserwartung von Studierenden: Facettentheoretische Validierung eines Messmodells am Beispiel der Psychologie. *Diagnostica*.

Chapter 4        Peiffer, H., Ellwart, T., Möller, J., & Preckel, F. (submitted). Academic self-concept and the internal/external frame of reference model in undergraduate psychology courses. *Research in Higher Education*.

Chapter 5        Peiffer, H., Ellwart, T., & Preckel, F. (in preparation). Empirical differentiation of academic self-concept and self-efficacy of psychology students in higher education. *Journal of Educational Psychology*.

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# 1. Introduction

German universities are called upon to impart subject-related, interpersonal, and intrapersonal skills to their students and to provide them with the necessary training and qualifications for their everyday professional life (KMK, 2005). Accordingly, the psychology curriculum at the University of Trier also aims to prepare students for the activities of psychological research and practice (Universität Trier, 2017). In doing so, it is not only crucial to optimally organize teaching and study conditions (Yorke, 2006), so that students successfully make the transition from university to work and avoid early university dropout. In 2009, for instance, every 10th psychology student dropped out before completion of their studies (Heublein, Richter, Schmelzer, & Sommer, 2012). A central goal is also to support the career development of students (Savickas, 2002), so that they can position themselves in the labor market after graduation (Hackett, 1995), thus guaranteeing their employability (Schindler, 2004).

One approach to support the career development of psychology students is the maintenance and promotion of positive self-perceptions in terms of their psychological competences. Among the competence-related self-perceptions of psychology students are mental representations of one's own abilities in psychological performance situations and domains (academic self-concept [ASC]; Brunner et al., 2010; Dickhäuser, 2006). Additionally, these self-perceptions include the assessment of one's own possibilities and prospects for success in dealing with a specific psychological task in the course of studies as well as in the future in one's profession (self-efficacy [SE]; Bandura, 1977, 1997).

The efficacy of using ASC and SE as central starting points to support the career development of students has been proven by numerous studies. There is evidence demonstrating that both ASC and SE influence learning and academic achievement (Brunner, Keller, Hornung, Reichert, & Martin, 2009; Hansford & Hattie, 1982; Robbins, Lauver, Le, Davis, Langley, &

Carlstrom, 2004) and academic and professional choice behavior (Hackett & Betz, 1995; Lent, Brown, & Hackett, 1994; Marsh & Yeung, 1997; Moulton, Brown, & Lent, 1991); moreover, they reduce the likelihood of dropping out of a study program (Cokley, 2000; Fellenberg & Hannover, 2006; Larsen, Kornbeck, Kirstensen, Larsen, & Sommersel, 2013; Sarcletti & Müller, 2011) and promote successful career choice decisions (Abele-Brehm & Stief, 2004; Holling, Lüken, Preckel, & Stotz, 2000; Robbins, Allen, Casillas, Peterson, & Le, 2006).

Despite the relevance of both constructs for the successful career development of students and the associated desirable academic outcomes, the research on ASC and SE of psychology students is inadequate. Currently, there is a lack of structural tests and measurement instruments to validly and reliably measure the ASC and SE of psychology students. Only when these are available can the claims about their relationships to external criteria be differentiated and an empirical distinction of both competence-related self-perceptions be validated, also with regard to their significance for external criteria (e.g., academic achievement).

To close this research gap, the present work focuses on the structure, measurement, correlates, and differentiation of ASC and SE as facets of the competence-related self-perceptions of psychology students. Specifically, ASC and SE are modeled to allow the structure-adapted measurement of both constructs. The relationship of ASC and SE to external criteria (i.e., grades in psychology courses), which are considered as indicators of academic success, is determined based on the structure and the measurement. Since ASC and SE are related constructs (e.g., Marsh, Martin, Yeung, & Craven, 2017), to avoid confounding in the present investigation of psychology students, they are empirically separated from one another by means of structural analysis, measurement, and correlates.

In essence, four fundamental research questions are answered in the context of this dissertation (see Figure 1):

1. Which structural models differentially depict academic self-concept and self-efficacy in psychology students?

2. Based on their internal structure, how can academic self-concept and self-efficacy be measured in psychology students?

3. What are the relationships of academic self-concept and self-efficacy with performance indicators in the context of psychology studies?

4. Is it possible to differentiate between psychology students' academic self-concept and self-efficacy?
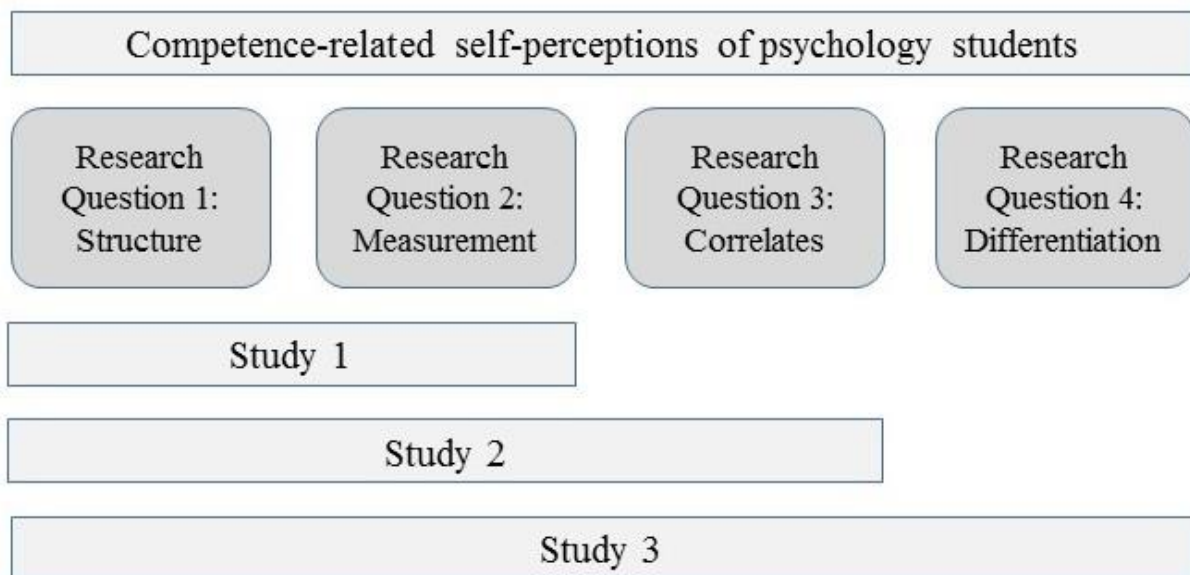


*Figure 1.* Overview of the four research questions and the three studies

In Chapter 2, previous theoretical and empirical research work on the structure, measurement, correlates, and differences between ASC and SE and to other competence-related constructs is summarized. To answer the four research questions, three empirical studies with samples of psychology students are conducted (Studies 1 to 3 presented in Chapters 3 to 5, respectively). Finally, in Chapter 6, the results and implications of the three studies according to the four research questions are discussed.

# 2. Theoretical Background

Competence-related self-perceptions such as academic self-concept (ASC) and self-efficacy (SE) have received much attention in educational research because both of these constructs have been valuable in the prediction and explanation of academic performance and motivation (Bong & Clark, 1999).

ASC represents the knowledge and perception of one's own academic competences (Marsh, 1990a; 1990b). Applied to psychology students, ASCs can be defined as the mental representations of their psychological competences in different psychological domains (e.g., in clinical and educational psychology). SE describes the confidence an individual has to possess the required competences to successfully master specific tasks to achieve desired outcomes (Bandura, 1977; Schwarzer & Jerusalem, 2002). When focusing on psychology students, these beliefs refer to their confidence to be able to successfully master psychological tasks to accomplish specific types of study-related assignments (e.g., being confident that they possess the competence to construct effective psychological interventions). There is much evidence for the relevance of ASC and SE in higher education, for example, for academic performance, academic interest, and academic choice (Hackett & Betz, 1995; Hansford & Hattie, 1982; Köller, Trautwein, Lüdtke, & Baumert, 2006; Richardson, Abraham, & Bond, 2012; Schneider & Preckel, 2017). Due to the fact that ASC and SE are considered as critical variables in higher education, there is need for an understanding of both competence-related self-perceptions as well as for construct validation itself (Byrne, 1984).

To test for construct validity of ASC and SE in a sample of psychology students, the present study relies on the proven *within-network* and *between-network* approaches that have been often applied in self-concept research (Byrne, 1984, 1996; Shavelson, Hubner, & Stanton, 1976). Within-network approaches investigate the internal structure of psychological constructs (e.g., correlations between construct facets) using factor analyses (exploratory, confirmatory).

Between-network approaches make use of the idea of a nomological network (Cronbach & Meehl, 1955). According to this idea, a construct is implicitly defined by its position in a nomological net of other constructs (Preckel & Brunner, 2017).

In the present study, both approaches of construct validation are applied in the sample of psychology students. In particular, the internal structure of ASC and SE (relations between facets of ASC and SE) are examined using confirmatory factor analyses (CFA). Likewise, within the nomological network of competence-related self-perceptions, the relationship between ASC and SE is investigated to determine their positions and their relationships to additional self-beliefs and external criteria (i.e., achievement).

## 2.1 Research Question 1: Which structural models differentially depict academic self-concept and self-efficacy in psychology students?

### 2.1.1 Structure of academic self-concept

Many studies have been motivated to answer the question of how to conceptualize the structure of self-concept (Brunner et al., 2010). Early self-concept research was dominated by a unidimensional perspective on self-concept that was represented by a general self-esteem score (Marsh et al., 2017). Rosenberg (1979) therefore defined self-concept as the "totality of the individual's thoughts and feelings having reference to himself as an object" (p. 7). However, this global definition of self-concept has been criticized because global measures of self-concept are not useful to predict specific behavior in specific realms of functioning (Bandura, 1982, Hansford & Hattie, 1982; Harter, 1982). Furthermore, in several studies, there was a lack of theoretical basis and a poor quality of self-concept measurement instruments (Marsh & Craven, 1997), leading Hattie (1992) to describe this period as *dustbowl empiricism* in which the predominant research design in self-concept studies was "throw it in and see what happens" (Marsh et al., 2017, p. 86).

One of the first differentiated structural models of self-concept was introduced by Epstein (1973), who postulated a hierarchical structure of the self. This assumption is in line with James (1892), who proposed that the self is both multifaceted and hierarchical and can be differentiated into the *I* (self as-knower) and the *Me* (self as-known). Based on the idea of a multidimensional and hierarchical structure of self-concept, Shavelson et al. (1976) postulated a general self-concept at the top of the hierarchy, which is composed of an academic and three nonacademic facets (social self-concept, emotional self-concept, and physical self-concept) according to the *Me* Self (James, 1892). At the next level of hierarchy, ASC was further divided into separable subdomains according to specific school subjects or curriculum domains (e.g., mathematics and English in K-12 educational settings; Marsh, Byrne, & Shavelson, 1988; Shavelson et al., 1976).

In the following years, the posited multidimensional and hierarchical structure of ASC has been intensively investigated by Marsh and colleagues (e.g., Marsh & Hattie, 1996; Marsh, Richards, & Barnes, 1986; Marsh, Smith, & Barnes, 1985) and has led to a more precise conceptualization of ASC. Today, there is consensus that ASC forms a multidimensional structure according to different subjects (e.g., Marsh, 1990b; Marsh, Parada, Yeung, & Healey, 2001; Marsh, Trautwein, Lüdtke, Köller, & Baumert, 2006). Likewise, there is empirical evidence for the assumption of a hierarchical structure with global self-concept at the apex (Brunner et al., 2009; Brunner et al., 2010). However, empirical evidence for the multidimensional and hierarchical structure of ASC has predominantly been reported in K-12 educational settings, with studies of university students remaining scarce (e.g., Lau, Yeung, Jin, & Low, 1999).

Thus, in Study 2 (see Chapter 4), the structure of ASC is examined to investigate whether psychology students' ASC is multidimensional and hierarchical structured as has been found in K-12 educational settings.

2.1.2 Structure of self-efficacy

The research history of SE is conceptually associated with Bandura's (1977) *Social-Cognitive Theory* (SCT). The name of the theory indicates that environmental events, inner personal factors (cognition, emotion, and biological events), and behavior are reciprocal influences (Bandura, 1986). One central inner personal factor influencing a person's behavior is perceived SE, described as the individual conviction that one can successfully execute the behavior required to produce a certain outcome (Bandura, 1977). SE varies on three different dimensions: the dimension of strength, magnitude/level, and generality (Pajares, 1996).

The *strength* of SE refers to how confident a person feels to master a challenging task successfully and, therefore, determines how much effort a person expends and how long he or she persists on the task (Bandura, 1982). Thus, the strength of SE determines a person's motivation and persistence in accomplishing a task (Zimmermann & Bandura, 1994). Participants typically rate the strength of their confidence in their competences to execute the required task (Bandura, 2006); thus, the dimension of strength is related to measurement of SE (see Chapter 2.2.2).

The dimension of *magnitude* or *level* of SE refers to different levels of task complexity, such as increasingly complex math problems (Zimmerman, 1995). Individuals who possess a strong expectation of mastery will behave differently than individuals with weak SE when faced with the same requirement of a specific task. Thus, the level of SE leads to differences among individuals dealing with the same challenging task (Bandura, 1977).

Finally, *generality* of SE across different requirements is closely associated with the question of how the structure of SE can be conceptualized (Bong & Clark, 1999). Some authors assume a *global* SE, which refers to the general confidence in one's own coping abilities (e.g., in psychology in general) across a wide range of demanding or novel situations (Schwarzer, Bäßler, Kwiatek, Schröder, & Zhang, 1997). Others expect SE to be structured at a lower level

of hierarchy, in particular, at a *domain-specific* level (Schyns & von Collani, 2002). At a domain-specific level, SE refers to the competence that a person perceives concerning his or her ability to complete different tasks successfully within a specific domain (e.g., constructing effective psychological interventions in a clinical psychology course). Hence, the confidence in one's own competences is strongly associated with a specific realm of functioning (Bandura, 2006). However, under certain circumstances, SE might be generalized across diverse requirements and situations, thus across different domains (Bong, 2001a). According to Bandura (2006), this is the case (1) when performance in different domains of activities are guided by higher-order competences (e.g., self-regulatory skills). Further, (2) when competences developed in one domain (e.g., in the domain of clinical psychology) also enhance performance in another domain of functioning (e.g., in the domain of educational psychology). Likewise, (3) when the development of competencies is socially structured so that skills in dissimilar domains are developed together (e.g., at the university), or (4) when strong mastery experiences are generalized on dissimilar domains of activity (e.g., from the university context to contexts outside the university).

On the lowest level of structural differentiation, researchers suspect a *task-specific* SE that represents the confidence in one's own competences to master the accomplishment of a specific task within a specific context (Finney & Schraw, 2003).

Despite the different conceptual levels of SE, most researcher prefer a task- and context-specific view of SE (Bandura, 1977) and reject a domain-specific or global structure of SE. In this regard, Bong and Skaalvik (2003) described the structure of SE as "loosely hierarchical" (p. 9). However, in contrast to the assumption of a loose hierarchy, there is empirical evidence for a stronger hierarchy of SE. In a sample of high school students, Bong (1997) found correlations across six first-order factors according to six school subjects (e.g., algebra, chemistry, and English) using confirmatory factor analyses. She concluded that students handle

multiple tasks across different subjects/domains with comparable self-confidence when they perceive these tasks to be similar. This conclusion remains of the assumption of generalizability of SE across diverse domains of functioning when activities are governed by, for example, similar subskills (Bandura, 2006).

In addition to the evidence for correlated first-order factors, Bong (1997) also found two second-order factors analogous to mathematic and verbal higher-order self-concepts found in K-12 educational settings (Marsh & Shavelson, 1985). Likewise, Lent, Brown, and Gore (1997) suspected that a certain proportion of variance of different first-order factors of mathematic SE (e.g., mathematic problem solving) might be explained by higher-order factors. Even though Lent et al. (1997) only found evidence for multidimensionality of SE in the domain of mathematics, but not for its hierarchy, the authors emphasized the need for further structural analysis of SE. Similarly, Schyns, and von Collani (2002) called for future examinations that simultaneously investigate global, domain-specific, and task-specific SE, and also Choi (2005) stressed the need for further structural analysis of SE.

Therefore, the aim of Study 1 is to test a structural model of SE that operationalizes SE at a task-specific level using a *microanalytic research strategy* (Bandura, 1982). Finally, in Study 3, several alternative structural models of SE are compared, taking in account the different levels of structural hierarchy (global, domain-specific, task-specific).

In sum, in the present study, the internal structure of ASC and SE of university students majoring in psychology are examined making use of CFAs according to the within-network approach of construct validation (Byrne, 1984, 1996). With the knowledge of the internal structure of ASC and SE of psychology students, currently, a valid assessment of these competence-related self-perceptions is feasible. As described below, research question 2 focuses on the measurement of ASC and SE.

## 2.2. Research Question 2: Based on their internal structure, how can academic self-concept and self-efficacy be measured in psychology students?

### 2.2.1 Measurement of academic self-concept

Although Shavelson et al. (1976) did not conduct early validation studies of the postulated multidimensional and hierarchical structure of ASC, they did point out the necessity of empirical construct validation (Byrne, 1984). Heeding this call, three versions of the *Self Description Questionnaires I-III* (SDQ I-III) were developed.

The three available versions of the SDQ assess self-concept in three different age groups, each utilizing a different number of items (Leach, Henson, Odom, & Cagle, 2006). The SDQ I is used with children (Marsh, 1990c), the SDQ II is conceptualized for early and middle adolescents (Marsh, 1990d), and the SDQ III (Marsh & O'Neill, 1984) for late adolescents and early adults (16-25 years). All instruments of the SDQ assess an affective (e.g., *"I like mathematics"*) and cognitive component of ASC (e.g., *"I am good at mathematics"*). There is some evidence that each domain of ASC is further differentiable into an affective and a cognitive component (Arens, Yeung, Craven, & Hasselhorn, 2011; Pinxten, Fraine, Van Damme, & D'Haenens, 2013), although both components are supposed to be highly correlated (Möller & Köller, 2004). However, when measuring ASC in educational settings, researchers typically tap the cognitive component (Renkl, 2008).

To date, there are several validation studies of the three instruments of the SDQ, for example, with gifted children (Plucker, Taylor, Callahan, & Tomchin, 1997), different cultures (e.g., Ļevina & Ivanova, 2011), or with short forms of the SDQ (e.g., Marsh, Ellis, Parada, Richards, & Heubeck, 2005). The internal consistency as well as the retest-reliability of this measure are considered to be good (Byrne, 1996). In this regard, it is no great surprise that the SDQ is thought of as one of the most useful instruments measuring self-concepts in diverse samples (Hattie, 1992).

In the present study, the SDQ III is applied in a sample of psychology students to assess the cognitive component of ASC. The structure of ASC is expected to be multidimensional and hierarchical, thus corroborating findings from K-12 educational settings (see Chapter 2.1.1). To measuring the multiple cognitive ASCs of psychology students, three items of the SDQ III were adapted to the context of undergraduate psychology courses (e.g., *"I am good at clinical psychology"*; for an overview see Table 3, Chapter 4.5.2). The items were chosen by apparent validity, and formulations only applied positive wordings. Student participants are asked to judge their ASC in three different areas of psychological application (clinical psychology, educational psychology, and industrial and organizational psychology), in statistics, and in psychology in general. A 6-point Likert scale is used, corresponding to the other measurement instruments applied in the present study.

## 2.2.2 Measurement of self-efficacy

When measuring SE, researchers refer back to the different theoretical assumptions of the internal structure of SE. Some researchers assess SE as a global belief that is generalized over several domains (Beierlein, Kemper, Kovaleva, & Rammstedt, 2013; Sherer et al., 1982), others prefer a domain-specific measurement (academic, occupational; e.g., Bruning, Dempsey, Kauffman, McKim, & Zumbrunn, 2013; Schyns & von Collani, 2002), and still others use task- and context-specific measurement strategies (e.g., problem solving in mathematics; Pajares & Miller, 1994). With regard to these different measurement traditions, there might be an infinite number of measurement instruments, which depend on the specific domain and the specific tasks a researcher selects to tap SE. Despite the variety of measurement instruments and techniques, however, the majority of SE researchers today assert that SE should be measured against levels of task demands after defining the domain of functioning (the context of SE), especially with reference to its important constituent behaviors (Bandura, 2006; Betz &

Hackett, 2006). This is in line with the assertion that one must ask *which type of SE* is being measured (Betz & Hackett, 2006). Pajares and Miller (1995) concluded that "there are different ways of assessing self-efficacy, but the most theoretically appropriate and empirically warranted is one in which the self-efficacy measure assesses the same or similar skills required for the performance task" (p. 196).

Therefore, based on the postulated task-specific structure of SE in Study 1, a questionnaire is developed to assess psychology students' SE to master specific psychological tasks in different areas of psychological application (domains). Note that these psychological domains are the same as those used in the measurement of ASC (see Chapter 2.2.1) except for the domain of statistics.

Despite the within-network approach, the authors of Study 1 also made use of the between-network-approach of construct validation. Therefore, the *Occupational Self-efficacy Scale* (Rigotti, Schyns, & More, 2008) is additionally used in Study 1 to test for convergent validity making use of the idea of a nomological network. This questionnaire has been translated into five languages and has been validated in samples from different cultures. It is comprised of six items, but in Study 1, four items of the original scale are applied to ensure an economic assessment of SE. The items were selected on the basis of their item characteristics, such as factor loadings ($\lambda > .65$ to $\lambda < .81$), and inter-item correlations ($r_{it} > .63$ to $r_{it} < .73$) found in a German sample (Rigotti et al., 2008). Again, responses are given on a 6-point Likert scale. Note that the Rigotti et al.'s (2008) questionnaire is also used in Study 3 regarding research question 4 (see Table 7, Chapter 5.5.2).

Before answering the SE items in Studies 1 and 3, carefully constructed and realistic scenarios of the psychological tasks within the different psychological domains are presented to the participants using the *vignette technique* (Aguines & Bradley, 2014; Bong & Hocevar, 2001). The vignette technique is considered a proven and practical procedure to create context

specificity in SE measurement (Aguinis & Bradley, 2014; Karren & Barringer, 2002). For an overview of the vignettes used in the present study, see Appendix A (Tabelle A1a-A1c) for a German and Appendix C (Table C1a-C1c) for an English version.

Based on the knowledge of their internal structure and measurement, in the following, the empirical findings on the relationship of ASC and SE to external criteria (achievement) according to the between-network approach (Byrne, 1984) are summarized. The examination of the relationship of both competence-related self-perceptions of psychology students with achievement in undergraduate psychology courses is the focus of research question 3.

## 2.3 Research Question 3: What are the relationships of academic self-concept and self-efficacy with performance indicators in the context of psychology studies?

Over the last decades, educational researchers have focused on various motivational, ability-related, and contextual factors with regard to their predictive power for academic performance in K-12 educational settings as well as in higher education. Not only personality traits such as conscientiousness and emotional stability (Barrick, Mount, & Judge, 2001; Poropat, 2009), or students' abilities and socioeconomic status, but also ASC and SE are expected to be substantive predictors of academic achievement (Richardson et al., 2012; Robbins et al., 2004; Schneider & Preckel, 2017). These positive relations apply particularly if predictor (ASC and SE) und criterion (achievement) are measured at the same degree of specificity (e.g., at the domain-specific level; Choi, 2005; Marsh, Trautwein, Lüdtke, Köller, & Baumert, 2005; Pajares, 1996).

2.3.1 Academic self-concept and achievement

With regard to ASC, there is strong agreement that prior achievement affects subsequent ASC (Chen, Yeh, Hwang, & Lin, 2013; Dickhäuser, 2006) as conceptualized within the *skill development approach* (Calsyn & Kenny, 1977). These positive effects from achievement to ASC are explained by intrapersonal and interpersonal comparison processes within different frames of reference (e.g., school class; Möller, Pohlmann, Köller, & Marsh, 2009). In addition to the skill development approach, researchers also believe that prior ASC is also a determinant of subsequent academic achievement, described in the *self-enhancement* approach (e.g., Helmke & van Aken, 1995). A compromise between the skill development and self-enhancement model is the *reciprocal effects model* (REM; Renkl, 2008) that has provided much empirical support (Chen et al., 2013; Marsh & Yeung, 1997; Pinxten, Marsh, De Fraine, Van Den Noortgate, & Van Damme, 2014). Moreover, applications of the REM reveals empirical evidence on a general level (Guay, Marsh, & Boivin, 2003) and on a domain-specific level (Marsh et al., 2005) within different educational settings (see Chen et al., 2013). Hence, there is no doubt that ASC and achievement are predictor and criterion concurrently (Retelsdorf, Köller, & Möller, 2014).

As mentioned above, the causal effects from achievement on subsequent ASC are typically explained by effects of different frames of reference (Marsh, 1986; Skaalvik & Skaalvik, 2002). According to this notion, on the one hand, students compare their own abilities with the perceived abilities of other students within an external frame of reference (social comparison processes; Möller et al., 2009). Depending on the average ability level of classmates compared to the ability level of the individual (better/worse), the ASC of two equally capable students in one subject can differ depending on their reference groups (Seaton, Marsh, & Craven, 2010; for a more in-depth discussion, see Chapter 6.2.3.1). On the other hand, students compare their own abilities in each different subject area (dimensional comparison process within an internal

frame of reference; Möller & Marsh, 2013). Due to dimensional comparison processes, students performing well in subject A and average in subject B will appreciate their ASC in subject A, but at the same time, devaluate their ASC in subject B. Consequently, the ASCs of subject A and subject B are less correlated than corresponding achievement. These two processes of comparison that form a student's ASC are described in the *internal/external frame of reference* (I/E) model (Marsh, 1986).

Today, in K-12 educational settings, there is strong evidence for the effects postulated by the I/E model, for example, in different age groups, cultures, and subjects (Ehm, Nagler, Lindberg, & Hasselhorn, 2014; Jansen, Schroeders, Lüdtke, & Marsh, 2015; Marsh et al., 2014). However, there is a lack of research on the I/E model in higher education (Paulick, Großschedl, Harms, & Möller, 2017).

Therefore, with the knowledge of the structure of ASC and its corresponding measurement, the relationship between ASC and achievement in undergraduate psychology courses are empirically analyzed in Study 2 according to research question 3. Specifically, the question of whether psychology students also undergo social and dimensional comparison processes as has been documented for students in K-12 educational settings is investigated.

## 2.3.2 Self-efficacy and achievement

The knowledge on the reciprocal relation between ASC and achievement brings up the question of how SE and achievement are related to each other. In contrast to the abundant empirical evidence on the I/E model in self-concept research, the assumptions of the I/E model have failed to receive clear support for the construct of SE (Marsh, Walker, & Debus, 1991; Skaalvik, & Rankin, 1990). For example, Bong (1997) only found evidence for a negative correlation between verbal achievement (e.g., in English) and SE in mathematics as postulated by dimensional comparison processes. However, she did find positive correlation coefficients

between SE in verbal subjects and SE in mathematics that was incompatible with the assumption of dimensional comparisons postulated by the I/E model.

According to Bandura's (1977) SCT, the relation between achievement and SE can be explained by positive *mastery experiences* that provide real evidence that one is able to successfully master a specific task (Palmer, 2006), and therefore strengthen SE to successfully complete the required task a second time (Bong, 1997; Maddux & Kleiman, 2012). Furthermore, SE is subject to steady change by environmental influences, because individuals constantly integrate information from several sources, for example, from performance feedback (Maddux & Kleiman, 2012). These changes in SE have a long-term effect in order to maintain persistence when faced with failure during the accomplishment of a task (Luszczynska, Gutiérrez-Doña, & Schwarzer, 2005; Wood & Bandura, 1989). Overall, much empirical evidence corroborates the causal order from achievement to SE (e.g., Chin & Kameoka, 2002; Pajares & Miller, 1994).

With the exception of the causal influence of achievement on SE, however, prior SE also influences subsequent achievement. Thus, individuals prefer to seek challenging situations in their course of study or in their job if their corresponding SE is high (Britner & Pajares, 2006; Gore, 2006; Zimmerman, 1995). As a consequence of a positive self-evaluation and the belief to have a good chance for success, individuals despite a great willingness to perform and persist longer than those low in SE (Lusczynska et al., 2005), which, in turn, heightens the probability of success (Eccles, 1983). Moreover, there is evidence that SE tends to be the best predictor for school and university average grades (Richardson et al., 2012; Robbins et al., 2004), academic and career choice (Hackett & Betz, 1995; Multon et al., 1991), and career success (Abele-Brehm & Stief, 2004).

In sum, due to the causal influence of achievement on SE and vice versa, a reciprocal influence as proposed for ASC and achievement seems to be reasonable. However, there is little

empirical evidence on such a reciprocal relationship, and when evidence is available, researchers have only used a cross-sectional design (e.g., Williams & Williams, 2010). Likewise, in the present study, it is not possible to examine the reciprocal relation between SE and achievement due to methodological limitations (see Chapter 6.3). However, in Study 3, bivariate and partial correlations of the relation between SE of psychology students and achievement in undergraduate psychology courses are investigated.

In sum, a positive relation between psychology students' ASC and SE with their achievements in undergraduate psychology courses are reasonable. However, with regard to the comparable relevance of ASC and SE for academic performance in K-12 educational settings, and also in higher education, one may ask whether ASC and SE differ at an empirical level, for example, in order to justify the use of two different construct names. Hence, focusing on research question 4, Study 3 empirically investigates the differences between ASC and SE of psychology students, e.g., with regard to their relationships to academic achievement.

## 2.4 Research Question 4: Is it possible to differentiate between psychology students' academic self-concept and self-efficacy?

To answer the question of whether ASC and SE represent two empirically distinct competence-related self-perceptions in psychology students, they are first arranged within a nomological network as associated self-beliefs (Cronbach & Meehl, 1955; Preckel & Brunner, 2017). Subsequently, building on research questions 1 to 3 (structure, measurement, and correlates of ASC and SE), ASC and SE are compared from a conceptual and operational perspective, before these constructs are differentiated on an empirical level (see Study 3, Chapter 5).

2.4.1 Academic self-concept, self-efficacy, and further self-believes

Researchers have conceptualized competence-related self-perceptions—such as self-esteem, self-concept, self-efficacy, outcome expectations, and locus of control—in different ways and from a variety of theoretical perspectives when investigating influences of cognitions and beliefs on human behavior (Marsh et al., 2017; van Dinther, Dochy, & Segers, 2011). Not surprisingly, there is empirical evidence that ASC and SE are empirically related to self-esteem (Arens & Hasselhorn, 2013; Gardner & Pierce, 1998), outcome expectations (Shell, Colvin, & Bruning, 1995), and locus of control (Schunk, 1991). Hence, within the nomological network of competence-related self-perceptions, these constructs are implicitly positioned next to each other.

*Self-esteem* represents the value that one places on oneself as an individual (Judge, Locke, & Durham, 1997) and is considered to be an affective reaction to the self (Harter, 1998). SE, in contrast, is foremost a cognitive evaluation of one's own competences (Pietsch, Walker, & Chapman, 2003), and therefore a judgment of one's own abilities to successfully master future tasks. However, both constructs are related to each other, because people who view themselves as having high abilities, being valuable, successful, and important, are often more likely to be confident in their own abilities to fulfill required demands and situations (Gardner & Pierce, 1998). With regard to self-concept, self-esteem is placed on the same level as global self-concept (Marsh & Craven, 1997; Trautwein, Lüdtke, Köller, & Baumert, 2006), defined as individuals' self-acceptance and self-respect (Harter, 1990; Marsh, 1990b). Hence, self-esteem and global self-concept can rarely be differentiated on a theoretical and empirical level (Craven & Marsh, 2008; Marsh & Hattie, 1996). The differences between self-esteem and ASC in particular are based on their internal structure, because self-esteem is commonly conceptualized as a domain-unspecific construct in contrast to ASC (Harter, 1990). Additionally, within ASC, researchers also suspect an affective and a cognitive component (e.g., Marsh, Craven, & Debus,

1999). The cognitive component involve students' self-perceived competences (Arens et al., 2011), that is, a judgment of one's own capacity without an affective appraisal (Renkl, 2008).

*Outcome expectation* is a further construct of the self that is closely associated with SE (Bandura, 1977). Outcome expectations describe the belief that a specific course of action will produce specific outcomes, whereas SE encompasses the belief to be able to perform the necessary activities to achieve certain outcomes (Bandura, 1997). Hence, outcome expectations anticipate consequences of performing particular behaviors (Lent et al., 1994), whereas SE represents a person's beliefs of being capable or not performing particular behaviors (Köller & Möller, 2006).

*Locus of control* describes the degree of an individuals' perceived behavioral control over one's own performance and behavior (Rotter, 1966). Some people believe that outcomes depend on external factors such as luck, chance, or fate (external control); others believe that outcomes depend on a person's individual actions (internal control; Schunk, 1991). Moreover, SE represents an individual's perceived capability to control his or her performance. Concluding, individuals with an internal control combined with a low level of SE show lower effort (Bandura, 1977), whereas individuals with high belief in their efficacy are likely to figure out ways of exercising control, even though they have an external locus of control (Bandura, 1993).

In sum, at a conceptual level, ASC and SE can be differentiated from other competence-related self-perceptions that are positioned next to each other within a nomological network. But how different are the constructs of ASC and SE? Bandura (1997) emphasized that both competence-related self-perceptions differ at a conceptual level, because both stress out different phenomena (Zimmerman, 1995). In particular, SE is "a judgment of the confidence that one has in one's abilities; self-concept is a description of one's own perceived self, accompanied by an evaluative judgment of self-worth" (Pajares & Schunk, 2001, p. 243). A

selection of further conceptual and operational issues that differentiate ASC and SE (Bong & Clark, 1999; Bong & Skaalvik, 2003; Köller & Möller, 2006) are presented in the following chapter.

2.4.2 Academic self-concept versus self-efficacy

(1) ASC reflects a student's evaluation of perceived *competence* and is composed of affective and cognitive components, whereas SE is defined as the perceived *confidence* and represents solely a cognitive concept of a student's competence-related self-perceptions (Bong & Skaalvik, 2003).

(2) ASC is foremost influenced by frames of reference against which students judge their own competences (Bong & Skaalvik, 2003); in particular, students evaluate their abilities using social comparison processes (e.g., with classmates; Pinxten et al., 2015) and dimensional comparison processes (e.g., across different subjects; Möller & Marsh, 2013). In contrast, SE is foremost formed through the evaluation of one's own competences on the basis of one's previous experiences dealing with a similar requirement (mastery experiences; Bandura, 1982).

(3) ASC is typically tapped at a domain-specific level (e.g., Marsh & O'Neill, 1984), whereas the measurement of SE is usually more task- and context-specific according to the microanalytic research strategy introduced by Bandura (1977).

(4) Judgments of ASC and SE are both generated from an individuals' past experiences in a specific performance situation. Nevertheless, SE is measured by asking individuals to judge their confidence for successfully accomplishing a forthcoming task, whereas ASC items refer to the current self (Bong & Skaalvik, 2003).

(5) Due to its task-specific measurement, SE is less resistant to change than ASC (Schunk, 1991), however

(6) SE tends to be a better predictor of subsequent performance (Choi, 2005; Pajares & Miller, 1994).


To conclude, at a conceptual and operational level, ASC and SE have some aspects in common, for example, the prediction of future performance, emotion, and motivation, and both are formed through previous mastery experiences (Bong & Clark, 1999; Bong & Skaalvik, 2003; Marsh et al., 2017). So far, empirical differences between ASC and SE originate mostly from studies conducted in K-12 educational settings and in only one academic domain (e.g., in mathematics; Ferla, Valcke, & Cai, 2009; in chemistry; Scherer, 2013). Moreover, many researchers included affective items in their self-concept measures that might have confounded empirical differences between ASC and SE (Hughes, Galbraith, & White, 2011; Pietsch et al., 2003). Furthermore, ASC and SE were often assessed at different levels of measurement specificity (domain-specific vs. task-specific) and were not matched according to specificity of external criteria such as achievement (Chen, Gully, & Eden, 2001). Hence, to compare ASC and SE on an empirical level in higher education, it is of great importance to control for these critical issues of previous studies (Hughes et al., 2011).

The aim of Study 3 is to answer research question 4 by investigating the empirical differences between ASC and SE as two competence-related self-perceptions of psychology students while taking into account the critical issues of previous studies mentioned above. Therefore, the findings of the investigations of structure and measurement of ASC and SE of psychology students (research questions 1 and 2) are taken into consideration as well as the findings concerning the relationship of ASC and SE to achievement in undergraduate psychology courses (research question 3).

## 2.5 Present study

In sum, the present study investigates the competence-related self-perceptions of psychology students. In particular, the aims of the three studies are to empirically distinguish ASC from SE, to determine how both constructs can be structurally modeled and validly measured in psychology students, and to investigate how both constructs differ from one another and in their strength of correlation with achievement in undergraduate psychology courses. If we know whether ASC and SE do in fact differ on an empirical level and are both related to academic achievement, we can engage in fostering ASC and SE through targeted interventions on the basis of their structure and measurement (e.g., diirect interventions; O'Mara, Marsh, Craven, & Debus, 2006; van Dinther et al., 2011; see Chapter 6.4.2). Fostering university students' competence-related self-perceptions supports their academic success and helps them to develop a clear and realistic competency profile. Having a competency profile that matches the qualifications and skills of the individual assists the communication of strengths and weaknesses in the labor market to help people find their right place within the world of employment.

# 3. Study 1

## 3.1 Zusammenfassung

Im Fokus dieses Beitrags steht die Selbstwirksamkeitserwartung (SWE) von Psychologiestudierenden, beschrieben als subjektive Gewissheit, Aufgaben der psychologischen Praxis erfolgreich bewältigen zu können. Im Hochschulkontext ist SWE der stärkste Prädiktor für Studien- und späteren Berufserfolg. Da bislang kein adäquates Strukturmodell der SWE von Psychologiestudierenden vorliegt, erfolgte die Entwicklung einer Selbstwirksamkeitserwartungs-Matrix (SWE-Matrix) mit zwei Facetten, welche zwischen *Operationen* (Auswahl/Bewertung, Konstruktion, Durchführung) und *Inhalten* (Diagnostik, Intervention, Forschung/Evaluation) unterscheidet. Darauf aufbauend wurde ein 18-Item-Fragebogen konstruiert, der die SWE polyvalent in Bachelor und Master sowie in den Anwendungsbereichen der Arbeits-, Organisations- und Wirtschaftspsychologie, Klinischen und Pädagogischen Psychologie mittels Vignettentechnik erfasst. Die Matrix-Struktur wurde an $N = 1242$ Psychologiestudierenden konfirmatorisch geprüft und gegen alternative Modelle getestet. Es zeigen sich gute Modellfits, skalare Messinvarianz des Fragebogens über Studiengänge und Anwendungsbereiche sowie theoriekonforme Korrelationen der sechs Faktoren mit beruflicher SWE, akademischem Selbstkonzept und Neurotizismus. Erste Ergebnisse zeigen einen faktorspezifischen Anstieg der SWE im Studienverlauf und Übereinstimmungsvaliditäten mit Leistungsindikatoren und Berufserfahrungen.

## 3.2 Einleitung

Psychologiestudierende erwerben im Zuge ihrer Ausbildung an der Hochschule Wissen, welches sie auf konsekutive Studiengänge und den Beruf vorbereitet. Neben dem theoretischen Wissenserwerb sammeln Studierende der Psychologie auch erste praktische Erfahrungen in der

Bewältigung von Aufgaben der psychologischen Praxis (Ellwart & Preckel, 2015). Diese Lern- und Praxiserfahrungen unterstützen die Entwicklung der SWE der Psychologiestudierenden, beschrieben als die subjektive Gewissheit, ausreichend Kompetenzen zu besitzen, um Aufgaben erfolgreich bewältigen zu können (Bandura, 1977). Zahlreiche Befunde zeigen, dass die SWE im Hochschulkontext einer der bedeutsamsten Prädiktoren für akademische Leistungen darstellt (Richardson et al., 2012; Schneider & Preckel, 2017) sowie den erfolgreichen Berufseinstieg von Hochschulabsolvierenden unterstützt (Abele-Brehm & Stief, 2004).

Trotz dieser Relevanz der SWE fehlt es bislang an einem Strukturmodell, welches die SWE von Psychologiestudierenden abbildet. Darüber hinaus erfassen bestehende Messinstrumente die SWE entweder nur fachspezifisch (z.B. Finney & Schraw, 2003) oder missachten die Notwendigkeit einer aufgabenspezifischen Messung (Betz & Hackett, 2006).

Ziele des vorliegenden Beitrags sind daher, die Güte eines differenzierten Modells der SWE von Psychologiestudierenden (SWE-Matrix) vorzustellen und aufbauend auf diesem Modell einen neu entwickelten Fragebogen zu validieren, der eine polyvalente Messung der SWE zur Bewältigung von spezifischen Aufgaben der psychologischen Praxis in Bachelor und Master sowie in beliebig wählbaren Anwendungsbereichen der Psychologie ermöglicht.

Zudem soll gezeigt werden, dass der Fragebogen die SWE im Hochschulkontext ebenso valide misst, wie bereits etablierte Verfahren. Der Mehrwert des vorgestellten SWE-Modells und des aufbauenden Fragebogens wird an drei Aspekten deutlich. Erstens kann eine nach Aufgaben und Anwendungsbereichen der psychologischen Praxis differenzierte Messung mögliche Veränderungen der SWE im Studienverlauf abbilden. Diese Verlaufsmessung der SWE kann zweitens zur Qualitätssicherung universitärer Lehre beitragen. Es kann geprüft werden, ob Studierende im Studienverlauf zunehmend über die Kompetenzen und die damit verbundene SWE verfügen, erworbenes Wissen und Verstehen in der Praxis anzuwenden

(KMK, 2005). Drittens ist die differenzierte Erfassung der SWE Voraussetzung einer bedarfsorientierten Förderung der SWE, denn Studierende verfügen nicht notwendigerweise über eine SWE entsprechend ihrer Kompetenzen (Freund & Kasten, 2012), sodass sie ihre tatsächliche Kompetenz häufig verschätzen. Durch z.B. die Reflexion eigener Fähigkeiten und deren Differenzierung nach spezifischen Aufgabenfeldern (Hulleman, Barron, Kosovich, & Lazowski, 2016), kann die SWE korrigiert und der erfolgreiche Hochschulabschluss unterstützt werden. Im Zuge des Berufseinstiegs ist eine differenzierte SWE dann für den Berufsfeldwahlprozess und die Anpassungsfähigkeit im Karriereverlauf von Bedeutung (Savickas, 2013). In der Arbeitsaufgabe selbst unterstützt eine hohe SWE den erfolgreichen Umgang mit beruflichen Herausforderungen (Alessandri, Borgogni, & Truxillo, 2015).

## 3.3 Theoretischer Hintergrund

### 3.3.1 Selbstwirksamkeitserwartung (SWE)

Das Konzept der SWE wurde durch Bandura (1977) im Rahmen seiner sozial-kognitiven Lerntheorie eingeführt und beschreibt die Gewissheit, herausfordernde Situationen auf Grund eigener Kompetenz bewältigen zu können. Menschen mit hoher SWE suchen sich eher herausfordernde Aufgaben als Menschen mit geringer SWE. Sie setzten sich höhere Ziele (Schunk, 1991), die sie ausdauernder verfolgen, bei denen sie eine größere Anstrengung zeigen und bei denen sie sich von Rückschlägen schneller erholen (Lusczcynska et al., 2005).

Im akademischen Kontext gilt SWE als zentraler Prädiktor des Lern- und Studienerfolgs (Robbins et al., 2004). Ebenso lenkt die SWE das berufsbezogene Wahlverhalten (Hackett, 1995) und führt dazu, dass Hochschulabsolvierende bei Eintritt in den Arbeitsmarkt eine bessere Berufserfolgsprognose aufweisen (Abele-Brehm & Stief, 2004). Die SWE speist sich aus vier verschiedenen Quellen, zu denen auch bisherige Erfahrungen mit der Bewältigung konkreter Aufgaben zählen (Bandura, 1977). Studierende entwickeln aufgrund ihrer Lern- und

Praktikumserfahrungen im Studium eine individuelle SWE, die sich theoretisch auf drei Ebenen operationalisieren lässt. Die oberste Ebene erfasst die *allgemeine SWE*, häufig verstanden als stabile Persönlichkeitseigenschaft, die über verschiedene Lebensbereiche generalisierbar ist (Chen et al., 2001). Die zweite Ebene beschreibt die *domänenspezifische SWE*, die über verschiedene berufliche (Rigotti et al., 2008) oder akademische Aufgaben (Lent, Brown, & Larkin, 1987) verallgemeinert wird. Eine solche Domäne stellt auch das Psychologiestudium mit seinen Teildisziplinen der Arbeits-, Organisations- und Wirtschaftspsychologie (AOW), der Klinischen Psychologie (KLIPS) und der Pädagogischen Psychologie (PAEPS) dar. Auf der dritten und damit spezifischsten Ebene befindet sich die *aufgabenspezifische SWE*. Der Glaube an eigene Fähigkeiten ist hier auf die Bewältigung konkreter Aufgabe bezogen (Pajares & Miller, 1995). Im Psychologiestudium lassen sich konkrete Aufgaben der psychologischen Praxis spezifizieren, hinsichtlich derer die SWE der Studierenden gemessen wird (z.B. einen Intelligenztest durchführen).

Trotz dieser theoretischen Unterscheidung dreier Messebenen der SWE sind Betz und Hackett (2006) der Auffassung, dass SWE immer eine subjektive und zukunftsorientierte Einschätzung der eigenen Fähigkeiten *hinsichtlich der Bewältigung einer spezifischen Aufgabe* darstellt und kein verallgemeinertes Zutrauen über verschiedene Aufgaben. Dieser Annahme folgend, wurden konkrete Aufgaben der psychologischen Praxis formuliert, um die SWE von Psychologiestudierenden zu messen.

### 3.3.2 Modellierung der SWE von Psychologiestudierenden: SWE-Matrix

Zur Modellierung der SWE wurde zunächst ein auf das Fach Psychologie zugeschnittenes theoretisches Modell anforderungsanalytisch entwickelt. Das Modell systematisiert notwendige Fähigkeiten zur Bewältigung von Aufgaben der psychologischen Praxis und die damit assoziierte SWE der Studierenden über eine rautenförmige Matrix mit zwei Facetten (SWE-

Matrix). Die Wahl eines Facettenmodells lässt sich mit der Annahme begründen, dass Aufgaben der psychologischen Praxis die Fähigkeiten zweier Modalitäten (*Operationen* und *Inhalte*) erfordern. Die Matrix-Darstellung wurde in Anlehnung an das „Berliner Intelligenz-Struktur-Modell" (BIS; Jäger, Süß, & Beauducel, 1997) entwickelt, welches Intelligenzleistungen ebenso nach zwei Modalitäten klassifiziert.

Die erste Facette *Operationen* umfasst die drei Faktoren *Auswahl/Bewertung, Konstruktion* und *Durchführung*. Die zweite Facette *Inhalte* unterscheidet analog die drei Faktoren *Diagnostik*, *Intervention* und *Forschung/Evaluation* (vgl. Abbildung 2).
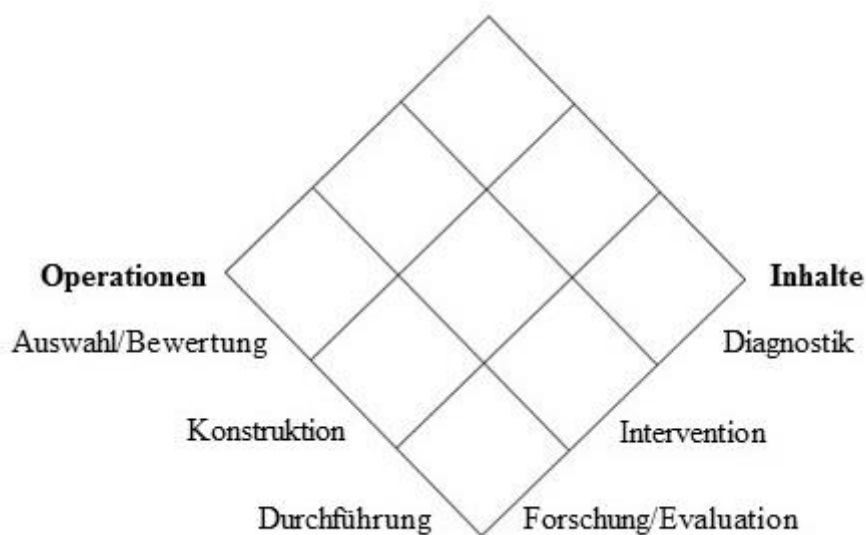


*Abbildung 2*. Selbstwirksamkeitserwartungs-Matrix als Facettenmodell mit zwei Modalitäten (Operationen und Inhalte)

Die operativen Fähigkeiten, die Psychologiestudierende im Hochschulstudium erwerben, wurden nach der *Handlungsregulationstheorie* (HRT; Hacker, 2003) differenziert. Gemäß der prozessorientierten Perspektive der HRT wird zunächst ein Handlungsziel gesetzt (*Auswahl/Bewertung*), ein Plan zu dessen Erreichung aufgestellt (*Konstruktion*), dieser Plan durchgeführt und damit das Handlungsergebnis erreicht und zurückgemeldet (*Durchführung*).

Die drei Inhaltsfaktoren der SWE-Matrix, in denen die drei operativen Fähigkeiten zum Tragen kommen, wurden deduktiv aus dem Selbstverständnis der Psychologie abgeleitet, die als empirische Wissenschaft versucht, menschliches Verhalten und Erleben zu beschreiben (*Diagnostik*), zu beeinflussen (*Intervention*) sowie zu erklären und vorauszusagen (*Forschung/Evaluation*) (Hussy, Schreier, & Echterhoff, 2010). Die drei Operationen und Inhalte sind wie folgt definiert:

*Auswahl/Bewertung:* Fähigkeit zur Informationsbeschaffung und -auswertung zur Einschätzung der Güte psychologischer Verfahren, des aktuellen Forschungsstands und der Relevanz psychologischer Konstrukte

*Konstruktion:* Fähigkeit zur Planung, Konzeption und Modifikation von psychologischen Verfahren, Veränderungsmaßnahmen und wissenschaftlichen Projekten und Methoden

*Durchführung:* Fähigkeit zur Umsetzung von psychologischen Verfahren, Veränderungsmaßnahmen und wissenschaftlichen Projekten und Methoden

*Diagnostik:* Fähigkeit zu Identifikation, Anpassung und Umsetzung psychologischer Verfahren im Rahmen von Ist-Analysen

*Intervention:* Fähigkeit zur theoretischen Herleitung, Anpassung und Umsetzung psychologischer Verfahren im Rahmen von Veränderungsmaßnahmen

*Forschung/Evaluation:* Fähigkeit zur theoretischen Herleitung, Anpassung und Umsetzung von wissenschaftlichen Projekten und Methoden im Rahmen von Zusammenhangs-, Änderungs- und Wirksamkeitsprüfungen

Gemäß der beiden Facetten von Fähigkeiten kann die SWE von Psychologiestudierenden beschrieben werden: Eine Psychologin oder ein Psychologe ist z.B. im Bereich der AOW tätig und unterstützt Unternehmen bei Personalauswahlentscheidungen. Hierzu gehört, geeignete Verfahren der Personaldiagnostik auszuwählen und auf ihre praktische Nützlichkeit hin zu

bewerten (Operation *Auswahl/Bewertung*, Inhalt *Diagnostik*). Ist ein geeignetes diagnostisches Verfahren identifiziert, kann dieses im nächsten Schritt angepasst werden, z.B. durch die Konstruktion zusätzlicher Items, die für das Unternehmen relevante Persönlichkeitseigenschaften erfragen (Operation *Konstruktion*, Inhalt *Intervention*). Schließlich sollte das Verfahren tatsächlich durchgeführt und die Ergebnisse dem Auftraggeber zurückgemeldet werden, um die Personalauswahlentscheidung zu unterstützen (Operation *Durchführung*, Inhalt *Forschung*/*Evaluation*).

Anzumerken ist, dass die Psychologie als empirische Wissenschaft einen methodischen Schwerpunkt in der Ausbildung legt. Forschungs- und Auswertungsmethoden sind bisher nur indirekt in den Faktoren abgebildet. Die SWE-Matrix erhebt daher keinen Anspruch auf Vollständigkeit, sondern stellt einen ersten Ansatzpunkt zur differenzierten Beschreibung von psychologischen Fähigkeiten dar. Das Modell ist offen für Erweiterungen sowie für Übertragungen auf andere Studiengänge, worauf im Ausblick genauer eingegangen wird.

### 3.3.3 Messung der SWE von Psychologiestudierenden

Hinsichtlich der operativ und inhaltlich spezifizierten Fähigkeiten soll nun die SWE von Psychologiestudierenden gemessen werden. Bisherige Verfahren erfassen die SWE entweder nicht im Hochschulkontext (Pajares & Miller, 1995), lediglich fachspezifisch (Finney & Schraw, 2003) oder nicht aufgabenspezifisch (Chemers, Hu, & Garcia, 2001). Laut Bandura (1977) müssen aber zur Messung der SWE zunächst die zu bewältigenden Aufgaben spezifiziert werden, was er als *mikroanalytisches Vorgehen* beschreibt.

Entsprechend wurden für jedes der neun Felder der SWE-Matrix je zwei konkrete Aufgaben der psychologischen Praxis generiert. Dabei identifizierten drei Expertinnen und Experten der Psychologie gemeinsam fächerübergreifende Aufgaben der Psychologie. Als

inhaltliche Grundlagen dienten das „Dictionary of Occupational Titles" (Farr, Ludden, & Shatkin, 2002), Berufsbeschreibungen der Bundesagentur für Arbeit (2013), Modulhandbücher des Psychologiestudiums und Interviews mit universitären Expertinnen und Experten sowie Arbeitgeberinnen und Arbeitgebern aus dem Feld der Psychologie. Die so generierten Berufsaufgaben wurden dann jeweils einer Operation und einem Inhalt zugeteilt. Der resultierende Fragebogen umfasst 18 Aufgabenbeschreibungen (Items), die durch Expertenratings auf ihre Inhaltsvalidität hin geprüft wurden. Im Kern wurde reflektiert, ob die Items die neun Zellen des Modells operationalisieren (z.B. „konzipieren" - Operation der „Konstruktion", vgl. Item 9, Tabelle 1).

Tabelle 1

*Items des Fragebogens zur Messung der Selbstwirksamkeitserwartung im Psychologiestudium*

---

*Sie sollen..*

Operation: *Auswahl/Bewertung;* Inhalt: *Diagnostik*

1.  .. für eine bestimmte Fragestellung diagnostische Verfahren auswählen.
2.  .. die Eignung und den Nutzen diagnostischer Verfahren bewerten.

Operation: *Konstruktion;* Inhalt: *Diagnostik*

3.  .. bereits vorhandene diagnostische Verfahren für eine spezifische Fragestellung adaptieren.
4.  .. neue diagnostische Verfahren konstruieren.

Operation: *Durchführung:* Inhalt: *Diagnostik*

5.  .. diagnostische Verfahren durchführen und die Ergebnisse auswerten.
6.  .. Ergebnisse aus diagnostischen Verfahren mündlich und schriftlich rückmelden.

Operation: *Auswahl/Bewertung;* Inhalt: *Intervention*

7.  .. für ein konkretes Projekt geeignete Fachliteratur auswählen.
8.  ..für ein konkretes Projekt Fachliteratur zusammenfassen und auswerten.

Operation: *Konstruktion;* Inhalt: *Intervention*

9.  .. ein Beratungsangebot konzipieren.
10. .. eine spezifische Veränderungsmaßnahme entwerfen.

Operation: *Durchführung;* Inhalt: *Intervention*

11. .. ein Beratungsangebot durchführen.
12. .. Veränderungsmaßnahmen durchführen.

Operation: *Auswahl/Bewertung;* Inhalt: *Forschung/ Evaluation*

13. .. den Kenntnisstand zur Forschung kritisch aufarbeiten und relevante Forschungsfrage identifizieren.
14. .. die relevanten Konstrukte hinter einer Evaluationsfrage identifizieren.

Operation: *Konstruktion;* Inhalt: *Forschung/Evaluation*

15. .. ein Forschungsprojekt planen.
16. .. ein Evaluationsprojekt planen.

Operation: *Durchführung;* Inhalt: *Forschung/ Evaluation*

17. .. ein Forschungsprojekt durchführen.
18. .. ein Evaluationsprojekt durchführen.

---

Die aufgabenspezifische SWE kann nur in Zusammenhang mit dem Anwendungsbereich gemessen werden, indem die konkrete Aufgabe bewältigt werden soll (Betz & Hackett, 2006). Dieser Anwendungsbereich wurde über einen Vignettenansatz abgebildet, indem den Studierenden für die drei betrachteten Anwendungsbereiche der Psychologie schriftlich beschriebene Szenarien aus der Praxis präsentiert wurden (vgl. Appendix A, Tabelle A1a-A1c). Für die Erstellung der Vignetten wurden wiederum Experteninterviews und die Modulhandbücher genutzt. Die Szenarien wurden anschließend mittels Expertenratings auf ihre

Adäquatheit hin bewertet. Hierbei stand die Frage im Fokus, ob die beschriebenen Situationen reale Anforderungen der psychologischen Praxis repräsentieren. Dies ist bedeutsam, da sich die Studierenden mit Hilfe der beschriebenen Szenarien in den jeweiligen Anwendungsbereich hineinversetzen sollen, um anschließend ihre SWE anhand der 18 Items einzuschätzen.

### 3.3.4 Empirische Überprüfung der SWE-Matrix

Datengrundlage für die Überprüfung der SWE-Matrix in den drei Anwendungsbereichen sind jeweils die SWE-Einschätzungen auf den 18 Items. Die 2-Facettenstruktur der SWE-Matrix wurde formal über einen *Multitrait-Multimethod-*(*MTMM*) Ansatz abgebildet. Spezifisch wurde hier die 2-Facettenstruktur der *Correlated-Traits-Correlated-Methods* (*CTCM*)-Modelle inhaltlich adaptiert. Eine Grundannahme solcher CTCM-Modelle besagt, dass jede der zwei Facetten in mindestens drei korrelierte Faktoren untergliedert wird, zwischen den Faktoren unterschiedlicher Facetten sollte aber kein Zusammenhang bestehen (z.B. Eid, Lischetzke, Nussbaum, & Trierweiler, 2003). Des weiteren lädt jedes Item auf genau einem Faktor jeder Facette (Byrne, 2012). Die SWE-Matrix erfüllt diese Voraussetzungen der CTCM-Modelle und wird entsprechend der sprachlich adaptierten Facetten als *„Multi-Operationen-Multi-Inhalte"* (*MOMI*)-Modell bezeichnet (vgl. Appendix A, Abbildung A2).

Um die Faktoren inhaltlich interpretieren zu können, muss beachtet werden, dass im MOMI-Modell jedes Item immer auf zwei Faktoren lädt. Demnach wird jeder Inhaltsfaktor immer unter dem kontrollierten Einfluss des zugehörigen Faktors der Operation interpretiert und umgekehrt. Die Varianz jedes Items lässt sich demnach immer in eine operative, eine inhaltliche und eine Fehlerkomponente unterteilen (Eid et al., 2003).

## 3.4 Ziele der vorliegenden Untersuchung

Der vorliegende Beitrag verfolgt drei übergeordnete Ziele: (1) Das MOMI-Modell als Strukturmodell der SWE von Psychologiestudierenden wird konfirmatorisch geprüft und gegen alternative Modelle getestet. Der Vergleich mit 1-Facetten-Modellen mit drei korrelierten Faktoren soll zeigen, ob eine sparsamere Darstellung sinnvoll erscheint; der Vergleich mit einem g-Faktor-Modell soll zeigen, dass die SWE von Psychologiestudierenden keinen „generellen Trait" darstellt (Betz & Hackett, 2006), sondern aufgabenspezifisch ist. (2) Die 18 Items werden auf Messinvarianz über die Studiengänge Bachelor und Master sowie über die drei Anwendungsbereiche der Psychologie getestet. Der Nachweis einer studiengang- und bereichsübergreifenden Passung ermöglicht eine polyvalente Erfassung der SWE anhand des Fragebogens auch in weiteren psychologischen Teildisziplinen (z.B. Forschungs- und Auswertungsmethoden). (3) Zuletzt wird der Fragebogen anhand etablierter Konstrukte und theoretisch assoziierter Außenkriterien pro Anwendungsbereich validiert. Zur Konvergenzprüfung werden die berufliche SWE und das akademische Selbstkonzept betrachtet. Letzteres gilt ebenso wie die SWE als zentraler Prädiktor für akademische Leistung (Brunner et al., 2009). Dennoch gelten die SWE und das akademische Selbstkonzept als theoretisch (Bong & Skaalvick, 2003) und empirisch (Ferla et al., 2009) differenzierbare Konstrukte. Diskriminante Validität nimmt einen im Betrag geringen oder negativen Zusammenhang zwischen zwei Konstrukten an und wird mittels des Zusammenhangs zwischen SWE und Neurotizismus geprüft. Neurotizismus beschreibt die Tendenz, negative Emotionen (z.B. Angst) zu empfinden, bei geringer Ausprägung weisen Personen u.a. ein besseres Vertrauen in sich und ihre Fähigkeiten auf (Zhao & Seibert, 2006). Die bisherige Forschung zeigt einen negativen (Judge & Ilies, 2002) oder keinen Zusammenhang zwischen SWE und Neurotizismus (Hartman & Betz, 2007), den auch wir vermuten. Als Außenkriterien werden erstens die Noten in den drei psychologischen Anwendungsfächern betrachtet. Insbesondere im

akademischen Kontext gilt SWE als zentraler Prädiktor für gute Leistungen bzw. Noten (Schneider & Preckel, 2017). Es wird folglich ein positiver Zusammenhang zwischen der SWE der Psychologiestudierenden und deren Noten im Studium erwartet (Chemers et al., 2001; Gore, 2006). Als zweites Kriterium wird die Berufserfahrung in den einzelnen Anwendungsbereichen im Kontext studienbegleitender Praktika herangezogen. Hier könnten Lernerfahrungen aus der psychologischen Praxis die SWE positiv beeinflussen (Bandura, 1977; Campbell & Hackett, 1986). Zuletzt wird die Veränderung der SWE in Abhängigkeit vom Studiensemester analysiert. Zunehmende Lern- und Praxiserfahrungen im Verlauf des Studiums sollten einen Anstieg der SWE bedingen und sich in Unterschieden zwischen den Semestern zeigen. Ergänzend werden auch die Korrelationen der beruflichen SWE und des akademischen Selbstkonzepts mit den beiden Außenkriterien sowie die Veränderung der latenten Mittelwerte im Studienverlauf betrachtet. Dadurch soll einerseits die Ähnlichkeit zu etablierten Konstrukten gezeigt, andererseits der Mehrwert unseres differenzierten und aufgabenspezifischen Instruments zur Messung der SWE herausgestellt werden.

## 3.5 Methode

### 3.5.1 Stichprobe und Prozedur der Datenerhebung

Die Erhebung fand dreimal zu Semesterbeginn an der Universität Trier statt. Insgesamt nahmen 1808 Psychologiestudierende teil, davon mussten 498 Datensätze aufgrund doppelter Teilnahmen und 68 aufgrund fehlender Werte auf allen Variablen ausgeschlossen werden, sodass $N = 1242$ Probandinnen und Probanden verblieben (80,7 % weiblich; Alter $M = 23.60$ Jahren, $SD = 3.50$). Von diesen befanden sich 812 im Bachelor (Semester 1-2: 38,5 %, Semester 3-4: 20,1 %, ab Semester 5: 30,6 %; fehlende Angabe: 10,8 %) und 428 im Master (Semester 1-2: 40,4 %; ab Semester 3: 20,6 %, fehlende Angabe: 39,0 %). Bei zwei Personen lag zum Studiengang keine Angabe vor. Insgesamt füllten 26,2 % der Probandinnen und Probanden den

Fragebogen online über einen zugesandten Link aus, 73,8 % Probandinnen und Probanden als ausgeteilte Papierversion in den Hauptvorlesungen des Studiengangs. Als Vergütung konnten die Studierenden entweder 30 Versuchspersonenminuten erhalten oder an der Verlosung von Geldgewinnen teilnehmen.

### 3.5.2 Instrumente

*SWE von Psychologiestudierenden:* Zunächst erhielten die Studierenden eine Vignette pro Anwendungsbereich und die Instruktion, sich die beschriebene Situation möglichst konkret vorzustellen. Im Anschluss beantworteten die Studierenden auf einer 6-stufige Likert Skala (1 = *"trifft überhaupt nicht zu"* bis 6 = *"trifft voll und ganz zu"*) die 18 Items pro Anwendungsbereich. Sie sollten dabei einschätzen, wie zuversichtlich sie aktuell sind, diese 18 Aufgaben bewältigen zu können. Die Wahl eines verbal-verankerten sechsstufigen Antwortformats für den SWE-Fragebogen beruht auf Ergebnissen eines kognitiven Interviews, nach denen Studierende dieses Antwortformat zur Erfassung der SWE präferieren (Müller, 2014). Das Antwortformat wurde bei allen weiteren Instrumenten beibehalten.

*Berufliche SWE:* Vier Items von Rigotti et al. (2008), die pro Anwendungsbereich im Anschluss an die Vignetten und den 18-Item-Fragebogen beantwortet wurden (z.B. „Ich fühle mich den beschriebenen beruflichen Anforderungen gewachsen."). Die Mittelwerte lagen zwischen $M = 3.07$ ($SD = 1.10$) und $M = 3.30$ ($SD = 1.11$), die Reliabilitäten zwischen $\alpha = .86$ und $\alpha = .87$.

*Akademisches Selbstkonzept:* Drei Items in Anlehnung an den *Self-Description Questionnaire III* (SDQ III; Marsh & O'Neill, 1984), die pro Anwendungsbereich ebenfalls im Anschluss an die Vignetten und den 18-Item-Fragebogen beantwortet wurden (z.B. „Ich bin gut

in Klinischer Psychologie."). Die Mittelwerte lagen zwischen $M = 3.19$ ($SD = 1.40$) und $M = 3.62$ ($SD = 1.47$), die Reliabilitäten zwischen $\alpha = .94$ und $\alpha = .95$.

*Neurotizismus:* Vier Items (z.B. „Ich mache mir viele Sorgen") der *Big-Five-Kurzskala* (BFI-K; Rammstedt & John, 2005) wurden einmalig am Ende der Befragung beantwortet. Der Mittelwert lag bei $M = 3.51$ ($SD = 1.02$), die Reliabilität bei $\alpha = .83$.

*Noten und Berufserfahrung:* Die Studierenden gaben abschließend Auskunft, welche Noten sie in den Modulabschlussprüfungen der drei Anwendungsfächer erzielt und wie viele Praktikumswochen sie bereits absolviert hatten.

### 3.5.3 Analysen

Die statistischen Analysen wurden mit SPSS 23 und MPlus 7 durchgeführt. Erstens wurde die Passung des MOMI-Modells (M0) mittels konfirmatorischer Faktorenanalysen (CFA) pro Anwendungsbereich geprüft. Als Schätzer wurde der *Maximum Likelihood Schätzer* verwendet. Die Korrelationen zwischen den Faktoren einer Facette wurden frei geschätzt, die Korrelationen über die Facetten hinweg auf Null gesetzt. Es wurden alle Faktorladungen frei geschätzt und die Varianz der latenten Faktoren auf 1 fixiert (Byrne, 2012).

Dann wurde das MOMI-Modell zunächst mit einem 1-Facetten-Modell mit drei korrelierten Faktoren für Operationen (M1) sowie analog mit einem 1-Facetten-Modell mit drei korrelierten Faktoren für Inhalte (M2) verglichen. Anschließend wurde ein g-Faktor-Modell (M3) betrachtet. Zur Bewertung der Modellgüte wurden etablierte Fit-Statistiken verwendet (CFI $\geq$ .95, TLI $\geq$ .95, RMSEA $\leq$ .08, SRMR $\leq$ .06; Dimitrov, 2010). Diese wurden um die relativen Fit-Indizes AIC und BIC ergänzt, bei denen kleinere Werte jeweils bessere Modellpassungen anzeigen (Byrne, 2012).

Zweitens wurde die Messinvarianz des Fragebogens über die beiden Erhebungsmodi (Papier und Online) sowie über die Studiengänge Bachelor und Master pro Anwendungsbereich geprüft. Zur besseren Vergleichbarkeit der Daten beider Erhebungsmodi wurde eine Zufallsstichprobe aus den Daten des Erhebungsmodus *Papier* ausgewählt, die der Größe der Stichprobe entsprach, die online teilgenommen hatte. Für die drei Anwendungsbereiche AOW, KLIPS und PAEPS wurde eine Messinvarianzprüfung über abhängige Daten vorgenommen, da von jedem Studierenden Daten innerhalb eines jeden Anwendungsbereiches vorlagen.

Bei allen drei Messinvarianztestungen wurden konfigurale, metrische und skalare Messinvarianz unter Verwendung des Step-up-Ansatzes schrittweise geprüft. Es wurde aufgrund des MLR-Schätzers der Satorra-Bentler skalierte $\chi^2$-Differenztest sowie das Verhältnis zwischen Chi-Quadrat und Freiheitsgraden ($\chi 2/df$) betrachtet, um die Stichprobensensitivität des $\chi^2$-Tests zu umgehen (Byrne, 2012). Zusätzlich wurden die Differenzen in alternativen Fit-Indizes herangezogen: Bei einer Gesamtstichprobe von $N \geq 300$ sollte nach Chen (2007) die Differenz zwischen den Invarianzstufen bei $\Delta$CFI $\leq$ .01 (metrisch) bzw. $\Delta$CFI $\leq$. 10 (skalar) und bei $\Delta$RMSEA $\leq$ .015 (metrisch, skalar) liegen; die nicht zu überschreitende Differenz zwischen den Invarianzstufen für $\Delta$SRMR liegt für metrische Messinvarianz mit .030 etwas höher als für skalare Messinvarianz (.010).

Drittens wurden zur Prüfung der Konstruktvalidität für jeden Anwendungsbereich getrennt zunächst die sechs SWE-Faktorwerte des MOMI-Modells latent in MPlus geschätzt, diese dann als f-scores abgespeichert und mit den konstruktnahen und -fernen Maßen sowie den Außenkriterien korreliert. Die berufliche SWE und das akademische Selbstkonzept wurden latent modelliert, Noten und Berufserfahrungen lagen manifest vor. Abschließend wurden die sechs latenten Faktorwerte sowie die der beruflichen SWE und des akademischen Selbstkonzepts zwischen verschiedenen Studiensemestern pro Anwendungsbereich auf Unterschiedlichkeit hin geprüft (MANOVA).

## 3.6 Ergebnisse

*Überprüfung des Strukturmodells*

Die Ergebnisse zeigen, dass das MOMI-Modell die Daten adäquat beschreibt und eine bessere Modellpassung aufweist als die drei alternativen Strukturmodelle (CFI = .967-.974, TLI = .954-.963, RMSEA = .060-.068, SRMR = .026-.029, vgl. Appendix A, Tabelle A3).

Die Faktorladungen der Operationsfaktoren des MOMI-Modells liegen zwischen $\lambda = .56$ (Item 4, PAEPS) und $\lambda = .92$ (Item 13, KLIPS) und die der Inhaltsfaktoren zwischen $\lambda = .11$ (Item 13, KLIPS) und $\lambda = .74$ (Item 11, PAEPS) (vgl. Appendix A, Tabelle A4). Die Faktorkorrelationen innerhalb einer Facette des MOMI-Modells liegen für die Operationen bei $r = .85$ bis $r = .92$, zwischen denselben Faktoren verschiedener Anwendungsbereiche bei $r = .83$ bis $r = .87$. Für die Inhaltsfaktoren zeigen sich Korrelationen von $r = .39$ bis $r = .53$ innerhalb und von $r = .45$ bis $r = .61$ über die Anwendungsbereiche hinweg (alle $p < .001$). Alle Reliabilitäten der latenten Faktoren (McDonald's Omega ω; McDonalds, 1999) können mit ω = .85 (*Diagnostik*, KLIPS) bis ω = .97 (*Durchführung*, KLIPS) als gut bis sehr gut bewertet werden.

Anzumerken ist, dass bei allen vier Modellen (M0-M3) die Residuen von Item 7 und 8 sowie von Item 15 und 18 frei korrelieren konnten. Dies ist im Rahmen von CFA gerechtfertigt, wenn die betreffenden Items ähnliche Inhalte erfragen (Byrne, 2012). Dies ist bei Item 7 und 8 gegeben; bei Item 15 und 18 ist anzunehmen, dass die Formulierungen „Forschungs- und Evaluationsprojekt" zu heterogenen Interpretationen der Begriffe und folglich zu korrelierten Residuen führten.

*Tests auf Messinvarianz*

Die Ergebnisse der CFAs des MOMI-Modells getrennt nach Anwendungsbereichen zeigen für die Daten der Papier- ($N = 901$) und Onlineversion ($N = 320$) sowie für die Daten der

Bachelor- (*N* = 812) und Masterstudierenden (*N* = 428) jeweils eine gute Modellpassung (CFI = .930-.976; vgl. Appendix A, Tabelle A5a-A5b). Um die Daten zusammenzulegen, wurde skalare Messinvarianz benötigt. Die Ergebnisse bestätigen das Vorliegen skalarer (PAEPS) und partiell skalarer Messinvarianz (AOW, KLIPS) über die Erhebungsmodi sowie partiell skalarer (AOW) und metrisch und partiell skalarer (KLIPS, PAEPS) Messinvarianz über die Daten der Bachelor- und Masterstudierenden (vgl. Appendix A, Tabelle A6a-A6b). Es kann über die drei Anwendungsbereiche partiell metrische und partiell skalare Messinvarianz des Fragebogens angenommen werden (vgl. Appendix A, Tabelle A6c). Für partiell metrische Messinvarianz als Voraussetzung (partiell) skalarer sollten nur die Minderheit der Faktorladungen freigesetzt werden (Vandenberg & Lance, 2000). Bei der Prüfung partiell skalarer Messinvarianz kann die Freisetzung von bis zu 20 % der Parameter als akzeptabel eingestuft werden (Dimitrov, 2010).

*Konvergente, diskriminante und kriterienbezogene Validität*

Die Korrelationen sind in Tabelle 2a und 2b abgebildet. Es zeigen sich wie erwartet über die drei Anwendungsbereiche hinweg signifikant positive Korrelationen der sechs Faktorwerte mit der beruflichen SWE und dem akademischen Selbstkonzept (konvergente Validität). Auffällig sind in allen Anwendungsbereichen die deutlich höheren Zusammenhänge der Operationsfaktoren (*r* = .58 bis *r*= .75) als der Inhaltsfaktoren (*r* = .13 bis *r* = .48) (alle *p* < .001). Die diskriminante Validität wird dadurch gestützt, dass die sechs Faktorwerte des MOMI-Modells pro Anwendungsbereich negative Korrelationen zu Neurotizismus aufweisen, die nahe bei null liegen.

Tabelle 2a

*Korrelationen von Faktorwerten zur Prüfung der Konstruktvalidität des Fragebogens pro Anwendungsbereich*

| | Berufliche SWE | | | Akademisches SK | | | Neurotizismus | | |
|---|---|---|---|---|---|---|---|---|---|
| | AOW | KLIPS | PAEPS | AOW | KLIPS | PAEPS | AOW | KLIPS | PAEPS |
| Dia | .45*** | .32*** | .34*** | .33*** | .24*** | .22*** | -.04 | -.01 | -.05 |
| Int | .48*** | .40*** | .41*** | .35*** | .22*** | .19*** | -.05 | .02 | -.08* |
| For/Eval | .44*** | .23*** | .38*** | .30*** | .13** | .20*** | -.02 | -.03 | -.06 |
| Aus/Bew | .66*** | .75*** | .68*** | .61*** | .69*** | .66*** | -.09* | -.06 | -.06 |
| Kon | .64*** | .73*** | .67*** | .55*** | .63*** | .60*** | -.11** | -.09* | -.06 |
| Durch | .58*** | .70*** | .62*** | .58*** | .68*** | .64*** | -.08 | -.07* | -.03 |

*Anmerkungen.* Dia = Diagnostik, Int = Intervention, For/Eval = Forschung/Evaluation, Aus/Bew = Auswahl/Bewertung, Kon = Konstruktion, Durch = Durchführung; Stichprobe Noten: $N = 446$ (AOW), $N = 442$ (KLIPS), $N = 448$ (PAEPS); SWE = Selbstwirksamkeitserwartung; SK = Selbstkonzept. Angegeben ist der Korrelationskoeffizient r; Noten sind invers kodiert, je besser die Note, desto geringer der Wert.
*$p < .05$. **$p < 01$, ***$p < .001$.

Tabelle 2b

*Korrelationen von Faktorwerten zur Prüfung der Konstruktvalidität des Fragebogens pro Anwendungsbereich*

| | Note | | | Berufserfahrung | | |
|---|---|---|---|---|---|---|
| | AOW | KLIPS | PAEPS | AOW | KLIPS | PAEPS |
| Dia | -.10* | -.08* | -.06 | .10** | .13*** | .06* |
| Int | -.13** | -.09* | -.09* | .15*** | .02 | .06* |
| For/Eval | -.15*** | -.04 | -.09* | .08** | .04 | .05 |
| Aus/Bew | -.46*** | -.53*** | -.48*** | .14*** | .27** | .21*** |
| Kon | -.40*** | -.45*** | -.42*** | .16*** | .24** | .18*** |
| Durch | -.45*** | -.50*** | -.48*** | .14*** | .26** | .21*** |
| Berufliche SWE | -.37*** | -.43*** | -.36*** | .22** | .27** | .18*** |
| Akademisches SK | -.52*** | -.52*** | -.49*** | .24*** | .27** | .22*** |

*Anmerkungen.* Dia = Diagnostik, Int = Intervention, For/Eval = Forschung/Evaluation, Aus/Bew = Auswahl/Bewertung, Kon = Konstruktion, Durch = Durchführung; Stichprobe Noten: $N = 446$ (AOW), $N = 442$ (KLIPS), $N = 448$ (PAEPS); Stichprobe Berufserfahrung: $N = 120$ (AOW), $N = 160$ (PAEPS), $N = 471$ (KLIPS). SWE = Selbstwirksamkeitserwartung; SK = Selbstkonzept. Angegeben ist der Korrelationskoeffizient r; Noten sind invers kodiert, je besser die Note, desto geringer der Wert.
*$p < .05$. **$p < 01$, ***$p < .001$.

Die Noten zeigen pro Anwendungsbereich erwartungsgemäße Zusammenhänge: je besser die Note, desto höher auch die SWE der Studierenden. Für die Operationsfaktoren liegen die

Korrelationen[1] zwischen $r = -.40$ (*Konstruktion,* AOW) und $r = -.53$; (*Auswahl/Bewertung,* KLIPS). Erwartungsgemäß zeigen sich auch positive Zusammenhänge zwischen den Operationsfaktoren und den Praktikumserfahrungen ($r = .14$; *Auswahl/Bewertung*, *Durchführung,* AOW bis $r = .27$; *Auswahl/Bewertung,* KLIPS). Die Zusammenhänge zwischen den Inhaltsfaktoren und den Außenkriterien sind geringer und zeigen sich für die Noten vorrangig im Bereich der AOW ($r = .15$; *Forschung/Evaluation*) sowie für die Praktikumserfahrungen in der KLIPS (*Intervention*; $r = .15$) (alle $p < .01$).

Die Korrelationen der beruflichen SWE und des akademischen Selbstkonzepts mit den Noten liegen zwischen $r = -.36$ (PAEPS) und $r = -.52$ (AOW, KLIPS); mit der Berufserfahrung zwischen $r = .18$ (PAEPS) und $r = .27$ (KLIPS) (alle $p < .01$).

*SWE und Semesteranzahl*

Die Ergebnisse der MANOVAs (vgl. Appendix A, Tabelle A7a-A7b) zeigen in allen drei Anwendungsbereichen signifikante Unterschiede zwischen den sechs Faktorwerten ($F(24, 3840) = 23.41$ bis $26.11$; $p < .001$, $\eta 2 = .13$ bis $.14$) sowie zwischen den latenten Mittelwerten der beruflichen SWE und des akademischen Selbstkonzepts ($F(10,2386) = 38.20$ bis $47.13$, $p<.001$, $\eta 2 = .14$ bis $.17$) in Abhängigkeit des Semesters. Post-hoc-Analysen bestätigen, dass sich die SWE der drei Operationsfaktoren zwischen verschiedenen Semestern unterscheidet, Ausnahme bildet der Vergleich der operationalen SWE zum Ende des Bachelors mit der zu Beginn des Masters. Im Master zeigen sich nur noch für die Operationsfaktoren *Auswahl/Bewertung* und *Konstruktion* in den Anwendungsbereichen KLIPS und PAEPS Unterschiede in der SWE verschiedener Semester. Hinsichtlich der drei Inhaltsfaktoren weist die SWE der ersten vier Semester im Bachelor einen geringeren Wert auf als in höheren Semestern (Bachelor und Master). Im Inhaltsfaktor *Diagnostik* ist die SWE im 3./4. Semester

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[1] Das negative Vorzeichen des Korrelationskoeffizienten ist durch die inverse Kodierung der Noten bedingt.

des Bachelors und zu Beginn des Masters deskriptiv sogar geringer als bei Studierenden niedrigerer Semester (vgl. Appendix A, Abbildung A8a-A8c).

Die Ergebnisse der Post-hoc-Analysen für die konvergenten Maße zeigen jeweils vergleichbare Faktorwerte in den ersten vier Semestern des Bachelors, die aber niedriger sind, als die in höheren Semester (Bachelor und Master). Die berufliche SWE ist im fortgeschrittenen Master (KLIPS, PAEPS), das akademische Selbstkonzept im Master generell höher ausgeprägt als zum Ende des Bachelors. Die Höhe beider Konstrukte unterscheidet sich im Master nicht zwischen den Semestern mit Ausnahme der beruflichen SWE im Bereich PAEPS (vgl. Appendix A, Tabelle A7a-A7b).

## 3.7 Diskussion

Der Beitrag zeigt, dass ein Strukturmodell (MOMI-Modell) mit sechs Faktoren die SWE von Psychologiestudierenden hinsichtlich der Bewältigung von Aufgaben der psychologischen Praxis adäquat beschreibt. Der darauf aufbauende Fragebogen ermöglicht damit die polyvalente Messung der SWE von Psychologiestudierenden im Bachelor und Master sowie in verschiedenen Anwendungsbereichen der Psychologie. Die SWE zeigt erwartungsgemäße konvergente (berufliche SWE, akademisches Selbstkonzept) und diskriminante (Neurotizismus) Beziehungen. Der Mehrwert des Fragebogens gegenüber bestehenden Verfahren zeigt sich in einer nach Facetten differenzierten Abbildung der Veränderungen der mittleren SWE; die SWE operativer Fähigkeiten steigt im Studienverlauf an, die SWE hinsichtlich inhaltlicher Fähigkeiten stagniert hingegen zum Ende des Bachelors.

Das MOMI-Modell weist verglichen mit alternativen Strukturmodellen eine gute Modellpassung auf. Dies weist darauf hin, dass Studierende ihre Fähigkeiten hinsichtlich operativer und inhaltlicher Fähigkeiten unterschiedlich einschätzen und dass Aufgaben der

psychologischen Praxis multiple Fähigkeiten erfordern. Eine umfassende Strukturforschung zur SWE, vergleichbar mit z.B. der Forschung zum akademischen Selbstkonzept (Brunner et al., 2009) fehlt bislang. In der SWE-Forschung finden sich lediglich einzelne Versuche eine multidimensionale und hierarchische Struktur der SWE nachzuweisen (z.B. Bandura, Barbaranelli, Caprara, & Pastorelli, 1996). Das MOMI-Modell liefert einen ersten Ansatzpunkt, dass die SWE von Studierenden der Psychologie durch zwei Facetten mit je drei Faktoren erster Ordnung abgebildet werden kann; einen übergeordneten Faktor der SWE konnte nicht nachgewiesen werden. Es bedarf weiterführender Untersuchungen der Struktur der SWE im Hochschulkontext.

Der auf dem Strukturmodell aufbauende Fragebogen kann im Bachelor oder Master sowie in verschiedenen Anwendungsbereichen der Psychologie eingesetzt werden. Diese Polyvalenz des Instruments kann genutzt werden, um Studierenden ein nach Anwendungsbereichen und Facetten differenziertes Feedback ihrer SWE zu geben (z.B. „Sie trauen sich im Bereich der AOW zu, ein diagnostisches Verfahren auszuwählen, jedoch nicht im Bereich der KLIPS). Feedback kann wiederum einen Ansatzpunkt individueller Trainingsmaßnahmen zur Beeinflussung der SWE darstellen. Durch die angeleitete Reflektion eigener Kompetenzen in Bezug auf einzelne Fähigkeiten (Hulleman et al., 2016) oder auch die Kommunikation eigener Kompetenzen im Rahmen von Bewerbungstrainings kann die SWE von Studierenden gesteigert werden (z.B. Peiffer, Preckel, & Ellwart, 2016). Für die berufliche Zukunft der Studierenden ist die Reflektion der eigenen SWE auch in Hinblick auf ihre Laufbahnentwicklung (konsekutiver Master oder Berufseinstieg) relevant (Savickas, 2013), denn durch eine individuelle Korrektur der SWE mittels Trainingsinterventionen wird das Interesse an bestimmten Anwendungsbereichen beeinflusst und damit das berufliche Wahlverhalten (Hacket, 1995).

Die wiederholte Messung der SWE kann auch der universitären Qualitätssicherung dienen, denn sie lässt Rückschlüsse auf die Angemessenheit der Lehre zur Berufsvorbereitung zu: Trauen sich Studierende mit zunehmendem Fortgang des Studiums mehr Fähigkeiten zu, wie es laut Bandura (1977) zu erwarten wäre? Oder gibt es, wie in unserer Untersuchung ersichtlich, Fähigkeitsbereiche (z.B. *Intervention*), in denen die SWE trotz Fortschreitens des Studiums stagniert? Eine mögliche Erklärung dieser Stagnation bietet der Aufbau des Studiengangs. Zu Beginn des Bachelors liegt der Fokus noch auf der Grundlagen- und Methodenausbildung, Anwendungsbezüge werden erst vertieft zum Ende des Bachelors gezogen. Erst dann können inhaltsbezogene Lernerfahrungen die inhaltsbezogene SWE unterstützen (Bandura, 1977). Werden im konsekutiven Master inhaltliche Fähigkeiten nicht weiter aufgebaut und lediglich bereits erworbene Kompetenzen von den Studierenden eingefordert, können keine weiteren positiven Lernerfahrungen gesammelt werden, womit die SWE stagniert.

In der SWE bzgl. diagnostischer Fähigkeiten gibt es sogar einen leichten Einbruch in der Mitte des Bachelors sowie zu Beginn des Masters. Die Diagnostik als zentrale Kompetenz der psychologischen Berufspraxis (Roth & Herzberg, 2008) wird vorrangig in diesen Studiensemestern gelehrt. Möglicherweise kommt es bei den Studierenden zunächst zu einem Gefühl der Überforderung mit den neuartigen Inhalten, was in einem Einbruch der SWE resultiert, bis sie die diagnostischen Aufgaben erfolgreich bewältigen (z.B. bestandene Klausur) und ihre SWE diesbezüglich ansteigt (Gore, 2006).

Festzuhalten ist, dass die Ergebnisse unserer Messung Hinweise dafür liefern können, über eine Anpassung von Lehrinhalten nachzudenken, indem z.B. mehr praktische Lernerfahrungen ermöglicht werden oder der Bezug der Lerninhalte zur psychologischen Praxis verstärkt durch die Dozierenden aufgezeigt wird (bedeutungshaltiges Lernen; siehe z.B. Schneider & Preckel, 2017). Nur dann kann auch die SWE inhaltsbezogener Fähigkeiten stetig anwachsen. Vorab

sollte aber eine längsschnittliche Messung der SWE der Psychologiestudierenden zeigen, ob der hier postulierte Verlauf der SWE auch intraindividuell bestätigt werden kann.

Um den Mehrwert des Verfahrens herauszustellen, wurden die Faktorwerte der SWE im Studienverlauf mit denen konvergenter Skalen verglichen, die nicht zwischen Operationen und Inhalten differenzieren. Die mittlere SWE operativer Fähigkeiten zeigt höhere Werte mit fortschreitendem Semester, Ausnahme bildet der Operationsfaktor *Durchführung* im Master. Die SWE von Studierenden hinsichtlich inhaltlicher Fähigkeiten zeigt im Studienverlauf nur leichte Unterschiede in Abhängigkeit des Semesters und diese vorrangig im Bachelor. Diese Mittelwertunterschiede weichen von denen der beruflichen SWE und des akademischen Selbstkonzepts ab. Beide Konstrukte weisen erst zum Ende des Bachelors höhere Werte auf, im Master gibt es lediglich im Bereich PAEPS Unterschiede in der beruflichen SWE verschiedener Semester, das akademische Selbstkonzept zeigt keine veränderten Mittelwerte. Die Ergebnisse verdeutlichen, dass nur eine nach Facetten differenzierte Messung in verschiedenen Phasen des Studiums wesentliche Informationen liefert, welche Fähigkeiten im Speziellen sich Studierende im Studienverlauf vermehrt zutrauen. Diese Informationen sind für die Lehrevaluation und -optimierung wertvoll, um z.B. gezielt einzelne Fähigkeitsbereiche im Modulhandbuch stärker zu berücksichtigen. Zudem kann das Wissen um die SWE der Studierenden die Entwicklung passgenauer Trainingsinterventionen zur Steigerung der facettenspezifischen SWE unterstützen. Mit Rückgriff auf die SWE-Matrix lassen sich darüber hinaus die Inhalte abstrakter Lehrpläne und Modulhandbücher mit konkreten fachlichen Aufgaben und Kompetenzen der psychologischen Praxis in Beziehung setzen. Studienanfänger erhalten damit eine realistische Tätigkeitsvorschau (Wanous, 1992) auf die im Studium gestellten Anforderungen und die zu erwerbenden Kompetenzen und können so die Passung zwischen Ausbildungsinhalten und Studienherausforderungen mit individuellen Motiven und Fähigkeiten abgleichen. Dies kann falschen Erwartungen an die Inhalte eines

Psychologiestudiums vorbeugen, die im Studienverlauf zu Enttäuschung und einem frühzeitigen Studienabbruch führen (Heublein, Hutzsch, Schreiber, Sommer, & Besuch, 2010). Ebenso spielt SWE eine wichtige Rolle bei der Berufsfeldwahl und Anpassungsfähigkeit im Karriereverlauf (Savickas, 2013) und ist damit relevanter Prädiktor bei der erfolgreichen Bewältigung beruflicher Aufgaben (Alessandria et al., 2015).

*Limitationen und Ausblick*

Die Korrelationen der Operationsfaktoren mit den konvergenten Maßen und Außenkriterien[2] sowie zwischen den Faktoren selbst innerhalb und über die drei Anwendungsbereiche hinweg sind größer, als für die drei Inhaltsfaktoren. Möglicherweise fließt bei der Einschätzung eigener operativer Fähigkeiten eine generalisierte Überzeugung mit ein, eine *Auswahl/Bewertung*, *Konstruktion* oder *Durchführung* bei psychologischen Aufgaben der Praxis bewältigen zu können. Dieses weniger aufgabenspezifische Zutrauen wird auch durch die konvergente SWE-Skala gemessen, wodurch sich die hohen Zusammenhänge zu den Operationsfaktoren erklären ließen. Eine mögliche Erklärung, warum die SWE der Studierenden für inhaltliche Fähigkeiten differenzierter abgebildet werden kann als für operationale, bieten die Curricula. Studierende der Psychologie erwerben vornehmlich theoretisches Wissen mit Schwerpunkt auf den drei Inhaltsbereichen, hingegen bieten sich Lerngelegenheiten im Umgang mit praktischen Problemstellungen, in denen die operationalen Fähigkeiten zum Tragen kommen, lediglich im Rahmen von studienbegleitenden Praktika oder praxisorientierten Lehrveranstaltungen. Studierende empfinden entsprechend den Lehrstoff in zu geringem Maße als berufs- und praxisbezogen (Heublein et al., 2010). Diese fehlende Anwendung operationalen Wissens könnte bedingen, dass Studierende z.B. zwischen der

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[2] Anzumerken ist bei der Prüfung auf Übereinstimmungsvalidität mittels Außenkriterien, dass keine Korrektur des Alphafehlers vorgenommen wurde, um eine zu konservative Testung zu vermeiden. Dennoch liefern die Ergebnisse erste Hinweise auf theoriekonforme Zusammenhänge der SWE mit Leistungsindikatoren (z.B. Chemers et al., 2001) und Berufserfahrung (Bandura, 1977).

*Auswahl/Bewertung* und *Durchführung* eines diagnostischen Verfahrens nicht ausreichend differenzieren können und sich beide psychologischen Fähigkeiten gleichermaßen zutrauen bzw. nicht zutrauen. Es bedarf zukünftig weiterer Forschung zu Möglichkeiten einer differenzierteren Messung der SWE operationaler Fähigkeiten. Zudem sollten zukünftig weitere Außenkriterien zur Validierung herangezogen werden, z.B. Klarheit des Berufswunschs oder Karriereerfolg gemessen über Entgelt (Abele-Brehm & Stief, 2004).

Eine Einschränkung der SWE-Matrix und des darauf aufbauenden Fragebogens besteht in den 18 anforderungsanalytisch abgeleiteten Berufsaufgaben selbst, da diese auf das Fach Psychologie zugeschnitten sind. Die SWE-Matrix wurde jedoch so konzipiert, dass durch sprachliche Anpassungen des Fragebogens bei Beibehaltung der 6-Faktoren-Struktur die SWE auch in anderen Studiengängen (z.B. Betriebswirtschaftslehre) gemessen werden kann. Des weiteren ist eine polyvalente Erfassung mit den 18 Items in verschiedenen Bereichen der Psychologie möglich und dieser damit auf weitere psychologische Anwendungsbereiche übertragbar. Dazu könnten weitere Aufgaben der psychologischen Praxis aus der SWE-Matrix abgeleitet werden (z.B. einen statistischen Kennwert zu berechnen) und entsprechende Vignetten generiert werden.

*Fazit*

Das MOMI-Modell beschreibt die Struktur der SWE von Psychologiestudierenden adäquat und der vorgestellte Fragebogen ist ein ökonomisches und valides Instrument zur differenzierten und polyvalenten Messung der SWE hinsichtlich der Bewältigung von Aufgaben der psychologischen Praxis. Der Fragebogen ergänzt bereits bestehenden Verfahren um eine nach operativen und inhaltlichen Fähigkeiten differenzierte und aufgabenbezogene Messung der SWE, deren Ergebnisse für die Qualitätssicherung der Hochschullehre sowie für passgenaue Trainingsprogramme zur Korrektur der SWE genutzt werden können.

# 4. Study 2

## 4.1 Abstract

Academic self-concept (ASC) is the mental representation of one's own abilities in achievement situations. According to the internal/external frame of reference (I/E) model, students form their ASCs through comparing their own abilities across different subject areas (dimensional comparisons) and through comparing these abilities with the perceived skills of other students within their frame of reference (social comparisons). Little is known about the structure of ASC and the consequences of comparison processes in educational settings beyond the K-12 school system. We assessed the ASCs and achievement of 708 psychology students in four different psychology courses. We compared various structural models by confirmatory factor analyses and found the nested Marsh/Shavelson model with four psychological domains (statistics, industrial and organizational, clinical, educational psychology) and one general higher order factor provided the best fit. Testing the I/E model, we found positive effects of achievement in one domain on the corresponding ASC, but negative cross-domain effects, especially for the domain of statistics. Results underscore the multidimensionality of ASC in undergraduate psychology courses and offer empirical evidence for the generalizability of the I/E model to higher education.

## 4.2 Introduction

Academic self-concept comprises mental representations of one's own abilities in academic domains or subjects (Brunner et al., 2010). There is evidence from multiple educational settings and student groups that academic self-concept is multidimensional and hierarchically organized in different educational settings and for a diversity of students (e.g., Brunner et al., 2009; Marsh, 1990a). Besides the internal structure of academic self-concept, there has been a large body of

research addressing the paradox that students perceive contrasts in their abilities in multiple domains although their actual achievements show convergence. To explain this self-contradicting finding, Marsh (1986) postulated the *internal/external frame of reference* (I/E) model, which depicts two different frames of reference that students work with (Möller, Streblow, Pohlmann, & Köller, 2006). Within the *external* frame of reference, students compare their own achievement in a specific domain with those of other students (i.e., social comparisons); within the *internal* frame of reference, they evaluate their own achievement in a particular domain in relation to their achievement in another domain (i.e., dimensional comparisons; Möller & Köller, 2001a). Social comparisons lead to positive correlations between achievement indicators and self-concepts within domains. Dimensional comparisons, however, have negative effects of achievement in one domain on academic self-concepts in another domain.

Numerous studies have investigated the I/E model (for an overview see Möller et al. 2009) as well as the antecedents, influencing factors, and consequences of dimensional comparison processes, described in the *dimensional comparison theory* (DCT, Möller & Marsh 2013). Moreover, based on the generalized I/E model (GI/E; Möller, Helm, Müller-Kalthoff, Nagy, & Marsh, 2016), assumptions of the traditional I/E model have been extended to further variables (e.g., interest; Schurtz, Pfost, Nagengast, & Artelt, 2014) and domains (e.g., science; Jansen et al., 2015).

So far, studies have primarily been conducted in the K-12 school setting rather than in the field of higher education. Hence, determining if assumptions of multidimensionality and hierarchy as well as the postulated effects of the I/E model can be extended to higher education would provide a valuable contribution to existing research. As in school settings, academic self-concepts are central predictors of achievement in higher education (Schneider & Preckel, 2017). Furthermore, if we know the positive and negative effects on academic self-concepts explained

by social and dimensional comparisons, we will be able to produce appropriate intervention strategies to enhance university students' academic self-concepts (O'Mara et al., 2006), a central goal of education worldwide (Marsh & Hau, 2003).

In sum, this study has two major goals. First, we aim to replicate and generalize previous findings regarding the multidimensional and hierarchical structure of academic self-concept in school by testing these assumptions with university students (undergraduate and graduate psychology students). Second, we aim to extend the original I/E model by expanding it to four different domains in higher education.

## 4.3 Theoretical Framework

### 4.3.1 Structure of academic self-concept

A person's self-concept is formed by interactions with the environment (Bong & Skaalvick 2003) and refers to one's perception of oneself (Shavelson et al., 1976). Shavelson and colleagues (1976) were the first to develop a multifaceted, hierarchical model of self-concept. They postulated a higher order self-concept at the apex, divided into general academic and non-academic components. According to this model, the general academic self-concept can further be differentiated into subject-specific domains (e.g., English), whereas the non-academic component of self-concept is composed of social, emotional, and physical self-concept domains.

In the following years, the internal structure of academic self-concept was further investigated (e.g., Marsh et al., 1985). The general academic self-concept introduced by Shavelson et al. (1976) was proposed to explain the relationships among the first-order academic self-concept factors representing different school subjects. There was, however, a lack of evidence to support the assumption of a general academic self-concept at the top of the hierarchy (Marsh et al., 1988). On the basis of these findings, Marsh and Shavelson (1985)

postulated the Marsh/Shavelson model, distinguishing two uncorrelated second-order academic self-concept factors (math and verbal) instead of just one. Additionally, general academic self-concept was subordinated to general math and general verbal self-concepts. Even though some empirical findings have confirmed these central assumptions, the Marsh/Shavelson model has also been criticized. Marsh, Kong and Hau (2001) found only modest correlations between verbal self-concepts in English and Chinese among Chinese students, although this model would predict that both would be influenced by the higher-order verbal self-concept. Likewise, Gogol, Brunner, Martin, Preckel, and Goetz (2017) found only a modest correlation between verbal academic self-concepts in French and German. In conclusion, evidence for independent math and verbal self-concepts is lacking (e.g., Marsh, 1990b), moreover, empirical studies have also found substantial correlations between measures of domain-specific and general academic self-concepts (Marsh et al., 1985). Some have argued that general academic self-concept should therefore be placed at the apex rather than as a subordinate construct (Hardy, 2014).

Following these results, Brunner et al. (2010) developed a structural model in which more specific factors are nested within more general factors (Gustafsson & Balke, 1993, p. 414), called the nested Marsh/Shavelson model (NMS). In this NMS model, there are multiple academic self-concept factors which account for the unique influence of the specific factor over and above the general academic self-concept. The general factor is placed at the apex according to the self-concept hierarchy assumption (Shavelson et al., 1976). With this model, one can identify whether a facet still exists after partialling out variability due to the general factor (Chen et al., 2013). Moreover, the NMS allows zero or negative correlations within verbal or math general domains (e.g., Marsh et al., 2001), so that the NMS model offers a differentiated interpretation of academic self-concept profiles.

To conclude, there is consensus that students' academic self-concept is domain-specific in the sense of multidimensionality, but also hierarchically structured with a general academic

self-concept at the apex. The assumption of multidimensionality has been replicated for different age groups (e.g., Byrne & Garvin, 1996), genders (Jansen et al., 2015), and cultures (Arens, Bodkin-Andrews, Craven, & Yeung, 2014). In contrast, empirical evidence for the assumption of hierarchy is scarce (e.g., Brunner, et al., 2009). In addition, research concerning the internal structure of academic self-concept has focused on the K-12 school context. Few assumptions have been tested in the context of higher education.

One of the few studies that examined the multidimensional and hierarchical nature of academic self-concept, and specifically of English self-concept, in higher education was conducted by Lau et al. (1999). The authors failed to find evidence for the global academic self-concept proposed by Shavelson et al. (1976), but they found strong relations between a global English self-concept and more specialized self-concepts of different English skills (e.g., speaking). These results supported the hierarchical assumption of self-concept at the subject-specific level and demonstrated the multidimensional nature of self-concept in different skill areas. In their study with university students in teacher education, Yeung, McInerney, and Russell-Bowie (2001) found that domain-specific self-concepts – representing the skill-specific self-concepts – were further subordinated to a higher order creative arts factor, supporting hierarchical relations of the skill- and domain-specific self-concepts.

Overall, there is a lack of research concerning the structure of academic self-concept in higher education. We aim to fill in this research gap by investigating students in undergraduate level psychology courses, with the hypothesis that their academic self-concept is multidimensional and hierarchically structured as postulated by the NMS model (Brunner et al., 2010).

4.3.2 Extension of the internal/external frame of reference model to higher education

In the K-12 educational setting, academic self-concept is associated with learning and achievement motivation, effort, positive academic emotions, and particularly with academic achievement (Guay, Ratelle, & Litaline, 2010; Marsh & Martin, 2011; Niepel, Brunner, & Preckel, 2014; Valentine, DuBois, & Cooper, 2004). Likewise, in higher education, academic self-concept is related to university drop out (e.g., Fellenberg & Hannover, 2006), academic adjustment and success (Wouters, Germeijs, Colpin, & Verschueren, 2011), as well as achievement (Schneider & Preckel, 2017). Drew and Watkins (1998) found a positive relationship between academic self-concept and achievement for technical undergraduate students, mediated by a deep approach to studying. Likewise, Awad (2007) indicated that academic self-concept significantly predicts university students' GPA. Cokley (2000) concluded that the best predictor of grade point average (GPA) for white students at white universities is their academic self-concept. In conclusion, there is strong evidence to positively link domain-specific academic self-concept with corresponding achievement in school and university (Hardy, 2014).

With regard to the relevance of academic achievement, Möller et al. (2009) conducted a meta-analysis of 69 studies that had simultaneously evaluated the effects of math and verbal achievements on corresponding self-concepts. The authors found an average positive correlation between math and verbal achievement ($r = .67$), but only a small correlation between corresponding self-concepts ($r = .10$). Moreover, the effects of math achievement on math self-concept ($\beta = .61$) and of verbal achievement on verbal self-concept ($\beta = .49$) were substantial and positive. However, the effects from verbal achievement to mathematical self-concept ($\beta = -.27$) and of mathematics achievement on verbal self-concept ($\beta = -.21$) were negative (Möller et al., 2009).

To explain these paradoxical findings of negative cross-domain effects, Marsh (1986) posited two different processes that contribute to self-concept construction, constituted in the *internal/external frame of reference* (I/E) model. On the one hand, students compare their own achievement with the achievement of other students, who are within their external frame of reference (e.g., classmates; Wouters, Colpin, Van Damme, De Laet, & Verschueren, 2013), called social comparisons. On the other hand, students also tend to compare their own achievement in a particular domain with their achievements in other domains (e.g., math and German), called dimensional comparisons (Möller & Köller, 2001a). Students use both processes of comparison concurrently, and they have different consequences for academic self-concept formation (Parker, Marsh, Lüdtke, & Trautwein, 2013). For example, a student with higher math achievement than her fellow students engages in social comparisons and therefore has a higher math self-concept than her peers; hence, achievement and self-concept within the math domain are positively correlated. Dimensional comparisons, in contrast, induce negative contrast effects of achievement in one domain (e.g., math achievement) on the academic self-concept in another domain (e.g., German academic self-concept). A student with higher grades in math than German, for instance, is likely to develop a lower German self-concept than a student with lower grades in math, although they have identical grades in German. Hence, students with good skills in different academic domains do not necessarily have positive self-concepts in these domains.

Concerning these findings, there is empirical evidence for generalizability of the I/E model to different types of schools (Ehm et al., 2014), age groups (Möller et al., 2009), and cultures (Marsh et al. 2015). Besides the classic I/E model regarding the consequences of comparison processes on math and verbal self-concept, researchers have extended the assumptions of the I/E model to foreign languages (e.g., Xu et al., 2013), longitudinal designs (Möller, Zimmermann, & Köller, 2014; Niepel et al., 2014), and to other domains (Möller et al., 2006)

and outcomes (instruction quality, interest; Arens & Möller, 2016; Schurtz et al., 2014). In their *dimensional comparison theory* (DCT), Möller and Marsh (2013) reviewed empirical findings from different methodological approaches that have investigated antecedents, influencing factors, and consequences of dimensional comparisons and have entailed the generalized I/E model (GI/E, Möller et al., 2016). On the basis of this model, researchers currently try to replicate assumptions of the I/E model for different antecedents (e.g., Dietrich, Dicke, Kracke, & Noack, 2015) and outcomes (e.g., teachers' professional knowledge; Paulick et al., 2017).

Although a vast body of research has confirmed the described consequences of dimensional and social comparison processes on academic self-concept, these findings are based on the data of students from primary and secondary educational contexts. Studies with university students are scarce, and therefore less is known about the consequences of comparison processes on academic self-concept within higher education.

## 4.4 The present study

In the present study, we examine the academic self-concepts and corresponding grades of psychology students in four university courses. In particular, we investigate three applied domains (industrial and organizational psychology, clinical psychology, and educational psychology) as well as the domain of statistics in psychology, because all psychology students are required to pass these four courses. The specific aim of the current study is (1) to replicate and generalize previous results of the multidimensional and hierarchical structure of academic self-concept in school to higher education, (2) to transfer the original I/E model to higher education and to extend this model by using four different domains in a sample of undergraduate and graduate psychology students.

Regarding our first research aim, we postulate a nested factor model (NMS model) of psychology students' academic self-concept according to Brunner et al. (2010).

Multidimensionality is given through specific academic-self-concepts for clinical psychology (Clin-ASC), educational psychology (Edu-ASC), industrial and organizational psychology (IO-ASC), and statistics (Stat-ASC). These four domain-specific factors account for the unique influence of each specific factor amongst the general academic self-concept. The hierarchical structure of academic self-concept in psychology students according to this model is represented by a general academic self-concept (g-ASC) at the apex. g-ASC includes mental representations of students' general psychological abilities and knowledge and should account for a substantial amount of variance in all measures of academic self-concept in the psychological context. Thus, our first hypothesis is:

1. Academic self-concept in psychology students is multidimensional and structured hierarchically according to the nested NMS model postulated by Brunner et al. (2010).

So far, the consequences of social and dimensional comparisons on the academic self-concept of university students have remained unresolved. If a psychology student has good marks in clinical psychology for instance, he or she may have a high self-concept in clinical psychology. This effect can be explained by social comparison, in that the student compares his or her own achievement in clinical psychology with the perceived abilities of fellow students (in this case lower achievers). Psychology students are likely to engage not only in social but also in dimensional comparisons. For example, dimensional comparisons could lead to the perception of being better in clinical psychology than educational psychology, although a student might have good marks in both domains. On the one hand, this should result in a higher self-concept in clinical psychology, but on the other hand this should reduce the self-concept in educational psychology. Thus, our second hypothesis is:

2. (a) There are positive paths from achievement to academic self-concept within psychological domains and from achievement in undergraduate psychology courses in

general to the corresponding general academic self-concept. (b) There are negative paths from achievement in psychological domains to academic self-concepts across psychological domains.

## 4.5 Method

### 4.5.1 Participants and procedure

Our sample comprised undergraduate and graduate psychology students from one university in Germany who took the same undergraduate psychology courses. A German Bachelor's or Master's degree in Psychology complies with standards outlined by the Bologna Process for European degree programs. Accordingly, psychology students acquire comprehensive knowledge in basic domains (e.g., biological and general psychology), as well as in applied fields of psychology (e.g., clinical psychology, educational psychology, industrial and organizational psychology). Furthermore, students are taught in research methods and psychological assessment (i.e., statistics).

In the fall of 2015 and 2016, $N = 1310$ psychology students answered our questionnaire either on the web or as a paper and pencil questionnaire completed during lectures at the beginning of the semester. Participants either received course credit or had the chance to win a small sum of money in a lottery. We only selected data from students who were at least in their fifth semester of undergraduate psychology courses at the time of measurement, in order to ensure that participants had already completed courses in the three applied psychology domains. In the final sample, $N = 708$ psychology students remained; $n = 254$ students were in the undergraduates' program, $n = 454$ students were in the graduates' program. Mean age of the participants was $M = 25.06$ ($SD = 3.00$) with a range from 19 to 42 years. 71.8 % of the participants were female.

4.5.2 Instruments

*Academic self-concept.* Three items from the *Self-Description Questionnaire III* (SDQ III; Marsh & O'Neill, 1984) used with adults aged 16-25 were adapted to the context of undergraduate psychology courses. The SDQ is one of the most empirically tested measures for academic self-concept among different age groups (Byrne, 1996). Participants rated their academic self-concepts on a 6-point Likert scale, ranging from 1 (*not at all true*) to 6 (*completely true*). We used four psychology domains, namely clinical psychology (Clin-ASC; e.g., "I am good at clinical psychology"), educational psychology (Edu-ASC; e.g., "I am good at educational psychology"), industrial and organizational psychology (IO-ASC; e.g., "I am good at industrial and organizational psychology"), and statistics[3] (Stat-ASC; e.g., "I am good at statistics"). Additionally, three items assessed general academic self-concept as separate domain (e.g., "I'm good at psychology"). Items assessing academic self-concepts in these domains are shown in Table 3. The wording of items was parallel for each academic self-concept measurement.

Table 3

*Items assessing academic self-concept in undergraduate psychology courses*

| Psychological domain | Code | Item wording |
|---|---|---|
| Clinical (C), educational (E), industrial and organizational (I) psychology; statistics (S) | C/E/I/S 1 | "I get good marks in *psychological domain*" |
| | C/E/I/S 2 | "I learn things quickly in *psychological domain*" |
| | C/E/I/S 3 | "I am good at *psychological domain*" |
| General academic (G) | G 1 | "I get good marks in psychology" |
| | G 2 | "I learn things quickly in psychology" |
| | G 3 | "I am good at psychology" |

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[3] Self-concept in statistics was only measured in fall 2016

*Academic Achievement.* Students' achievement in the three applied psychology domains were assessed by single-indicator variables. Students reported their grades (i.e., end-of-semester overall results; item: "Which grade did you receive in the following domain?") in clinical psychology (Clin-ACH), educational psychology (Edu-ACH), and industrial and organizational psychology (IO-ACH). Statistics grades (Stat-ACH) were averaged over two statistics courses ("Methodenlehre I/II"), which students completed in the undergraduate program. Grades ranged from 1 (representing the lowest grade) to 10 (representing the highest grade). Furthermore, students provided current information about their average grade in the undergraduate program (general achievement, g-ACH). Meta-analytic results support the validity of self-reported grades, with an average correlation between self-assessments of grades and objective grades of $r = .82$ (Kuncel, Credé, & Thomas, 2005).

### 4.5.3 Statistical analysis

We first tested for measurement invariance across undergraduate and graduate psychology students as well as across paper-pencil and web measurements testing configural, metric, and scalar measurement invariance (Dimitrov, 2010). This procedure ensured that the construct meaning of the latent factors was equal for each subsample. Furthermore, testing measurement invariance is a necessary requirement for pooling data (De Beuckelaer & Swinnen, 2011). We applied the statistical package of *MPlus* 7 (Muthen & Muthen, 1998-2014) and conducted a multiple-group confirmatory factor analysis (CFA) using the step-up approach. Hence, we started with the least constrained solution and successively imposed restrictions for equality of specific parameters (e.g., factor loadings) across groups to produce nested models, which were tested against each other using the chi-square test (Dimitrov, 2010). We further assessed model fit by evaluating other fit indices that are less sensitive to sample size than chi-square (e.g., ΔCFI; Cheung & Rensvold, 2002).

To investigate the first research question concerning the internal structure of academic self-concept, we used CFAs. To address missing data, the data analysis was carried out using *Full Information Maximum Likelihood* (*FIML*) estimation. FIML produces more efficient estimates than other methods of treating missing data (e.g., listwise deletion) and is therefore superior (Enders & Bandalos, 2001). The rate of missing data for the nine items measuring domain-specific academic self-concepts in industrial and organizational psychology, clinical psychology and educational psychology ranged from 9.6 % to 14.4 %; for general self-concept, missing data rates ranged from 19.6 % to 19.8 %. The highest incidence of missing data was for items capturing academic self-concept in statistics (from 57.9 % to 58.1 %) due to design (i.e., it was only included in the questionnaire in the fall of 2016) and can therefore be classified as missing completely at random (MCAR; Enders & Bandalos, 2001).

Subsequently, we compared the properties of three structural models (see Figure 3a-c): Model 1 (M1) represents a first-order correlated factor model and contains five different factors that correspond to academic self-concepts in the four psychological domains (Stat-ASC, IO-ASC, Edu-ASC, Clin-ASC) and to one general factor of academic self-concept (ASC). The model accounts for the multidimensionality of academic self-concept, but does not explicitly incorporate the idea that academic self-concept has a hierarchical structure with general academic self-concept at the apex (Shavelson et al., 1976).

To account for the assumption of a higher-order factor that includes common variance of the first-order factors, in Model 2 (M2) we extended M1 by a second-order factor. This higher-order general academic self-concept (g-ASCSO) is located at the apex of the academic self-concept hierarchy and is indirectly influenced through domain-specific academic self-concepts operationalized as first-order factors (Edwards & Bagozzi, 2000; Gustafsson & Balke, 1993). The second-order factor within this model is comprised of three single items capturing the academic self-concept in general. Model 2 therefore represents an incomplete second-order

model (Chen, West, & Sousa, 2006). However, findings have indicated that a second-order model fails to explain the pattern of correlations among the first-order factors (Marsh et al. 1988).

Therefore, Model 3 (M3) replicates the nested Marsh/ Shavelson model (NMS model) developed by Brunner et al. (2010). This model assumes that the general academic self-concept does not represent a first-order factor as depicted in M1, but operates at the apex as in M2. However, in contrast to Model 2, general academic self-concept does not represent common variance of first-order factors. Instead, the specific and general factors are uncorrelated and orthogonal (Reise, 2012). This incomplete bifactor model (Chen et al., 2006) can be compared to an incomplete second-order model (M2), because it is less restricted. The benefit of the incomplete bifactor model is that it can be used to evaluate the role of general and domain-specific factors separately, because the general factor is not represented by disturbances of the first-order factors.

In sum, the NMS model (M3) accounts for multidimensionality and hierarchy of the academic self-concept and points out the relevance of domain-specificity in defining academic self-concept (Hardy, 2014).
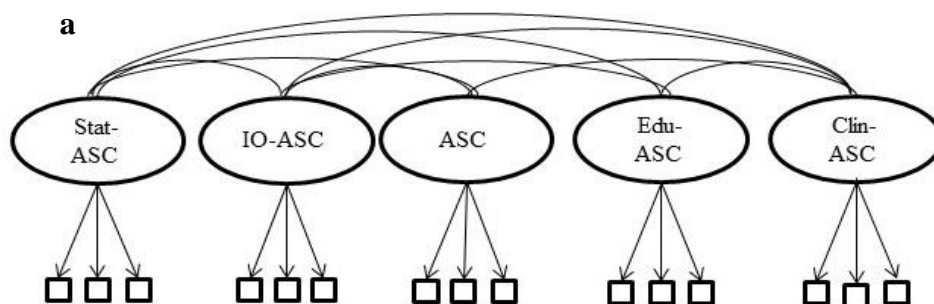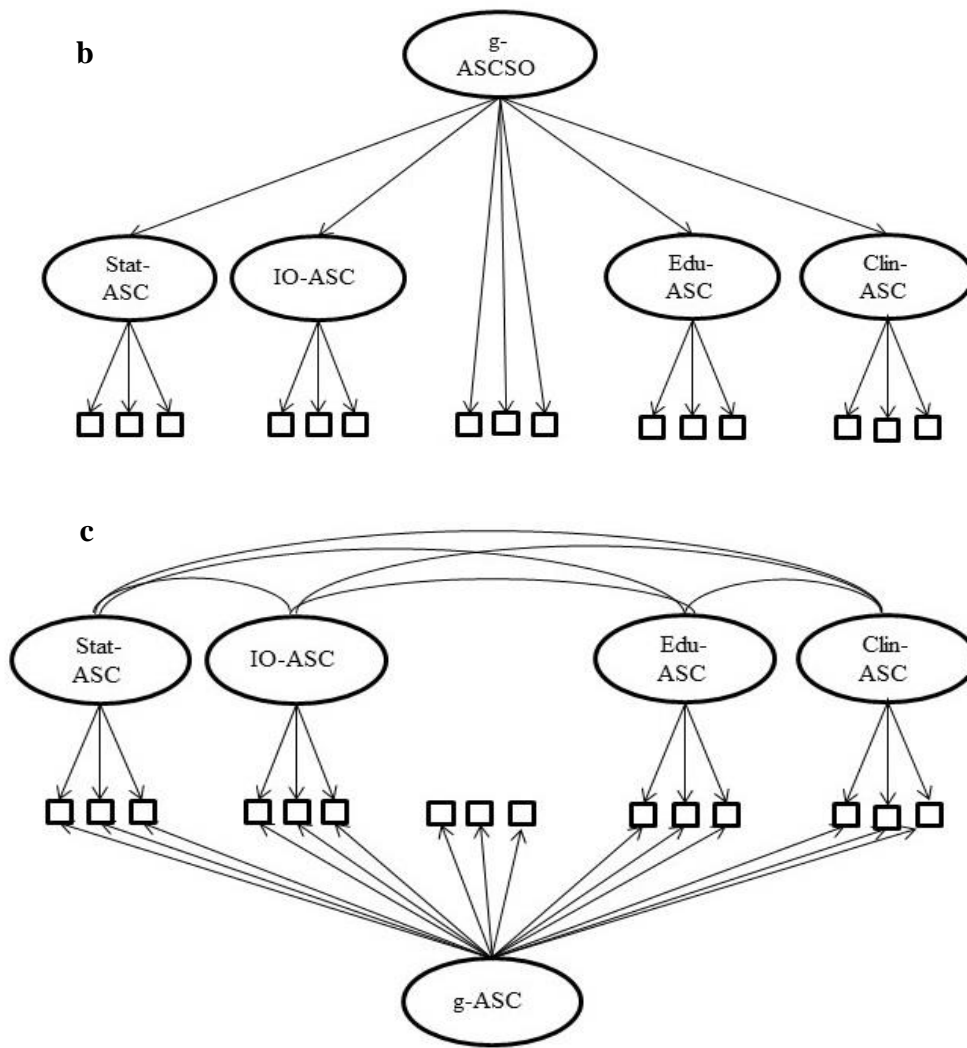
*Figure 3a-c.* Alternative structural conceptions of academic self-concepts: (a) first-order factor model (Model 1), (b) incomplete second-order model (Model 2), and (c) nested Marsh/Shavelson model (incomplete bifactor model). Stat-ASC = statistics self-concept; IO-ASC = industrial, and organizational self-concept; Edu-ASC = educational self-concept; Clin-ASC = clinical self-concept; ASC = general academic self-concept; g-ASCSO = second-order general academic self-concept; g-ASC = nested general academic self-concept.

In all CFAs, self-concept constructs were specified as latent variables. To handle convergence problems, the unstandardized loading of the first item of each first-order factor was fixed to 1 (M1 through M3) and also the unstandardized loading of one first-order factor on the respective higher order factor (M2). Additionally, correlated uniqueness was assumed

so that the measurement errors of parallel worded items were allowed to correlate to account for the shared variance due to the common measurement method (e.g., "I get good marks in clinical/ educational psychology").

To test our first research aim, the three structural models of academic self-concept outlined above were evaluated based on different fit indices. We hypothesized that the NMS model would best fit our data. First, we evaluated the chi-square goodness-of-fit statistic, although this value tends to be overly sensitive when the sample size is large (Kline 2011). Therefore, other established model fit indices were examined (Hu & Bentler, 1999): The *Comparative Fit Index* (CFI) and the *Tucker-Lewis Index* (TLI) are commonly used incremental indices. For these indices, sufficient model fit is indicated by values above .95. We additionally examined the *Root Mean Square Error of Approximation* (RMSEA) and the *Standardized Root Mean Squared Residual* (SRMR), which are absolute model fit indices that should have values below .08 and .06 respectively (Dimitrov, 2010). We further evaluated relative model fit indices, namely the *Akaike Information Criterion* (AIC) and the *Bayesian Information Criteria* (BIC), for which lower values denote better model fit (Kline, 2011).

To test the second aim of this study based on the I/E model, we applied the best fitting model (e.g., the NMS model, see below) and used structural equation modeling (SEM), CFAs, and path analyses with the latent variables (academic self-concepts were again estimated as latent variables). Grades were included as manifest variables. Evaluation of model fit was conducted using the same absolute and incremental fit indices as for evaluating the fit of the three different structural models.

## 4.6 Results

To pool data, CFAs were conducted for undergraduate ($\chi2$ = 77.373; $p$ < .001, CFI = .977; TLI = .943; RMSEA = .059) and graduate students ($\chi2$ = 54.030; $p$ = 0.10, CFI = .995; TLI =

.988; RMSEA = .026), as well as for paper-pencil ($\chi 2$ = 116.807; $p < .001$, CFI = .978; TLI = .946; RMSEA = .061) and web questionnaire ($\chi 2$ = 59.103; $p < .05$, CFI = .985; TLI = .961; RMSEA = .048), separately. CFAs were undertaken within the NMS model because this model showed the best model fit of comparative structural models (see below). Next, we tested for measurement invariance (see Table 4 for the fit indices) across undergraduate/graduate students and paper-pencil/web measurement. The evaluation of model fit indices and difference-testing statistics between more and less restricted models suggested that in both cases a model with partial scalar measurement invariance provided a good approximation to the data.

Table 4

*Measurement invariance among undergraduate and graduate psychology students and across paper-pencil and web questionnaire*

| Model | $\chi 2$ | df | Model comparison | $\Delta SB\chi 2$ | $\Delta df$ | CFI | $\Delta CFI$ | RMSEA | $\Delta$ RMSEA |
|---|---|---|---|---|---|---|---|---|---|
| | | | | undergraduate/graduate | | | | | |
| c | 132.924*** | 84 | - | - | - | .988 | - | .042 | - |
| m | 165.753*** | 106 | m-c | 32.95 | 22 | .985 | -.003 | .041 | -.001 |
| s | 206.430*** | 116 | s-m | 44.64*** | 10 | .978 | -.007 | .049 | .008 |
| ps[a] | 173.839*** | 112 | ps-m | 7.99 | 6 | .985 | .000 | .041 | .000 |
| | | | | paper-pencil/web | | | | | |
| c | 175.769 *** | 84 | - | - | - | .980 | - | .058 | - |
| m | 199.067*** | 106 | m-c | 23.11 | 22 | .980 | -000 | .052 | -.006 |
| s | 223.577*** | 116 | s-m | 25.13** | 10 | . 977 | -.003 | .053 | .001 |
| ps[b] | 212.385*** | 115 | ps-m | 12.87 | 9 | .979 | -.001 | .051 | -.001 |

*Note.* $\chi 2$ = Chi-Square; df = degrees of freedom; CFI = comparative fit index; RMSEA = root mean square error of approximation; SB$\chi 2$ = Satorra-Bentler scaled chi-square difference test; $\Delta CFI \geq |.0.10|$, $\Delta RMSEA \geq |.015|$ signal lack of invariance between nested models; c = configural (factor loadings are invariant); m = metric (factor loadings and intercepts are invariant); s = scalar (factor loadings, intercepts, and residuals are invariant), ps = partial scalar (factor loadings, and residuals are invariant, intercepts are partial invariant).
a. Intercept of item C2, C3, E1, I1 released.
b. Intercept of item S2 released.
*$p < .05$. **$p < .01$. ***$p < .001$.

The first research aim of the present study was to investigate the structure of academic self-concept in higher education. Results indicate that academic self-concept among undergraduate

and graduate psychology students can be described as a multidimensional and hierarchical structured construct. Hence, as expected, the NMS model provided the best fit of academic self-concept in undergraduate and graduate psychology students. Table 5 gives an overview of the three structural models and their corresponding goodness-of-fit indices; factor loadings are represented in Appendix B (Table B1-B2). All model estimation terminated normally, no parameter estimates had negative variances, and all matrices of parameter estimates were positive. None of the three models exhibited poor model fit, although the chi-square goodness-of-fit statistic was statistically significant for each model. Evaluating the different structural models in regard to alternative fit indices, the first-order factor model (M1) returned the lowest incremental fit indices ($\chi2$ = 177.860, CFI = .955, TLI = .909), good absolute model fit indices (RMSEA = .058; SRMR = .038) and highest relative model fit indices of AIC and BIC. However, only the value of TLI was below the recommended benchmark. Latent correlations among first-order factors estimated in M1 ranged from $r$ = .12 to $r$ = .92. This provides support for the multidimensionality of academic self-concept. In Model 2 (M2) we tested if the common variance among first-order factors could be captured by a second-order general factor. M2 (incomplete second-order model with a second-order general factor) had a higher chi-square, and better incremental fit indices ($\chi2$ = 246.651, CFI = .955, TLI = .917), whereas AIC and BIC exhibited lower values compared to M1. RMSEA (.071) indicated a higher value for M2 than M1 as it favors parsimony and is therefore sensitive to the number of estimated parameters in the model (Hooper, Coughlan, & Mullen, 2008). Likewise, SRMR (.117) indicated a percentage of residual variances not explained by the second-order factor. However, the good model fit indices indicated that academic self-concept can not only be described as multidimensional, but also as hierarchically structured. M3 (the NMS model) with correlated domain-specific academic self-concepts nested within a general academic self-concept resulted in the best model fit ($\chi2$ = 104.709, CFI = .985, TLI = .963, RMSEA = .048; SRMR = .035). All incremental and

absolute fit indices fulfilled the required benchmarks, while AIC and BIC had the lowest values

of all three models.

Table 5

*Goodness-of-Fit Indices of Alternative CFA Models*

|  | $\chi^2$ | *df* | CFI | TLI | RMSEA | SRMR | AIC | BIC |
|---|---|---|---|---|---|---|---|---|
| M1 | 177.860 | 52 | .955 | .909 | .058 | .038 | 72419.139 | 72797.822 |
| M2 | 246.651 | 55 | .955 | .917 | .071 | .117 | 19186.159 | 19536.080 |
| M3 | 104.709 | 42 | .985 | .963 | .048 | .035 | 19051.091 | 19468.303 |

Note. M1 = First-Order Factor model; M2 = incomplete second-order model; M3 = nested Marsh/Shavelson Model (incomplete bifactor model); $\chi^2$ = Chi-Square (for M1-M3 is p<.001); *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA=root-mean-square error of approximation; SRMR = standardized root-mean-square residual.

In regard to the NMS model, all factor loadings (see Appendix B, Table B2) on the domain-specific factors were large, ranging from $\lambda = .69$ to $\lambda = .88$, factor loadings on *g*-ASC were also substantial and high, ranging from $\lambda = .21$ ("I learn things quickly in clinical psychology") to $\lambda = .95$ ("I am good at psychology"). Table 6 presents correlations, means, standard deviations, and latent internal consistencies for all measures of academic self-concept within the NMS model. To estimate internal consistencies, we used McDonalds's Omega (McDonald, 1999), which has been shown to be a more sensible index of factor reliability than Cronbach's alpha (Dunn, Baguley, & Brunsden, 2014). All measures revealed good latent internal consistencies between $\omega = .86$ and .92. Correlations between domain-specific academic self-concepts were close to zero ($r = .00$ to $r = .09$), except for the correlation between clinical and educational academic self-concept that was substantial and significant ($r = .39, p < .001$) and the correlation between clinical and statistic academic self-concept that was significant and negative ($r = -.27, p < .001$). In sum, the NMS model was best able to account for the complex organization of academic self-concepts in psychology students and its multidimensional and hierarchical structure.

Table 6

*Descriptive Statistics and Intercorrelations of the Scales Assessing Academic Self-Concept within the NMS model*

| Scale | *M* | *SD* | ω | IO-ASC | Clin-ASC | Edu-ASC |
|-------|-----|------|---|--------|----------|---------|
| IO-ASC | 3.84 | 1.08 | .88 | - | - | - |
| Clin-ASC | 4.42 | 0.90 | .86 | .07 | - | - |
| Edu-ASC | 4.19 | 0.93 | .88 | .09 | .39*** | - |
| Stat-ASC | 3.55 | 1.21 | .89 | .00 | -.27*** | -.07 |
| g-ASC | 4.02 | 0.63 | .92 | - | - | - |

*Note.* Scale scores were computed as the mean of the respective item scores. *M* = Mean value, *SD* = standard deviation; ω = Mc Donald's Omega; IO-ASC = academic self-concept in industrial, and organizational psychology; Clin-ASC = academic self-concept in clinical psychology; Edu-ASC = academic self-concept in educational psychology; Stat-ASC = academic self-concept in statistics; g-ASC = general academic self-concept in undergraduate psychology courses.
*$p < .05$. **$p < .01$. ***$p < .001$.

In the second research question of this study, assumptions of the I/E model were extended to higher education (see Figure 4). Results suggested that the effects postulated by the I/E model could be also found in undergraduate psychology courses. Model fit was acceptable ($\chi2 = 390.975$; $p < .001$, CFI = .944; TLI = .890; RMSEA = .069, SRMR = .037). As predicted, (a) path coefficients from all achievement indicators to their corresponding self-concepts were positive and significant (path coefficients ranged from $\beta = .48$ to $\beta = .65$, $p < .001$). The path from general achievement to general academic self-concept was also positive, but lower than the domain-specific path coefficients ($\beta = .22$, $p < .001$). To evaluate the quality of prediction, we used the multivariate effect size measure $f^2$ (Cohen, 1992) and the corresponding squared multiple correlation coefficient $R^2$. Effect sizes of .02, .15, and .35 are classified as small, medium, and large effects, respectively (Cohen, 1992). In the present study we obtained medium $f^2$ values for the prediction of academic self-concept in industrial and organizational psychology and large effects for the prediction of the other domain-specific self-concepts as well as of general self-concept. Secondly, (b) all path coefficients from achievement in the domain of statistics to academic self-concepts of the other three domains were substantial and negative ($\beta = -.14$ to $\beta = -.26$, $p < .05$ to $p < .001$). Cross-domain negative effects from

achievement to self-concept were also found for clinical psychology on statistics ($\beta$ = -.20, $p <$ .05), industrial and organizational psychology on educational psychology ($\beta$ = -.13, $p <$ .05), and educational psychology on clinical psychology ($\beta$ = -.13, $p <$ .05). The remaining cross-paths from achievement in one psychological domain to academic self-concept in another domain were close to zero ($\beta$ = -.03 to $\beta$ = .09, *n.s.*)
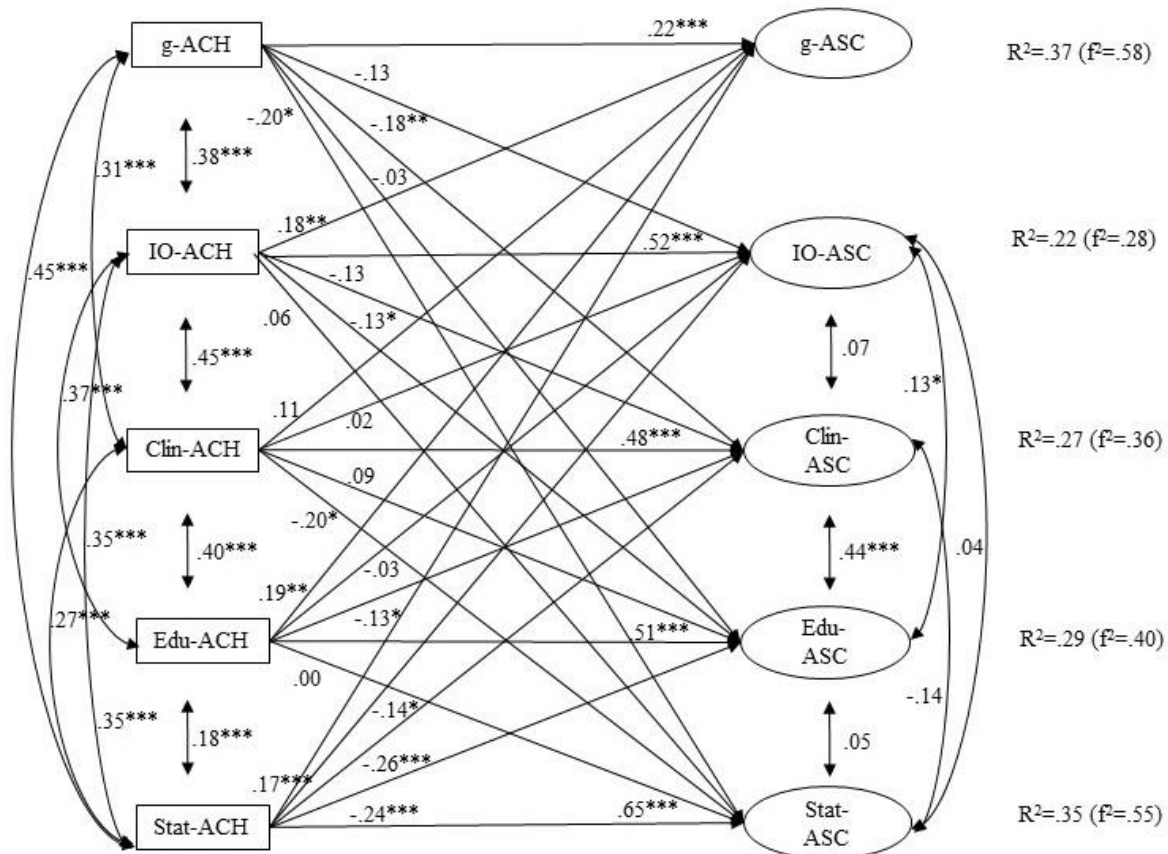


*Figure 4.* Internal/external frame-of-reference (I/E) model in undergraduate psychology courses. $f^2$ = multivariate effect size measure; $R^2$ = squared multiple correlation coefficient; g-ACH = average grade in undergraduate psychology courses in general; IO-ACH = achievement in industrial, and organizational psychology; Clin-ACH = achievement in clinical psychology; Edu-ACH = achievement in educational psychology; Stat-ACH = achievement in statistics; g-ASC = general academic self-concept in undergraduate psychology courses in general. IO-ASC = academic self-concept in industrial, and organizational psychology; Clin-ASC = academic self-concept in clinical psychology; Edu-ASC = academic self-concept in educational psychology; Stat-ASC = academic self-concept in statistics.
*$p <$ .05. **$p <$ .01. ***$p <$ .001.

## 4.7 Discussion

### 4.7.1 General Discussion

For a sample of psychology students, we found that academic self-concept in higher education is multidimensional and hierarchically structured as postulated by the NMS model (Brunner et al., 2010). Furthermore, our findings mainly supported the I/E model when considering four psychological domains. In line with predictions of an external frame of reference, domain-specific and general achievement had a positive effect on the corresponding self-concept. Our findings also supported the use of internal frames of reference by psychology students as well. We found negative cross-domain effects between achievement in statistics and students' self-concepts in the remaining three psychological domains. Apart from achievement in statistics, only some of the other path coefficients from achievement in one psychological domain to academic self-concepts across domains were substantial and negative (e.g., from achievement in educational psychology to academic self-concept in clinical psychology). We also found negligibly negative or even positive paths close to zero (e.g., relationship between achievement in clinical psychology and academic self-concept in educational psychology).

There is empirical evidence for the domain-specificity of academic self-concept for different age groups (Byrne & Garvin 1996) and educational contexts (Ehm et al., 2014). Structural models with general academic self-concept have rarely supplied a good fit (Lau et al., 1999; Yeung et al., 2000) and some data suggests that the hierarchy might be more complicated than was first conceived (Hardy, 2014). Brunner et al. (2010) therefore proposed the NMS model that accounts for multidimensionality and hierarchy of academic self-concept by moving the general factor back to the apex. Our findings replicate the structure of the NMS model within the context of higher education, although the general self-concept facet actually accounts for more domain-specific variance ($\omega = .92$) than the general factor found in K-12

educational settings ($\omega$ = .87; Brunner et al., 2010). This difference may be explained by the fact that although K-12 schools and universities bear many resemblances (e.g., transfer of knowledge, possibility to engage in social and dimensional comparisons), there are also differences concerning the structure of curricula: K-12 schools teach students in diverse subjects that require specific abilities (Brunner, 2008). For example, whereas in math students acquire numerical aptitude and spatial visualization, in the native language, students are taught in the field of verbal skills. Hence, one may conclude that students' self-perceived abilities are more separated across domains in K-12 education. In higher education, however, psychology students are primarily taught in psychological subjects that require similar skills: Students need, for example, the ability to select different assessment techniques, to judge test reliability and validity, to construct an intervention, or to analyze real data, irrespective of whether they take clinical or educational psychology courses. Accordingly, a general factor reflecting students' self-perceived psychological abilities in general accounts for a substantial amount of the variance in each domain-specific measure of academic self-concept in undergraduate psychology courses (Brunner et al., 2009). This assumption is well-aligned with findings for the structure of abilities (e.g., Carroll, 1993). Cognitive abilities are domain-specific, including specific cognitive content domains, but there is also evidence for general ability that is placed at the top of the ability hierarchy (Brunner, 2008; Gustafsson & Balke, 1993). Hence, structures of academic self-concept and of cognitive ability can be compared with each other: general academic self-concept in psychology students resembles general cognitive ability, while domain-specific academic self-concepts (e.g., educational psychology) resemble domain-specific abilities.

Concerning the expansion of the I/E model to higher education, our findings firstly suggest that psychology students engage in social comparisons using two independent routes (Brunner et al., 2010): first, psychology students who evaluated their domain-specific achievements more

favorably than the achievements of their peers (e.g., in statistics), had a more favorable self-concept in that academic domain. Second, general achievement in undergraduate psychology courses was also positively associated with general academic self-concept. As the NMS model specified achievements in psychological domains to be independent from general achievement, these findings indicate that the two ways of social comparisons also operate independently within the external frame of reference. In line with this conclusion, we found higher regression coefficients for the domain-specific route than for the general or domain-transcending routes.

The I/E model secondly predicts negative effects of achievement in one domain on the self-concept in another domain. In line with this assumption, we also found comprehensive negative cross-domain effects. We did not find negative regression coefficients from achievements in the four psychological domains to general academic self-concept. Given the fact that domain-specific achievement and corresponding self-concept are positively correlated, and that the general academic self-concept accounts for a substantial amount of variance in all measures of academic self-concept, we found positive regression coefficients between domain-specific achievement and general academic self-concept. Hence, this latter finding of positive instead of null or negative path may be a further indicator for an overlap of required abilities between psychological domains as mentioned above.

Besides the internal structure of academic self-concept and the effects of social and dimensional comparisons within and across academic domains, previous studies in high school have also investigated how subjects can be arranged on a continuum (e.g., from math to German; Marsh, 1990a; Marsh et al., 1988). Based on theoretical and empirical research, cross-domain effects are expected to appear particularly between academic domains that are a greater distance from each other on that continuum. The fact that math and statistics have a lot in common (e.g., Baloğlu, 2003; Zeidner, 1991) indicates that statistics may also be placed at the end or beginning of an analogous continuum of psychological domains. In accordance with that

assumption, we obtained the highest negative cross-domain effects for achievement in statistics and academic self-concept in the remaining three psychological domains. In this regard, it is also worth noting that we did not obtain effects in the other direction except for the negative contrast effect from achievement in clinical psychology to academic self-concept in statistics. Besides, in the NMS model, the correlation between academic self-concept in clinical psychology and statistics was substantial and negative, whereas academic self-concept in clinical and educational psychology was substantial and positive. This may suggest that the domain of statistics is furthest from the domain of clinical psychology, and the latter placed next to the domain of educational psychology. This assumption of near domains fits with the idea that cross paths between two closely related domains are predicted to be less negative, or even positive (assimilation effect; Marsh et al., 2014). In line with this, our results show a small positive cross path between clinical achievement and educational self-concept, indicating that both domains are similar to each other. At least, the zero correlations between industrial and organizational psychology and the remaining three domains suggest that the domain of industrial and organizational psychology can be placed in the middle of the continuum. Nevertheless, we can only speculate about the order of psychological domains on a continuum. By additionally measuring self-concepts in further psychological domains, future research can provide a more accurate assessment of the arrangement of psychological domains on the continuum.

### 4.7.2 Limitations

Despite its strengths, the present study has some limitations. To begin with, we decided to measure academic self-concept in only four psychological domains. At German universities, each psychology student completes these four selected psychology domains during undergraduate psychology courses, so it seemed appropriate to assess self-concept in these

domains. Psychology students also acquire comprehensive knowledge in basic subjects, like biological and general psychology. Furthermore, Marsh and Yeung (2001) stated that it would be meaningful testing the I/E model in a more diverse set of academic domains and to integrate different subjects (Marsh et al., 2015). Hence, our measurement was nearly comprehensive with regard to psychological domains.

In addition, our findings are limited to undergraduate psychology courses in Germany. It would be valuable to replicate our findings of multidimensionality and hierarchy of academic self-concept as well as the observed effects of social and dimensional comparison processes at other universities in various countries. This would also promote the assumption that the effects postulated by the I/E model are "not restricted to a particular achievement or self-concept measure or to specific age groups, gender groups, or countries'' (Möller et al., 2009, p. 1157).

Moreover, our data was cross-sectional, so that we could neither investigate the causal relation between achievement and self-concept in psychological domains, nor their development over time. Longitudinal studies on the relation between achievement and academic self-concept could generate new insights about the formation of academic self-concept, which may show an increasing differentiation with age (Harter, 1998).

Another limitation of our study is the missing data measuring academic self-concept in the domain of statistics, although experts have not reached a consensus regarding the percentage of missing data that becomes problematic (Schlomer, Bauman, & Card, 2010). We decided to use FIML to analyze our data, because FIML does not systematically over- or underestimate regression coefficients under completely at random conditions and is superior to other methods of treating missing data (Enders & Bandalos, 2001).

### 4.7.3 Future Research

Our study provides rich and fruitful implications for future research and practice in higher education. This paper is the first to explore the multidimensional and hierarchical structure of academic self-concept in undergraduate psychology courses. To build on our findings, future research should investigate psychological self-concepts in various countries, a broader range of psychological domains, and in other university subjects (e.g., economics with accounting and finance). Concerning different countries, a different learning environment (e.g., an English-speaking country) may require researchers to account for other psychological domains depending on local course systems (Jansen et al., 2015).

The question then arises of whether the effects found in this investigation between achievement and self-concept within psychological domains can be explained in terms of social and/or dimensional comparisons. In higher education, students no longer have a fixed class and timetable, but an arbitrary course system that enables different frames of reference depending on individual course selection. Based on these changed conditions, it is crucial to investigate if the obtained results of positive within-domain and negative across-domain effects can be explained by social and dimensional comparison processes. Unfortunately, we cannot observe these processes directly (Pinxten et al., 2014). Hence, future studies may benefit from using qualitative methods assessing more explicitly how students experience their academic context and how these experiences form their academic self-concepts (e.g., diary studies; Möller & Husemann, 2006). Future research could also test the I/E model within experimental designs, because experiments offer the possibility for a better understanding of the psychological processes that stimulate the engagement in dimensional comparison processes within educational settings (Möller & Köller, 2001a). Likewise, for a better understanding of why and when students engage in dimensional comparisons, moderator variables should be investigated. Möller, Pohlmann, Streblow, and Kauffmann (2002) examined the impact of students' ability

beliefs on the impact of dimensional comparisons. For students who think that abilities are quite domain-specific, the authors found higher negative path coefficients between achievement in one domain and academic self-concepts across domains as compared to students who have less specific ability beliefs.

### 4.7.4 Practical implications

Students with positive academic self-concepts reach higher educational attainment levels and are more successful when it comes to career entrance (Pinquart, Juang, & Silbereisen, 2003). In addition, a realistic academic self-concept is associated with successfully completing university (Fellenberg & Hannover, 2006), academic adjustment (Wouters et al. 2011), coursework selection (e.g., Dickhäuser, Reuter, & Hilling, 2005), as well as better occupational aspirations (Ireson & Hallam, 2009). Hence, the enhancement of students' academic self-concepts is an important educational goal (e.g., Kagan, Moore, & Bredekamp, 1995; Marsh & Hau, 2003). Fostering academic self-concept should improve students' perception of him- or herself, so that good marks are attributed to one's own abilities (Dresel & Ziegler, 2006). There are different meta-analyses of self-concept interventions (e.g., O'Mara et al., 2006). Some of the included studies directly tried to enhance self-concept using achievement feedback, whereas others used a more indirect strategy by targeting a related construct (e.g., skill building; O'Mara et al., 2006). Valentine and colleagues (2004) highlight the reciprocal relations between academic self-concept and subsequent achievement, which suggests that interventions should simultaneously improve academic self-concept and academic abilities. Furthermore, it becomes clear that interventions are most promising when conceptualized for a specific domain (e.g., statistics self-concept; O'Mara et al., 2006). In this respect, it should be noted that domain-specific interventions may indeed heighten academic self-concept in the focused domain but

may subsequently lower academic self-concept of another domain due to dimensional comparisons.

In summary, as academic self-concept is associated with desirable academic outcomes (e.g., with learning and achievement motivation; Guay et al., 2010), and as it is a malleable construct, direct and/or indirect intervention strategies are useful to improve academic self-concept in educational contexts. One possible intervention may be to make use of the performance feedback that is central to the formation of academic self-concept (Möller & Marsh, 2013) as feedback is the most effective strategy to improve academic self-concept (O'Mara et al., 2006).

## 4.8 Conclusion

In sum, we replicated assumptions of the multidimensionality and hierarchy of academic self-concept in a sample of psychology students and further extended the I/E model to the context of higher education by using four psychological domains. We provided evidence that academic self-concept in higher education is multidimensional and hierarchically structured and that not only K-12 students (e.g., Möller et al., 2009), but also psychology undergraduate and graduate students seem to apply social and dimensional achievement comparisons to form their domain-specific self-concepts. Our results suggest it would be fruitful to further investigate academic self-concept in different university studies and contexts in order to clarify its structure, its causal relationship to achievement, and the role of comparison processes in forming academic self-concept within higher education.

# 5. Study 3

## 5.1 Abstract

Academic self-concept (ASC) and self-efficacy (SE) are central competence-related self-beliefs that predict students' academic success in various educational settings. The present study generalizes findings indicating conceptual and empirical differentiation of these constructs from K-12 educational settings to psychology students in higher education. To assess ASC and SE at the same level of specificity, considering a broader scope of academic domains, and matching specificity between predictor and criterion, we analyzed their internal structure first. We found both ASC and SE to be multidimensional and hierarchically structured. On the basis of their structure, we then integrated both constructs into a common model that accounted for the hierarchical and multidimensional structure of both constructs simultaneously. The model, allowing overlap of factors at a domain- and general level, provided a good fit. We found positive effects of ASC and SE in one domain and at the general level on the corresponding achievement in undergraduate psychology courses. Overall, ASC was a significantly better predictor of achievement than SE.

## 5.2 Introduction

Self-perceptions are core constructs in educational research (Byrne, 1984) and numerous studies have investigated the constructs of self-concept and self-efficacy (Bong & Skaalvik, 2003). Students' academic self-concepts (ASC) comprise mental representations of their own abilities in academic domains (Brunner et al., 2010). Self-efficacy (SE) refers to students' convictions that they can master given academic tasks at designated levels (Schunk, 1991). As mentioned by several researchers, ASC and SE have much in common (e.g., an emphasis on perceived competence; Marsh et al., 2017), but also differ regarding their composition (affective and cognitive vs. cognitive components) and their measurement strategy (domain-

vs. task-specific; Bong & Clark, 1999; Pajares & Schunk, 2001). However, in spite of these conceptual and operational differences, empirical efforts to distinguish between ASC and SE have been less successful (Valentine et al., 2004). The majority of studies that have investigated empirical differences between ASC and SE were conducted in K-12 educational settings (e.g., Ferla et al., 2009; Scherer, 2013); studies with university students are scarce. The lack of empirical differentiation can lead to *jingle-jangle fallacies* (Marsh, 1994), in which researchers use dissimilar names for two scales that actually assess the same construct (Marsh et al., 2017). Thus, the investigation of the empirical differentiation of ASC and SE in higher education is necessary to justify the use of different labels and scales. Furthermore, once these empirical differences are established, researchers can design construct-specific interventions fostering ASC or SE (Rodgers, Markland, Selzler, Murray, & Wilson, 2014) in order to support university students' academic and professional success (Abele-Brehm & Stief, 2004; Richardson et al., 2012).

When reviewing the research on ASC and SE and their relation in higher education, there are some critical issues that should be considered (Hughes et al., 2011). First, previous studies have assessed ASC and SE at different levels of specificity (e.g., ASC is typically assessed at a more general level than SE), partly because ASC and SE become increasingly similar when measured at the same level of specificity (Pajares, 1996). Likewise, researchers have often failed to take into account the need for specificity-matching between predictor and criterion (e.g., Chen et al., 2001) when comparing the predictive power of ASC and SE for achievement (e.g., Lent et al., 1997). Second, research has primarily compared ASC and SE within only a single academic domain (e.g., mathematics; Pajares & Miller, 1994). Thus, results of empirical differences are limited to that specific domain and restrict generalization of empirical differentiation to further academic domains. Moreover, considering only a single academic domain prevents the comparison of both constructs with regard to their internal structure. Third,

a number of studies comparing domain-specific ASC to SE measured ASC using both competence- and affect-related items but measured SE solely through cognitive SE items (e.g., Pietsch et al., 2003). Investigating whether ASC and SE are empirically distinct constructs might therefore be confounded by the inclusion of affective components within the ASC measure (Hughes et al., 2011).

To increase knowledge of the empirical differentiation of ASC and SE in higher education and in order to control for these critical issues, this study has three major goals. First, we aim to generalize findings in support of empirical differentiation of ASC and SE from K-12 educational settings to the context of higher education. To ensure the empirical comparability of both constructs, it is important to measure ASC and SE at the same level of specificity and to use only cognitive ASC measures. However, measuring these constructs at the same level of specificity requires an understanding of the structural model of both constructs. Therefore, our second aim is to analyze the internal structure of university students' ASC and SE considering a broader scope of academic domains. Based on the internal structure, we can investigate the relation of ASC and SE at different and matched levels of hierarchy. By doing so, our third aim is to examine the overlap between ASC and SE at different levels of hierarchy and in different academic domains. Additionally, we will compare their respective relations with academic achievement, again matching in specificity.

In the following section, in order to approach our first research aim, we introduce conceptual and operational differences between ASC and SE found in K-12 educational settings. These differences constitute the starting point for the assumption that ASC and SE might also differ at an empirical level. Then, with respect to the second research aim, we review previous research investigating the internal structure of ASC and SE in K-12 educational settings to derive assumptions of their internal structure in higher education. Last, we

summarize findings of empirical research on the relationship between ASC and SE, and their relation to academic achievement, on which we build our third research question.

## 5.3 Conceptual and Operational differences between ASC and SE

In educational settings, ASC is an evaluative self-perception (Guay, Larose, & Boivin, 2004) that refers to how individuals view themselves in specific academic situations (e.g., Byrne, 1984). ASC therefore revolves around questions of "being" and "feeling" (Pajares & Schunk, 2001). Concerning the formation of students' academic ASC, the most relevant principles are processes and feedback of comparison. Students compare their own skills with the perceived skills of other students (e.g., classmates; Marsh et al., 1991) who are within their external frame of reference (social comparison; Marsh, 1986) as well as to their own abilities across different academic domains (e.g., mathematics and German; dimensional comparisons within an internal frame of reference; Möller & Marsh, 2013). Additionally, the causes to which students attribute previous success and failure influence subsequent ASC (causal attributions; e.g., Skaalvik, 1994); this ASC, in turn, affects later attributions (e.g., Marsh & O'Mara, 2008). Reflected appraisals from significant others (Rosenberg, 1979) and prior mastery experiences are further environmental influences that form students' ASC (Rayner & Devi, 2001; Skaalvik, 1997).

When measuring ASC, students report their general feeling of doing well or poorly in a given academic domain (Bong & Skaalvik, 2003). Thus, ASC measures often ask for affective as well as cognitive self-perceptions of one's own competence (Arens et al., 2011). In particular, items assessing students' ASC typically ask the individual to judge his or her past performances (e.g., "I have always done well in …"; Pietsch et al., 2003) within a particular academic domain (e.g., mathematics; Ferla et al., 2009). Hence, ASCs represent past-orientated self-perceptions.

Compared to the large body of research on ASC (Swann, Chang-Schneider, & McClarty, 2007), SE has been investigated for a relatively short period (Bong & Skaalvick, 2003). Bandura (1977) introduced the concept of SE within his *Social Cognitive Theory* (SCT) defining it as "beliefs in one's capabilities to organize and execute the courses of action required to produce given levels of attainments" (Bandura, 2000, p.16). SE beliefs are inherently future-oriented even though these expectations result from experiences gained in the past (Bandura, 1977; Bong & Skaalvik, 2003). Hence, mastery experiences are not only relevant for ASC formation but specifically for the development of SE: experiences interpreted as successful raise confidence in one's own abilities; experiences interpreted as unsuccessful lower it (Britner & Pajares, 2006). Additionally, students form their SE by observing others performing a task and subsequently evaluating their own probability of success at the same task (vicarious experiences; Bandura, 1997). Verbal persuasion and feedback (e.g., about one's writing skills; Dempsey, PytlikZillig, & Bruning, 2009) from significant others (e.g., teachers) also influence one's SE (Bong & Skaalvik, 2003). Finally, physical reactions (e.g., arousal) can serve as an indicator for SE (Jonas & Brömer, 2002).

When measuring SE, it is important to specify the task that is being addressed, because SE is a cognitive perception of one's own future performance within a specific task (Bandura, 1977; Betz & Hackett, 2006; Finney & Schraw, 2003). Furthermore, SE is sensitive to contextual variation in a particular task (Pajares & Schunk, 2001). Hence, items assessing SE in academic settings focus on students' confidence to master a specific academic task within a specific context (e.g., "I'm confident I will be able to…"; Pajares, 1996).

## 5.3.1 Structure of ASC and SE

Shavelson and colleagues (1976) introduced an ASC model prominent in educational psychology. In this model, ASC is multidimensional and hierarchically structured with a

general ASC at the apex of the ASC hierarchy. At the next level, the authors postulated general academic and three non-academic components and further differentiated academic ASC into various domains according to different school subjects (e.g., mathematics). In the following years, Marsh and colleagues further analyzed the Shavelson et al. model in several studies (Marsh, 1990b; Marsh et al., 1988) and postulated the Marsh/Shavelson model, distinguishing two (nearly) uncorrelated second-order academic ASC factors (math and verbal). However, there was a lack of evidence supporting the existence of math and verbal higher-order ASC factors when considering a broader scope of academic domains (Gogol et al., 2017; Marsh et al., 2001). Furthermore, unexpected correlations between general and domain-specific ASCs were found (Marsh, 1990a). Following these results, Brunner et al. (2010) developed the nested Marsh/Shavelson model (NMS). In this model, a single general factor is placed at the apex of the ASC hierarchy according to the original ASC model of Shavelson and colleagues (Hardy, 2014). This general factor represents the common variance of items assessing domain-specific and general ASCs, whereas the specific variance explained by each ASC domain is separated from the variance explained by the general factor. Today, in K-12 educational settings, there is ample evidence for the multidimensionality of ASC with a general ASC factor at the apex (Arens et al., 2014; Byrne & Gavin, 1996; Jansen et al., 2015).

Relative to ASC, there has been little research on the structural characteristics of SE in academic settings. Some authors suggest that students form differentiated perceptions of their own capability across diverse tasks within a domain (Schunk, 1991; Schyns, & von Collani, 2002). Others assume that SE is linked to distinct realms of functioning and students differentiate between different academic domains in their SE judgments (Bandura, 2006; Bong & Hocevar, 2002). Furthermore, there is debate about the presence of a general SE factor analogous to general ASC (Lent et al., 1997). Some authors propose that SE might be less general and only depend on specific tasks and contexts (Betz & Hackett, 2006; Finney &

Schraw, 2003; Pajares & Schunk, 2001), others expect a higher-order SE factor that generalizes SE over several domains (Chen et al., 2001). In this regard, Bong (1997) was one of the few who found empirical evidence for higher-order SE factors (math and verbal) that accounted for common variance of different first-order factors of six academic subjects (e.g., Algebra, English, and Spanish) in a sample of high school students. These results indicated that, in K-12 educational settings, SE might be multidimensional with respect to different academic domains, and also hierarchically organized with a general component at the apex of the hierarchy.

Overall, there is a lack of research concerning the structure of ASC and SE in higher education. However, knowledge of their internal structure is needed for an empirical comparison of ASC and SE, taking in account the critical issues of previous studies mentioned above (Hughes et al., 2011).

### 5.3.2 Empirical relations between ASC, SE, and academic achievement

*Relation between ASC and SE*

Despite these widely accepted conceptual and operational differences between ASC and SE (Bong, 1998; Bong & Clark, 1999; Bong & Skaalvik, 2003), research in K-12 educational settings has also tried to answer the question of whether ASC variables and SE beliefs are empirically distinct (Lent et al., 1997), although they are positively correlated (mean $r = .60$; Robbins et al., 2004). Using structural equation modeling, Scherer (2013) found evidence for distinct ASC and SE factors within the domain of chemistry. Likewise, Lee (2009) found evidence for two distinct latent factors for ASC and SE in the domain of mathematics in a sample of 250.000 students in 41 countries. Ferla et al. (2009) also found evidence for an empirical distinction between ASC and SE in the domain of mathematics with a small positive relation between both constructs ($r = .37$; $p < .01$).

The majority of studies has investigated the empirical overlap between ASC and SE in K-12 educational settings, although in higher education ASC and SE are also positively correlated (e.g., $r = .61$; Choi, 2005). Peterson and Whiteman (2007) were one of the few who investigated the relation between ASC and SE in higher education, conducting a structural equation model of different self-beliefs for university students in different countries (e.g., New Zealand) and in different courses of study (e.g., psychology). The structural model fitted the data well. However, as in K-12 educational settings, the authors found evidence for an overlap between ASC and SE factors ($r = .43$) within the structural model indicating that they are positively correlated but distinct constructs.

Nevertheless, all studies investigating the empirical differentiation of ASC and SE using structural equation models disregarded the need for an initial test of their internal structure in order to include several domains and different levels of hierarchy.

*Relation to achievement*

Previous research indicates that students' ASC is related to academic performance in the K-12 educational setting (e.g., Guay et al., 2003; Marsh & Martin, 2011) as well as in higher education (Schneider & Preckel, 2017). Moreover, Marsh and Craven (2006) reviewed a large body of research showing that not only achievement, but diverse academic outcomes (e.g., achievement motivation, academic emotions) are systematically related to students' ASC in the K-12 school system (Craven & Marsh, 2008; Guay et al., 2010), and in higher education (Richardson et al., 2012). Hence, there is growing recognition that a person's positive ASC can facilitate a whole range of desirable educational outcomes (Hardy, 2014; Trautwein & Möller, 2016).

Numerous studies have also reported empirical evidence for the positive relation between SE and academic variables (Pajares & Schunk, 2001). Students with high belief in their efficacy

willingly undertake more challenging tasks than students with lower SE. They also put a greater amount of effort into performing chosen academic tasks, persist longer in the presence of difficulties, and choose situations according to their abilities and goals (Bandura, 1997; Bandura & Schunk, 1981; Jonas & Brömer, 2002; Lusczcynska et al., 2005; Schunk, 1991). In their meta-analysis, Moulton et al. (1991) found that SE accounts for approximately 14% of the variance in students' academic performance even when previous achievements were not controlled for. Robbins and colleagues (2004) summarized results from 109 studies with a total sample of 10.000 students and found SE had the strongest association with academic performance. Unsurprisingly, SE also tends to be a good predictor of academic achievement in higher education (Richardson et al., 2012), even controlling for prior academic performance (Zimmerman, Bandura, & Martinez-Pons, 1992).

Comparing the strength of their relation to academic achievement within a particular domain, SE, compared to ASC, has a stronger association with academic performance (Choi, 2005; Hansford & Hattie, 1982; Stankov, Lee, Luo, & Hogan, 2012). For instance, the predictive power of math SE to master a specific mathematics task ($ß = .55$) is considerably larger than for domain-specific ASC ($ß = .16$; Pajares & Miller, 1994). The finding that SE tends to be a stronger predictor of academic achievement than ASC might be explained by the level of specificity with which the two constructs are assessed. When SE and the prospective performance are both measured for a specific task, but ASC is measured for a specific domain, it is not surprising that results provide evidence for a higher predictive validity of SE (Choi, 2005). This assumption is in line with several studies that found the strongest relationships between ASC and SE and performance when the predictor and criterion were measured at the same level of specificity (e.g., at the domain-specific level; Joo, Bong, & Choi, 2000; Marsh & O'Neill, 1984; Möller et al., 2006; Moulton et al., 1991; Swann et al., 2007; Valentine et al., 2004).

Nevertheless, there is a lack of research comparing the predictive power of ASC and SE in higher education, matching measurement specificity between ASC/SE (predictor) and achievement (criterion) equally, as several researchers have argued is necessary (Choi, 2005; Rigotti et al., 2008).

## 5.4 The present study

Numerous studies have investigated the empirical differences between ASC and SE in K-12 educational settings, but studies with university students are scarce. Therefore, the first aim of the present investigation is to generalize these findings to higher education with a sample of undergraduate and graduate psychology students[4].

To examine empirical differences while taking into account critical issues of previous studies (e.g., the narrow breadth of academic domains; Hughes et al., 2011) our second aim is to investigate the internal structure of ASC and SE. We hypothesize ASC and SE in our higher education sample to be multidimensional and hierarchically structured as found in K-12 educational settings.

