Sex differences in secondary school achievement – The contribution of self-perceived abilities and fear of failure

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ARTICLE INFO

ABSTRACT

While previous studies demonstrated the existence of a 'gender gap', according to which girls outperform boys in their scholastic achievement, the reason for these differences is yet unclear. We used structural equation analyses and multiple-group comparisons to determine sex-specific influences of self-reported motivational variables (domain-specific self-perceived abilities, fear of failure) on teacher-reported mid-term school grades of 140 boys ($M_{age} = 10.9$) and 185 girls ($M_{age} = 10.8$) from Germany. Our results suggest that the gender gap derives at least partly from sex differences in the contribution of these motivational variables to children's performance in school: Regarding German, girls' level of self-perceived abilities was higher and also more relevant for their performance. Moreover, higher levels of fear of failure led to worse Math grades only for girls, suggesting the presence of gender-stereotypic beliefs. Further research should investigate the impact of additional constructs, e.g., gender-stereotype awareness, self-regulation.

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1. Introduction

Being successful in school is considered to be a critical prerequisite for later academic success and more generally for the pursuit of successful life paths (Jimerson, Egeland, & Teo, 1999). Thus, inequalities regarding educational achievement are of central concern. With respect to gender differences, the underachievement of girls in educational settings and its antecedents were the center of discussion for years, both in research as well as in society. This gender gap has shifted throughout the past decades (Freudenthaler, Spinath, & Neubauer, 2008): Two meta-analyses found only negligible gender differences in the results of standardized Math tests (Else-Quest, Hyde, & Linn, 2010; Hyde, Fennema, & Lamon, 1990) and various studies now consistently show that girls outperform boys in language based subjects (Deary, Strand, Smith, & Fernandes, 2007; Marsh & Yeung, 1998; Spinath, Freudenthaler, & Neubauer, 2010; for an overview on German samples see Hannover & Kessels, 2011). A similar pattern emerged when grades

were considered as the achievement criterion: "When differences are found, they almost always favor girls" (Kimball, 1989, p. 199, see also Kuhl & Hannover, 2012; Marsh & Yeung, 1998; Spinath et al., 2010; Weis, Heikamp, & Trommsdorff, 2013). There is still no generally accepted idea, which individual characteristics potentially account for this gender gap. However, variables might be of relevance, for which both sex differences in mean levels and significant associations with school achievement have been reported (Spinath, Spinath, & Plomin, 2008). Furthermore, the relative importance of these predictor variables for boys' and girls' school achievement has been considered to give first insights into the understanding of the gender gap (Freudenthaler et al., 2008). Children's motivational characteristics such as domain-specific self-perceived abilities (SPAs; potentially enhancing performance) as well as fear of failure (FOF; potentially debilitating performance) are promising candidates for such analyses, given their well demonstrated predictive value for school achievement over and above general cognitive ability (g; Spinath, Spinath, Harlaar, & Plomin, 2006; Steinmayr & Spinath, 2009). However, studies on the prediction of school achievement have often neglected the role of gender. Hence, the purpose of our study was to investigate how domain-specific SPAs and FOF contribute to sex differences in school grades beyond g. In this context, children who have recently completed the transition from elementary to secondary school are

of particular interest, because motivational components undergo crucial adjustments at this developmental stage (see Eccles & Midgley, 1989; for a review).

1.1. Predictors of school achievement

Although measures of g typically correlate with later educational achievement at approximately .50 (e.g., Gustafsson & Undheim, 1996), it is also apparent that a large proportion of the variance in achievement criteria remains unexplained. As a consequence, the contribution of other potentially relevant predictor variables has been discussed, such as the students' SPAs or their FOF. Nevertheless, the consideration of g in studies on school success is necessary to obtain a valid estimation of common and specific contributions of the studied concepts as well as their incremental validity.

SPAs, often also referred to as academic self-concept, are defined as the "individual's perception of his or her current competence at a given activity" (Wigfield & Eccles, 2000, p. 70) and are embedded in a hierarchical and multidimensional self-concept structure (Brunner et al., 2010; Marsh, Byrne, & Shavelson, 1988). This academic facet of a global self-concept is assumed to be domain-specific (i.e., distinguishable for different school subjects; Brunner et al., 2010) and is typically assessed by asking children how good they think they are in a specific domain (Gottschling, Spengler, Spinath, & