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Dipl.-Psych. Heike Dietrich

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Dean: Prof. Dr. Dirk Hagemann
Advisor: Prof. Dr. Birgit Spinath

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SUMMARY

Research indicates that SES is relevant for students' educational decisions and outcomes and that people's justice perceptions are important for their performance and behavior. However, in Germany, the role of SES has received little attention in the area of higher education. In addition, justice perceptions are often not considered in higher educational contexts. The current dissertation tried to fill both voids—by seeking to extend the knowledge and understanding of the roles of students' SES and students' justice perceptions in social science study programs. The first study in this dissertation addressed the question of whether first-semester social science students' objective SES would be related to the characteristics students brought to their study programs. The second study addressed the questions of whether psychology students' objective SES would predict their academic achievement and whether psychology students' subjective SES would explain additional variance beyond objective SES. In addition, different measures of subjective SES were investigated. The third study addressed the question of whether psychology students' justice perceptions could be assessed with a questionnaire that originated in organizational psychology. In addition, associations between students' justice perceptions and student characteristics were investigated. The main results of the studies revealed that objective SES was associated with only some of the characteristics students brought to their studies (e.g., school grades, number of hours spent working side jobs) but not others (e.g., intelligence). In addition, objective SES and most measures of subjective SES did not predict psychology students' academic achievement—with the exception of a trinity of measures of subjective SES that disentangled classical aspects of SES and that were adapted to higher education. Finally, to a large extent, it appears to be possible to assess students' justice perceptions with a questionnaire from organizational psychology. These and additional findings are discussed and placed in a broader context, recommendations for future research are derived, and conclusions are drawn.

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Introduction

John Stacy Adams wrote in 1965, “The experience of injustice need not be an accepted fact of life.” (p. 297). Adams was and still is well known in justice research for his formulation of the equity theory. Now, more than 50 years later, his statement seems to have even gained in importance—not least of all in the broad field of education: For example, the *Open Science* Movement advocates for publicly accessible science (e.g., see Nosek et al., 2015), and the *Open Education* Movement emphatically speaks out for free education for all (e.g., see Jhangiani & Biswas-Diener, 2017). In some ways, both movements address and seek to correct social inequalities and social injustice in educational contexts, for example, by bypassing some of the hurdles that are commonly encountered when attempting to access knowledge. However, whereas inequality and injustice in education have been core topics in sociological theory and research ever since (e.g., Bourdieu & Passeron, 2007; Hadjar, 2008; Hartmann, 2004; for an overview, see Becker, 2011), these topics have received less attention in psychological research. And when these topics do receive attention, they are often found in textbooks with an *interdisciplinary* assembly of authors—at least in Germany (e.g., Gollwitzer, Lotz, Schlösser, & Streicher, 2011; Reinders, Ditton, Gräsel, & Gniewosz, 2015). Vis-à-vis the rising awareness of social inequality and social injustice in the field of education and an increasing need for action, there is still a desperate need for empirically sound knowledge about many *psychological* aspects of social inequalities and social (in-)justice in education and the associated mechanisms. The current dissertation tries to address a part of this need by focusing on two aspects of social inequalities and social (in)justice in social science study programs, that is, the roles of students’ socioeconomic status (hereafter: *SES*) and students’ justice perceptions.

In the following sections, the theoretical framework of the current dissertation will be delineated in brief. Then, the *WiKom-SoWi – Modeling and Measuring Scientific Competencies in the Social Sciences* (hereafter: *WiKom-SoWi*) project, from which this dissertation originated, will be introduced. This is done to give the reader a comprehensible background to evaluate the data against. Subsequently, the three studies of the current dissertation will be summarized. Then, one important variable from this dissertation—the socioeconomic background of the people who participated in this project—will be placed in the broader socioeconomic context of the German population. Finally, the current dissertation will be discussed.

Theoretical Framework

The APA Task Force on Socioeconomic Status (2007) expressed serious concern that psychology is underrepresented in work on social class and SES as determinants of how humans function. The Task Force acknowledged that there is already a large amount of research that in principle is relevant to research on social class and SES. However, the Task Force highlighted the mission to further understand and investigate the role of social class and SES from a *psychological* point of view because SES plays an important role in determining people's development, well-being, and health. Whereas macrolevel approaches determine the effects of SES in societal processes, psychological microlevel approaches can add to the understanding of the interplay between the macro- and microlevels and particularly to the understanding of the effects of SES in individuals. A closely related appeal by German scientists concerns the role of psychology in exploring *justice* in educational systems: According to Lotz and Feldhaus (2013), psychology still fails to consider individual perceptions of justice in *educational* systems.

For the abovementioned reasons, that is, the underrepresentation of psychological research on social class and SES (APA Task Force on Socioeconomic Status, 2007) and the stated need to consider justice in educational contexts (Lotz & Feldhaus, 2013), the aim of the current dissertation was to contribute to the broader knowledge of social inequalities and social (in)justice with regard to SES and justice perceptions in the area of higher education, or to be more precise, in the social sciences. The first study of this dissertation focused on the role of students' objective SES and its associations with the preexisting characteristics students bring to their studies of the social sciences. The second study focused on the role of psychology students' objective and subjective SES in predicting academic achievement. The third study focused on the assessment of psychology students' justice perceptions. In the following sections, the basic theoretical framework of the three studies of this dissertation will be outlined.

Socioeconomic Status and Students' Characteristics

Many studies have pointed to a pronounced role of SES regarding academic achievement in primary and secondary education. In such research, objective SES is often operationalized via educational attainment, occupation, or income (American Psychological Association, Task Force on Socioeconomic Status, 2007). For children and adolescents in secondary education, parents' SES has been demonstrated to be an important predictor of academic achievement (e.g., Helmke & Schrader, 2010; Sirin, 2005; White, 1982). A recent longitudinal study revealed that children's academic achievement at age 7 was related to their SES. Moreover, the differences in the development of academic achievement from age 7 to age 16 and onwards were—independent of intelligence—even *amplified* by SES (von Stumm, 2017).

Furthermore, the hitherto existing PISA studies revealed that the association between SES and academic performance in 15-year-olds is more pronounced in Germany than the

OECD average (e.g., OECD, 2007, 2010, 2013, 2016). Additional results for Germany by the Authoring Group Educational Reporting (2010) indicate that students with the same grades in their university entrance qualifications enroll less often in tertiary education if they have a nonacademic background (i.e., their parents do not hold a degree in tertiary education)—the last of which can be seen as an indicator of lower SES. Not least of all, if students enroll in tertiary education, their final university grades are positively related to the number of parents who completed university (Jaksztat, 2014). In sum, in Germany, SES plays a major role not only in academic achievement in secondary education but also in the transition to tertiary education and in tertiary education itself.

However, whereas research on the role of SES in secondary education has again recently increased due to the PISA studies, less is known about SES and its relations to the preexisting characteristics with which students *begin* their academic careers in tertiary education, for example, in the social sciences. The model of scientific competencies in the social sciences (Dietrich et al., 2015) highlights the role of personal characteristics for the successful acquisition and use of scientific competencies. The successful acquisition and use of scientific competencies, in turn, should be closely tied to students' academic development and, furthermore, students' future careers. In the abovementioned framework, it seems relevant to also investigate more distal variables that are potentially associated with students' personal characteristics—variables that might then be indirectly associated with students' academic development through their association with students' personal characteristics. Therefore, the first study in this dissertation was aimed at investigating the role of students' objective SES as such a variable that might be associated with students' personal characteristics.

To do so, Study 1 drew from personal characteristics that have been shown to be related to SES (mostly) in the area of secondary education, that is, students' intelligence, their

grade point average in their general qualifications for university entrance, their achievement motivation, their academic self-concept, their study interest, their personality, or the number of hours they spent working side jobs. The question that was addressed was whether associations of SES with these personal characteristics (or their equivalents in higher education) could also be found in social science students. The first study of this dissertation addressed possible associations of social science students' objective SES—assessed as a composite of parents' education and occupation—with the abovementioned preexisting characteristics students bring to their studies.

Objective and Subjective Socioeconomic Status

In Study 1, possible relations between students' SES with the preexisting characteristics they bring to their studies were investigated. As argued before, students' personal characteristics seem relevant for the successful acquisition and use of scientific competencies (Dietrich et al., 2015)—and consequently—students' academic achievement. Therefore, the second study in this dissertation investigated the role of SES in psychology students' *academic achievement* during the course of their studies. As stated before, findings in a German sample pointed to a relation between parents' academic versus nonacademic background (one possible indicator of SES) and higher education students' academic achievement (Jaksztat, 2014). In the context of the current dissertation, the first question that was addressed was whether a broader assessment of SES (i.e., SES assessed as a composite of parents' education and occupation) was related not only to the preexisting characteristics social science students bring to their studies but also to their academic achievement in the study program. Therefore, the second study of this dissertation focused on the role of objective SES in the prediction of academic achievement in psychology students.

However, the APA Task Force on Socioeconomic Status (2007) advised researchers to employ objective *and* subjective measures of SES to improve the quality of psychological research on SES. Subjective measures of SES assess participants' *subjective* psychological standing with regard to SES in different social hierarchies (Adler, Epel, Castellazzo, & Ickovics, 2000; Adler, Stewart, & the Psychosocial Working Group, 2007; Goldman, Cornman, & Chang, 2006). As the APA Task Force on Socioeconomic Status (2007) pointed out, theory and research on relative deprivation already highlighted the role of subjective perceptions beyond alleged objective experiences: Cases exist in which the subjective experiences (e.g., that of deprivation) differ from what one would expect on the basis of objective criteria. A difference between subjective perceptions and objective criteria can also be illustrated by an example from educational psychology where an individual's academic self-concept is more than simply internalized (and therefore rather objective) performance feedback and where comparing different dimensions for an individual can lead to very different self-evaluations (e.g., Möller & Marsh, 2013). In sum, there is evidence that suggests that it makes sense to expect fruitful gains from employing additional subjective measures in research on SES.

Furthermore, Rubin et al. (2014) argued that tertiary education students' SES might differ from their parents' SES—the latter of which is usually assessed in higher education research (e.g., see Jaksztat, 2014; Johnson, Richseon, & Finkel, 2011). This argument adds another layer to the proper investigation of the role of SES in the area of higher education: It speaks for the use of subjective measures of SES in higher education research, not only for the sake of enhancing the quality of research on SES but also to value possible qualitative differences between students' and parents' SES in higher education. Therefore, the second study of this dissertation also investigated whether social science students' subjective SES could explain additional variance in students' academic achievement *beyond* objective SES.

Finally, bearing in mind the classical conceptualization of SES as income, education, occupation, or a combination thereof, a problem emerges for student-related SES measures in the area of higher education: Because higher education students share the same educational degree (i.e., they all have a general qualification for university entrance) and the same (main) occupation (i.e., they are all students), only their income should show variability. Therefore, additional subjective measures of SES that could be used to *disentangle* the aspects of income, education, and occupation and that were *adapted* to be appropriate for students in higher education were developed. Therefore, beyond the prediction of psychology students' academic achievement by objective and subjective SES, the second study of this dissertation also addressed the use of different measures of subjective SES in the prediction of academic achievement.

Justice Perceptions in Higher Education

The role of SES and its relation to students' preexisting characteristics in the social sciences and the prediction of academic achievement by objective and subjective SES in psychology give rise to more fundamental thoughts about social inequalities in higher education. Closely interwoven with thoughts about social inequalities are thoughts about (social) justice: If social inequalities were found to lead to different academic starting points in the social sciences (investigated in Study 1) or to different academic outcomes at least in psychology (investigated in Study 2), would that not be unfair? Are there reasons to believe that, for example, students from low SES backgrounds would perceive that they are treated more unfairly than students from high SES backgrounds? In order to be able to investigate such questions, however, a measure of justice perceptions in higher education would need to be established *first*. This was the main aim of Study 3.

For a long time, questions of justice have been a core subject in organizational psychology (e.g., Adams, 1965; Bies & Moag, 1986; Leventhal, 1980). Around the millennium, Colquitt (2001) provided a four-factor organizational justice measure that differentiated between distributive justice, procedural justice, interpersonal justice, and informational justice. Whereas distributive justice focuses on the fairness of the allocation of resources (Adams, 1965), procedural justice focuses on the fairness of the process in arriving at the allocation of resources (Leventhal, 1980). Interpersonal justice refers to the fairness of the (interpersonal) interactions between the allocator(s) of the resources and the receiver(s), informational justice refers to the fairness of the informational openness of the allocator(s) toward the receiver(s) (see Greenberg, 1993; Leung & Tong, 2004).

However, as stated before, Lotz and Feldhaus (2013) criticized a lack of psychological research on justice perceptions in the area of education. In the context of the current dissertation, the question that emerged was whether psychology students' justice perceptions could be assessed with an adapted measure of the organizational justice scales by Colquitt (2001) or the corresponding German version by Maier, Streicher, Jonas, and Woschée (2007). Therefore, the third study of this dissertation was aimed at investigating whether the four-factor structure also held up in a higher educational setting and whether the scale characteristics were satisfactory.

In addition, the first two studies in this dissertation led to another objective: It seemed plausible that not only students' SES but also their justice ratings would be associated with several student characteristics, that is, personality, intelligence, need for cognition, study interest, achievement motivation, academic self-concept, average university grades, or number of hours spent working side jobs. In addition, bearing in mind the interweaving of social inequality and social justice, possible relations between students' justice ratings and their objective and subjective SES were also investigated.

The WiKom-SoWi Project

The studies of the current dissertation drew on data gathered for the project *WiKom-SoWi – Modeling and Measuring Scientific Competencies in the Social Sciences*. This project took place from 2012 until 2015 and was funded by the German Federal Ministry of Education and Research (grants 01PK11008A and 01PK11008B). The aim of the project was to model and measure scientific competencies in the social sciences, that is, psychology, sociology, and political science.

To model scientific competencies in the social sciences, qualitative data on students' scientific competencies were gathered via interviews of experts regarding their views and beliefs and via content analyses of module handbooks. On the basis of these data and theoretical groundwork, a model of scientific competencies in the social sciences was developed (Dietrich et al., 2015). To identify preexisting characteristics that students brought to their studies of the social sciences and to record potential predictors of students' future scientific competencies and academic achievement, three waves of data collection were conducted with bachelor students and master students at the beginning of each winter term during the course of the project. To assess students' scientific competencies, tests of scientific competencies in psychology, sociology, and political science were developed. The test of scientific competencies in psychology was mostly developed at Saarland University; the tests of scientific competencies in sociology and political science were mostly developed at Heidelberg University in cooperation with experts from the two respective domains. Unfortunately, constraints on time and resources meant that only the test of scientific competencies in psychology could be employed in two reasonably large samples.

Overview of the Quantitative WiKom-SoWi Data Collection

The current dissertation is based on the quantitative data that were collected for the project *WiKom-SoWi*. Quantitative data emerged from two different types of data collection, that is, the three *assessments of students' preexisting characteristics* and the two *assessments of students' scientific competencies*.

To answer the research questions in this dissertation, I added some further measures to the project: I added items on subjective SES to the assessment of psychology students' scientific competencies—either based on previous studies (Adler et al., 2000; Goldman et al., 2006) or adapted to and specified for the context of higher education. These latter items accounted for the fact that education and occupation should not show much variance when assessed in the traditional way in higher education students. In addition, I introduced two slightly different adaptions of the questionnaire on organizational justice by Colquitt (2001) to the assessments of scientific competencies to capture psychology students' justice perceptions.

Assessment of Students' Preexisting Characteristics

The collection of data on students' preexisting characteristics (*PreCha*) was conducted in three waves (hereafter: *PreCha1, PreCha2, or PreCha3*) when students began their studies of the social sciences in the respective bachelor and master study programs. However, only data from the first two waves (i.e., PreCha1 and PreCha2) were considered in the current dissertation (see Table 1). In these two waves, data were collected from psychology students at two sites, that is, Saarland University and Heidelberg University. Data were collected from sociology students and political science students at one site only, that is, Heidelberg University.

Materials consisted of three booklets, one of which was administered under standardized conditions on site (i.e., assessment of students' intelligence). The other booklets comprised several measures of interest (e.g., assessment of students' personality, motivational variables, and demographic variables). These booklets were either administered on site (predominant mode at Saarland University) or filled out at a location of students' choice (predominant mode at Heidelberg University). Unfortunately, the latter mode led to a larger share of students not returning the booklets, see Table 1: The number of participants who completed the intelligence assessment was usually larger than the number of participants who completed the personality or demographic assessments. Participants received compensation for their participation only if they returned all booklets.

Table 1
Overview of the Collection of Data on Students' Preexisting Characteristics and Students' Scientific Competencies used in the Current Dissertation

Data collection:	Preexisting characteristics								Scientific competencies			
Wave:	1				2				1		2	
Term:	Winter 2012/2013				Winter 2013/2014				Summer 2014		Winter 2014/2015	
Site:	SU	HU	HU	HU	SU	HU	HU	HU	SU	HU	SU	HU
Domain:	Psy	Psy	Soc	Pol	Psy	Psy	Soc	Pol	Psy	Psy	Psy	Psy
Site- & domain-specific *n*:	142	86	78	77	106	141	68	81	138	48	126	61
Number of participants with available data:												
Intelligence	139	86	78	77	106	141	68	81	-	-	-	-
Personality and motivational variables	139	46	62	52	106	136	56	62	-	-	-	-
Demographic variables	142	46	62	52	106	136	56	62	138	48	126	61
Scientific competencies	-	-	-	-	-	-	-	-	138	48	126	61
Justice scale version 1	-	-	-	-	-	-	-	-	138	48	-	-
Subjective SES version 1	-	-	-	-	-	-	-	-	30	48	-	-
Justice scale version 2	-	-	-	-	-	-	-	-	-	-	126	61
Subjective SES version 2	-	-	-	-	-	-	-	-	-	-	126	61
Overall *N* per wave	**383**				**396**				**186**		**187**	

Note. SU = Saarland University; HU = Heidelberg University; Psy = Psychology; Soc = Sociology; Pol = Political Science.

Assessment of Students' Scientific Competencies in Psychology

Data on students' scientific competencies (*SciCom*) in psychology were collected in two waves (hereafter: *SciCom1* or *SciCom2*) at both sites. Data were gathered from a total of $N = 290$ different psychology students who took part in one or both waves of data collection (SciCom1: $N = 186$; SciCom2: $N = 187$; participants who participated in one wave only: $n = 207$; participants who participated in both waves: $n = 83$, see also Table 2).

Materials consisted of a booklet comprising the test of scientific competencies and another booklet comprising demographic variables, justice scales, and subjective SES measures. The second booklet differed slightly between SciCom1 and SciCom2 with regard to the justice scales and the subjective SES measures provided: In SciCom2, the justice scales were provided with an additional answer option, and four additional subjective SES measures were added. In both waves, participants worked on the booklets on site. However, due to difficulties in test administration at Saarland University during SciCom1, subjective SES measures were available for only approximately 22% of the SciCom1 participants at Saarland University (see Table 1).

Data used in the Current Dissertation

The studies in the current dissertation used different WiKom-SoWi data sets or subsamples of these data sets (see Table 2). Study 1 used data on students' preexisting characteristics (PreCha1 and PreCha2). These data came from psychology students, sociology students, and political science students. To answer the research questions, data from the two waves of data collection were merged into one data set. However, not all data gathered in PreCha1 and PreCha2 were considered in this set. Rather, only data from first-semester students in the bachelor study programs who completed all measures of interest and who had not dropped out of or completed another program beforehand were used. This approach was adopted to

identify the preexisting characteristics of students who had *just begun their studies of the social sciences* without having any previous experiences in tertiary education. All analyses in Study 1 refer to this combined data set.

Table 2
Overview of the (Sub-)Data Sets Employed in the Current Studies

Data	Data collection	Measures	Participants	Additional information
		Study 1		
Data collected on *preexisting characteristics*. Merged data set including *only* bachelor students in their first semester.	PreCha1 & PreCha2	Intelligence, personality and motivational variables, demographic variables, objective SES.[a]	***N* = 336** psychology, sociology, and political science students.	
		Study 2		
Data collected on *scientific competencies*. Samples from the waves were treated separately in all analyses.	SciCom1 SciCom2	Objective SES,[a] subjective SES *Version 1*, subjective SES *Version 2*, demographic variables.	***n* = 78** psychology students. ***N* = 187** psychology students.	Data on subjective SES only available on a subsample of Wave 1. A subset of $n = 39$ participants took part in both waves.
		Study 3		
Data collected on *scientific competencies*. Samples from the waves were treated separately in all analyses.	SciCom1 SciCom2	Justice scales *Version 1*, Justice scales *Version 2*, demographic variables.	***N* = 186** psychology students. ***N* = 187** psychology students.	A subset of $n = 83$ participants took part in both waves.
Merged longitudinal data sets linking participants' data on *scientific competencies* to *preexisting characteristics* (Waves 1 or 2) if possible.	SciCom1 & PreCha1 or PreCha2 SciCom2 & PreCha1 or PreCha2	In addition: intelligence, personality and motivational variables, objective SES,[a] subjective SES *Version 1*, subjective SES *Version 2*.	***n* = 106** psychology students. ***n* = 101** psychology students.	

Note. SciCom = assessment of scientific competencies; PreCha = assessment of preexisting characteristics.
[a]Inferred from demographic variables.

Study 2 used data collected on students' scientific competencies (i.e., SciCom1 and SciCom2). These data came from psychology students only. Difficulties in test administration and some students' repeated participation in both samples led to the decision to use the two data sets separately: For analyses of the SciCom1 data, only a subset of data could be used (i.e., the subset of participants who completed all measures of interest including the subjective SES measures). For analyses of the SciCom2 data, all data were used. However, a subset of $n = 39$ participants took part in both waves of data collection.

Study 3 used data collected on students' scientific competencies (i.e., SciCom1 and SciCom2) as well. However, because an additional answer option was offered in SciCom2, the two data sets were used separately in all analyses in Study 3. A subset of $n = 83$ participants took part in both waves of data collection. Study 3 also involved longitudinal data to some extent: Longitudinal data sets were created for participants who had taken part in at least one of the waves in which data were collected on students' scientific competencies (i.e., SciCom1 and SciCom2) *and* in one of the waves in which data were collected on students' preexisting characteristics (i.e., PreCha1 or PreCha2).

Summaries

In the following sections, the three studies of this dissertation and the associated research questions will be presented, followed by a short summary of the methods employed, the main results found, and a brief discussion thereof.

Study 1: Socioeconomic Status and Social Science Students' Preexisting Characteristics

The main aim of Study 1 was to investigate whether students' SES was related to the preexisting characteristics students bring to their studies of psychology, sociology, or political

science. Because there was not much previous research on students' SES and their preexisting characteristics in higher education, research questions were generated mostly on the basis of findings from secondary education. SES has been found to be associated with intelligence (Steinmayr, Dinger, & Spinath, 2010, 2012), school grades (Steinmayr et al., 2010), achievement motivation (Suarez-Álvarez, Fernandéz-Alonso, & Muñiz, 2014), academic self-concept (Steinmayr et al., 2012), intrinsic values (Steinmayr et al., 2012), the Big Five factors of personality (Steinmayr et al., 2010), or side jobs on or off campus (Martinez, Sher, Krull, & Wood, 2009). Therefore, the first set of research questions asked whether students' SES was related to students' intelligence, their grade point average in their general qualifications for university entrance (hereafter: *school GPA*), their achievement motivation, their academic self-concept, their study interest, their personality, or the number of hours they spent working side jobs.

Two additional aims of Study 1 were to investigate potentially differential effects between fathers' and mothers' indicators of SES and students' preexisting characteristics (see Marks, 2008) and to compare the effects of the composite indicator of SES with the single indicators (see Marks, 2011; White, 1982). Therefore, the second set of research questions asked whether mothers' education was more strongly and mothers' occupation less strongly related to students' preexisting characteristics than fathers' education and occupation, respectively. The third research question asked whether a composite measure of SES was more strongly related to students' preexisting characteristics than the single indicators.

A combined data set comprising the first and the second waves of data that were collected on students' preexisting characteristics (i.e., PreCha1 and PreCha2) was employed to answer the research questions. However, only data from first-semester students in the bachelor study programs of psychology, sociology, and political science were taken into account. The final sample comprised $N = 336$ participants. SES was operationalized as a

composite variable (hereafter: *cSES*) consisting of students' parents' highest educational attainment and students' parents' current occupation as formative indicators.

A correlational design with a Bonferroni-Holm correction was employed and yielded the following results: Students' cSES was positively correlated with students' school GPA (r = .35) and students' extraversion (r = .20). CSES was negatively correlated with the number of hours students spent working side jobs (r = -.25). However, cSES was not significantly correlated with students' general intelligence (r = .08, *ns*) or the intelligence subscales analogies (r = .18, *ns*), numerical series (r = .00, *ns*), and matrices (r = -.01, *ns*). SES was also not significantly correlated with students' achievement motivation (r = .10, *ns*), academic self-concept (r = .12, *ns*), study interest (r = .02, *ns*), or the other four factors of the Big Five, that is, neuroticism (r = -.14, *ns*), openness (r = .14, *ns*), conscientiousness (r = .00, *ns*), or agreeableness (r = .06, *ns*).

The investigation of the additional research questions revealed that the use of different indicators hardly made any difference: Overall, mothers' (vs. fathers') education did not exhibit a significantly stronger relation to students' preexisting characteristics, and mothers' (vs. fathers') occupation did not have a significantly weaker relation with students' preexisting characteristics. Also, cSES did not yield stronger relations with students' preexisting characteristics than the single indicators (mothers' or fathers' education or occupation, respectively). The abovementioned findings will now be discussed briefly.

A puzzling insight regarding the findings was the correlation between SES and students' school GPA and—simultaneously—the fact that there was no association between social science students' SES and their general intelligence. One explanation might be that in Germany, students with the same grades enroll less often in tertiary education if they have a nonacademic background (Authoring Group Educational Reporting, 2010). Simultaneously, it

seems possible that intelligence might play a protective role during the process of transitioning from secondary to tertiary education.

Regarding the association between SES and extraversion, there are findings that if students perceive their socioeconomic status as lower than that of a comparison standard, they tend to question their academic fit (Johnson, Richeson, & Finkel, 2011). It might be possible that students who question their academic fit to a larger extent might also feel more inhibited in the academic environment. Therefore, their behavior might reflect introversion to a greater extent, and consequently, they might even perceive themselves as more introverted. However, future research is needed to clarify the mechanisms at work here.

Regarding the interchangeability of the different indicators of objective SES—that is, the fact that the single and the composite indicator(s) hardly differed in their relations with students' preexisting characteristics—one reason might lie in the fact that the overall influence of mothers' education/occupation and fathers' education/occupation is becoming less important for students in tertiary education in comparison with students in secondary education. In addition, the relative privilege of our sample in terms of parents' education and parents' occupation might point to limited variance in the single indicators as well as in the composite indicator (for details on the relative privilege of our sample, see also the upcoming section *placing the current data in [a socioeconomic] context*).

Overall, SES was not related to most of the personal characteristics that social science students brought to their studies. This might make sense insofar as the students who *do* in fact enroll in the social sciences are rather similar—independent of their SES. However, the sample appeared to be fairly privileged in terms of their SES and their intelligence. Therefore, further research should investigate the associations of students' socioeconomic status with their preexisting characteristics in different student samples with greater variability in socioeconomic status.

Study 2: Predicting Psychology Students' Academic Achievement with Objective and Subjective Socioeconomic Status

The aim of Study 2 was to investigate the role of objective and subjective SES (e.g., Adler et al., 2000; Adler et al., 2007; Goldman, et al., 2006) in predicting psychology students' academic achievement. The first set of research questions asked whether psychology students' objective SES could predict their academic achievement (i.e., their university grade point average [hereafter: *university GPA*] or their score on a test of scientific competencies in psychology [hereafter: *test score*], respectively). The second set of research questions asked whether psychology students' society-related and specific subjective SES (i.e., the classical measure of subjective SES presented by Adler et al., 2000) could predict their academic achievement beyond their objective SES. An additional aim of Study 2 was to investigate different measures of subjective SES: Two measures did not address specific reference criteria and targeted a freely chosen community or students at university as frames of reference, respectively (i.e., community-related and general subjective SES; university-related and general subjective SES). Another trinity of items disentangled students' income, education, and occupation and targeted the people in the students' study program as a frame of reference (study-program-related subjective SES involving reputation, finances, or academic achievement). Therefore, the last set of research questions asked which of these subjective measures of SES explained the most variance in psychology students' academic achievement.

To answer the research questions, data sets from the two waves of data collected on students' scientific competencies (i.e., SciCom1 and SciCom2) in the WiKom-SoWi project were used in the analyses. However, because of difficulties in test administration during SciCom1, the corresponding data set provided a subsample with $n = 78$ participants who completed the necessary measures. The data set regarding SciCom2 provided a sample with

N = 187 participants. Please also note that a subset of *n* = 39 participants participated in both waves of data collection. Hierarchical regression analyses were used to determine the predictive power of the different measures of SES. However, in all analyses, school GPA was introduced in the first step. Analyses were conducted separately for the two samples.

After controlling for school GPA, objective SES negatively predicted university GPA in SciCom1 (β = -.21, *p* = .04) but not in SciCom2 (β = .00, *ns*); objective SES negatively predicted test scores in SciCom1 (β = -.35, *p* = .00) and SciCom2 (β = -.06, *ns*). After controlling for school GPA and objective SES, the classical measure of subjective SES (i.e., society-related and specific subjective SES) negatively predicted university GPA in SciCom1 (β = - .10, *ns*) and positively predicted university GPA in SciCom2 (β = .09, *ns*); society-related and specific subjective SES negatively predicted test scores in SciCom1 (β = -.04, *ns*) and positively predicted test scores in SciCom2 (β = .06, *ns*).

The additional analyses regarding the different sSES measures were conducted on the SciCom2 data only. The analyses revealed that after controlling for school GPA in the first step, society-related and specific subjective SES, community-related and general subjective SES, or university-related and general subjective SES did not predict students' academic achievement. Only adding a trinity of study-program-related subjective SES measures involving students' reputation, finances, and academic achievement in the second step increased the amount of explained variance to 29% for students' university GPA and 17% for students' test scores. This increase in explained variance was mostly due to the positive association of the study-program-related subjective SES measure involving students' academic achievement with their university GPA (β = .57, *p* = .00) or their test scores (β = .45, *p* = .00). The abovementioned findings will now be discussed briefly.

Overall, the results were rather counterintuitive with objective SES either negatively predicting academic achievement or not predicting academic achievement at all. In addition,

the subjective SES measures did not explain additional variance beyond objective SES. Independent from objective SES, only the subjective SES measures that disentangled the classical aspects of SES and that were adapted to the context of higher education were able to explain variance in students' academic achievement. Among other things, this highlights the importance of adapting classical SES measures to the specific context of higher education.

Whether the conflicting results between SciCom1 and SciCom2 were due to differences in sample sizes or due to special properties of the respective samples remains open. The fact that neither objective nor society-related subjective SES predicted academic achievement in SciCom2 leaves room for interpretation. Both samples consisted of psychology students who were fairly privileged in terms of SES—a plausible indicator of limited variance. For these students, objective as well as subjective SES might not play such a crucial role in higher education. Overall, the adapted, more proximal approach regarding the assessment of students' subjective indicators of SES—instead of their parents' objective indicators—seems promising but requires further research.

Study 3: Justice in Higher Education: Psychology Students' Justice Perceptions

The aim of Study 3 was to adapt a justice measure developed by Colquitt (2001) and its German version by Maier et al. (2007) to the area of German higher education. The first set of research questions asked whether this questionnaire (hereafter: *Colquitt questionnaire*) could successfully be adapted to samples in higher education, whether its proposed four-factor structure of justice (i.e., the distinction between procedural, distributive, interpersonal, and informational justice) would hold up in higher education, and whether the justice scales would be internally consistent. The second set of research questions asked whether students' justice ratings would be related to certain student characteristics (i.e., personality, intelligence, need for cognition, study interest, achievement motivation, academic self-concept, average

university grades, number of hours spent working side jobs, objective SES, or subjective SES). The last set of research questions emerged after the first wave of data that were collected on scientific competencies (i.e., SciCom1) and focused on changes made between SciCom1 and SciCom2, that is, the addition of the answer option "*I cannot rate this item"* in SciCom2. This set of research questions asked whether differences would be found in the percentages of missing values in SciCom1 and SciCom2 and whether the additional answer option would offer additional benefits.