Based on the internal structure and considering the aforementioned critical issues, our third aim is to differentiate ASC and SE empirically in the sample of psychology students. We therefore use structural equation modeling to investigate the overlap of ASC and SE factors at different levels (e.g., at the domain level) within several psychological domains (e.g., educational psychology) and in psychology in general. Further, we analyze the respective relationships of ASC and SE factors with achievement within and across different academic domains and in general, matching measurement specificity between predictor and criterion. We hypothesize that both constructs form empirically distinct but correlated factors within each domain and at each level of hierarchy. Furthermore, we hypothesize that ASC and SE factors

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[4] We subsequently use only the term *psychology students*

measured at a domain-specific level (e.g., in educational psychology) will correspond better with the respective criterion variable (e.g., achievement in educational psychology) than the general factors do. Likewise, we predict the general ASC and general SE factor will have the highest correlations with general achievement. Overall, we expect stronger relationships with achievement for SE than for ASC factors.

## 5.5 Method

### 5.5.1 Participants and procedure

In the spring semester of 2015 and the fall semesters of 2015 and 2016, $N = 1243$ undergraduate and graduate psychology students (80.8 % female) from a German university completed our questionnaire during lectures at the beginning of the semester, either as a web or as a paper and pencil questionnaire. Students' mean age was $M = 23.62$ ($SD = 3.53$) years; $n = 428$ students had already finished their undergraduate psychology studies, $n = 813$ students were doing their graduate studies, and two students did not provide this information. The participants rated their ASCs as well as their SE in clinical, educational, and industrial and organizational psychology, in statistics, and in undergraduate psychology courses in general. Additionally, they gave information about their achievements in these four different areas of psychological application as well as about their average psychology grades.

### 5.5.2 Instruments

*ASC.* Three items of the Self-Description Questionnaire III (SDQ III; Marsh & O'Neill 1984), which is frequently used in other ASC research (e.g., Byrne & Garvin, 1996), were adapted to the context of undergraduate psychology courses. Participants rated their ASCs for each of the four areas of psychological application (e.g., "I'm good at *psychological domain*") using a 6-point Likert scale that ranged from 1 (*not at all true*) to 6 (*completely true*).

Additionally, three items assessed general ASC as a separate domain (e.g., "I'm good at psychology "). The wording of items was parallel for each ASC measurement. Items assessing ASCs are shown in Table 7.

*SE* is typically assessed in the context of performing specific tasks within a particular domain (Bandura, 2006; Betz & Hackett, 2006). Since it is not possible to assess every single task that a psychology student must master within the context of his or her university studies or later profession, we used carefully constructed and realistic scenarios of the psychological tasks of each psychological domain (Aguines & Bradley, 2014). To construct vignettes, we conducted interviews with experts and read job descriptions of being a psychologist. Following, experts reviewed the adequacy of each vignette in terms of its representation of a psychologist's real job requirements. For an example, see Appendix C (Table C1a-C1c). Participants read the vignette and then answered four items (e.g., "I feel prepared for most of the demands in my job") on a 6-point Likert scale ranging from 1 (*not at all true*) to 6 (*completely true*) according to the short version of the occupational SE scale developed by Rigotti et al. (2008). Students rated their SE separately for the tasks in each psychological domain. Additionally, after having presented the vignettes for psychological tasks in the four psychological domains, participants rated their SE to successfully master psychological tasks in general. Items assessing SE are shown in Table 7.

*Academic Achievement.* Students reported their final grades in the subjects of clinical psychology, educational psychology, and industrial-organizational psychology by single-indicator variables ("Which grade did you receive in the following subject?"). We further averaged statistics grades over the two basic statistics courses that students completed in the undergraduate program. Grades ranged from 1 (*representing the lowest grade*) to 10

(*representing the highest grade*). Last, students reported their average grade in the undergraduate program (general achievement).

Table 7

*Items assessing academic self-concept and self-efficacy in psychology students*

| Code | Academic self-concept |
| --- | --- |
| C/E/I/S 1 | "I get good marks in *psychological domain*" |
| C/E/I/S 2 | "I learn things quickly in *psychological domain*" |
| C/E/I/S 3 | "I am good at *psychological domain*" |
| G 1 | "I get good marks in psychology" |
| G 2 | "I learn things quickly in psychology" |
| G 3 | "I am good at psychology" |

| Code | Self-efficacy |
| --- | --- |
| C/E/I/S/G 5 | When I am confronted with a problem in performing the given tasks, I can usually find several solutions. |
| C/E/I/S/G 6 | I feel prepared for most of the demands in my job. |
| C/E/I/S/G 7 | I can remain calm when facing difficulties in performing the given tasks, because I can rely on my abilities. |
| C/E/I/S/G 8 | My past experiences in my studies have prepared me well for the given tasks. |

*Note*. C = Clinical psychology; E = Educational psychology; I = Industrial and Organizational psychology; S = Statistics; G = General

### 5.5.3 Statistical analysis

To pool data, we first tested for measurement invariance of scales across undergraduate/ graduate psychology students and across paper-pencil/ web measurements. All Confirmatory factor analysis (CFA) models were conducted with Mplus Version 7 using maximum likelihood estimator (MLR) which is robust against mild violations of non-normal distributed data. Testing for measurement invariance, we started with the least constrained solution and subsequently imposed restrictions for equality of different parameters (e.g., for equal factor loadings) across

groups in order to produce nested models, which were then tested against each other using the chi-square test (Dimitrov, 2010). Furthermore, we evaluated other fit indices that are considered to be less sensitive to sample size than chi-square (e.g., ΔCFI; Cheung & Rensvold, 2002). To handle the missing data, full information maximum likelihood (FIML) was used. The rate of missing data for the 15 items measuring ASCs ranged from 7.4 % to 12.4%. The rate of missing data for the 20 items measuring SE ranged from 9.4 % to 10.7 %. The rate of missing data was highest for items capturing ASC or SE in the domain of statistics (from 52.8 % to 54.1 %), as this was only included in the questionnaire in the fall of 2016. The missing data rate for achievement ranged from 39.5 % (statistics I) to 64.4 % (clinical psychology[5]); general achievement was missing for 80 students (6.4 %).

First, to provide the basis for an empirical comparison of ASC and SE in higher education, we tested four different CFA models in order to examine the internal structure of ASC and SE separately (see Figure 5a-d). Model 1a represents a g-factor model with a general ASC/SE factor at the apex as proposed by several researchers for SE (Sherer et al., 1982). Model 1b contains five mutually correlated first-order factors that correspond to ASC/ SE in the four psychological domains and in undergraduate psychology courses in general. Thus, Model 1b incorporates the idea of multidimensionality that has been widely shown for students' ASCs (Brunner et al., 2010) and in a few cases for their SE (e.g., Bong, 1997). However, the model does not explicitly incorporate the idea that ASCs or SE might have a hierarchical structure with a general factor at the apex. Model 1c therefore represents a bifactor model with a general factor that accounts for the shared variance of all items and domain-specific factors that account for the unique influence of the specific domain (e.g., ASC/SE in educational psychology) over and above the general factor (Chen, Hayes, Carver, Laurenceau, & Zhang, 2012). Note that the

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[5]Only students who were at least in their fifth semester of undergraduate psychology courses had already passed the exam in industrial-organizational, educational, and clinical psychology. Hence, missing items are due to design and can therefore be classified as missing completely at random (MCAR; Enders & Bandalos 2001).

general factor is uncorrelated with the domain-specific factors (Reise, 2012). Lastly, in Model 1d, in accordance with the nested Marsh/Shavelson model of students' ASC (Brunner et al., 2010), we tested an incomplete bifactor (IBF[6]) model (Chen et al., 2006). In contrast to the bifactor model (Model 1c), in Model 1d the general ASC/SE factor is not added as a first-order factor, but take account for a great amount of variance in all domain-specific measures of academic ASC/SE while being defined by the general items. Hence, the IBF model subdivides the variance attributable to general ASC/SE of psychology students from the variances attributable to domain-specific factors.

**a**
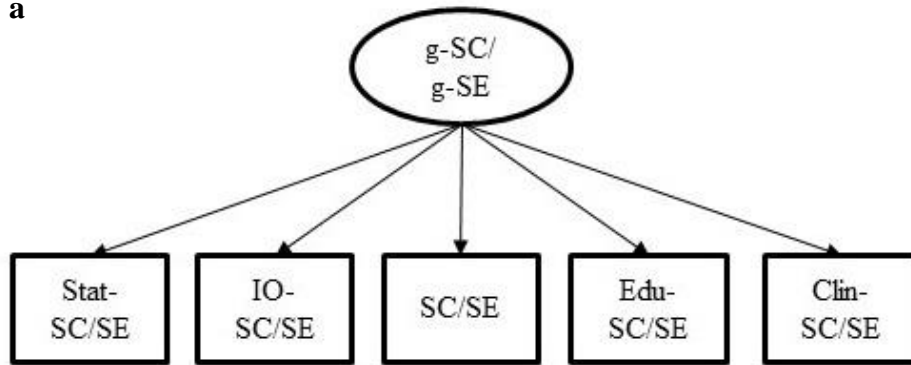


**b**



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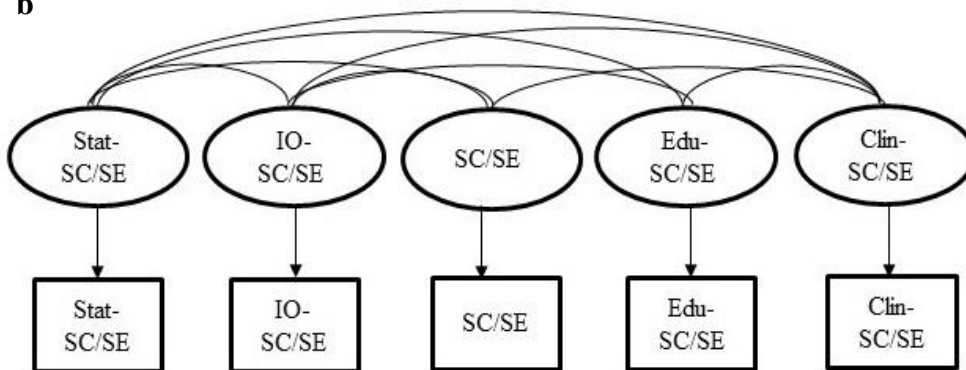
[6] We will subsequently use the term incomplete bifactor model (IBF) instead of nested Marsh/Shavelson model when modeling ASC and SE

c



d
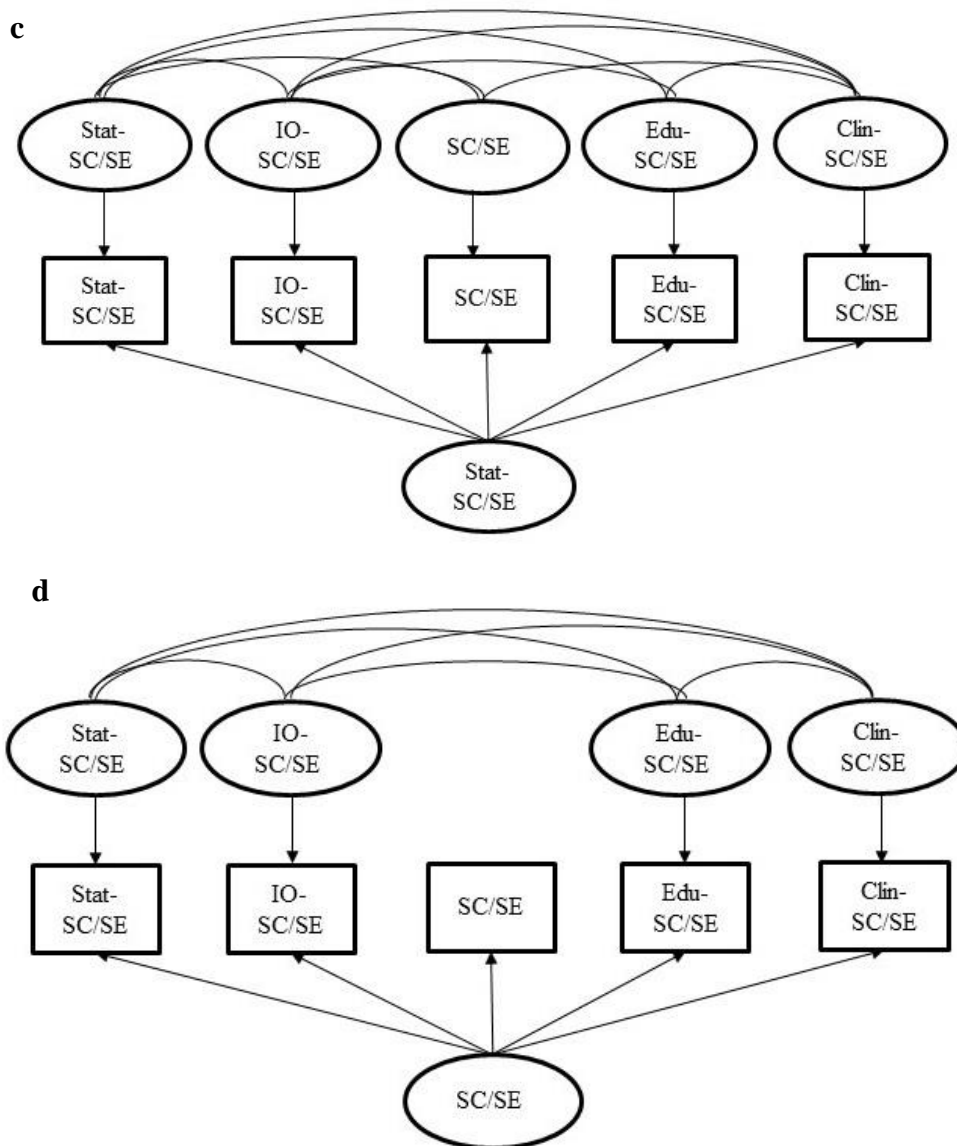


*Figure 5a-d.* Alternative structural conceptions of self-concepts and self-efficacy beliefs: (a) g-factor model (Model 1a), (b) first-order-correlated factor model (Model 1b), (c) bifactor model (Model 1c), and (d) incomplete bifactor model. SC = Self-concept; SE = Self-efficacy; Stat = Statistics; IO = Industrial, and Organizational psychology; Edu = Educational psychology; Clin = Clinical psychology; GSC = General self-concept; GSE = general self-efficacy.

In all models, general and domain-specific ASCs and SE were specified as latent variables. The unstandardized loading of the first item of each ASC/SE factor was fixed to 1 (Model 1a through Model 1d). Additionally, correlated uniqueness was allowed in all CFAs due to the

shared variance of the common measurement method. To evaluate model fit, we used the chi-square ($\chi 2$) goodness-of-fit statistic. Because this statistic is sensitive to sample size, we also used the following recommended descriptive measures of model fit (Hu & Bentler, 1999): (1) the *root mean square error of approximation* (RMSEA), which should be below .06, (2) the *comparative fit index* (CFI), which should exceed .95, and (3) the *standardized root mean square residual* (SRMR), which should be below .08. Additionally, we evaluated two relative model fit indices (*Akaike Information Criterion* [AIC]; *Bayesian Information Criterion* [BIC]). The lower values denote better model fit (Kline, 2011).

Second, we applied the best fitting models for ASC and SE (e.g., the IBF models, see below) and integrated them within different models. Model 2a (see Appendix C, Figure C2) assumes one general factor that accounts for the common variance of all measures of ASC and SE. Model 2b (see Figure 6) has two correlated general factors representing either general ASC or general SE. In both models, the domain-specific factors were allowed to correlate within and across constructs. Further, the general ASC factor could correlate with the general and domain-specific SE factors and vice versa. The fit of both models was tested against each other using the same descriptive measures of model fit as before (i.e., $\chi 2$, CFI, TLI, RMSEA, SRMR, AIC, and BIC).

Third, within the best fitting common IBF model found in step two (i.e., Model 2b, see below), we tested the relations among general and domain-specific ASC and SE factors with academic achievement. We therefore saved factor scores and used the Pearson correlation coefficient to evaluate correlations between domain-specific and general factor scores of both constructs with grades in the four psychological domains and with general achievement. We also used Fisher's Z test for dependent samples with one-tailed testing to compare correlations between ASC and SE with achievement (Cohen & Cohen, 1983). Cohen's q (1988) was used to quantify the size of the effect for the correlation differences: q ≥ .1 indicates a small effect,

q ≥ .3 indicates a moderate effect, and q ≥ .5 indicates a large effect. Furthermore, within each psychological domain, we evaluated the relation between ASC and achievement while controlling for SE and vice versa (partial correlations).
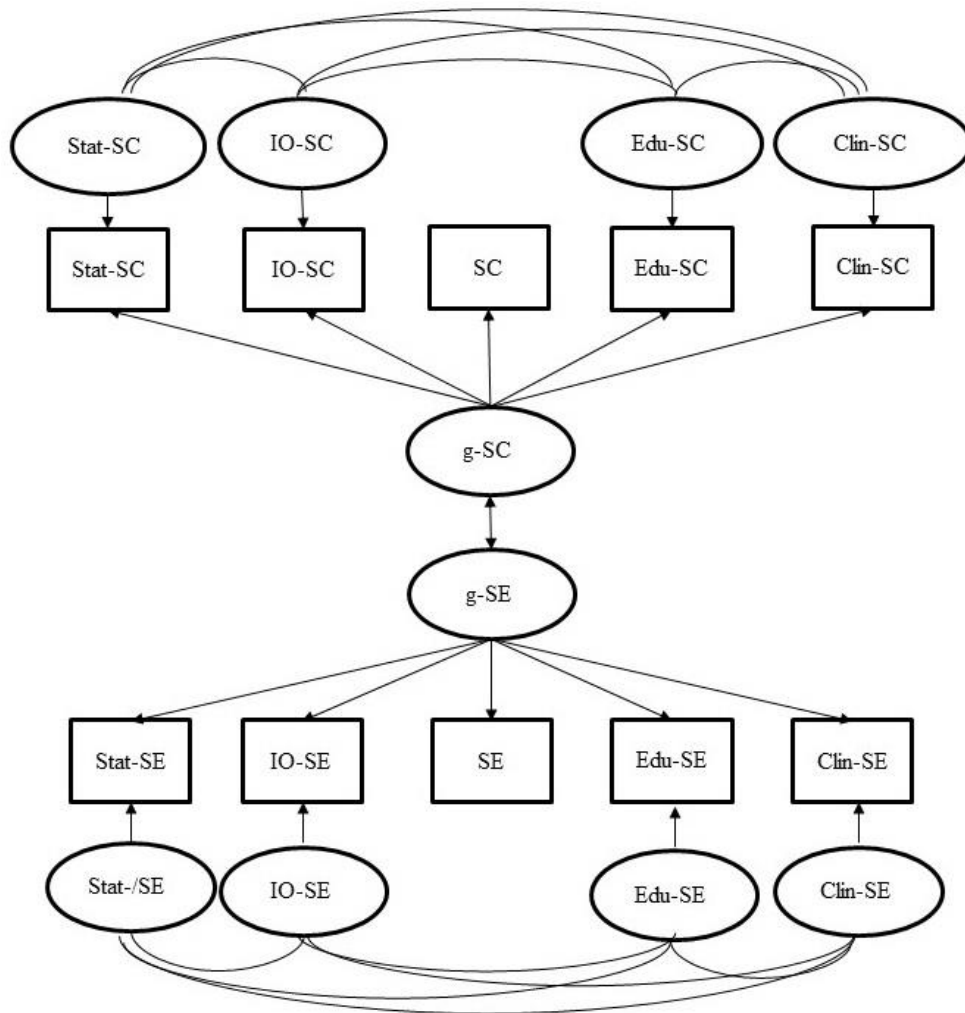


*Figure 6.* Common incomlete bifactor model (C-IBF). SC = Self-concept; SE = Self-efficacy; Stat = Statistics; IO = Industrial, and Organizational psychology; Edu = Educational psychology; Clin = Clinical psychology; GSC = General self-concept; GSE = General self-efficacy; g = General factor.

## 5.6 Results

All descriptive statistics of the test scales are shown in the Appendix C, Table C3. The items used to assess ASCs and SE in the four different psychological domains and in general showed excellent reliabilities ($\alpha$ = .855 to .951).

As a prerequisite to pool the data over study level and mode of assessment, we tested for measurement invariance of the ASC and SE scales across both groups of psychology students and across paper-pencil/web assessment (see Appendix C, Table C4a-C4b for the fit indices). The analysis of model fit indices and difference-testing statistics indicated that in both cases a model with partial scalar measurement invariance provided a good approximation to the data.

Results for the comparison of the four different structural models in line with our second research aim indicated that the IBF models provided the best fit for ASC and SE in psychology students. Table 8 gives an overview of the four structural models and their corresponding goodness-of-fit indices separated by construct.

Table 8

*Goodness-of-Fit Indices of Alternative CFA models for self-concept and self-efficacy*

| Model | $\chi^2$ | df | CFI | TLI | RMSEA | SRMR | AIC | BIC |
|---|---|---|---|---|---|---|---|---|
| g-factor SC | 4079.660 | 60 | .646 | .380 | .236 | .131 | 42860 | 43242 |
| FOCF SC | 102.850 | 50 | .980 | .958 | .029 | .024 | 138390 | 138826 |
| Bifactor SC | 1051.478 | 57 | .912 | .839 | .120 | .157 | 38485 | 38882 |
| IBF SC | 153.346 | 42 | .990 | .976 | .047 | .020 | 37419 | 37893 |
| g-factor SE | 3860.036 | 130 | .721 | .592 | .159 | .101 | 55897 | 56400 |
| FOCF SE | 712.199 | 120 | .956 | .930 | .066 | .055 | 52073 | 52627 |
| Bifactor SE | 1015.144 | 127 | .934 | .901 | .078 | .080 | 52431 | 52950 |
| IBF SE | 689.711 | 108 | .957 | .923 | .069 | .054 | 52065 | 52679 |

*Note.* SC = self-concept; SE = self-efficacy; FOCF = First-order-correlated factor; IBF = incomplete bifactor; $\chi^2$ = Chi-Square for all models is $p < .001$; $df$ = degrees of freedom; CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root-mean-square error of approximation; SRMR = standardized root-mean-square residual; AIC = Akaike information criterion; BIC = Bayesian information criterion.

Evaluating the different structural models in regard to alternative fit indices, the g-factor model (Model 1a) showed the lowest incremental and highest absolute fit for ASC ($\chi2$ = 4079.660, $p$ < .001, CFI = .646, TLI = .380, RMSEA = .236, SRMR = .131) and for SE ($\chi2$ = 3860.036, $p$ < .001, CFI = .721, TLI = .592, RMSEA =.159, SRMR = .101). Likewise the g-factor model revealed the highest relative model fit of AIC and BIC for both constructs.

The first-order correlated factor models (Model 1b) returned good incremental and absolute model fit for ASC ($\chi2$ = 102.850, CFI = .980, TLI = .958, RMSEA = .029, SRMR = .024) and for SE ($\chi2$ = 712.199, $p$ < .001, CFI =.956, TLI = .930, RMSEA =.066, SRMR= .055) and lower relative fit compared to the g-factor model. Latent correlations among first-order factors estimated for both constructs separately ranged more widely for ASC ($r$ = .072 to $r$ = .861) than for SE ($r$ = .530 to $r$ = .779).

For both constructs, the bifactor model (Model 1c) showed a better model fit than the g-factor model (ASC: $\chi2$ = 1051.478, $p$ < .001, CFI = .912, TLI = .839, RMSEA = .120, SRMR= .157; SE: $\chi2$ = 1015.144, $p$ < .001, CFI = .934, TLI = .901, RMSEA = .078, SRMR = .080), but not compared to the first-order correlated factor model. In particular, the first-order-correlated factor model (Model 1b) represented the structure of ASC better than the bifactor model (Model 1c). In contrast, the bifactor model (Model 1c) fitted the structure of SE better than a first-order correlated factor model (Model 1b).

Lastly, Model 1d (IBF model) with correlated domain-specific ASC/SE factors nested under a general ASC/general SE factor resulted in the best fitting model fit (ASC: $\chi2$ = 153.346, $p$ < .001, CFI = .990, TLI = .976, RMSEA = .047, SRMR = .020; SE: $\chi2$ = 689.711, $p$ < .001, CFI = .957, TLI = .923, RMSEA =.069, SRMR = .054). For both constructs, all incremental and absolute fit indices fulfilled the conventional benchmarks (Cheung & Rensvold, 2002), and AIC and BIC had the lowest values compared to the alternative models. Factor loadings of the IBF models are reported in the Appendix C (Table C5).

Based on the fit indices, we chose IBF models of both constructs and synthetized them into common IBF models (Models 2a and 2b). The common IBF model with two correlated g-factors (Model 2b) indicated a better model fit ($\chi 2$ = 1235.090, $p$ < .001, CFI = .972, TLI = .960, RMSEA = .040, SRMR = .040) than Model 2a with only a single g-factor, indicating that ASC and SE form distinct factors (see Table 9). Within Model 2b, the relationship between the general factors of ASC and SE was $r$ = .607, $p$ < .001. The correlations between the ASC factors of the four psychological domains ranged between $r$ = -.031, $n.s.$ and $r$ = .709, $p$ < .001; for SE factors the range was considerable lower ($r$ = -.001, $n.s.$ to $r$ = .241, $p$ < .001). Correlations between constructs within a domain (e.g., between ASC and SE in educational psychology) ranged between $r$ = .569 and $r$ = .683, $p$ < .001. For an overview of correlations between ASC and SE factors within the common IBF model with two g-factors, see Appendix C (Table C6).

Table 9

*Goodness-of-Fit Indices for the common incomplete bifactor (C-IBF) models*

| | $\chi^2$ | $p$ | df | CFI | TLI | RMSEA | SRMR | AIC | BIC |
|---|---|---|---|---|---|---|---|---|---|
| C-IBF one g-factor | 2427.992 | <.001 | 435 | .930 | .905 | .061 | .079 | 88992.722 | 90166.108 |
| C-IBF two g-factors | 1235.090 | <.001 | 425 | .972 | .960 | .040 | .040 | 87614.187 | 88838.589 |

*Note.* C-IBF: Common incomplete bifactor; $\chi^2$ = Chi-Square (for M2a- M2b is $p$ < .001); df = degrees of freedom; CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root-mean-square error of approximation; SRMR = standardized root-mean-square residual; AIC = Akaike information criterion; BIC = Bayesian information criterion.

Based on the common IBF model with two distinct latent g-factors, we evaluated the relations between the domain-specific and general factors of ASC/SE with domain-specific and general achievement using bivariate and partial correlation analyses, and further used Fisher's Z test to compare the correlations (see Table 10). The bivariate correlation coefficients for the relation between domain-specific ASC and achievement in the same domain - except for the domain of statistics ($r$ = -.052, $n.s.$) - ranged between $r$ = .332 and $r$ = .380 ($p$ < .001). SE within the four psychological domains correlated descriptively lower with corresponding achievement

($r$ = .250 and $r$ = .315, $p$ < .001). As for ASC, the relationship between SE and achievement in the domain of statistics was insignificant and small ($r$ = .008). Overall, domain-specific ASC was a significantly better predictor for corresponding achievement than SE, although the effects were small according to Cohen (1988; .07 ≤ q ≤ .11). Likewise, general ASC correlated significantly stronger with general achievement than general SE ($r$ = .252 and $r$ = .212, $p$ < .001), although the Cohen's q indicated no effect (q = .00). Results of the partial correlations further revealed that the relationship between ASC and achievement in each psychological domain/on the general level was minimally lower when controlling for SE, but the correlation between SE and achievement was close to zero when the effect of ASC was partialled out .

Table 10

*Bivariate (partial) correlations among academic self-concepts and self-efficacy with academic achievement in the four psychological domains and with general achievement as well as tests and effect sizes for the difference of correlations between both constructs.*

| | Ach IO | Ach Clin | Ach Edu | Ach Stat | Ach General | z | p | Cohen's q |
|---|---|---|---|---|---|---|---|---|
| SC IO | .351*** (.256***) | .308*** | .314*** | .156*** | .048 | -.553 | <.001 | .11 |
| SE IO | .250*** (-.036) | .200*** | .217*** | .124*** | .029 | | | |
| SC Clin | .338*** | .380*** (.233***) | .364*** | .175*** | .044 | .329 | <.01 | .07 |
| SE Clin | .274*** | .315*** (.061*) | .295*** | .121*** | .004 | | | |
| SC Edu | .301*** | .303 | .332*** (.243***) | .193*** | .049 | 11.501 | <.001 | .10 |
| SE Edu | .210*** | .215*** | .233*** (.022*) | .158*** | .033 | | | |
| SC Stat | -.096** | -.121*** | -.111*** | -.051 (-.074*) | .065* | -2.477 | <.01 | .07 |
| SE Stat | -.028 | -.048 | -.043 | .008 (.055) | .093** | | | |
| SC General | .313*** | .308*** | .307*** | .239*** | .252*** (.151***) | .177 | <.05 | .00 |
| SE General | .312*** | .319*** | .311*** | .246*** | .212*** (.060*) | | | |

*Note*. IO = Industrial and organizational psychology, Clin = Clinical psychology, Edu = Educational psychology, Stat = Statistics, SC = Self-concept, SE = Self-efficacy, Ach = Achievement. Negative correlations between constructs and achievement in general = the higher constructs the better achievements. Inferential statistical test is based on Fisher's Z differences test between the two constructs. Effect size measure for the difference between the correlations in the two constructs was calculated with Cohen's q.
*$p < .05$. **$p < .01$. ***$p < .001$.

## 5.7 Discussion

### 5.7.1 Summary

The present study investigated ASC and SE in higher education with three major goals. First, we wanted to test the generalizability of previous findings regarding the empirical relationship of ASC and SE from K-12 educational settings to higher education. Second, in order to provide the base for such an investigation, we analyzed the structure of ASC and SE

using only cognitive ASC items and measuring both constructs at the same level of specificity in different domains. Third, we investigated the relation of ASC and SE factors and their relations (and partial relations) with academic achievement. For this purpose, we integrated ASC and SE into a common structural model that accounted for the hierarchical and multidimensional structure of both constructs simultaneously. Within that common model, we analyzed correlations between ASC and SE as well as between both constructs and academic achievement, considering the need for specificity-matching between predictor and criterion.

Findings revealed that ASC and SE are both multidimensional and hierarchically structured. The common structural model of both constructs with two g-factors revealed a good model fit, and within that model, we found domain-specific ASCs and SE to be significantly and positively correlated within each domain and at the general level. Likewise, ASC and SE factors were positively and significant related to achievement within the same domain and at the general level when matched in specificity, except for the domain of statistics. However, for each domain and at the general level, ASC factors were correlated with achievement significantly stronger than SE factors, even when controlled for SE. In contrast, when partialling out the effect of ASC, the correlation between SE and achievement was close to zero within each psychological domain and at the general level.

## 5.7.2 Limitations

Despite its strengths, it should be kept in mind that the present study has some limitations. First, even though we believe that our results of the internal structure of psychology students' ASC and SE - that is supposed to form the basis for an empirical differentiation - can be generalized to other German psychology students, the sample was not completely representative, especially regarding student populations outside of Germany. For example, due to local course systems, psychology students might develop domain-specific ASC and SE for

further psychological subjects (e.g., traffic psychology) that would need to be integrated within the presented structural model in future studies. Likewise, in Germany, there are many more psychological subjects that have to be considered (e.g., developmental psychology). In the future, in an expanded structural model of ASC or SE, researchers might find, for example, a higher-order factor for ASC or SE that accounts for common variance across different psychological domains (e.g., across educational psychology and developmental psychology). If this is the case, the structural basis for an empirical comparison would change. Besides, we do not know whether ASC and SE of university students in different courses of study (e.g., business studies) also form a multidimensional and hierarchical structure as found for psychology students.

Second, the way we assessed SE might limit our results. We decided to measure SE at a domain-specific level by presenting students scenarios of the psychological tasks within different psychological domains to ensure comparability with ASC measurement. However, the question remains if participants were actually able to put themselves in the described situation of the psychological tasks in the vignettes to validly judge their SE.

Third, the rate of missing data for ASC and SE items in the domain of statistics was high, because these items were only included in the questionnaire in the last assessment. Likewise, the missing rate for achievement in clinical psychology, for example, was high due to the fact that at the time of measurement, only some students had already passed this exam. This lack of data could have led to distorted estimations of the parameters (Lüdtke, Robitzsch, Trautwein, & Köller, 2007).

Fourth, measures of ASC, SE, and achievement were collected at the same time in the same context and were obtained from a single source (self-report), potentially making the results susceptible to method bias (Friedrich, Byrne, & Mumford, 2009). Furthermore, we computed single bivariate correlations that might have led to an inflation of the alpha level (Abdi, 2007).

Hence, the reported relationships between ASC/SE and achievement should be interpreted carefully.

### 5.7.3 General discussion

The present investigation contributes to the debate of whether ASC and SE form distinguishable constructs in higher education. None of the previous studies had examined the internal structure of ASC and SE before comparing the constructs empirically, although we argue that this is a central prerequisite, considering the multiple domains and levels of hierarchy. Moreover, a preliminary structure analysis is necessary to take into account specificity-matching between predictor and criterion (Choi, 2005).

The multifaceted and hierarchical structure of academic ASC has received empirical support, for example, looking at different types of educational settings (Byrne & Garvin, 1996) and different cultures (Arens et al., 2014). Our results, indicating a multidimensional and hierarchical structure of psychology students' ASC underline the generalizability of findings of the internal structure of ASC to educational settings beyond the K-12 school system. This generalizability might be advantaged by the fact that both educational settings have much in common, e.g., allowing students to integrate achievement-related information from different sources in order to form their domain-specific ASC (Möller & Köller, 2001b; Möller & Marsh, 2013). Nevertheless, there are substantial differences between K-12 school systems and higher education. For example, university students are provided with advanced knowledge in particular study-related domains, whereas students in primary and secondary education are equipped with wide skills and knowledge that are useful in broad areas of later life (Schneider & Preckel, 2017). Because of these and further differences between both educational settings, analysis of the internal structure of ASC in higher education extends existing knowledge of students' competence-related self-perceptions.

In addition to these novel findings regarding ASC, our results revealed that assumptions about multidimensionality and hierarchy does not only apply for psychology students' ASCs but also for their SE. This latter finding contributes essentially to the debate of the internal structure of SE. Some authors found evidence for a general SE construct (Lent et al., 1997), whereas others found evidence only for multidimensionality but nor for hierarchy of SE (Bong, 1997; Bruning et al., 2013). In the present study, an IBF (according to the NMS model of academic ASC) provided the best fit of a number of structural models representing the different perspectives on the structure of SE as mentioned above (e.g., multidimensionality by examining a first-order-correlated factor model). Our finding of multidimensionality and hierarchy of SE as described in an IBF model might be a good starting point for further structural analyses of SE in higher education with further samples, such as university students in different courses of study.

However, the value of our work is not only in reference to new insights into the structure of ASC and SE in higher education. It also has practical implications. For example, if we know whether ASC and SE are structured multidimensional, we can better understand academic and career choices of university students. Imagine a psychology student who believes that he has high abilities in the domain of educational psychology and is self-efficacious to fulfill required tasks within that psychological domain. We can predict that this student will be more likely to choose educational psychology as a continuation, because ASC and SE are highly correlated with academic interest and choice (Hackett & Betz, 1995; Köller et al., 2006; Marsh et al., 2005). It is conceivable that, due to his interest and positive self-view in educational psychology, the student invests significant effort and is more likely to show persistence when faced with failure, which in turn increases his performance and grade in educational psychology (Guay et al., 2010; Lusczcynska et al., 2005). However, little is known about the relative predictive power of ASC and SE for academic interest and choice in higher education. Hence,

if we know whether university students form domain-specific ASC and SE factors in higher education, we can investigate whether ASC and SE differentially influence domain-specific academic interest and career choice, and this would further contribute to research on their empirical differences.

Based on their internal structure, we were secondly able to examine correlations between ASC and SE factors. With regard to the degree of empirical overlap of the latent factors of ASC and SE, Pietsch et al. (2003) stressed that when considering only the cognitive component of ASC, items of ASC and SE would load on a single factor. Likewise, Pajares (1996) noted that both constructs might become increasingly similar, when measuring at the same level of specificity. To test whether these assumptions are applicable in higher education, we used only cognitive items, and integrated both in a common model based on their comparable internal structure (IBF models). The domain-specific and general conceptualizations of ASC and SE have not been explored simultaneously in previous research in higher education. In contrast to the assumptions of Pajares (1996) and Pietsch and colleagues (2003), we found evidence for empirically distinct domain-specific and general factors as indicated by good model fit in a number of fit indices. In addition to the goodness of fit, we also found high positive correlation coefficients between ASC and SE factors in line with previous findings (Choi, 2005; Marsh, Dowson, Pietsch, & Walker, 2004; Robbins et al., 2004), but we found inconsistent results compared to previous studies with regard to the strength of the relation between ASC or SE with achievement. In several studies, researchers found SE to be a better predictor of achievement than ASC (Hansford & Hattie, 1982; Richardson et al., 2012; Stankov et al., 2012). We, however, found ASC to be more strongly correlated with achievement than SE; moreover, after partialling out ASC, the remaining paths from domain-specific and general SE to corresponding achievement were close to zero. One reason for these contradictory results may be based on the fact that previous studies often have failed to match specificity between

predictor and criterion (Choi, 2005). Pajares and Miller (1994), for example, compared math ASC assessed with the SDQ III at a domain-specific level with math SE assessed at a task-specific level for their predictive power to solve a specific mathematics task. Consequently, they found mathematics SE better predicted students' the success at solving the mathematics task than domain-specific ASC, because ASC and achievement did not match in the specificity of their measurement level. However, our research suggests that when ASC and SE are measured at the same level of specificity, ASC measured at a task-specific level should predict task-specific achievement as well as SE, and likewise, a more general SE measure (e.g., at the domain-level) should be able to predict performance measured at a more general level (Pajares & Schunk, 2001). Due to the fact that grades in undergraduate psychology courses represent students' domain-specific ability across diverse tasks within a psychological domain, we needed to assess ASC and SE at a domain-specific level. However, we did not find positive correlations between ASC and SE with achievement in the domain of statistics. This might be due to the fact that the sample in that domain was limited, which might have led to distorted estimations of the parameters (Lüdtke et al., 2007).

In addition to prior studies' disregard for specificity matching, another reason our findings may differ regarding the predictive power of ASC and SE for achievement may lie in the fact that achievement is more highly correlated with the cognitive component of ASC (Arens et al., 2011). Hence, including affective ASC items in previous studies may have reduced the predictive power of ASC for achievement.

Finally, the question arises of why differences between psychological constructs (e.g, ASC and SE) should be investigated at all. Marsh and colleagues (2017) argue that researchers are prone to focus on their preferred constructs that they conceptualize in different ways and from different theoretical perspectives. In educational research, for example, theorists use several terms when examining the influence of thoughts and beliefs on human functioning, such as self-

esteem, self-concept, outcome expectations, and locus of control (van Dinther et al., 2011). These various conceptualizations might lead to confusion as to how these terms should be interpreted (Swann et al., 2007). Hence, investigating whether two constructs are empirically different reduces the risk that two scales with similar labels might measure different psychological constructs or two scales with dissimilar names might assess similar constructs (Marsh et al., 2017). Thus, analyzing psychological constructs simultaneously that are supposed to be different (e.g., concerning their relative predictive power) can bring significant contributions to science.

### 5.7.4 Implications and future research

Future research should extend the present analysis of the internal structure of ASC and SE in higher education by using different populations of university students in different courses of study and outside of Germany. This can contribute to the lack of research that has examined the internal structure of ASC and SE in higher education at all (e.g., Yeung et al., 2001). Moreover, an investigation of the empirical overlap of ASC and SE in higher education first requires the testing of the internal structure of both constructs. Only then are researchers able to compare ASC and SE in several academic domains and at the same level of measurement specificity. Likewise, building upon their internal structure, a valid comparison of ASC and SE with regard to their relation to achievement matched in specificity is then possible.

However, the present study remains cross-sectional, so that our results are foremost based on correlations and therefore cannot shed light on the causal relation between achievement and ASC or SE or their development over time. In K-12 educational settings, there is much evidence for reciprocal relations between ASC and achievement (Britner & Pajares, 2006; Marsh & Martin, 2011; Pietsch et al., 2003), but less evidence for the longitudinal relation between SE and achievement (Williams & Williams, 2010). Moreover, the causal relation between prior SE

and subsequent academic achievement is more consistent (Bandura, 1997; Zimmerman, 1995) than that for ASC (Marsh & O'Mara, 2008; Marsh et al., 2005). Therefore, longitudinal studies would be useful to compare the within-domain and cross-domain relations between ASC, SE, and achievement in different psychological domains and in psychology studies in general (as well as in further courses of study) to test whether causal findings from K-12 educational settings can be generalized to higher education.

Additionally, future research should investigate the predictive power of combined ASC and SE measures to academic achievement and, likewise, with regard to diverse academic outcomes (e.g., interest). As for achievement, ASC and SE are supposed to be comparably good predictors of interest and academic choice, for example (e.g., Hackett & Betz, 1995; Köller et al., 2006). Thus, a comparison of the predictive power of ASC and SE for further variables can contribute to our understanding of the empirical differentiation of ASC and SE. Note that again critical issues need to be considered, such as preliminary structure analyses to take in account the need for specificity matching between predictor and criterion (Chen et al., 2001; Choi, 2005).

In addition to their theoretical implications, the knowledge about the internal structure of ASC and SE can help us to develop intervention strategies that target specific academic domains (e.g., those in which students report the lowest degree of ASC and SE). Enhancing ASC and SE is a central educational goal (Marsh & Craven, 2006; van Dinther et al., 2011), and it is most effective when focused on specific domains (O'Mara et al, 2006).

There are interventions that indirectly try to improve domain-specific ASCs and SE, such as through skill building (O'Mara et al., 2006). Indirect interventions lead to better performance due to enhanced skills that in turn heighten ASC (Valentine et al., 2004). Likewise, skill building provides students the opportunity to gain positive mastery experiences that in turn enhance SE, because mastery experiences provide authentic information about one's own ability to master a specific task (Palmer, 2006). However, with regard to the reciprocal relation

between ASC/SE and achievement found in K-12 educational settings, the most successful strategy to enhance ASC and related performance is to improve both simultaneously (O'Mara et al., 2006). Thus, in addition to skill building, direct intervention aimed at the sources of ASC and SE (e.g., vicarious experiences, causal attributions, mastery experiences, processes and feedback of comparison) are useful. There is a vast body of direct intervention methods that positively affect sources of ASC or SE. For example, guided reflection of one's own experiences, feedback attributing success to ability and effort, persuasive communication, evaluative feedback from people that are viewed as knowledgeable and reliable, and observational experiences provided by social models have been shown to be supportive (Bandura, 1997; Dresel & Ziegler, 2006; Hattie & Timperley, 2007; Hulleman et al., 2016; van Dinther et al., 2011).

In conclusion, based on the knowledge of their internal structure, future research can implement diverse intervention methods to support students' domain-specific ASC and SE. Furthermore, knowing that ASC and SE form empirically distinct constructs in higher education allow us to build on their operational and conceptual differences (e.g., concerning their major sources) in developing direct intervention strategies.

## 5.8 Conclusion

In sum, the findings from the present study contribute to research concerning empirical differentiation of ASC and SE. Our results support the idea that when investigating the internal structure of ASC and SE, both constructs can be measured on comparable levels of hierarchy, considering a broader range of academic domains, and taking in account specificity matching between predictor and criterion. Additionally, using only cognitive ASC items, the empirical differentiation of ASC and SE in higher education is possible. Hence, research should further treat and support both constructs differently. However, future research is needed to extend the

understanding of the empirical separation of ASC and SE to further populations of university students. In this regard, the analysis of the internal structure of both constructs is a central presupposition.

# 6. General Discussion

In the following chapters, the results of Study 1 to Study 3 are summarized and discussed with regard to the four overarching research questions. Then, limitations of the present studies and theoretical implications for future research work are reported. Additionally, practical implications are presented that might be useful to foster the competence-related self-perceptions of ASC and SE in higher education in general, and in psychology students in particular. Note that the enhancement of ASC and SE are considered central goals in educational settings (Marsh & Hau, 2003; van Dinther et al., 2011).

## 6.1 Summary

### 6.1.1 Study 1

In Study 1, focusing on research questions 1 and 2 regarding SE, a 2-dimensional model of SE was developed, which differentiated between three operations (Selection/Assessment, Designing, Realization) and three contents (Diagnostics, Intervention, Research/Evaluation), in line with the multitrait-multimethod modeling framework (Campbell & Fiske, 1959). Following the strategy of within-network construct validation, CFAs were implemented to test the fit of this new structural model of SE in psychology students in three areas of psychological application (psychological domains: clinical psychology, educational psychology, industrial and organizational psychology). Results revealed that the postulated structural model fit the data well in each of the three psychological domains (CFI, TLI > .95). This theoretical framework was then operationalized by a newly developed questionnaire in order to validly assess the SE of psychology students according to Bandura's (1982) microanalytic research strategy. In particular, students rated their SE to successfully master 18 specific psychological tasks in the three psychological domains on a 6-point Likert scale using the vignette technique. With regard to the between-network approach of construct validation, results demonstrated that

the questionnaire did indeed validly assess psychology student's SE: As hypothesized, the authors found positive relations with convergent constructs (e.g., SE measured by a general self-efficacy scale; Rigotti et al., 2008) and negative relations close to zero with divergent constructs (e.g., personality trait of neuroticism; Rammstedt & John, 2005). Furthermore, according to the theory, SE was positively correlated with external criteria such as achievement in undergraduate psychology courses. Overall, higher mean SE values were found for students in advanced semesters. In sum, the 2-dimensional structural model with six factors described the SE of psychology students well, and a valid, task-specific measurement of SE in psychology students was possible.

### 6.1.2 Study 2

In Study, 2 focusing on research questions 1 and 2 regarding ASC, the authors measured the ASC of psychology students in four psychological domains (clinical psychology, educational psychology, industrial and organizational psychology, statistics) and in psychology in general, each with three adapted items of the SDQ III (Marsh & O'Neill, 1984). Results indicated that the recently developed NMS model (Brunner et al., 2010) that operationalizes ASC as domain-specific, with general ASC at the apex, fit the data better than alternative structural models (e.g., first-order correlated factor model). Hence, the structure of ASC is multidimensional and hierarchical in psychology students. According to research question 3, the authors then tested the assumptions of the I/E model in the sample of psychology students. Results supported the generalizability of the I/E model from K-12 educational settings to higher education: For each of the four psychological domains, achievement had a positive effect on corresponding ASC and achievement in undergraduate psychology courses in general had a positive effect on general ASC. These findings are in line with predictions of social comparison processes within an external frame of reference. Dimensional comparisons within an internal

frame of reference were obviously used by psychology students as well. Especially achievement in statistics had a substantial and negative effect on cross-domain ASC. In sum, results confirmed the generalizability of the assumptions of the I/E model in the sample of psychology students, especially when including the psychological domain of statistics.

### 6.2.3 Study 3

In the third study, the authors investigated whether the competence-related self-perceptions of ASC and SE of psychology students differ on an empirical level. To ensure the comparability of both constructs, critical issues of previous studies (e.g., the disregard of comparable levels of measurement) were controlled for. At first, the internal structure of ASC and SE were investigated separately. Specifically, students answered items on their ASC and SE in four psychological domains (clinical psychology, educational psychology, industrial and organizational psychology, statistics) and in psychology in general. In order to ensure a task-specific measurement strategy of SE, participants additionally read verbal descriptions of realistic scenarios of the psychological tasks of each psychological domain (vignette technique; Aguines & Bradley, 2014) before answering the SE items. Results suggested that ASC and SE are both structured in a multidimensional and hierarchical manner according to the NMS model of ASC (this is also known as incomplete bifactor model [IBF model]; see Study 3, Chapter 5.5.3). Next, both competence-related self-perceptions of psychology students were combined in a common structural model that took domain-specific and general conceptualizations of ASC and SE simultaneously into account. CFAs, according to the within-network approach, provided a good fit for this common structural model (CFI/TLI > .95). Furthermore, results indicated that ASC and SE appeared as autonomous, but correlated factors at different levels of hierarchy (e.g., at the domain-specific level). The common structural model further compared the strength of the relationship between ASC/SE and achievement in the four psychological

domains and in undergraduate psychology courses in general following the between-network approach. Overall, the relation between ASC and achievement were significantly higher than the relation between SE and achievement in the same psychological domain and on general level. In sum, ASC and SE were found to form correlated, yet empirically different competence-related self-perceptions of psychology students.

## 6.2 Critical reflection of the four research questions

Following, for ASC and SE separately, the results of the three studies with regard to the four overarching research questions are discussed.

### 6.2.1 Research question 1

#### 6.2.1.1 Structure of academic self-concept

The finding of a multidimensional and hierarchical structure of psychology students' ASC is in accordance with studies that have investigated the internal structure of ASC in different educational settings (e.g., Brunner et al., 2010; Lau et al., 1999). Moreover, these results are in line with findings of multidimensionality and hierarchy of self-concepts from further areas of psychological research: In personality psychology, for instance, there is evidence for differential relations between the Big Five and 17 different self-concept factors assessed in a sample of German adolescents using the SDQ III (Marsh & O'Neill, 1984). For example, the personality factor of agreeableness, which is associated with traits such as being courteous, cooperative, and tolerant (Barrick et al., 2001), is positively correlated with different factors of the social self-concept ($r = .29$ to $r = .41$; Marsh et al., 2006). Likewise, in the domain of sports, the physical self-concept (which is subdivided under the nonacademic self-concept according to Shavelson et al., 1976) is composed of multiple self-concept factors at different levels of hierarchy that are correlated with multiple components of physical fitness ($r > .70$; Marsh &

Redmayne, 1994). Likewise, in mental health research there is evidence for differentiable relations between 11 self-concept factors and seven mental health problems (mean $r = -.35$; Marsh, Parada, & Avotte, 2004).

Thus, based on vast empirical evidence, the multidimensional perspective of self-concept is widely accepted in several psychological disciplines (e.g., educational psychology, personality psychology, and sport psychology; e.g., Marsh, Xu, & Martin, 2012). In this regard, the present study contributes to the self-concept research by generalizing assumptions of multidimensionality and hierarchy of ASC to the context of higher education. Note, however, that only few studies that have yet investigated the internal structure of ASC in higher education (e.g., Lau et al., 1999; Paulick et al., 2017). However, the present studies do not allow any final conclusions on the internal structure of the ASC of psychology students, because in order to minimize the scope of the questionnaire, items measuring ASC pertaining to several basic subjects were not included in the questionnaire (e.g., ASC in the domains of biological or developmental psychology).

Overall, this wide range of empirical support for the multidimensional and hierarchical structure of self-concepts raises the question of whether findings of different research disciplines could be integrated. For example, the knowledge of self-concept differentiation found in K-12 educational settings (e.g., Cole et al., 2001) might be useful to derive assumptions for self-concept differentiation in higher education. In particular, younger students tend to have only dichotomous views about their abilities in different academic domains, whereas older students tend to rate their abilities along a continuum (e.g., Marsh, Craven, & Debus, 1998). If the assumption of an increasing differentiation in competence-related judgments also holds for samples of university students, this knowledge can enable researchers to identify, for example, contextual influences in higher education that contribute to self-concept differentiation (Shapka & Kreating, 2005).

Results of Study 2 also revealed that psychology students have multiple ASCs (e.g., in clinical psychology and in educational psychology), irrespective of whether they are actually in the undergraduate or graduate program at the time of measurement (see Table 4, Chapter 4.6). This leads one to suspect that at an early stage of their studies, psychology students form multiple ASCs that remain stable during their course of study with regard to their multidimensional structure. In K-12 educational settings, younger students' self-concepts are thought of as more flexible and changeable, but they become increasingly multidimensional over time (e.g., Filipp & Mayer, 2005; Marsh & Shavelson, 1985), and remain stable with age (Schmidt et al., 2017; Wigfield et al., 1997). However, longitudinal investigations of the development of multidimensionality of ASC in higher education are lacking.

Apart from that lack of longitudinal research on the structure of ASC in higher education, one may question the practical utility of examinations of the internal structure of psychological constructs at all.

In the present study, CFAs were implemented to test the multidimensional and hierarchical structure of ASC according to the within-network approach of construct validation (Byrne, 1984). Results of Study 2 revealed relatively low correlations between students' ASC in the psychological domains of e.g., clinical psychology and industrial and organizational psychology within the NMS model ($r = .07$, see Table 6, Chapter 4.6). However, the absolute value of the correlation coefficient does not help to understand the functionality of this relationship. Next to dimensional comparisons that are primarily based on far comparisons (Marsh et al., 2017), the low correlation between the ASC of clinical psychology and the ASC of industrial and organizational psychology could have been caused by, for example, a psychology student's interest, which includes both value-related and feeling-related valence (Krapp, 2002). For example, Denissen, Zarrett, and Eccles (2007) investigated the longitudinal development of students' coupling between academic achievement, interest, and ASC in a

sample of approximately 1,000 children between grades 1 and 12, and they found evidence for a positive relation between domain-specific ASC and corresponding academic interest. Thus, interest might also have an impact on the formation of domain-specific ASC in higher education: Imagine a psychology student is interested in the domain of clinical psychology, and therefore associates a high personal significance of clinical psychology for his or her future career (Wigfield & Eccles, 1992). This student enrolls in clinical psychology courses to be able to later complete postgraduate education in psychological psychotherapy, thus the student values clinical courses, because he or she thinks that these courses are relevant for becoming a psychotherapist (Schunk & DiBenedetto, 2016). Due to the student's interest in clinical psychology, he or she shows much effort and persistence in the issues of clinical psychology that in turn strengthens his or her performance and the related clinical ASC (Eccles & Wigfield, 2002; Schiefele, Krapp, & Winteler, 1992). At the same time, the student might have a comparatively modest level of interest in industrial and organizational psychology, thus showing lower effort and persistence in courses of this psychological domain. Accordingly, the student's performance as well as the related ASC in industrial and organizational psychology decrease (Hackett & Betz 1995; Köller, Daniels, Schnabel, & Baumert, 2000). Subsequently, a low ASC in industrial and organizational psychology leads to a decreased interest in the contents of that domain (Aunola, Tolvanen, Viljaranta, & Nurmi, 2013).

If the assumption is true that domain-specificity of ASC is not only formed through frames of reference and related performance feedback, but also influenced by emotional value in relation to a specific psychological topic (Gogol et al., 2016), interventions fostering ASC through skill-building (Marsh et al., 2006) should also focus on domain-specific interest.

To conclude, the investigation of the internal structure of psychological constructs such as ASC provides information about within structural relations, but it does not inform about the underlying affective or motivational processes.

With regard to the consideration that affective processes might additionally underlie ASC formation, one should also discuss the role played by the affective component of ASC ("I like '*psychological domain*'"/ "I like *psychology*") in the cognitive judgment process of one's own abilities (cognitive ASC). Marsh et al. (1999), for example, found correlations between affective and cognitive factors of ASC ranging from $r = .70$ to $r = .80$. This high, positive relation is in line with the assumption of Harter (1998) who proposed that students feel positive affect in areas in which they perceive themselves to be competent. Therefore, it might be possible that psychology students who enjoy learning in a specific academic domain, receive better grades and therefore perceive themselves to be more competent (e.g., Arens et al., 2011; Köller et al., 2006). In K-12 educational settings, both components of students' ASC are thought of as separate (e.g., Arens et al., 2011; Marsh et al., 1999; Pinxten et al., 2013), but correlated aspects (Möller & Köller, 2004). However, researchers still do not know if and how the affective and cognitive components of ASC are related in higher education and such investigations should therefore be part of future studies (see Chapter 6.4.1.1).

## 6.2.1.2 Structure of self-efficacy

In Study 1, a 2-dimensional structural model with six factors was found to describe the structure of psychology students' SE well. However, next to the good differentiability between the two suspected dimensions of contents and operations, there was a wide range and partly low factor loadings within the three content factors as demonstrated, for example, by the content factor *Intervention* in the domain of industrial and organizational psychology ($\lambda = .21$ to $\lambda = .70$; see Appendix A, Tabelle A4). In contrast, with regard to the three operational factors, results did not indicate the need for e.g., a further factor subdivision due to diverging factor loadings, but for the inclusion of a higher-order factor due to high correlations between the three operational factors within and across the different areas of psychological application ($r > .83$,

see Chapter 3.6). This theoretical consideration reminds of the debate of how SE can be conceptualized.

As noted earlier (see Chapter 2.2.2), in psychological research, there is discordance on whether SE—as part of competence-related self-perceptions—is a task-specific construct, or whether SE represents the more generalized confidence in one's own abilities and competences. Such a generalized SE leads to some interdomain relations of perceived efficacy that can be represented by higher-order SE factors (e.g., Chen et al., 2001; Schyns & von Collani, 2002). Interdomain relations are caused by higher-order skills (e.g., self-regulatory skills; Bandura, 2006) or by experiences of success and failure that are less context specific (Schwarzer & Jerusalem, 1999). For example, in psychology students, interdomain relations can be found if psychological tasks (e.g., evaluation of interventions and their outcomes; Bieschke, 2006) are central requirements in different psychological domains (e.g., in clinical psychology and in educational psychology). Thus, mastery experiences when evaluating interventions and their outcomes can foster the related task-specific SE and support performance in those psychological contexts where the task has to be fulfilled (Bandura, 2006).

Against the background of the task-specific conceptualization of SE (Bandura, 1977), a multilevel model of the theoretical framework developed in Study 1 might be able to take into account psychology students' general confidence in their operational competences to successfully perform on psychological tasks in several psychological domains (Schunk, 1991). In this regard, it should be noted that only three areas of psychological application were considered in Study 1. Thus, SE in further psychological domains must be assessed to offer a comprehensive overview of the structure of psychology students' SE and the examination of global, domain-specific, and task-specific SE simultaneously (Schyns & von Collani, 2002).

Nevertheless, up to now, research work has still not investigated multidimensional, hierarchical models of SE in diverse academic settings that integrate global and domain-specific

components of SE as those underlying self-concept theory (Marsh et al., 2017). Moreover, the majority of researchers in the field of SE have continued to focus on task-specific SE while ignoring the probability of domain-specific and general factors of SE (Bandura, 2006). Thus, little research has focused on what kind of different, in this case, psychological domains have to be distinguished and how they relate to general SE (Schyns & von Collani, 2002), although the investigation of the internal structure of a psychological construct is an important prerequisite for its valid measurement.

### 6.2.2 Research question 2

6.2.2.1 Measurement of academic self-concept

Instruments assessing self-concepts differ in the self-concept dimensions they address (Byrne, 1996), but they usually include one or more self-concept factors for assessing, for example, academic (ASC in math, ASC in verbal domains) or physical (e.g., attractiveness, physical competence) self-concepts as posited in the Shavelson et al. (1976) model.

In the present study, multiple ASCs of psychology students were assessed using the established instrument, the SDQ III (Marsh & O`Neill, 1984). Due to the fact that this questionnaire has not yet been applied to the sample of psychology students, the items were adapted to the context of undergraduate psychology courses (see Table 3, Chapter 4.5.2). However, there are no validation studies of the adapted questionnaire with comparable samples that offer reliability estimates (e.g., internal consistency). In this regard one should critically scrutinize whether the item: "I get good marks in *psychological domain*" validly assesses psychology students' ASC in the specified domain, because it implicitly refers to the achievement indicator (marks) in undergraduate psychology courses. Thus, a positive correlation between ASC and achievement in a specific psychological domain is obvious (see Figure 4, Chapter 4.6). Moreover, one should also take into account that recent performance

feedback may has a stronger influence on students' actual ASC than feedback that was given a while ago. In particular, if students receive positive performance feedback in clinical psychology shortly before the assessment of ASC takes place, they possibly judge their abilities differently (e.g., higher) than students who received feedback one or two semesters earlier. This might cause measurement errors in ASC assessments and should have been controlled for by, for example, asking students how long has it been since they passed their exam in clinical psychology.

In addition to the single items of the SDQ III, it is important to question whether the closed-ended assessment technique was appropriate to measure ASC in psychology students. In contrast to closed-ended questions, open-ended self-concept measures via self-report are also useful to assess students' ASC (Wolff, Nagy, Helm, & Möller, 2017). Open-ended self-concept questions (e.g., "How do you see yourself in clinical psychology?") encourage students to focus on facets of their ASC that have individual importance. Thus, the advantage of an open-ended measure of ASC (that has a highly positive correlation with closed-ended measures) is that participants are allowed to express their opinion without being influenced by the researcher (Reja, Manfreda, Hlebec, & Vehovar, 2003). With regard to the application of an open-ended questionnaire in undergraduate psychology courses, researchers could gain insight into psychology students' individual understanding of what self-concept exactly means to them. This can contribute to the debate on how to conceptualize the construct of ASC in educational settings (Trautwein & Möller, 2016). Moreover, open-ended questions (e.g., Why do you think you are good/bad in clinical psychology?) can provide valuable information on the experiences with the environment that shape the formation of high/low ASC, for example, by comparison processes as explained by the I/E model (Marsh, 1986). This information can then be used to construct direct ASC interventions that affect the sources of ASC (see Chapter 6.4.2.1).

6.2.2.2 Measurement of self-efficacy

In Chapter 6.2.1.2, it was mentioned that—due to inhomogeneous factor loadings—the three content factors within the two-dimensional structural model of SE developed in Study 1 might be further differentiable. Nevertheless, there were also partly differential relationships between the three content factors and external criteria ($\Delta r < .10$, see Table 2b, Chapter 3.6), and little differences between higher mean values in factor-specific SE in students of advanced semesters (see Appendix A, Figure A8a-A8c). In addition to the modeling strategy that was used, some of the 18 items measuring task-specific SE might be an alternative reason for the inadequate differentiation between the three content factors.

In the classical test theory (CTT), the observed score of an individual is composed of a true score and a measurement error that are uncorrelated with each other (Novick, 1965). Error scores are caused by test construction, test application, or test evaluation (Schmidt-Atzert & Amelang, 2012). Concerning test construction, it is possible that the questionnaire developed in Study 1 may has included ambiguously worded items that produced measurement errors. In particular, psychology students might not have been able to clearly distinguish between the similar sounding terms "evaluation" and "research" (see Tabelle 1, Chapter 3.3.3) due to a lack of practical experiences in dealing with research and evaluation projects. Note that mastery experiences with specific takes significantly contribute to differentiable task-specific SE formation (Bandura, 1977).

In addition to the methodological aspects of measurement, the discourse should also consider whether SE should be measured as a task-specific, domain-specific, or global construct. This debate is closely associated with the discourse on how SE can be conceptualized. Bong (2001a) investigated the equivalence of different SE judgments assessed by different methods (task-specific, problem-specific, general). The author found higher convergent validity between instruments assessing SE using a similar measurement technique (e.g., task- and

problem-specific measurement) compared to questionnaires using different measurement techniques (e.g., task-specific and general assessment of SE). This is in line with results indicating a lower correlation between any two SE scores when differences in the measurement levels decrease (Bong, 2001b). Note that in the present study, two different measurement techniques were applied to assess the SE of psychology students, and the question arises of which technique and related instrument might be more useful to validly assess SE in psychology students.

In Study 1, verbal descriptions of specific psychological tasks were presented. This standard method is useful when students estimate their confidence in performing well in several tasks of a particular domain (e.g., Bong, 2001a). Hence, SE was assessed at a task-specific level in Study 1 according to the demand that one must ask *which type of SE* is being measured (Betz & Hackett, 2006). Results revealed that the questionnaire validly assessed SE in psychology students and, therefore, confirmed the need for task-specific measurement of SE as postulated by several researchers (e.g., Bandura, 1977, 2006; Zimmerman, 1995).

In Study 3, in contrast, a general SE scale (Rigotti et al., 2008) was applied instead of a task-specific instrument. At first glance, this seems contradictory. However, a valid task-related measurement can also be accomplished using a general SE scale. According to such a general scale, participants are asked to judge their confidence to function successfully in a given domain without explicit reference being made to any specific task of that domain of functioning (Bong, 2001a). Since it is not possible to assess every single task that a psychology student must master within different psychological domains, carefully constructed and realistic scenarios of the psychological tasks of each psychological domain can be supportive (vignette technique; Aguines & Bradley, 2014). Therefore, not only in Study 1, but also in Study 3, participants first read different vignettes (that describe different psychological tasks of a specific psychological domain; see Appendix C, Table C1a-C1c for an English version) and then answered four items

of the general SE scale developed by Rigotti et al. (2008). Analyses supported the convergent validity of this scale with the newly developed questionnaire measuring SE at a task-specific level (see Table 2a, Chapter 3.6). Thus, if researchers start with a careful and comprehensive definition of the domain of behavior of interest (Betz & Hackett, 2006), a valid measurement of SE is appropriate, although a general SE scale is used. To conclude, when assessing SE, a researcher must make use of a task-specific measurements, although this strategy does not preclude the application of domain-specific or general SE scales insofar that the researchers also create context- and task-specificity (e.g., using the vignette technique).

Thus, to answer the question of which measurement technique should be preferred, the outcome of interest must be defined (Bong, 2001a). If a researcher aims to predict academic or occupational outcomes at a more general level (e.g., semester grades), the researcher should use a general SE scale. If the outcomes on specific tasks is the goal of prediction (e.g., to solve a specific type of mathematic problem; Pajares & Miller, 1994), one should only use a task-related scale.

Building on the structure and corresponding measurement of ASC and SE, in the following, the results of the relationship between ASC/SE and achievement in undergraduate psychology courses are discussed according to research question 3, referring to the methodology of the between-network approach.

### 6.2.3 Research question 3

#### 6.2.3.1 Academic self-concept and achievement

Regarding the positive relationship between domain-specific ASC and corresponding achievement in undergraduate psychology courses found in Study 2, the question arises of how psychology students evaluate their abilities in different psychology domains.

According to the I/E model, students in K-12 educational settings compare their own academic abilities with those of their classmates, and this social comparison information subsequently contributes to ASC formation (Marsh et al., 2017; Müller-Kalthoff et al., 2017). If a student's performance in a specific subject is lower than the performance of the reference group (e.g., classmates), then the student's corresponding ASC will be lower, too, and vice versa if the student's performance is relatively higher than that of the reference group (Dickhäuser & Galfe, 2004; Köller, Klemmert, Möller, & Baumert, 1999). Consequently, achievement and ASC within the specific academic subject are positively related.

Along these lines, note that the average level of performance of the reference group substantially influences the consequences of social comparisons as postulated by the *Big-Fish-Little-Pond-Effect* (BFLPE; Marsh & Parker, 1984). The BFLPE states that students of comparable level of ability have lower ASC if the average ability level (e.g., intelligence) of their reference group is high, but develop higher ASC if the average ability level in their reference group is low (e.g., contrast effect; Marsh & Craven, 2002). However, against the BFLPE, students do not necessarily experience a decrease in their ASC when grouped in high-ability classes. This contrasting phenomenon of higher instead of lower ASCs in high-ability settings/classes is explained by the *Basking-in-Reflected-Glory-Effect* (BIRGE; Cialdini et al., 1976). The BIRGE states that being grouped with students of high ability, and identifying oneself with this group, can evoke feelings of pride to be part of the group (assimilation effect). That in turn improves individual ASC and related performances (Dijkstra, Kuyper, van der Werf, Buunk, & van der Zee, 2008; Huguet, Dumas, Monteil, & Genestoux, 2001; Marsh, Köller, & Baumert. 2001; Preckel & Brüll, 2010). Despite the coexisting BIRGE, the absence of the BFLPE might also be explained by the construct of *self-clarity*, defined as the extent an individual's self-concept is clearly, consistently, and temporally stable (Campbell et al., 1996). Thus, students who subjectively feel secure about their abilities in one academic domain (e.g.,

in mathematics), should be less influenced by their high-achieving fellow students (Filipp, 2006).

It seems reasonable that not only students in K-12 educational settings, but also psychology students in higher education conduct social comparisons in order to obtain a realistic judgment of their own abilities (e.g., in clinical psychology). Psychology students can be classified as a population of high achievers, because only high school graduates with good grade point averages are accepted to attend universities and those with the highest grades are allowed to study psychology (based on German numerus clauses restrictions). Despite the high-ability context, psychology students do not experience a substantial decrease (BFLPE) or increase (BIRGE) in their ASC, indicated by a positive correlation between domain-specific achievement and ASC as proposed by social comparisons (see Figure 4, Chapter, 4.6). Thus, in undergraduate psychology courses, the described effects of the BFLPE and the BIRGE might coexist and even cancel each other out (Preckel & Brüll, 2010; Wheeler & Suls, 2005) as has been demonstrated in K-12 educational settings.

In addition, it is important to also note that university students do not have fixed schedules as in K-12 educational settings, and they can choose of their own accord when to attend a lecture or take an exam (e.g., switching exams between different semesters). Besides the flexible schedules of university students, the external frame of reference in higher education is also constantly changing according to course selections. Furthermore, university students may leave the university (e.g., while transitioning into the graduate program) or change their course of study (Heublein et al., 2012). Due to a variable external frame of reference, two other explanations can be discussed that explain the absence of increasing or decreasing ASC within the high-ability context of undergraduate psychology courses as postulated by the BFLPE and the BIRGE.

First, one might assume that psychology students do not pay much attention to the average achievement level of their fellow students, because the reference group is constantly changing and the average ability level is, therefore, ambiguous. For example, in one psychology course a student might perform slightly better than average whereas in another psychology course the student might perform slightly worse than average. Therefore, students might be less motivated to compare their achievements with those of their fellow students, because this achievement comparison does not provide valid information about one's own relative ability level.

Second, due to the freedom of choice as a consequence of a variable external reference group, psychology students do not only conduct *forced* comparisons (e.g., by an overview of grades) with the entire group of fellow students, but can also conduct *deliberate* social comparisons with single fellow students (Huguet et al., 2009). According to Blanton, Buunk, Gibbons, and Kuyper (1999), students deliberately select those fellow students for a social comparison with whom they perceive similarities concerning central characteristics (e.g., gender) but who differ in interesting characteristics (e.g., achievement in a specific subject of undergraduate psychology courses). Thus, students prefer an upward social comparison with a beneficial effect on course grades, but with no effects on self-perceived abilities (Seaton et al., 2008). This can be explained by the fact that upward comparison with fellow students who perform slightly better might be inspirational rather than threatening (Huguet et al., 2009) and might increase the motivation to perform (Huguet et al., 2001). In this case, social comparisons are less motivated by the desire to evaluate one's own achievement level in relation to fellow students, but to receive useful information about how to improve (Huguet et al., 2001). This comparison process then should effect ASC less but have more of an effect on subsequent performance.

According to the I/E model (Marsh, 1986), students not only conduct social comparisons but also dimensional comparisons that also form domain-specific ASC (Möller & Marsh, 2013).

In Study 2, the authors found negative contrast effects that were the consequence of dimensional comparison processes primary between the domain of statistics and the three areas of psychological application (e.g., clinical psychology). According to the dimensional comparison theory (DCT; Möller & Marsh, 2013), strong contrast effects appear primarily for domains that are at the opposite ends of a theoretical continuum of ASC (Marsh et al., 2014). Thus, statistics might be positioned at one end of such a theoretical continuum in undergraduate psychology courses.

Overall, the verification of the existence of negative contrast effects in undergraduate psychology courses is surprising given a low intrapersonal degree of performance variance across different psychological subjects. Thus, the existence of negative contrast effects might be explained by the high average ability level in undergraduate psychology courses as mentioned above so that psychology students might interpret minimal differences in their achievements across different domains as substantial differences in their own capabilities. This explanation is in line with findings from high ability classes in K-12 educational settings where the intra- and interpersonal ability level is homogenously high as well. Likewise, in higher ability classes, there is evidence for negative contrast effects as a consequence of dimensional comparison processes and, thus, underline the generalizability of the I/E model to frames of reference with a high average ability level (Mui, Yeung, Low, & Jin, 2000; Plucker & Stocking, 2001).

However, there might be further explanations and other variables that cause negative regression paths between achievement in one psychological domain and ASC in another domain. One explanation might be gender stereotype differences in domain-specific ASC. Marsh (1989) found that boys have a higher mathematics ASC, whereas girls have a higher ASC in verbal domains (e.g., in English), findings that are reasonably consistent from early childhood to adulthood (e.g., Eccles & Wigfield, 2002; Marsh et al., 2017). Likewise, results

from the *Programme for International Student Assessment* (PISA, 2000) revealed that boys reported higher ASCs and received better grades in subjects such as mathematics and physics, whereas girls reported higher ASCs and received better grades in verbal domains such as English and German (Schilling, Sparfeldt, & Rost, 2006). Due to the fact that mathematics in school and statistics in higher education have some aspects in common (e.g., both subjects generate anxiety in students; Finney & Schraw, 2003) and that in the present sample over 80 % of the participants were female, one could assume that female psychology students might have a lower ASC in the psychological domain of statistics compared to male students. Gender, therefore, might strengthen negative contrast effects between achievement in statistics and the ASCs of the three applied psychological subjects (e.g., clinical psychology). Consequently, female psychology students should receive fundamental support to strengthen their statistics ASC (see Chapter 6.4.2.1 for interventions).

Summarizing, due to the different consequences of social and dimensional comparisons on the ASCs of psychology students (e.g., Möller et al., 2009), psychology students should make use of multiple information from different sources to obtain a realistic judgment of their own abilities in several psychological domains.

Finally, note that the investigation of transferability of the I/E model to higher education does not incorporate the question of causal relations between ASC and achievement because, in the present study, achievement in several psychological subjects were only measured once. In K-12 educational settings, there is evidence for a reciprocal relation between ASC and achievement as postulated within the *reciprocal effects model* (REM; e.g., Marsh & Martin, 2011; Marsh & Yeung, 1997). Likewise, there is evidence for generalizability of the REM over age, nationality, or assessment strategies of achievement (Huang, 2011); thus, the generalizability to higher education seems reasonable. However, due to its design (see Chapter 6.3), the present investigation could not answer the question of whether the assumption of a

reciprocal relation between ASC and achievement also applies to the sample of psychology students.

6.2.3.2 Self-efficacy and academic achievement

Despite ASC, SE is also positively related to achievement in higher education (Richardson et al., 2012). With regard to the I/E model, the question arises if negative contrast effects between achievement in one psychological domain also effects SE in another psychological domain, that is, whether the comparison processes described by the I/E model also play a role in SE formation (Bong, 1998).

According to the I/E model, researchers suspect that negative contrast effects of achievement on cross-domain ASC particularly appear between academic domains that are a greater distance from each other on a continuum (Marsh et al., 2014; Marsh et al., 2015). The perceived distance between domains/subjects and their related requirements remain on the assumption of interdomain relations in perceived efficacy (Bandura, 2006). According to this, if psychology students can use similar subskills within different spheres of psychological activity (e.g., in the domain of clinical and educational psychology equally), they might develop comparable beliefs of efficacy in both domains. If this assumption is true, likewise, psychology students should develop a "different" SE in psychological domains that they perceive to be dissimilar concerning their major task-specific requirements. However, researchers have not yet found evidence for generalizability of the I/E model to SE (Bong, 1999; Marsh et al., 2001). For example, Möller et al. (2009) found that the correlation between math and verbal SE measures ($r = .50$) is much higher than the correlation between ASC measures (between $r = -.09$ and $r = .17$), and nearly as high as the correlation between achievement ($r = .70$).

Perhaps the lack of empirical evidence for the I/E model in SE research can be explained by the ordinarily applied measurement technique of SE.

In particular, SE is typically assessed at a task-specific level (see Chapter 2.2.2), because SE is foremost formed through mastery experiences with a specific task (e.g., Zimmerman, 1995). Due to the fact that psychological task requirements are comparable across different areas of psychological application (see Appendix A, Table A6c), the same task-specific SE can support psychology students to successfully manage the same tasks in different psychological domains. Hence, due to the perception of a high degree of similarities between the task-specific requirements of different psychological domains, or in the case that skills in dissimilar domains are developed together (Bandura, 2006), students do not need to contrast their task-specific achievements across domains, but rather across diverse tasks. Moreover, due to the fact that grades (e.g., grade in clinical psychology) reflect students' average performance across diverse tasks and do not represent one's own capability for a specific task (for which students develop a task-specific SE), psychology students do not contrast their grades to evaluate their capabilities to master specific tasks in different domains. Consequently, thus far, the assumptions of dimensional comparisons of the I/E model have not yet been replicated for SE.

In this regard, also note that SE measures are typically less affected by frames of reference than are self-concept responses (e.g., Marsh et al., 2017). For example, when measuring SE, psychology students are asked to judge the probability of correctly solving a specific psychological problem or task; their responses are based on an absolute criterion that does not require them to compare their own performances across different psychological subjects (Marsh et al., 2017).

Lastly, as noted for ASC, the question of which type of relationship exists between SE and achievement in higher education remains. According to Bandura's (1986) SCT and its *triadic reciprocal determinism*, a person's cognition, affect, and biological events, his or her behavior, and also environmental influences interact reciprocally and create human functioning. In educational settings, there is evidence for the causal influence of prior SE on subsequent

achievement (e.g., Britner & Pajares, 2006; Robbins et al., 2004) and likewise for the inverse influence of prior achievement on subsequent SE (Chin & Kameoka, 2002). The notion of reciprocal determinism between SE (cognition) and students' achievement (behavior) has been assumed for K-12 educational settings (environment). For example, Schunk and Swartz (1993) enhanced fourth graders' SE in writing by providing them with strategies, a process goal, and progress feedback that in turn enhanced their feelings of competence, and this SE in turn improved writing performance. However, the reciprocal determinism of SE and achievement seems to be without direct empirical support (Williams & Williams, 2010).

In sum, it becomes clear that ASC and SE are both positively related to achievement in undergraduate psychology courses. This raises the question whether ASC and SE form different competence-related self-perceptions of psychology students that justify, for example, a different wording. This question was part of the fourth research question.

### 6.2.4 Research question 4

The results of Study 3 investigating the fourth research question demonstrated that in psychology students, ASC and SE form correlated but empirically distinct constructs at a general and at a domain-specific level in several psychological domains. Moreover, results revealed that even though SE in clinical psychology is more highly correlated to ASC in clinical psychology ($r = .63$, $p < .001$, see Appendix C, Table C6), it is also positively correlated with ASC in industrial and organizational psychology ($r = .31$, $p < .001$, see Appendix C, Table C6). This indicates that psychology students who feel self-efficacious to master psychological tasks within the domain of clinical psychology (high SE in clinical psychology), believe that they are competent in clinical psychology (positive ASC in clinical psychology), but also tend to have an ability-related positive ASC in the domain of industrial and organizational psychology. This

within- and cross-domain relation between SE and ASC might be explained by mastery experiences that are thought of as a central source for both ASC and SE (Bong & Skaalvik, 2003). Thus, psychology students who are self-efficacious to behave on a specific task must have made positive mastery experiences with the task that also influence students' judgment of how able they perceive themselves in a specific academic domain. Due to the fact that similar task requirements appear across domains as mentioned earlier, in the present study, a positive mastery experience with a specific task can contribute to the formation of ASC in different domains.

Building on the overlap of ASC and SE in undergraduate psychology courses within and across domains, the question arises whether both constructs are not only correlated, but also related reciprocally. In this regard, Ferla et al. (2009) tested a structural model integrating ASC and SE simultaneously in the academic domain of mathematics. The authors assumed that both constructs influence each other reciprocally, or, in other words, students who believe to be able in mathematics (ASC) should subsequently feel more SE to master specific mathematic tasks that in turn again should foster their mathematic ASC. If the consideration of a reciprocal relation between ASC and SE might be true, SE in clinical psychology, for example, should subsequently increase corresponding domain-specific ASC in clinical psychology, and ASC then should contribute to SE formation (Schunk & DiBenedetto, 2016). Although Ferla et al. (2009) found evidence for a mutual relation between ASC and SE in mathematics, they could not investigate cause-effect relationships between both constructs, because the authors used a cross-sectional design. The investigation of causal relations needs to measure the interesting constructs at least twice (Schunk & Pajares, 2001). Likewise, in Study 3, the authors were not able to investigate possible causal relations between ASC and SE due to design (see Chapter 6.3 for limitations).

Despite positive correlations, it was concluded that the ASC and SE of psychology students form empirically differentiable constructs. With regard to this conclusion, it is surprising that several recent studies which are based on the *Expectancy-Value-Theory* (EVT; e.g., Wigfield & Eccles, 2000), used ASC responses to operationalize expectations of success (e.g., Eccles, 2009), although the conceptualization of expectancy within the EVT is similar to that used in SE research (Marsh et al., 2017; Schunk & Pajares, 2005). In response to this, Marsh et al. (2017) criticized that researchers tend to focus on their preferred constructs, but only test how different self-beliefs differ from each other.

The present research contributes to this indirect research demand of testing the empirical overlap of related constructs. However, in the present study, investigating the implicit position of ASC and SE of psychology students within a nomological network of competence-related self-perceptions, several further competence-related self-perceptions were not included (e.g., locus of control, outcome expectations, self-esteem), although relationships have been demonstrated with ASC and SE (Arens & Hasselhorn, 2013; Bandura, 1977; Schunk 1991; Marsh et al., 2017; Renkl, 2008; Schunk & DiBenedetto, 2016). Thus, the results of empirical differences between ASC and SE in the present study are limited to a nomological network that excludes further constructs of the self.

Finally, one should discuss the methodology used to empirically compare ASC and SE with regard to the exclusion of affective self-concept items. Previous studies, which were conducted in K-12 educational settings, typically used both affective and cognitive ASC items equally (e.g., Marsh et al., 1999). The inclusion of the affective component in ASC measures may have caused differences between ASC and SE at an empirical level (Pietsch et al., 2013). Therefore, the present study does not exactly generalize findings from K-12 educational settings to higher education, but extends previous research by examining the empirical overlap of ASC and SE

using a self-concept measure that focuses only on students' cognition of self-competence (Hughes et al., 2011).

Now that the implications of the studies for the four research questions have been discussed, it is time to focus on the three important limitations of the findings in the following chapter.

## 6.3 Limitations

First, the sample limits the results. The present study only included psychology students from one German university. This would call into question whether results of findings, for example, of the internal structures of ASC and SE can be generalized to further samples of psychology students from other German universities. With the introduction and implementation of the Bologna reform in 1999 for the Europe-wide standardization of undergraduate and graduate courses of study, one may conclude that, at the majority of European universities, psychology students are taught in similar basic and application psychological subjects (e.g., general psychology, clinical psychology). However, due to the size of the university and the related teaching capacities, for example, there might be differences in the range of subjects that are on offer. As a consequence, some European psychology students develop ASC and SE for further subjects and related tasks (e.g., traffic psychology) while others cannot choose these subjects and, therefore, are not able to judge their perceived competences and their confidence to master specific tasks within these psychological subjects due to a lack of, for example, mastery experiences (Bong & Skaalvick, 2003). Hence, the structure of ASC/SE might differ between universities due to curriculum. Likewise, the structure of competence-related self-perceptions of psychology students outside Europe could be expected (e.g., American, Australian or Chinese psychology students) due to the diverging academic programs. Concluding, the present results on the structure, measurement, correlates, and differentiation of

ASC and SE in psychology students are limited to students of the University of Trier. Moreover, the results of the present study investigating ASC and SE in higher educations are limited to the ASC and SE in psychology students themselves.

Second, the present study deals with cross-sectional and longitudinal data concurrently. In particular, the sample comprises psychology students that have passed the final exam in, for example, clinical psychology in semester A, but provided information on their competence-related self-perceptions only in semester B. This type of data can be classified as longitudinal, because one could examine the causal influence from prior achievement on subsequent ASC and SE (as described in the skill development approach; Calsyn & Kenny, 1977). The sample also includes data of participants that passed the final exam in clinical psychology in semester B and also answered the questionnaire in the same semester. Thus, achievement feedback and measurement of ASC and SE took place in short time interval so that data can be classified as cross-sectional. In the present data set, however, the time of the examination was not surveyed, and it is therefore not possible to differentiate between cross-sectional and longitudinal data. Finally, the authors also included data of participants that completed the questionnaire in semester B, but at that time of measurement, they had not yet passed the final exam in a specific psychological subject. In this case, one could ask for students' grades in a future semester C in order to investigate the causal influence from prior ASC/SE on subsequent achievement according to the self-enhancement approach (Helmke & van Aken, 1995). Nevertheless, there were only $N = 40$ psychology students that had already answered the questionnaire, but had not yet taken the exam. Thus, a statistical test of the causal relation between ASC/SE and achievement in semester C will not provide valid information due to small sample size.

Despite the conflict of cross-sectional and longitudinal data, achievements in the three areas of psychological application (i.e., clinical psychology, educational psychology, industrial and organizational psychology) were only measured once so that reciprocal relations could not

have been investigated for these domains, although there is evidence for such a relation according to the REM (Marsh & O'Mara, 2008; Marsh & Yeung, 1997; Williams & Williams, 2010). Note that although psychology students must complete several statistics exams during the undergraduate and graduate psychology program, a test of reciprocal relation was also not possible because ASC and SE in the domain of statistics had only been assessed once (winter semester 2016/2017).

Third, the measurement strategy of achievements themselves might limit the results of the present study. All data included in the present study are based on self-reports. With regard to grades in several psychological subjects, memory effects, for example, might have affected the data, in particular, when an exam was performed a long time ago. Furthermore, social desirability might have biased the data. Responding in a socially desirable way describes the tendency of participants to present a favorable image of themselves (Johnson & Fendrich, 2005). Socially desirable responding is most likely to occur in responses to socially sensitive questions (King & Bruner 2000), and in the present study, social desirable responding is likely in responses to questions of individual grades. To minimize the risk for social desirable responding, it is important to assure the anonymity of data (Lucas & Baird, 2006). In the studies reported here, data were primarily collected in public lectures, a situation that might have revoked the feeling of anonymity, and students might have felt compelled to answer in a socially desirable manner thus reporting better grades than they had actually received.

Overall, further research is needed to overcome the limitations of the present study as proposed in the following Chapter 6.4.1.

## 6.4 Theoretical and practical implications

### 6.4.1 Theoretical implications

In the following, several theoretical implications for future studies according to the four overarching research questions are anticipated. To avoid redundancy, only implications are stated that have not been mentioned within the three separate studies (see Chapters 3.7, 4.7.3 and 5.7.4).

#### 6.4.1.1 Research question 1

With regard to the ASC of psychology students, future research should investigate a broader range of psychological domains (e.g., biological psychology, developmental psychology) in order to get a more comprehensive overview of how the ASC of psychology students in different domains can be conceptualized. By investigating the strength of correlations between different ASCs of the different psychological domains, researchers would be able to examine psychology students' perceptions of similarity/dissimilarity of psychological domains. High correlations of psychological domains indicate that these domains should be arranged on a theoretical continuum next to each other (Marsh et al., 2014; Marsh et al., 2015).

Additionally, the sample should be extended by further populations of psychology students from other German and international universities to generalize findings of the internal structure of ASC in psychology students to different cultures and contexts. A larger sample size can also be useful to carry out a longitudinally designed study to examine the stability of the structure of ASC of psychology students during their course of study. Correlations between the ASC of the different domains/subject areas should decrease with age (Marsh & Ayotte, 2003) with ASCs therefore becoming increasingly multidimensional (e.g., Filipp & Mayer, 2005), but possibly remaining stable over the course of study.

Moreover, there is a need for investigating whether the ASC of psychology students is composed of affective and cognitive components as found in K-12 educational settings (Arens et al., 2011; Pinxten et al., 2013). According to the affective component of ASC toward specific academic domains, it might be also useful to evaluate domain-specific interest of psychology students (e.g., using a questionnaire measuring academic interest according to Gogol et al., 2016) in order to better understand, for example, interest-related academic choice in the graduate program (Köller et al., 2006). This information could be then used to foster students' interest in different psychological domains, thus reducing the risk of early specialization in a psychological domain, which could ultimately limit the professional career to a sole area of psychological application. Thus, one should investigate not only structural relations within the domain-specific ASCs using factor analysis, but also investigate the affective and motivational processes that might underline domain-specific formation of ASCs.

With regard to SE, there is also a need to consider broader psychological domains, additional psychology student populations from different universities, as well as students studying different subjects/majors to gain more insight into the structure of SE in higher education. Therefore, the structural model of SE developed in Study 1 can be extended to further psychological domains, but also be generalized to other courses of study, such as mathematics, information technology, natural sciences, and technical disciplines (known as the "MINT" subjects; Heublein & Wolter, 2011). There is empirical evidence that students in MINT subjects estimate requirements to be high challenging which leads to low feelings of efficacy to master the study-related requirements. Consequently, students are more likely to change to another study program or to leave the university prematurely (Fellenberg & Hannover, 2006). In order to minimize the risk of early university dropout, one could try to enhance students' SE. Therefore, a framework of SE must first be developed (e.g., in mathematics) according to the approach taken in Study 1. Based on a theoretical framework developed by expert interviews

and job descriptions, SE should be operationalized by a questionnaire which assesses students' SE with regard to specific tasks in diverse areas of application (e.g., algebra, stochastics). Moreover, vignettes should be generated that describe real requirements of the job to ensure the context-specificity of SE measurement (Aguines & Bradley, 2014; Betz & Hackett, 2006). When measuring SE with the newly developed scale, one could first identify those mathematic students who experience a low feeling of efficacy and then target those areas in which their confidence to master specific tasks required in undergraduate/graduate mathematic courses and later within the job should be fostered (for specific SE interventions see Chapter 6.4.2.2).

In addition to generalizations of the SE model, one could use the structural framework developed in Study 1 as a realistic job preview in undergraduate psychology courses (Wanous, 1992). University dropout or change mainly occurs during the first semesters (Fellenberg & Hannover, 2006) and can be explained by a lack of accuracy of students' academic and job expectations (Breaugh, 2010; Heublein et al., 2010). To minimize the risk of premature dropout, high school graduates who would like to study psychology could be invited to an information event where contents of the undergraduate psychology courses are illustrated using the described psychological tasks of the 2-dimensional framework. Future studies should then evaluate the systematic application of the structural model as an instrument to provide a realistic job preview (e.g., by evaluating dropout rates of students who participated in the information event).

Overall, with regard to the internal structure of SE, evidence was found in Study 1 supporting the task-specific structure of SE of psychology students. However, this structure should be further investigated using CFAs to compare fit indices of alternative structural models. In particular, some of the factors (e.g., the content factor of interventions) should be further differentiated, for example, into consultative and changing aspects of interventions. The operational factors, in contrast, might be conceptualized by a higher-order factor. Overall,

internal structure analysis of SE in higher education are scarce. To counter the lack of research, future studies should examine the internal structure of SE in diverse contexts and university samples and should compare alternative multilevel structural models that operationalize SE as a global, domain-specific, and task-specific construct (Schyns & von Collani, 2002). In conclusion, to obtain a comprehensive picture of the structure of SE, researchers should systematically investigate the internal structure of SE as has been done in self-concept research.

6.4.1.2 Research question 2

With regard to the measurement of ASC and SE in psychology students, there are several implications for future research.

Concerning ASC, one should consider whether the item "I get good marks in *psychological domain*" can be replaced by another item that does not implicitly refer to achievement in undergraduate psychology courses (e.g., I do well in *psychological domain*). Alternatively, one could delete the item when ASC is highly correlated with grades as external criterion. Moreover, there is a need for validation studies that investigate whether the SDQ III validly assesses ASC in undergraduate psychology courses. Therefore, future studies should additionally implement alternative instruments assessing ASC in the sample of psychology students to investigate convergent validity as assumed by the between-network approach (Byrne, 1984).

In their literature review, Braun, Woodley, Richardson, and Leidner (2012) summarized the comparative advantages and disadvantages and the validity of seven instruments assessing competence-related self-perceptions in higher education. For example, the *Cooperative Institutional Research Program* (CIRP) asks students to judge their actual competences with regard to a comparable able peer of the same age. Hence, the measurement makes social comparison processes as a subject of the judgment, because comparison processes

are central in ASC formation (see Chapter 2.3.1). In addition to using alternative instruments constructed for university students, one could consider whether to adapt instruments constructed for K-12 educational settings to the sample of university students, for example, the self-concept grid (Rost & Sparfeldt, 2002). This questionnaire was constructed based on two samples of German high school students and cross-validated with two further samples in order to contribute to the research gap resulting from the lack of instruments to assess ASC of older German students. The questionnaire provides good psychometric properties (e.g., Schilling, Sparfeldt, Rost, & Nickels, 2005) and items refer—as the CIRP—on social comparisons within an external frame of reference (e.g., class). Items could be adapted to the sample of German university students (e.g., *"At my university, I am among the best students"*).

Next to other closed-ended self-concept instruments, researcher could consider using open-ended questions. Assessing psychology students' ASC in a psychological domain (e.g., clinical psychology), researchers could use the following instructions: "How do you see yourself in clinical psychology? How do you like clinical psychology? How good or bad are you in clinical psychology? Why do you think you are good/bad in clinical psychology?" and so on (Wolff et al., 2017). The information provided by the participants can be used to subsequently construct closed-end questionnaires for different samples of university students (e.g., for the sample of psychology students). It is important to note that after data collection there is a need to train raters to code students' self-perceptions (e.g., negative, neutral, or positive in each psychological domain; Wolff et al., 2017).

Finally, future research work should assess the date when students complete their final exams in order to hinder measurement errors in ASC assessment due to varying length of the period between exam and ASC measurement.

With regard to SE measurement, future research should evaluate whether some items of the questionnaire developed in Study 1 produce a high proportion of measurement error.

Specifically, one could check the items by means of a two-phase pretesting (Prüfer & Rexroth, 2000): In the first phase, cognitive techniques are applied, for example, the technique of *Probing* (questioning of judgments) or *Think Aloud*. The latter technique collects information concurrently or retrospectively regarding participants' experiences while answering the question. This information enables researchers to detect deficits in item formulation. In the second phase, participants complete the preliminary questionnaire (standard pretest) a second time, and again report problems of understanding.

In addition to carrying out further pretests of the long form, future research could construct and validate a short form of the questionnaire developed in Study 1. Measuring SE of psychology students with 18 items in different areas of psychological application using the vignette technique is very time consuming. Furthermore, students might be demotivated by the long questionnaire and therefore respond to the items using response tendencies (Bühner, 2011). To choose items from the existing questionnaire developed in Study 1, one could refer to the factor loadings and further item characteristics. For example, the mean degree of selectively of items should lie between $rit = .30$ and $rit = .50$, and an item difficulty of Pi = .50 is desirable (Lienert & Raatz, 1994). Note that items of a short form are selected based on the item characteristics of the original questionnaire; thus, the short form should be validated using a cross-validation sample (Marsh et al., 2005). Once this is completed, the questionnaire should be pretested in different samples of psychology students to ensure a valid assessment of psychology students' SE (Marsh et al., 2017).

With regard to SE measurement in general, future studies should investigate the convergent validity of different instruments assessing SE of university students. According to Bong (2001a) and Pajares (1996), correlations between different scores should decrease if measurement levels become increasingly different. Thus, to test this assumption, a researcher should compare different instruments that assess SE on general, domain-specific, and task-specific levels.

Furthermore, the use of the vignette technique should be further investigated. In particular, examination should focus on whether other, less time extensive methods can be used to create context-specificity in SE measurement when using a general SE scale.

### 6.4.1.3 Research question 3

Study 2 reports evidence for the generalizability of social comparison effects to higher education (see Chapter 4), even though psychology students are grouped within a high-achieving context. With regard to this high-ability context, future studies should ask psychology students if they indeed consider their fellow students' current level of ability to be high. If this is the case, researchers should also ask if psychology students are proud to be part of that group of (high achieving) university students (e.g., Do you feel proud to study psychology?). If both questions can be answered positively, this would provide evidence for the assumption that BFLPE and BIRGE might cancel each other out (e.g., Wheeler & Suls, 2005). Moreover, future studies should include the construct of self-clarity to investigate whether psychology students' certainty about their own competences in one or more psychological domains might also relativize the BFLPE.

Furthermore, due to the variable frame of reference in higher education, it would be interesting to examine whether the intentional integration of forced comparisons (e.g., distributions of grades are read out loud during lectures) strengthen the BFLPE, because forced comparison causes the average ability level to become more salient and less ambiguous (Huguet et al., 2009). In this regard, psychology students should also be asked with whom they usually deliberately compare their own achievements in different psychology courses. This can provide information on whether psychology students prefer upward comparison when they can freely choose a reference person (Blanton et al., 1999), as postulated for students in K-12 educational settings.

In addition to social comparisons, negative cross-effects between achievement and ASC across domains were also found, and these might not only have been produced by dimensional comparisons, but also by gender stereotypes. Future studies should therefore investigate the internal structure of ASC of exclusively male psychology students in order to subsequently prove whether the assumptions made by the I/E model (Marsh, 1986) are also true for male psychology students, especially with regard to the negative contrast effects between the domain of statistics and the three areas of clinical psychology, educational psychology, and industrial and organizational psychology. Next to gender, future research should also take into account student's *ability beliefs* as a potential moderator of the negative contrast effects postulated by the I/E model (Möller et al., 2002). Psychology students who believe that their abilities, for example, in clinical psychology and in statistics, are quite domain specific (e.g., *"Someone who is good in clinical psychology is usually worse in statistics"*) should create stronger contrast effects between achievements and the ASCs of other psychological domains.

With regard to SE, the I/E model has not yet been replicated in K-12 educational settings (e.g., Bong, 1998). This might be due to the fact that SE judgments are focused on individual's capabilities in relation to a specific task, and furthermore, are less influenced by frames of reference than ASC (Marsh et al., 1991). However, future studies should examine whether the I/E model can be varified in higher education in differing populations of university.

Apart from the I/E model, in K-12 educational settings, there is a great number of studies that found reciprocal relations between ASC/SE and achievement (e.g., Marsh & O'Mara, 2008; Retelsdorf et al., 2014). However, the REM for ASC and achievement has not been investigated in higher education in general and in undergraduate psychology courses in particular. With regard to SE, there is only an implicit assumption of reciprocal relations in K-12 educational settings (Ferla et al., 2009; Williams & Williams, 2010).

Therefore, future research should investigate reciprocal relations while taking into account that ASC and SE as well as achievements are measured at least twice and preferably more frequently (Pajares & Schunk, 2001). Due to the fact that psychology students only take final exams in clinical/educational/industrial and organizational psychology at the end of their undergraduate studies, researchers should include the grades from specific seminars/courses and from the specific tracks of the graduate program to investigate longitudinal relations. Note, however, that in order to conduct a longitudinal study, the research must additionally ask students exactly when they completed their final exams in order to thwart methodological problems (see Chapter 6.3 for limitations).

In addition to the longitudinal analysis of the reciprocal relations between ASC/SE and achievement, moderators and mediators of the relation between ASC/SE and achievement could also be included in future studies.

For example, researchers could take a look at the interpersonal relationship between instructors and students in higher education. In a meta-analysis with 32 studies overall, Feldman (2007) found that instructors, who motivate students to do their best, encourage them to ask questions, give feedback, and show openness to individual opinions positively influence the academic success of their students and support the awareness of the students' individual abilities. Future research could use ratings (negative, neutral, positive) for the interactional behavior of instructors toward students in the different seminars. It could be investigated, for example, if a more precise and positive performance feedback on prior achievement leads to more a differentiated and realistic ASC of a student.

Next, the construct of *autonomous motivation* might be a potential mediator of the relationship between ASC and achievement and could, therefore be included in future studies (Guay & Vallerand, 1997). The *Relative Autonomy Index* (RAI) according to the *Self-Determination Theory* (SDT; Guay et al., 2010; Deci & Ryan, 1985) calculates autonomous

motivation. It is assumed that students who perceive themselves to be competent to successfully master academic requirements, have a higher RAI and thus show better performance (Guay et al., 2010). If future examinations reveal evidence of the proposed mediating effect in undergraduate psychology courses, one intervention could be to try and enhance the autonomous motivation of psychology students, for example, by fostering enjoyment in studying to support their academic success (Guay et al., 2010).

With regard to SE, the role of mediating and moderating processes in the relation between achievement and SE and vice versa has also been discussed. For example, a high learning orientation may buffer the negative consequences of failure for subsequent SE (Bell & Kozlowski, 2002) that in turn strengthens an individual's effort and persistence in the face of future obstacles in order to reach the pursued learning goal (Gore, 2006). Furthermore, SE directly and indirectly influences academic performance through goal setting, because people who feel a strong sense of efficacy set themselves higher goals and persist longer when faced with obstacles toward the goal (Zimmerman & Bandura, 1994). Likewise, personality (e.g., Chen, Casper, & Cortina, 2001) and good self-regulatory skills mediate the relationship between academic SE and academic performance (Zimmerman & Martinez-Pons, 1990). Finally, SE for self-regulated learning itself influences achievement indirectly through prior achievement, intelligence, self-esteem, and personality (e.g., openness; Ziffiano et al., 2012).

Thus, future studies should examine moderating and mediating effects of goal setting, personality, and self-regulatory skills on the relationship between SE and achievement and vice versa within higher education. For example, if we know that self-regulatory skills do indeed mediate the relationship between SE and subsequent performance in various psychological tasks, interventions should not only focus on skill building and on SE itself, but also enhance the capability of self-regulating one's own motivation and academic learning (Zimmerman & Bandura, 1994).

Overall, with regard to measurement of achievement and the risk of social desirability in self-reported grades (see Chapter 6.3 for limitations), future studies could assess students achievement or ability by standardized achievement tests or multidimensional ability tests (e.g., BIS; Jäger et al., 1997; IST 2000-R; Amthauer, Brocke, Liepmann, & Beauducel, 2001). These have the advantage that they use the same metric and are less confounded by frames of reference, teachers/university instructors, or the environment (Marsh et al., 2014). Possibly, using standardized test values, correlations between ASC and SE with achievement might vary in strength and valence. As a final note here, however, it is important to be aware that assessing more complex achievement indicators bears the risk of large effort of time and personnel costs which infringes the quality criteria of economy and reasonableness (Bühner, 2011), and should therefore be carefully considered.

### 6.4.1.4 Research question 4

As mentioned above, a reciprocal relation between the two competence-related self-perceptions of ASC and SE of psychology students seems reasonable and needs to be investigated in future studies using longitudinal designs. Furthermore, the examination of reciprocal relations of ASC and SE within and across domains could also extend research on empirical differentiation by comparing the strength of their causal influences on each other. If a causal relation can be found, researchers should then also investigate whether achievement might be a mediator of this relationship: SE should lead to high performance in specific tasks, for example, in clinical psychology, which in turn strengthens ASC in clinical psychology and subsequently fosters achievement, which again forms SE (Schunk & Pajares, 2005).

In line with the assumption of reciprocal relations, the authors of Study 3 found evidence for empirical differences between ASC and SE in higher education. In contrast to previous research implemented in K-12 educational settings, the internal structures of both constructs

were tested previously in order to be able to investigate their empirical overlap in different domains and at different levels of hierarchy (i.e., domain-specific, general). Future research should try to replicate the empirical separation of ASC and SE in higher education samples, testing their internal structures first and taking into account critical issues of previous research (see Hughes et al., 2011). Nonetheless, the following aspects should be realized in future studies.

The affective component of self-concept should also be considered when testing the empirical differentiation between the ASC and SE of university students. Including affective self-concept items would allow future research to test if the empirical overlap between ASC and SE change, for instance, becoming significantly larger, as postulated by Pietsch and colleagues (2003).

The comparison of ASC and SE should also include further competence-related self-perceptions within the nomological network such as self-esteem or outcome expectations to investigate their empirical overlap with these constructs, too. Moreover, pertaining to the distinction of ASC and SE, most research work has only investigated conceptual and operational differences between several competence-related self-perceptions, but only rarely their empirical differences (e.g., Bandura, 1977; Marsh et al., 2017). Investigations of empirical differences can hinder *jingle-jangle* fallacies (Marsh, Craven, Hinkley, & Debus, 2003), so that two scales with similar names assess different constructs, or that two scales with dissimilar names measure similar psychological constructs (Marsh et al., 2017). As a starting point, researchers could refer to Bandura's (1977) distinction between outcome expectations (estimation that a certain behavior will lead to certain outcome) and efficacy expectations (conviction to effectively perform the behavior necessary to produce the outcome; Eccles & Wigfield, 2002). SE and outcome experiences are related, but they are not synonymous, because an efficacious student who perceives him- or herself to be capable of learning new concepts

(e.g., in English) might also believe that he or she will not receive a good mark on his oral English exam because the teacher does not like him (Schunk & Pajares, 2001).

With the knowledge of empirical separation of ASC, SE, and further self-beliefs, researchers can develop theoretical hypotheses regarding how to foster these different competence-related self-perceptions (Rodgers et al., 2014) in order to ensure students' academic and career success (e.g., Fouad, Smith, & Zao, 2002; O'Mara et al., 2006).

A sampling of construct-specific interventions for ASC and SE are presented in the following Chapter 6.4.2.

## 6.4.2 Practical implications

Despite the individual level of performance, personal interests, and preferences, likewise, competence-related self-perceptions influence whether or not young adults set themselves ambitious work or career goals for the future (Filipp, 2006). Misjudgments of one's own competences—over- and underestimation equally—might decrease university students' academic motivation and thereby increase the probability of an early dropout from higher education (Sarcletti & Müller, 2011).

In particular, on the one hand, if psychology students overestimate their abilities in a psychological domain and are overconfident to successfully master specific psychological tasks, they run the risk to set themselves too high performance goals (e.g., always getting the best grades) and, therefore, possibly do not achieve these goals. As a result, psychology students experience failure and frustration, and this results in the belief of not being able to achieve desired academic and professional goals (Ackerman & Wolman, 2007).

On the other hand, underestimation of one's own abilities and a lack of confidence to be able to fulfill the required demands at the desired level might lead to self-set goals that do not correspond to their individual performance level (Freund & Kasten, 2012). Thus, academic

goals represent an inappropriate level of challenge and might produce feelings of boredom (Preckel, Götz, & Frenzel, 2010).

Hence, it is necessary that psychology students have the opportunity to develop realistic competence-related self-perceptions. Equipped with these, psychology students will then be able to discriminatingly communicate their individual psychological competences on the labor market, which provides them with the opportunity to find a suitable workplace that matches their competences. Ultimately, they are more likely to cope successfully with demanding tasks in the professional practice (e.g, Marsh & O'Mara, 2008; Abele-Brehm & Stief, 2004).

To summarize, psychology students should be supported in their competence-related self-perceptions to become aware of the competences they already have and which they should develop in the future (Pajares, 1996). Universities should therefore go beyond teaching intellectual skills, and also foster competence-related self-perceptions of ASC and SE in their students (Marsh & Hau, 2003; van Dinther et al., 2011).

There are a several studies in diverse educational settings that have sought to foster students' ASC and SE using a wide range of intervention strategies (O'Mara et al., 2006; van Dinther et al., 2011). These interventions include methods that affect ASC and SE indirectly by targeting related constructs (e.g., fostering ASC and SE through skill-building interventions). Others try to enhance ASC and SE by directly affecting the major sources of ASC (frames of reference, causal attributions, reflected appraisals from others, mastery experiences) and SE (mastery experiences, vicarious experiences, verbal persuasion, physical reactions).

In the following, examples of indirect and especially of direct interventions are presented that might be useful to differentially tap the several sources of both competence-related self-perceptions of psychology students. Direct intervention strategies are considered most effective in ASC and SE enhancement (e.g., O'Mara et al., 2006).

6.4.2.1 Academic self-concept interventions

Interventions fostering ASC have been primarily constructed for students in K-12 educational settings and are typically adapted to specific academic domains (Craven, Marsh, & Burnett, 2003). According to a multidimensional perspective of self-concept, interventions are more effective when constructed with regard to specific domains (O'Mara et al., 2006).

Researchers who aim to indirectly enhance ASC enhance ASC focus on enhancing students' skills. It is expected that enhanced abilities and skills result in better performance and lead to a more positive ASC in a specific subject. In undergraduate psychology courses, one strategy to indirectly enhance the ASCs of psychology students could be the inclusion of practical exercises during psychology lectures that provide skills needed in applied psychological practice (e.g., the skill to understand and apply scientific concepts; Gelso, 1993). Additionally, the active and continuous inclusion of questions, examples, and findings from psychological practice as well as specific events on practical methods and requirements should be integrated within the curriculum (Multrus, Ramm, & Bagel, 2012). However, since self-concept and achievement are supposed to be reciprocally related, interventions should not only strive to promote skill development, but should also seek to simultaneously enhance ASC (Marsh et al., 2017).

With regard to direct intervention strategies fostering self-concepts, research work refers to the formation process of ASC that relies primary on social and dimensional comparison processes (Bong & Skaalvik, 2003). In the sample of psychology students, performance feedback (e.g., using grades) may induce comparison processes so that psychology students evaluate their achievement in one psychological subject in relation to the achievements of their fellow students (social comparison) or to their own achievement in another psychological subject (dimensional comparison). In this regard, remember that dimensional achievement comparisons can lead to negative contrast effects from achievement in one psychological

subject to domain-specific ASC of another psychological subject (see Study 2, Chapter 4). Therefore, it seems reasonable to use further direct intervention strategies that not only make use of performance feedback and the related frames of references, but also focus on causal attributions, reflected appraisals from others, and mastery experiences that are considered further important sources in the formation process of students' ASC (Bong & Skaalvick, 2003).