To answer the first and the third sets of research question, WiKom-SoWi data from the two waves of data collected on students' scientific competencies (i.e., SciCom1 and SciCom2) were used in the analyses. A total of $N = 186$ students of psychology took part in SciCom1, and $N = 187$ students of psychology took part in SciCom2. However, a subset of $n = 83$ students participated in both waves. To answer the second set of research questions, additional data from one of the two waves of data that were collected on students' preexisting characteristics (i.e., PreCha1 or PreCha2) were used if available for participants of SciCom1 and SciCom2, respectively. Note that the collection of data on students' preexisting characteristics took place at least one and at most four semesters before the assessment of students' justice perceptions—so the delay in measurement differed between participants. Longitudinal data sets were available for $n = 106$ SciCom1 participants and $n = 101$ SciCom2 participants. Two independent confirmatory factor analyses were employed using AMOS 22 (Arbuckle, 2013)—one for each sample. In addition, a correlational design was employed with adjusted significance levels (Bonferroni-Holm correction) to control the familywise error rate.

Results indicated an acceptable model fit in terms of the χ^2-ratio, CFI, and RMSEA, for the four-factor structure in SciCom1 ($\chi^2 = 286.27$, $df = 164$, $p < .01$; CFI = .90; RMSEA = .06) and a good model fit for the four-factor model in SciCom2 ($\chi^2 = 239.66$,

df = 164, $p < .01$; CFI = .95; RMSEA = .05). All except one standardized factor loadings λ yielded significance on the $p \leq .001$ level (two-tailed). The exception was Item 7 in SciCom1. Standardized factor loadings ranged from λ = .24 to λ = .91 in SciCom1 and from λ = .32 to λ = .92 in SciCom2. Across the two samples, the correlations between all but one pair of latent factors or scale means, respectively, remained significant after the Bonferroni-Holm correction was applied. The only exception was the correlation between distributive and interpersonal justice, which was not significant in SciCom2. The reliabilities of the justice subscales distributive justice, interpersonal justice, and informational justice were excellent to acceptable with Cronbach's α ranging from α = .70 to α = .93. However, the procedural justice subscale yielded unsatisfactory α values (SciCom1: α = .62; SciCom2: α = .69).

Regarding the second set of research questions, after the Bonferroni-Holm correction, participants' ratings of *distributive justice* were significantly and positively correlated with university GPA in SciCom1 (*r* = .30) and two measures of subjective SES (university-related and general subjective SES: *r* = .40; study-program-related subjective SES regarding academic achievement: *r* = .31). Participants' ratings of *informational justice* were also significantly and positively correlated with two measures of subjective SES (society-related and specific subjective SES in SciCom2: *r* = .25; university-related and general subjective SES: *r* = .29). Participants' justice ratings were not significantly correlated with their personality, intelligence, need for cognition, study interest, achievement motivation, number of hours spent working side jobs, or objective SES. However, three pairs of correlations deserve mention because they were significant *before* the Bonferroni-Holm correction had been applied and *across both samples*: Participants' ratings of distributive justice were negatively correlated with neuroticism (SciCom1: *r* = -.28; SciCom2: *r* = -.20) and positively correlated with academic self-concept (SciCom1: *r* = .26; SciCom2: *r* = .22), and participants'

ratings of informational justice were positively correlated with agreeableness (SciCom1: $r = .19$; SciCom2: $r = .21$).

Regarding the third set of research questions, whereas overall, missing values occurred less in SciCom1 (0.46%) than in SciCom2 (7.26%), this increase in the percentage of missing values was mostly due to participants stating that they could not rate the respective item in SciCom2 (5%). Results also revealed that participants had the most trouble with Items from the procedural justice scale. The abovementioned findings will now be discussed briefly.

Overall, the current results suggest that the Colquitt questionnaire and its German counterpart by Maier et al. (2007) can successfully be adapted to higher education. The questionnaire seemed to especially capture the factors distributive justice, interpersonal justice, and informational justice very well. However, some items from the procedural justice scale in particular stood out because they showed very small factor loadings across both samples and because a larger number of participants expressed that they could not rate these items. The reasons for these problems might be the more general instructions in the questionnaire at hand or that these items tapped decision processes that students had no experience with. However, these items require further attention, and in principle, they might also point to problems in the overall assessment of the distinct justice dimensions, which might have a historical basis (e.g., the concept of procedural justice mentioned by Leventhal in 1980 might comprise aspects of interpersonal and informational justice, both of which were introduced only years later by Greenberg in 1993).

Students' ratings of distributive justice were not only positively associated with students' university GPA and their study-program-related academic achievement but also with students' subjective standing at their university. This makes sense because students with better academic achievement, which was captured by their university GPA but also in part by their study-program-related subjective SES involving academic achievement, should be more

likely to perceive that their exam performances were evaluated in a just manner. It also seems plausible that the students who felt they were better off in comparison with other students at their university were the ones who were also greatly satisfied with their outcomes—and vice versa.

Students' ratings of informational justice were positively associated with society-related and specific subjective SES as well as university-related and general subjective SES. It seems plausible that students who felt that they subjectively held a high standing—in society as well as at their university—were also the ones who either did fine with the information that was given or who knew whom to ask.

Finally, although several limitations might impair the generalizability of the current results, the connection of participants' justice ratings to constructs such as their justice sensitivity (see Schmitt, Baumert, Gollwitzer, & Maes, 2010) seems very fruitful. In addition, a further revision of the questionnaire should be helpful. Employing the questionnaire in different educational contexts and using it with different samples (e.g., children, adolescents, their parents, their educators, and their teachers) from different backgrounds (e.g., immigration background, gender, SES) should prove very helpful in furthering the understanding of the (subjective) meaning of different backgrounds for the daily (subjective) experiences these individuals have in the educational system.

Placing the Current Data in (a Socioeconomic) Context

All of the studies in this dissertation referred to students' objective SES to some extent. In the WiKom-SoWi samples, participants' objective SES was assessed as a composite variable of students' parents' education and students' parents' occupation. In Study 1, data from first-semester students in all three social sciences (i.e., psychology, sociology, and political science) were considered. In Studies 2 and 3, data from only psychology students in different

semesters were considered. The aim of the following sections was to place participants' SES in the respective WiKom-SoWi samples into a broader context: This was done in order to get a sense of where the samples' SES was located in German society. Such a socioeconomic placement should give valuable insights, for instance, into the extent to which conclusions can be drawn from the current studies or on the reproducibility of results.

Representative data on educational and vocational attainment in the German population in 2015 are available through the report on educational background (Statistisches Bundesamt (Destatis, 2017). Subsets of these data on *educational attainment* and *vocational attainment* of adults between the ages of 30 and 65 were created from the report—one subset on women and one on men. The respective age interval was chosen because WiKom-SoWi participants' parents' ages should also range from 30 to 65. The subsets of the German population served as frames of reference with which the *WiKom-SoWi* samples were contrasted and will therefore be called *reference samples* hereafter. Educational and vocational attainment served as proxies for objective SES.

Two things should be noted, however. First, whereas objective SES in the WiKom-SoWi samples was assessed as a composite of students' parents' educational attainment and occupational prestige (assessed as ISEI-08; Ganzeboom, 2010), only data on parents' highest educational and vocational attainment were contrasted against the reference samples. Second, in both reference samples, *all* habitants of Germany were included, that is, the data also included individuals who did not have children (yet). Therefore, the samples (reference groups vs. WiKom-SoWi samples) differed at least with regard to the amount of data that were collected from persons with children.

Educational Attainment

To obtain data on educational attainment that were comparable, differences in coding had to be resolved first. For the data on the reference samples, *Abschluss der Polytechnischen Oberschule* (a common school leaving certificate that students of the former German Democratic Republic have) was recoded as *secondary school level 1 certificate*. For the WiKom-SoWi samples, data were recoded such that the indication of a degree from *Fachhochschule* and *Hochschule* as well as the indication of a PhD led to a coding as *higher education entrance qualification* regarding educational background because a person cannot receive such a degree without this type of qualification.

To contrast the WiKom-SoWi samples with the reference samples, data on educational attainment are presented as ranging from *no school leaving certificate at all* via *secondary general school certificate* and *secondary school level 1 certificate* to *higher education entrance qualification*. Data for men in the reference group and students' fathers are presented in the left group of bars, data for women in the reference group and students' mothers are presented in the right group of bars (see Figure 1).

As can be seen in the left bars in each group of men and women, respectively, 3.8% of the 30- to 65-year-old male reference sample and 3.9% of the 30- to 65-year-old female reference sample did not possess a school leaving certificate at all. In the same reference samples, 61.7% of men and 63.6% of women owned some sort of secondary school leaving certificate. Finally, 34.0% of men and 32.0% of women owned a higher education entrance qualification.

By contrast, the WiKom-SoWi samples revealed another composition with regard to highest educational attainment: Data from the samples regarding preexisting characteristics (PreCha1 and PreCha2) and the samples regarding students' scientific competencies (SciCom1 and SciCom2) suggested percentages of parents without a school leaving certificate

that ranged from 0.5% to 0.6% for students' fathers and from 0.9% to 1.6% for students' mothers. In the same samples, 25.6% to 31.7% of men and 28.3% to 37.8% of women owned some sort of secondary school leaving certificate. Finally, 65.6% to 72.8% of men and 59.5% to 67.3% of women owned a higher education entrance qualification.

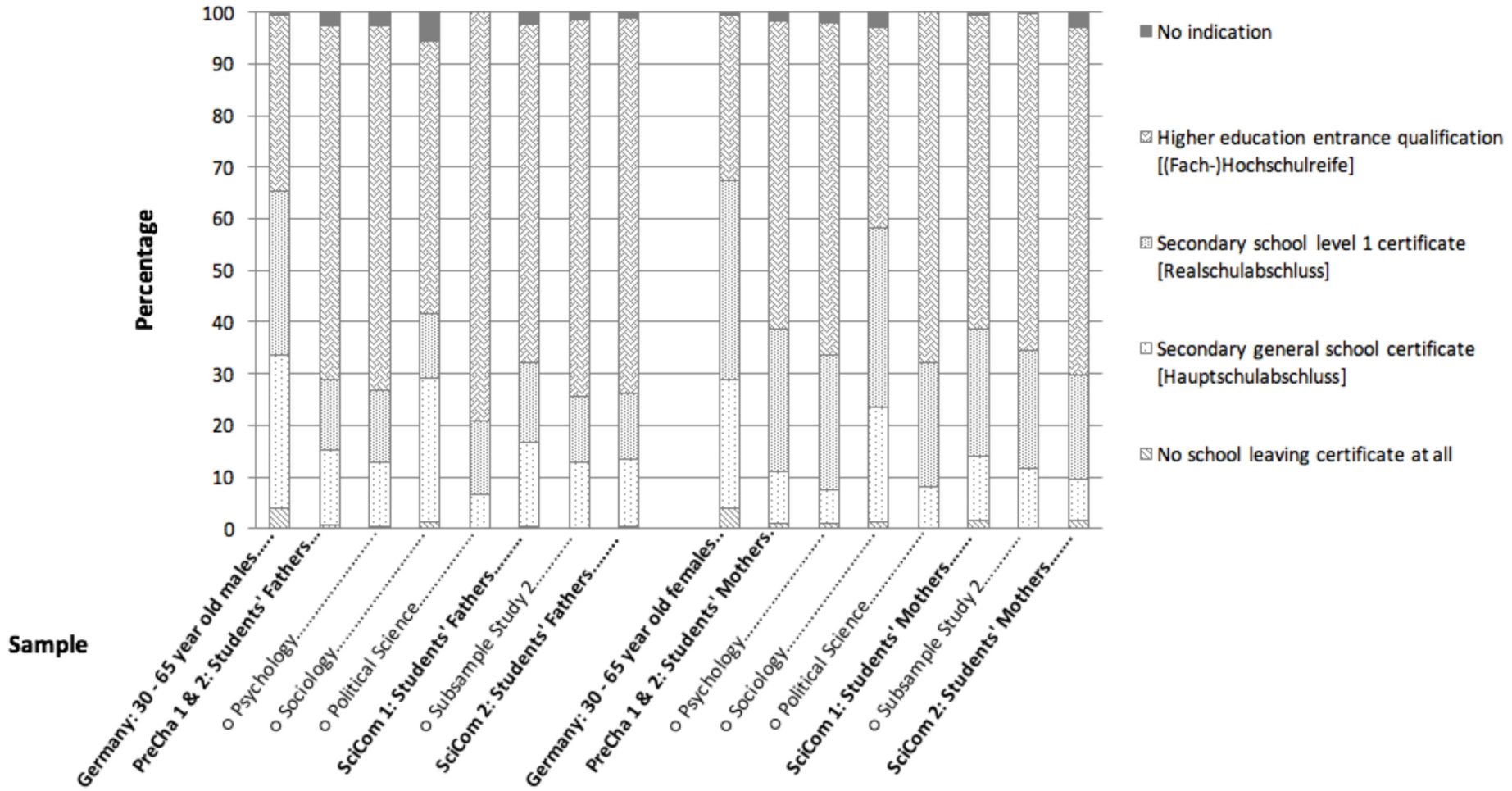
Comparing the data from the reference samples with the WiKom-SoWi samples, it became apparent that in the latter data sets, the percentage of parents who owned a higher education entrance qualification was about twice the size as in the reference samples. This hints that WiKom-SoWi participants' parents showed an unusually high educational background, which, in turn, should be associated with a higher socioeconomic position.

Taking a closer look at the domain-specific subsamples of the merged data set from PreCha1 and PreCha2 regarding students' preexisting characteristics allowed further insights to be made: Whereas the percentages of fathers and mothers with higher education entrance qualifications were 70.8% and 64.4% in psychology students, respectively, and 79.0% and 67.7% in political science students, they were only 52.8% and 38.9% in sociology students. By contrast, 26.2% and 32.7% of psychology students' fathers and mothers, respectively, as well as 21.0% and 32.3% of political science students' fathers and mothers had earned some sort of secondary school leaving certificate—as opposed to 40.3% and 56.9% of sociology students' fathers and mothers.

The abovementioned percentages hinted that there were differences in participants' socioeconomic positions even *within* the social sciences—with sociology students having a lower socioeconomic position in terms of their parents' educational attainment than psychology students or political science students. However, in comparison with the reference samples, sociology students' socioeconomic position in terms of their parents' educational background still exceeded that of the respective reference samples.

Figure 1

Educational Attainment of Students' Parents in the WiKom-SoWi Samples in Comparison with German Reference Samples of 30- to 65-year-old Men and Women



Note. PreCha = data collected on students' preexisting characteristics (consisting of the subsamples in psychology, sociology, and political science); SciCom = data collected on students' scientific competencies in psychology.

Vocational Attainment

To obtain data on vocational attainment that would be comparable across the different data sets, differences in codings again had to be resolved. For the data sets created on the reference samples, *Fachschulabschluss* and *Fachschulabschluss in der ehemaligen DDR* were both coded as *advanced vocational training*. The indications *Master* and *Diplom* were both subsumed under the category *master's degree or diploma*. For the WiKom-SoWi samples, data were recoded such that the indication *Meister/Techniker* was categorized as *advanced vocational training*. The indication of a degree from *Fachhochschule* was categorized as a *bachelor's degree*.

To contrast the WiKom-SoWi samples with the reference samples, data on vocational attainment were presented as ranging from *no vocational training* via *basic vocational training*, *advanced vocational training*, *bachelor's degree*, and *master's degree or diploma*, to *PhD.* Again, data for the male reference sample and students' fathers are presented in the left group of bars, and data for the female reference sample and students' mothers are presented in the right group of bars (see Figure 2).

As can be seen in the left bars in each group of men and women, respectively, 13.6% of the 30- to 65-year-old male reference sample and 17.0% of the 30- to 65-year-old female reference sample had no vocational training at all. In the same reference samples, 63.6% of the men and 63.6% of the women had basic or advanced vocational training. Finally, 22.1% of the men and 18.7% of the women held a degree in tertiary education (i.e., a bachelor's degree, a master's degree or diploma, or even a PhD).

Again, the WiKom-SoWi samples revealed another composition with regard to highest vocational attainment: Data from the samples regarding preexisting characteristics (PreCha1 and PreCha2) and the samples regarding students' scientific competencies (SciCom1 and

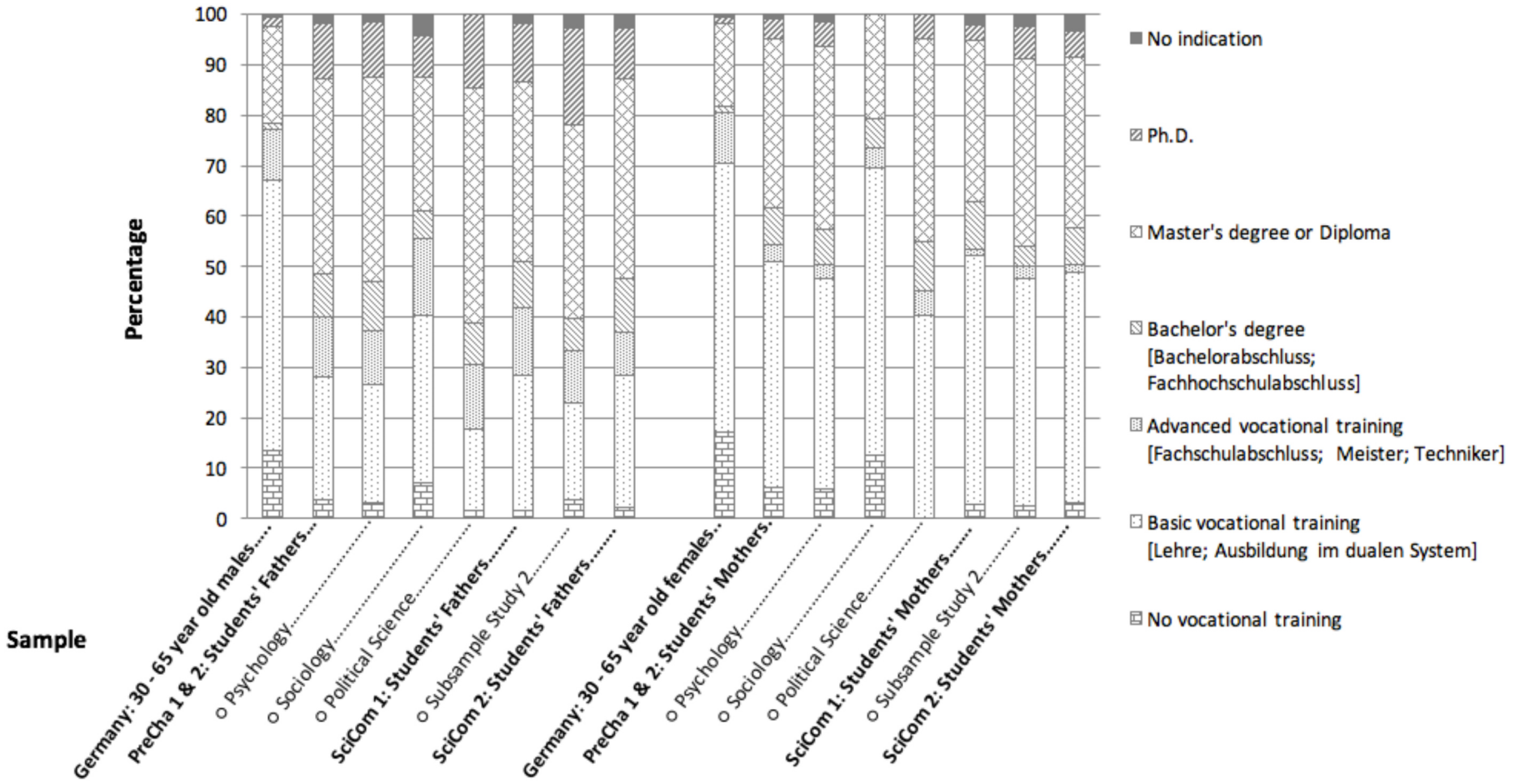
SciCom2) suggested percentages of parents without some sort of vocational training that ranged from 1.6% to 3.6% for students' fathers and from 2.7% to 6.2% for students' mothers. In the same samples, 34.8% to 40.3% of fathers and 47.1% to 50.6% of mothers had basic or advanced vocational training. Finally, 56.4% to 60.5% of fathers and 44.6% to 46.5% of mothers held a degree in tertiary education.

Comparing the data on the German reference samples with the WiKom-SoWi samples, it became apparent that in the latter data sets, the percentages of parents who held a degree in tertiary education were about twice the size as in the reference samples. This again hints at the socioeconomic privilege of the WiKom-SoWi participants' parents—and through more or less direct effects, also the participants themselves.

Again, a closer look at the domain-specific subsamples of the merged data set from PreCha1 and PreCha2 regarding students' preexisting characteristics allowed further insights to be made: Whereas the percentages of fathers and mothers who held a degree in tertiary education were 61.4% and 48.2% for psychology students, respectively, and 69.4% and 54.8% for political science students, the percentages were only 40.3% and 26.4% for sociology students. Again, these percentages hint at differences in participants' socioeconomic position even within the social sciences—with sociology students having a lower socioeconomic position in terms of their parents' vocational attainment than psychology students or political science students. Again, in comparison with the reference samples, sociology students' socioeconomic position in terms of their parents' vocational background still exceeded that of the respective reference samples.

Figure 2

Vocational Attainment of Students' Parents in the WiKom-SoWi Samples in Comparison with German Reference Samples of 30- to 65-year-old Men and Women



Note. PreCha = data collected on students' preexisting characteristics (consisting of the subsamples in psychology, sociology, and political science); SciCom = data collected on students' scientific competencies in psychology.

General Discussion

The main findings of this dissertation, including their implications, will be discussed in the following sections. Then, the limitations will be addressed, followed by the strengths of this dissertation. Finally, future directions will be presented, and a general conclusion will be drawn.

Findings and Implications

Placing the Data in (a Socioeconomic) Context

The additional analyses in this Synopsis were aimed at placing participants' objective SES into the socioeconomic context of the broader German society. They revealed two main findings: First, all samples used in the three current studies (i.e., the sample that included first-semester social science students [Study 1] as well as the samples that included psychology students only [Studies 2 and 3]) seemed privileged with regard to their SES in terms of students' parents' educational and vocational attainment. Second, in the social sciences, psychology and political science students both seemed to have parents with high educational and vocational attainments, whereas the parents of sociology students seemed to have lower educational and vocational attainments. These two findings challenge the generalizability of the results found in this dissertation. Among other aspects, their roles will be discussed in the following sections with regard to the implications of the studies.

The Role of SES at the Beginning of Students' Academic Careers in the Social Sciences

The main finding of Study 1 might be the intriguing correlational pattern in which social science students' SES was positively associated with their grades in their general qualifications for university entrance but not associated with their intelligence. The first part

of this pattern (i.e., the positive association between SES and students' school GPA) reflects what has often been found in the area of secondary education and—in fact—belongs to that area, that is, students receive their general qualifications for university entrance *at the end of* secondary education. Bearing in mind the finding that SES has been found to amplify the achievement gap from age 7 to age 16 independent of intelligence (von Stumm, 2017), this result leaves room for general concern and leads to the question of whether SES plays the same amplifying role with regard to academic achievement during the course of students' studies in tertiary education in general and the social sciences in particular.

The second part of the pattern that was found (i.e., no association between SES and students' overall intelligence) attenuates these concerns to some extent. At least in theory, the role of intelligence might be more important in tertiary education, where, for example, critical thinking (Halpern, 1998) is required or higher and complex cognitive processes (e.g., analyzing, evaluating, and creating) are necessary in order that a student can demonstrate scientific competencies (Dietrich et al., 2015; for an overview of complex cognitive processes, see also Anderson et al., 2001). However, after conducting an in-depth investigation of the role of the relation between SES and intelligence in Study 1, it makes sense to be concerned about the small positive correlation between SES and the language-related subscale of intelligence even though this correlation was nonsignificant after the Bonferroni-Holm correction was applied. *If* students from lower SES backgrounds were to show overall worse language proficiencies independent of their *general* intelligence (which to my knowledge has not yet been investigated), there would be reason to believe that they should particularly suffer from disadvantages in the areas of higher education that are strongly related to the skillful use of language (e.g., philology, law, the humanities, or the social sciences) in comparison with the areas that are less strongly related to language (e.g., the STEM disciplines). It seems plausible that students' language skills play a large role in

teachers' evaluations of essays or theses—going beyond the mere presentation of students' ideas (including the demonstration of more or less critical thinking or complex cognitive processes in these pieces of work). If lower SES students' language proficiencies are indeed found to be worse than those of their higher SES counterparts, a possible consequence for higher education and especially the social sciences could be to put more emphasis on classes that teach field-specific scientific writing (classes in which students do not receive grades) during the early semesters of the respective study programs. By doing so, self-reinforcing mechanisms could potentially be initiated.

The finding that SES was negatively correlated with the number of hours students spent working side jobs did not seem too surprising, yet this finding also leaves room for concern and suggests questions for further investigations. If students *need* to work side jobs to be able to finance their studies, this might simultaneously pose a threat to their academic achievement (see Brandstätter & Farthofer, 2003) in that it probably consumes a good part of students' most important resource: their time. In addition, the financially more rewarding side jobs are often found outside the university, implying that the time spent in such a side job would probably not even support students' academic development—whereas a job as a tutor or student research assistant probably would. A possible consequence for higher education and the social sciences would be to offer additional student scholarships and to make student loans more accessible (i.e., depending on *students*'—not their parents'—SES) in order to decrease students' need to work additional side jobs during the course of their studies. In addition, institutionalized domain-specific side job markets offering side jobs that will allow students to further develop their *academic* skills would seem to be a promising and resource-friendly idea.

Finally, students' SES was not related to some characteristics that it has been found to be related to in other countries (e.g., Spain or the United States of America; see Suarez-

Álvarez, Fernandéz-Alonso, & Muñiz, 2014; Terenzini, Springer, Yaeger, Pascarella, & Nora, 1996). A possible explanation for the differences between secondary and tertiary education is that the associations of SES with student characteristics simply might *no longer* exist in the area of tertiary education. Findings on the effects of parental SES on school transitions from the 1980s suggested that these effects decline with each additional transition (Mare, 1980). A similar pattern might hold for the associations of SES with students' characteristics. In addition, it is likely that the relations between SES and students' characteristics led students with certain characteristics to drop out *before* the transition to higher education, such that only students with similar characteristics—independent of students' SES—pursue tertiary education. However, a second explanation might lie in the study sample itself: Approximately 80% of the Study 1 sample consisted of psychology and political science students, that is, students in the two social science study programs where students' background in terms of SES seems the *most privileged* (see prior sections for details). A possible explanation for the country-specific differences might lie in the different educational systems (e.g., different admission restrictions, different student body, and different educational tracks).

The Role of Objective and Subjective SES in the Prediction of Academic Achievement

The main finding of Study 2 might be that neither objective SES nor the classical measure of subjective SES by Adler et al. (2000) predicted psychology students' academic achievement. Again, a possible explanation is that SES simply *no longer* plays such a critical role in psychology as a field of tertiary education and a domain of the social sciences.

It seems possible that the SES-related achievement gaps found in secondary education impede or deter certain students from transitioning to tertiary education. Especially in the field of psychology, the admission standards are extremely high with regard to students' grades in their general qualifications for university entrance. Such standards allow only the students with the best grades to be admitted—which means that even a seemingly

unimportant difference of 0.1 grade points between two students can make all the difference. Supporting this argument, Study 1 revealed that the correlation between social science students' SES and their grades in their general qualifications for university entrance was even larger than the correlation between SES and school grades typically found in secondary education (e.g., Steinmayr et al., 2010)—whereas SES was not associated with students' intelligence. Even though the samples in Studies 1 and 2 differed in their composition (i.e., Study 1 also comprised political science and sociology students), this pattern suggests at least two possibilities: First, students with lower SES might simply not get admitted into psychology study programs—either because students with the same grades in their qualifications for university entrance pursue tertiary education less often if they have a nonacademic background (Authoring Group Educational Reporting, 2010) or because they receive *minimally worse* grades, which, in this case, can make a difference. Second, students with higher SES might more often decide to pursue tertiary education, or they might benefit from their *minimally better* grades, which increase their chances to be admitted to a psychology study program.

Another main finding of Study 2 concerns the different subjective SES measures and the fact that academic achievement was predicted only by the three most proximal, subjective SES measures, which (a) targeted students in the study program as a reference group, (b) disentangled aspects of income, occupation, and education, and (c) were adapted to the specific situation of higher education. However, in this trinity, it was mostly students' subjective SES regarding academic achievement that explained variance in students' academic achievement. On the content level, one could argue that this item tapped students' academic self-concept. Retroactive analyses of the Study 3 longitudinal data set (not presented in the studies in this dissertation) partially supported this argument: study-program-related subjective SES regarding academic achievement was significantly and positively

correlated with students' academic self-concept (r = .25). However, this correlation was of medium size only, hinting at similarities as well as differences between the two constructs. In addition, limitations of this longitudinal data set should be considered (see Study 3).

An incidental yet intriguing finding concerns potential differences in students' objective and subjective SES measures at the two sites. Students' objective SES was numerically lower at Saarland University than at Heidelberg University, and the classical subjective SES measure (i.e., the measure that focused on German society and targeted income, education, and occupation) followed this pattern. However, students' community-related and general subjective SES (i.e., the measure that allowed students to choose their own reference group [i.e., the community that was most meaningful to them] and that did not specify any reference criteria) was numerically higher. As these results are based on numerical differences only, they should be interpreted with caution. However, they hint that there might be psychological processes at work in students and that such processes might compensate for students' more negative perceptions of their objective SES (as well as the classical subjective, society-related SES) such that students employ more positive perceptions of their subjective SES with regard to the communities and the criteria that they deem meaningful (i.e., students' community-related and general subjective SES).

Finally, the findings that objective SES (indicated by students' parents' education and occupation) was only moderately correlated with students' society-related and specific subjective SES (the classical measure of subjective SES) or the study-program-related subjective SES regarding finances indicate that these measures tap different aspects of students' SES.

Assessing Psychology Students' Justice Perceptions

The main finding from Study 3 might be that students' justice perceptions could, to a large extent, be assessed with the Colquitt questionnaire—with the exception of the procedural

justice subscale. This subscale hinted at problems in terms of scale reliability, standardized factor loadings, and the percentage of students who indicated that they could not rate some of the respective items belonging to this subscale. In addition, there is reason to believe that the content of some of the procedural justice items overlaps with other factors of justice, especially interpersonal and informational justice. This might be due to the historical development of the four-factor structure of justice that Colquitt (2001) proposed; however, this problem requires further attention.

Another relevant finding might be the associations between distributive justice and *university*-related characteristics, that is, university GPA, university-related and general subjective SES, and study-program-related subjective SES regarding academic achievement. In addition, distributive justice was also positively correlated with students' academic self-concept in both longitudinal samples, even though this finding was not significant after the Bonferroni-Holm correction was applied. Distributive justice was not associated with objective SES or the classical measure of subjective SES (i.e., society-related and specific subjective SES). In a way, this pattern hints at the special role of distributive justice in higher education, a role that should be investigated further.

Limitations of the Current Dissertation

With regard to the samples used in this dissertation, several limitations should be noted. The sample in Study 1 consisted of psychology, sociology, and political science students. Whereas the data were collected from psychology students at two sites, that is, Saarland University and Heidelberg University, the data were collected from the sociology and political science students at one site only, that is, Heidelberg University. The reason for this approach was that Saarland University does not offer study programs in sociology or political science. Limited resources in the WiKom-SoWi project prevented data from being collected at other sites, even

though this would have been very useful—especially in terms of the generalizability of results.

The samples in Studies 2 and 3 consisted of only psychology students. Again, limited resources did not allow for more extensive data to be collected on sociology students' or political science students' scientific competencies and the measures associated with this dissertation, that is, students' subjective SES or students' justice perceptions. This places a limitation on the generalizability of results with regard to the social sciences as a whole.

Furthermore, the fact that students were allowed and even encouraged to participate twice in the assessments of scientific competencies led to a total subset of $n = 83$ participants who participated in both the first ($N = 186$) and the second ($N = 187$) assessments of scientific competencies. Studies 2 and 3 used data from both assessments. Due to changes in the measures of interest between the first and second assessments, it was not possible to simply merge the data from the two assessments and to exclude the people who participated in the second round of data collection who had already participated in the first round.

In addition, because of difficulties in test administration in the first assessment of students' scientific competencies (i.e., not all students at Saarland University received the booklet with the subjective SES measures), Study 2 could use only a subset of the data collected in the first assessment of students' scientific competencies. Therefore, the Study 2 analyses of data from the first assessment of students' scientific competencies are less compelling.

The additional analyses in the Synopsis highlighted the relative privilege of social science students' objective socioeconomic status in terms of their parents' educational and occupational attainments in comparison with comparable German reference groups. This might support the idea of limited variance in terms of SES. However, whereas the data on psychology students were collected at Saarland University and Heidelberg University, the

data on sociology and political science students were collected at Heidelberg University only. Heidelberg University is a rather prestigious university that probably attracts a specific student body with rather high SES. Therefore, the role the latter site played with regard to the results that were found remains unclear. In addition, the results hinted that sociology students were the subgroup of social science students whose parents had the lowest educational and vocational attainments. Unfortunately, neither subjective SES nor justice perceptions were assessed in sociology students.

With regard to the analyses that were conducted, in most cases, the most conservative approach was taken. First, in the correlational analyses, Bonferroni-Holm corrections were employed to avoid inflating the familywise error rate. However, to provide balance, correlations that seemed meaningful (e.g., because they were significant before the Bonferroni-Holm correction was applied across *two* samples) were addressed and interpreted cautiously. Second, in the comparisons of the correlations of the different indicators of SES with students' preexisting characteristics in Study 1, the smallest *n* was always used. Third, in the hierarchical regression analyses in Study 2, coefficients were based on 1,000 bootstrap samples. Overall, the decision to employ a conservative approach was modified to some extent in order to account for the limitations that arose from the samples as mentioned above.

Finally, the additional analyses presented in this Synopsis used educational and vocational attainment as indicators of SES in order to compare the sample data with data from German reference groups. These indicators of SES differed from the composite measure of SES used in the current studies. With this latter measure, students' parents' occupation was represented by the ISEI-08, which allowed for a more differentiated perspective on occupation and more variation in comparison with vocational attainment. However, even though the indicators of SES used in the Synopsis versus the three studies differed from each other, the results of the additional analyses in the Synopsis should be taken seriously.

Strengths and Future Directions

After discussing the limitations of the current dissertation, the following sections advocate the strengths of this dissertation and provide questions to address in future research.

Additional Analyses

The additional analyses conducted in the Synopsis provide further insights into students' SES in the social sciences. Jaksztat's (2014) findings already revealed that students' educational background as one aspect of SES differed across different areas of tertiary education in Germany. For example, 42.8% of medical students versus 23.6% of social science students versus 15.1% of educational science students in Jaksztat's sample had the highest educational background, that is, both of their parents held a degree. However, the additional analyses in this Synopsis shed light on possible differences even *within* the social sciences.

The results of the additional analyses give rise to the question of whether the domain-specific differences in SES (i.e., the findings that psychology students and political science students share a similarly high background and that sociology students show a lower background in terms of SES) are a site-specific phenomenon (i.e., they are specific to Heidelberg University, a renowned institution that might simply attract a certain kind of student body with rather high SES backgrounds) or whether they can be found across different sites.

Study 1

Study 1 focused on the role of SES at the *beginning* of students' academic endeavors in the social sciences, highlighting characteristics that are associated with students' SES. Such an inventory-taking allowed for the identification of important correlates of SES in students of the social sciences. This, in turn, encourages further investigations into these characteristics and, for example, students' academic achievement over the course of their studies. The study

also encourages an investigation of the role that SES might play directly or indirectly at the beginning and over the course of students' academic endeavors.

In particular, the results of Study 1 encourage future research to focus on the replicability of the correlational pattern found on the relations of social science students' SES and the characteristics they bring along, especially with regard to students' intelligence and school GPA. Future research should also focus on the role of SES and the *need* to work side jobs. The consequences of these side jobs (e.g., with regard to the upsides and downsides of academic vs. nonacademic side jobs) should be investigated.

In addition, Study 1 suggests research questions that need to be addressed *before* students enter social science study programs: Who is interested in a social science study program? If interested in a social science study program, do students with lower SES more often decide not to pursue such a study program than students with higher SES? What is the overall role of SES in the decision to pursue or not to pursue a social science study program?

Finally, future research should also focus on the role of SES in students' academic and scientific language proficiencies. Such an approach would pay attention to the subtle differences, for example, as proposed by Bourdieu and Passeron (2007)—but from a *psychological* point of view, not only investigating potential differences in patterns of language between students from higher and lower SES backgrounds but also experimentally investigating how such patterns would affect teachers' impressions of students or their grading of students' work—independent of the ideas brought forward.

Study 2

Study 2 paid respect to the additional role of subjective perceptions of SES with regard to higher education. This approach acknowledges two aspects in comparison with the traditional objective measures of SES often employed in (higher) education research. First, this approach acknowledges that students' subjective perceptions of their SES might differ from their

(parents') objective SES and that in some cases it might comprise aspects that are more meaningful to students than those specified by researchers (see Rubin et al., 2014). Second, this approach acknowledges that, as students get older, they might become more independent from their parents' SES.

Another strength of Study 2 was that it introduced different subjective SES measures that were able to go beyond the measures provided in the literature to date (i.e., Adler et al., 2000; Goldman et al., 2006). Not only could the additional measures be applied to assess students' subjective views on SES but, for example, they could also be used to disentangle the traditional aspects of SES (i.e., income, education, and occupation) and adapt them to the context of higher education, where education and occupation assessed in the traditional ways would yield almost 100% congruity among participants (i.e., all students have a general qualification for university entrance [education], and all students are students [occupation]).

The results of Study 2 encourage research on the utility of students' parents' SES versus students own SES in tertiary education. In addition, the results hint at the usefulness of disentangling the classical aspects of objective SES (i.e., income, education, or occupation) and adapting the respective items to higher education—not only with regard to subjective measures but also with regard to objective measures of SES.

Future research should also refine the nomological network of students' study-program-related subjective SES regarding academic achievement and students' academic self-concept, for example, in focusing on conceptual and empirical differences and similarities. Finally, future research should investigate the replicability of the compensation mechanisms hinted at in the current study, that is, the findings with regard to higher versus lower objective SES/society-related subjective SES that were associated with the opposite pattern of lower versus higher community-related subjective SES. If so, it will be important to ask whether, for example, students who have low SES and who perceive that their subjective standing in

German society is low will compensate for these aspects if they are allowed to freely choose the community with whom to compare themselves and the criteria on which they will assess their subjective standing—as they are allowed to do in the community-related and general subjective SES measure.

Study 3

Study 3 provided a rather in-depth examination of items in the Colquitt questionnaire when employed in (higher) education research. Among other things, the use of the additional answer option *I cannot rate this item* allowed for the identification of items students had trouble assessing and shed light on problems with the procedural justice subscale. In addition, Study 3 also offered insights into the correlational patterns of the justice scales with student characteristics in general and objective and subjective SES in particular—highlighting the role of SES-related aspects and their possible association with students' justice perceptions in higher education.

The results of Study 3 encourage further theory development and theory testing with regard to a more precise demarcation of the four factors of justice in the educational context—paying special attention to procedural justice. In addition, whereas Burger and Groß (2016) investigated the role of procedural justice in students' intentions to drop out, the data at hand suggest the importance of aspects of distributive justice as well: Whether students feel they are treated fairly with regard to the outcomes they receive should be relevant not only to their potential intentions to drop out of their study program but also to their academic work behavior or their motivation. Future research should seek to investigate the roles of distributive justice perceptions and the four factors of justice overall with regard to students' work behavior, their motivation, or their citizenship behavior at university.

Conclusion

In 1971, John Rawls, a US-American philosopher and political theorist, proposed an intriguing thought experiment—the veil of ignorance: Roughly put, if people are asked to negotiate a social contract when they do not know *which* position they will occupy in this society (e.g., what age they are, what their health status is, what kind of education or occupation they have, or where they live), they will be likely to negotiate for fairness for all positions. He referred to this as negotiating behind the so-called veil of ignorance.

Adapting the veil of ignorance thought experiment to the context of higher education, what social order would we (i.e., as researchers, teachers in higher education, or students) want? For example, being randomly assigned to either high or low SES, would we want the mere fact of SES aside from other factors to be associated with our past and moreover our future opportunities for learning? Would we want SES to be—directly or indirectly—associated with our academic development or with our academic outcomes? Would we perceive an educational system in which such associations existed as just?

After all, this is a *thought experiment* under the hypothetical assumption that we could randomly assign someone to any condition. Nevertheless, getting involved in this thought experiment should encourage researchers to investigate possible social inequalities and injustices at different positions in the current educational system—and it certainly encouraged me to pursue an investigation of the roles of socioeconomic status and justice perceptions in the area of higher education in which I am located, that is, the social sciences.

I began this Synopsis with a quote from John Stacy Adams, and I personally feel this quote in my heart. In line with the appeals that many others such as the APA Task Force on Socioeconomic Status (2007) and Lotz and Feldhaus (2013) have stated before, and going beyond these appeals, I would like to complement the quote in a very scientific manner and as a researcher in psychology: “The experience of injustice need not be an accepted fact of life”

(Adams, 1965, p. 297). However, if one chooses not to accept social inequalities and injustice, one approach would be to understand them by investigating the mechanisms they unfold, their consequences for people's well-being, and the ways in which it is possible to decrease such inequalities and injustices. This is a task for psychologists, not only in the field as a whole and with regard to societal concerns, but especially for educational psychologists and with regard to the area of education.

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Study 1:
Socioeconomic Status and Social Science Students' Preexisting Characteristics

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Introduction

When the PISA studies began, schoolchildren's socioeconomic status (hereafter: *SES*) once again began receiving increased attention as a factor that is related to academic achievement (e.g., OECD, 2010, 2013). Whereas studies in Germany tend to focus on children and adolescents in school (e.g., Steinmayr, Dinger, & Spinath, 2010, 2012), research on SES and its impact in higher education is still rather scarce. However, there are some quite remarkable findings in higher education: In Germany, students with equivalent results on their university entrance qualifications enroll at universities less often when they have a nonacademic background compared with those students who have at least one parent who completed university (Authoring Group Educational Reporting, 2010). In addition, when students are engaged in their studies, their grades are positively related to the number of parents who completed university (Jaksztat, 2014).

Even though there is such evidence, little is known about the preexisting characteristics with which students begin their academic careers in tertiary education. However, these preexisting characteristics should be of great importance regarding the development of students' scientific competencies and their further academic development and occupational accomplishments (e.g., for the prediction of academic achievement in higher education from school grades, see the meta-analysis by Trapmann, Hell, Weigand, & Schuler, 2007).

In a model of scientific competencies in the social sciences, Dietrich et al. (2015) specified four key components of scientific competencies: input, operations, output, and personal characteristics, the last of which is seen as especially "important for successful competency acquisition and utilization" (p. 125). Examples of personal characteristics are motivation, openness, and intelligence. Going beyond such personal characteristics,

situational characteristics (e.g., working a side job) might also come into play as important factors that influence students' competency acquisition and utilization. In fact, if SES and students' preexisting characteristics (i.e., personal or situational characteristics) were found to be linked, it might be possible that students who are socioeconomically worse off than their peers would have yet another disadvantage to overcome in order to achieve success.

For the abovementioned reasons, the main aim of the present study was to link students' socioeconomic background variables (i.e., parents' education and occupation) with the preexisting characteristics (i.e., intelligence, grades, achievement motivation, academic self-concept, study interest, personality, and side jobs) they bring to their studies of the social sciences. The research questions were primarily based on characteristics related to SES that have been shown to be important in the area of secondary education. The study then went on to investigate whether the results from tertiary education were similar or not. The goal was to expand knowledge about SES in the field of tertiary education in Germany.

Socioeconomic Status

According to the Task Force on Socioeconomic Status of the American Psychological Association (2007), most research uses educational attainment, income, or occupation as indicators of SES. This section provides a closer look at parents' education, parents' occupation, and a composite measure of parents' education and occupation as indicators of SES.

Parents' Education

Parents' education can be assessed via the highest level of education completed by mothers or fathers. For example, in a study of German adolescents, Steinmayr et al. (2010) used six rank-ordered categories (ranging from *no school leaving certificate at all* to *university degree*) and an additional open-ended alternative (*other*). In a meta-analysis on the relation between SES

and academic achievement, White (1982) found a mean correlation of r = .18 between parents' education and school students' academic achievement. In replicating and extending White's meta-analysis, Sirin (2005) found a mean correlation of r = .30 between parents' education and school students' academic achievement.

Parents' Occupation

Parents' occupation can be assessed via students' answers to open-ended questions. These indications can be transformed into so-called ISEI scores (International Socio-Economic Index of Occupational Status; Ganzeboom, De Graaf, & Treiman, 1992) as Steinmayr et al. (2012) did. ISEI scores can take on values ranging from 16 to 90. The purpose of these scores is to focus on the role of occupation. On the one hand, occupation is related to both income and education, but on the other hand, it seems to make a distinct contribution with regard to SES. White (1982) found a mean correlation of r = .20 between parents' occupation and school students' academic achievement. Sirin (2005) found a mean correlation of r = .28 between parents' occupation and school students' academic achievement.

Composite Measures

A composite variable can be built by using a linear combination of formative indicators (Bollen & Bauldry, 2011). White (1982) reported several composites of SES, for example, a twofold composite of parents' education and occupation. He found a mean correlation of r = .32 between this composite and school students' academic achievement.

However, summarizing across different approaches for measuring SES, the Task Force on Socioeconomic Status of the American Psychological Association (2007) stated that different indicators of SES assess different aspects of SES. Therefore, they should not be used interchangeably. Furthermore, the task force recommended that single indicators be used instead of composite measures because single indicators allow researchers to examine the

unique contribution of each indicator. By contrast, Marks (2011) argued that composite measures should be used because of their stronger effects and their broader frame. In Marks' line of reasoning, when a cross-cultural view is of interest, the order of countries does not show as much shuffling when composite measures are used.

Therefore, in the current study, parents' education and parents' occupation were considered formative indicators of a composite variable of SES (hereafter *cSES*). However, bearing in mind the suggestions made by the Task Force on Socioeconomic Status, the indicators of SES were also investigated separately.

Students' Preexisting Characteristics

Some findings—mostly from the area of secondary education—have revealed meaningful relations between SES and important student characteristics. In this section, such personal and situational characteristics (hereafter referred to as *preexisting characteristics*) that are related to SES and that university students bring to their studies in social science programs are explored. Potential relations of the cSES variable with these preexisting characteristics will be discussed, and research questions (RQs) in the area of higher education will be derived.

Intelligence

In two studies of adolescents (2010: mean age M = 16.98, SD = .74; 2012: mean age M = 16.46, SD = .55) in the highest German school track, Steinmayr et al. (2010, 2012) found correlations of r = .19 in both studies between adolescents' intelligence and fathers' SES and correlations of r = .17 and r = .16, respectively, between adolescents' intelligence and mothers' SES. It should be noted that Steinmayr et al. (2010) used fathers' or mothers' education, whereas Steinmayr et al. (2012) used fathers' or mothers' scholastic and vocational degree and occupational status as indicators of SES. With regard to the current study, the research question was:

RQ_{1a}: Is social science students' cSES related to their intelligence?

Grades in Students' General Qualification for University Entrance

Steinmayr et al. (2010) found that adolescents' academic achievement (grade point average) was correlated $r = .21$ with fathers' SES and $r = .23$ with mothers' SES. With regard to the current study, the research question was:

RQ_{1b}: Is social science students' cSES related to their school grades in their general qualification for university entrance?

Achievement Motivation

In a sample of Spanish adolescents (mean age $M = 13.78$, $SD = 0.82$), Suarez-Álvarez, Fernandéz-Alonso, and Muñiz (2014) found that SES was correlated $r = .21$ with adolescents' motivation and $r = .26$ with adolescents' academic expectations. Terenzini, Springer, Yaeger, Pascarella, and Nora (1996) found that first-generation students showed lower aspirations to get a degree with respect to their current studies than continuing-generation students. With regard to the current study, the research question was:

RQ_{1c}: Is social science students' cSES related to their achievement motivation?

Academic Self-Concept

Steinmayr et al. (2012) found significant correlations between fathers' SES and adolescents' academic ability self-concepts in mathematics ($r = .20$), physics ($r = .17$), and chemistry ($r = .16$). However, the authors found no significant correlations between mothers' SES and adolescents' academic ability self-concepts in mathematics, physics, or chemistry. With regard to the current study, the research question was:

RQ_{1d}: Is social science students' cSES related to their academic self-concept?

Study Interest

Steinmayr et al. (2012) found significant correlations between fathers' SES and adolescents' intrinsic values with respect to mathematics (r = .18), physics (r = .17), and chemistry (r = .16). The authors found no significant correlations between mothers' SES and adolescents' intrinsic values with respect to these subjects. With regard to the current study, the research question was:

RQ_{1e}: Is social science students' cSES related to their study interest?

Big Five Factors of Personality

Steinmayr et al. (2010) found correlations of r = .15 between adolescents' openness and fathers' education and r = .20 between adolescents' openness and mothers' education. However, in this sample, neuroticism, extraversion, agreeableness, and conscientiousness were not correlated with fathers' or mothers' education. With regard to the current study, the research question was:

RQ_{1f}: Is social science students' cSES related to one or more of the Big Five factors of personality?

Side Jobs on or off Campus

Martinez, Sher, Krull, and Wood (2009) found that in contrast to continuing-generation students, first-generation students were more likely to work in college. Terenzini et al. (1996) found that first-generation students worked more hours per week off campus than continuing-generation students. With regard to the current study, the research question was:

RQ_{1g}: Is social science students' cSES related to the number of hours spent working side jobs?

Additional Research Questions

In addition to the previous main research questions, further research questions were of interest in the current study. Therefore, the following paragraphs include additional research questions.

Differential Effects between Fathers' or Mothers' Socioeconomic Status and Students' Preexisting Characteristics

In his analysis of data from PISA 2000, Marks (2008) found opposite patterns for parents' education versus parents' occupation in German data: Whereas mothers' education was more strongly related to children's reading and mathematics scores than fathers' education, mothers' occupation was less strongly related to children's reading and mathematics scores than fathers' occupation. Transferring these results to higher education and expanding them to preexisting characteristics other than verbal and mathematical achievement, with regard to the current study, the research questions were:

RQ_{2a}: Is mothers' education more strongly related to students' preexisting characteristics than fathers' education?

RQ_{2b}: Is mothers' occupation less strongly related to students' preexisting characteristics than fathers' occupation?

Composite Measures versus Single Indicators

As stated before, White (1982) found larger correlations between an SES composite of parents' education and parents' occupation with dependent variables as compared with the correlations of the single indicators. Marks (2011) even argued that composite measures should be used on a regular basis because they show stronger effects. With regard to the current study, the research question was:

RQ_3: Is the composite measure more strongly related to students' personal characteristics than either single measure regarding fathers' or mothers' education and fathers' or mothers' occupation?

Method

Sample and Procedure

All data on students' preexisting characteristics (hereafter: *PreCha1* and *PreCha2*) were gathered in two waves from the project WiKom-SoWi. The first wave of data collection (i.e., PreCha1) took place in the winter term 2012/2013 (N = 383), whereas the second wave (i.e., PreCha2) took place in the winter term 2013/2014 (N = 396). For analyses, only data from first-semester students in the bachelor study programs who completed all measures of interest and who had not dropped out of or completed another program beforehand were taken into account. Therefore, in the winter term 2012/2013, there were n = 150, and in the winter term 2013/2014, there were = 186 remaining participants. Because systematic variation was not expected between the two terms, the two subsamples were merged into one sample with N = 336 participants (264 women; mean age M = 20.04, SD = 2.72) in all further analyses. The two waves of data collection were each conducted at two universities, that is, Saarland University and Heidelberg University. Participants were approached in large introductory lectures or were personally addressed. Participants were enrolled in psychology (Saarland University and Heidelberg University), sociology (Heidelberg University), or political science (Heidelberg University). For an overview of the numbers of participants in each subgroup, see Table 1.

Table 1
Number of Participants Who Fulfilled the Selection Criterion in Each Round of Data Collection

	Saarland University		**Heidelberg University**		
Data collection:	PreCha1	PreCha2	PreCha1	PreCha2	
Term:	2012/2013	2013/2014	2012/2013	2013/2014	Total
Psychology	*n* = 51	*n* = 67	*n* = 26	*n* = 58	*n* = 202
Sociology	-	-	*n* = 40	*n* = 32	*n* = 72
Political science	-	-	*n* = 33	*n* = 29	*n* = 62
				Sample	***N* = 336**

Note. To be selected, participants needed to (1) be first-semester students in a bachelor study program of psychology, sociology, or political science, (2) have completed all measures of interest, and (3) have neither dropped out nor completed another study program beforehand.

The waves of data collection comprised three parts each: The first part (Set A) was administered on site during a lecture or at a fixed appointment at both universities. This part was conducted under standardized conditions to obtain adequate data on students' intelligence. The second part (Set B) consisted of a questionnaire comprised of the measures of interest. The third part (Set C) consisted of items that referred to demographic variables. Participants at Saarland University mostly filled out Sets B and C on site, whereas participants at Heidelberg University predominantly filled out Sets B and C at a location of their choice. At both universities, several dates for returning the remaining questionnaires that were not filled out on site were offered. Participants received course credit (psychology) or monetary compensation (psychology, sociology, political science) for taking part in the study. In addition, feedback on selected results was offered if desired.

Measures

The measures of achievement motivation, study interest, and personality were all presented with answer options ranging from 1 (*does not apply at all*) to 5 (*fully applies*). Except for intelligence, all other measures were self-reported by participants.

Intelligence

To assess intelligence, three subscales from the Intelligence-Structure-Test 2000 R (I-S-T 2000 R; Liepmann, Beauducel, Brocke, & Amthauer, 2007) were presented: analogies, numerical series, and matrices. This test was administered under standardized conditions as described in the test manual. Raw scores from the three subscales were then transformed into age-specific standard scores with grammar school pupils as the reference norm. Finally, the mean of the three standard scores was computed.

Grades in Students' General Qualification for University Entrance

Students indicated their grade point average in their general qualification for university entrance. The data were reverse-coded so that higher scores indicated better grades.

Achievement Motivation

To assess achievement motivation, the items from the short form of the Achievement Motivation Inventory (LMI-K; Schuler & Prochaska, 2001) were presented. After correcting for number of answer options (a 5-point Likert scale was employed instead of a 7-point Likert scale as suggested by Schuler & Prochaska), the raw scores were transformed into sex-specific standard scores.

Academic Self-Concept

To assess students' academic self-concept, the *absolute* subscale from the Academic Self-Concept Scales (student version; Schöne, Dickhäuser, Spinath, & Stiensmeier-Pelster, 2002) was presented. The mean of all items was then computed.

Study Interest

To assess study interest, the Study Interest Questionnaire (FSI [SIQ]; Schiefele, Krapp, Wild, & Winteler, 1993) was presented. First, the negatively keyed items were reverse-coded. Then, the mean of all items was computed.

Big Five Factors of Personality

To assess the Big Five personality factors, the German version of the Big Five Inventory (BFI; German adaptation as cited in Rammstedt & John, 2005) was presented. First, the negatively keyed items were reverse-coded. Then, the mean of all items per subscale was computed.

Side Jobs on or off Campus

Students were identified with regard to whether or not they had a side job and if so, how many hours they worked their side job as a student assistant and/or their off-campus side job. Because students were typically not yet working as student assistants in science-related jobs on campus during the first semester, the number of hours spent working a side job on or off campus was summed to make the results easier to interpret.

Demographic Variables

Amongst other variables, participants' sex and age was assessed.

Socioeconomic Status: Parents' Education

To infer parents' education, participants' self-reported information about their mothers' and fathers' education and vocational training was recoded into two variables, one each for mothers' and fathers' education, respectively (0 = *no school leaving certificate* at all to 7 = *PhD*). The two variables were then standardized via a *z*-transformation.

Socioeconomic Status: Parents' Occupation

Participants were asked to self-report their fathers' and mothers' occupation in an open-answer format. To infer parents' occupational status, two trained research assistants coded these occupations according to the ISEI (Ganzeboom et al., 1992). Different codings were discussed until agreement was achieved. One research assistant then converted the ISEI scores into the more novel and revised ISEI-08 scores, the new International Socio-Economic Index of Occupational Status by Ganzeboom (2010a). One advantage of this new classification is that it is based on data from women as well as men, whereas the classical ISEI was based on data from men only. ISEI-08 scores can take values that range from 10 (e.g., kitchen helpers) to 89 (e.g., medical doctors; Ganzeboom 2010b) and form "a continuous hierarchical scale" (Ganzeboom 2010c, para. 19). According to Ganzeboom (2010c), the scale is constructed for "minimizing the direct effect of education on earnings and maximizing the indirect ('mediated') effect of education on earnings via occupation" (para. 3). The two variables were then standardized via a *z*-transformation.

Socioeconomic Status: Composite Score

To infer parents' SES as a composite, the mean of the *z*-standardized values for mothers' education, mothers' occupation, fathers' education, and fathers' occupation was calculated. If the variables had missing values, the composite consisted of the mean of the remaining variables. As stated before, missing data were expected to result primarily from mothers working as housewives or parents working as freelancers.

Data Analysis

Wherever correlations are reported, these are Pearson Product Moment Coefficients with adjusted significance levels (Bonferroni-Holm correction) to control the familywise error rate.

However, because one might argue that the variables regarding parents' education and occupation, and thus the cSES, are not measured as interval-scale variables, and because the number of hours spent working a side job was not normally distributed, Kendall's τ or Spearman's ρ was also calculated for these correlations. Results indicated that all three correlation coefficients (*r*, τ, and ρ) produced results that were similar in direction and significance levels. Therefore, only the Pearson Product Moment Coefficients are reported.

As suggested by Field (2013a), the correlations were compared by computing a *t*-test for dependent correlations (for additional information, see also Field, 2013b). Here too, the significance levels were adjusted to control the familywise error rate. In addition, due to different numbers of missing values for each correlation, the most conservative strategy was employed, and when calculating each comparison, the smallest *n* was used.

Results

The mean cSES in the sample was *M* = -0.02 (*SD* = 0.83; Range: -2.02 to 1.68; see Table 2). Please note that the variation in cSES in terms of standard deviations was smaller than what was expected. For the single indicators, the mean unstandardized values for mothers' education were *M* = 3.92 (*SD* = 2.01; *n* = 330; Range: 0 to 7; Mode = 6); for fathers' education *M* = 4.45 (*SD* = 2.13; *n* = 327; Range: 0 to 7; Mode = 6); for mothers' occupation *M* = 53.17 (*SD* = 15.25; *n* = 273; Range: 17 to 89; Mode = 55); and for fathers' occupation *M* = 60.28 (*SD* = 17.39; *n* = 285; Range: 10 to 89; Mode = 68).

Correlations between the CSES and Students' Preexisting Characteristics

RQ 1a through 1g asked whether the cSES was related to students' intelligence, school grades, achievement motivation, academic self-concept, study interest, neuroticism, extraversion, openness, agreeableness, conscientiousness, or number of hours spent working

side jobs. It should be noted that the significance levels were adjusted via the Bonferroni-Holm correction to control the familywise error rate. The last significant correlation had a *p*-value of $p = .0004$. Data analyses revealed the following correlations (see Table 2): CSES was correlated with school grades (RQ_{1b}; $r = .35$) and extraversion (RQ_{1f}; $r_{ex} = .20$). Furthermore, cSES was negatively correlated with number of hours spent working side jobs (RQ_{1g}; $r = -.25$). However, cSES was not significantly correlated with mean intelligence (RQ_{1a}; $r = .08$; $p = .16$), the intelligence subscales analogies (RQ_{1a}; $r_{an} = .18$; $p \leq .01$), numerical series (RQ_{1a}; $r_{ns} = .00$; $p = .95$), or matrices (RQ_{1a}; $r_{ma} = -.01$; $p = .80$), achievement motivation (RQ_{1c}; $r = .10$; $p = .08$), academic self-concept (RQ_{1d};$r = .12$; $p = .02$), study interest (RQ_{1e}; $r = .02$; $p = .71$), neuroticism (RQ_{1f}; $r_{ne} = -.14$; $p \leq .01$), openness (RQ_{1f}; $r_{op} = .14$; $p \leq .01$), conscientiousness (RQ_{1f}; $r_{co} = .00$; $p = .95$), or agreeableness (RQ_{1f}; $r_{ag} = .06$; $p = .29$).

Differential Effects of Mothers' and Fathers' Indicators and CSES

RQ 2a asked whether mothers' (vs. fathers') education would be more strongly related to intelligence, school grades, achievement motivation, academic self-concept, study interest, personality, and number of hours spent working side jobs. Numerically, this was the case for the intelligence subscale numerical series ($\Delta r = 0.09$), achievement motivation ($\Delta r = 0.03$), academic self-concept ($\Delta r = 0.01$), study interest ($\Delta r = 0.12$), and number of hours spent working side jobs ($\Delta r = -0.02$; see Table 3). However, the *t*-tests for testing the respective dependent correlations with Bonferroni-Holm-adjusted significance levels were not statistically significant.

RQ 2b asked whether mothers' (vs. fathers') occupation would be less strongly related to intelligence, school grades, achievement motivation, academic self-concept, study interest, personality, or number of hours spent working side jobs. Numerically, this was the case for

intelligence (Δr = -0.12), the intelligence subscales analogies (Δr = -0.09), numerical series (Δr = -0.04), and matrices (Δr = -0.13), and also for school grades (Δr = -0.06), achievement motivation (Δr = -0.02), neuroticism (Δr = -0.01), extraversion (Δr = -0.05), openness (Δr = -0.01), conscientiousness (Δr = -0.12; note that mothers' occupation was indeed negatively correlated with conscientiousness), and number of hours spent working side jobs (Δr = 0.01; see Table 3). Here again, *t*-tests for testing the respective dependent correlations with Bonferroni-Holm-adjusted significance levels were not statistically significant.

RQ3 asked whether the composite measure (vs. the single measures) would be more strongly related to intelligence, school grades, achievement motivation, academic self-concept, study interest, personality, and number of hours spent working side jobs. Numerically, this was the case for 36 out of the 56 possible comparisons (see Table 3).

Taking a closer look at all comparisons of the correlation coefficients for the different indicators, only seven of the 84 comparisons revealed differences of $\Delta r \geq 0.10$. In five of these seven comparisons, the two indicators even had different algebraic signs. In only one of these comparisons did both single correlation coefficients differ significantly from zero. However, none of the *t*-tests for testing the respective dependent correlations with Bonferroni-Holm-adjusted significance levels were statistically significant.