Dresel and Ziegler (2006) used the method of attributional feedback (source of causal attribution) to enhance mathematic ASC of seventh-graders by causal attributions (see also Chodkiewicz & Boyle, 2014). A positive ASC is said to be accompanied by positive attributions (e.g., attributions to abilities in success situations; Skaalvik, 1994). Interventions that use such an attributional feedback are most effective ($d = 1.52$) compared with other feedback strategies (e.g., goal feedback; O'Mara et al., 2006). In their study, Dresel and Ziegler (2006) found evidence for ASC enhancement through causal attributions if students were instructed to attribute their achievements to individual effort and abilities. When using attributional feedback in undergraduate psychology courses to enhance psychology students' ASC, it should be noted that interventions that entirely instruct students to attribute success either to abilities or to effort might decrease the other causal factor of success or failure (Dresel & Ziegler, 2006). Likewise, the sequence of both attribution strategies contribute substantially to the success of the intervention. Therefore, after having passed an exam, psychology students should first receive feedback on their effort, which was responsible for their poor/good performance. At a later time, psychology students who did well on the exam should be instructed to attribute their good performance to their abilities.

Next to performance feedback and causal attributions, the reflection of personal mastery experiences seems useful to enhance psychology students' ASC. Reflection is an active process of exploration and discovery of prior experiences and acquired knowledge (Boud, Keogh, & Walker, 2013). Psychology students who reflect on their abilities and competences as well as

on their individual learning and development processes (mastery experiences) should perform higher in undergraduate psychology courses than those who do not reflect on their competences (DiStefano, Gino, Pisano, & Staat, 2016; Johnson & Stapel, 2011). Methods that can be used in undergraduate psychology courses to induce a steady reflection and judgment of one's own acquired abilities in several psychological domains are the methods of keeping a learning diary or answering reflective questions referring to psychological competences via an online tool.

Despite feedback, causal attributions and mastery experiences, a further source of ASC are reflected appraisals from significant others. Bouchey and Harter (2005) asked students to judge how their parents, teachers, and peers would rate the importance of different subjects and the students' individual abilities to perform well in these subjects. Furthermore, students provided information on the degree of social support received by their different reference persons. Results indicated that students who think that their related persons would judge the students' competences to be high—with the exception of the group of peers—strengthen self-reported ASCs and subsequent achievements. According to the source of reflected appraisals from significant others, in undergraduate psychology courses, instructors should stress the importance of contents and methods of a specific psychological subject (e.g., of statistics). They should also offer social support when psychology students are faced with obstacles (offering appointments) and should give personal competence-related feedback with regard to their coursework (e.g., an oral presentation or a written research paper). In this regard, note that feedback should not only refer to grades, but also to several additional skills (e.g., self-management and time management skills, the ability to cope with uncertainty; Andrews & Higson, 2008). These *employability skills* play a central role for graduates to assert themselves in the labor market (Tymon, 2013). Individual feedback of this nature, however, is very time consuming and can only be realized within small seminar groups.

Among direct interventions that make use of theoretical foundation of ASC formation, interventions can be based on the EVT model of achievement performance and choice (Eccles, 1983). According to this model, two central aspects explain students' achievement-related choices: their persistence and their performance on tasks (Wigfield & Eccles, 2000). Expectancy-related beliefs comprise beliefs about one's own abilities and expectancies of how well one will do on an upcoming task (Xiang, McBride, Guan, & Solmon, 2003), for example, on a final exam in psychology. The subjective value of a task can be described by four different values (attainment value, intrinsic value, utility value, and costs; Wigfield, 1994). To make use of subjective values in enhancing psychology students' self-concepts, one could refer on *Utility Value Interventions* (Hulleman & Harackiewicz, 2009). According to these interventions, psychology students should be asked to explain how the psychological material they are learning is relevant to their lives (or not). The personal importance and value which students attribute to specific contents of the curriculum subsequently leads to more interest, higher performance, and positive ASC in these psychological subjects (Hulleman, Godes, Hendricks, & Harackiewicz, 2010). Likewise, Cole, Bergin, and Whittacker (2008) reported that the strength of one's own interest and the positive feeling of usefulness attributed to specific tasks in a standardized general education exam resulted in higher task-related effort and better achievements. Thus, instructors should include exercises in their seminars, which allow psychology students to reflect on the usefulness of several psychological contents.

In addition to ASC, SE also is a part of psychology students' competence-related self-perceptions. Therefore, in the following, possible direct and indirect interventions to enhance the SE of psychology students are also presented.

6.4.2.2 Self-efficacy interventions

As for ASC, researchers have examined how SE of (university) students can be fostered using direct and indirect intervention strategies. As already mentioned in relation to ASC enhancement, indirect interventions try to enhance SE by skill-building with regard to the core competences of e.g., *scientifically minded psychologists* (Bieschke, Fouad, Collins, & Halonen, 2004). Improved skills help students to make positive learning experiences when coping with a specific task that again heightens their SE for similar future task-related requirements. In undergraduate psychology courses, one could integrate practical exercises in the seminars. For example, instructors could foster psychology students' SE by training their ability to critically evaluate interventions and their outcomes (Bieschke, 2006).

SE enhancement can also be accomplished by using direct intervention strategies that tap the major sources of SE (Bong & Skaalvick, 2003). In their literature review, van Dinther et al. (2011) summarized several interventions conducted in samples of university students that support the four major sources of SE separately or in combination. For example, Urbani et al. (2002) investigated SE of counseling students using a subject-specific training intervention that focused on all four sources of SE equally. After the intervention, participants demonstrated greater gains in counseling SE than students who did not participate in the training.

With the focus on single sources of SE, Adams (2004), for example, used a small case study to compare the influence of observing a seminar presentation of a peer to that of a senior academic on SE of counseling students (source of vicarious experiences). Results revealed that observing a peer model had more potential to heighten the SE of participants, due to a greater similarity between participant and model. In undergraduate psychology courses, fellow students and instructors could act as role models and, therefore, contribute to SE enhancement. Note, that especially instructors should emphasize similarities between themselves and the students,

for example, by reporting their own experiences gained in accompanying practical courses when they were students.

Anderson (2000) conducted an experimentally designed study to foster university students' SE. In detail, the author compared the effects of symbolic modeling (observing a young woman while performing a breast self-examination; source of vicarious experiences) to persuasive efficacy (information from a doctor; source of verbal persuasion) on SE and the intention of female university students to perform breast self-examination. The author found a stronger effect for symbolic modeling on subsequent intention and SE of students for health-seeking behavior, perhaps due to resemblances of the model (e.g., gender, age). Again, vicarious experiences in undergraduate psychology courses can be useful to heighten psychology students' SE. Applying this strategy to heighten SE in psychology students, for instance, they could observe a fellow student while performing a psychological exercise (e.g., a questionnaire evaluation).

Even though Anderson (2000) did not find strong effects of verbal persuasion on SE (e.g., "*You can do this*", Schunk, 1991, p. 160), this type of persuasive communication combined with evaluative feedback from significant others (Bong & Skaalvick, 2003) can also be useful to strengthens SE of university students. In psychology students, this could be accomplished by feedback being given by fellow students who have taken the same courses and seminars over time. These fellow students can therefore be viewed as knowledgeable and credible (Bong & Skaalvik, 2003). Likewise, fellow students could talk about experiences that they have gained in internships during their undergraduate psychology courses. The explored competences and skills can then be written down, and periodically extended by further competences acquired in the further course of study. It might therefore be useful to form small groups of psychology students immediately at the beginning of their studies. This procedure would ensure that students within the same small group constantly accompany the skill development process of

their group members thus enabling them to be able to give realistic and competent feedback on gained abilities.

Usually, the most powerful source of SE are mastery experiences, because past performances are the most valid basis upon which students can judge their own abilities that lead to stable and generalized SE (Palmer, 2006; Schunk, 1991). In this regard, note that the method of reflection (Boud et al., 2013) does not only ASC, but also raises awareness of one's own competences and positive mastery experiences to feel more self-efficacious when faced with future challenging tasks and situations.

To foster SE by manipulating mastery experiences, Dempsey et al. (2009) investigated teacher education students interacting with fourth-graders' writing samples via an online tool. They read student papers and justified their assessments using analytic criteria. After each paper, they received performance feedback. Participants significantly improved in their individual ability to accurately assess students' papers and showed significant greater SE for assessing students' writing. Thus, in undergraduate psychology courses, students should receive performance feedback based not only on end-of semester overall achievement, but also on their performances in several tasks in seminars and in project groups focusing on, for example, their scientifically based critical thinking ability (Stricker & Trierweiler, 1995).

With regard to mastery experiences, Larson et al. (2009) compared the effects of vicarious experiences to the effects of mastery experiences on SE. University students in counseling classes observed a video of counseling sessions or they were instructed to perform a role play with mock patients. Results indicated that role plays had more potential to strengthen counseling SE. Conferring this finding to undergraduate psychology courses, students should be given the opportunity to try out psychological techniques for themselves (e.g., the application of a clinical intervention to support people with mental disorder).

At last, the source of physical reactions can be tapped in SE interventions. As a result of the Bologna reform, almost half of all students report strong feelings of strain (Thees, Gobel, Jose, Bohrhardt, & Esch, 2012). In particular, university students often feel a high pressure to perform, they experience time pressure, and also feel stress due to less specific examination requirements (Multrus et al., 2012). Stress (as a physical reaction) in turn is negatively correlated with SE (Jerusalem & Schwarzer, 1992) and has negative consequences on students' health and performance level (Thees et al., 2012). Interventions, therefore, should support university students to modify their negative expectations and to revalue the requirements of their course of studies into challenges (Büttner & Dlugosch, 2013). For example, breathing exercises that lead to low physiological arousal can support SE (Bandura, 1977) and might help psychology students to remain calm in challenging situations and when confronted with demanding tasks in order to successfully master the study-related requirements (Schulz, Vögele, & Meyer, 2009).

In sum, there are numerous interventions that are useful to enhance psychology students' ASC and SE. To identify students that need to be supported by specific interventions, students should reflect their SE concerning specific psychological tasks using the questionnaire developed in Study 1 (see Table 1, Chapter 3.3.3), and further periodically rate their ASC, for example, by using the adapted form of the SDQ III (see Table 3, Chapter 4.5.2). This would offer researchers the opportunity to examine whether psychology students gain more differentiated SE and ability-related ASC during their course of study, if not; these students are good candidates for the specific interventions mentioned in this chapter.

## 6.5 General conclusion

In the present dissertation, a conceptual perspective of psychology students' ASC and SE was taken. Construct validation of both constructs was realized by investigating the internal structures of ASC and SE according to the within-network approach (Byrne, 1984). On the basis of their structures, ASC and SE were measured and further validated by investigating their relations with external criteria such as achievement in undergraduate psychology courses. Lastly, based on the structure and the measurement, using only cognitive self-concept items and a comparable measurement level (i.e., domain-specific and general), both competence-related self-perceptions were compared on an empirical level with regard to their relations to one another and to achievement that corresponded in specificity.

In sum, there is evidence that psychology students form different competence-related self-perceptions of ASC and SE when judging their psychological abilities and competences in different psychological domains and tasks. These self-perceptions are positively related to desirable outcomes such as achievement in undergraduate psychology courses. Moreover, both competence-related self-perceptions form multidimensional and hierarchical structured constructs that can be validly assessed in undergraduate psychology courses when creating context- and task-specificity in SE measurement.

The knowledge of the structure, measurement, correlates, and empirical differences of ASC and SE in the sample of psychology students can be used to contribute to research on both of these competence-related self-perceptions in higher education. Competence-related self-perceptions are widely accepted as a universal aspect of being human and as central to understanding the quality of human existence (Marsh et al., 2017). Positive and realistic ASC and SE can support psychology students' academic success and their successful start into professional life. Furthermore, "a person's sense of competence in a specific domain not only leads to a range of positive outcomes in that domain, but may influence their competence

perceptions in other domains and modify how that person acts, feels, and adjusts to a changing environment" (Marsh et al., 2017, pp. 3-4). Thus, investigating and fostering the ASC and SE of psychology students is a useful goal in higher education.

# References

Abdi, H. (2007). Bonferroni and Šidák corrections for multiple comparisons. *Encyclopedia of measurement and statistics*, *3*, 103-107.

Abele-Brehm, A. E., & Stief, M. (2004). Die Prognose des Berufserfolgs von Hochschul-absolventinnen und -absolventen: Befunde zur ersten und zweiten Erhebung der Erlanger Längsschnittstudie BELA-E. *Zeitschrift für Arbeits- und Organisationspsychologie*, *48*(1), 4-16. doi:10.1026/0932-4089.48.1.4

Ackerman, P. L., & Wolman, S. D. (2007). Determinants and validity of self-estimates of abilities and self-concept measures. *Journal of Experimental Psychology: Applied*, *13*(2), 57-78. doi:10.1037/1076-898X.13.2.57

Adams, K. (2004). Modelling success: enhancing international postgraduate research students' self-efficacy for research seminar presentations. *Higher Education research & development*, *23*(2), 115-130. doi:10.1080/0729436042000206618

Aguinis, H., & Bradley, K. J. (2014). Best practice recommendations for designing and implementing experimental vignette methodology studies. *Organizational Research Methods*, *17*(4), 351-371. doi: 10.1177/1094428114547952

Amthauer, R., Brocke, B., Liepmann, D., & Beauducel, A. (2001). *Intelligenz-Struktur-Test 2000 R. Göttingen: Hogrefe*.

Anderson, R. B. (2000). Vicarious and persuasive influences on efficacy expectations and intentions to perform breast self-examination. *Public Relations Review, 26*(1), 97–114. doi:10.1016/S0363-8111(00)00033-3

Andrews, J., & Higson, H. (2008). Graduate employability,'soft skills' versus 'hard'business knowledge: A European study. *Higher education in Europe*, *33*(4), 411-422. doi:10.1080/03797720802522627

Alessandri, G., Borgogni, L., & Truxillo, D. M. (2015). Tracking job performance trajectories over time: A six-year longitudinal study. *European Journal of Work and Organizational Psychology*, *24*(4), 560-577. doi:10.1080/1359432X.2014.949679

Arens, A. K., Bodkin-Andrews, G., Craven, R. G., & Yeung, A. S. (2014). Self-concept of Indigenous and non-Indigenous Australian students: Competence and affect components and relations to achievement. *Learning and Individual Differences*, *32*, 93-103. doi:10.1080/00220973.2013.813362

Arens, A. K., & Hasselhorn, M. (2013). Age and gender differences in the relation between self-concept facets and self-esteem. *The Journal of Early Adolescence*, *34*(6), 760-791. doi:10.1177/0272431613503216

Arens, A. K., & Möller, J. (2016). Dimensional comparisons in students' perceptions of the learning environment. Learning and Instruction, 42, 22-30. doi:10.1016/j.learninstruc.2015.11.001

Arens, A. K., Yeung, A. S., Craven, R. G., & Hasselhorn, M. (2011). The twofold multidimensionality of academic self-concept: Domain specificity and separation between competence and affect components. *Journal of Educational Psychology*, *103*(4), 970-981. doi:10.1037/a0025047

Aunola, K., Tolvanen, A., Viljaranta, J., & Nurmi, J. E. (2013). Psychological control in daily parent–child interactions increases children's negative emotions. *Journal of Family Psychology*, *27*(3), 453-462. doi:10.1037/a0032891

Awad, G. H. (2007). The role of racial identity, academic self-concept, and self-esteem in the prediction of academic outcomes for African American students. *Journal of Black Psychology*, *33*(2), 188-207.

Baloğlu, M. (2003). Individual differences in statistics anxiety among college students. *Personality and Individual Differences, 34*(5), 855-865. doi:10.1016/S01918869(02) 00076-4

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191-215. doi:10.1037/0033-295X.84.2.191

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37*(2), 122-147. doi:10.1037/0003-066X.37.2.122

Bandura, A. (1986). The explanatory and predictive scope of self-efficacy theory. *Journal of social and clinical psychology*, *4*(3), 359-373. doi:10.1521/jscp.1986.4.3.359

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational psychologist*, *28*(2), 117-148. doi:10.1207/s15326985ep2802_3

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Bandura, A. (2000). Self-efficacy: The foundation of agency. In A. Flammer (Ed.), *Control of human behavior, mental processes, and consciousness: Essays in honor of the 60th birthday of August, 16-*32.

Bandura, A. (2006). Guide for constructing self-efficacy scales. *Self-efficacy beliefs of adolescents*, *5*, 307-337.

Bandura, A., Barbaranelli, C., Caprara, G. V. & Pastorelli, C. (1996). Multifaceted impact of self-efficacy beliefs on academic functioning. *Child development*, *67*(3), 1206-1222.

Bandura, A., & Schunk, D. H. (1981). Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation. *Journal of Personality and Social Psychology*, *41*(3), 586-598. doi:10.1037/0022-3514.41.3.586

Barrick, M. R., Mount, M. K., & Judge, T. A. (2001). Personality and performance at the beginning of the new millennium: What do we know and where do we go next? *International Journal of Selection and assessment*, *9*(1-2), 9-30. doi:10.1111/1468-2389.00160

Bell, B. S., & Kozlowski, W. J. (2002). Goal orientation and ability: Interactive effects on self-efficacy, performance, and knowledge. *Journal of Applied Psychology*, *87*(3), 497-505. doi:10.1037/0021-9010.87.3.497

Beierlein, C., Kemper, C., Kovaleva, A., & Rammstedt, B. (2013). Kurzskala zur Erfassung allgemeiner Selbstwirksamkeitserwartungen (ASKU). *Methoden, Daten, Analysen (mda)*, *7*(2), 251-278. doi:10.12758/mda.2013.014

Betz, N.E. & Hackett, G. (2006). Career self-efficacy theory: Back to the future. *Journal of Career Assessment*, *14*(1), 3-11. doi:10.1177/1069072705281347

Bieschke, K. J. (2006). Research self-efficacy beliefs and research outcome expectations: Implications for developing scientifically minded psychologists. *Journal of Career Assessment*, *14*(1), 77-91. doi:10.1177/1069072705281366

Bieschke, K. J., Fouad, N. A., Collins, F. L., & Halonen, J. S. (2004). The scientifically-minded psychologist: Science as a core competency. *Journal of Clinical Psychology*, *60*(7), 713-723. doi:10.1002/jclp.20012

Blanton, H., Buunk, B. P., Gibbons, F. X., & Kuyper, H. (1999). When better-than-others compare upward: Choice of comparison and comparative evaluation as independent predictors of academic performance. *Journal of personality and social psychology*, *76*(3), 420-430. doi:10.1037/0022-3514.76.3.420

Bong, M. (1997). Generality of academic self-efficacy judgments: Evidence of hierarchical relations. *Journal of Educational Psychology*, *89*(4), 696-709.

Bong, M. (1998). Tests of the internal/external frames of reference model with subject-specific academic self-efficacy and frame-specific academic self-concepts. *Journal of Educational Psychology*, *90*(1), 102-110.

Bong, M. (2001a). Between-and within-domain relations of academic motivation among middle and high school students: Self-efficacy, task value, and achievement goals. *Journal of educational psychology*, *93*(1), 23-34. doi:10.1037/0022-0663.93.1.23

Bong, M. (2001b). Role of self-efficacy and task-value in predicting college students' course performance and future enrollment intentions. *Contemporary educational psychology*, *26*(4), 553-570. doi:10.1006/ceps.2000.1048

Bong, M., & Clark, R. E. (1999). Comparison between self-concept and self-efficacy in academic motivation research. *Educational psychologist*, *34*(3), 139-153.

Bong, M., & Hocevar, D. (2002). Measuring self-efficacy: Multitrait-multimethod comparison of scaling procedures. *Applied Measurement in Education*, *15*(2), 143-171.

Bong, M., & Skaalvik, E. M. (2003). Academic self-concept and self-efficacy: How different are they really? *Educational Psychology Review*, *15*(1), 1-40.

Bouchey, H. A., & Harter, S. (2005). Reflected appraisals, academic self-perceptions, and math/science performance during early adolescence. *Journal of Educational Psychology*, *97*(4), 673-686. doi:10.1037/0022-0663.97.4.673

Boud, D., Keogh, R., & Walker, D. (Eds.). (2013). *Reflection: Turning experience into learning*. Routledge.

Braun, E., Woodley, A., Richardson, J. T., & Leidner, B. (2012). Self-rated competences questionnaires from a design perspective. *Educational Research Review*, *7*(1), 1-18. doi:10.1016/j.edurev.2011.11.005

Breaugh, J. (2010). Realistic job previews. In K. H. Silber, W. R. Foshay, R. Watkins, D. Leigh, J. L. Moseley, J. C. Dessinger (Eds.), *Handbook of Improving Performance in the Workplace: Volumes 1-3*, 203-220.

Britner, S. L., & Pajares, F. (2006). Sources of science self-efficacy beliefs of middle school students. *Journal of research in science teaching*, *43*(5), 485-499. doi:10.1002/tea.20131

Bruning, R., Dempsey, M., Kauffman, D. F., McKim, C., & Zumbrunn, S. (2013). Examining dimensions of self-efficacy for writing. *Journal of Educational Psychology*, *105*(1), 25-38. doi:10.1037/a0029692

Brunner, M. (2008). No g in education? *Learning and Individual Differences*, *18*(2), 152-165. doi:10.1016/j.lindif.2007.08.005

Brunner, M., Keller, U., Dierendonck, C., Reichert, M., Ugen, S., Fischbach, A., & Martin, R. (2010). The structure of academic self-concepts revisited: The nested Marsh/Shavelson model. *Journal of Educational Psychology*, *102*(4), 964-981. doi:10.1037/a0019644

Brunner, M., Keller, U., Hornung, C., Reichert, M. & Martin, R. (2009). The cross-cultural generalizability of a new structural model of academic self-concepts. *Learning and Individual Differences*, *19*(4), 387-403. doi:10.1016/j.lindif.2008.11.008

Bühner, M. (2011). *Einführung in die Test-und Fragebogenkonstruktion*. Pearson Deutschland GmbH.

Bundesagentur für Arbeit (2013, November). *Berufenet*. Retrieved from http://berufenet.arbeitsagentur.de/berufe/index.jsp.

Büttner, T. R., & Dlugosch, G. E. (2013). Stress im Studium. *Prävention und Gesundheitsförderung*, *8*(2), 106-111. doi:10.1007/s11553-012-0369-7

Byrne, B. M. (1984). The general/academic self-concept nomological network: A review of construct validation research. *Review of educational research*, *54*(3), 427-456.

Byrne, B. M. (1996). *Measuring Self-Concept Across the Life Span: Issues and Instrumentation*. Washington DC: American Psychological Association.

Byrne, B. M. (2012). *Structural equation modeling with Mplus: Basic concepts, applications, and programming*. New York: Taylor & Francis Group.

Byrne, B. M., & Gavin, D. A. (1996). The Shavelson Model revisited: Testing for the structure of academic self-concept across pre-, early, and late adolescents. *Journal of Educational Psychology*, *88*(2), 215-228.

Calsyn, R. J., & Kenny, D. A. (1977). Self-concept of ability and perceived evaluation of others: Cause or effect of academic achievement? *Journal of Educational Psychology*, *69*(2), 136-145. doi:10.1037/0022-0663.69.2.136

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological bulletin*, *56*(2), 81-105. doi:10.1037/h0046016

Campbell, N. K., & Hackett, G. (1986). The effects of mathematics task performance on math self-efficacy and task interest. *Journal of Vocational Behavior*, *28*(2), 149-162.

Campell, J. D., Trapnell, P. D., Heine, S. J., Katz, I. M., Lavallee, L. F., & Lehman, D. R. (1996). Self-concept clarity: Measurement, personality correlates, and cultural boundaries. *Journal of personality and social psychology*, *70*(1), 141-156. doi:10.1037/0022-3514.70.1.141

Carroll, J. B. (1993). *Human cognitive abilities: A survey of factor-analytic studies.* New York: Cambridge University Press.

Chemers, M. M., Hu, L.T., & Garcia, B. F. (2001). Academic self-efficacy and first year college student performance and adjustment. *Journal of Educational Psychology*, *93*(1), 55-66.

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural equation modeling*, *14*(3), 464-504. doi:10.1080/10705510701301834

Chen, G., Casper, W. J., & Cortina, J. M. (2001). The roles of self-efficacy and task complexity in the relationships among cognitive ability, conscientiousness, and work-related performance: A meta-analytic examination. *Human Performance*, *14*(3), 209-230. doi:10.1207/S15327043HUP1403_1

Chen, G., Gully, S. M., & Eden, D. (2001). Validation of a new general self-efficacy scale. *Organizational Research Methods*, *4*(1), 62-83.

Chen, F. F., Hayes, A., Carver, C. S., Laurenceau, J. P., & Zhang, Z. (2012). Modeling general and specific variance in multifaceted constructs: A comparison of the bifactor model to other approaches. *Journal of personality*, *80*(1), 219-251. doi:j.1467-6494.2011.00739.x

Chen, F. F., Jing, Y., Hayes, A., & Lee, J. M. (2013). Two concepts or two approaches? A bifactor analysis of psychological and subjective well-being. *Journal of Happiness Studies,* 14(3), 1033-1068. doi:10.1007/s10902-012-9367-x

Chen, F. F., West, S. G., & Sousa, K. H. (2006). A comparison of bifactor and second-order models of quality of life. *Multivariate Behavioral Research*, *41*(2), 189-225. doi:10.1207/s15327906mbr4102_5

Chen, S. K., Yeh, Y. C., Hwang, F. M., & Lin, S. S. (2013). The relationship between academic self-concept and achievement: A multicohort–multioccasion study. *Learning and Individual Differences*, *23*, 172-178. doi:10.1016/j.lindif.2012.07.021

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural equation modeling*, *9*(2), 233-255.

Chin, D., & Kameoka, V. A. (2002). Psychosocial and contextual predictors of educational and occupational self-efficacy among Hispanic inner-city adolescents. *Hispanic Journal of Behavioral Sciences*, *24*(4), 448-464.

Chodkiewicz, A. R., & Boyle, C. (2014). Exploring the contribution of attribution retraining to student perceptions and the learning process. *Educational Psychology in Practice*, *30*(1), 78-87. doi:10.1080/02667363.2014.880048

Choi, N. (2005). Self-efficacy and self-concept as predictors of college students' academic performance. *Psychology in the Schools*, *42*(2), 197-205. doi:10.1002/pits.20048

Cialdini, R. B., Borden, R. J., Thorne, A., Walker, M. R., Freeman, S., & Sloan, L. R. (1976). Basking in reflected glory: Three (football) field studies. *Journal of Personality and Social Psychology*, *34*, 366−375.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*, 155-159.

Cohen, J.,& Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences.* Hillsdale, NJ: Lawrence Erlbaum.

Cokley, K. (2000). An investigation of academic self-concept and its relationship to academic achievement in African American college students. *Journal of Black Psychology*, *26*(2), 148-164.

Cole, J. S., Bergin, D. A., & Whittaker, T. A. (2008). Predicting student achievement for low stakes tests with effort and task value. *Contemporary Educational Psychology*, *33*(4), 609-624. doi:10.1016/j.cedpsych.2007.10.002

Cole, D. A., Maxwell, S. E., Martin, J. M., Peeke, L. G., Seroczynski, A. D., Tram, J. M., ... & Maschman, T. (2001). The development of multiple domains of child and adolescent self-concept: A cohort sequential longitudinal design. *Child development*, *72*(6), 1723-1746. doi:10.1111/1467-8624.00375

Craven, R. G. & Marsh, H. W. (2008). The centrality of self-concept construct for psychological wellbeing and unlocking human potential: Implications for child and educational psychologists. *Educational and Child Psychology, 25*, 104-118.

Craven, R. G., Marsh, H. W., & Burnett, P. (2003). Cracking the self-concept enhancement conundrum. *International advances in self research*, *1*, 91-126.

Cronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological bulletin*, *52*(4), 281-302.

De Beuckelaer, A., & Swinnen, G. (2011). Biased latent variable mean comparisons due to measurement noninvariance: A simulation study. In E. Davidov, P. Schmidt, & J. Billiet (Eds.), *Methods and applications in cross-cultural analysis* (pp. 117-148). New York: Taylor and Francis Group.

Deci, E. L., & Ryan, R. M. (1985). The general causality orientations scale: Self-determination

in personality. *Journal of Research in Personality*, *19*(2), 109−134. doi:10.1016/0092-6566(85)90023-6

Dempsey, M. S., PytlikZillig, L. M., & Bruning, R. H. (2009). Helping preservice teachers learn to assess writing: Practice and feedback in a Web-based environment. *Assessing Writing*, *14*(1), 38-61. doi:10.1016/j.asw.2008.12.003

Denissen, J. J., Zarrett, N. R., & Eccles, J. S. (2007). I like to do it, I'm able, and I know I am: Longitudinal couplings between domain-specific achievement, self-concept, and interest. *Child development*, *78*(2), 430-447. doi:10.1111/j.1467-8624.2007.01007.x

Dickhäuser, O. (2006). Fähigkeitsselbstkonzepte: Entstehung, Auswirkung, Förderung. *Zeitschrift für Pädagogische Psychologie*, *20*(1/2), 5-8. doi:10.1024/1010-0652.20.12.5

Dickhäuser, O., & Galfe, E. (2004). Besser als..., schlechter als... *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie*, *36*(1), 1-9. doi:10.1026/0049-8637.36.1.1

Dickhäuser, O., Reuter, M., & Hilling, C. (2005). Coursework selection: A frame of reference approach using structural equation modelling. *British Journal of Educational Psychology*, *75*(4), 673-688. doi:10.1348/000709905x37181

Dietrich, J., Dicke, A. L., Kracke, B., & Noack, P. (2015). Teacher support and its influence on students' intrinsic value and effort: Dimensional comparison effects across subjects. *Learning and Instruction*, *39*, 45-54. doi:10.1016/j.learninstruc.2015.05.007

Dijkstra, P., Kuyper, H., van der Werf, G., Buunk, A. P., & van der Zee, Y. G. (2008). Social comparison in the classroom: A review. *Review of educational research*, *78*(4), 828-879. doi:10.3102/0034654308321210

Dimitrov, D. M. (2010). Testing for factorial invariance in the context of construct validation. *Measurement and Evaluation in Counseling and Development*, *43*(2), 121-149 doi:10.1177/0748175610373459

Di Stefano, G., Gino, F., Pisano, G. P., & Staats, B. R. (2016, June). *Making experience count: The role of reflection in individual learning*. (Harvard Business School Working Paper No. 14-093) Boston, MA: Harvard Business School.

Dresel, M., & Ziegler, A. (2006). Langfristige Förderung von Fähigkeitsselbstkonzept und impliziter Fähigkeitstheorie durch computerbasiertes attributionales Feedback. *Zeitschrift für Pädagogische Psychologie*, *20*(1/2), 49-63. doi:10.1024/1010-652.20.12.49

Drew, P. Y., & Watkins, D. (1998). Affective variables, learning approaches and academic achievement: A causal modelling investigation with Hong Kong tertiary students. *British*

*Journal of Educational Psychology, 68*(2), 173-188. doi:10.1111/j.20448279.1998. tb01282.x

Dunn, T. J., Baguley, T., & Brunsden, V. (2014). From alpha to omega: A practical solution to the pervasive problem of internal consistency estimation. *British Journal of Psychology, 105*(3), 399-412. doi:10.1111/bjop.12046

Eccles, J. (1983). Expectancies, values and academic behaviors. In J.T. Spence (Ed.), *Achievement and achievement motives* (pp. 75-146). San Francisco: Freeman.

Eccles, J. S. (2009). Who am I and what am I going to do with my life? Personal and collective identities as motivators of action. *Educational Psychologist*, *44*, 78–89. doi:10.1080/00461520902832368

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual review of psychology*, *53*(1), 109-132. doi:10.1146/annurev.psych.53.100901.135153

Edwards, J. R., & Bagozzi, R. P. (2000). On the nature and direction of relationships between constructs and measures. *Psychological Methods, 5*(2), 155-174.

Ehm, J. H., Nagler, T., Lindberg, S., & Hasselhorn, M. (2014). Dimensionale Vergleichseffekte zwischen Lesen, Rechtschreiben und Rechnen. Eine Erweiterung des I/E Modells für die Grundschule. *Zeitschrift für Pädagogische Psychologie, 28*(2), 51- 56. doi:10.1024/1010-0652/a000117

Eid, M., Lischetzke, T., Nussbeck, F.W., & Trierweiler, L.I. (2003). Separating trait effects from trait-specific method effects in multitrait-multimethod models: A multiple-indicator CT-C (M-1) model. *Psychological Methods*, *8*(1), 38-60.

Ellwart, T. & Preckel, F. (2015). *Das Projekt CoCheck: Kommunikation und Förderung berufsbezogener Kompetenzen* (Projektberichte Abteilung Wirtschaftspsychologie, Heft 02-2015) Trier: Universität, Fachbereich I / Psychologie.

Enders, C. K., & Bandalos, D. L. (2001). The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural equation modeling*, *8*(3), 430-457.

Epstein, S. (1973). The self-concept revisited: Or a theory of a theory. *American Psychologist, 28*(5), 404-416. doi:10.1037/h0034679

Farr, J., Ludden, L, & Shatkin, L. (2002). *O\*Net. Dictionary of Occupational Titles*. Indianapolis, IN: JIST Publishing.

Feldman, K. A. (2007). Identifying Exemplary Teachers and Teaching: Evidence from Student Ratings1. In *The scholarship of teaching and learning in higher education: An evidence-based perspective* (pp. 93-143). Springer Netherlands.

Fellenberg, F., & Hannover, B. (2006). Kaum begonnen, schon zerronnen? Psychologische Ursachenfaktoren für die Neigung von Studienanfängern, das Studium abzubrechen oder das Fach zu wechseln. *Empirische Pädagogik, 20*(4), 381-399.

Ferla, J., Valcke, M., & Cai, Y. (2009). Academic self-efficacy and academic self-concept: Reconsidering structural relationships. *Learning and Individual Differences*, *19*(4), 499-505. doi:10.1016/j.lindif.2009.05.004

Filipp, S. H. (2006). Kommentar zum Schwerpunktthema: Entwicklung von Fähigkeitsselbst-konzepten. *Zeitschrift für Pädagogische Psychologie*, *20*(1/2), 65-72. doi:10.1024/1010-0652.20.12.65

Filipp, S.-H., & Mayer, A.-K. (2005). Selbstkonzept-Entwicklung. In J.B. Asendorpf (Hrsg.), *Soziale, emotionale und Persönlichkeitsentwicklung*. Enzyklopädie der Psychologie, Themenbereich C: Theorie und Forschung, Serie V: Entwicklungspsychologie, Band 3 (S. 259-334). Göttingen: Hogrefe.

Finney, S. J., & Schraw, G. (2003). Self-efficacy beliefs in college statistics courses. *Contemporary Educational Psychology*, *28*(2), 161-186.

Fouad, N. A., Smith, P. L., & Zao, K. E. (2002). Across academic domains: Extensions of the social-cognitive career model. *Journal of Counseling Psychology, 49*(2), 164-171. doi:10.1037/0022-0167.49.2.164

Freund, P. A., & Kasten, N. (2012). How smart do you think you are? A meta-analysis on the validity of self-estimates of cognitive ability. *Psychological Bulletin*, *138,* 296-321. doi:10.1037/a0026556

Friedrich, T. L., Byrne, C. L., & Mumford, M. D. (2009). Methodological and theoretical considerations in survey research. *The Leadership Quarterly 20*, 57-60. doi:10.1016/j.leaqua.2009.01.001

Gardner, D. G., & Pierce, J. L. (1998). Self-esteem and self-efficacy within the organizational context: An empirical examination. *Group & Organization Management*, *23*(1), 48-70.

Gelso, C. J. (1993). On the making of a scientist-practioner: A theory of research training in professional psychology. *Professional Psychology: Research and Practice*, *24*(4), 468-476. doi:10.1037/0735-7028.24.4.468

Gogol, K., Brunner, M., Martin, R., Preckel, F., & Goetz, T. (2017). Affect and motivation within and between school subjects: Development and validation of an integrative structural model of academic self-concept, interest, and anxiety. *Contemporary Educational Psychology, 49,* 46-65. doi:10.1016/j.cedpsych.2016.11.003

Gore, P. A. (2006). Academic self-efficacy as a predictor of college outcomes: Two incremental validity studies. *Journal of career assessment*, *14*(1), 92-115. doi:10.1177/ 1069072705281367

Guay, F., Marsh, H. W., & Boivin, M. (2003). Academic self-concept and academic achievement: Developmental perspectives on their causal ordering. *Journal of Educational Psychology*, *95*(1), 124–136. doi:10.1037/0022-0663.95.1.124

Guay, F., Larose, S., & Boivin, M. (2004). Academic self-concept and educational attainment level: A ten-year longitudinal study. *Self and identity*, *3*(1), 53-68. doi:10.1080/13576500342000040

Guay, F., Ratelle, C. F., Roy, A., & Litalien, D. (2010). Academic self-concept, autonomous academic motivation, and academic achievement: Mediating and additive effects. *Learning and Individual Differences*, *20*(6), 644-653. doi:10.1016/j.lindif.2010.08.001

Guay, F., & Vallerand, R. J. (1997). Social context, students' motivation, and academic Achievement: Toward a process model. *Social Psychology of Education*, *1*, 211−233. doi:10.1007/BF02339891

Gustafsson, J. E., & Balke, G. (1993). General and specific abilities as predictors of school achievement. *Multivariate Behavioral Research*, *28*(4), 407-434.

Hacker, W. (2003). Action regulation theory: A practical tool for the design of modern work processes? *European Journal of work and organizational psychology*, *12*(2), 105-130.

Hackett, G. (1995). Self-efficacy and career choice and development. In A. Bandura (Ed.), *Self-efficacy in changing societies* (pp. 232-258). New York: Cambridge University Press.

Hackett, G., & Betz, N. E. (1995). Self-efficacy and career choice and development. In J. E. Maddux (Ed.), *Self- efficacy, adaptation, and adjustment* (pp. 249-280). Springer US.

Hansford, B. C., & Hattie, J. A. (1982). The relationship between self and achievement/ performance measures. *Review of Educational Research*, *52*(1), 123-142.

Hardy, G. (2014). Academic self-concept: Modeling and measuring for science. *Research in Science Education*, *44*(4), 549-579. doi:10.1007/s11165-013-9393-7

Harter, S. (1982). The perceived competence scale for children. *Child Development, 53,* 87–97.

Harter, S. (1990). Causes, correlates and the functional role of global self-worth: A life span

perspective. In R. J. Sternberg & J. Kolligian, Jr. (Eds.), *Competence considered* (pp.67-97). New Haven, CT: Yale University Press.

Harter, S. (1998). The development of self-representations. In W. Damon (Series Ed.) and S. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional and personality development* (5th ed., pp.553-617). New York: Wiley.

Hartman, R. O. & Betz, N. E. (2007). The Five-Factor model and career self-efficacy general and domain-specific relationships. *Journal of Career Assessment*, *15*(2), 145-161. doi:10.1177/1069072706298011

Hattie, J. (1992). *Self-concept.* Hillsdale, NJ: Erlbaum.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of educational research*, *77*(1), 81-112. doi:10.3102/003465430298487

Helmke, A., & van Aken, M. A. (1995). The causal ordering of academic achievement and self-concept of ability during elementary school: A longitudinal study. *Journal of Educational Psychology*, *87*(4), 624-637. doi:10.1037/0022-0663.87.4.624

Heublein, U., Hutzsch, C., Schreiber, J., Sommer, D., & Besuch, G. (2010). *Ursachen des Studienabbruchs in Bachelor- und in herkömmlichen Studiengängen*. (HIS-Forum Hochschule 2/2010). Hannover, HIS-Forum.

Heublein, U., Richter, J., Schmelzer, R., & Sommer, D. *Die Entwicklung der Schwund-und Studienabbruchquoten an den deutschen Hochschulen*. (HIS-Forum Hochschule 3/2012). Hannover, HIS-Forum.

Heublein, U., & Wolter, A. (2011). Studienabbruch in Deutschland. Definition, Häufigkeit, Ursachen, Maßnahmen. *Zeitschrift für Pädagogik*, *57*(2), 214-236.

Holling, H., Lüken, K. H., Preckel, F., & Stotz, M. (2000). *Berufliche Entscheidungsfindung*, Nürnberg: Institut für Arbeitsmarkt- und Berufsforschung der Bundesanstalt für Arbeit.

Hooper, D., Coughlan, J., & Mullen, M. (2008). Structural Equation Modelling: Guidelines for determining model fit. *Electronic Journal of Business Research Methods, 6*(1), 53-60.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55.

Huang, C. (2011). Self-concept and academic achievement: A meta-analysis of longitudinal relations. *Journal of School Psychology*, *49*(5), 505-528. doi:10.1016/j.jsp.2011.07.001

Hughes, A., Galbraith, D., & White, D. (2011). Perceived competence: a common core for self-efficacy and self-concept? *Journal of Personality Assessment*, *93*(3), 278-289. doi:10.1080/00223891.2011.559390

Huguet, P., Dumas, F., Marsh, H., Régner, I., Wheeler, L., Suls, J., ... & Nezlek, J. (2009). Clarifying the role of social comparison in the big-fish–little-pond effect (BFLPE): An integrative study. *Journal of personality and social psychology*, *97*(1), 156-170. doi:10.1037/a0015558

Huguet, P., Dumas, F., Monteil, J. M., & Genestoux, N. (2001). Social comparison choices in the classroom: Further evidence for students' upward comparison tendency and its beneficial impact on performance. *European journal of social psychology*, *31*(5), 557-578. doi:10.1002/ejsp.81

Hulleman, C. S., Barron, K. E., Kosovich, J. J., & Lazowski, R. A. (2016). Student motivation: Current theories, constructs, and interventions within an expectancy-value framework. In: A.A. Lipnevich, F. Preckel & R. D. Roberts (Eds.), *Psychosocial skills and school systems in the 21st century. Theory, research, and practice* (pp. 241-278). New York: Springer.

Hulleman, C. S., Godes, O., Hendricks, B. L., & Harackiewicz, J. M. (2010). Enhancing interest and performance with a utility value intervention. *Journal of Educational Psychology*, *102*(4), 880-895. doi:10.1037/a0019506

Hulleman, C. S., & Harackiewicz, J. M. (2009). Promoting interest and performance in high school science classes. *Science*, *326*(5958), 1410-1412. doi:10.1126/science.1177067

Hussy, W., Schreier, M., & Echterhoff, G. (2010). *Forschungsmethoden in Psychologie und Sozialwissenschaften für Bachelor*. Berlin / Heidelberg: Springer-Verlag. doi:10.1007/978-3-540-95936-6

Ireson, J., & Hallam, S. (2009). Academic self-concepts in adolescence: relations with achievement and ability grouping in schools. *Learning and Instruction*, *19*, 201-213. doi:10.1016/j.learninstruc.2008.04.001

Jäger, A. O., Süß, H.-M. & Beauducel, A. (1997). *Berliner Intelligenzstruktur-Test, Form 4*. Göttingen: Hogrefe.

James, W. (1892). *Psychology: The briefer course*. New York: Henry Holt & Co.

Jansen, M., Schroeders, U., Lüdtke, O., & Marsh, H. W. (2015). Contrast and assimilation effects of dimensional comparisons in five subjects: An extension of the I/E model. *Journal of Educational Psychology, 107*(4), 1086-1101. doi:10.1037/edu0000021

Jerusalem, M., & Schwarzer, R. (1992). Self-efficacy as a resource factor in stress appraisal

processes. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 195-213). Washington DC: Hemisphere.

Johnson, T., & Fendrich, M. (2005). Modeling sources of self-report bias in a survey of drug use epidemiology. *Annals of epidemiology*, *15*(5), 381-389. doi:10.1016/j.annepidem.2004.09.004

Johnson, C. S., & Stapel, D. A. (2011). Reflection versus self-reflection. *Social Psychology*, *42*, 144-151. doi:10.1027/1864-9335/a000053.

Jonas, K., & Brömer, P. (2002). Die sozial-kognitive Theorie nach Bandura. In D. Frey & M. Irle (Hrsg.), *Theorien der Sozialpsychologie. Bd. 2: Gruppen-, Interaktions- und Lerntheorien* (pp. 376-407). Bern: Hans Huber.

Joo, Y. J., Bong, M., & Choi, H. J. (2000). Self-efficacy for self-regulated learning, academic self-efficacy, and Internet self-efficacy in Web-based instruction. *Educational technology research and development*, *48*(2), 5-17.

Judge, T. A. & Ilies, R. (2002). Relationship of personality to performance motivation: a meta-analytic review. *Journal of applied psychology*, *87*(4), 797-807.

Judge, T. A., Locke, E. A., & Durham, C. C. (1997). The dispositional causes of job satisfaction: A core evaluations approach. *Research in organizational behavior, 19*, 151-188.

Kagan, S. L., Moore, E., & Bredekamp, S. (1995). *Considering children's early development and learning: Toward common views and vocabulary* (Report No. 95-03). Washington, DC: National Education Goals Panel.

Karren, R. J., & Barringer, M. W. (2002). A review and analysis of the policy-capturing methodology in organizational research: Guidelines for research and practice. *Organizational Research Methods*, *5*(4), 337-361.

King, M. F., & Bruner, G. C. (2000). Social desirability bias: A neglected aspect of validity testing. *Psychology and Marketing*, *17*(2), 79-103.

Kline, R. B. (2011). *Principles and practice of structural equation modeling*. New York: Guilford Press.

Köller, O., Daniels, Z., Schnabel, K. U., & Baumert, J. (2000). Kurswahlen von Mädchen und Jungen im Fach Mathematik: Zur Rolle von fachspezifischem Selbstkonzept und Interesse. *Zeitschrift für Pädagogische Psychologie / German Journal of Educational Psychology, 14*(1), 26-37. doi:10.1024//1010-0652.14.1.26

Köller, O., Klemmert, H., Moller, J., & Baumert, J. (1999). Leistungsbeurteilungen und Fähigkeitsselbstkonzepte: Eine längsschnittliche Überprüfung des Internal. *External Frame of Reference Modells. Zeitschrift für Pädagogische Psychologie*, *13*, 128-134.

Köller, O., & Möller, J. (2006). Selbstwirksamkeit. In D. H. Rost (Ed.), Handwörterbuch der Pädagogischen Psychologie (pp. 693 – 699). Weinheim: Beltz.

Köller, O., Trautwein, U., Lüdtke, O., & Baumert, J. (2006). Zum Zusammenspiel von schulischer Leistung, Selbstkonzept und Interesse in der gymnasialen Oberstufe. *Zeitschrift für pädagogische Psychologie*, *20*(1/2), 27-39.

Krapp, A. (2002). Structural and dynamic aspects of interest development: Theoretical considerations from an ontogenetic perspective. *Learning and instruction*, *12*(4), 383-409. doi:10.1016/S0959-4752(01)00011-1

Kuncel, N. R., Credé, M., & Thomas, L. L. (2005). The validity of self-reported grade point averages, class ranks, and test scores: A meta-analysis and review of the literature. *Review of Educational Research, 75*(1), 63-82. doi:10.3102/00346543075001063

Kultusministerkonferenz (KMK) (2005, April). Qualifikationsrahmen für Deutsche Hochschulabschlüsse. Retrieved from http://www.kmk.org/fileadmin/Dateien/-veroeffen-tlichungen_beschluesse/2005/2005_04_21-Qualifikationsrahmen-HS-Abschluesse.pdf.

Larson, L. M., Clark, M. P., Wesely, L. H., Koraleski, S. F., Daniels, J. A., & Smith, P. L. (1999). Videos versus role plays to increase counseling self-efficacy in prepractica trainees. *Counselor Education and Supervision*, *38*(4), 237-248. doi:10.1002/j.1556-6978.1999.tb00574.x

Larsen, M. S., Kornbeck, K. P., Kristensen, R., Larsen, M. R., & Sommersel, H. B. (2013). *Dropout Phenomena at Universities: What is Dropout? Why does Dropout Occur? What Can be Done by the Universities to Prevent or Reduce it?* Copenhagen: Danish Clearinghouse for educational research.

Lau, I. C. Y., Yeung, A. S., Jin, P., & Low, R. (1999). Toward a hierarchical, multidimensional English self-concept. *Journal of Educational Psychology, 91*(4), 747-755.

Leach, L. F., Henson, R. K., Odom, L. R., & Cagle, L. S. (2006). A reliability generalization study of the Self-Description Questionnaire. *Educational and Psychological Measurement*, *66*(2), 285-304. doi:10.1177/0013164405284030

Lee, J. (2009). Universals and specifics of math self-concept, math self-efficacy, and math anxiety across 41 PISA 2003 participating countries. *Learning and individual differences*, *19*(3), 355-365. doi:10.1016/j.lindif.2008.10.009

Lent, R. W., Brown, S. D., & Gore Jr, P. A. (1997). Discriminant and predictive validity of academic self-concept, academic self-efficacy, and mathematics-specific self-efficacy. *Journal of Counseling Psychology*, *44*(3), 307-315.

Lent, R. W., Brown, S. D., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of vocational behavior*, *45*(1), 79-122.

Lent, R. W., Brown, S.D. & Larkin, K.C. (1987). Comparison of three theoretically derived variables in predicting career and academic behavior: Self-efficacy, interest congruence, and consequence thinking. *Journal of Counseling Psychology*, *34*(3), 293-298.

Ļevina, J., & Ivanova, N. (2011). Psychometric properties of the Russian version of the Self-Description Questionnaire II (SDQ-II). *Baltic Journal of Psychology, 12 (1,2)*, 102-113.

Lienert, G. A., & Raatz, U. (1994). *Testaufbau und Testanalyse (5th ed.)*. Beltz.

Lucas, R. E., & Baird, B. M. (2006). Global Self-Assessment. In M. Eid & E. Diener (Eds.), *Handbook of multimethod measurement in psychology* (pp. 29-42). doi:10.1037/11383-003

Lüdtke, O., Robitzsch, A., Trautwein, U., & Köller, O. (2007). Umgang mit fehlenden Werten in der psychologischen Forschung. *Psychologische Rundschau*, *58*(2), 103-117. doi:10.1026/0033-3042.58.2.103

Luszczynska, A., Gutiérrez-Doña, B. & Schwarzer, R. (2005). General self-efficacy in various domains of human functioning: Evidence from five countries. *International Journal of Psychology*, *40*(2), 80-89. doi:10.1080/00207590444000041

Maddux, J. E., & Kleiman, E. M. (2012). *Self-efficacy. The Wiley Handbook of Positive Clinical Psychology*, 89-101. doi:10.1002/9781118468197.ch7

Marsh, H. W. (1986). Verbal and math self-concepts: An internal/external frame of reference model. *American Educational Research Journal, 23,* 129-149.

Marsh, H. W. (1989). *The Self Description Questionnaire SDQ: Manual.* Sydney: University of Western.

Marsh, H. W. (1990a). The structure of academic self-concept: The Marsh/Shavelson model. *Journal of Educational Psychology, 82,* 623-636.

Marsh, H. W. (1990b). A multidimensional, hierarchical model of self-concept: Theoretical and empirical justification. *Educational Psychology Review, 2*, 77-172.

Marsh, H. W. (1990c). *Self Description Questionnaire-I (SDQ I). Manual.* Macarthur, N.S.W. Australia: University of Western Sydney.

Marsh, H. W. (1990d). *Self Description Questionnaire-II (SDQ II). Manual.* Macarthur, N.S.W. Australia: University of Western Sydney.

Marsh, H. W. (1994). Sport motivation orientations: Beware of the jingle-jangle fallacies. *Journal of Sport and Exercise Psychology*, *16*, 365–380.

Marsh, H. W., Abduljabbar, A. S., Parker, P. D., Morin, A. J., Abdelfattah, F., Nagengast, B., & Abu-Hilal, M. M. (2015). The internal/external frame of reference model of self-concept and achievement relations: Age-cohort and cross-cultural differences. *American Educational Research Journal, 52*(1), 168-202. doi:10.3102/0002831214549453

Marsh, H. W., & Ayotte, V. (2003). Do Multiple Dimensions of Self-Concept Become More Differentiated With Age? The Differential Distinctiveness Hypothesis. *Journal of Educational Psychology*, *95*(4), 687-706. doi:10.1037/0022-0663.95.4.687

Marsh, H. W., Byrne, B. M., & Shavelson, R. J. (1988). A multifaceted academic self-concept: Its hierarchical structure and its relation to academic achievement. *Journal of Educational Psychology, 80,* 366-380.

Marsh, H. W., & Craven, R. G. (1997). Academic self-concept: Beyond the dustbowl. In G. Phye (Ed.), *Handbook of classroom assessment: Learning, achievement, and adjustment* (pp. 131–198). Orlando, FL: Academic press.

Marsh, H. W., & Craven, R. (2002). The pivotal role of frames of reference in academic self-concept formation: The big-fish-little-pond effect. In F. Pajares & T. Urdan (Eds.), *Adolescence and education* (pp. 83−123) Greenwich, CT: Information Age.

Marsh, H. W., & Craven, R. G. (2006). Reciprocal effects of self-concept and performance from a multidimensional perspective: Beyond seductive pleasure and unidimensional perspectives. *Perspectives on Psychological Science*, *1*, 133–163. doi:10.1111/j.1745-6916.2006.00010.x

Marsh, H. W., Craven, R., & Debus, R. (1998). Structure, stability, and development of young children's self-concepts: A multicohort–multioccasion study. *Child development*, *69*(4), 1030-1053. doi:10.1111/j.1467-8624.1998.tb06159

Marsh, H. W., Craven, R., & Debus, R. (1999). Separation of competency and affect components of multiple dimensions of academic self-concept: A developmental perspective. *Merrill-Palmer Quarterly*, *45*, 567-601.

Marsh, H. W., Craven, R. G., Hinkley, J. W., & Debus, R. L. (2003). Evaluation of the Big-Two-Factor Theory of academic motivation orientations: An evaluation of jingle- jangle

fallacies. *Multivariate Behavioral Research*, *38*(2), 189-224. doi:10.1207/ S15327906MBR3802_3

Marsh, H. W., Dowson, M., Pietsch, J., & Walker, R. (2004). Why multicollinearity matters: a reexamination of relations between self-efficacy, self-concept, and achievement. *Journal of Educational Psychology*, *96*(3), 518-522. doi: 10.1037/0022-0663.96.3.518

Marsh, H. W., Ellis, L. A., Parada, R. H., Richards, G., & Heubeck, B. G. (2005). A short version of the Self Description Questionnaire II: operationalizing criteria for short-form evaluation with new applications of confirmatory factor analyses. *Psychological assessment*, *17*(1), 81-102. doi:10.1037/1040-3590.17.1.81

Marsh, H. W. & Hattie, J. (1996). Theoretical perspectives on the structure of self-concept. In B. A. Bracken (Ed.), *Handbook of self-concept: Developmental, social, and clinical considerations* (pp. 38-90). New York: Wiley.

Marsh, H. W., & Hau, K. T. (2003). Big-Fish-Little-Pond effect on academic self-concept: A cross-cultural (26-country) test of the negative effects of academically selective schools. *American Psychologist, 58*(5), 364-376.

Marsh, H. W., Köller, O., & Baumert, J. (2001). Reunification of East and West German school systems: Longitudinal multilevel modeling study of the big-fish-little-pond effect on academic self-concept. *American Educational Research Journal*, *38*(2), 321-350.