Table 2

Descriptive Statistics, Internal Consistencies, and Intercorrelations between SES and Students' Preexisting Characteristics

		M	SD	α	I	IAN	INS	IMA	GPA	AM	ASC	SI	NE	EX	OP	CO	AG	HSJ	ME	FE	MO	FO
CSES	**[CSES]**	-0.02	0.83	.82	.08	.18**	.00	-.01	**.35♦**	.10	.12*	.02	-.14**	**.20♦**	.14**	.00	.06	**-.25♦**	**.82♦**	**.85♦**	**.80♦**	**.79♦**
Intelligence (mean score)	**[I]**	104.59	6.80	.60[a]		**.75♦**	**.77♦**	**.72♦**	**.22♦**	.10*	**.27♦**	.06	-.10	-.06	.04	-.01	-0.10	-.16**	.08	.09	-.03	.08
Intelligence – analogies	**[IAN]**	105.49	9.35	–			**.37♦**	**.29♦**	**.34♦**	.15**	**.27♦**	.07	-0.04	-.05	.16**	-.03	-.12*	-.15**	.12*	.19**	.09	.18**
Intelligence – numerical series	**[INS]**	104.80	9.24	–				**.34♦**	.16**	.04	**.24♦**	.05	-.13*	-.09	-.11*	.01	-.09	-.16**	.08	-.02	-.05	-.01
Intelligence – matrices	**[IMA]**	103.48	8.79	–					-.02	.02	.09	.02	-.05	.02	.04	-.01	-.01	-.05	-.01	.02	-.12*	.01
School grades (GPA)	**[GPA]**	5.36	0.55	–						**.29♦**	**.24♦**	.14**	.06	.01	.16**	**.25♦**	-.02	**-.24♦**	**.30♦**	**.31♦**	**.25♦**	**.31♦**
Achievement motivation	**[AM]**	105.36	7.41	–							**.36♦**	**.43♦**	-.05	**.20♦**	**.38♦**	**.50♦**	-.10*	-.03	.10	.07	.06	.07
Academic self-concept	**[ASC]**	3.69	0.51	.74								**.28♦**	-.18**	.09	**.26♦**	.14**	-.06	-.08	.13*	.12*	.13*	.04
Study interest	**[SI]**	3.74	0.58	.88									-.02	.06	**.25♦**	**.27♦**	.14**	-.07	.08	-.03	.03	-.02
Neuroticism	**[NE]**	3.09	0.77	.85										**-.20♦**	.02	.00	**-.19♦**	.03	-.06	-.07	-.16**	-.15**
Extraversion	**[EX]**	3.70	0.69	.57											**.24♦**	.08	.01	.07	.12*	**.21♦**	.14*	.19**
Openness	**[OP]**	3.73	0.57	.79												.06	.03	-.03	.12*	.17**	.08	.09
Conscientiousness	**[CO]**	3.57	0.62	.82													.06	-.06	-.02	.03	-.07	.05
Agreeableness	**[AG]**	3.64	0.52	.72														.02	.03	.04	.05	.05
Hours spent working side jobs	**[HSJ]**	2.87	5.19	–															**-.22♦**	**-.20♦**	-.20**	**-.21♦**
Mothers' education	**[ME]**	3.92	2.01	–																**.57♦**	**.68♦**	**.38♦**
Fathers' education	**[FE]**	4.45	2.13	–																	**.43♦**	**.70♦**
Mothers' occupation	**[MO]**	53.17	15.25	–																		**.43♦**
Fathers' occupation	**[FO]**	60.28	17.39	–																		

Note. CSES = mean of the *z*-standardized values of mothers' and fathers' education and occupation. School grades were recoded so that 6 was the best and 1 the worst grade possible.
[a]This α value refers to the standard scores of the three subscales analogies, numerical series, and matrices.
*$p \leq .05$. **$p \leq .01$. ♦Correlations that remained significant after the Bonferroni-Holm correction are marked with a diamond and printed in bold.

Table 3

Differences in and Comparisons of the Correlations between CSES, Mothers' and Fathers' Education, Mothers' and Fathers' Occupation, and Students' Preexisting Characteristics

		I	IAN	INS	IMA	GPA	AM	ASC	SI	NE	EX	OP	CO	AG	HSJ
ME vs. FE	$\Delta_{ME\text{-}FE}$	0.00[a]	-0.07	0.09	-0.03	-0.01	0.03	0.01	0.12	0.00	-0.09	-0.05	-0.05	-0.01	-0.02
	$t_{ME\text{-}FE}$	-0.08	-1.35	1.81	-0.63	-0.16	0.62	0.19	2.23	0.08	-1.69*	-1.05	-0.92	-0.15	-0.42
MO vs. FO	$\Delta_{MO\text{-}FO}$	-0.12	-0.09	-0.04	-0.13	-0.06	-0.02	0.09	0.05	-0.01	-0.05	-0.01	-0.12	0.01	0.01
	$t_{MO\text{-}FO}$	-1.68*	-1.38	-0.52	-1.89*	-0.96	-0.24	1.26	0.71	-0.13	-0.73	-0.17	-1.71*	0.13	0.13
CSES vs. ME	$\Delta_{CSES\text{-}ME}$	0.01	0.06	-0.07	0.00	0.05	-0.01	-0.01	-0.06	-0.08	0.08	0.02	0.02	0.03	-0.03
	$t_{CSES\text{-}ME}$	-0.21	1.89	-2.24**	-0.12	1.58	-0.18	-0.18	-1.96*	-2.44**	2.43	0.52	0.67	0.82	-0.88
CSES vs. FE	$\Delta_{CSES\text{-}FE}$	-0.01	-0.01	0.02	-0.04	0.04	0.03	0.00	0.05	-0.08	-0.01	-0.04	-0.03	0.02	-0.05
	$t_{CSES\text{-}FE}$	-0.36	-0.26	0.68	-1.21	1.42	0.85	0.13	1.67	-2.48**	-0.27	-1.22	-0.85	0.62	-1.65*
CSES vs. MO	$\Delta_{CSES\text{-}MO}$	0.11	0.09	0.05	0.10	0.10	0.04	0.00	-0.01	0.02	0.06	0.06	0.07	0.00	-0.04
	$t_{CSES\text{-}MO}$	2.84	2.33	1.37	2.68	2.79	1.08	-0.03	-0.31	0.49	1.57	1.43	1.81	0.10	-1.16
CSES vs. FO	$\Delta_{CSES\text{-}FO}$	-0.01	-0.01	0.02	-0.03	0.04	0.03	0.09	0.04	0.01	0.01	0.04	-0.05	0.01	-0.03
	$t_{CSES\text{-}FO}$	-0.18	-0.13	0.44	-0.71	1.08	0.66	2.27	0.97	0.26	0.27	1.13	-1.26	0.34	-0.94

Note. ME = mothers' education; FE = fathers' education; MO = mothers' occupation; FO = fathers' occupation; CSES = SES composite, I = intelligence mean standard score, IAN = intelligence – analogies; INS = intelligence – numerical series; IMA = intelligence – matrices; GPA = school grade point average (GPA); AM = achievement motivation; ASC = academic self-concept; SI = study interest; EX = extraversion; CO = conscientiousness; OP = openness; AG = agreeableness; NE = neuroticism; HSJ = number of hours spent working side jobs.

[a]Due to mathematical rounding some differences between correlation coefficients are .00, even though the two coefficients differ slightly from each other.

*$p \leq .05$. **$p \leq .01$. ♦Differences that remained significant after the Bonferroni-Holm correction are marked with a diamond and printed in bold.

Discussion

In the following sections, the main findings will be recapped. Second, these findings will be discussed, and some implications will be presented. Third, limitations of the current study will be discussed. Fourth and finally, further questions that should be investigated in future research will be addressed.

Recap of the Main Findings

In the current study, cSES was not significantly correlated with mean intelligence (RQ_{1a}). Taking a closer look at the intelligence subscales, cSES showed a numerically positive correlation with the analogies subscale. However, this correlation was not significant after the Bonferroni-Holm correction was applied. CSES was correlated with school grades (RQ_{1b}) such that students of the social sciences with higher cSES showed better school grades. CSES was not correlated with achievement motivation (RQ_{1c}), academic self-concept (RQ_{1d}), study interest (RQ_{1e}), neuroticism, openness, conscientiousness, or agreeableness (RQ_{1f}). However, cSES was correlated with extraversion (RQ_{1f}) such that students with higher cSES showed higher extraversion scores. Last, cSES was negatively correlated with number of hours spent working side jobs (RQ_{1g}) such that students with lower cSES spent more hours working side jobs.

The investigation of the additional research questions revealed that the different indicators that were used made hardly any difference: Mothers' (vs. fathers') education did not exhibit a significantly stronger relation to students' preexisting characteristics, and mothers' (vs. fathers') occupation did not have a significantly weaker relation with students' preexisting characteristics. Also, cSES did not yield stronger relations with students'

preexisting characteristics in comparison with the single indicators (mothers' or fathers' education or occupation).

General Discussion and Implications

In the current study, cSES was significantly correlated with school grades. However, cSES was not correlated with mean intelligence: This is interesting because one would expect a positive correlation with mean intelligence as well if the correlation between cSES and school grades was based on different levels of cognitive ability. However, these findings make sense in conjunction with the finding of the Authoring Group Educational Reporting (2010) that students with equivalent grades enroll in higher education less often when they have a nonacademic background. The increase in the correlation between SES and school grades from secondary to tertiary education might mirror the dropping out of students with a nonacademic and probably socioeconomically lower background at the transition to higher education, which might intensify the correlational pattern between SES and school grades. On the other hand, intelligence might work as a protective factor for students from lower SES while they make such decisions about transitioning. However, the underlying mechanisms need to be further investigated.

A closer inspection of the correlations of cSES with the intelligence subscales might reveal another mechanism at work: CSES showed a small, but after the Bonferroni-Holm correction was applied, nonsignificant correlation with the intelligence subscale analogies. However, this finding might nevertheless be relevant because the analogies subscale was the subscale with the strongest emphasis on language in the current study (in contrast to the other two subscales numerical series and matrices). In the analogies subscale, participants are given a pair of words from which to draw inferences about how these two words are related. Participants are then presented a single word and asked to indicate which of the five response

alternatives exhibits the same relation to this given word. In a way, the idea that students with higher cSES should score better on this subscale is in line with Bourdieu (1991), who—with regard to the concept of a class-specific habitus—emphasized the role of language as incorporated cultural capital. Connected with this conception is the assumption that the higher students' SES, the more incorporated capital they possess, and therefore the better their language proficiencies should be.

No correlations were found between cSES and achievement motivation, academic self-concept, study interest, neuroticism, openness, conscientiousness, or agreeableness. This might make sense insofar as the students who in fact decided to enroll in higher education at that time were similar in motivational aspects and personality. One reason for the nonsignificant relation with academic self-concept may have also been the point in time when students' preexisting characteristics were assessed: Having just started their studies, students probably still had a good sense of what they were academically capable of accomplishing in school. Therefore, their frame of reference at that time might still have been their former classmates. Out of these former classmates, many might have decided not to enroll in higher education.

A negative relation was also found between SES and the number of hours spent working side jobs. This finding might not be too surprising: Coming from a socioeconomically lower background should result in students having less money at their disposal and therefore more of a necessity to earn extra money. On the one hand, Brandstätter and Farthofer (2003) found that in an Austrian sample, the more hours students spent working a side job, the fewer examinations they took per semester, the worse their grade point average, the lower their student satisfaction, and the higher their risk of attrition. On the other hand, Jaksztat (2014) found that former tutors and/or research assistants at university showed a higher educational background than their fellow students who did not work as tutors and/or

research assistants. Because participants in the current study were students in their first semester, it did not make sense to introduce this differentiation yet. However, at later points in participants' studies, it might make sense to distinguish between side jobs that are related to students' studies and side jobs that are not.

Another finding was the correlation between cSES and the Big Five factor extraversion. This finding might also be in line with Bourdieu (1991), and in this case, his notion of social capital: It might be possible that students from socioeconomically well-off families might have been encouraged to be more outgoing and to socialize more than students from socioeconomically challenged families. Therefore, the better-off students should perceive themselves as more extraverted. Another possible mechanism might be that students with lower SES tend to question their place in academia and therefore perceive themselves as more introverted—at least in an academic setting. As Johnson, Richeson, and Finkel (2011) already showed, students do not even need to have a low SES but can also have an average SES and still question their academic fit and act differently after an academically challenging task if they think their fellow students have a high(er) SES.

The current results suggest either none or only marginal differences between different indicators of SES such as parents' education or occupation and their respective relations to students' preexisting characteristics. By contrast, the Task Force on Socioeconomic Status of the American Psychological Association (2007) argued for the uniqueness of these indicators, and Marks (2008) found that mothers' (vs. fathers') education was more strongly and mothers' (vs. fathers') occupation was less strongly related to 15-year-old students' achievement.

One reason for the current findings is that the variance not only in most of the preexisting characteristics but also in parents' education and occupation may have been restricted in our sample. Furthermore, it might be possible that the variation in parents'

education and occupation was not the same for the social science students in the current sample versus the school students investigated in previous studies or the German population in general (see the Synopsis for details on these assumptions). These issues might have resulted in some kind of convergence of relations between parents' education and occupation with students' preexisting characteristics. Along this line of reasoning, it makes sense that, in the current study, the composite and the single indicators showed similar relations to the respective preexisting characteristics. However, it might also be the case that the overall influence of mothers' education and fathers' occupation became less important as students moved from secondary to tertiary education.

Whereas cSES had positive relations with school grades and extraversion and a negative relation with number of hours spent working side jobs, no relations with other preexisting characteristics of students (i.e., achievement motivation, academic self-concept, study interest, neuroticism, openness, agreeableness, or conscientiousness) or different indicators of SES were found. One reason for these similarities might be the further restriction of variance in SES in tertiary education in comparison with secondary education. Another reason might be that the role of SES is stronger before students' transition to higher education and that it diminishes for students who decide to pursue a study program in the social sciences. However, additional research is needed to substantiate these arguments. Overall, the results suggest the necessity to differentiate between different levels of education: A transfer of results from the area of secondary education to the area of tertiary education does not seem to do justice to the complex relations between SES and students' preexisting characteristics.

Limitations

The current study exhibited some limitations: Whereas data on psychology students were collected at two sites, data on sociology students and political science students were collected

at only one site. This might be relevant because on the one hand, admission standards could potentially differ between the two sites, and on the other hand, students' SES might be different at the two sites. Furthermore, psychology students were overrepresented in the current sample, providing more than twice the number of participants than sociology students and political science students combined. The high admission standards in psychology and, in addition, psychology students' and political science students' overall privilege with regard to SES might have led to a further restriction of variance in SES in the sample—especially because the subgroup with the most variance in SES, that is, sociology students, comprised only about one fifth of the participants (see Table 1 and the Synopsis for details).

In addition, there were many missing values on the occupational indicators. However, this problem of missing values is typical for occupational classifications such as the ISEI-08, where occupations such as "househusband/housewife" or "freelancer" cannot be assigned a specific score: Even though, for example, the activities of a househusband/housewife might involve some of the same tasks implemented by a housekeeper, neither income nor occupational prestige is the same (GESIS, 2009). Also, being a "freelancer" can mean anything from cleaning houses for 2 hours per week to owning a consulting agency. Here, too, assigning a value without knowledge of the typical tasks or activities performed would most likely fail to yield appropriate results. However, missing data could have led to biased calculations of the composite measure and especially the smaller standard deviation of the cSES.

Finally, all indicators of SES assessed via students' self-reports concerned students' parents' education and occupation. However, it might be plausible that tertiary education students' SES differs more from their parents' SES than secondary education students' SES does.

Future Directions

The differential patterns of pursuing tertiary education shown by socioeconomically disadvantaged students in comparison with their well-off counterparts (Authoring Group Educational Reporting, 2010) could have severe economic consequences: In particular, *losing* students with clearly above-average cognitive abilities due to their socioeconomically lower background is something universities should avoid in their own interest. Future research should therefore strive to answer the following questions: What are the hurdles students face during the transition to tertiary education? How can overcoming these hurdles be facilitated?

Another focus regarding the correlational patterns of SES, grades, and/or cognitive ability should be whether these patterns are similar at the point when students achieve their degrees in higher education: Is students' SES also positively correlated with their university grades when it is not correlated with their cognitive abilities? If so, it would seem necessary to examine possible moderators and mediators of these relations, for example, students' language proficiencies.

Regarding the further development of students' academic self-concept, it might be plausible for academic self-concept to change over time. Whereas there is hardly a correlation between cSES and academic self-concept at the beginning of tertiary education, a correlational pattern might emerge when students learn what their peers at university know and can do—especially after the first exams. This might actually be a crucial point in time where differential effects that depend on SES come into play. One research question might involve asking whether cSES is positively correlated with an increase in academic self-concept.

In the group of students who decided to study the social sciences, motivational variables such as achievement motivation or study interest did not seem to be related to SES. This is interesting as there might be crucial differences between the German students in

higher education and, for example, the US-American students in higher education, where such differences have been found (e.g., Terenzini et al., 1996). Here, future research could focus on a cultural comparison, which might reveal new and valuable insights.

Furthermore, even though the correlation between cSES and the number of hours spent working side jobs does not necessarily need to be a causal one, it can be taken as an indication that there is a need to further explore the relations between students' SES, their necessity to earn money, and their academic achievement. Do students with the need to work side jobs receive worse grades because of these side jobs? Are they at greater risk of attrition because of these side jobs? Do the types of side jobs (academic vs. nonacademic) show differential effects? It might be plausible that on-campus (academic) side jobs show a positive correlation with students' SES, whereas off-campus (nonacademic) side jobs show a negative correlation with students' SES. Future research might focus on the question of whether side jobs on and off campus affect students' grades and attrition differently. There are results that have hinted that this might be the case (Brandstätter & Farthofer, 2003; Jaksztat, 2014). However, additional research is needed to clarify the causal pathways, for example, via experiments (e.g., in the context of student loans or funding via scholarships) or cross-lagged panel designs.

Regarding the adequacy of students' parents' SES as an indicator of students' SES, it seems fruitful to also investigate students' actual income and the extent to which they benefit from their parents' educational resources or their parents' occupations. It might be possible that the influence of students' parents' indicators gradually weakens, whereas students' own indicators gradually gain weight during their studies in tertiary education.

Some of the current findings can be seen as hints to meaningful challenges for the social sciences. In addition, this study revealed three main findings on the relations between SES and students' preexisting characteristics in the social sciences: First, results regarding the

relations between SES and students' preexisting characteristics cannot simply be transferred from secondary education to tertiary education. Second, there are positive relations between SES and school grades that are probably not due to differences in cognitive ability. Third, there is a negative relation between SES and the number of hours spent working side jobs. These findings, their possible roots in students' transition from secondary to tertiary education, and their role in academic achievement should be further investigated so that higher education can provide equal opportunities to all students.

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Study 2:
Predicting Psychology Students' Academic Achievement with Objective and Subjective Socioeconomic Status

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Introduction

As long ago as 2007, the members of the Task Force on Socioeconomic Status from the American Psychological Association stated the need to consider social class in psychology. They appealed to individuals in research, practice, and education to pay more attention to the effects of socioeconomic status (hereafter: *SES*) and social class on psychological processes and outcomes. Furthermore, they called on these individuals to consider the *subjective experiences* that go along with SES, social class, and class-related inequities.

Whereas international studies in the area of health increasingly take measures of subjective SES into consideration beyond measures of objective SES, this is rarely done in Germany (for a systematic review of subjective SES in the area of health, see Hegar & Mielck, 2010). Exceptions are two studies outside the area of health—one from Germany and one from the neighboring country of Austria - that shed light on the role of subjective SES in money priming (Schuler & Wänke, 2016) and aggression (Greitemeyer & Sagioglou, 2016). However, the topic of subjective SES along with *education* or *educational outcomes* does not appear to have been addressed in Germany.

Further, not much is known about students' subjective views of their SES in general. These views might be especially important in the area of tertiary education, where students' subjective views might differ from objective indicators (e.g., their parents' income, education, or occupation; Rubin et al., 2014), which have been brought up in conjunction with academic achievement in several educational reports (e.g., report on PISA 2012, OECD, 2013)

In addition, much of the research that is conducted nationally and internationally with regard to SES has hailed from disciplines that tend to focus on the macro level of society (e.g., sociology) rather than on the micro level of the individual (e.g., psychology, microsociology). Therefore, the aim of the present study was to shed light on predicting

academic achievement in higher education with traditional objective measures of SES and, in addition, with subjective measures of SES.

Traditional Measures of Objective SES and their Associations with Academic Achievement

The Organisation for Economic Co-operation and Development (OECD) has acknowledged that SES is a broad concept that targets students, schools, and school systems (OECD, 2016). To measure socioeconomic status, researchers usually draw on a combination of education, income, and occupation (American Psychological Association, 2015). In recent PISA studies, SES was estimated via the PISA index of economic, social, and cultural status. This index considers parental education, parental occupation, and indicators of material wealth and educational resources available in students' homes (e.g., OECD, 2016).

Objective SES and Academic Achievement in Secondary Education

Drawing on data from PISA 2000, Marks (2008) investigated the association of fathers' and mothers' education as well as fathers' and mothers' occupation with student performance in reading and mathematics: On the basis of the OECD average in the year 2000, fathers' and mothers' education explained 12% (Germany: 16%) of the variation in students' reading performance and 12% (Germany: 17%) of the variation in students' math performance, whereas fathers' and mothers' occupational status explained 13% (Germany: 19%) of the variation in students' reading performance and 12% (Germany: 17%) of the variation in students' math performance. Similar results were found in subsequent PISA studies (OECD, 2007, 2010, 2013, 2016), where the PISA index of economic, social, and cultural status explained variance in science performance in 2006 (OECD average: 14%; Germany: 19%), in reading performance in 2009 (OECD average: 14%; Germany: 18%), in mathematics

performance in 2012 (OECD average: 15%; Germany: 17%), and in science performance in 2015 (OECD average: 13%; Germany: 17%).

In two comprehensive meta-analyses on the relation between common indicators of objective SES and school students' academic achievement, White (1982) and Sirin (2005) reported mean correlations of $r = .18$ and $r = .30$, respectively, between parents' education and students' academic achievement, and mean correlations of $r = .20$ and $r = .28$, respectively, between parents' occupation and students' academic achievement. In addition, White (1982) also investigated composite scores of SES. The composite of education and occupation yielded a higher correlation with academic achievement ($r = .32$) than the composite of income and education ($r = .23$) and a correlation that was as high as the one with the composite of income, education, and occupation ($r = .32$) or the composite of income and education ($r = .33$). Overall, the results pointed to a relation of students' SES and their academic achievement in secondary education. In addition, the PISA studies suggested that this relation might be more pronounced in Germany than found for the OECD average.

Objective SES and Achievement-Related Findings in Tertiary Education

One study with a representative sample of German university graduates from 2005 suggested that parents' educational status as one aspect of SES is related to higher education students' final school and university grades: Jaksztat (2014) found that the three groups of students (i.e., no parent holding a degree vs. one parent holding a degree vs. both parents holding a degree) differed with regard to their final school and university grades. Students with no parent holding a degree had grades up to 0.3 grade points worse in both final school and final university grades than students whose parents both held a degree. This study therefore pointed to a relation of students' SES and their academic achievement in tertiary education, too.

Objective SES and Academic Achievement: Potential Mechanisms at Work

After reviewing the findings on the relation between SES and academic achievement in secondary and tertiary education, the questions that remain are: Why and how should SES be related to academic achievement? One possible mechanism that might shape the relation between SES and academic achievement might work through differential access to resources that depend on SES: Such resources might concern nutrition, access to health care, housing, parents' expectations and styles, teachers' attitudes and expectations, and—in particular—*access to cognitively stimulating materials and experiences* (for an overview, see Bradley & Corwyn, 2002).

Another possible mechanism that might shape the relation of SES and academic achievement might lie in differences in intelligence. For example, Rost (2009) argued that there are two reasons for the overrepresentation of children with high SES backgrounds in high achievers. The first reason is that marriages usually take place among individuals who are similar in intelligence; because the heritability of intelligence lies around 50% to 70%, highly intelligent individuals (who usually have a higher SES) are more likely to have highly intelligent offspring. The second reason is that intellectual stimulation is usually higher among high SES families than among low SES families, a tendency that is in line with the resource argument above.

Substantiating this line of reasoning, von Stumm and Plomin (2015) found that higher SES was related not only to higher intelligence at age 2 but also to *greater gains* in intelligence from age 2 to age 16 and onwards: At age 2, both boys and girls with low SES backgrounds scored 6 IQ points lower on average than children with high SES backgrounds. At age 16, boys from low SES backgrounds scored 15 IQ points lower and girls from low SES background scored 17 IQ points lower than their counterparts with high SES backgrounds.

Similar results were found for academic performance (von Stumm, 2017): At age 7, low SES children's academic performance on average was 0.43 grade points lower than that of high SES children. At age 16, this disadvantage increased to 1.25 grade points. After adjusting for intelligence, these differences diminished to 0.15 grade points for children's academic performances at age 7 and 0.50 grade points for adolescents' academic performance at age 16. Apart from intelligence, SES accounted for 2% of the variance in academic performance at age 7 and 8% of the variance in the development of academic performance between age 7 and age 16—emphasizing the role of SES in the *development* of academic performance.

In sum, differential access to resources and differences in intelligence in early childhood that increase with age and depend on SES might contribute to the relation between SES and academic achievement in adolescents.

Research Questions on Measures of Objective SES

The aforementioned findings point to a relation between SES and academic achievement in education. Academic achievement was operationalized as grade point average in some studies and as scores on standardized tests in other studies. To indicate academic achievement in this study, university grade point average and scores on a test of scientific competencies were both used as dependent variables.

In addition, White's (1982) meta-analysis also indicated that it is appropriate to use a composite of parents' education and occupation as an indicator of SES. Therefore, a composite variable of mothers' and fathers' education and occupation (hereafter: *composite SES*), which represents objective SES, was employed in this study. The first aim of the present study was to answer the following research questions regarding traditional measures of objective SES:

RQ_{1a}: Is objective SES a positive predictor of psychology students' university grades?

RQ_{1b}: Is objective SES a positive predictor of psychology students' scores on a test of scientific competencies?

Measures of Subjective SES

Kraus, Piff, and Keltner (2009) argued that material resources as well as the perceived rank of an individual define an individual's social class. Even though there are differences between social class and SES (i.e., social class comprises an individual's social background and is more stable, whereas SES focuses on a person's current situation and is more mutable; Rubin et al., 2014), it makes sense to apply this division to SES, too. According to Kraus et al. (2009), the material resources are often measured with objective indicators of SES, and perceived rank in the social hierarchy is often measured with subjective indicators of SES. The latter subjective measures of SES target an individual's subjective psychological perception of his or her standing in the social hierarchy. According to Adler, Stewart, and the Psychosocial Working Group (2007), subjective SES relies heavily on multiple dimensions of SES and therefore represents a summative approach. Similarly, Andersson (2017) argued that the subjective self-definition of SES might differ from an individual's objective SES—because it encompasses additional factors that are not always congruent with a person's objective SES.

The APA Task Force on Socioeconomic Status (2007) advocated the use of objective and subjective measures of SES in psychological research. In 2014, Rubin et al. (2014) pointed to the fact that subjective self-definitions of SES were (still) missing in research on higher education. Therefore, they strongly suggested that objective *and* subjective measures of social class and SES be integrated in higher education research. While acknowledging the advantages of objective socioeconomic measures, the authors argued against the *sole* use of objective measures of SES in research on higher education for several reasons. One reason is

that classical objective measures focus on parents' indicators, which might not always be congruent with students' indicators. Other reasons include the lack of context-sensitivity of objective measures of SES, their overlooking of intersectionality, and their ignoring of students' subjective perceptions of SES, which might differ from the objective categorization.

According to Rubin et al. (2014), subjective measures of SES assess higher education students' self-definitions more directly as they do not need to be interpreted in relation to objective standards but instead invite participants to reflect on their internal standards, and they are more sensitive to changes in participants' SES. In addition, they allow for an adaption to different, meaningful frames of reference. Therefore, the authors argue that additional subjective measures of social class and SES should be employed in addition to objective measures.

Subjective SES in the Area of Health

One of the subjective measures referred to in most of the studies on subjective SES is the MacArthur Scale of Subjective Social Status (Adler, Epel, Castelazzo, & Ickovics, 2000). This scale was first introduced in the context of health psychology. On this scale, participants are asked to indicate their *subjective standing in society* on a drawn ladder with 10 rungs with respect to a combination of income, education, and occupation (the three traditional indicators of objective socioeconomic status). This measure will hereafter be called *society-related and specific subjective SES*.

Another study by Goldman, Cornman, and Chang (2006) introduced an additional ladder measure: In their modified version, participants are asked to indicate their *standing in the community that was most meaningful to them*. For this measure, the authors did not determine a reference group nor did they mention the classical SES indicators such as income, education, or occupation. The corresponding measure will hereafter be called *community-related and general subjective SES*. Even though both the society-related and the community-

related measures were highly correlated (r = .78), the authors argued that researchers might leave it to the individuals to determine which criteria to use to assess their own status.

When controlling for objective SES and negative affectivity, the society-related and specific subjective SES measure explained up to 15% of the variance in several physiological and psychological indices (Adler et al., 2000). More recent results from a study investigating 29 countries suggested that—after controlling for objective SES—a 1-unit increase in subjective SES was associated with an increase of 0.11 standard deviations in self-rated health and 0.12 standard deviations in psychological well-being (Präg, Mills, & Wittek, 2016).

Subjective Experiences related to SES in Higher Education

Johnson, Richeson, and Finkel (2011) investigated students' subjective experiences of SES, that is, how students at an elite university experienced their own SES relative to their peers. The authors argued that even students from middle-class backgrounds experience discrepancies between their own SES and that of their (privileged) peers. In their study, most of the students' families' household incomes were described as at least middle class. However, the household income of the majority (56%) was described as the highest income category. The authors assessed students' sensitivity to such SES-based identity discrepancies. Results revealed that the lower students' SES, the more they were sensitive to discrepancies in SES between themselves and their peers (r = -.33). The authors also found a small positive correlation between SES and academic fit (i.e., students' concerns about living up to the universities' standards; r = .11). A mediational analysis revealed that sensitivity to SES-based identity discrepancy mediated the relation between SES and academic fit. These findings emphasize the importance of students' subjective experiences.

Research Questions on Measures of Subjective SES

Consistent with the aforementioned suggestion that studies should include measures of subjective SES in higher education research, the first indications of an incremental explanation of variance with subjective SES beyond objective SES, and findings regarding students' sensitivity to discrepancies in SES, another aim of the present study was to answer the following research questions:

RQ_{2a}: Is subjective SES a positive predictor of psychology students' average university grades beyond objective SES?

RQ_{2b}: Is subjective SES a positive predictor of psychology students' scores on a test of scientific competencies beyond objective SES?

Additional Measures of Subjective SES

In the literature on subjective SES, several authors have argued for the importance of employing different frames of reference in subjective SES measures (Kraus et al., 2009; Wollf, Subramanian, Acevedo-Garcia, Weber, & Kawachi, 2010). To meet this request and to identify potentially different patterns in the amount of variance that is explained with different measures of subjective SES, additional measures of subjective SES beyond those used by Adler et al. (2000) and Goldman et al. (2006) were employed in the current study. Thus, beyond the society-related and specific as well as the community-related and general subjective SES measures, one additional item asked participants to compare themselves with all students at their university instead of a freely chosen community. This item did not specify any criteria (*university-related and general subjective SES*).

Another aim of this study was to disentangle subjective perceptions of the different criteria that usually compose the classical objective SES measures (i.e., occupation, income, education): Three additional items assessed participants' social standing in comparison with

other students in their study program and tapped the different classical objective SES criteria in a more subjective manner. Because they were adapted to the context of higher education where the classical criteria of occupational prestige and education are the same among students (i.e., all students are students, and all students necessarily have a higher education entrance qualification), these items assessed *students'* subjective occupational prestige (*study-program-related subjective SES regarding reputation*), students' subjective financial means (*study-program-related subjective SES regarding finances*), and students' subjective education (*study-program-related subjective SES regarding academic achievement*). These items differed from the classical objective SES-indicators in that they focused on students' instead of their parents' occupational prestige, financial means, and education, and in doing so, they were adapted so that they applied to the context of higher education.

Research Questions on Additional Measures of Subjective SES

The final aim of this study was to investigate potentially different patterns of different measures of subjective SES. To achieve this goal, the following research questions were posited:

RQ_{3a}: Which subjective SES measure explains the most variance in psychology students' university grades?

RQ_{3b}: Which subjective SES measure explains the most variance in psychology students' test scores on a test of scientific competencies?

The Current Study

The first aim of the current study was to investigate the power of objective SES in predicting psychology students' academic achievement. The second aim was to investigate the predictive power of subjective SES beyond objective SES. The third aim was to investigate the predictive power of different subjective SES measures. To pursue these goals, data from two

samples were considered. Average university grades as well as scores on a test of scientific competencies were considered as dependent variables.

Method

All data used in the following analyses stemmed from the two waves of data that were collected on students' scientific competencies (hereafter: *SciCom1* and *SciCom2*) from the WiKom-SoWi project (for further details, see the Synopsis of this dissertation). Among other variables, demographic variables such as students' parents' education, parents' vocational training, and parents' occupation and students' subjective socioeconomic status, scientific competencies, and university grades were assessed.

Samples and Procedure

In the summer term 2014, $N = 186$ students of psychology (145 women; age $M = 22.97$ years, $SD = 6.17$ years) took part in SciCom1 regarding scientific competencies in psychology at Saarland University and Heidelberg University. All further analyses in SciCom1 refer to a subset of these students ($N = 78$; 61 women; age $M = 23.22$, $SD = 3.80$ years) because only about one fifth of the participants at Saarland University received the subjective SES measures.

In the winter term 2014/2015, $N = 187$ students of psychology (143 women; age $M = 22.20$ years, $SD = 3.18$ years) took part in SciCom2 regarding scientific competencies in psychology at Saarland University and Heidelberg University. Participants who took part in SciCom1 were strongly encouraged to take part in SciCom2 as well. Therefore, regarding the analyses here, a subset of $n = 39$ students participated in both samples. For further details regarding the samples, see Tables 1 and 2 in the Synopsis.

In both waves of data collection, the material was presented as a paper and pencil questionnaire in several booklets. The only exception was the assessment of students' university grades at Saarland University (see the Measures section). The first booklet always consisted of the test of scientific competencies in psychology; the other booklets consisted of all additional measures and the demographic variables. The items regarding subjective SES were adapted from Adler et al. (2000) and Goldman et al. (2006) and were modified as needed. All analyses were conducted separately for the two samples.

Measures

Demographic Variables

In the demographics section, students were asked to indicate their sex and age. They were also asked to indicate the semesters they had studied up to then, their grades in their general qualifications for university entrance, each parent's education, each parent's vocational training, and each parent's occupation. Students' indications of the number of semesters studied were corrected if they indicated that they had studied for fewer than six semesters but were simultaneously enrolled in a master's study program. In these cases, six semesters (i.e., the regular duration of a bachelor study program in psychology at both universities) were added to students' original indication.

Grades in Students' General Qualification for University Entrance

Grades in students' general qualifications for university entrance (hereafter: *school GPA*) were assessed via students' self-reports. Missing data were replaced with data from self-reports in earlier surveys if available. Data were reverse-coded so that higher scores indicated better grades. Preliminary analyses revealed site-specific differences in mean school GPA, probably because of differences in admission standards at the two sites. Therefore, the grades

were *z*-standardized separately for each site to balance these differences. Finally, the *z*-standardized scores were merged into one variable.

SES: Parents' Education

Participants were asked to report information about their mothers' and fathers' education and vocational training. To infer parents' education, these data were recoded into two variables, one each for mothers' and fathers' education (0 = *no school leaving certificate at all* to 7 = *PhD*). Variables were then *z*-standardized.

SES: Parents' Occupation

Participants were asked to indicate their fathers' and mothers' occupations in an open-answer format. To infer parents' occupational status, two trained research assistants coded these occupations according to the ISEI (Ganzeboom, De Graaf, & Treiman 1992). Different codings were discussed until agreement was achieved. One research assistant then converted the ISEI scores into the more novel and revised ISEI-08 scores, the new International Socio-Economic Index of Occupational Status by Ganzeboom (2010). Variables were then *z*-standardized.

Composite SES Score

To infer parents' SES as a composite, the mean of the *z*-standardized values for mothers' education and occupation as well as for fathers' education and occupation were calculated. If variables had missing values, the composite consisted of the mean of the remaining variables. For difficulties with a large amount of missing data on mothers' occupation, see Study 1 of this dissertation.

Subjective SES

Subjective SES was assessed in accordance with Adler et al. (2000) and Goldman et al. (2006). For an overview of the items that were employed, see Table 1 (for the original items in the German language, see Appendices A and B). Participants were asked to indicate their social standing on a 10-runged ladder with regard to their society and their community. The first item regarding social standing in participants' society addressed the classical, specific aspects of SES: income, education, and occupation (i.e., society-related and specific subjective SES). The second item regarding participants' social standing in their community consciously avoided making such specifications (i.e., community-related and general subjective SES).

In SciCom2, four more items that focused on different reference groups and criteria were employed. One item asked about participants' social standing with regard to all students at their university. This item did not address the classical aspects of SES but rather avoided making such specifications (i.e., university-related and general subjective SES). Therefore, its focus was much broader, similar to that of Goldman et al. (2006). The other three items asked about participants' social standing with regard to their fellow students in their study program, but they each tapped different, specific criteria (i.e., study-program-related subjective SES regarding reputation, study-program-related subjective SES regarding finances, and study-program-related subjective SES regarding academic achievement).

Average University Grades

Students' average university grades (hereafter: *university GPA*) were assessed differently at the two sites: At Saarland University, students' course grades were provided by the examination office. At Heidelberg University, students indicated their course grades via self-reports in one of the booklets. Note, however, that the number of course grades differed to a

large extent across students, for example, depending on the number of semesters students had attended the university. For students in the master's program, all grades were considered—including the grade from a student's bachelor thesis.

At Saarland University, psychology students were allowed to remove grades in some courses during the process of calculating their average university grade. At Heidelberg University, students were not allowed to do so. Therefore, an unweighted average of all course grades available was computed first and then recoded so that 5 was the best grade possible and 1 was the worst grade possible (which—if received—meant that the student had failed the respective course). As with school GPA, preliminary analyses revealed site-specific differences in university GPA. In addition, the differential mechanisms of calculating university GPA led to the decision to *z*-standardize the values separately for each site before merging the *z*-standardized scores into one variable.

Scientific Competencies

Students' scientific competencies were assessed with a scenario-based test of scientific competencies in psychology (Klopp et al., 2014). This test covered several topics by means of five scenarios that offered narrative settings and provided information about the items to be solved. In addition, the test also included items from previous exams at Saarland University. Overall, the test comprised 172 items. However, due to problems with item wording, the final test comprised 170 items.

An unweighted test score treating every item equally was calculated. If answered correctly, the participant received 1 point for the item. If answered falsely, the participant did not receive a point. Therefore, participants could receive a total of 170 points. However, preliminary analyses revealed site-specific differences in raw test scores, probably due to the closer connection of test items to study content at Saarland University (for details, see also the

Synopsis of this dissertation). This led to the decision to *z*-standardize the values separately for each site before merging the *z*-standardized scores into one variable.

Analyses

In the current study, two methods of standardization were employed (for the rationales behind the different approaches, see the respective subsections above): First, mothers' and fathers' educational attainments, as well as mothers' and fathers' occupations, were standardized across the two sites. These variables were then used to build the composite SES variable. Second, students' school GPA, students' university GPA, and students' test scores were standardized separately for each site and then merged into one variable, respectively.

Hierarchical regression analyses were employed to answer the research questions. Separate regression analyses were conducted for both samples. Furthermore, because school grades have been shown to be a strong predictor of academic achievement in tertiary education (for an overview, see Trapmann, Hell, Weigand, & Schuler, 2007), students' school GPA was always added in the first step.

Table 1

Wording of Items Employed to Assess Subjective Socioeconomic Status (For Original Items, see Appendices A and B)

		In the following, you will find several drawings of ladders on the right. There are a total of 10 rungs from the bottom to the top.				
		Think of ladder X as representing where…	**At the top of the ladder are…**	**At the bottom are…**	**If you consider your current personal situation and compare it with…**	**…where would you place yourself on this ladder…**
Society-related and specific subjective SES	**SRS**[a]	…all residents stand in Germany.	…the people who are the best off—those who have the most money, the most education, and the most respected jobs.	…the people who are the worst off, those who have the least money, the least education, and the least respected jobs or no jobs.	…all residents in Germany,	?
Community-related and general subjective SES	**CRG**[b]	…all people stand in their communities. People define communities in different ways; please define it in whatever way is most meaningful to you.	…the people who have the highest standing in their community.	…the people who have the lowest standing in their community.	…all other people in your community,	?
University-related and general subjective SES	**URG**	…all students stand at your university.	…the students in your university who are the best off.	…the students in your university who are the worst off.	…all students at your university,	?
Study-program-related subjective SES regarding reputation	**SPRR**	…all fellow students stand in your study program.	…the students in your study program who have the highest reputation.	…the students in your study program who have the poorest reputation.	…the students in your study program	…regarding your own reputation?
Study-program-related subjective SES regarding finances	**SPRF**	…all fellow students stand in your study program.	…the students in your study program who are the best off financially—who have the most funds at their disposal.	…the students in your study program who are the worst off financially—who have the least funds at their disposal.	…the students in your study program	…regarding your own financial situation?
Study-program-related subjective SES regarding academic achievement	**SPRA**	…all fellow students stand in your study program.	…the students in your study program who show the best academic achievement.	…the students in your study program who show the worst academic achievement.	…the students in your study program	…regarding your own academic achievement?

[a]Phrasing of item corresponding to Adler et al. (2000).
[b]Phrasing of item corresponding to Goldman et al. (2006).

Results

Descriptive Statistics

For item means, standard deviations, and information regarding the site-specific subsamples, see Table 2. Note that unstandardized values of school GPA, university GPA, test scores, mothers' education, fathers' education, mothers' occupation, and fathers' occupation are presented. For site-specifically standardized and merged values of school GPA, university GPA, and test scores, as well as standardized values (across sites) of mothers' education, fathers' education, mothers' occupation, and fathers' occupation, see Appendix C.

Item means in both samples indicated that participants from Saarland University belonged to numerically higher semesters, had numerically lower school GPA and university GPA, received numerically higher test scores, showed numerically lower composite SES, and indicated numerically lower society-related and specific subjective SES but numerically higher community-related and general subjective SES.

For intercorrelations between items in SciCom1 and SciCom2, respectively, see Table 3. Significance levels were adjusted via the Bonferroni-Holm correction to control the familywise error rate. Note that intercorrelations of the unstandardized variables are presented. For intercorrelations of the site-specifically standardized and merged values of school GPA, university GPA, and test scores, as well as standardized values (across sites) of mothers' education, fathers' education, mothers' occupation, and fathers' occupation, see Appendix D.

In both samples, unstandardized school GPA was positively correlated with unstandardized university GPA (SciCom1: r = .39; SciCom2: r = .34). However, the correlation coefficients of the standardized variables were significant for SciCom2 only

(SciCom1: r = .25; SciCom2: r = .29; see Appendix D). In SciCom2, unstandardized school GPA was correlated r = .31 with the unstandardized test scores (the correlation between the standardized variables was r = .38).

Unstandardized university GPA and the unstandardized test scores were positively correlated: r = .48 (SciCom1) and r = .39 (SciCom2) (the intercorrelations for the standardized variables were r = .66 [SciCom1] and r = .56 [SciCom2], see Appendix D).

In SciCom2, the objective composite measure of SES was positively correlated with the society-related and specific subjective SES (r = .25) and the study-program-related subjective SES regarding finances (r = .26). All but one of the subjective SES measures (i.e., society-related and specific subjective SES, community-related and general subjective SES, university-related and general subjective SES, study-program-related subjective SES regarding reputation, and study-program-related subjective SES regarding finances) were positively intercorrelated with each other with correlations ranging from r = .41 to r = .54. The exception was study-program-related subjective SES regarding academic achievement, which was correlated with only university-related and general subjective SES (r = .42) as well as study-program-related subjective SES regarding reputation (r = .41).

Table 2

Overall and Site-Specific Means and Standard Deviations for the Unstandardized Values

		SciCom1						SciCom2					
		Overall		Saarland University		Heidelberg University		Overall		Saarland University		Heidelberg University	
		M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Semester	SEM	5.72	2.91	7.17	2.42	4.81	2.85	4.67	2.40	4.96	2.48	4.08	2.14
School Grade Point Average[a,b]	SGPA	4.55	0.43	4.32	0.34	4.69	0.43	4.45	0.45	4.38	0.43	4.60	0.44
University Grade Point Average[a,b]	UGPA	4.15	0.59	3.77	0.66	4.37	0.43	3.83	0.76	3.62	0.79	4.21	0.51
Scientific Competencies Test Score[b]	TEST	100.19	21.40	103.03	20.50	98.42	21.96	97.39	24.20	101.20	22.51	89.51	25.80
Education Mother[b]	EDM	4.12	2.04	3.80	2.06	4.31	2.02	4.15	1.96	3.99	1.99	4.47	1.88
Education Father[b]	EDF	4.75	2.14	4.70	2.04	4.79	2.23	4.51	2.05	4.20	2.07	5.13	1.88
Occupation Mother[b]	ISEIM	53.71	14.91	51.22	15.56	55.44	14.39	54.53	15.82	52.97	16.34	58.20	14.01
Occupation Father[b]	ISEIF	63.78	16.48	62.86	17.81	64.28	15.94	65.04	15.50	63.20	16.14	69.06	13.28
Composite SES	CSES	-0.01	0.81	-0.15	0.81	0.08	0.81	-0.01	0.78	-0.12	0.79	0.22	0.72
Society-related and specific subjective SES	SRS	6.68	1.30	6.15	1.10	6.98	1.31	6.37	1.39	6.31	1.42	6.49	1.32
Community-related and general subjective SES	CRG	6.82	1.53	6.89	1.32	6.77	1.65	6.61	1.55	6.67	1.56	6.49	1.54
University-related and general subjective SES	URG							6.16	1.67	6.23	1.71	6.02	1.60
Study-prog.-related subjective SES – reputation	SPRR							5.67	1.54	5.82	1.52	5.36	1.57
Study-prog.-related subjective SES – finances	SPRF							5.88	2.02	6.09	1.97	5.46	2.08
Study-prog.-related subjective SES – academic achievement	SPRA							5.79	1.72	5.71	1.70	5.95	1.76

Note. SciCom1 overall: N = 60-78 (Saarland Uni: n = 21-30; Heidelberg Uni: n = 39-48); SciCom2 overall: N = 150-187 (Saarland Uni: n = 99-126; Heidelberg Uni: n = 45-61).

[a]GPA was reverse-coded so that 5 was the best grade possible and 0 (school) or 1 (university) the worst grade possible.

[b]Unstandardized values. For the means and standard deviations for the standardized variables, see Appendix C.

Table 3

Intercorrelations for the Unstandardized Values

		SEM	SGPA	UGPA	TEST	EDM	EDF	ISEIM	ISEIF	CSES	SRS	CRG	URG	SPRR	SPRF	SPRA
Semester	SEM	-	-.16*	.06	.14*	.00	.03	-.02	.06	.00	-.03	-.15*	.06	.02	-.07	.04
School GPA[a]	SGPA	-.37**	-	**.34♦**	**.31♦**	-.04	.13	-.14	.21*	.05	.11	.03	.00	.03	-.04	.19*
University GPA[a]	UGPA	.00	**.39♦**	-	**.39♦**	-.08	.13	-.14	.09	.01	.09	-.06	.10	.06	.02	**.52♦**
Scientific Competencies Test Score[a]	TEST	.21	.14	**.48♦**	-	-.11	-.06	-.20*	.00	-.12	.07	.01	.19**	.17*	.14*	**.42♦**
Education Mother[a]	EDM	-.06	.19	-.01	-.32**	-	**.46♦**	**.64♦**	.24**	**.78♦**	.14	-.01	.11	.09	.19**	-.05
Education Father[a]	EDF	-.08	.32**	.03	-.16	**.53♦**	-	**.41♦**	**.58♦**	**.82♦**	.22**	.14	.13	.15*	.22**	.00
Occupation Mother[a]	ISEIM	-.06	-.01	-.16	**-.51♦**	**.72♦**	.36**	-	.30**	**.78♦**	.16*	.00	.04	-.01	.17*	-.11
Occupation Father[a]	ISEIF	-.03	.04	-.16	-.01	.37**	**.62♦**	.29*	-	**.70♦**	**.29♦**	.08	.16	.18*	.21**	-.06
Composite SES	CSES	-.08	.22	-.01	-.29**	**.85♦**	**.81♦**	**.79♦**	**.75♦**	-	**.25♦**	.08	.15*	.14	**.26♦**	-.07
Society-related and specific subjective SES	SRS	**-.43♦**	.26*	.12	-.04	.06	.21	.09	.16	.17	-	**.43♦**	**.47♦**	**.41♦**	**.54♦**	.24**
Community-related and general subjective SES	CRG	-.23*	.07	-.05	.15	-.16	-.08	-.11	-.07	-.12	**.46♦**	-	**.42♦**	**.49♦**	**.52♦**	.22
University-related and general subjective SES	URG	-	-	-	-	-	-	-	-	-	-	-	-	**.47♦**	**.50♦**	**.42♦**
Study prog.-related subjective SES – reputation	SPRR	-	-	-	-	-	-	-	-	-	-	-	-	-	**.42♦**	**.41♦**
Study prog.-related subjective SES – finances	SPRF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.22**
Study prog.-related subjective SES – academic achievement	SPRA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note. SciCom1 below diagonal, SciCom2 above diagonal. SciCom1: N = 52-78; SciCom2: N = 123-184;

[a]In this table, the correlations for the unstandardized values are reported. For intercorrelations for the standardized variables, see Appendix D.

*$p \leq .05$, **$p \leq .01$, and ♦Correlations that were significant after the Bonferroni-Holm correction was applied are marked with a diamond and printed in bold.

Regression of University Grades on School Grades and Objective SES

RQ_{1a} asked whether objective SES would be a positive predictor of psychology students' university GPA. Two separate hierarchical regression analyses for the two samples with the addition of students' school GPA in the first step and the addition of composite SES in the second step were conducted (see Table 4).

In the first step, students' school GPA was a positive predictor of students' university GPA in SciCom1 (β = .25) and SciCom2 (β = .29): the better students' school GPA, the better their university GPA. Whereas the addition of school GPA yielded a significant change in R^2 in both samples, the beta weight of school GPA was not statistically significant in SciCom1.

In the second step, students' composite SES was a negative predictor of university GPA in SciCom1 (β = -.21): the higher students' composite SES, the worse their university GPA. Students' composite SES did not predict university GPA in SciCom2. In both samples, the addition of composite SES in the second step did not yield a significant change in R^2.

Table 4

Regression of University Grades[a] on School Grades[a] and Composite SES

		B	*CI*[b]		*SE B*[b]	β	*p*[b]	R^2	ΔR^2
SciCom1 Step 1	Constant	0.05	-0.18	0.25	0.10		.63		
	SGPA	0.22	-0.05	0.43	0.13	.25	.09	.06	.06*
SciCom1 Step 2	Constant	0.05	-0.18	0.24	0.10		.63		
	SGPA	0.25	-0.02	0.46	0.13	.28	.05		
	CSES	-0.23	-0.43	-0.04	0.11	-.21	.04	.10	.04
SciCom2 Step 1	Constant	0.02	-0.13	0.18	0.08		.78		
	SGPA	0.29	0.11	0.44	0.08	.29	.00	.08	.08**
SciCom2 Step 2	Constant	0.02	-0.14	0.18	0.08		.79		
	SGPA	0.29	0.11	0.43	0.08	.29	.00		
	CSES	-0.01	-0.24	0.23	0.12	.00	.95	.08	.00

Note. SciCom1: $N = 70$; SciCom2: $N = 136$. SGPA = school GPA; CSES = composite SES.
[a] Site-specifically standardized variable.
[b] Based on 1,000 bootstrap samples; Confidence intervals are 95% bias corrected and accelerated.
* $p \leq .05$. ** $p \leq .01$.

Regression of Scientific Competencies on School Grades and Objective SES

RQ_{1b} asked whether objective SES would be a positive predictor of psychology students' scores on a test of scientific competencies. Two separate hierarchical regressions for the two samples with the addition of students' school GPA in the first step and the addition of composite SES in the second step were conducted (see Table 5).

In the first step, students' school GPA was a positive predictor of students' test scores in SciCom1 (β = .17) and SciCom2 (β = .38): the better students' school GPA, the better their test scores. However, the beta weight of school GPA was not statistically significant in SciCom1. The addition of school GPA did not yield a significant change in R^2 in SciCom1, but it yielded a significant change in R^2 in SciCom2.

In the second step, students' composite SES was a negative predictor of students' test scores (β = -.35) in SciCom1, such that the higher students' composite SES, the worse their score on the test of scientific competencies. Students' composite SES was also a negative predictor of students' test scores in SciCom2 (β = -.06), however the beta weight was not statistically significant. Whereas the addition of composite SES yielded a significant change in R^2 in SciCom1, it did not yield a significant change in R^2 in SciCom2.

Table 5
Regression of Scientific Competencies on School Grades[a] and Composite SES

		B	*CI*[b]		*SE B*[b]	β	*p*[b]	R^2	ΔR^2
SciCom1 Step 1	Constant	0.05	-0.18	0.30	0.11		.68		
	SGPA	0.17	-0.10	0.41	0.14	.17	.23	.03	.03
SciCom1 Step 2	Constant	0.04	-0.17	0.29	0.11		.70		
	SGPA	0.23	-0.04	0.46	0.14	.23	.11		
	CSES	-0.43	-0.66	-0.18	0.12	-.35	.00	.15	.12**
SciCom2 Step 1	Constant	0.06	-0.07	0.21	0.07		.38		
	SGPA	0.37	0.22	0.49	0.08	.38	.00	.14	.14**
SciCom2 Step 2	Constant	0.06	-0.07	0.21	0.07		.38		
	SGPA	0.37	0.21	0.50	0.08	.38	.00		
	CSES	-0.07	-0.24	0.10	0.10	-.06	.47	.15	.00

Note. SciCom1: $N = 72$; SciCom2: $N = 154$. SGPA = school GPA; CSES = composite SES.
[a] Site-specifically standardized variable.
[b] Based on 1,000 bootstrap samples; Confidence intervals are 95% bias corrected and accelerated.
* $p \leq .05$. ** $p \leq .01$.

Regression of University Grades on School Grades, Objective SES, and Subjective SES

RQ_{2a} asked whether subjective SES would be a positive predictor of psychology students' university GPA beyond school grades and objective SES. Analyses were performed with society-related and specific subjective SES. Two separate hierarchical regressions for the two samples with the addition of students' school GPA in the first step, the addition of composite SES in the second step, and the addition of society-related and specific subjective SES in the third step were conducted (see Table 6).

Table 6

Regression of University Grades on School Grades,[a] Composite SES, and Society-Related Subjective SES

		B	*CI*[b]		*SE B*[b]	β	*p*[b]	R^2	ΔR^2
SciCom1 Step 1	Constant	0.04	-0.17	0.26	0.11		.74		
	SGPA	0.23	-0.11	0.48	0.14	.25	.11	.06	.06*
SciCom1 Step 2	Constant	0.02	-0.19	0.24	0.10		.83		
	SGPA	0.27	-0.04	0.54	0.14	.30	.05		
	CSES	-0.27	-0.52	-0.03	0.12	-.24	.03	.12	.05*
SciCom1 Step 3	Constant	0.51	-0.68	10.73	0.63		.41		
	SGPA	0.28	-0.06	0.56	0.14	.31	.05		
	CSES	-0.25	-0.50	0.02	0.12	-.22	.06		
	SRS	-0.07	-0.25	0.09	0.09	-.10	.41	.13	.01
SciCom2 Step 1	Constant	0.02	-0.16	0.18	0.08		.76		
	SGPA	0.29	0.11	0.44	0.08	.29	.00	.08	.08**
SciCom2 Step 2	Constant	0.02	-0.15	0.19	0.08		.77		
	SGPA	0.29	0.12	0.43	0.08	.29	.00		
	CSES	-0.01	-0.24	0.23	0.11	.00	.95	.08	.00
SciCom2 Step 3	Constant	-0.37	-1.13	0.31	0.35		.28		
	SGPA	0.28	0.11	0.43	0.08	.28	.00		
	CSES	-0.04	-0.28	0.21	0.12	-.03	.73		
	SRS	0.06	-0.04	0.17	0.05	.09	.23	.09	.01

Note. SciCom1: $N = 67$; SciCom2: $N = 135$. SGPA = school GPA; CSES = composite SES; SRS = society-related and specific subjective SES.

[a] Site-specifically standardized variable.

[b] Based on 1,000 bootstrap samples; Confidence intervals are 95% bias corrected and accelerated.

*$p \leq .05$. **$p \leq .01$.

In the first step, students' school GPA positively predicted students' university GPA in SciCom1 (β = .25) and SciCom2 (β = .29). Whereas the addition of school GPA yielded a significant change in R^2 in both samples, the beta weight of school GPA was not statistically significant in SciCom1.

In the second step, students' composite SES was a negative predictor of university GPA in SciCom1 (β = -.24), such that the higher students' composite SES, the worse their university GPA. Students' composite SES did not predict university GPA in SciCom2 (β = .00). Whereas the addition of composite SES yielded a significant change in R^2 in SciCom1, it did not yield a significant change in R^2 in SciCom2.

In the third step, university GPA was negatively predicted by society-related and specific subjective SES in SciCom1 (β = -.10) and positively predicted by society-related and specific subjective SES in SciCom2 (β = .09). In both samples, the addition of the subjective SES measure did not yield a significant change in R^2.

Regression of Scientific Competencies on School Grades, Objective SES, and Subjective SES

RQ_{2b} asked whether subjective SES would be a positive predictor of psychology students' scores on a test of scientific competencies beyond school grades and objective SES. Analyses were performed with society-related and specific subjective SES. Two separate hierarchical regressions for the two samples with the addition of students' school GPA in the first step, the addition of composite SES in the second step, and the addition of society-related and specific subjective SES in the third step were conducted (see Table 7).

In the first step, students' school GPA was a positive predictor of students' test scores in SciCom1 (β = .17) and SciCom2 (β = .37). However, the addition of school GPA did not yield a significant change in R^2 in SciCom1, but it did in SciCom2.

In the second step, students' composite SES was a negative predictor of students' test scores in SciCom1 (β = -.37) and in SciCom2 (β = -.05). The addition of composite SES yielded a significant change in R^2 in SciCom1, but it did not yield a significant change in R^2 in SciCom2.

In the third step, society-related and specific subjective SES was a negative predictor of students' test scores in SciCom1 (β = -.04) and a positive predictor of students' test scores in SciCom2 (β = .06). However, in both samples, the addition of the subjective SES measure did not yield a significant change in R^2.

Table 7

Regression of Scientific Competencies on School Grades,[a] Composite SES, and Society-Related Subjective SES

		B	***CI*[b]**		***SE B*[b]**	**β**	***p*[b]**	***R*²**	**Δ*R*²**
SciCom1 Step 1	Constant	0.04	-0.24	0.31	0.12		.74		
	SGPA	0.16	-0.12	0.40	0.15	.17	.26	.03	.03
SciCom1 Step 2	Constant	0.01	-0.22	0.26	0.11		.93		
	SGPA	0.24	-0.03	0.48	0.14	.25	.08		
	CSES	-0.47	-0.74	-0.15	0.13	-.37	.00	.16	.13**
SciCom1 Step 3	Constant	0.224	-10.26	10.62	0.77		.77		
	SGPA	0.244	-0.05	0.51	0.14	.25	.09		
	CSES	-0.456	-0.75	-0.14	0.14	-.36	.00		
	SRS	-0.031	-0.24	0.19	0.11	-.04	.77	.16	.00
SciCom2 Step 1	Constant	0.07	-0.07	0.22	0.07		.32		
	SGPA	0.36	0.20	0.50	0.07	.37	.00	.14	.14**
SciCom2 Step 2	Constant	0.07	-0.07	0.22	0.07		.32		
	SGPA	0.36	0.21	0.50	0.07	.37	.00		
	CSES	-0.07	-0.26	0.15	0.10	-.05	.52	.14	.00
SciCom2 Step 3	Constant	-0.20	-0.92	0.52	0.35		.58		
	SGPA	0.36	0.20	0.50	0.08	.37	.00		
	CSES	-0.09	-0.29	0.15	0.11	-.07	.41		
	SRS	0.04	-0.06	0.14	0.05	.06	.44	.15	.00

Note. SciCom1: $N = 69$; SciCom2: $N = 153$. SGPA = school GPA; CSES = composite SES; SRS = society-related and specific subjective SES.

[a]Site-specifically standardized variable.

[b]Based on 1,000 bootstrap samples; Confidence intervals are 95% bias corrected and accelerated.

*$p \leq .05$. **$p \leq .01$.

Additional Analyses: Regression of University Grades on Society-Related, Community-Related, University-Related, and Study-Program-Related Subjective SES

RQ_{3a} asked which subjective SES item would explain the most variance in students' university grades. Four separate hierarchical regression analyses for SciCom2 data with the addition of students' school GPA in the first step and the addition of society-related and specific subjective SES, community-related and general subjective SES, university-related and general subjective SES, or a combination of study-program-related subjective SES regarding reputation, finances, and academic achievement in the second step were conducted (see Table 8).

Analyses revealed that in the first steps, school GPA positively predicted students' university grades (β = .29 to β = .32).

In the second steps, society-related and specific subjective SES (β = .08) and university-related and general subjective SES (β = .14) positively predicted students' university GPA. Community-related and general subjective SES (β = -.04) negatively predicted students' university GPA. Adding society-related and specific subjective SES, community-related and general subjective SES, or university-related and general subjective SES did not yield significant changes in R^2.

However, adding a combination of study-program-related subjective SES regarding reputation, finances, and academic achievement in the second step yielded a significant change in R^2 (ΔR^2 = .29): University GPA was negatively predicted by study-program-related subjective SES regarding reputation (β = -.08) and positively predicted by study-program-related subjective SES regarding finances (β = .02) and study-program-related subjective SES regarding academic achievement, (β = .57). The lower students study-program-related subjective SES regarding reputation, the higher students' study-program-related subjective

SES regarding finances, or the higher students' study-program-related subjective SES regarding academic achievement, the better their university GPA. However, the beta weights of study-program-related subjective SES regarding reputation and finances were not statistically significant; only the beta-weight for study-program-related subjective SES regarding academic achievement was.

Table 8

Regression of University Grades on School Grades[a] and Society-Related versus Community-Related versus University-Related versus Study-Program-Related Subjective SES regarding Reputation, Finances, and Academic Achievement, respectively

		B	*CI*[b]		*SE B*[b]	β	*p*[b]	R^2	ΔR^2
SciCom2 Step 1	Constant	0.03	-0.15	0.20	0.08		.71		
	SGPA	0.29	0.10	0.44	0.08	.29	.00	.08	.08**
SciCom2 Step 2	Constant	-0.34	-1.13	0.44	0.35		.34		
	SGPA	0.28	0.09	0.43	0.08	.28	.00		
	SRS	0.06	-0.04	0.15	0.05	.08	.26	.09	.01
SciCom2 Step 1	Constant	0.03	-0.14	0.22	0.08		.72		
	SGPA	0.29	0.09	0.44	0.08	.29	.00	.08	.08**
SciCom2 Step 2	Constant	0.21	-0.55	0.93	0.35		.55		
	SGPA	0.29	0.10	0.44	0.08	.29	.00		
	CRG	-0.03	-0.13	0.07	0.05	-.04	.59	.08	.00
SciCom2 Step 1	Constant	0.03	-0.13	0.18	0.08		.72		
	SGPA	0.29	0.11	0.43	0.08	.29	.00	.08	.08**
SciCom2 Step 2	Constant	-0.50	-1.16	0.13	0.34		.14		
	SGPA	0.29	0.10	0.43	0.08	.28	.00		
	URG	0.08	-0.02	0.19	0.06	.14	.11	.10	.02
SciCom2 Step 1	Constant	0.05	-0.11	0.23	0.08		.52		
	SGPA	0.31	0.15	0.44	0.08	.32	.00	.10	.10**
SciCom2 Step 2	Constant	-1.68	-2.54	-0.75	0.40		.00		
	SGPA	0.23	0.12	0.34	0.06	.23	.00		
	SPRR	-0.06	-0.17	0.04	0.06	-.08	.33		
	SPRF	0.01	-0.08	0.09	0.04	.02	.84		
	SPRA	0.34	0.25	0.41	0.04	.57	.00	.39	.29**

Note. SciCom2: $N = 134 – 136$. SGPA = school GPA; SRS = society-related and specific subjective SES; CRG = community-related and general subjective SES; URG = university-related and general subjective SES; SPRR = study-program-related subjective SES (reputation); SPRF = study-program-related subjective SES (finances); SPRA = study-program-related subjective SES (academic achievement).

[a] Site-specifically standardized variable.

[b] Based on 1,000 bootstrap samples; Confidence intervals are 95% bias corrected and accelerated.

$^{*}p \leq .05$. $^{**}p \leq .01$.

Additional Analyses: Regression of Scientific Competencies on Society-Related, Community-Related, University-Related, and Study-Program-Related Subjective SES

RQ_{3b} asked which subjective SES item would explain the most variance in students' scores on a test of scientific competencies. Four separate hierarchical regressions with the addition of students' school GPA in the first step and the addition of society-related and specific subjective SES, community-related and general subjective SES, university-related and general subjective SES, or the combination of study-program-related subjective SES regarding reputation, finances, and academic achievement in the second step were conducted (see Table 9).