Marsh, H. W., Kong, C. K., & Hau, K. T. (2001). Extension of the internal/external frame of reference model of self-concept formation: Importance of native and nonnative languages for Chinese students. *Journal of Educational Psychology*, *93*(3), 543-553.

Marsh, H. W., Kuyper, H., Seaton, M., Parker, P. D., Morin, A. J., Möller, J., & Abduljabbar, A. S. (2014). Dimensional comparison theory: An extension of the internal/external frame of reference effect on academic self-concept formation. *Contemporary Educational Psychology*, *39*(4), 326-341. doi:10.1016/j.cedpsych.2014.08.003

Marsh, H. W., Lüdtke, O., Nagengast, B., Trautwein, U., Abduljabbar, A. S., Abdelfattah, F., & Jansen, M. (2015). Dimensional comparison theory: Paradoxical relations between self-beliefs and achievements in multiple domains. *Learning and Instruction*, *35*, 16-32. doi:10.1016/j.learninstruc.2014.08.005

Marsh, H. W., & Martin, A. J. (2011). Academic self-concept and academic achievement: Relations and causal ordering. *British Journal of Educational Psychology*, *81*(1), 59-77. doi:10.1348/000709910X503501

Marsh, H. W., Martin, A. J., Yeung, A. S., & Craven, R. G. (2017). Competence self-perceptions. In A. J. Elliot, C. Dweck, & D. S. Yeager (Eds.), *Handbook of competence and motivation. Theory and application* (pp. 85–115). New York, London, New York, London: The Guilford Press.

Marsh, H. W., Parada, R. H., & Ayotte, V. (2004). A multidimensional perspective of relations between self-concept (Self Description Questionnaire II) and adolescent mental health (Youth Self-Report). *Psychological Assessment*, *16*(1), 27-41. doi:10.1037/1040-3590.16.1.27

Marsh, H. W., Parada, R. H., Yeung, A. S. & Healey, J. (2001). Aggressive school troublemakers and victims: A longitudinal model examining the pivotal role of self-concept. *Journal of Educational Psychology,* 93, 411-419.

Marsh, H. W., & Parker, J. W. (1984). Determinants of student self-concept: Is it better to be a relatively large fish in a small pond even if you don't learn to swim as well? *Journal of personality and social psychology*, *47*(1), 213-231. doi:10.1037/0022-3514.47.1.213

Marsh, H. W., & O'Mara, A. (2008). Reciprocal effects between academic self-concept, self-esteem, achievement, and attainment over seven adolescent years: Unidimensional and multidimensional perspectives of self-concept. *Personality and Social Psychology Bulletin*, *34*(4), 542-552. doi:10.1177/0146167207312313

Marsh, H. W., & O'Neill, R. (1984). Self description questionnaire III: The construct validity of multidimensional self-concept ratings by late adolescents. *Journal of Educational Measurement*, *21*(2), 153-174.

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

Marsh, H. W., Richards, G. E. & Barnes, J. (1986). Multidimensional self-concepts: A long term follow-up of the effect of participation in an Outward Bound program. *Personality and Social Psychology Bulletin, 12*, 475-492.

Marsh, H. W., & Shavelson, R. J. (1985). Self-concept: Its multifaceted hierarchical structure. *Educational Psychologist*, *20*, 107-123.

Marsh, H. W., Smith, I. D., & Barnes, J. (1985). Multidimensional self-concepts: Relations with sex and academic achievement. *Journal of Educational Psychology*, *77*, 581- 596.

Marsh, H. W., Trautwein, U., Lüdtke, O., Köller, O., & Baumert, J. (2005). Academic self-concept, interest, grades, and standardized test scores: Reciprocal effects models of

causal ordering. *Child Development*, *76*(2), 397-416. doi:10.1111/j.1467-8624.2005. 00853.x

Marsh, H. W., Trautwein, U., Lüdtke, O., Köller, O., & Baumert, J. (2006). Integration of multidimensional self-concept and core personality constructs: Construct validation and relations to well-being and achievement. *Journal of personality*, *74*(2), 403-456. doi:10.1111/j.1467-6494.2005.00380.x

Marsh, H. W., Walker, R., & Debus, R. (1991). Subject-specific components of academic self-concept and self-efficacy. *Contemporary Educational Psychology*, *16*(4), 331-345.

Marsh, H.W., Xu, K., & Martin, A.J. (2012). Self-concept: A synergy of theory, method, and application. In K. Harris., S. Graham., & T. Urdan (Eds). *APA Educational Psychology Handbook*. Washington, DC: American Psychological Association.

Marsh, H. W., & Yeung, A. S. (1997). Coursework selection: Relations to academic self-concept and achievement. *American Educational Research Journal*, *34*(4), 691-720.

Marsh, H. W., & Yeung, A. S. (2001). An extension of the internal/external frame of reference model: A response to Bong (1998). *Multivariate Behavioral Research, 36*(3), 389-420.

McDonald, R. P. (1999). *Test theory: A unified treatment*. Mahwah, NJ: Lawrence Erlbaum Associates.

Möller, J., Helm, F., Müller-Kalthoff, H., Nagy, N., & Marsh, H. W. (2016). The Generalized Internal/External Frame of Reference Model: An Extension to Dimensional Comparison Theory. *Frontline Learning Research*, *4*(2), 1-11. doi: 10.14786/flr.v4i2.169

Möller, J., & Husemann, N. (2006). Internal comparisons in everyday life. Journal of *Educational Psychology, 98(2)*, 342-353. doi:10.1037/0022-0663.98.2.342

Möller, J., & Köller, O. (2001a). Dimensional comparisons: An experimental approach to the Internal/External frame of reference model. *Journal of Educational Psychology, 93*, 826-835.

Möller, J., & Köller, O. (2001b). Frame of reference effects following the announcement of exam results. *Contemporary Educational Psychology*, *26*(2), 277-287. doi:10.1006/ceps.2000.1055

Möller, J., & Köller, O. (2004). Die Genese akademischer Selbstkonzepte. *Psychologische Rundschau*, *55*(1), 19-27. doi:10.1026/0033-3042.55.1.19

Möller, J., & Marsh, H. W. (2013). Dimensional comparison theory. *Psychological Review*, *120*(3), 544-560. doi:10.1037/a0032459

Möller, J., Pohlmann, B., Köller, O., & Marsh, H. W. (2009). A meta-analytic path analysis of the internal/external frame of reference model of academic achievement and academic self-concept. *Review of Educational Research, 79*(3), 1129-1167. doi:10.3102/003465-4309337522

Möller, J., Pohlmann, B., Streblow, L., & Kauffmann, J. (2002). Die Spezifität von Begabungsüberzeugungen als Determinanten des verbalen und mathematischen Begabungsselbstkonzepts. *Zeitschrift für Pädagogische Psychologie, 16*(2), 87-97.

Möller, J., Streblow, L., Pohlmann, B., & Köller, O. (2006). An extension to the internal/external frame of reference model to two verbal and numerical domains. *European Journal of Psychology of Education*, *21*(4), 467-487. doi:10.1007/bf03173515

Möller, J., Zimmermann, F., & Köller, O. (2014). The reciprocal internal/external frame of reference model using grades and test scores. *British Journal of Educational Psychology, 84*(4), 591-611. doi:10.1111/bjep.12047

Moulton, K.D., Brown, S.D., & Lent, R.W. (1991). Relation of self-efficacy beliefs to academic outcomes: A meta-analytic investigation. *Journal of Counseling Psychology*, *38*(1), 30-38.

Mui, F. L. L., Yeung, A. S., Low, R., & Jin, P. (2000). Academic self-concept of talented students: Factor structure and applicability of the internal/external frame of reference model. *Journal for the Education of the Gifted*, *23*(3), 343-367.

Müller, R. (2014). *Erprobung verschiedener Skalen zur Erfassung der beruflichen Selbstwirksamkeit*. (Unveröffentlichte Bachelorarbeit). Universität Trier.

Müller-Kalthoff, H., Jansen, M., Schiefer, I. M., Helm, F., Nagy, N., & Möller, J. (2017). A double-edged sword? On the benefit, detriment, and net effect of dimensional comparison on self-concept. *Journal of Educational Psychology*, *109*(7), 1029-1047. doi:10.1037/edu0000171

Multrus, F., Ramm, M., Bargel, T. (2012) Studiensituation und studentische Orientierungen. 11. Studierendensurvey an Universitäten und Fachhochschulen. Bonn: Bundesministerium für Bildung und Forschung.

Muthén, B. O., & Muthén, L. K. (1998-2014). *Mplus (Version 7) [Computer Software]*. Los Angeles, CA: Muthén & Muthén.

Niepel, C., Brunner, M., & Preckel, F. (2014). The longitudinal interplay of students' academic self-concepts and achievements within and across domains: Replicating and extending the reciprocal internal/external frame of reference model. *Journal of Educational Psychology*, *106*(4), 1170-1191. doi:10.1037/a0036307

Novick, M. R. (1965). The axioms and principal results of classical test theory. *ETS Research Report Series*, *1965*(1), 1-31. doi:10.1002/j.2333-8504.1965.tb00132.x

O'Mara, A. J., Marsh, H. W., Craven, R. G., & Debus, R. L. (2006). Do self-concept interventions make a difference? A synergistic blend of construct validation and meta-analysis. *Educational Psychologist*, *41*(3), 181-206. doi:10.1207/s15326985ep4103_4

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of educational research*, *66*(4), 543-578.

Pajares, F., & Miller, M.D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem solving: A path analysis. *Journal of Educational Psychology, 86*(2), 193–203.

Pajares, F. & Miller, M.D. (1995). Mathematics self-efficacy and mathematics performances: The need for specificity of assessment. *Journal of Counseling Psychology, 42*(2), 190-198.

Pajares, F., & Schunk, D. H. (2001). Self-beliefs and school success: Self-efficacy, self-concept, and school achievement. *Perception*, *11*, 239-266.

Palmer, D. H. (2006). Sources of self-efficacy in a science methods course for primary teacher education students. *Research in Science Education*, *36*(4), 337-353. doi:10.1007/s11165-005-9007-0

Parker, P. D., Marsh, H. W., Lüdtke, O., & Trautwein, U. (2013). Differential school contextual effects for math and English: Integrating the big-fish-little-pond effect and the internal/external frame of reference. *Learning and Instruction*, *23*, 78-89. doi:10.1016/j.learninstruc.2012.07.001

Paulick, I., Großschedl, J., Harms, U., & Möller, J. (2017). Preservice teachers' professional knowledge and its relation to academic self-concept. *Journal of Teacher Education*, *67*(3), 173-182. doi:10.1177/0022487116639263

Peiffer, H., Preckel, F. & Ellwart, T. (2016, September). Kompetenzerwartungen für die psychologische Berufspraxis: Facettentheoretische Modellierung und Messung. Vortrag beim *50. Kongress der Deutschen Gesellschaft für Psychologie (DGPS)*, Leipzig

Peterson, E. R., & Whiteman, M. C. (2007). "I think I can, I think I can…": The interrelationships among self-assessed intelligence, self-concept, self-efficacy and the

personality trait intellect in university students in Scotland and New Zealand. *Personality and Individual Differences*, *43*(4), 959-968. doi:10.1016/j.paid.2007.02.019

Pietsch, J., Walker, R., & Chapman, E. (2003). The relationship among self-concept, self-efficacy, and performance in mathematics during secondary school. *Journal of Educational Psychology*, *95*(3), 589-603.

Pinquart M., Juang, L. P, & Silbereisen, R. K. (2003) Self-efficacy and successful school-to-work transition: A longitudinal study. *Journal of Vocational Behavior, 63*, 329-346.

Pinxten, M., De Fraine, B., Van Damme, J., & D'Haenens, E. (2013). Student achievement and academic self-concept among secondary students in Flanders: gender and changes over time. *Irish Educational Studies*, *32*(2), 157-178. doi:10.1080/03323315.2012.749058

Pinxten, M., Marsh, H. W., De Fraine, B., Van Den Noortgate, W., & Van Damme, J. (2014). Enjoying mathematics or feeling competent in mathematics? Reciprocal effects on mathematics achievement and perceived math effort expenditure. *British Journal of Educational Psychology, 84*(1), 152-174. doi:10.1111/bjep.12028

Pinxten, M., Wouters, S., Preckel, F., Niepel, C., De Fraine, B., & Verschueren, K. (2015). The formation of academic self-concept in elementary education: A unifying model for external and internal comparisons. *Contemporary Educational Psychology*, *41*, 124-132. doi:10.1016/j.cedpsych.2014.12.003

Plucker, J. A., & Stocking, V. B. (2001). Looking outside and inside: Self-concept development of gifted adolescents. *Exceptional children*, *67*(4), 535-548. doi:10.1177/001440290106700407

Plucker, J. A., Taylor V, J. W., Callahan, C. M., & Tomchin, E. M. (1997). Mirror, mirror, on the wall: Reliability and validity evidence for the Self-Description Questionnaire-II with gifted students. *Educational and Psychological Measurement*, *57*(4), 704-713.

Poropat, A. E. (2009). A meta-analysis of the five-factor model of personality and academic performance. *Psychological bulletin*, *135*(2), 322-338. doi:10.1037/a0014996

Preckel, F., & Brüll, M. (2010). The benefit of being a big fish in a big pond: Contrast and assimilation effects on academic self-concept. *Learning and Individual Differences*, *20*(5), 522-531. doi:10.1016/j.lindif.2009.12.007

Preckel, F. & Brunner, M. (2017). Nomological Nets. In V. Zeigler-Hill & T. Shackelford (Eds.), *Encyclopedia of Personality and Individual Differences*. New York: Springer. doi:10.1007/978-3-319-28099-8_1334-1

Preckel, F., Götz, T., & Frenzel, A. (2010). Ability grouping of gifted students: Effects on academic self-concept and boredom. *British Journal of Educational Psychology*, *80*(3), 451-472. doi:10.1348/000709909X480716

Prüfer, P., & Rexroth, M. (2000, August). *Zwei-Phasen-Pretesting* (ZUMA Arbeitsbericht 2000/08) Mannheim: ZUMA.

Rammstedt, B. & John, O.P. (2005). Kurzversion des Big Five Inventory (BFI-K): Entwicklung und Validierung eines ökonomischen Inventars zur Erfassung der fünf Faktoren der Persönlichkeit. *Diagnostica, 51*(4), 195-206. doi:10.1026/0012-1924.51.4.195

Rayner, S. G., & Devi, U. (2001). Self-esteem and self-perceptions in the classroom: Valuing circle time? In R. J. Riding & S. G. Rayner (Eds.), *International perspectives on individual differences. Vol. 2: Self perception* (pp. 171-208). Westport, CO: Ablex.

Reise, S. P. (2012). The rediscovery of bifactor measurement models. *Multivariate behavioral research*, *47*(5), 667-696. doi:10.1080/00273171.2012.715555

Reja, U., Manfreda, K. L., Hlebec, V., & Vehovar, V. (2003). Open-ended vs. close-ended questions in web questionnaires. *Developments in applied statistics*, *19*(1), 159-177.

Renkl, A. (2008). Lernen und Lehren im Kontext der Schule. *Lehrbuch Pädagogische Psychologie*, *1*, 109-153.

Retelsdorf, J., Köller, O., & Möller, J. (2014). Reading achievement and reading self-concept–Testing the reciprocal effects model. *Learning and Instruction*, *29*, 21-30. doi:10.1016/j.learninstruc.2013.07.004

Richardson, M., Abraham, C. & Bond, R. (2012). Psychological correlates of university students' academic performance: a systematic review and meta-analysis. *Psychological Bulletin*, *138*(2), 353-387. doi:10.1037/a0026838

Rigotti, T., Schyns, B. & Mohr, G. (2008). Short version of the Occupational Self-Efficacy Scale: Structural and construct validity across five countries. *Journal of Career Assessment, 16*(2), 238-255. doi:10.1177/1069072707305763

Robbins, S. B., Allen, J., Casillas, A., Peterson, C. H., & Le, H. (2006). Unraveling the differential effects of motivational and skills, social, and self-management measures from traditional predictors of college outcomes. *Journal of educational psychology*, *98*(3), 598-616. doi:10.1037/0022-0663.98.3.598

Robbins, S.B., Lauver, K., Le, H., Davis, D., Langley, R. & Carlstrom, A. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Pschological Bulletin*, *130*(2), 261-288. doi:10.1037/0033-2909.130.2.261

Rodgers, W. M., Markland, D., Selzler, A. M., Murray, T. C., & Wilson, P. M. (2014). Distinguishing perceived competence and self-efficacy: An example from exercise. *Research quarterly for exercise and sport*, *85*(4), 527-539. doi:10-1080/02701367.2014.961050

Rosenberg, M. (1979). *Conceiving the self*. New York: Basic.

Rost, D. H., & Sparfeldt, J. R. (2002). Facetten des schulischen Selbstkonzepts. Ein Verfahren zur Messung des differentiellen Selbstkonzepts schulischer Leistungen und Fähigkeiten (DISK-Gitter). *Diagnostica*, *48*(3), 130-140.

Roth, M., & Herzberg, P. Y. (2008). Psychodiagnostik in der Praxis: State of the art. *Klinische Diagnostik und Evaluation*, *1*(1), 5-18.

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological monographs: General and applied*, *80*(1), 1-28. doi:10.1037/h0092976

Sarcletti, A., & Müller, S. (2011). Zum Stand der Studienabbruchforschung. Theoretische Perspektiven, zentrale Ergebnisse und methodische Anforderungen an künftige Studien. *Zeitschrift für Bildungsforschung*, *1*(3), 235-248.

Savickas, M. L. (2002). Career construction: A developmental theory of vocational behavior. In D. Brown (Ed.), *Career choice and development* (4th ed., pp. 149 –205). San Francisco: Jossey-Bass.

Savickas, M. L. (2013): Career Construction Theory and practice. In: S. D. Brown, & R. W. Lent (Eds.), *Career development and counseling. Putting theory and research to work* (2nd. ed., pp. 147-183). Hoboken, NJ: Wiley.

Scherer, R. (2013). Further evidence on the structural relationship between academic self-concept and self-efficacy: On the effects of domain specificity. *Learning and Individual Differences*, *28*, 9-19. doi:10.1016/j.lindif.2013.09.008

Schiefele, U., Krapp, A., & Winteler, A. (1992). Interest as a predictor of academic achievement: A meta-analysis of research. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 183-212). Hillsdale, NJ: Lawrence Erlbaum Associates.

Schilling, S. R., Sparfeldt, J. R., & Rost, D. H. (2006). Facetten schulischen Selbstkonzepts: Welchen Unterschied macht das Geschlecht? *Zeitschrift für Pädagogische Psychologie*, *20*(1/2), 9-18. doi:10.1024/1010-0652.20.12.9

Schilling, S. R., Sparfeldt, J. R., Rost, D. H., & Nickels, G. (2005). Schulische Selbstkonzepte-Zur Validität einer erweiterten Version des Differentiellen Selbstkonzept Gitters (DISK-Gitter). *Diagnostica*, *51*(1), 21-28. doi:10.1026/0012-1924.51.1.21

Schindler, G. (2004). Employability und Bachelor-Studiengänge–eine unpassende Verbindung. *Beiträge zur Hochschulforschung*, *26*(4), 6-26.

Schlomer, G. L., Bauman, S., & Card, N. A. (2010). Best practices for missing data management in counseling psychology. *Journal of Counseling Psychology, 57*(1), 1-10. doi:10.1037/a0018082

Schmidt-Atzert, L., & Amelang, M. (2012). *Psychologische Diagnostik (Lehrbuch mit Online-Materialien)*. Springer Science & Business Media. doi:10.1007/978-3-642-17001-0

Schmidt, I., Brunner, M., Keller, L., Scherrer, V., Wollschläger, R., Baudson, T. G., & Preckel, F. (2017). Profile formation of academic self-concept in elementary school students in grades 1 to 4. *PLoS ONE 12(5): e0177854.*doi:10.1371/journal.pon-e.0177854

Schneider M, & Preckel, F. (2017). Variables associated with achievement in higher education: a systematic review of meta-analyses. *Psychological Bulletin. 143*(6), 565–600. doi:10.1037/bul0000098

Schulz, H., Vögele, C., & Meyer, B. (2009). Optimism, self-efficacy, and perceived stress as predictors of self-reported health symptoms in college students. *Zeitschrift für Gesundheitspsychologie*, *17*(4), 185-194. doi:10.1026/0943-8149.17.4.185

Schunk, D. H. (1991). Self-efficacy and academic motivation. *Educational psychologist*, *26*(3-4), 207-231.

Schunk, D. H. & DiBenedetto, M. K. (2016). Self-efficacy theory in education. In K. R. Wentzel & D. B. Miele (Eds.), *Handbook of motivation in school* (2nd ed., pp. 34–54). New York: Routledge.

Schunk, D. H., & Pajares, F. (2005). Competence Perceptions and Academic Functioning. In A. J. Elliot & C. S. Dweck (Eds.), *Handbook of competence and motivation* (pp. 85–104). New York: Guilford Publications.

Schunk, D. H., & Swartz, C. W. (1993). Goals and progress feedback: Effects on self-efficacy and writing achievement. *Contemporary Educational Psychology*, *18*(3), 337-354.

Schurtz, I., Pfost, M., Nagengast, B., & Artelt, C. (2014). Impact of social and dimensional comparisons on student's mathematical and English subject-interest at the beginning of

secondary school. *Learning and Instruction, 34*, 32-41. doi:10.1016/j.learninstruc.2014.08.001

Schwarzer, R., Bäßler, J., Kwiatek, P., Schröder, K., & Zhang, J. X. (1997). The assessment of optimistic self-beliefs: comparison of the German, Spanish, and Chinese versions of the general self-efficacy scale. *Applied Psychology*, *46*(1), 69-88. doi:10.1111/j.1464-0597.1997.tb01096.x

Schwarzer, R. & Jerusalem, M. (Hrsg.) (1999). Skalen zur Erfassung von Lehrer- und Schülermerkmalen. Dokumentation der psychometrischen Verfahren im Rahmen der Wissenschaftlichen Begleitung des Modellversuchs Selbstwirksame Schulen. Berlin: Freie Universität Berlin.

Schwarzer, R., & Jerusalem, M. (2002). Das Konzept der Selbstwirksamkeit. *Zeitschrift für Pädagogik, 44* (Beiheft: Selbstwirksamkeit und Motivationsprozesse in Bildungsinstitutionen), 28–53.

Schyns, B., & Von Collani, G. (2002). A new occupational self-efficacy scale and its relation to personality constructs and organizational variables. *European Journal of Work and Organizational Psychology*, *11*(2), 219-241.

Seaton, M., Marsh, H. W., & Craven, R. G. (2010). Big-fish-little-pond effect: Generalizability and moderation-Two sides of the same coin. *American Educational Research Journal*, *47*(2), 390-433. doi:10.3102/0002831209350493

Seaton, M., Marsh, H. W., Dumas, F., Huguet, P., Monteil, J. M., Régner, I., ... & Suls, J. (2008). In search of the big fish: Investigating the coexistence of the big-fish-little-pond effect with the positive effects of upward comparisons. *British Journal of Social Psychology*, *47*(1), 73-103. doi:10.1348/014466607X202309

Shapka, J. D., & Keating, D. P. (2005). Structure and Change in Self-Concept During Adolescence. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement*, *37*(2), 83-96. doi:10.1037/h0087247

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

Shell, D. F., Colvin, C., & Bruning, R. H. (1995). Self-efficacy, attribution, and outcome expectancy mechanisms in reading and writing achievement: Grade-level and achievement-level differences. *Journal of Educational Psychology*, *87*(3), 386-398. doi:10.1037/0022-0663.87.3.386

Sherer, M., Maddux, J. E., Mercandante, B., Prentice-Dunn, S., Jacobs, B., & Rogers, R. W. (1982). The self-efficacy scale: Construction and validation. *Psychological reports*, *51*(2), 663-671.

Skaalvik, E. M. (1994). Attribution of perceived achievement in school in general and in maths and verbal areas: Relations with academic self-concept and self-esteem. *The British journal of educational psychology*, *64*(1), 133–143.

Skaalvik, E. M. (1997). Issues in research on self-concept. In M. Maehr & P. R. Pintrich (Eds.), *Advances in motivation and achievement* (Vol. 10, pp. 51-97). New York: JAI Press.

Skaalvik, E. M., & Rankin, R. J. (1990). Math, verbal, and general academic self-concept: The internal/external frame of reference model and gender differences in self-concept structure. *Journal of Educational Psychology*, *82*(3), 546-554. doi:10.1037/0022-0663.82.3.546

Skaalvik, E. M., & Rankin, R. J. (1996, April). Self-concept and self-efficacy: Conceptual analysis. In annual meeting of the American Educational Research Association, New York.

Skaalvik, E. M., & Skaalvik, S. (2002). Internal and external frames of reference for academic self-concept. *Educational Psychologist*, *37*(4), 233-244. doi:10.1207/S15326985-EP3704_3

Stankov, L., Lee, J., Luo, W., & Hogan, D. J. (2012). Confidence: A better predictor of academic achievement than self-efficacy, self-concept and anxiety? *Learning and Individual Differences*, *22*(6), 747-758. doi: 10.1016/j.lindif.2012.05.013

Stricker, G., & Trierweiler, S. J. (1995). The local clinical scientist: A bridge between science and practice. *American Psychologist*, *50*(12), 995-1002.

Swann Jr, W. B., Chang-Schneider, C., & Larsen McClarty, K. (2007). Do people's self-views matter? Self-concept and self-esteem in everyday life. *American Psychologist*, *62*(2), 84-94. doi:10.1037/0003-066x.62.2.84

Thees, S., Gobel, J., Jose, G., Bohrhardt, R., & Esch, T. (2012). Students' health in the Bologna Process: studies on health behavior, stress, and well-being show a need for action. Prävention und Gesundheitsförderung, 7(3), 196-202. doi:10.1007/s11553-012-0338-1

Trautwein, U., Lüdtke, O., Köller, O., & Baumert, J. (2006). Self-esteem, academic self-

concept, and achievement: how the learning environment moderates the dynamics of self-concept. *Journal of personality and social psychology*, *90*(2), 334-349. doi:10.1037/0022-3514.90.2.334

Trautwein, U., & Möller, J. (2016). Self-concept: Determinants and consequences of academic self-concept in school contexts. In Herausgeber: A. A. Lipnevich, F. Preckel, R. D. Roberts (Eds.) *Psychosocial Skills and School Systems in the 21st Century* (pp. 187-214). Springer International Publishing. doi: 10.1007/978-3-319-28606-8_8

Tymon, A. (2013). The student perspective on employability. *Studies in higher education*, *38*(6), 841-856. doi:10.1080/03075079.2011.604408

Universität Trier (2017). *Modulhandbuch Bachelor of Science Psychologie* (Stand 07.11.2017).

Urbani, S., Smith, M. R., Maddux, C. D., Smaby, M. H., Torres-Rivera, E., & Crews, J. (2002). Skills-Based Training and Counseling Self-Efficacy. *Counselor Education and Supervision*, *42*(2), 92-106. doi: 10.1002/j.1556-6978.2002.tb01802.x

Valentine, J. C., DuBois, D. L., & Cooper, H. (2004). The relation between self-beliefs and academic achievement: A meta-analytic review. *Educational Psychologist*, *39*(2), 111-133. doi:10.1207/s15326985ep3902_3

Vandenberg, R. J. & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational research methods*, *3*(1), 4-70.

van Dinther, M., Dochy, F., & Segers, M. (2011). Factors affecting students' self-efficacy in higher education. *Educational research review*, *6*(2), 95-108. doi:10.1016/j.edurev.2010.10.003

Wanous, J.P. (1992). *Organizational Entry. Reading*, MA: Addison-Wesley.

Wheeler, L., & Suls, J. (2005). Social Comparison and Self-Evaluations of Competence. In A. J. Elliot & C. S. Dweck (Eds.), *Handbook of competence and motivation* (pp. 566-578). New York: Guilford Publications.

Wigfield, A. (1994). Expectancy-value theory of achievement motivation: A developmental perspective. *Educational Psychology Review*, *6*(1), 49-78.

Wigfield, A., & Eccles, J. S. (1992). The development of achievement task values: A theoretical analysis. *Developmental review*, *12*(3), 265-310. doi:10.1016/0273-2297(92)90011-P

Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. *Contemporary educational psychology*, *25*(1), 68-81. doi:10.1006/ceps.1999.1015

Wigfield, A., Eccles, J. S., Yoon, K. S., Harold, R. D., Arbreton, A. J., Freedman-Doan, C., & Blumenfeld, P. C. (1997). Change in children's competence beliefs and subjective task values across the elementary school years: A 3-year study. *Journal of educational psychology*, *89*(3), 451-469. doi:10.1037/0022-0663.89.3.451

Williams, T., & Williams, K. (2010). Self-efficacy and performance in mathematics: Reciprocal determinism in 33 nations. *Journal of educational Psychology*, *102*(2), 453-466. doi:10.1037/a0017271

Wolff, F., Nagy, N., Helm, F., & Möller, J. (2017). Testing the internal/external frame of reference model of academic achievement and academic self-concept with open self-concept reports. *Learning and Instruction*. doi:10.1016/j.learninstruc.2017-.09.006

Wood, R., & Bandura, A. (1989). Social cognitive theory of organizational management. *Academy of management Review*, *14*(3), 361-384. doi: 10.5465/AMR.1989.4279067

Wouters, S., Colpin, H., Van Damme, J., De Laet, S., & Verschueren, K. (2013). Early adolescents' academic self-concept formation: Do classmates or friends matter most? *Learning and Individual Differences, 27*, 193-200. doi: 10.1016/j.lindif.2013.09.002

Wouters, S., Germeijs, V., Colpin, H., & Verschueren, K. (2011). Academic self-concept in high school: Predictors and effects on adjustment in higher education. *Scandinavian Journal of Psychology, 52*(6), 586-594. doi: 10.1111/j.1467-9450.2011.00905.x

Xiang, P., McBride, R., Guan, J., & Solmon, M. (2003). Children's motivation in elementary physical education: An expectancy-value model of achievement choice. *Research Quarterly for Exercise and Sport*, *74*(1), 25-35. doi:10.1080/02701367.2003.10609061

Xu, M. K., Marsh, H. W., Hau, K. T., Ho, I. T., Morin, A. J., & Abduljabbar, A. S. (2013). The internal/external frame of reference of academic self-concept: Extension to a foreign language and the role of language of instruction. *Journal of Educational Psychology, 105*(2), 489-503. doi: 10.1037/a0031333

Yeung, A. S., McInerney, D. M., & Russell-Bowie, D. (2001). Hierarchical, multidimensional creative arts self-concept. *Australian Journal of Psychology, 53*(3), 125-133.

Yorke, M. (2006). *Employability in higher education: what it is-what it is not*. York: Higher Education Academy.

Zeidner, M. (1991). Statistics and mathematics anxiety in social science students: Some interesting parallels. *British Journal of Educational Psychology, 61*(3), 319-328.

Zhao, H. & Seibert, S. E. (2006). The big five personality dimensions and entrepreneurial status: a meta-analytical review. *Journal of applied psychology*, *91*(2), 259-271. doi:10.1037/0021-9010.91.2.259

Zimmerman, B. J. (1995). Self-efficacy and educational development. *Self-efficacy in changing societies*, 202-231.

Zimmerman, B. J., & Bandura, A. (1994). Impact of self-regulatory influences on writing course attainment. *American Educational Research Journal*, *31*(4), 845-862.

Zimmerman, B. J., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American Educational Research Journal, 29*, 663-676.

Zuffianò, A., Alessandri, G., Gerbino, M., Kanacri, B.P.L., Di Giunta, L., Milioni, M. & Caprara, G.V. (2013). Academic achievement: The unique contribution of self-efficacy beliefs in self-regulated learning beyond intelligence, personality traits, and self-esteem. *Learning and Individual Differences*, *23*, 158-162. doi:10.1016/j.lindif.2-012.07.010

# Appendix A

Tabelle A1a.

*Vignetten im Anwendungsbereich der Arbeits-, Organisations- und Wirtschaftspsychologie (AOW) für die Inhaltsfaktoren der Diagnostik, Intervention und Forschung/Evaluation*

Stellen Sie sich vor, Sie sind nach Abschluss Ihres Psychologie-Studiums bei einem Arbeitgeber angestellt, der sich auf die Personal- und Organisationsdiagnostik spezialisiert hat. Bei Ihrer Tätigkeit befassen Sie sich mit der Messung und Analyse im Bereich der Personalauswahl, Personalentwicklung und Organisationsentwicklung. Sie sollen zum Beispiel Variablen wie Führungseigenschaften, Teamfähigkeit, Arbeitszufriedenheit und -motivation, oder Belastungs- und Beanspruchungsfaktoren erfassen. Als Methoden setzen Sie Fragebögen, standardisierte Interviews, systematische Verhaltensbeobachtung und psychologische Testverfahren ein.

Stellen Sie sich vor, Sie sind nach Abschluss Ihres Psychologie-Studiums bei einem Arbeitgeber angestellt, der sich auf die Beratung von Organisationen und die Durchführung von Interventionen im Bereich der Personal- und Organisationsentwicklung spezialisiert hat. Bei Ihrer Tätigkeit befassen Sie sich mit der Beratung von Mitarbeitenden und den Veränderungen von Organisationen. Dazu gehören zum Beispiel Fort- und Weiterbildungen von Mitarbeitenden und Führungskräften, Seminare zum Thema „Zeitmanagement" und dazugehörige Trainings. Weitere beispielhafte Inhalte von Interventionen sind Verbesserungsmaßnahmen zur Gestaltung von Arbeitsplätzen und -abläufen, sowie von Teamprozessen.

Stellen Sie sich vor, Sie sind nach Abschluss Ihres Psychologie-Studiums bei einem Arbeitgeber angestellt, der sich auf die Forschung und Evaluation im Bereich der Arbeits- und Organisationspsychologie spezialisiert hat. Bei Ihrer Tätigkeit befassen Sie sich mit Forschungs- und Evaluationsprojekten. Bei Forschungsprojekten sollen Sie auf Grundlage bisheriger Forschung neue empirische Erkenntnisse gewinnen, zum Beispiel in den Bereichen Teamarbeit, Arbeitsmotivation und Stressverarbeitung. Bei Evaluationsprojekten sollen Sie die Wirksamkeit von Maßnahmen überprüfen, zum Beispiel in den Bereichen Kommunikation, Arbeitsplatzsicherheit und Teamarbeit.

Tabelle A1b

*Vignetten im Anwendungsbereich der Klinischen Psychologie (KLIPS) für die Inhaltsfaktoren der Diagnostik, Intervention und Forschung/Evaluation*

Stellen Sie sich vor, Sie sind nach Abschluss Ihres Psychologie-Studiums bei einem Arbeitgeber angestellt, der sich auf die Diagnostik von psychischen Problemen spezialisiert hat. Im Rahmen Ihrer Tätigkeit befassen Sie sich mit der klassifikatorischen, biografischen und funktionalen Diagnostik bei der Indikationsstellung und bei der Verlaufs- und Prozessdiagnostik. Zudem gehört die Erfolgsdiagnostik von Therapiemaßnahmen zu Ihrem Aufgabenbereich. Die psychischen Probleme reichen von Angststörungen, Essstörungen und affektiven Störungen bis hin zu Persönlichkeitsstörungen. Als Methoden setzen Sie standardisierte Interviews und Testverfahren, systematische Verhaltensbeobachtung sowie Gesprächsführung ein.

Stellen Sie sich vor, Sie sind nach Abschluss Ihres Psychologie-Studiums bei einem Arbeitgeber angestellt, der sich auf die Prävention psychischer Störungen, die Beratung von Betroffenen von psychischen Störungen und das Empfehlen von geeigneten Therapiemaßnahmen spezialisiert hat. Bei Ihrer Tätigkeit befassen Sie sich mit der Beratung und Veränderung von Betroffenen, Angehörigen und Interessierten. Dazu gehört, dass Sie angemessene Behandlungen zuweisen und durchführen und durch Prävention, Unterstützung und Rehabilitation die Gesundheit fördern. Zum Beispiel sollen Sie Klienten und deren Angehörige in Krisensituationen beraten, oder bei Paarproblemen und bei sozialen Konfliktsituationen intervenieren.

Stellen Sie sich vor, Sie sind nach Abschluss Ihres Psychologie-Studiums bei einem Arbeitgeber angestellt, der sich auf die Bereiche Forschung und Evaluation im Bereich der Klinischen Psychologie spezialisiert hat. Bei Ihrer Tätigkeit befassen Sie sich mit Forschungs- und Evaluationsprojekten. Bei Forschungsprojekten sollen Sie auf Grundlage der bisherigen Forschung neue empirische Erkenntnisse gewinnen. Die Bereiche können Beratung und Psychotherapie oder einzelne Störungsbilder wie Depression und Schizophrenie umfassen. Bei Evaluationsprojekten sollen Sie die Wirksamkeit von Maßnahmen überprüfen, zum Beispiel von Anti-Raucher-Kampagnen, neuen Beratungstechniken oder Maßnahmen der Psychoedukation.

Tabelle A1c

*Vignetten im Anwendungsbereich der Pädagogischen Psychologie (PAEPS) für die Inhaltsfaktoren der Diagnostik, Intervention und Forschung/Evaluation*

Stellen Sie sich vor, Sie sind nach Abschluss Ihres Psychologie-Studiums bei einem Arbeitgeber angestellt, der sich auf die Diagnostik von Voraussetzungen und Ergebnissen von Lernen und Leistung in den Bereichen Erziehung und Bildung spezialisiert hat. Bei Ihrer Tätigkeit befassen Sie sich mit der Diagnostik von Bedürfnissen, Einschränkungen und Potenzial bei Lernenden und Lehrenden, mit der Diagnostik von Lernprozessen und -ergebnissen und mit der Diagnostik von Merkmalen der Lernumgebung. Als Methoden setzen Sie Fragebögen, standardisierte Interviews, systematische Verhaltensbeobachtung und psychologische Testverfahren ein.

Stellen Sie sich vor, Sie sind nach Abschluss Ihres Psychologie-Studiums bei einem Arbeitgeber angestellt, der sich auf die Unterstützung von Lernenden und Lehrenden sowie die Unterstützung bei erzieherischen Tätigkeiten spezialisiert hat. Bei Ihrer Tätigkeit befassen Sie sich mit der Beratung und Veränderung von Lernenden, Erziehenden, Familien, Lehrkräften und Pädagog/innen. Dazu gehören Erziehungsberatung, Lernberatung, Beratung bei sozio-emotionalen Problemen im Bildungskontext (z.B. Mobbing), sowie Trainings von Lernfähigkeiten, Erziehungskompetenz (z.B. Elterntrainings) oder sozio-emotionalen Fähigkeiten (z.B. Gewaltprävention).

Stellen Sie sich vor, Sie sind nach Abschluss Ihres Psychologie-Studiums bei einem Arbeitgeber angestellt, der sich auf die Bereiche Forschung und Evaluation im Bereich der Pädagogischen Psychologie spezialisiert hat. Bei Ihrer Tätigkeit befassen Sie sich mit Forschungs- und Evaluationsprojekten. Bei Forschungsprojekten sollen Sie auf Grundlagen der bisherigen Forschung neue empirische Erkenntnisse gewinnen, zum Beispiel in den Bereichen Gestaltung von Lernumgebungen, Erfassung von Kompetenzen oder Vorhersage von Leistungen. Bei Evaluationsprojekten sollen Sie die Wirksamkeit von Maßnahmen überprüfen, zum Beispiel von Trainings zur Förderung sozialer Kompetenzen oder von Verfahren zur Optimierung von Lernumgebungen.
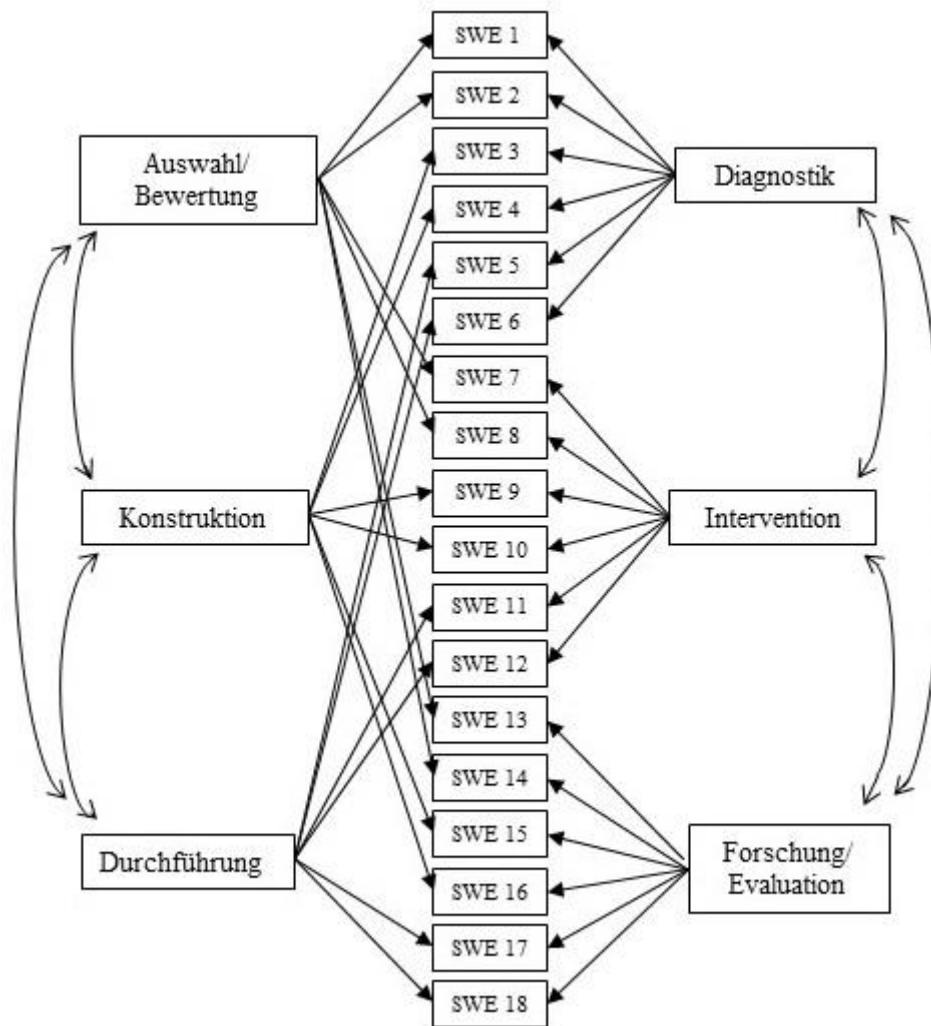
*Abbildung A2.* Multi-Operationen-Multi-Inhalte (MOMI)-Modell der Selbstwirksamkeitserwartung (SWE) von Psychologiestudierenden mit zwei Facetten (Operationen und Inhalte) und insgesamt sechs Faktoren

Tabelle A3

*Fit-Indizes der vier Strukturmodelle pro Anwendungsbereich*

| | $\chi^2$ | *df* | $\chi^2/df$ | CFI | TLI | RMSEA | SRMR | AIC | BIC |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | AOW | | | | |
| M0 | 698.648 | 109 | 6.41 | .967 | .954 | .068 | .028 | 49545.293 | 49949.925 |
| M1 | 5523.807 | 130 | 42.49 | .792 | .755 | .189 | .057 | 54120.197 | 54418.613 |
| M2 | 2548.178 | 130 | 19.60 | .864 | .840 | .127 | .077 | 52092.072 | 52390.488 |
| M3 | 4600.329 | 133 | 34.59 | .749 | .712 | .170 | .060 | 55071.890 | 55355.132 |
| | | | | | KLIPS | | | | |
| M0 | 640.247 | 109 | 5.87 | .972 | .960 | .065 | .026 | 49162.645 | 49567.070 |
| M1 | 4790.621 | 130 | 36.85 | .751 | .707 | .176 | .058 | 54866.795 | 55165.058 |
| M2 | 2609.747 | 130 | 20.07 | .868 | .844 | .128 | .088 | 51883.153 | 52181.417 |
| M3 | 5151.099 | 133 | 38.73 | .732 | .692 | .180 | .062 | 55573.539 | 55856.637 |
| | | | | | PAEPS | | | | |
| M0 | 574.591 | 109 | 5.27 | .974 | .963 | .060 | .029 | 49937.316 | 50342.291 |
| M1 | 4608.978 | 130 | 35.45 | .749 | .705 | .172 | .065 | 55271.952 | 55570.622 |
| M2 | 2633.989 | 130 | 20.26 | .860 | .835 | .128 | .086 | 52714.511 | 53013.180 |
| M3 | 5028.682 | 133 | 38.81 | .726 | .684 | .178 | .066 | 56160.342 | 56443.825 |

*Anmerkungen.* $\chi^2$ = Chi-Square (für M0-M3 ist p < .001); *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis Index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; AIC = Akaike information criterion; BIC: Bayesian information criterion; M0 = Modell mit je 3 korrelierten Faktoren für Operationen und Inhalte; M1 = Modell mit 3 korrelierten Operationen (Auswahl/ Bewertung, Konstruktion, Durchführung); M2 = Modell mit 3 korrelierten Inhalten (Diagnostik, Intervention, Forschung/ Evaluation); M3 = 1-Faktor-Modell (g-Faktor).

Tabelle A4

*Items des Fragebogens zur Messung der Selbstwirksamkeitserwartung von Psychologiestudierenden, sowie deskriptive Statistiken und standardisierte Faktorladungen*

| Sie sollen.. | AOW | | | | KLIPS | | | | PAEPS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *M* | *SD* | O | I | *M* | *SD* | O | I | *M* | *SD* | O | I |
| **Operation: *Auswahl/Bewertung*; Inhalt: *Diagnostik*** | | | | | | | | | | | | |
| 1. ...für eine bestimmte Fragestellung diagnostische Verfahren auswählen. | 3.22 | 1.48 | .72 | .56 | 3.50 | 1.61 | .75 | .55 | 3.40 | 1.50 | .72 | .59 |
| 2. ...die Eignung und den Nutzen diagnostischer Verfahren bewerten. | 3.23 | 1.48 | .72 | .56 | 3.42 | 1.56 | .75 | .55 | 3.41 | 1.51 | .74 | .52 |
| **Operation: *Konstruktion*; Inhalt: *Diagnostik*** | | | | | | | | | | | | |
| 3. ...bereits vorhandene diagnostische Verfahren für eine spezifische Fragestellung adaptieren. | 3.00 | 1.37 | .65 | .53 | 3.17 | 1.45 | .70 | .47 | 3.13 | 1.39 | .64 | .55 |
| 4. …neue diagnostische Verfahren konstruieren. | 2.30 | 1.23 | .59 | .53 | 2.34 | 1.22 | .64 | .44 | 2.35 | 1.21 | .56 | .52 |
| **Operation: *Durchführung*; Inhalt: *Diagnostik*** | | | | | | | | | | | | |
| 5. ...diagnostische Verfahren durchführen und die Ergebnisse auswerten. | 3.76 | 1.71 | .82 | .42 | 3.70 | 1.73 | .86 | .39 | 3.91 | 1.68 | .82 | .44 |
| 6. ...Ergebnisse aus diagnostischen Verfahren mündlich und schriftlich rückmelden. | 3.90 | 1.59 | .82 | .33 | 4.04 | 1.62 | .82 | .35 | 4.03 | 1.55 | .81 | .38 |
| **Operation: *Auswahl/Bewertung*; Inhalt: *Intervention*** | | | | | | | | | | | | |
| 7. ... für ein konkretes Projekt geeignete Fachliteratur auswählen. | 3.88 | 1.43 | .74 | .21 | 4.05 | 1.46 | .76 | .19 | 4.06 | 1.40 | .74 | .24 |
| 8. ... für ein konkretes Projekt Fachliteratur zusammenfassen und auswerten. | 3.97 | 1.40 | .75 | .23 | 4.13 | 1.41 | .78 | .19 | 4.16 | 1.35 | .74 | .24 |
| **Operation: *Konstruktion*; Inhalt: *Intervention*** | | | | | | | | | | | | |
| 9. ...ein Beratungsangebot konzipieren. | 2.92 | 1.38 | .69 | .63 | 3.10 | 1.44 | .71 | .61 | 3.13 | 1.38 | .64 | .64 |
| 10. ...eine spezifische Veränderungsmaßnahme entwerfen. | 2.79 | 1.36 | .66 | .64 | 2.91 | 1.43 | .68 | .65 | 3.00 | 1.38 | .67 | .67 |
| **Operation: *Durchführung*; Inhalt: *Intervention*** | | | | | | | | | | | | |
| 11. ...ein Beratungsangebot durchführen. | 3.13 | 1.50 | .64 | .70 | 3.32 | 1.54 | .67 | .67 | 3.34 | 1.50 | .59 | .74 |
| 12. ...Veränderungsmaßnahmen durchführen. | 3.06 | 1.48 | .64 | .68 | 3.18 | 1.54 | .66 | .68 | 3.23 | 1.47 | .61 | .72 |
| **Operation: *Auswahl/Bewertung*; Inhalt: *Forschung/ Evaluation*** | | | | | | | | | | | | |
| 13. ...den Kenntnisstand zur Forschung kritisch aufarbeiten und relevante Forschungsfragen identifizieren. | 3.42 | 1.47 | .89 | .19 | 3.59 | 1.51 | .92 | .11 | 3.54 | 1.50 | .90 | .21 |
| 14. ...die relevanten Konstrukte hinter einer Evaluationsfrage identifizieren. | 3.25 | 1.45 | .86 | .25 | 3.39 | 1.49 | .91 | .17 | 3.36 | 1.45 | .88 | .26 |
| **Operation: *Konstruktion*; Inhalt: *Forschung/Evaluation*** | | | | | | | | | | | | |
| 15. ...ein Forschungsprojekt planen. | 2.92 | 1.40 | .68 | .62 | 3.04 | 1.44 | .74 | .62 | 3.04 | 1.40 | .67 | .70 |
| 16. ...ein Evaluationsprojekt planen. | 2.80 | 1.36 | .67 | .72 | 2.95 | 1.41 | .76 | .55 | 2.90 | 1.38 | .66 | .66 |
| **Operation: *Durchführung* Inhalt: *Forschung/ Evaluation*** | | | | | | | | | | | | |
| 17. ...ein Forschungsprojekt durchführen. | 3.19 | 1.48 | .69 | .70 | 3.29 | 1.53 | .75 | .58 | 3.30 | 1.11 | .67 | .66 |
| 18. ...ein Evaluationsprojekt durchführen. | 3.07 | 1.47 | .68 | .64 | 3.19 | 1.50 | .73 | .65 | 3.16 | 1.47 | .65 | .73 |

*Anmerkungen.* Angegeben sind *M* = Mittelwerte; *SD* = Standardabweichungen; O = standardisierte Ladungen des Items auf der Facette der Operationen; I = standardisierte Ladung des Items auf der Facette der Inhalte; AOW = Arbeits-, Organisations- und Wirtschaftspsychologie, KLIPS = Klinische Psychologie; PAEPS = Pädagogische Psychologie.

Tabelle A5a

*Konfirmatorische Faktorenanalysen des MOMI-Modells getrennt für die beiden Erhebungsmodi pro Anwendungsbereich*

| | $\chi^2$ | *df* | *χ2/df* | CFI | TLI | RMSEA | SRMR |
|---|---|---|---|---|---|---|---|
| | | | Papier | | | | |
| AOW | 413.652*** | 109 | 3.79 | .976 | .966 | .057 | .024 |
| KLIPS | 475.049*** | 109 | 4.36 | .972 | .961 | .062 | .025 |
| PAEPS | 409.674*** | 109 | 3.76 | .976 | .966 | .057 | .029 |
| | | | Online | | | | |
| AOW | 322.339*** | 109 | 2.96 | .960 | .944 | .081 | .033 |
| KLIPS | 233.569*** | 109 | 2.14 | .968 | .955 | .074 | .036 |
| PAEPS | 340.736*** | 109 | 3.13 | .958 | .940 | .084 | .037 |

*Anmerkungen.* χ2 = Chi-Square; *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis Index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; AOW = Arbeits-, Organisations- und Wirtschaftspsychologie; KLIPS = Klinische Psychologie; PAEPS = Pädagogische Psychologie.
*p < .05. **p < .01. ***p < .001.

Tabelle A5b

*Konfirmatorische Faktorenanalysen des MOMI-Modells getrennt für die beiden Studiengänge Bachelor und Master pro Anwendungsbereich*

| | $\chi^2$ | *df* | *χ2/df* | CFI | TLI | RMSEA | SRMR |
|---|---|---|---|---|---|---|---|
| | | | Bachelor | | | | |
| AOW | 466.725*** | 109 | 4.28 | .969 | .957 | .064 | .029 |
| KLIPS | 478.597*** | 109 | 4.39 | .970 | .958 | .065 | .029 |
| PAEPS | 431.607*** | 109 | 3.96 | .974 | .963 | .061 | .036 |
| | | | Master | | | | |
| AOW | 418.747*** | 109 | 3.84 | .930 | .902 | .089 | .045 |
| KLIPS | 341.673*** | 109 | 3.13 | .940 | .916 | .077 | .061 |
| PAEPS | 299.696*** | 109 | 2.75 | .949 | .929 | .070 | .059 |

*Anmerkungen.* χ2 = Chi-Square; *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis Index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; AOW = Arbeits-, Organisations- und Wirtschaftspsychologie; KLIPS = Klinische Psychologie; PAEPS= Pädagogische Psychologie.
*p < .05. **p < .01. ***p < .001.