Analyses revealed similar results as with university grades as the dependent variable: In the first steps, school GPA positively predicted students' test scores (β = .37 to β = .38).

In the second steps, society-related and specific subjective SES (β = .05) and university-related and general subjective SES (β = .14) positively predicted students' test scores. Community-related and general subjective SES (β = -.06) negatively predicted students' test scores beyond students' school GPA. Adding society-related and specific subjective SES, community-related and general subjective SES, or university-related and general subjective SES did not yield significant changes in R^2.

However, adding a combination of study-program-related subjective SES regarding reputation, finances, and academic achievement in the second step yielded a significant change in R^2 (ΔR^2 = .17). Test score was negatively predicted by study-program-related subjective SES regarding reputation (β = -.19) and positively predicted by study-program-related subjective SES regarding finances (β = .10) and study-program-related subjective SES regarding academic achievement (β = .45): the lower students' study-program-related subjective SES regarding reputation, the higher students' study-program-related subjective

SES regarding finances or the higher students' study-program-related subjective SES regarding academic achievement, the higher their test scores. However, the beta weight for study-program-related subjective SES regarding finances was not statistically significant; only the beta weights for study-program-related subjective SES regarding reputation and study-program-related subjective SES regarding academic achievement were.

Table 9

Regression of Scientific Competencies on School Grades[a] and Society-Related and Specific Subjective SES versus Community-Related and General Subjective SES versus University-Related and General Subjective SES versus Study-Program Related Subjective SES regarding Reputation, Finances and Academic Achievement, respectively

		B	*CI*[b]		*SE B*[b]	β	*p*[b]	R^2	ΔR^2
SciCom2 Step 1	Constant	0.08	-0.06	0.24	0.07		.28		
	SGPA	0.36	0.20	0.49	0.07	.37	.00	.14	.14**
SciCom2 Step 2	Constant	-0.13	-0.73	0.44	0.31		.68		
	SGPA	0.36	0.20	0.48	0.07	.37	.00		
	SRS	0.03	-0.06	0.12	0.05	.05	.50	.14	.00
SciCom2 Step 1	Constant	0.08	-0.08	0.23	0.07		.29		
	SGPA	0.36	0.22	0.49	0.07	.37	.00	.14	.14**
SciCom2 Step 2	Constant	0.34	-0.25	0.99	0.32		.30		
	SGPA	0.36	0.22	0.49	0.08	.38	.00		
	CRG	-0.04	0.13	0.05	0.05	-.06	.43	.14	.00
SciCom2 Step 2	Constant	0.08	-0.07	0.22	0.07		.30		
	SGPA	0.36	0.20	0.50	0.07	.37	.00	.14	.14**
SciCom2 Step 2	Constant	-0.46	-1.10	0.23	0.36		.20		
	SGPA	0.36	0.19	0.50	0.07	.37	.00		
	URG	0.09	-0.04	0.21	0.06	.14	.13	.16	.02
SciCom2 Step 1	Constant	0.09	-0.07	0.26	0.07		.23		
	SGPA	0.37	0.22	0.50	0.07	.38	.00	.15	.15**
SciCom2 Step 2	Constant	-1.00	-1.64	-0.26	0.33		.00		
	SGPA	0.30	0.16	0.44	0.07	.32	.00		
	SPRR	-0.13	-0.26	-0.01	0.06	-.19	.03		
	SPRF	0.05	-0.03	0.13	0.04	.10	.21		
	SPRA	0.26	0.17	0.35	0.04	.45	.00	.32	.17**

Note. SciCom2: N = 152-154. SGPA = school GPA; SRS = society-related and specific subjective SES; CRG = community-related and general subjective SES; URG = university-related and general subjective SES; SPRR = study-program-related subjective SES (reputation); SPRF = study-program-related subjective SES (finances); SPRA = study-program-related subjective SES (academic achievement).

[a] Site-specifically standardized variable.

[b] Based on 1,000 bootstrap samples; Confidence intervals are 95% bias corrected and accelerated.

*$p \leq .05$. **$p \leq .01$.

Discussion

Recap and Discussion of the Main Findings

Objective SES and Psychology Students' Academic Achievement

The first set of research questions (RQ_{1a} & RQ_{1b}) asked whether objective SES would positively predict psychology students' university grades or their scores on a test of scientific competencies. When students' school grades were controlled for, composite SES was a negative predictor of students' academic achievement (i.e., university GPA or test scores) in SciCom1. However, in SciCom2, composite SES did not predict students' academic achievement.

These results seem somewhat counterintuitive. Bearing in mind the usually positive associations of SES with academic achievement (e.g., in the PISA studies; OECD, 2013, 2016), it seems surprising that in the current study, composite SES showed a negative or no association with academic achievement. A possible explanation for the findings of SciCom1 (i.e., the negative association of composite SES with both indicators of academic achievement) might be the small sample size, where a nonrepresentative sample composition could lead to strongly biased estimates.

Considering the data from the larger sample in SciCom2, as these data were probably more reliable, it might be possible that psychology students' composite SES was simply not related to their academic achievement: The findings from Study 1 of this dissertation suggested that first-semester social science students' composite SES was not associated with their overall intelligence. If this was also true for psychology students later on in their studies (i.e., the samples at hand), it might also be plausible for the composite SES of these psychology students to not be associated with their academic achievement.

Another problem might lie in a restriction of variance due to methodological reasons: When building the composite SES variable, the four potential indicators were separately *z*-standardized and then merged into one composite variable. If participants had missing values on one or more of the four potential indicators, the resulting composite score was computed as the mean of the remaining indicators. After *z*-standardization, the single indicators (i.e., mothers' education, mothers' occupation, fathers' education, fathers' occupation) had the properties of $M = 0$ and $SD = 1$ each. Taking a look at Table 2, the standard deviations of the composite SES variable attract attention in both samples: Due to the composition of the indicators and probably also due to missing values in some indicators but not in others, the composite SES had the properties of $M = -0.01$ and $SD = 0.81$ in SciCom1 and $M = -0.01$ and $SD = 0.78$ in SciCom2. In both cases, the standard deviations were smaller than what would be expected (i.e., $SD = 1$) and therefore substantiate the argument of limited variance.

Subjective SES and Psychology Students' Academic Achievement

The second set of research questions (RQ_{2a} & RQ_{2b}) asked whether subjective SES would positively predict psychology students' university grades or their scores on a test of scientific competencies beyond school GPA and objective SES. This was not the case for the classical measure of subjective SES, that is, society-related and specific subjective SES—in SciCom1 or in SciCom2.

On the one hand, it might be possible that psychology students' subjective views of their own socioeconomic status are simply not related to their academic achievement. On the other hand, it might also be possible that the samples showed limited variance not only in terms of *objective* SES (see above) but also in terms of *subjective* SES: The samples consisted solely of psychology students, a student group that is highly selected and—in terms of objective SES—rather privileged (for details, see the Synopsis of this dissertation). It is also

possible for this student group to have limited variability in their subjective SES: For example, Andersson (2017) reported values of $M = 6.24$ and $SD = 1.79$ and $M = 6.50$ and $SD = 1.86$ for samples from the General Social Survey and the National Survey of Midlife Development in the United States, respectively. In their cross-national study, Präg et al. (2016) mean-centered the subjective SES variable; however, they reported a standard deviation as high as $SD = 1.81$. In the current samples, most of the subjective SES measures had smaller standard deviations.

Different Measures of Subjective SES and Psychology Students' Academic Achievement

The last set of research questions (RQ_{3a} & RQ_{3b}) asked which of the subjective SES items explained the most variance in psychology students' university GPA or their scores on a test of scientific competencies. Society-related and specific subjective SES, community-related and general subjective SES, and university-related and general subjective SES all failed to explain significant amounts of variance in students' academic achievement.

However, the trinity of study-program-related subjective SES items that captured each aspect of subjective SES separately (i.e., students' reputation, finances, and academic achievement in the study program) and that were adapted to the context of higher education significantly increased the amount of variance that could be explained in students' academic achievement (29% in university GPA; 17% in test scores).

The increase in the amount of variance that could be explained in university GPA was due to the positive association between study-program-related subjective SES regarding academic achievement and university GPA. The increase in the amount of variance that could be explained in test scores was due to the negative association between study-program-related subjective SES regarding reputation and test scores as well as the positive association with study-program-related subjective SES regarding academic achievement and test scores.

The strongest predictor of both university GPA and test scores was study-program-related subjective SES regarding academic achievement. This makes sense insofar as students should be able to provide reliable indications of their standing regarding their own educational achievements within their study programs. In addition, the item tackles the problem of parents' education as a classical indicator of SES in research regarding tertiary education: Parents' education can be distinct from students' education (Rubin et al., 2014)—and the data at hand hints to the fact that it probably is. Whereas fathers' and mothers' education showed only small and nonsignificant correlations with students' academic achievement in SciCom2, study-program-related subjective SES regarding academic achievement showed medium (test score) to high (university GPA) correlations with students' academic achievement. In addition, study-program-related subjective SES regarding academic achievement appeared to be more proximal than parents' education.

However, the picture became less clear regarding parents' occupational prestige versus students' study-program-related subjective SES regarding reputation. It might be the case that parents' occupational prestige taps a different aspect of (social) prestige than the reputation aspect of prestige that study-program-related subjective SES tapped into. It might also be the case that the wording of the item led participants to employ a broader focus of prestige instead of a narrower focus regarding *occupational* prestige.

Finally, the study-program-related subjective SES item regarding finances, which was closest to the classical indicators of objective SES and which would be logically expected to predict academic achievement (i.e., if SES is related to academic achievement), was not a significant predictor of students' academic achievement. However, looking at the site-specific descriptive data at hand, it seems like opposing psychological mechanisms might be at work: Whereas the mean of students' composite SES was numerically lower at Saarland University than at Heidelberg University, and their society-related specific subjective SES followed this

pattern, their *community-related subjective SES* was numerically higher. This pattern is rather intriguing and requires further research. Besides, this pattern of differential perceptions of different subjective SES measures in comparison with objective SES can be seen as another hint of the importance of students' subjective views and experiences and the frames of reference they compare themselves to.

Intercorrelations of the SES Measures

In SciCom1, there was no association between composite SES and the two subjective SES measures, that is, society-related and specific subjective SES and community-related and general subjective SES. In SciCom2, composite SES was positively associated with society-related and specific subjective SES (r = .25) and study-program-related subjective SES regarding finances (r = .26). However, these associations between composite SES with society-related and specific subjective SES or study-program-related subjective SES regarding finances were rather moderate in strength. At the same time, composite SES was not associated with community-related and general subjective SES or university-related and general subjective SES. It was also not related to the study-program-related subjective SES measures tapping students' reputation or students' program achievement. Taken together, these findings support the idea that in tertiary education, composite SES—as measured with a composite of students' parents' education and students' parents' occupation—captures different aspects than those captured by measures of students' subjective SES.

Most of the subjective SES measures were highly associated with each other with correlation coefficients ranging from r = .41 to r = .54. For example, the associations between society-related and specific subjective SES and community-related and general subjective SES were high in the two samples (r = .46 and r =.43, respectively), but not as high as those reported in literature (e.g., r = .78; Goldman et al., 2006). This finding might also hint at the

relevance of the reference groups and the specificity of the criteria employed in subjective SES items.

Limitations

Regarding the current study, several limitations should be noted. First, the issues in assessing subjective SES at Saarland University led to a very small sample size in the SciCom1 subsample. Therefore, all interpretations of the SciCom1 results should be made with caution—especially because the results of SciCom2 often did not point in the same direction.

A second limitation concerns the assessment of university GPA: Whereas students' university GPA was transferred from the official examination office at Saarland University, it was self-reported at Heidelberg University. This probably resulted in a larger amount of error variance at Heidelberg University in comparison with Saarland University for two reasons: On the one hand, the correctness of self-reported indications relies on the precision of participants' memories. On the other hand, self-reported indications can be subject to self-serving biases. In addition, the different mechanisms of calculating university GPA led to another source of error variance: Whereas an unweighted average of *all* grades was used in the current study, students at Saarland University were able to remove some of these grades for the university GPA reported in their final university certificates. It might be plausible that students put much less effort into such courses—that is, the courses they were allowed to exclude from the calculation of their university GPA—and therefore received lower grades in these courses. This could also explain the differences in university GPA between the two sites.

A third limitation arises with regard to the test scores on the test of scientific competencies: Here, too, the descriptive data at hand hinted at site-specific differences. Among other items, the test of scientific competencies included exam items from Saarland

University. In addition, the test was constructed by a research assistant from Saarland University. Therefore, it might be plausible that students from Saarland University experienced a site-specific benefit. However, despite the limitations regarding university GPA and test scores, the results pointed in similar directions for both dependent variables.

A fourth limitation that addresses some of the site-specific differences concerns the different ways of standardizing the variables site-specifically or across sites. The approach that was chosen changed the variance in school GPA, university GPA, and test scores for the reasons mentioned before. However, one could argue about whether other approaches would have been useful, too.

A final limitation concerns the highly selective sample of psychology students: This is a sample that might show very limited variance in terms of cognitive ability (e.g., see Table 1 in Study 1 of this dissertation) and SES. Putting the sample into a broader socioeconomic context (see the Synopsis of this dissertation) revealed that in the social sciences, especially students in psychology and political science share an extraordinarily high socioeconomic background in terms of their parents' educational and occupational attainment. One might wonder whether, for example, the pattern of results regarding composite SES, subjective SES, and academic achievement would differ in a sample comprised of students of sociology.

Implications and Future Directions

Considering the current findings, it seems necessary for future research to replicate the current findings before reliable conclusions can be drawn. In addition, it seems necessary to investigate more heterogenous groups of students with more variance in terms of their objective and subjective SES (e.g., preservice teachers, students of the arts, life sciences, natural sciences, or engineering). Finally, it seems necessary to develop a more precise understanding of the reference groups with which students compare themselves in their

everyday experiences and on a regular basis. Future research should focus on further elaborating suitable reference groups that students compare themselves with. In addition, measures of objective SES that directly target students in higher education—not their parents—should be developed. These measures should also try to disentangle aspects of income, education, and occupation in an adaption that is suitable for the area of higher education. Overall, further refinement of the measurement of higher education students' subjective and objective SES seems fruitful for a more precise understanding of the role of SES in students' academic life.

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Appendix

Appendix A. Original Items used to Measure Subjective Socioeconomic Status in SciCom1.

1. Im Folgenden finden Sie auf der rechten Seite die Abbildungen von vier Leitern. Diese Leitern weisen jeweils von ganz unten bis ganz oben insgesamt zehn Ränge auf.

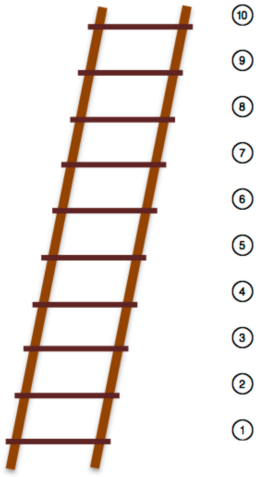
1.1 Betrachten Sie **Leiter 1** als Darstellung der **gesellschaftlichen Positionen aller Einwohnerinnen und Einwohner Deutschlands**.

Leiter 1

Am oberen Ende der Leiter stehen die Personen, denen es in Deutschland am besten geht – diejenigen, die über das meiste Geld verfügen, die über die höchste Bildung verfügen und die die angesehensten Arbeitsplätze haben.
Am unteren Ende der Leiter stehen die Personen, die in Deutschland am schlechtesten dran sind – diejenigen, die am wenigsten Geld haben, die über die geringste Bildung verfügen und die die am wenigsten angesehenen oder gar keine Arbeitsplätze haben.

Wenn Sie an **Ihre** derzeitige persönliche Situation denken und diese mit der Situation **aller Einwohnerinnen und Einwohner Deutschlands** vergleichen, **wo würden Sie sich auf dieser Leiter verorten?**

Bitte kreuzen Sie Ihre Antwort in Form der entsprechenden Zahl rechts neben der Leiter an!



1.2 Betrachten Sie **Leiter 2** als Darstellung der **Positionen aller Personen in Ihrem sozialen Umfeld**.

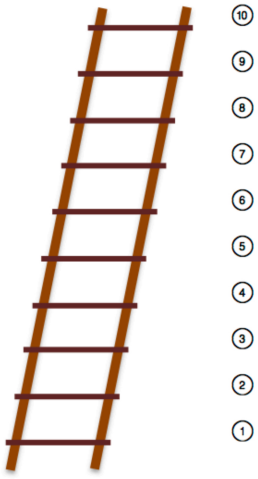
Leiter 2

Menschen definieren ihr soziales Umfeld sehr unterschiedlich. Bitte beziehen Sie sich daher **auf das Umfeld, das Ihnen persönlich am bedeutsamsten erscheint**!

Am oberen Ende der Leiter stehen die Personen, die in Ihrem sozialen Umfeld die höchste Stellung einnehmen.
Am unteren Ende der Leiter stehen die Personen, die in Ihrem sozialen Umfeld die niedrigste Stellung einnehmen.

Wenn Sie an **Ihre** derzeitige persönliche Situation denken und diese mit der Situation **aller Personen in Ihrem sozialen Umfeld vergleichen, wo würden Sie sich auf dieser Leiter verorten?**

Bitte kreuzen Sie Ihre Antwort in Form der entsprechenden Zahl rechts neben der Leiter an!



Appendix B. Original Items used to Measure Subjective Socioeconomic Status in SciCom2.

Im Folgenden finden Sie auf der rechten Seite die Abbildungen von mehreren Leitern. Diese Leitern weisen jeweils von ganz unten bis ganz oben insgesamt zehn Ränge auf.

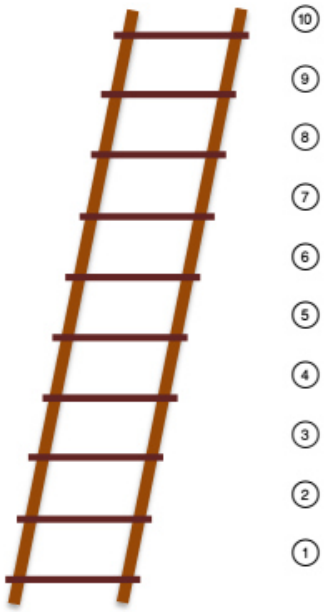
1. Betrachten Sie **Leiter 1** als Darstellung der **gesellschaftlichen Positionen aller Einwohnerinnen und Einwohner Deutschlands**.

Am oberen Ende der Leiter stehen die Personen, denen es in Deutschland am besten geht – diejenigen, die über das meiste Geld verfügen, die über die höchste Bildung verfügen und die die angesehensten Arbeitsplätze haben.
Am unteren Ende der Leiter stehen die Personen, die in Deutschland am schlechtesten dran sind – diejenigen, die am wenigsten Geld haben, die über die geringste Bildung verfügen und die die am wenigsten angesehenen oder gar keine Arbeitsplätze haben.

Wenn Sie an **Ihre** derzeitige persönliche Situation denken und diese mit der Situation **aller Einwohnerinnen und Einwohner Deutschlands** vergleichen, **wo würden Sie sich auf dieser Leiter verorten?**

Bitte kreuzen Sie Ihre Antwort in Form der entsprechenden Zahl rechts neben der Leiter an!

Leiter 1



2. Betrachten Sie **Leiter 2** als Darstellung der **Positionen aller Personen in Ihrem sozialen Umfeld**.

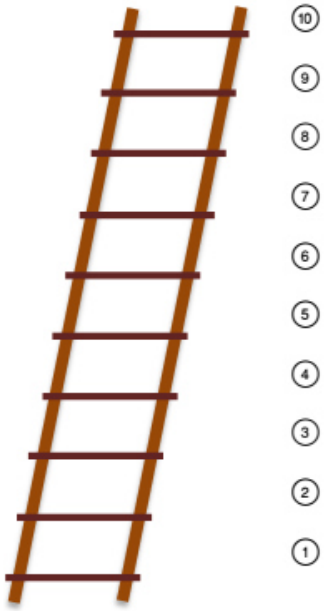
Menschen definieren ihr soziales Umfeld sehr unterschiedlich. Bitte beziehen Sie sich daher **auf das Umfeld, das Ihnen persönlich am bedeutsamsten erscheint**!

Am oberen Ende der Leiter stehen die Personen, die in Ihrem sozialen Umfeld die höchste Stellung einnehmen.
Am unteren Ende der Leiter stehen die Personen, die in Ihrem sozialen Umfeld die niedrigste Stellung einnehmen.

Wenn Sie an **Ihre** derzeitige persönliche Situation denken und diese mit der Situation **aller Personen in Ihrem sozialen Umfeld vergleichen, wo würden Sie sich auf dieser Leiter verorten?**

Bitte kreuzen Sie Ihre Antwort in Form der entsprechenden Zahl rechts neben der Leiter an!

Leiter 2



3. Betrachten Sie **Leiter 3** als Darstellung der **Positionen aller Studierender Ihrer Universität**.

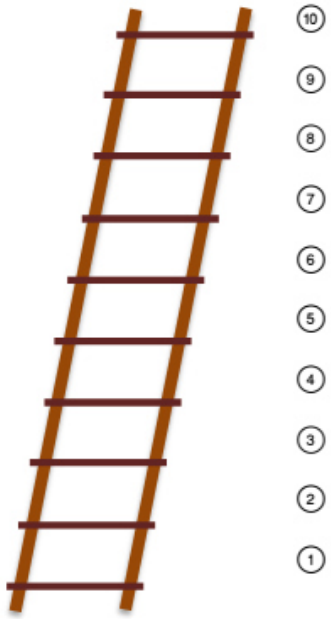
Am oberen Ende der Leiter stehen die Studierenden Ihrer Universität, denen es am besten geht.

Am unteren Ende der Leiter stehen die Studierenden Ihrer Universität, denen es am schlechtesten geht.

Wenn Sie an **Ihre** derzeitige persönliche Situation denken und diese mit der Situation **aller Studierender Ihrer Universität vergleichen, wo würden Sie sich auf dieser Leiter verorten?**

Bitte kreuzen Sie Ihre Antwort in Form der entsprechenden Zahl rechts neben der Leiter an!

Leiter 3



4. Betrachten Sie **Leiter 4** als Darstellung der **Positionen aller Kommilitoninnen und Kommilitonen Ihres Studiengangs**.

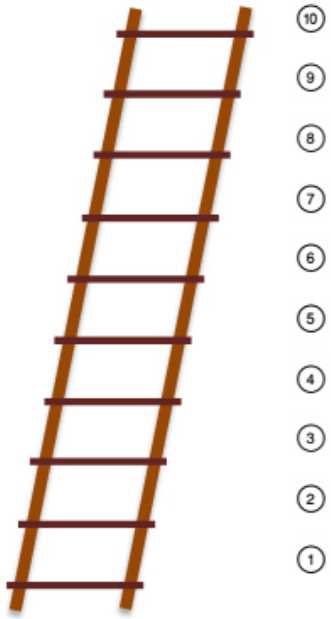
Am oberen Ende der Leiter stehen die Kommilitoninnen und Kommilitonen, die in Ihrem Studiengang über das meiste Ansehen verfügen.

Am unteren Ende der Leiter stehen die Kommilitoninnen und Kommilitonen, die in Ihrem Studiengang über das geringste Ansehen verfügen.

Wenn Sie an **Ihre** derzeitige persönliche Situation denken und diese mit der Situation **Ihrer Kommilitoninnen und Kommilitonen Ihres Studiengangs vergleichen, wo würden Sie sich hinsichtlich Ihres Ansehens auf dieser Leiter verorten?**

Bitte kreuzen Sie Ihre Antwort in Form der entsprechenden Zahl rechts neben der Leiter an!

Leiter 4



5. Betrachten Sie **Leiter 5** als Darstellung der **Positionen aller Kommilitoninnen und Kommilitonen Ihres Studiengangs**.

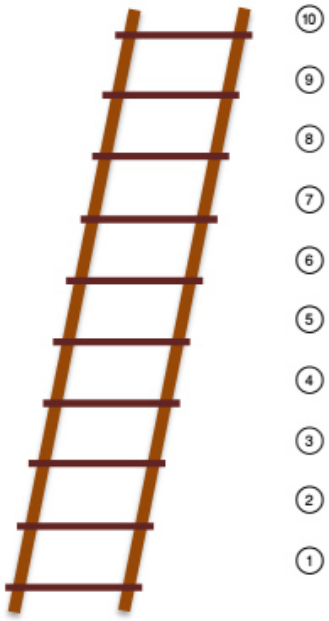
Am oberen Ende der Leiter stehen die Kommilitoninnen und Kommilitonen, denen es in Ihrem Studiengang finanziell am besten geht – diejenigen, die über das meiste Geld verfügen.

Am unteren Ende der Leiter stehen die Kommilitoninnen und Kommilitonen, denen es in Ihrem Studiengang finanziell am schlechtesten geht – diejenigen, die über das wenigste Geld verfügen.

Wenn Sie an **Ihre** derzeitige persönliche Situation denken und diese mit der Situation **Ihrer Kommilitoninnen und Kommilitonen Ihres Studiengangs vergleichen, wo würden Sie sich hinsichtlich Ihrer finanziellen Situation auf dieser Leiter verorten?**

Bitte kreuzen Sie Ihre Antwort in Form der entsprechenden Zahl rechts neben der Leiter an!

Leiter 5



6. Betrachten Sie **Leiter 6** als Darstellung der **Positionen aller Kommilitoninnen und Kommilitonen Ihres Studiengangs**.

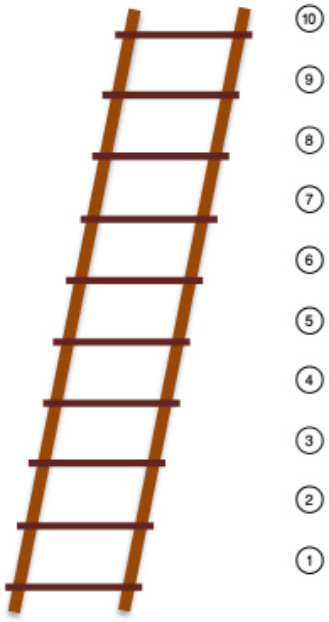
Am oberen Ende der Leiter stehen die Kommilitoninnen und Kommilitonen, die in Ihrem Studiengang die besten Studienleistungen erbringen.

Am unteren Ende der Leiter stehen die Kommilitoninnen und Kommilitonen, die in Ihrem Studiengang die schlechtesten Studienleistungen erbringen.

Wenn Sie an **Ihre** derzeitige persönliche Situation denken und diese mit der Situation **Ihrer Kommilitoninnen und Kommilitonen Ihres Studiengangs vergleichen, wo würden Sie sich hinsichtlich Ihrer Studienleistungen auf dieser Leiter verorten?**

Bitte kreuzen Sie Ihre Antwort in Form der entsprechenden Zahl rechts neben der Leiter an!

Leiter 6



Appendix C. Means and Standard Deviations of the Standardized Variables

Overall and Site-Specific Means and Standard Deviations for the Standardized Variables

		Study 1						Study 2					
		Overall		Saarland University		Heidelberg University		Overall		Saarland University		Heidelberg University	
		M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
School Grade Point Average[a]	SGPA	0.00	0.99	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
University Grade Point Average[a]	UGPA	0.00	0.99	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Scientific Competencies Test Score[a]	TEST	0.00	0.99	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Education Mother[b]	EDM	0.00	1.00	-0.15	1.01	0.10	0.99	0.00	1.00	-0.08	1.01	0.17	0.96
Education Father[b]	EDF	0.00	1.00	-0.02	0.95	0.02	1.04	0.00	1.00	-0.15	1.01	0.30	0.92
Occupation Mother[b]	ISEIM	0.00	1.00	-0.17	1.04	0.12	0.96	0.00	1.00	-0.10	1.03	0.23	0.88
Occupation Father[b]	ISEIF	0.00	1.00	-0.06	1.08	0.03	0.97	0.00	1.00	-0.12	1.04	0.26	0.86

Note. SciCom1 overall: N = 60-78; Saarland uni: n = 21-30; Heidelberg uni: n = 39-48; SciCom2 overall: N = 153-187; Saarland uni: n = 99-126; Heidelberg uni: n = 45-61.
[a]Standardized site-specifically and then merged into one variable.
[b]Standardized across sites.

Appendix D. Intercorrelations of the Standardized Variables

Intercorrelations of the Standardized Variables

		SEM	SGPA	UGPA	TEST	EDM	EDF	ISEIM	ISEIF	CSES	SRS	CRG	URG	SPRR	SPRF	SPRA
Semester	SEM	-	-.11	.14	.11	.00	.03	-.02	.06	.00	-.03	-.15*	.06	.02	-.07	.04
School Grade Point Average[a]	SGPA	-.20	-	**.29♦**	**.38♦**	-.06	.08	-.18*	.17*	.01	.09	.03	.02	.06	.00	.18*
University Grade Point Average[a]	UGPA	.23*	.25*	-	**.56♦**	-.10	.05	-.19*	.02	-.06	.07	-.03	.15	.16	.07	**.56♦**
Scientific Competencies Test Score[a]	TEST	.16	.17	**.66♦**	-	-.08	-.01	-.17*	.05	-.07	.09	-.00	.18**	.13	.11	**.45♦**
Education Mother[b]	EDM	-.06	.14	-.11	-.31**	-	**.46♦**	**.64♦**	.24**	**.78♦**	.14*	-.01	.11	.09	.19**	-.05
Education Father[b]	EDF	-.08	.32**	.03	-.16	**.53♦**	-	**.41♦**	**.58♦**	**.82♦**	.22**	.14	.13	.15*	.22**	-.00
Occupation Mother[b]	ISEIM	-.06	-.08	-.27*	**-.50♦**	**.72♦**	.36**	-	.30**	**.78♦**	.16	.00	.04	-.01	.17*	-.11
Occupation Father[b]	ISEIF	-.03	-.00	-.15	.00	.37**	**.62♦**	.29*	-	**.70♦**	**.29♦**	.08	.16	.18*	.21**	-.06
Composite SES	CSES	-.08	.16	-.10	-.28**	**.85♦**	**.81♦**	**.79♦**	**.75♦**	-	**.25♦**	.08	.15*	.14	**.26♦**	-.07
Society-related and specific subjective SES	SRS	**-.43♦**	.09	-.03	.00	.06	.21	.09	.16	.17	-	**.43♦**	**.47♦**	**.41♦**	**.54♦**	.24**
Community-related and general subjective SES	CRG	-.23*	.03	-.02	.14	-.16	-.08	-.11	-.07	-.12	**.46♦**	-	**.42♦**	**.49♦**	**.52♦**	.22**
University-related and general subjective SES	URG	-	-	-	-	-	-	-	-	-	-	-	-	**.47♦**	**.50♦**	**.42♦**
Study prog.-related subjective SES – reputation	SPRR	-	-	-	-	-	-	-	-	-	-	-	-	-	**.42♦**	**.41♦**
Study prog.-related subjective SES – finances	SPRF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.22**
Study prog.-related subjective SES – academic achievement	SPRA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note. SciCom1 below diagonal, SciCom2 above diagonal. SciCom1 N = 52-78; SciCom2 N = 123-184.
[a]Correlations of site-specifically standardized variables.
[b] Correlations of variables standardized across sites.
*$p \leq .05$, **$p \leq .01$, and ♦Correlations that remained significant after the Bonferroni-Holm correction was applied are marked with a diamond and printed in bold.

Study 3:
Justice in Higher Education:
Psychology Students' Justice Perceptions

Table of Contents

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Introduction

Justice is an ideal state involving balanced interests without certain individuals or groups suffering from disadvantages (Schmitt, 2014). Issues of justice seem to comprise virtually all areas of life. Whereas justice has been widely investigated in organizational contexts (e.g., Adams, 1965; Greenberg & Colquitt, 2005), the situation is different for the area of education: Lotz and Feldhaus (2013) argued that psychology still neglects to consider individual perceptions of justice in educational systems. One instance in which such perceptions of justice in an educational system might play a major role is higher education: Students' perceptions of justice might, for example, be linked to students' satisfaction (Colquitt, 2001) or even students' dropout rates (Burger & Groß, 2016). Furthermore, subgroups of students (e.g., first-generation students, students with an immigration background, female students) might perceive study-related issues as more or less just than other groups of students do.