Tabelle A6a

*Test auf Messinvarianz zwischen den beiden Erhebungsmodi pro Anwendungsbereich*

| M | $\chi2$ | df | Modell-vergleich | $\Delta SB\chi2$ | $\Delta df$ | CFI | $\Delta$CFI | RMSEA | $\Delta$RMSEA | SRMR | $\Delta$SRMR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AOW | | | | | | |
| k | 511.325*** | 218 | - | - | - | .968 | - | .062 | - | .051 | - |
| m | 530.398*** | 248 | m-k | 20.97 | 30 | .970 | .002 | .067 | .005 | .029 | -.022 |
| s | 556.123*** | 260 | s-m | 25.75* | 12 | .970 | .000 | .061 | -.006 | .038 | .009 |
| ps [a] | 544.528*** | 259 | ps-m | 14.13 | 11 | .971 | .001 | .060 | -.007 | .036 | .007 |
| | | | | | KLIPS | | | | | | |
| k | 525.644*** | 218 | - | - | - | .971 | - | .068 | - | .031 | - |
| m | 537.166*** | 248 | m-k | 15.12 | 30 | .973 | .002 | .062 | -.006 | .035 | .004 |
| s | 566.432*** | 260 | s-m | 29.76** | 12 | .971 | -.002 | .063 | .001 | .040 | .005 |
| ps [b] | 552.564*** | 258 | ps-m | * 14.54 | 10 | .972 | -.001 | .062 | .000 | .037 | .002 |
| | | | | | PAEPS | | | | | | |
| k | 587.138*** | 218 | - | - | - | .964 | - | .075 | - | .036 | - |
| m | 598.555*** | 248 | m-k | 35.82 | 30 | .966 | .002 | .068 | -.007 | .045 | .009 |
| s | 618.224*** | 260 | s-m | 18.90 | 12 | .965 | -.001 | .067 | -.001 | .047 | .002 |

*Anmerkungen.* $\chi2$ = Chi-Square; *df* = degrees of freedom; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; $\Delta SB\chi2$ = Satorra-Bentler scaled chi-square difference test; $\Delta$CFI ≤ .01 (metrisch) und $\Delta$CFI ≤ .10 (skalar), $\Delta$RMSEA ≤ .015; $\Delta$SRMR ≤. 030 (metrisch) und $\Delta$SRMR ≤ .010 (skalar) signalisiert Invarianz zwischen den genesteten Modellen; M = Modell; k = konfigural (invariante Faktorladungen); m = metrisch (invariante Faktorladungen und invariante Itemintercepts); s = skalar (invariante Faktorladungen, invariante Itemintercepts und invariante Residualvarianzen); ps = partiell skalar (invariante Faktorladungen, partiell invariante Itemintercepts und invariante Residualvarianzen).
a. freigesetzte Intercepts Item 7.
b. freigesetzte Intercepts Item 4, 7.
*p < .05. **p < .01. ***p < .001.

Tabelle A6b

*Test auf Messinvarianz zwischen den Studiengängen Bachelor und Master pro Anwendungsbereich*

| M | $\chi2$ | *df* | Modell-vergleich | $\Delta SB\chi2$ | $\Delta df$ | CFI | $\Delta$CFI | RMSEA | $\Delta$ RMSEA | SRMR | $\Delta$SRMR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AOW | | | | | | | |
| k | 763.828*** | 218 | - | - | - | .967 | - | .066 | - | .035 | - |
| m | 792.040*** | 248 | m-k | 38.51 | 30 | .967 | .000 | .062 | -.004 | .043 | .008 |
| s | 827.185*** | 260 | s-m | 34.53** | 12 | .966 | -.001 | .061 | -.001 | .045 | .002 |
| ps[a] | 807.082*** | 257 | ps-m | 12.07 | 9 | .967 | .000 | .061 | -.001 | .044 | .001 |
| | | | | KLIPS | | | | | | | |
| k | 832.685*** | 218 | - | - | - | .964 | - | .070 | - | .042 | - |
| m | 866.632*** | 248 | m-k | 51.70** | 30 | .963 | -.001 | .066 | -.004 | .060 | .018 |
| pm[b] | 846.931*** | 246 | pm-k | 36.10 | 28 | .964 | .000 | .065 | -.005 | .054 | .012 |
| s | 895.132*** | 258 | s-pm | 49.03*** | 12 | .962 | -.002 | .065 | .000 | .058 | .004 |
| ps[c] | 859.019*** | 252 | ps-pm | 11.59 | 6 | .964 | .000 | .065 | .000 | .054 | .000 |
| | | | | PAEPS | | | | | | | |
| k | 735.807*** | 218 | - | - | - | .968 | - | .064 | - | .045 | - |
| m | 808.103*** | 248 | m-k | 75.99*** | 30 | .966 | -.002 | .062 | -002 | .054 | .009 |
| pm[d] | 760.822*** | 240 | pm-k | 33.52 | 22 | .968 | .000 | .061 | -.003 | .042 | -.003 |
| s | 790.368*** | 252 | s-pm | 27.53** | 12 | .967 | -.001 | .061 | .000 | .043 | .001 |
| ps[e] | 776.477*** | 250 | ps-pm | 13.62 | 10 | .968 | .000 | .060 | -.001 | .043 | .001 |

*Anmerkungen.* $\chi2$ = Chi-Square; *df* = degrees of freedom; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; $\Delta SB\chi2$ = Satorra-Bentler scaled chi-square difference test; $\Delta$CFI ≤ .01 (metrisch) und $\Delta$CFI ≤ .10 (scalar), $\Delta$RMSEA ≤ .015; $\Delta$SRMR ≤. 030 (metrisch) und $\Delta$SRMR ≤ .010 (scalar) signalisiert Invarianz zwischen den genesteten Modellen; M = Modell; k = konfigural, (invariante Faktorladungen); m = metrisch (invariante Faktorladungen und invariante Itemintercepts); pm = partiell metrisch (partiell invariante Faktorladungen und invariante Itemintercepts); s = skalar, (invariante Faktorladungen, invariante Itemintercepts und invariante Residualvarianzen); ps = partiell skalar (partiell invariante Faktorladungen, partiell invariante Itemintercepts und invariante Residualvarianzen).

a. freigesetzte Intercepts Item 5, 6, 14.

b. freigesetzte Faktorladung Item 13 auf Faktor Auswahl.

c. freigesetzte Faktorladung Item 13 auf Faktor Auswahl; freigesetzte Intercepts Item 2, 3, 6,12, 13, 14.

d. freigesetzte Faktorladung Item 4,5 auf Faktor Diagnostik, Item 10 auf Faktor Intervention, Item 13 auf Faktor Auswahl, Item 4,9 auf Faktor Konstruktion, Item 5,6 auf Faktor Durchführung.

e. freigesetzte Faktorladung Item 4,5 auf Faktor Diagnostik, Item 10 auf Faktor Intervention, Item 13 auf Faktor Auswahl, Item 4,9 auf Faktor Konstruktion, Item 5,6 auf Faktor Durchführung; freigesetzte Intercepts Item 6, 10.

*p* < .05. **p < 01. ***p < .001.

Tabelle A6c

*Test auf Messinvarianz zwischen den drei Anwendungsbereichen über abhängige Daten*

| M | $\chi2$ | df | Ver-gleich | $\Delta SB\chi2$ | $\Delta df$ | CFI | $\Delta$CFI | RMSEA | $\Delta$ RMSEA | SRMR | $\Delta$SRMR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| k | 7388.224*** | 1191 | - | - | - | .913 | - | .066 | - | .031 | - |
| m | 7601.605*** | 1263 | m-k | 103.29*** | 72 | .911 | -.002 | .065 | -.001 | .034 | .003 |
| pm[a] | 7586.593*** | 1261 | pm-k | 88.22 | 70 | .911 | -.002 | .065 | -.001 | .033 | .002 |
| s | 7700.468*** | 1287 | s-pm | 78.22*** | 26 | .910 | -.001 | .065 | .000 | .034 | .001 |
| ps[b] | 7651.356*** | 1279 | ps-pm | 27.81 | 18 | .911 | .001 | .065 | .000 | .034 | .001 |

*Anmerkungen.* $\chi2$ = Chi-Square; *df* = degrees of freedom; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR=standardized root mean square residual; $\Delta SB\chi2$ = Satorra-Bentler scaled chi-square difference test; $\Delta$CFI ≤ .01 (metrisch) und $\Delta$CFI ≤ .10 (scalar), $\Delta$RMSEA ≤ .015; $\Delta$SRMR ≤ .030 (metrisch) und $\Delta$SRMR ≤ .010 (scalar) signalisiert Invarianz zwischen den genesteten Modellen; k = konfigural (invariante Faktorladungen); m = metrisch (invariante Faktorladungen und invariante Itemintercepts); pm = partiell metrisch (partiell invariante Faktorladungen und invariante Itemintercepts); s = skalar (partiell invariante Faktorladungen, invariante Itemintercepts und invariante Residualvarianzen); ps = partiell skalar (partiell invariante Faktorladungen, partiell invariante Itemintercepts und invariante Residualvarianzen).

a. freigesetzte Faktorladung Item 1 auf Faktor Auswahl in AOW und KLIPS.

b. freigesetzte Faktorladung Item 1 auf Faktor Auswahl in AOW und KLIPS; freigesetzte Intercepts Item 1, 5, 6, 10, 11 in KLIPS; Item 12 in AOW.

*p < .05. **p < .01. ***p < .001.

Tabelle A7a

*Ergebnisse der multivariaten Varianzanalysen (MANOVA) für die Inhaltsfaktoren pro Anwendungsbereich*

| Faktor | Semester-vergleich | | AOW Mittlere Differenz | $p$ | KLIPS Mittlere Differenz | $p$ | PAEPS Mittlere Differenz | $p$ |
|---|---|---|---|---|---|---|---|---|
| Inhaltsfaktor Diagnostik | 1 | 2 | 0.21 | .06 | 0.25 | .02 | 0.16 | .26 |
| | | 3 | -0.38 | .00 | -0.32 | .00 | -0.41 | .00 |
| | | 4 | -0.26 | .01 | -0.22 | .05 | -0.25 | .01 |
| | | 5 | -0.28 | .05 | -0.36 | .00 | -0.30 | .02 |
| | 2 | 3 | -0.58 | .00 | -0.57 | .00 | -0.57 | .00 |
| | | 4 | -0.47 | .00 | -0.47 | .00 | -0.41 | .00 |
| | | 5 | -0.48 | .00 | -0.61 | .00 | -0.46 | .00 |
| | 3 | 4 | 0.12 | .63 | 0.102 | .75 | 0.07 | .29 |
| | | 5 | 0.10 | .87 | -0.04 | .10 | 0.09 | .84 |
| | 4 | 5 | -0.01 | 1.0 | -0.14 | .72 | -0.05 | .99 |
| Inhaltsfaktor Intervention | 1 | 2 | 0.07 | .22 | 0.08 | .04 | .026 | .94 |
| | | 3 | -0.07 | .13 | -0.00 | 1.0 | -0.07 | .08 |
| | | 4 | -0.09 | .04 | -0.02 | .90 | -0.10 | .02 |
| | | 5 | -.09 | .21 | -0.05 | .63 | -0.09 | .22 |
| | 2 | 3 | -0.13 | .00 | -0.08 | .04 | -0.10 | .03 |
| | | 4 | -0.15 | .00 | -1.00 | .01 | -0.12 | .01 |
| | | 5 | -0.15 | .00 | -0.12 | .01 | -0.11 | .09 |
| | 3 | 4 | -0.02 | .97 | -0.02 | .94 | -0.02 | .95 |
| | | 5 | -0.02 | .99 | -0.05 | .69 | -0.02 | 1.0 |
| | 4 | 5 | 0.00 | 1.0 | 0.02 | .97 | 0.01 | 1.0 |
| Inhaltsfaktor Forschung/Evaluation | 1 | 2 | 0.03 | .85 | 0.04 | .07 | 0.03 | .91 |
| | | 3 | -0.11 | .00 | -0.01 | .86 | -0.09 | .01 |
| | | 4 | -0.07 | .15 | -0.02 | .81 | -0.09 | .03 |
| | | 5 | -0.09 | .16 | -0.07 | 1.0 | -0.14 | .00 |
| | 2 | 3 | -0.14 | .00 | -0.06 | .01 | -0.12 | .00 |
| | | 4 | -0.10 | .03 | -0.06 | .01 | -0.12 | .01 |
| | | 5 | -0.12 | .04 | -0.05 | .19 | -0.17 | .00 |
| | 3 | 4 | 0.04 | .77 | -0.00 | 1.0 | 0.00 | 1.0 |
| | | 5 | 0.02 | .99 | 0.01 | 1.0 | -0.05 | .73 |
| | 4 | 5 | -0.02 | .99 | 0.011 | .99 | -0.06 | .73 |

*Anmerkungen.* 1 = Bachelorsemester 1-2; 2 = Bachelorsemester 3-4; 3 = Bachelorsemester > 5; 4 = Mastersemester 1-2; 5 = Mastersemester > 5.
*p* < .05. **p* < .01. ***p* < .001.

Tabelle A7b

*Ergebnisse der multivariaten Varianzanalysen (MANOVA) für die Operationsfaktoren pro Anwendungsbereich*

| Faktor | Semester-vergleich | | AOW Mittlere Differenz | $p$ | KLIPS Mittlere Differenz | $p$ | PAEPS Mittlere Differenz | $p$ |
|---|---|---|---|---|---|---|---|---|
| Operationsfaktor Konstruktion | 1 | 2 | -0.31 | .00 | -0.35 | .00 | -0.34 | .00 |
| | | 3 | -0.84 | .00 | -1.09 | .00 | -0.91 | .00 |
| | | 4 | -1.00 | .00 | -1.17 | .00 | -0.98 | .00 |
| | | 5 | -1.22 | .00 | -1.62 | .00 | -1.27 | .00 |
| | 2 | 3 | -0.53 | .00 | -0.74 | .00 | -0.57 | .00 |
| | | 4 | -0.69 | .00 | -0.82 | .00 | -0.64 | .00 |
| | | 5 | 0-.91 | .00 | -1.27 | .00 | -0.93 | .00 |
| | 3 | 4 | -0.16 | .23 | -0.08 | .88 | -0.07 | .91 |
| | | 5 | -0.38 | .00 | -0.53 | .00 | -0.35 | .01 |
| | 4 | 5 | -0.22 | .23 | -0.45 | .00 | -0.29 | .04 |
| Operationsfaktor Durchführung | 1 | 2 | -0.49 | .00 | -0.66 | .00 | -0.53 | .00 |
| | | 3 | -1.64 | .00 | -1.87 | .00 | -1.74 | .00 |
| | | 4 | -1.89 | .00 | -2.05 | .00 | -1.88 | .00 |
| | | 5 | -2.03 | .00 | -2.42 | .00 | -2.16 | .00 |
| | 2 | 3 | -1.15 | .00 | -1.24 | .00 | -1.21 | .00 |
| | | 4 | -1.40 | .00 | -1.42 | .00 | -1.35 | .00 |
| | | 5 | -1.54 | .00 | -1.79 | .00 | -1.63 | .00 |
| | 3 | 4 | -0.25 | .21 | -0.18 | .57 | -0.14 | .71 |
| | | 5 | -0.39 | .06 | -0.55 | .00 | -0.42 | .02 |
| | 4 | 5 | -0.15 | .89 | 0.37 | .13 | -0.29 | .30 |
| Berufliche Selbstwirksam-keitserwartung | 1 | 2 | -54.32 | .97 | -64.90 | .95 | -111.32 | .66 |
| | | 3 | -595.07 | .00 | -719.50 | .00 | -709.18 | .00 |
| | | 4 | -744.12 | .00 | -880.00 | .00 | -683.94 | .00 |
| | | 5 | -816.75 | .00 | -1168.56 | .00 | -1008.98 | .00 |
| | 2 | 3 | -540.74 | .00 | -654.59 | .00 | -597.86 | .00 |
| | | 4 | -689.79 | .00 | -815.09 | .00 | -572.62 | .00 |
| | | 5 | -762.42 | .00 | -1103.66 | .00 | -897.66 | .00 |
| | 3 | 4 | -149.05 | .32 | -160.50 | .31 | 25.24 | 1.0 |
| | | 5 | -221.68 | .21 | -449.07 | .00 | -299.80 | .03 |
| | 4 | 5 | -72.63 | .96 | -288.57 | .08 | -325.04 | .02 |
| Akademisches Selbstkonzept | 1 | 2 | -209.19 | .39 | -215.27 | .42 | -260.39 | .19 |
| | | 3 | -1121.68 | .00 | -1414.72 | .00 | -1340.05 | .00 |
| | | 4 | -1589.75 | .00 | -1774.06 | .00 | -1558.09 | .00 |
| | | 5 | -1516.04 | .00 | -2053.10 | .00 | -1774.50 | .00 |
| | 2 | 3 | -912.50 | .00 | -1199.45 | .00 | -1079.65 | .00 |
| | | 4 | -1380.57 | .00 | -1558.80 | .00 | -1297.70 | .00 |
| | | 5 | -1306.86 | .00 | -1837.83 | .00 | -1514.11 | .00 |
| | 3 | 4 | -468.07 | .00 | -359.35 | .02 | -218.04 | .32 |
| | | 5 | -394.36 | .06 | -638.38 | .00 | -434.45 | .03 |
| | 4 | 5 | 73.71 | .99 | -279.04 | .44 | -216.41 | .66 |

*Anmerkungen.* 1 = Bachelorsemester 1-2; 2 = Bachelorsemester 3-4; 3 = Bachelorsemester > 5; 4 = Mastersemester 1-2; 5 = Mastersemester > 5.

*p* < .05. **p* < .01. ***p* < .001.
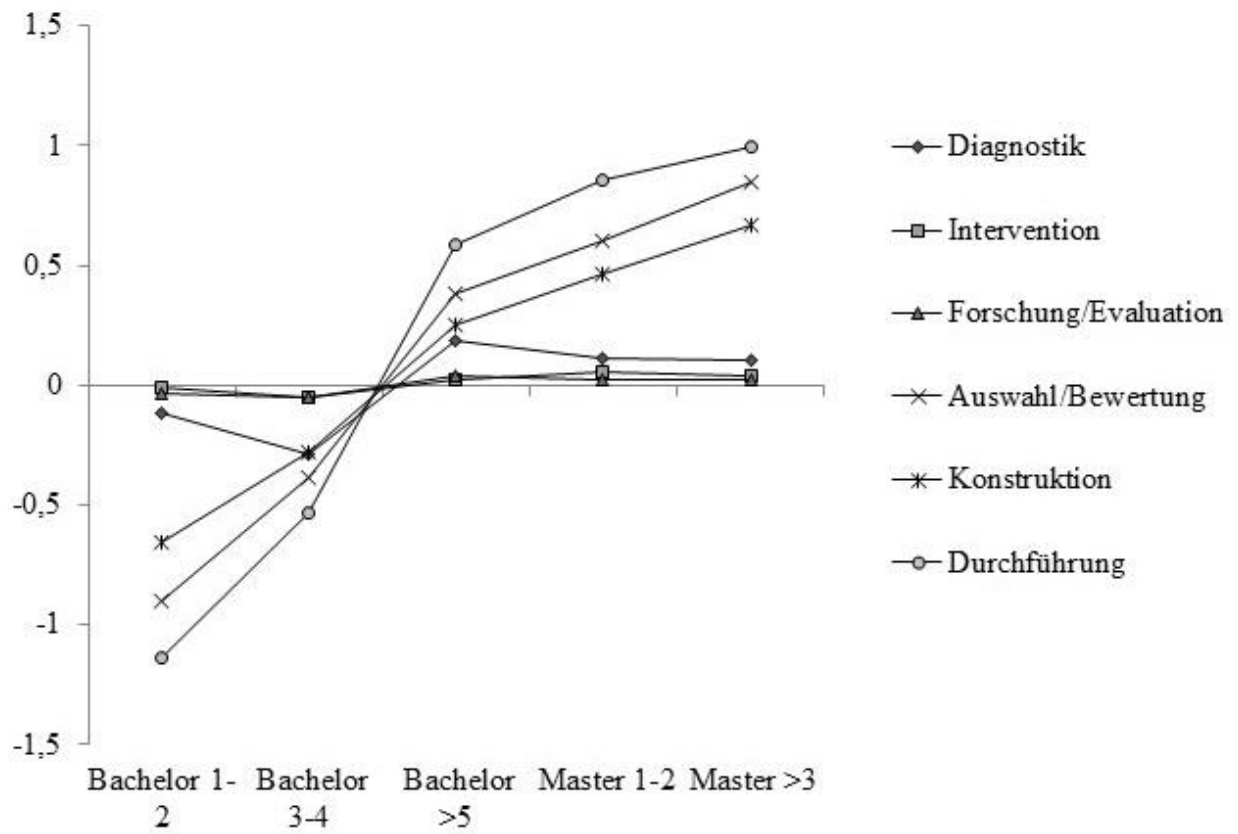
*Abbildung A8a.* Mittelwerte der Selbstwirksamkeitserwartung im Studienverlauf im Anwendungsbereich Arbeit-, Organisations- und Wirtschaftspsychologie
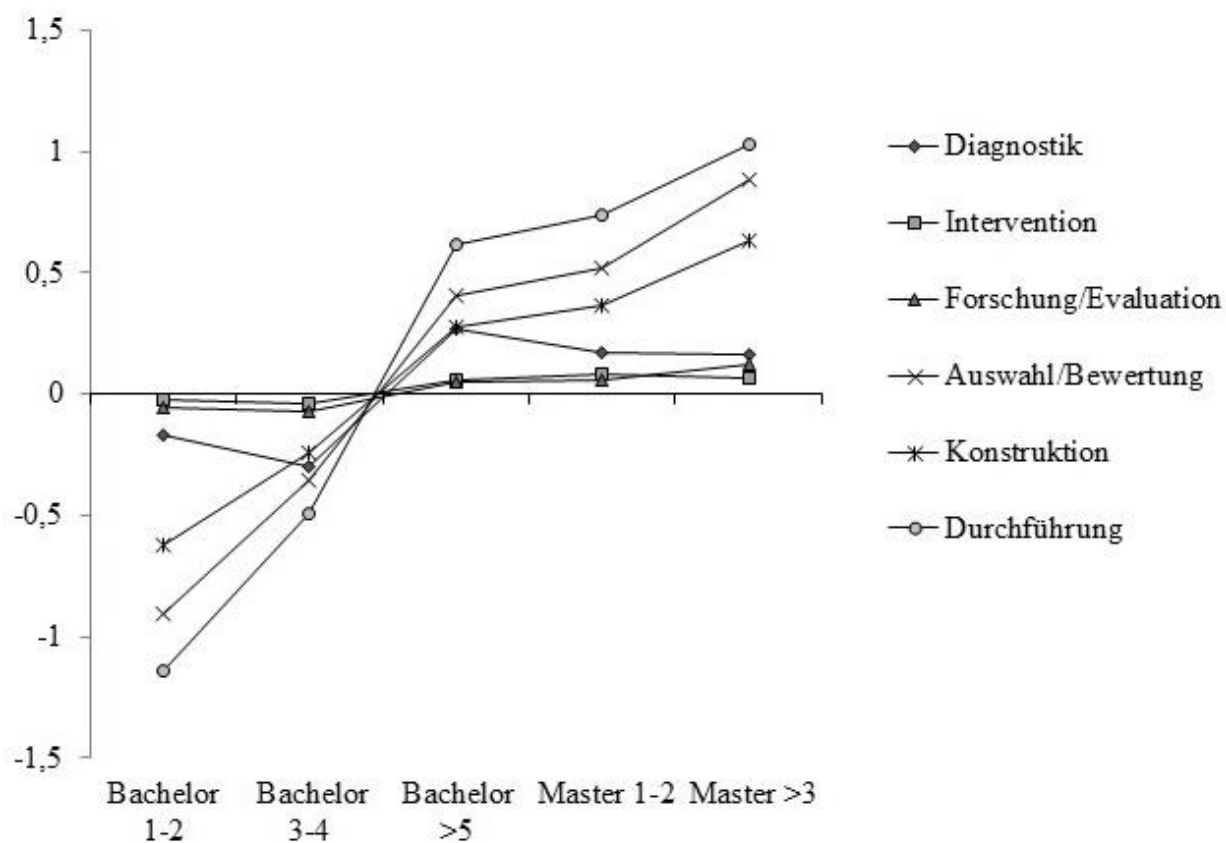
*Abbildung A8b.* Mittelwerte der Selbstwirksamkeitserwartung im Studienverlauf im Anwendungsbereich Klinische Psychologie
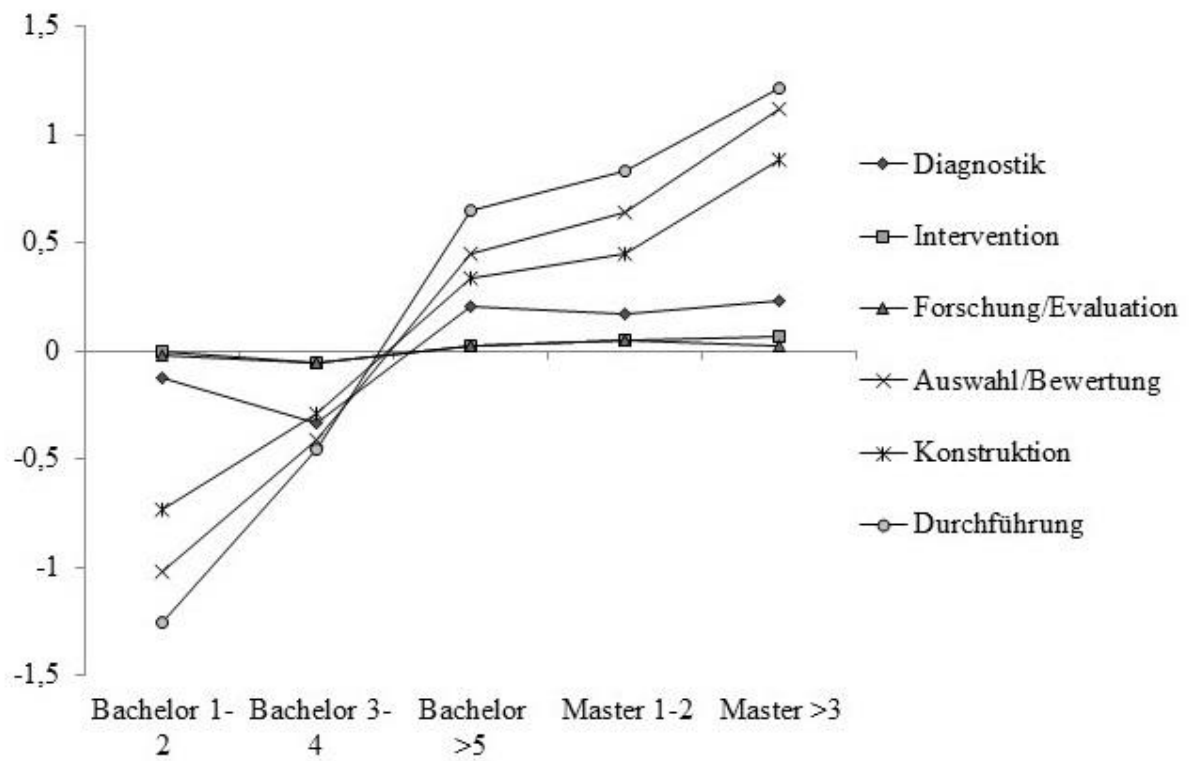
*Abbildung A8c*. Mittelwerte der Selbstwirksamkeitserwartung im Studienverlauf im Anwendungsbereich Pädagogische Psychologie

# Appendix B

Table B1

*Standardized factor loadings of academic self-concept items as obtained in Model 1 through Model 2*

| Item | IO-ASC | Clin-ASC | Edu-ASC | Stat-ASC | g-ASC |
|------|--------|----------|---------|----------|-------|
| W1 | .85/.79 | | | | |
| W2 | .93/.83 | | | | |
| W3 | .98/.94 | | | | |
| C1 | | .87/.76 | | | |
| C2 | | .96/.80 | | | |
| C3 | | .99/.92 | | | |
| E1 | | | .88/.83 | | |
| E2 | | | .93/.82 | | |
| E3 | | | .98/.90 | | |
| S1 | | | | 1.0/.87 | |
| S2 | | | | 1.0/.87 | |
| S3 | | | | .99/.97 | |
| G1 | | | | | 1.0/.89 |
| G2 | | | | | 1.0/.73 |
| G3 | | | | | 1.0/.96 |

*Note.* IO-ASC = academic self-concept in industrial, and organizational psychology; Clin-ASC = academic self-concept in clinical psychology; Edu-ASC = academic self-concept in educational psychology; Stat-ASC = academic self-concept in statistics; g-ASC = general academic self-concept in undergraduate psychology courses. All factor loadings were statistically significantly different from zero, $p < .001$.

Table B2

*Standardized factor loadings of academic self-concept items as obtained in Model 3 and within the internal/external frame-of-reference model*

| Item | IO-ASC | Clin-ASC | Edu-ASC | Stat-ASC | g-ASC |
|------|--------|----------|---------|----------|-------|
| W1 | .70/.71 | | | | .41/.35 |
| W2 | 79/.80 | | | | .27/.19 |
| W3 | .88/.87 | | | | .33/.24 |
| C1 | | .68/.71 | | | .38/.47 |
| C2 | | .79/.79 | | | .21/.31 |
| C3 | | .86/.85 | | | .32/.42 |
| E1 | | | .76/.78 | | .37/.32 |
| E2 | | | .78/.77 | | .27/.22 |
| E3 | | | .84/.83 | | .31/.25 |
| S1 | | | | .69/.73 | .44/.35 |
| S2 | | | | .78/.80 | .35/.24 |
| S3 | | | | .85/.86 | .46/.33 |
| G1 | | | | | .89/.91 |
| G2 | | | | | .71/.71 |
| G3 | | | | | .95/.93 |

*Note.* IO-ASC = academic self-concept in industrial, and organizational psychology; Clin-ASC = academic self-concept in clinical psychology; Edu-ASC=academic self-concept in educational psychology; Stat-ASC = academic self-concept in statistics; g-ASC = general academic self-concept in undergraduate

# Appendix C

Table C1a

*Vignettes describing the factors of assessment, intervention, and research/evaluation in the domain of industrial and organizational psychology psychology*

| |
|---|
| Imagine that after completing your psychology studies you are working for an employer who specializes in personnel and organizational diagnostics. In your work, you will be involved in the assessment and analysis of personnel selection, personnel development, and organizational development. For example, you will assess variables such as leadership skills, teamwork ability, job satisfaction, job motivation, or workload and stress factors. As methods you use questionnaires, standardized interviews, systematic behavioral observation, and psychological tests. |
| Imagine that after completing your psychology studies you are working for an employer who specializes in consulting organizations and implementing interventions in the field of human resources and organizational development. This includes, for example, advanced training courses for both employees and managerial staff as well as seminars on the subject of time management and the corresponding training courses. Further examples of interventions are optimization measures for the design of workplaces and workflows as well as for team processes. |
| Imagine that after completing your psychology studies you are working for an employer who specializes in research and evaluation in the field of industrial and organizational psychology. You will be involved in research and evaluation projects. In research projects, you will gain new empirical insights based on previous research, for example, in the areas of teamwork, work motivation, and stress management. In evaluation projects, you will examine the effectiveness of measures, for example, in the areas of communication, job safety, and teamwork. |

Table C1b

*Vignettes describing the factors assessment, intervention, and research/evaluation in the domain of clinical psychology*

Imagine that after completing your psychology studies you are working for an employer who specializes in the diagnosis of mental health problems. As part of your work you will be involved in the classificatory, biographical, and functional assessment of indications as well as progression and process assessment. You will also be responsible for evaluating the effectiveness of therapeutic measures. The mental problems range from anxiety disorders, eating disorders, and affective disorders to personality disorders. As methods you use standardized interviews and test procedures, systematic behavioral observation as well as guidance and counseling techniques.

Imagine that after completing your psychology studies you are working for an employer who specializes in the preventative care of mental disorders, counseling those affected by mental health problems as well as recommending suitable therapies. In your work, you will be involved in the counseling and adjustment processes of the affected persons, their family members, and other interested parties. This includes identifying and providing the appropriate therapy and promoting good health through preventative, supportive, and rehabilitative measures. For example, you are expected to counsel clients and their relatives in crisis situations or be able to intervene in case of relationship problems and social conflict situations.

Imagine that after completing your psychology studies you are working for an employer who specializes in research and evaluation in the field of clinical psychology. You will be involved in research and evaluation projects. In the research projects, you will gain new empirical knowledge based on the extant scientific research. This can include counseling and psychotherapy or specific disorders such as depression and schizophrenia. In evaluation projects, you will examine the effectiveness of measures such as anti-smoking campaigns, new counseling techniques, or psychoeducational practices.

Table C1c

*Vignettes describing the factors assessment, intervention, and research/evaluation in the domain of educational psychology*

Imagine that after completing your psychology studies you are working for an employer who specializes in the prerequisites and outcomes of learning and achievement in the fields of education and training. In your work, you will focus on the assessment of needs, constraints, and potentials of both students and teachers, on the identification of learning processes and outcomes, and on the evaluation of learning environment characteristics. As methods you use questionnaires, standardized interviews, systematic behavioral observations, and psychological test procedures.

Imagine that after completing your psychology studies you are working for an employer who specializes in supporting students and teachers as well as assisting them in their educational activities. In your work, you will be involved in counseling and training students, parents/guardians, families, teachers, and educational staff. This includes educational guidance, learning guidance, counseling of socioemotional problems in the educational context (e.g., bullying), as well as training of learning skills, parenting competence (e.g., parent training), or socioemotional skills (e.g., violence prevention).

Imagine that after completing your psychology studies you are working for an employer who specializes in research and evaluation in the field of educational psychology. In your work, you will be involved in research and evaluation projects. In the research projects you will gain new empirical knowledge on the basis of previous research, for example, in the areas of designing learning environments, assessing competences, or predicting performance. In evaluation projects, you will examine the effectiveness of measures such as training programs to promote social skills or methods for optimizing learning environments
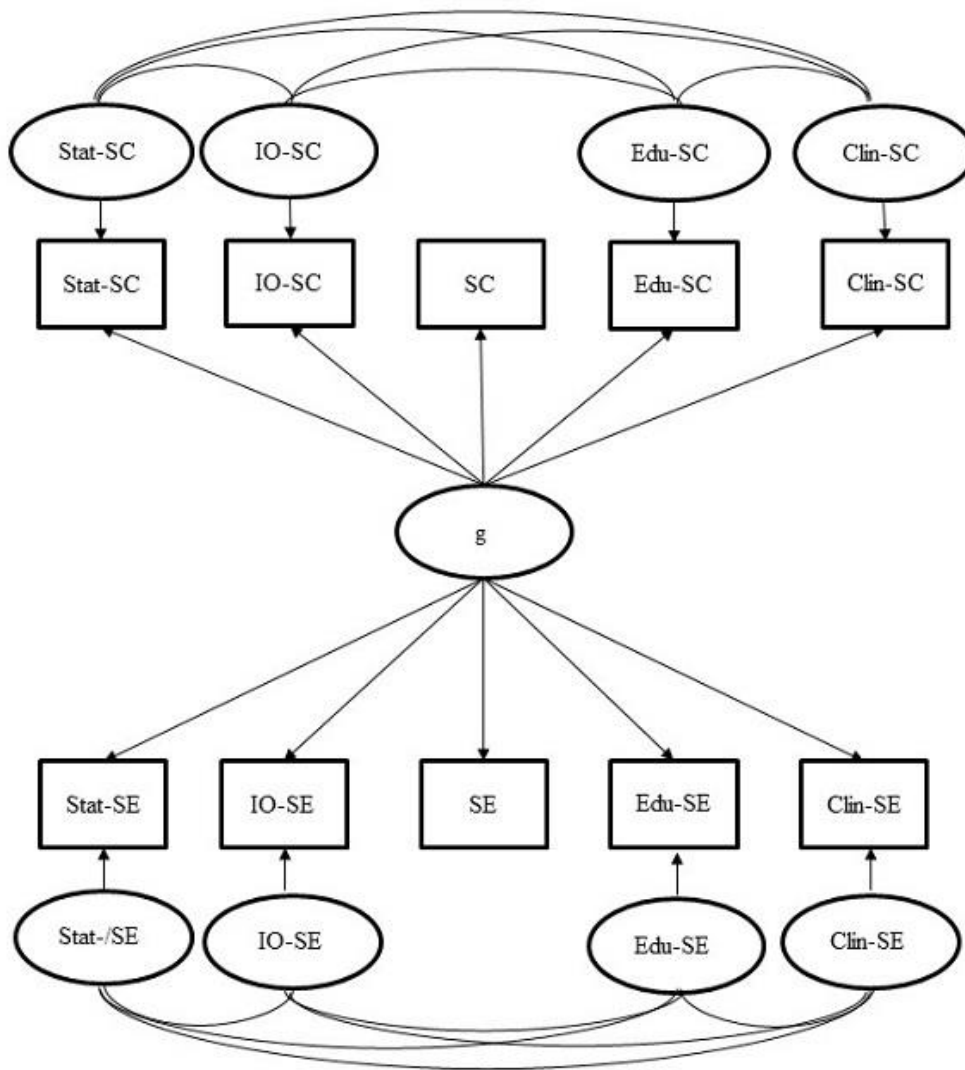
*Figure C2.* Common incomplete bifactor model (C-IBF) with one common g-factor. SC = Self-concept; SE = Self-efficacy; Stat = Statistics; IO = Industrial, and Organizational psychology; Edu = Educational psychology; Clin = Clinical psychology; GSC = General self-concept; GSE = General self-efficacy; g = General factor.

Table C3

*Descriptive statistics of the test scales (N = 1243)*

|  | *N* | *M* | *SD* | Min | Max | α |
|---|---|---|---|---|---|---|
| Self-concept clinical psychology | 1107 | 3.63 | 1.49 | 1.00 | 6.00 | .951 |
| Self-concept educational psychology | 1111 | 3.50 | 1.41 | 1.00 | 6.00 | .947 |
| Self-concept industrial and organizational | 1101 | 3.19 | 1.41 | 1.00 | 6.00 | .941 |
| Self-concept statistics | 570 | 3.32 | 1.36 | 1.00 | 6.00 | .926 |
| Self-concept general | 1085 | 3.88 | 1.24 | 1.00 | 6.00 | .917 |
| Self-efficacy clinical psychology | 1109 | 3.33 | 1.16 | 1.00 | 6.00 | .868 |
| Self-efficacy educational psychology | 1116 | 3.31 | 1.11 | 1.00 | 6.00 | .869 |
| Self-efficacy industrial and organizational | 1113 | 3.07 | 1.09 | 1.00 | 6.00 | .858 |
| Self-efficacy statistics | 577 | 3.23 | 1.16 | 1.00 | 6.00 | .855 |
| Self-efficacy general | 1101 | 3.60 | 1.06 | 1.00 | 6.00 | .890 |

*Note*. *N* = sample size, *M* = means; *SD* = standard deviation; Min = Minimum; Max = Maximum; α = Cronbach's Alpha

Table C4a

*Measurement invariance of self-concept scales among undergraduate and graduate psychology students and across paper-pencil and web questionnaire*

| | $\chi2$ | *df* | Model comparison | $\Delta SB\chi2$ | $\Delta df$ | CFI | $\Delta$CFI | RMSEA | $\Delta$RMSEA |
|---|---|---|---|---|---|---|---|---|---|
| | | | undergraduate/ graduate | | | | | | |
| | | | SC industrial, and organizational psychology | | | | | | |
| configural (c) | 0.00 | 0 | - | 0.00 | 0 | 1.00 | - | 0.00 | - |
| metric (m) | 1.327 | 2 | m-c | 1.33 | 2 | 1.00 | .00 | .00 | .00 |
| scalar (s) | 79.609*** | 4 | s-m | 86.26*** | 2 | .917 | -.083 | .182 | .182 |
| partial[a] scalar (ps) | 3.114 | 3 | ps-m | 1.84 | 1 | 1.00 | .000 | .008 | .008 |
| | | | SC clinical psychology | | | | | | |
| configural (c) | 0.00 | 0 | - | .00 | - | 1.00 | - | 0.00 | - |
| metric (m) | 3.225 | 2 | m-c | 3.23 | 2 | .999 | -.001 | .033 | .033 |
| scalar (s) | 30.597*** | 4 | s-m | 30.62*** | 2 | .974 | -.025 | .108 | .075 |
| partial[b] scalar (ps) | 11.252 | 3 | ps-m | 9.53* | 1 | .992 | -.007 | .069 | .036 |
| | | | SC educational psychology | | | | | | |
| configural (c) | 0.00 | 0 | - | 0.00 | - | 1.00 | - | .00 | - |
| metric (m) | 0.52 | 2 | m-c | 0.52 | 2 | 1.00 | .00 | .00 | .00 |
| scalar (s) | 42.73*** | 4 | s-m | 41.59*** | 2 | .130 | .130 | .964 | -.036 |
| partial[c] scalar (ps) | 0.67 | 3 | ps-m | 0.14 | 1 | 1.00 | .00 | .00 | .00 |
| | | | SC statistics | | | | | | |
| configural (c) | 0.00 | 0 | - | 0.00 | - | 1.00 | - | .00 | - |
| metric (m) | 3.694 | 2 | m-c | 3.964 | 2 | .998 | -.002 | .054 | .054 |
| scalar (s) | 24.00*** | 4 | s-m | 19.83*** | 2 | .971 | -.027 | .132 | .078 |
| partial[d] scalar (ps) | 3.62 | 3 | ps-m | 0.00 | 1 | .999 | .001 | .027 | -.027 |
| | | | SC General | | | | | | |
| configural (c) | 0.00 | 0 | - | 0.00 | - | 1.00 | - | .00 | - |
| metric (m) | 1.80 | 2 | m-c | 1.80 | 2 | 1.00 | .00 | .00 | .00 |
| scalar (s) | 19.40 | 4 | s-m | 18.61*** | 2 | .987 | -.013 | .084 | .084 |
| partial[e] scalar (ps) | 1.95 | 3 | ps-m | 0.11 | 1 | 1.00 | .00 | .00 | .00 |
| | | | paper-pencil/ web | | | | | | |
| | | | SC industrial, and organizational psychology | | | | | | |
| configural (c) | 0.00 | 0 | - | 0.00 | - | 1.00 | - | 0.00 | - |
| metric (m) | 4.00 | 2 | m-c | 4.00 | 2 | .998 | -.002 | .042 | .042 |
| scalar (s) | 13.01 | 4 | s-m | 8.56* | 2 | .990 | -.008 | .063 | .021 |
| partial[f] scalar (ps) | 4.08 | 3 | ps-m | 2.62 | 1 | .999 | .001 | .025 | -.017 |
| | | | SC clinical psychology | | | | | | |

| | $\chi^2$ | df | | $SB\chi^2$ | df | CFI | $\Delta$CFI | RMSEA | $\Delta$RMSEA |
|---|---|---|---|---|---|---|---|---|---|
| configural (c) | 0.00 | 2 | - | - | - | 1.00 | - | .00 | - |
| metric (m) | 2.82 | 4 | m-c | 2.82 | 2 | .999 | -.001 | .027 | .027 |
| scalar (s) | 2.63 | 2 | s-m | 0.07 | 2 | 1.00 | .00 | .00 | .00 |
| SC educational psychology | | | | | | | | | |
| configural (c) | 0.00 | 2 | - | - | - | 1.00 | - | .00 | - |
| metric (m) | 4.12 | 4 | m-c | 4.12 | 2 | .998 | -.002 | .043 | .043 |
| scalar (s) | 7.19 | 2 | s-m | 3.05 | 2 | .997 | -.001 | .037 | -.006 |
| SC statistics | | | | | | | | | |
| configural (c) | 0.00 | 2 | - | - | - | 1.00 | - | .00 | - |
| metric (m) | 0.29 | 4 | m-c | 0.29 | 2 | 1.00 | .00 | .00 | .00 |
| scalar (s) | 8.28 | 2 | s-m | 6.28* | 2 | .993 | -.007 | .061 | .061 |
| partial[g] scalar (ps) | 0.78 | 3 | ps-m | 0.44 | 3 | 1.00 | .00 | .00 | .00 |
| SC General | | | | | | | | | |
| configural (c) | 0.00 | 0 | - | - | - | 1.00 | - | .00 | - |
| metric (m) | 4.76 | 2 | m-c | 4.58 | 2 | .098 | -.002 | .050 | .050 |
| scalar (s) | 10.52 | 4 | s-m | 5.75 | 2 | .094 | -.004 | .055 | .005 |

*Note.* SC = Self-conept; $\chi2$ = Chi-Square; *df* = degrees of freedom; CFI = comparative fit index; RMSEA = root mean square error of approximation; SB$\chi2$ = Satorra-Bentler scaled chi-square difference test; $\Delta$CFI $\geq$ $|$.0.10$|$, $\Delta$RMSEA $\geq$ $|$.015$|$ signal lack of invariance between nested models; configural = factor loadings are invariant; metric = factor loadings and intercepts are invariant; scalar = factor loadings, intercepts, and residuals are invariant, partial scalar = factor loadings, and residuals are invariant, intercepts are partial invariant.
[a]Intercept I1 released.
[b]Intercept C1 released.
[c]Intercept E1 released.
[d]Intercept S1 released.
[e]Intercept G1 released.
[f]Intercept I1 released.
[g]Intercept S3 released.
*p < .05. **p < .01. ***p < .001.

Table C4b

*Measurement invariance of self-efficacy scales among undergraduate and graduate psychology students and across paper-pencil and web questionnaire*

| | $\chi^2$ | *df* | Model comparison | $\Delta SB\chi^2$ | $\Delta df$ | CFI | $\Delta$CFI | RMSEA | $\Delta$ RMSEA |
|---|---|---|---|---|---|---|---|---|---|
| undergraduate/ graduate | | | | | | | | | |
| SE industrial, and organizational psychology | | | | | | | | | |
| configural (c) | 44.72 | 4 | - | 0.00 | - | .969 | - | .135 | - |
| metric (m) | 57.63 | 7 | m-c | 7.14 | 3 | .962 | -.007 | .114 | -.019 |
| scalar (s) | 76.26 | 10 | s-m | 17.81*** | 3 | .950 | -.012 | .109 | -.005 |
| partial[a] scalar (ps) | 65.10 | 9 | ps-m | 5.45 | 2 | .958 | -.004 | .105 | -.009 |
| SE clinical psychology | | | | | | | | | |
| configural (c) | 78.29 | 4 | - | - | - | .942 | - | .182 | - |
| metric (m) | 85.20 | 7 | m-c | 0.82 | 3 | .939 | -.003 | .141 | -.041 |
| scalar (s) | 100.34 | 10 | s-m | 13.12** | 3 | .929 | -.010 | .127 | -.014 |
| partial[b] scalar (ps) | 91.58 | 9 | ps-m | 4.98 | 2 | .935 | -.004 | .128 | -.013 |
| SE educational psychology | | | | | | | | | |
| configural (c) | 61.55 | 4 | - | - | - | .959 | - | .160 | - |
| metric (m) | 74.34 | 7 | m-c | 2.68 | 3 | .952 | -.007 | .141 | -.019 |
| scalar (s) | 88.75 | 10 | s-m | 12.61** | 3 | .944 | -.008 | .118 | -.023 |
| partial[c] scalar (ps) | 76.59 | 8 | ps-m | 0.23 | 1 | .951 | -.001 | .123 | -.018 |
| SE statistics | | | | | | | | | |
| configural (c) | 46.35 | 4 | - | - | - | .950 | - | .190 | - |
| metric (m) | 52.42 | 7 | m-c | 3.54 | 3 | .946 | -.004 | .149 | -.041 |
| scalar (s) | 72.43 | 10 | s-m | 19.85*** | 3 | .926 | -.020 | .146 | -.003 |
| partial[d] scalar (ps) | 54.47 | 9 | ps-m | 0.25 | 2 | .945 | -.001 | .141 | -.008 |
| SE General | | | | | | | | | |
| configural (c) | 75.40 | 4 | - | - | - | .942 | - | .179 | - |
| metric (m) | 88.65 | 7 | m-c | 6.77 | 3 | .934 | -.008 | .145 | -.034 |
| scalar (s) | 112.79 | 10 | s-m | 22.05*** | 3 | .917 | -.017 | .136 | -.009 |
| partial[e] scalar (ps) | 92.126 | 8 | ps-m | 0.37 | 1 | .932 | -.002 | .137 | -.008 |
| paper-pencil/ web | | | | | | | | | |
| SE industrial, and organizational psychology | | | | | | | | | |
| configural (c) | 49.34 | 4 | - | - | - | .966 | - | .143 | - |
| metric (m) | 59.00 | 7 | m-c | 5.77 | 2 | .961 | -.005 | .116 | -.027 |
| scalar (s) | 83.36 | 10 | s-m | 24.15*** | 2 | .945 | -.016 | .115 | -.001 |
| partial[f] scalar (ps) | 61.31 | 8 | ps-m | 1.09 | 1 | .960 | -.001 | .109 | -.007 |
| SE clinical psychology | | | | | | | | | |

| | $\chi2$ | df | | SB$\chi2$ | df | CFI | $\Delta$CFI | RMSEA | $\Delta$RMSEA |
|---|---|---|---|---|---|---|---|---|---|
| configural (c) | 109.05 | 4 | - | - | - | .933 | - | .217 | - |
| metric (m) | 132.44 | 7 | m-c | 10.38* | 3 | .920 | -.013 | .179 | -.038 |
| partial[g] metric | 121.33 | 6 | pm-c | 3.91 | 2 | .927 | .007 | .186 | -.031 |
| scalar (s) | 168.64 | 9 | s-pm | 45.33*** | 3 | .899 | -.028 | .179 | -.007 |
| partial[h] scalar (ps) | 122.89 | 7 | ps-pm | 0.06 | 1 | .926 | -.001 | .172 | -.014 |
| **SE educational psychology** | | | | | | | | | |
| configural (c) | 72.34 | 4 | - | - | - | .953 | - | .175 | - |
| metric (m) | 90.62 | 7 | m-c | 10.25* | 3 | .942 | -.011 | .146 | -.029 |
| partial[i] metric | 81.85 | 6 | pm-c | .091 | 2 | .948 | -.005 | .150 | -.025 |
| scalar (s) | 114.52 | 9 | s-pm | 32.07*** | 3 | .927 | -.021 | .145 | -.005 |
| partial[j] scalar (ps) | 82.33 | 7 | ps-pm | 1.68 | 2 | .948 | .000 | .139 | -.011 |
| **SE statistics** | | | | | | | | | |
| configural (c) | 49.11 | 4 | - | - | | .956 | - | .169 | - |
| metric (m) | 58.35 | 7 | m-c | 2.78 | | .949 | 3 | .158 | -.011 |
| scalar (s) | 65.42 | 10 | s-m | 5.45 | | .945 | 3 | .137 | -.022 |
| **SE General** | | | | | | | | | |
| configural (c) | 293.07 | 4 | - | - | | .780 | - | .361 | - |
| metric (m) | 132.77 | 7 | m-c | 1.33 | | .904 | 3 | .180 | -.181 |
| scalar (s) | 162.77 | 10 | s-m | 23.26*** | | .884 | 3 | .166 | -.014 |
| partial[k] scalar (ps) | 137.60 | 8 | ps-m | 1.78 | | .901 | 1 | .171 | -.009 |

*Note.* SE = Self-efficacy; $\chi2$ = Chi-Square (all p < .001); *df* = degrees of freedom; CFI = comparative fit index; RMSEA = root mean square error of approximation; SB$\chi2$ = Satorra-Bentler scaled chi-square difference test; $\Delta$CFI $\geq$ |.0.10|, $\Delta$RMSEA $\geq$ |.015| signal lack of invariance between nested models; configural = factor loadings are invariant; metric = factor loadings and intercepts are invariant; scalar = factor loadings, intercepts, and residuals are invariant, partial scalar = factor loadings, and residuals are invariant, intercepts are partial invariant.
[a]Intercept I1 released.
[b]Intercept C3 released.
[c]Intercept E3, E4 released.
[d]Intercept S, S3 released.
[e]Intercept G3, G4 released.
[f]Intercept I1, I3 released.
[g]Item C1 released.
[h]Intercept C1, C3 released.
[i]Item E2 released.
[j]Intercept E1, E3 released.
[k]Intercept G2, G4 released.
*p < .05. **p < .01. ***p < .001.

Table C5

*Standardized factor loadings of academic self-concept/ self-efficacy items as obtained in Model 1d.*

| Item | IO-SC/ SE | Clin-SC/ SE | Edu-SC/ SE | Stat-SC/ SE | g-SC/ SE |
|------|-----------|-------------|------------|-------------|----------|
| I1 | .66/.55 | | | | .59/.57 |
| I2 | 75/.47 | | | | .49/.55 |
| I3 | .79/.49 | | | | .56/.51 |
| I4 | - /.58 | | | | - /.58 |
| C1 | | .70/.52 | | | .60/.64 |
| C2 | | .75/.55 | | | .52/.58 |
| C3 | | .76/.47 | | | .58/.55 |
| C4 | | - /.56 | | | - /.60 |
| E1 | | | .71/.57 | | .58/.57 |
| E2 | | | .73/.58 | | .54/.55 |
| E3 | | | .77/.48 | | .56/.55 |
| E4 | | | - /.57 | | - /.59 |
| S1 | | | | .58/.67 | .65/.47 |
| S2 | | | | .69/.71 | .55/.54 |
| S3 | | | | .74/.60 | .61/.61 |
| S4 | | | | - /.53 | - /.55 |
| G1 | | | | | .90/.81 |
| G2 | | | | | .80/.77 |
| G3 | | | | | .97/.73 |
| G4 | | | | | - /.77 |

*Note.* IO-SC/ SE = Self-concept/ self-efficacy in industrial, and organizational psychology; Clin-SC/ SE = Self-concept/ self-efficacy in clinical psychology; Edu-SC/ SE = Self-concept/ self-efficacy in educational psychology; Stat-SC/ SE = Self-concept/ self-efficacy in statistics; g-SC/ SE = General self-concept/ self-efficacy in undergraduate psychology courses. All factor loadings were statistically significantly different from zero, *p* < .001.

Table C6

*Correlations between ASC and SE factors within the common IBF model with two g-factors (Model 2b)*

| | SC IO | SC Clin | SC Edu | SC Stat | SC General | SE IO | SE Clin | SE Edu |
|---|---|---|---|---|---|---|---|---|
| SC IO | | | | | | | | |
| SC Clin | .534*** | | | | | | | |
| SC Edu | .559*** | .709*** | | | | | | |
| SC Stat | -.031 | -.201*** | -.113* | | | | | |
| SC General | - | - | - | - | | | | |
| SE IO | .683*** | .278*** | .358*** | -.010 | .032 | | | |
| SE Clin | .312*** | .630*** | .414*** | -.211*** | .008 | .368*** | | |
| SE Edu | .289*** | .370*** | .569*** | -.102* | .054 | .446*** | .498*** | |
| SE Stat | -.056 | -.175*** | -.145** | .606*** | .153*** | .241*** | -.001 | .097 |
| SE General | .224*** | .246*** | .205*** | .001 | .607*** | - | - | - |

*Note*. IO = Industrial and Organizational psychology; Clin = Clinical psychology; Edu = Educational psychology; Stat = Statistics

*p < .05. **p < .01. ***p < .001

# Eidesstattliche Erklärung

Ich erkläre hiermit, dass ich die vorliegende Arbeit ohne unzulässige Hilfe Dritter und ohne Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe. Die aus anderen Quellen direkt oder indirekt übernommenen Daten und Konzepte sind unter Angabe der Quellen gekennzeichnet. Die Arbeit wurde bisher weder im In- noch im Ausland in gleicher oder ähnlicher Form einer anderen Prüfungsbehörde vorgelegt.

Ich versichere die Richtigkeit der vorangegangenen Erklärung und bin mir der strafrechtlichen Folgen einer Falschaussage bewusst.

Trier, den 18. Dezember 2017                               Henrike Marie Peiffer, M.Sc