To address these and other issues, a first step is to adapt a valid measure of justice to the context of higher education. Colquitt (2001) created a questionnaire that could be used to assess employees' perceptions of organizational justice (hereafter: *Colquitt questionnaire*). Back when he created the measure, Colquitt argued that there was a lack of coherent measurement and that problems also often occurred at the measurement level because the different constructs were not clearly separated. With his questionnaire, he then distinguished four factors of justice, namely, procedural justice, distributive justice, interpersonal justice, and informational justice. To test the construct validity of this four-factor structure and to corroborate it, Colquitt (2001) drew samples from a university setting and from an organizational setting. However, the German adaptation of this questionnaire focused on organizational contexts: Maier, Streicher, Jonas, and Woschée (2007) drew a random sample

of participants who belonged to only different organizational settings, omitting the university context. In subsequent research, Streicher et al. (2008) investigated the construct and criterion validity of this measure—again in organizational settings. In their Discussion, the authors expressed a desire to employ different samples and foci in future research. The current study tried to meet this desire by providing a German adaptation for the area of higher education.

Four Factors of Organizational Justice and the Colquitt Questionnaire

Ever since the beginnings of psychological justice research, there have been heated discussions about the (factor) structure of the concept of justice (see Bies, 2005; Colquitt, 2001; Streicher et al., 2008). Different authors have argued for different conceptions of justice. Even for seemingly similar concepts, very different agendas were more or less openly present. As a result, measurement was often corrupted by what Colquitt (2001) termed a "cross-pollination of items" (p. 387). In the following, the four factors of justice as described by Colquitt (2001) will be presented, and the first set of research questions will be derived.

Distributive Justice

Distributive justice brings the fairness of the outcome to the center of attention and thereby focuses on the allocation of resources. In 1965, Adams was primarily concerned with *equity* as a principle of distributive justice: Individuals use a social comparison by which they compare their own input-outcome ratio with that of another person. According to the equity principle, an outcome is perceived as just if the input-outcome ratio of the respective individual matches the input-outcome ratio of the comparison standard (i.e., the other person).

Ten years later, Deutsch (1975) argued for two additional principles of distributive justice, namely, *equality* and *need*. The equality principle states that a distribution across all parties is perceived as just if it is even across all parties. The need principle states that a

distribution is perceived as just if it depends on the (sometimes differential) needs of the parties.

In most organizational contexts, distributive justice is seen in terms of the equity rule or equity principle (e.g., Adams, 1965; Deutsch, 1975; Leventhal, 1980). In his questionnaire, Colquitt (2001) drew from Leventhal (1976) to derive four items that measure distributive justice. However, neither the equality principle nor the need principle received attention in Colquitt's assessment in relation to distributive justice.

Procedural Justice

In 1980, Leventhal argued that beyond a fair distribution, aspects of the process that is followed to arrive at a distribution also matter: If individuals perceive the procedures that lead to the distributions as fair, they are more likely to accept the distributions - even if (personal) disadvantages come along with them. Overall, procedural justice concerns the fairness of the procedures that are followed in deciding how to allocate resources. Leventhal (1980) identified seven structural components that represent a person's ideas about how a just procedure should be structured or what it should contain (e.g., a fair selection of decision makers). In addition, he identified six procedural justice rules that allow individuals to judge the fairness of the allocative process (i.e., consistency rule, bias-suppression rule, accuracy rule, correctability rule, representativeness rule, and ethicality rule). However, whereas Leventhal's seven structural components received less attention, the six procedural justice rules are well-established.

In his questionnaire, Colquitt (2001) drew from work by Thibaut and Walker (1975) and Leventhal (1980) to derive seven items that measure procedural justice. Whereas the first two items from the Colquitt questionnaire focus on the concepts of process control and decision control (Thibaut & Walker, 1975), the remaining five items focus on five of the six procedural justice rules (Leventhal, 1980)—with the representativeness rule being omitted.

Colquitt (2001) justified this reduction by presenting an argument made by Lind and Tyler (1988), who stated that process control and decision control were both subsumed under the representativeness rule.

An Interlude: Interactional Justice

In 1986, Bies and Moag introduced the concept of interactional justice, drawing attention to interpersonal treatment during an allocation of resources. Greenberg (1993) developed this concept of interactional justice even further within the frame of a 2 (Focal Determinant: structural vs. social) x 2 (Justice Category: procedural vs. distributive justice) matrix, which introduced interpersonal justice and informational justice. According to the author, these two dimensions refer to the social focal determinant crossed with the two alleged categories of justice.

Interpersonal and informational justice have often been found to be highly correlated. However, they predict differential outcomes (Colquitt, 2001). In 2005, Bies himself clearly spoke out for the separation of interactional justice into interpersonal and informational justice. Therefore, contrary to Bies and Moag's (1986) conception that merged interpersonal and informational justice under interactional justice, Colquitt (2001) differentiated between these two aspects as distinct factors. Both factors will be described in the following.

Interpersonal Justice

Interpersonal justice is related to the decision maker's concerns for the individuals with regard to the outcomes they receive (Greenberg, 1993). Interpersonal justice refers to the interpersonal interaction of the decision maker(s) and the affected party. To be perceived as just, decision makers' behavior toward the affected party should show respect and propriety (see Leung & Tong, 2004). Colquitt (2001) drew from Bies and Moag (1986) to derive four items that measure interpersonal justice.

Informational Justice

Informational justice is related to informational openness about the procedures employed to come to a decision and thereby demonstrates a regard for individuals' concerns (Greenberg, 1993). It refers to the information given to the parties that are affected by the decision maker. To be perceived as just, truthfulness and justification as well as reasonableness, timeliness and specificity are important justice criteria (see Leung & Tong, 2004). Colquitt (2001) drew from Bies and Moag (1986) as well as Shapiro, Buttner, and Barry (1994) to derive five items that could be used to measure informational justice.

Research Questions on the Adaption of the Colquitt Questionnaire to Higher Education

The main aim of the present study was to adapt the Colquitt questionnaire and its German version by Maier et al. (2007), respectively, to the area of higher education in Germany. Thus, the research questions that come along with this endeavor are:

RQ_{1a}: Can the Colquitt questionnaire be successfully adapted to samples in higher education?

RQ_{1b}: Does the four-factor structure hold up with samples in higher education?

RQ_{1c}: Are the respective justice scales internally consistent?

Justice Ratings and Students' Characteristics

Apart from the adaptability of the measure, the question that emerges is whether students' justice ratings are related to certain student characteristics. Therefore, results that indicate relations between participant characteristics and their justice ratings will be presented in the following, and additional research questions will be derived.

Justice and Personality

In their study, Shi, Lin, Wang, and Wang (2009) investigated the associations of organizational justice with the Big Five factors of personality in a Chinese employee sample.

To assess participants' justice perceptions of interpersonal and informational justice, the authors drew from the respective subscales from the Colquitt questionnaire. However, to assess distributive and procedural justice, the authors drew from measures by other authors. Their results indicated that agreeableness significantly and positively predicted ratings of distributive justice (β = .11), procedural justice (β = .09), interpersonal justice (β = .21), and informational justice (β = .13). In addition, neuroticism significantly and negatively predicted ratings of procedural justice (β = -.08) and informational justice (β = -.10).

Justice and Socioeconomic Status

Among other predictors, Burger and Groß (2016) investigated university students' procedural justice ratings and their socioeconomic status (hereafter: *SES*) as predictors of university dropout intentions. The authors separated two aspects of procedural justice, that is, control-related and validity-related aspects. After controlling for several sociodemographic variables and educational aspirations, dropout intentions were significantly and negatively predicted by both control-related and validity-related procedural justice ratings regarding grading procedures at university. SES did not significantly predict dropout intentions. However, adding an *interaction term* involving control-related procedural justice ratings and SES into the regression model, this interaction term significantly predicted dropout intentions: Dropout intentions were not related to control-related procedural justice ratings for high-SES participants, but they were related to control-related justice ratings for participants with medium levels of SES and were even more strongly related for low-SES participants. Even though this study was not meant to investigate a possible relation between justice ratings and SES, it encourages further research on whether justice ratings and SES *might* be related.

Research Questions on Students' Characteristics and their Relations to the Justice Ratings

Chinese employees' personality has been shown to be related to their ratings of the justice dimensions in the Colquitt questionnaire and other measures, respectively (Shi et al., 2009). However, the question at hand is whether psychology students' personality is also related to their ratings of the justice subscales from the Colquitt questionnaire. Furthermore, Burger and Groß's (2016) results encourage the investigation of possible relations between justice ratings and SES: One might wonder whether students' objective and subjective SES would be found to be related to students' justice ratings of the four dimensions.

Finally, in the context of the current dissertation, one might wonder whether the other person- and situation-specific characteristics that were addressed in Studies 1 and 2 of this dissertation might also be related to students' justice ratings. For example, characteristics such as student intelligence, study interest, need for cognition, achievement motivation, academic self-concept, grade point average at university, or the number of hours students (have to) work side jobs might also be related to students' justice ratings.

To address these considerations, possible associations between students' characteristics and their ratings of the four justice subscales were investigated. Because some of the constructs were assessed only in the previous rounds of data collection regarding students' preexisting characteristics (for details, see the Synopsis of this dissertation and the Method section of this study), a practical—not theoretical—distinction will be made in the following between students' former and current characteristics. *Former* student characteristics of interest were students' personality, students' intelligence, students' need for cognition, students' study interest, students' achievement motivation, and students' academic self-concept. *Current* student characteristics of interest were students' average university grades, the number of hours they spent working side jobs, their objective SES, and their subjective SES. Thus, the research questions were:

RQ_{2a}: Are students' justice ratings related to their former characteristics (i.e., personality, intelligence, need for cognition, study interest, achievement motivation, or academic self-concept)?

RQ_{2b}: Are students' justice ratings related to their current characteristics (i.e., average university grades, number of hours spent working side jobs, objective SES, or subjective SES)?

The Current Study—and Some Measurement Issues

The main aim of the current study was to adapt the Colquitt questionnaire to higher education. Further aims were to corroborate the four-factor structure, to check the internal consistencies of the four justice scales, and to investigate the relations of the four justice dimensions with students' specific characteristics.

However, while collecting the two waves of data on students' scientific competencies (hereafter: *SciCom1* and *SciCom2*) that are used in the current study, another issue required attention: During the first wave of data collection (i.e., SciCom1), some participants made remarks that they found it hard to assess certain items. Therefore, an additional answer option was added in the second round of data collection (i.e., SciCom2). This answer option allowed participants to state that they could not rate the respective item. Thus, the accompanying research questions were:

RQ_{3a}: Were there differences in the percentages of missing values in SciCom1 versus SciCom2?

RQ_{3b}: Did the additional answer option in SciCom2 yield additional benefits?

Method

All data were collected as part of the *WiKom-SoWi* project (see the Synopsis of this dissertation for further details). In this project, three waves of data collection were aimed at identifying social science students' preexisting characteristics (hereafter: *PreCha1*, *PreCha2*, and *PreCha3*) mostly at the beginning of their studies in psychology, sociology, or political science. Another two waves of data collection were aimed at identifying psychology students' scientific competencies (i.e., SciCom1 and SciCom2). The data regarding justice perceptions, average university grades, number of hours spent working side jobs, and objective and subjective SES came from SciCom1 and SciCom2. The data regarding intelligence, study interest, need for cognition, personality, and achievement motivation came from PreCha1 or PreCha2. For the purposes here, only data available for psychology students who participated in at least one of the waves of data that were collected on students' scientific competencies were used. If available, additional data from the waves of data collected on students' preexisting characteristics were used to build longitudinal data sets.

Samples and Procedure

For further details about data acquisition, data handling, and overall samples, see also the Synopsis, Study 1, and Study 2 of this dissertation.

Justice Perceptions, Average University Grades, Side Jobs on or off Campus, Objective SES, and Subjective SES

In the summer term 2014, N = 186 psychology students (145 women; age M = 22.97 years, SD = 6.17 years) took part in SciCom1 regarding scientific competencies in psychology. In the winter term 2014/2015 N = 187 psychology students (143 women; age M = 22.20 years, SD = 3.18 years) took part in SciCom2 regarding scientific competencies in psychology.

Because participants who took part in the first round of data collection were strongly encouraged to take part in the second round as well, a subset of $n = 83$ subjects participated in both rounds.

In both of the waves in which data were collected on scientific competencies, the material was presented as a paper-and-pencil test in several booklets. The first booklet always consisted of the test of scientific competencies in psychology; the other booklets consisted of all additional measures and the demographic variables. All data regarding justice perceptions, average university grade, side jobs on or off campus, and objective and subjective SES were collected in these rounds of data collection. For details about missing cases with regard to subjective SES in SciCom1, see Study 2 of this dissertation.

Data on Students' Preexisting Characteristics

Data on students' intelligence, study interest, need for cognition, personality, and achievement motivation came from one of the two rounds of data that were collected on students' preexisting characteristics (i.e., PreCha1 or PreCha2; for details, see the Synopsis). For further analyses, only data from psychology students who had completed the necessary subsets (i.e., justice perceptions and preexisting characteristics) were taken into account. It should be noted that the preexisting characteristics were assessed at least one and at most four semesters before the assessment of students' justice perceptions - so the delay in measurement differed between participants. Each participants' data from PreCha1 or PreCha2 were merged with data from SciCom1 or SciCom2. Longitudinal data sets were available for $n = 106$ SciCom1 participants and $n = 101$ SciCom2 participants.

Adaption of the Colquitt Questionnaire

Overall, the Colquitt questionnaire (Colquitt, 2001) contains 20 items allocated to the four established factors of justice: Seven items cover procedural justice (Items 1 to 7), four items

cover distributive justice (Items 8 to 11), four items cover interpersonal justice (Items 12 to 15), and five items cover informational justice (Items 16 to 20). Due to the impression that the phrasing of Item 4 in the German version (Maier et al., 2007) did not entirely capture the meaning of the phrasing in the American version (Colquitt, 2001), this item was slightly rephrased. Due to differences in the American and German languages regarding Item 15, Maier et al. (2007) decided to reverse the phrasing for the German questionnaire. This strategy was applied in the current study as well. For the items employed, see Table 1 in the Results section (for the original items used in the German language, see Appendix A).

In the Colquitt questionnaire, the instructions for procedural justice target the procedures used to arrive at the outcome, the instructions for distributive justice target the outcome, and the instructions for interpersonal and informational justice target the authority figure who enacted the procedure (for the original phrasing, see Colquitt, 2001, p. 389). In the German translation by Maier et al. (2007), there is a small difference insofar as the instructions for interpersonal and informational justice target only the *person* (not the authority figure) who enacted the procedure.

Regarding procedural justice, the (multiple) procedures in teaching, exams, and general study management that participants deemed relevant for themselves and their studies were targeted in SciCom1. The instructions were slightly rephrased and additional explanations for some of these procedures (i.e., choice of course contents, course registration, and exam registration) were added in SciCom2. Regarding distributive justice, the outcome that was targeted was exam performance. Regarding interpersonal and informational justice, teachers, people who administered exams, and administrative personnel were targeted in SciCom1. The instructions were slightly rephrased to include people involved in the administration and implementation of the general study program, for example, lecturers,

examinants, and administrative staff in SciCom2. For changes in phrasing between SciCom1 and SciCom2, see indications in Table 1.

A 5-point Likert-type scale ranging from 1 (*not at all*) to 5 (*totally*) was employed in SciCom1, which—due to the context—differed slightly from the options given by Maier et al. (2007) or Colquitt (2001). An additional answer option of *I cannot rate this [item]* was provided in SciCom2 (the original German version was *kann ich nicht beurteilen*). This was due to the fact that some participants had made remarks that they found it hard to rate certain items because they felt they were not able to assess these items properly during SciCom1. Hence, this option was included to get qualitative information about which items participants felt were difficult to assess. Please note that for all confirmatory factor analyses, this option was coded as missing. For a critical debate of this assumption, see the Discussion section.

Additional Measures

All measures regarding study interest, need for cognition, personality, and achievement motivation were presented with answer options ranging from 1 (*does not apply at all*) to 5 (*fully applies*). For the analyses, negatively keyed items were reverse-coded.

Average University Grades

Students' average university grades were assessed differently at the two sites: At Saarland University, grades were provided by the examination office. At Heidelberg University, grades were assessed via student self-reports (for further details, see Study 2 of this dissertation). The recoded average grades were *z*-standardized separately for each site and then merged into one variable.

Side Jobs on or off Campus

Students self-reported whether they had a side job, and if so, how many hours they worked this (these) side job(s). They also indicated whether the respective side job was on or off campus. Finally, the number of hours spent working any side jobs was summed.

Objective Socioeconomic Status: Composite Score

To infer objective SES, a composite variable (hereafter: *composite SES*) was calculated (for details regarding this variable, see Studies 1 and 2 of this dissertation). The composite variable was calculated as the mean of the *z*-standardized values for mothers' and fathers' education and occupation. If indicator variables showed missing values, the composite was calculated as the mean of the remaining variables.

Subjective Socioeconomic Status

Essentially, subjective SES was assessed according to Adler, Epel, Castellazzo, and Ickovics (2000). Participants were asked to indicate their social standing on a 10-runged ladder. Subjective SES measures with regard to several frames of reference and criteria were employed (for further details, see Study 2 of this dissertation): The first item assessed *society-related and specific subjective SES*. The second item assessed *community-related and general subjective SES*. Four more items in SciCom2 assessed *university-related and general subjective SES*, *study-program-related subjective SES regarding reputation*, *study-program-related subjective SES regarding finances*, and *study-program-related subjective SES regarding academic achievement*.

Intelligence

To assess intelligence, three subscales from the Intelligence-Structure-Test 2000 R (I-S-T 2000 R; Liepmann, Beauducel, Brocke, & Amthauer, 2007) were presented: analogies,

numerical series, and matrices. This test was administered under standardized conditions as described in the test manual. The raw scores from the three subscales were then transformed into age-specific standard scores with grammar school pupils as the reference norm. Finally, the mean of the three standard scores was computed.

Study Interest

To assess study interest, the Study Interest Questionnaire (FSI [SIQ]; Schiefele, Krapp, Wild, & Winteler, 1993) was presented. The mean of all items was computed.

Need for Cognition

To assess Need for Cognition (original questionnaire by Cacioppo & Petty, 1982), the German version of the questionnaire (NFC; Bless, Wänke, Bohner, Fellhauer, & Schwartz, 1994) was presented. The mean of all items was computed.

Big Five Inventory (*BFI; German Big Five Factors of Personality*)

To assess the Big Five personality factors, the German version of the Big Five Inventory (BFI; German adaptation as cited in Rammstedt & John, 2005) was presented. The mean of all items per subscale was computed.

Achievement Motivation

To assess achievement motivation, the items from the short form of the Achievement Motivation Inventory (LMI-K; Schuler & Prochaska, 2001) were presented. After correcting for number of answer options (a 5-point Likert scale was employed instead of a 7-point Likert scale as employed by Schuler & Prochaska, 2001), the raw scores were transformed into sex-specific standard scores.

Academic Self-Concept

To assess students' academic self-concept, the *absolute* subscale from the Academic Self-Concept Scales (student version; Schöne, Dickhäuser, Spinath, & Stiensmeier-Pelster, 2002) was presented. The mean of all items was computed.

Analyses

To answer the research questions, two independent confirmatory factor analyses were conducted using AMOS 22 (Arbuckle, 2013). Wherever correlations are reported, these are Pearson Product Moment Coefficients with adjusted significance levels (Bonferroni-Holm correction) to control the familywise error rate.

Results

The Colquitt Questionnaire Employed in the Context of Higher Education

Research questions 1a through 1c asked whether the Colquitt questionnaire could be successfully adapted for use in samples in higher education, whether the four-factor structure would hold up in such samples, and whether the respective justice scales would be found to be internally consistent. In the following sections, the results regarding these questions will be presented. In addition, the correlations among the latent justice variables will also be inspected.

Adaption of the Colquitt Questionnaire for Samples in Higher Education and Analyses of the Four-Factor Structure

The items employed in the current questionnaires can be found in Table 1—including information about the means, standard deviations, and standardized factor loadings. In addition, the total number of missing values for each item and the number of missing values

that occurred due to participants judging the item as *I cannot rate this* in SciCom2 are reported.

Table 1
Items, Means, Standard Deviations, Standardized Factor Loadings (Four-Factor Solution), Number of Missing Values, and Number of Items Ticked Off as I cannot rate this *(SciCom2)*

		SciCom1 (N = 186)				SciCom2 (N = 187)				
		M	***SD***	**λ**	***mv***	***M***	***SD***	**λ_2**	***mv***	***cannot rate***
	Procedural Justice									
	The following questions refer to your perception of decision processes during your current studies. In your answers, please consider decision processes… **SciCom1**: in teaching, exams, and general study management that are relevant to yourself and your studies: **SciCom2**: in general study administration, for example, in teaching, at exams, when choosing course contents, at course registration, and at exam registration, etc.:									
01	To what extent are you able to express your views and feelings during the decision processes?	3.24	0.94	.62↓[b]	1	3.48	1.07	.58↓	13	9
02	To what extent do you have influence over the… **SciCom1**: outcomes of the decision processes? **SciCom2**: outcomes?	3.17	0.99	.61→	2	3.49	1.03	.72↑	8	4
03	To what extent are the decision processes applied consistently?	3.42	0.83	.36↓	1	3.66	0.79	.38↓	28	23
04	To what extent are the decision processes free of mistakes and biases?[a]	2.80	0.82	.32↓	2	2.96	0.88	.34↓	29	25
05	To what extent are the decision processes based on accurate information?	3.64	0.59	.52↓	3	3.78	0.73	.50↓	29	23
06	To what extent are you able to appeal the outcomes of the decision processes?	2.72	0.92	.40↓	2	2.69	1.00	.57↑	28	23
07	To what extent are ethical and moral standards upheld during the decision processes?	3.78	0.76	.24↓	3	3.99	0.86	.36↓	32	26
	Distributive Justice									
	The following questions refer to your exam performances:									
08	To what extent do your grades reflect the effort you showed?	3.45	1.04	.91↑	0	3.46	1.10	.90↑	7	3
09	To what extent are your grades appropriate for the work you have completed?	3.45	1.01	.90↓	0	3.49	1.05	.92↓	8	4
10	To what extent do your grades reflect what you have contributed to your studies?	3.33	0.97	.80↓	1	3.47	1.03	.90↑	7	3
11	To what extent are your grades justified, given your performance?	3.55	0.91	.81↓	1	3.62	1.07	.79↓	13	8

		SciCom1 (N = 186)				SciCom2 (N = 187)				
		M	***SD***	**λ**	***mv***	***M***	***SD***	**λ_2**	***mv***	***cannot rate***
The following questions refer to the people… **SciCom1**: in teaching, administration of examinations, and administration, with whom you interact regarding your current studies: **SciCom2**: in general study organization, for example, lecturers, examinants, and administrative staff, with whom you interact regarding your current studies:										
Interpersonal Justice										
12	To what extent do these people treat you in a polite manner?	4.16	0.71	.73↓	0	4.28	0.84	.87↓	4	0
13	To what extent do these people treat you with dignity?	4.03	0.78	.77↓	0	4.31	0.89	.87↓	7	4
14	To what extent do these people treat you with respect?	4.02	0.78	.81↓	0	4.19	0.93	.85↓	3	0
15	To what extent do these people make improper remarks or comments? [reverse-keyed]	3.88	0.91	.27↓	0	3.96	0.95	.46↑	6	3
Informational Justice										
16	To what extent are these people open and honest in disclosure?	3.87	0.73	.47↓	0	3.75	1.02	.32↓	13	9
17	To what extent do these people explain procedures and their requirements thoroughly in advance?	3.46	0.97	.71↓	0	3.60	0.98	.63↓	7	4
18	To what extent are the explanations regarding the procedures and requirements reasonable?	3.56	0.73	.57↓	0	3.73	0.88	.72↓	7	2
19	To what extent do these people communicate details in a timely manner?	3.33	0.86	.56↓	0	3.51	1.02	.70↓	8	4
20	To what extent do these people tailor their communication to your specific needs?	2.73	0.94	.50↓	1	2.82	1.02	.67↓	13	10

Note. M = mean; SD = standard deviation; λ = standardized factor loading; mv = number of missing values; cannot rate = number of participants ticking off *I cannot rate this* [item].
[a]Note that a slightly different phrasing than that from Maier et al. (2007) was used to capture the meaning of the phrasing in the original version.
[b]Note that ↑ indicates a standardized factor loading that was numerically larger than that reported by Maier et al. (2007), ↓ indicates a standardized factor loading that was numerically smaller, and → indicates a standardized factor loading that was numerically equal.

Two independent confirmatory factor analyses (i.e., one for each sample) with the four factors procedural justice, distributive justice, interpersonal justice, and informational justice were conducted. Results indicated an appropriate model fit (see Table 2). Whereas the four-factor model in SciCom1 provided an acceptable model fit in terms of the χ^2-ratio, CFI, and RMSEA (χ^2 = 286.27, df = 164, p < .01; CFI = .90; RMSEA = .06), the four-factor model in

SciCom2 provided a good model fit (χ^2 = 239.66, *df* = 164, $p < .01$; CFI = .95; RMSEA = .05).

A consideration of the pClose, however, pointed to a less acceptable model fit in SciCom1: The pClose "is a 'p value' for testing the null hypothesis that the population RMSEA is no greater than .05" (see first paragraph of AMOS help; Arbuckle, 2013). A pClose value smaller than .05 indicates that the population RMSEA is greater than .05, which indicates a poor(er) model fit. Therefore, the model in SciCom1 could not be interpreted as a close-fitting model, whereas the model in SciCom2 could be interpreted as a close-fitting model.

All except one standardized factor loadings λ yielded significance on the $p \leq .001$ level (two-tailed). The exception was Item 7 in SciCom1 ($\lambda = .24$, $p \leq .008$). Standardized factor loadings ranged from $\lambda = .24$ to $\lambda = .91$ in SciCom1 and from $\lambda = .32$ to $\lambda = .92$ in SciCom2 (see Table 1).

For a numerical comparison of the standardized factor loadings of the samples and the standardized factor loadings in the study by Maier et al. (2007), see the direction of the arrows to the right of the standardized factor loadings in Table 1. Overall, 33 out of the 40 standardized factor loadings were numerically smaller than those reported by Maier et al. (2007), six were numerically larger, and one was equal. Maier et al. (2007) reported all standardized factor loadings $\lambda \geq .40$. In the two samples at hand, the factor loadings of Items 3, 4, 7, and 15 in SciCom1 and Items 3, 4, 7, and 16 in SciCom2 fell below this threshold.

Table 2
Fit Statistics of the Confirmatory Factor Analyses for the Two Samples (Four-Factor Solution)

	χ^2	*df*	χ^2/df	CFI	RMSEA	90% CI RMSEA	pClose
SciCom1	286.27	164	1.75	.90	.06	[.05, .08]	.04
SciCom2	239.66	164	1.46	.95	.05	[.04, .06]	.50

Note. CI = confidence interval; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation.

Table 3

Comparison of Selected Fit Statistics for the Four-Factor Models in the Two Current Samples, Colquitt (2001) and Maier et al. (2007)[a]

		χ^2/df	CFI	RMSEA
SciCom1 Student sample	(*N* = 186)	1.75	.896	.063
SciCom2 Student sample	(*N* = 187)	1.46	.947	.050
Colquitt (2001) Student sample	(*N* = 301)	1.90	.92	.055
Colquitt (2001) Field sample	(*N* = 337)	2.08	.94	.057
Maier et al. (2007) Field sample	(*N* = 512)	3.50	.938	.070

Note. CFI = comparative fit index; RMSEA = root mean square error of approximation.
[a]To ease comparisons, values are reported with three decimals wherever available.

Compared with the four-factor models from Colquitt (2001) and Maier et al. (2007), the results at hand suggest numerically better model fit in terms of the χ^2/df-ratio for both samples, and better model fit in terms of the CFI and RMSEA for SciCom2 (see Table 3).

Intercorrelations among the Latent Justice Variables and Internal Consistencies of the Four Justice Subscales

Across the two samples, the correlations between all but one pair of latent factors remained significant after the Bonferroni-Holm correction (see Table 4). The only exception was the correlation between distributive and interpersonal justice, which was not significant in SciCom2. The same pattern of correlations emerged among the scale means.

In both samples, the distributive justice subscales yielded excellent values of Cronbach's α with SciCom1 α = .92 and SciCom2 α = .93 (see also Table 4). The interpersonal and informational justice subscales yielded acceptable values of Cronbach's α, with interpersonal justice yielding values of SciCom1 α = .71 and SciCom2 α = .84 and informational justice yielding values of SciCom1 α = .70 and SciCom2 α = .73. By contrast, however, the procedural justice subscales yielded unsatisfactory values of Cronbach's α with SciCom1 α = .62 and SciCom2 α = .69.

Table 4
Correlations among Latent Variables, Correlations among Scale Means, and Scale Reliabilities

			Procedural justice	Distributive justice	Interpersonal justice	Informational justice	α
Procedural justice	SciCom1		-	**.19♦**	**.28♦**	**.40♦**	.62
		N		185	185	185	
	SciCom2		-	**.17♦**	**.30♦**	**.39♦**	.69
		N		179	181	181	
Distributive justice	SciCom1		**.22♦**	-	**.27♦**	**.22♦**	.92
		N			186	186	
	SciCom2		**.23♦**	-	.10	**.33♦**	.93
		N			181	181	
Interpersonal justice	SciCom1		**.36♦**	**.27♦**	-	**.55♦**	.71
		N				186	
	SciCom2		**.40♦**	.11	-	**.52♦**	.84
		N				184	
Informational justice	SciCom1		**.49♦**	**.22♦**	**.74♦**	-	.70
		N					
	SciCom2		**.52♦**	**.38♦**	**.58♦**	-	.73
		N					

Note. Correlations among the latent factors are presented below the diagonal. Correlations of scale means are presented above the diagonal. For scale reliabilities, see last column.
$^{*}p \leq .05$. $^{**}p \leq .01$. ♦Correlations that remained significant after the Bonferroni-Holm correction are marked with a diamond and printed in bold.

Justice Ratings and their Relation to Students' Characteristics

Overall, research questions 2a and 2b asked whether students' justice ratings were related to their former or current characteristics. To answer these questions, mean justice scale means were correlated with students' characteristics. In the following sections, the results regarding these questions will be reported.

Justice Ratings and Students' Former Characteristics

In detail, research question 2a asked whether students' justice ratings would be related to their personality, their intelligence, their need for cognition, their study interest, their achievement motivation, or their academic self-concept. Results indicated that after the Bonferroni-Holm correction, neither justice dimension was significantly correlated with participants'

personality, intelligence, need for cognition, study interest, achievement motivation, or academic self-concept (see Table 5).

Three pairs of correlations deserve to be mentioned, however. These pairs did not remain significant after the Bonferroni-Holm correction, but they were significant at $p \leq .05$ across *both* samples: Participants' ratings of distributive justice were negatively correlated with neuroticism (SciCom1: $r = -.28$; SciCom2: $r = -.20$), participants' ratings of distributive justice were positively correlated with academic self-concept (SciCom1: $r = .26$; SciCom2: $r = .22$), and participants' ratings of informational justice were positively correlated with agreeableness (SciCom1: $r = .19$; SciCom2: $r = .21$).

Justice Ratings and Students' Current Characteristics

In detail, research question 2b asked whether students' justice ratings would be related to their university GPA, the number of hours they spent working side jobs, their objective SES, or their subjective SES. For results, see Table 6. After the Bonferroni-Holm correction, participants' ratings of distributive justice were significantly and positively correlated with their university GPA in SciCom1 ($r = .30$), with university-related and general subjective SES in SciCom2 ($r = .40$), and with study-program-related subjective SES regarding academic achievement in SciCom2 ($r = .31$). Participants' ratings of informational justice were significantly and positively correlated with their society-related and specific subjective SES in SciCom2 ($r = .25$) and their university-related and general subjective SES in SciCom2 ($r = .29$).

Wherever there was a second sample regarding a significant correlation available, the tendency went in the same direction (i.e., distributive justice and university GPA were correlated $r = .17$ in SciCom2; informational justice and society-related and specific subjective SES were correlated $r = .28$ in SciCom1). Again, two further pairs of correlations deserve mention, even though both pairs did not remain significant after the Bonferroni-Holm

correction: Across both samples, interpersonal justice was correlated with both society-related and specific subjective SES (SciCom1: $r = .27$; SciCom2: $r = .19$) and community-related and general subjective SES (SciCom1: $r = .32$; SciCom2: $r = .17$). Finally, across both samples, neither the number of hours students spent working side jobs nor their objective SES was significantly correlated with one or more of the justice dimensions.

Table 5
Correlations among Justice Ratings (Scale Means) and Students' Former Characteristics

				NE	EX	OP	CO	AG	I	IAN	INS	IMA	NFC	SI	AM	ASC
Procedural justice	**[PRO]**	SciCom1		.01	-.06	-.21*	.10	.02	.01	.01	-.04	.04	-.05	.00	.12	-.09
			N	104	104	104	104	104	104	104	104	104	104	104	104	104
		SciCom2		-.01	.16	-.05	.09	.23*	-.23*	-.10	-.21*	-.19	-.19	-.05	.09	-.08
			N	97	97	97	97	97	97	97	97	97	97	97	97	97
Distributive justice	**[DIS]**	SciCom1		-.28**	-.16	-.03	-.02	.11	.07	.26**	.01	-.11	.15	.21*	-.01	.26**
			N	105	105	105	105	105	105	105	105	105	105	105	105	105
		SciCom2		-.20*	.02	-.05	.00	.29**	-.07	.10	-.06	-.20	-.02	.06	-.02	.22*
			N	97	97	97	97	97	97	97	97	97	97	97	97	97
Interpersonal justice	**[INT]**	SciCom1		-.03	-.16	-.26**	-.07	.00	.10	.18	.06	-.02	-.20*	.09	-.15	.16
			N	105	105	105	105	105	105	105	105	105	105	105	105	105
		SciCom2		.03	.18	-.02	.11	.02	-.06	.03	-.14	-.01	-.05	-.10	.12	.02
			N	99	99	99	99	99	99	99	99	99	99	99	99	99
Informational justice	**[INF]**	SciCom1		-.10	.05	-.25**	-.12	.19*	.08	.16	-.01	.03	-.19	.11	-.14	.11
			N	105	105	105	105	105	105	105	105	105	105	105	105	105
		SciCom2		-.11	.13	-.05	.12	.21*	-.12	.06	-.24**	-.08	-.12	-.05	-.02	.06
			N	99	99	99	99	99	99	99	99	99	99	99	99	99

Note. NE = neuroticism; EX = extraversion; OP = openness; CO = conscientiousness; AG = agreeableness; I = intelligence mean standard score; IAN = intelligence – analogies; INS = intelligence – numerical series; IMA = intelligence – matrices; NFC = need for cognition; SI = study interest; AM = achievement motivation; ASC = academic self-concept.
*$p \leq .05$. **$p \leq .01$. ♦Correlations that remained significant after the Bonferroni-Holm correction are marked with a diamond and printed in bold.

Table 6

Correlations among Justice Ratings (Scale Means) and Students' Current Characteristics

				UGPA[a]	HSJ	CSES	SRS	CRG	URG	SPRR	SPRF	SPRA
Procedural justice	**[PRO]**	SciCom1		.11	-.10	.03	-.03	.16	-	-	-	-
			N	175	184	185	74	75	-	-	-	-
		SciCom2		-.04	-.06	.13	.12	.05	.16*	.11	.09	.03
			N	150	181	180	181	181	181	181	181	180
Distributive justice	**[DIS]**	SciCom1		**.30♦**	-.05	.00	-.05	-.05	-	-	-	-
			N	176	185	186	75	76	-	-	-	-
		SciCom2		.17*	-.03	.10	.10	.08	**.40♦**	.12	.17*	**.31♦**
			N	149	181	180	181	181	181	181	180	180
Interpersonal justice	**[INT]**	SciCom1		.14	-.12	-.10	.27*	.32**	-	-	-	-
			N	176	185	186	75	76	-	-	-	-
		SciCom2		-.04	.01	.02	.19**	.17*	.23**	.11	.20**	.11
			N	152	184	183	184	184	184	184	183	182
Informational justice	**[INF]**	SciCom1		.05	-.19**	.04	.28*	.06	-	-	-	-
			N	176	185	186	75	76	-	-	-	-
		SciCom2		.00	-.10	.11	**.25♦**	.13	**.29♦**	.11	.16*	.17*
			N	152	184	183	184	184	184	184	183	182

Note. UGPA = university grade point average; HSJ = number of hours spent working side jobs; CSES = composite SES; SRS = society-related and specific subjective SES; CRG = community-related and general subjective SES; URG = university-related and general subjective SES; SPRR = study-program-related subjective SES, reputation; SPRF = study-program-related subjective SES, finances; SPRA = study-program-related subjective SES, academic achievement.

[a]Average grades were recoded so that 5 = best grade possible and 1 = worst grade possible (failed), scores were then *z*-standardized separately for each site and the merged into one variable.

*$p \leq .05$. **$p \leq .01$. ♦Correlations that remained significant after the Bonferroni-Holm correction are marked with a diamond and printed in bold.

Missing Values and the Additional Answer Option *I cannot rate this*

Research questions 3a and 3b asked whether there would be differences in the number of missing values in SciCom1 versus SciCom2 and whether the additional answer option in SciCom2 would yield additional benefits.

A closer inspection of missing values and items ticked off as *I cannot rate this* revealed that the overall percentage of missing values was lower in SciCom1 (0.46%) than in SciCom2 (7.26%). For details, see Table 7 and Table 1. However, when differentiating between genuinely missing values and items ticked off as *I cannot rate this* in SciCom2, it became apparent that about two thirds of the missing values in SciCom2 were due to participants stating that they could not rate the items. In SciCom2, on average, approximately 5% of the participants found that they were not able to rate the respective item. Even more so, participants seemed to have the most problems with items regarding procedural justice: Here, 10.16% of the items were ticked off as *I cannot rate this*. A closer inspection of Table 1 suggests that especially Items 3 through 7 showed the largest numbers of such ratings. These five items showed more than twice the average number of *I cannot rate this* answers. That is, for each of these items, more than 19 participants stated *I cannot rate this*. Item 7 had the largest number such that 26 participants (approximately 14% of the SciCom2 samples' participants) were unable to rate this item.

Table 7
Percentage of Overall Missing Values (SciCom1 and SciCom2), Genuinely Missing Values (SciCom2), and Items Ticked Off as I cannot rate this *(SciCom2)*

	SciCom1	SciCom2		
	% of missing values	% of missing values (overall)	% of missing values (genuinely)	% of "I cannot rate this"
Procedural justice	1.08	12.76	2.60	10.16
Distributive justice	0.27	4.68	2.27	2.41
Interpersonal justice	0.00	2.67	1.74	0.94
Informational justice	0.11	5.13	2.03	3.10
Overall:	0.46	7.26	2.23	5.03

For a comparison of the means of the subsample of participants who participated in both rounds of data collection, see Table 8. Paired-sample *t*-tests with pairwise deletion to treat missing values revealed that none of the item means differed significantly between the two rounds of data collection. Note, however, that the answer options differed between the two

Table 8

Means of the Subsample of Participants who Participated in the two Rounds of Data Collection (n = 83), Comparison of Means, Number of Participants who Checked I cannot rate this item in SciCom2 and Their Mean Values/Number of Missing Values in SciCom1

	SciCom1 Subsample (S1)		**SciCom2 Subsample (S2)**		Comparison of means of the subsamples from **SciCom1 vs. SciCom2**			Number of participants checking "I cannot rate this item" in **SciCom2** and respective means/ missing values in **SciCom1**		
Item	M_1	SD_1	M_2	SD_2	t^b	*df*	*p*	*Cannot rate S2*	*M in S1*	*Missing in S1*
Procedural Justice										
01	3.19	0.96	3.11	1.17	0.26	78	.80	4	4.00	0
02	3.01	1.02	3.15	1.15	-0.88	81	.38	1	2.00	0
03	3.47	0.85	3.59	0.78	-1.23	73	.22	9	3.67	0
04	2.90	0.78	2.96	0.88	-0.41	73	.68	9	2.89	0
05	3.67	0.61	3.65	0.81	1.12	67	.27	13	3.23	0
06	2.66	0.89	2.49	0.95	1.29	72	.20	9	2.67	0
07	3.87	0.71	3.94	0.87	0.00	68	1.00	13	3.54	0
Scale:	**3.25**	**0.44**	**3.23**	**0.65**	**0.56**	**81**	**.58**			
Distributive Justice										
08	3.47	1.08	3.51	1.07	-0.31	81	.76	1	3.00	0
09	3.49	1.01	3.54	1.07	-0.29	80	.77	2	3.00	0
10	3.33	0.98	3.44	1.08	-0.89	81	.37	1	-	1
11	3.61	0.95	3.67	1.12	-0.65	78	.52	4	4.00	1
Scale:	**3.47**	**0.89**	**3.54**	**0.99**	**-0.59**	**81**	**.56**			
Interpersonal Justice										
12	4.19	0.76	4.20	0.96	-0.10	81	.92	0	-	0
13	4.02	0.81	4.19	1.04	-1.36	80	.18	2	4.00	0
14	4.00	0.81	4.10	1.09	-0.75	82	.45	0	-	0
15[a]	4.06	0.89	4.00	0.86	0.48	81	.64	1	4.00	0
Scale:	**4.07**	**0.62**	**4.12**	**0.84**	**-0.42**	**81**	**.67**			
Informational Justice										
16	3.93	0.68	3.77	0.97	1.45	78	.15	3	3.33	0
17	3.48	0.94	3.60	0.95	-0.92	82	.36	0	-	0
18	3.58	0.74	3.68	0.91	-0.74	79	.46	1	4.00	0
19	3.43	0.80	3.45	0.97	-0.10	81	.92	1	3.00	0
20	2.64	0.89	2.60	0.95	0.34	79	.74	3	2.67	0
Scale:	**3.41**	**0.55**	**3.42**	**0.63**	**0.17**	**81**	**.87**			

Note. [a]The phrasing of Item 15 was reversed. The means of the recoded values are presented.
[b]To treat missing values, pairwise deletion was used for paired-sample *t*-tests.

rounds of data collection regarding the additional answer option *I cannot rate this item* in SciCom2, which—if checked—was recoded as a missing value.

In the columns on the right side of Table 8, results reflecting the number of subsample participants who checked *I cannot rate this item* regarding the respective items in SciCom2 are provided, as well as the corresponding item means and the number of missing values in SciCom1 from this subsample of participants. Note that out of the 77 times participants in this subsample checked *I cannot rate this item* in SciCom2, only two times did the respective participant have a corresponding missing value for the item in SciCom1. In the other 75 cases, the participants had in fact assigned a value to the respective item in SciCom1. Also, the item means for these participants in SciCom1 did not seem to differ numerically to a large degree from the means of the other participants in SciCom2. However, because there was only a small number of cases for each item (0-13), a statistical comparison of the means does not seem adequate.

Discussion

The first set of research questions asked whether the Colquitt questionnaire could be successfully adapted to samples in higher education, whether the four-factor structure would hold up, and whether the justice scales would be found to be internally consistent. The second set of research questions asked whether students' justice ratings would be found to be related to their former or current characteristics. The third set of research questions asked whether there would be differences in the number of missing values in SciCom1 versus SciCom2 and whether the additional answer option in SciCom2 would yield additional benefits. In the following sections, the main findings regarding these research questions will be recapped and then discussed.

Recap of the Main Findings and Discussion

Standardized Factor Loadings and the Four-Factor Structure of the Colquitt Questionnaire

Overall, the current results suggest that the Colquitt questionnaire and its German counterpart by Maier et al. (2007) can successfully be adapted to higher education: In both of the current samples, the model fit was comparable to that attained by Colquitt (2001) and Maier et al. (2007). The questionnaire seems to especially capture the factors distributive justice, interpersonal justice, and informational justice very well. To this end, the suggestions made by Lotz and Feldhaus (2013) to consider justice perceptions in education and by Streicher et al. (2008) to validate the German measure in the field with a different sample and a different focus were satisfied.

However, in more than three fourths of the items, the standardized factor loadings in the current samples fell below those reported by Maier et al. (2007). Especially Items 3, 4, and 7 from the procedural justice scale stood out because of low factor loadings in both samples (i.e., $\lambda \leq .40$). These three items were based on the Leventhal (1976) rules of procedural justice, namely, the consistency rule, the bias-suppression rule, and the ethicality rule. On the content level, Item 3 covered the consistent application of decision processes, Item 4 covered the unbiasedness of decision processes, and Item 7 covered the ethical and moral standards during decision processes. In both of the current samples, the instructions for procedural justice targeted the (multiple) procedures in teaching, exams, and general study management that students deemed relevant for themselves and their studies. This is contrary to the results for the first study provided by Colquitt (2001) because a broader approach was taken than merely focusing on grading procedures.

One aspect that might account for the difficulties with the three items is that it is exactly this focus on more general decision processes that lacks a *specified entity* of decision process situations. For example, one student might think about a decision process where the

examination board had to decide whether or not he was allowed to retry an exam. This student might have found it very easy to come up with a decision process to assess. Another student, who had not (yet) deliberately experienced a decision process might find it hard to come up with an idea of which decision process to assess. An adjacent possibility is that these three items in general tap aspects of campus life that students sometimes have no insights into—especially if they are not involved in activities regarding students' affairs. For example, being a member of the student representatives, an undergraduate committee, or an examination committee is voluntary—but provides insights into many decision processes that take place on campus. And it is this lack of a specified entity (i.e., a concrete, predetermined decision process specified in the questionnaire) or of certain missing experiences that might have resulted in the trouble that some students had in assessing the respective items and left them unable to judge the decision processes regarding consistency (Item 3), unbiasedness (Item 4), or moral standards (Item 7). However, only these three of the seven procedural justice items showed the reported difficulties in factor loadings.

Justice Ratings and Students' Former Characteristics

The four justice dimensions were not related to students' intelligence, their need for cognition, their study interest, or their achievement motivation. However, the current results have to be interpreted cautiously because the assessment of students' former characteristics took place one to four semesters before their justice ratings. Three associations were not significant after the Bonferroni-Holm correction was applied—but they showed tendencies that went in the same direction across the two samples: Distributive justice was negatively associated with neuroticism and positively associated with academic self-concept, and informational justice was positively associated with agreeableness. The results regarding neuroticism and agreeableness were, in principle, in line with the results by Shi et al. (2009), who also found that distributive justice was negatively associated with neuroticism, and

informational justice was positively associated with agreeableness. The positive association between distributive justice and academic self-concept might make sense in conjunction with the ideas that, on the one hand, students with good grades should perceive that distributive justice is rather high, especially with regard to the grades they receive (see also the following section for a positive association between university GPA and distributive justice). On the other hand, these students should also have a higher academic self-concept. However, the mechanisms hypothesized here require further research.

Justice Ratings and Students' Current Characteristics

An inspection of the correlations between students' justice ratings and students' current characteristics revealed that distributive justice was positively associated with students' university GPA, their university-related general subjective SES, and their study-program-related subjective SES regarding academic achievement. These results seem intuitive: The better students' academic achievement—which was captured by their university GPA and also in part by their study-program-related subjective SES regarding academic achievement—the more students should perceive that their exam performances were evaluated in a just manner. In addition, the positive association between perceived distributive justice and university-related and general subjective SES might also make sense: With this subjective SES measure, students are asked to think of a ladder that represents where all students at their university stand and to compare themselves with those students—without specifying any further criteria. It seems plausible that the students who feel they are better off in comparison with other students are the ones who are also greatly satisfied with their outcomes—and vice versa.

The results also revealed that informational justice was positively associated with society-related and specific subjective SES as well as university-related and general subjective SES. It seems plausible that people who feel that they subjectively hold a high

standing—in society as well as at their university—are also individuals who either do well with the information given or who know whom to ask for information and therefore give high ratings to informational justice. Here, again, several causal patterns can be imagined, including the opposite pattern or another third variable (e.g., the ability to realistically evaluate circumstances) that influences both subjective standing in society or university and the perception of informational justice.

Two associations were not significant after the Bonferroni-Holm correction was applied—but they showed tendencies that went in the same direction across the two samples: Interpersonal justice was positively associated with society-related and specific subjective SES as well as community-related and general subjective SES. It seems plausible that students who feel they have a higher standing in society or at their university might also feel that they are treated more fairly on an interpersonal level at university. Here again, it might also be possible that another third variable is in play, for example, a certain student habitus (sensu Bourdieu, 1991) that is associated with both students' ratings of interpersonal justice and their subjective standing in society or at university (i.e., students who feel entitled to a certain role might rate their subjective standing in society or university higher, and at the same time, they might also feel that they are—or they might actually be—treated more fairly at university on an interpersonal level).

Assessability

The option *I cannot rate this [item]* was provided to participants in SciCom2 as a reaction to SciCom1 participants' comments. Because of the addition of this option, inferences can be drawn about the suitability of single items. Overall, the percentage of genuinely missing values was slightly smaller in SciCom1 than in SciCom2. When provided the option *I cannot rate this* (SciCom2), only a small portion of participants made use of this option: On average, only 5% of the answers were identified as not assessable. In the subsample of students who

participated in both rounds of data collection, in less than 3% of the cases, students rated an item as not assessable in SciCom2 when they had actually failed to rate the same item in SciCom1. However, what attracts attention is that the items with more than twice the average number of *I cannot rate this* answers—Items 3 through 7—all belonged to the procedural justice scale. Again, particularly Items 3, 4, and 7 from the procedural justice scale seemed problematic with regard to assessability—resulting in the highest numbers of items identified by the participants as unrateable.

Overall, the additional answer option *I cannot rate this* poses a downside and an upside at the same time: It can be seen as a downside that participants who participated in both samples had rates of missing values in SciCom1 of less than 3% when in SciCom2 they in fact often identified an item as *I cannot rate this*. In addition, the answer option *I cannot rate this* was treated as a missing value in the current confirmatory factor analyses. Technically speaking, they were assumed to be either missing completely at random (MCAR) or missing at random (MAR), and full information maximum likelihood (FIML) estimation was employed. If values are assumed to be missing completely at random, missing values in the respective variable are not related to the value of the variable itself or to another variable. If values are assumed to be missing at random, missing values in the respective variable are not related to the value of the variable itself, but they might be related to one or more of the other observed variables. However, it is important to consider the possibility that because of this answer option, the missing values might have been *missing not at random* (MNAR), that is, the missingness of the values might have actually depended on the values the participants would have assigned to them. In this case, the FIML estimation employed in the confirmatory factor analyses might not have yielded appropriate results. For further discussions of this topic, see Brown (2015), Lüdtke, Robitzsch, Trautwein, and Köller (2007), or Rubin (1976).

After all, the additional answer option might also have an enormous upside: It identified items participants found difficult to assess, pointing attention especially toward some of the items from the procedural justice scale. In the current samples, this gain in information should probably be valued more highly than the loss of possibly biased results due to (uncorrected) full information maximum likelihood estimation.

Cross-Pollination and General Issues with the Colquitt Questionnaire

The preceding findings regarding the factor loadings (SciCom1 and SciCom2) and assessability (SciCom2) point to some difficulties with the procedural justice scale—at least for the context of higher education. In addition, the comparably low reliability of the procedural justice scale in terms of Cronbach's α undermines this assumption.

Colquitt (2001) criticized that the nomological network of justice has often not been assessed properly at the measurement level and that items have been cross-pollinated. However, taking a closer look at certain items from the Colquitt questionnaire, it makes sense to wonder whether in his (and also the present) questionnaire, this problem still deserves attention: The operationalization of some factors still seems to tap other factors.

Item 5, for example, which captures the accuracy of information used in decision processes and which is assigned to procedural justice, also seems to tap the core content of informational justice. Item 7, which captures the ethical and moral standards upheld during decision processes and which is also assigned to procedural justice, also seems to tap core aspects of interpersonal justice. So, too, do Items 16 and 20, which capture the candidness of the people and whether communication is tailored to participants' needs, respectively. Both items are assigned to informational justice; however, they also tap into core aspects of interpersonal justice. Finally, another item might be difficult with regard to item wording: Item 1 asks for the extent to which participants are able to express their views and feelings during decision processes. This item was assigned to procedural justice. Here, one problem

might be that views and feelings are different concepts. Therefore, it might make sense to divide this item into two separate items.

Colquitt (2001) argued that there were difficulties on the measurement level (see above). However, it might also be the case that there are still some problems regarding the *nomological network* of the four justice constructs. Especially the historical development of the different justice factors might have led to some trouble regarding a clear distinction of the different justice factors: For example, some of Leventhal's (1980) procedural justice rules tap into justice factors (i.e., interpersonal and informational justice) that were not on the map of organizational justice back then: Interpersonal and informational justice were first brought up by Greenberg in 1993. However, the procedural justice rules are included in the Colquitt questionnaire without an attempt to further differentiate the contents of these rules with regard to aspects of distributive justice versus aspects of interpersonal or informational justice.

Whereas Leventhal's (1980) justice rules are referred to in the Colquitt questionnaire, Leventhal's seven structural components are neglected. However, it is these structural components, namely, the selection of agents, the setting of ground rules, the gathering of information, decision structure, appeals, safeguards, and change mechanisms that also regulate just decision processes (Leventhal, 1980) and might be connected to aspects of interpersonal and informational justice. Bearing in mind the necessity of a more precise theory about the four factors of justice, these structural components might indeed prove valuable for further consideration.

Limitations

The samples consisted of psychology students only. Psychology is a field of study that has strong admission restrictions and attracts a rather privileged student body (see the Synopsis for this assumption). Therefore, the variability in the samples might be heavily restricted. In

addition, the students who took part in the waves of data collected on scientific competencies had been studying psychology for different numbers of semesters. However, students' justice perceptions might vary depending on their (cumulative) experiences and—along with this—their respective number of semesters: The more semesters students have already spent at university, the more likely they are to have had experiences with (in-)justice. However, separate analyses for students who had been studying for different numbers of semesters were not possible because of the small sample sizes.

Another shortcoming of the present study beyond the small size of the samples involved the partial dependencies of the two samples. A comparison of the means of the subsample of subjects who participated in both samples revealed no differences for any of the variables, though. However, in these analyses, the values for the participants who checked *I cannot rate this* were excluded from the analyses due to pairwise deletion. Given the small percentage of participants who chose this answer option, one might wonder whether it was worth the trouble that came along with it. However, as stated before, the insights that were gained most likely made this approach worthwile.

A further shortcoming concerns the scarcity of external criteria to validate students' justice perceptions. Among other associations, in his student sample, Colquitt (2001) found that justice was related to outcome satisfaction, rule compliance, and leader evaluation. In the more general literature on organizational justice, justice has been found to be related to task performance, citizenship behavior, as well as counterproductive (work) behavior (for an overview, see the meta-analysis by Colquitt et al., 2013). In the current study, university GPA can be seen as an indicator of task performance in a broader sense. Unfortunately, external criteria (e.g., students' satisfaction with their grades or teachers; students' work behavior) were not assessed in the current assessments on students' scientific competencies—even though this could have proven useful.

Future Directions

A fundamental future direction is the further revision of the Colquitt questionnaire for educational contexts according to the points of criticism mentioned above (e.g., a more precise demarcation of the four factors of justice; an accompanying adaptation of items including a revision, separation, or deletion of ambiguous items). Afterwards it should be possible to relate students' justice perceptions to such important outcomes as students' satisfaction, students' achievement, or students' dropout rates. For the last outcome, recent findings from higher education have already revealed that procedural justice ratings are a predictor of university dropout (Burger & Groß, 2016). Additional findings from this study revealed that *interactions* of procedural justice ratings with SES or second-generation immigration status (i.e., both parents were born in a foreign country, whereas the participants were born in Germany) predicted dropout intentions as well. These findings highlight the role of the interplay of justice perceptions on the one hand and demographic variables on the other. Future research should seek to replicate these findings and broaden them to the four justice dimensions and other educational contexts, for example secondary education and its different school tracks in Germany (e.g., Realschule [middle track] or Gymnasium [highest track]).

As Streicher et al. (2008) already stated it might also prove useful to reconsider the respective foci of the instructions for different situations in (higher) education. In particular, it might be helpful to compare results from narrower and broader foci. For example, a narrow focus could target exam grades as the respective outcome and examinants as the people who enact the procedures. Colquitt (2001) employed such a narrow focus with his American student sample. A broader focus should then target general study-related outcomes and general university staff. In comparing these different foci, it would be possible to determine whether or not they have differential effects on the justice ratings.

A further promising direction lies in the concept of justice sensitivity. More recent evidence by Schmitt, Baumert, Gollwitzer, and Maes (2010) suggested that people differ in the extent to which they are sensitive to (in-)justice. The authors introduced a questionnaire for assessing justice sensitivity as a personality trait. Justice sensitivity targets the *readiness* with which an individual perceives (in-)justice as well as his or her reactions to it. The authors distinguished four perspectives of justice sensitivity, namely, observer sensitivity (i.e., the extent to which individuals are sensitive to injustice to another person's disadvantage), beneficiary sensitivity (i.e., the extent to which individuals are sensitive to injustice to their own advantage and to another person's disadvantage), perpetrator sensitivity (i.e., the extent to which individuals are sensitive to injustice that originates from their own wrongdoing), and victim sensitivity (i.e., the extent to which individuals are sensitive to injustice to their own disadvantage). The latter perspective, victim sensitivity, seems especially relevant regarding justice ratings in higher education: Whether participants are sensitive to injustice that is directed toward them might strongly influence their ratings of justice in the setting of higher education. Schmitt et al. (2010) found that victim sensitivity was significantly predicted by subfacets of neuroticism, agreeableness, and openness. Because justice sensitivity can be seen as a trait, one would expect differential relations of students' justice sensitivity to their justice ratings. For example, it seems plausible to expect that students' victim sensitivity will be negatively correlated with their justice ratings.

Overall, the Colquitt questionnaire has a huge potential to assess justice perceptions not only in higher education students but also in children, adolescents, their parents, their educators, and their teachers. Such justice perceptions might be of special interest in the context of students' (subjective) SES, their immigration background, or their gender—all aspects closely related to social (in-)equality. Assessing individuals' justice perceptions could prove very helpful for furthering the understanding of the (subjective) meaning of—for

example—different backgrounds for the daily (subjective) experiences these individuals have in the educational system and how they relate to whether individuals feel they are being treated fairly.

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Appendix

Appendix A. Original Questionnaire in German Language

Original Items Used for Assessing German Students' Justice Perceptions in the two Rounds of Data Collection

Item No.	**Version 1** (summer 2014)	**Version 2** (winter 2014/2015)[a]
	Procedural Justice	
	Die folgenden Fragen beziehen sich darauf, wie Sie Entscheidungsprozesse in Ihrem derzeitigen Studium wahrnehmen. Bitte berücksichtigen Sie bei Ihren Antworten Entscheidungsprozesse in Lehre, Prüfungen und allgemeiner Studienverwaltung, die für Sie und Ihr Studium relevant sind:	*Die folgenden Fragen beziehen sich darauf, wie Sie **die** Entscheidungsprozesse in Ihrem derzeitigen Studium wahrnehmen. Berücksichtigen Sie bei Ihren Antworten **bitte die** Entscheidungsprozesse in **der allgemeinen Studienorganisation, z.B. in der** Lehre, **bei** Prüfungen, **bei der Wahl von Studieninhalten, bei der Anmeldung für Lehrveranstaltungen und Prüfungen, etc.:***
01	Wie sehr können Sie Ihre Sichtweisen und Empfindungen im Rahmen der Entscheidungsprozesse ausdrücken?	Wie sehr können Sie Ihre Sichtweisen und Empfindungen im Rahmen der Entscheidungsprozesse ausdrücken?
02	Wie sehr haben Sie Einfluss auf die Ergebnisse der Entscheidungsprozesse?	Wie sehr haben Sie Einfluss auf die **Ergebnisse?**
03	Wie sehr werden die Entscheidungsprozesse konsistent angewandt?	Wie sehr werden die Entscheidungsprozesse konsistent angewandt?
04	Wie sehr sind die Entscheidungsprozesse frei von Fehlern und Verzerrungen?	Wie sehr sind die Entscheidungsprozesse frei von Fehlern und Verzerrungen?
05	Wie sehr basieren die Entscheidungsprozesse auf zutreffenden Informationen?	Wie sehr basieren die Entscheidungsprozesse auf zutreffenden Informationen?
06	Wie sehr ist es Ihnen möglich, gegen die Ergebnisse der Entscheidungsprozesse Widerspruch einzulegen?	Wie sehr ist es Ihnen möglich, gegen die Ergebnisse der Entscheidungsprozesse Widerspruch einzulegen?
07	Wie sehr werden während der Entscheidungsprozesse ethische und moralische Standards eingehalten?	Wie sehr werden während der Entscheidungsprozesse ethische und moralische Standards eingehalten?

	Distributive Justice	
	Die folgenden Fragen beziehen sich auf Ihre Prüfungsleistungen:	*Die folgenden Fragen beziehen sich auf Ihre Prüfungsleistungen:*
08	Wie sehr spiegeln Ihre Noten den Aufwand wider, den Sie geleistet haben?	Wie sehr spiegeln Ihre Noten den Aufwand wider, den Sie geleistet haben?
09	Wie sehr sind Ihre Noten angemessen für die Arbeit, die Sie geleistet haben?	Wie sehr sind Ihre Noten angemessen für die Arbeit, die Sie geleistet haben?
10	Wie sehr spiegeln Ihre Noten den Beitrag wider, den Sie für Ihr Studium geleistet haben?	Wie sehr spiegeln Ihre Noten den Beitrag wider, den Sie für Ihr Studium geleistet haben?
11	Wie sehr sind Ihre Noten in Anbetracht Ihrer Leistung gerechtfertigt?	Wie sehr sind Ihre Noten in Anbetracht Ihrer Leistung gerechtfertigt?
	Die folgenden Fragen beziehen sich auf die Personen in Lehre, Prüfungswesen und Verwaltung, mit denen Sie im Rahmen Ihres derzeitigen Studiums zu tun haben:	*Die folgenden Fragen beziehen sich auf die Personen in **der allgemeinen Studienorganisation, z.B. Lehrende, Prüfer/innen und Verwaltungsangestellte**, mit denen Sie im Rahmen Ihres derzeitigen Studiums zu tun haben:*
	Interpersonal Justice	
12	Wie sehr werden Sie von diesen Personen höflich behandelt?	Wie sehr werden Sie von diesen Personen höflich behandelt?
13	Wie sehr werden Sie von diesen Personen mit Würde behandelt?	Wie sehr werden Sie von diesen Personen mit Würde behandelt?
14	Wie sehr werden Sie von diesen Personen mit Respekt behandelt?	Wie sehr werden Sie von diesen Personen mit Respekt behandelt?
15	Wie sehr werden von diesen Personen unangemessene Bemerkungen und Kommentare gemacht? [rekodiert]	Wie sehr werden von diesen Personen unangemessene Bemerkungen und Kommentare gemacht? [rekodiert]
	Informational Justice	
16	Wie sehr verhalten sich diese Personen in Auskünften offen und ehrlich?	Wie sehr verhalten sich diese Personen in Auskünften offen und ehrlich?
17	Wie sehr werden Ihnen von diesen Personen Vorgänge und deren Anforderungen zu Beginn gründlich erklärt?	Wie sehr werden Ihnen von diesen Personen Vorgänge und deren Anforderungen zu Beginn gründlich erklärt?
18	Wie sehr sind Ihnen diese Erklärungen zu den Vorgängen und deren Anforderungen nachvollziehbar?	Wie sehr sind Ihnen diese Erklärungen zu den Vorgängen und deren Anforderungen nachvollziehbar?
19	Wie sehr werden Ihnen von diesen Personen Einzelheiten rechtzeitig mitgeteilt?	Wie sehr werden Ihnen von diesen Personen Einzelheiten rechtzeitig mitgeteilt?
20	Wie sehr werden von diesen Personen Erklärungen auf Ihre persönlichen Bedürfnisse zugeschnitten?	Wie sehr werden von diesen Personen Erklärungen auf Ihre persönlichen Bedürfnisse zugeschnitten?

Note. [a]Please note that differences in wording between the two versions are accentuated in bold script in Version 2.

UNIVERSITÄT HEIDELBERG
ZUKUNFT SEIT 1386

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der Ruprecht-Karls-Universität Heidelberg
Doctoral Committee of the Faculty of Behavioural and Cultural Studies, of Heidelberg University

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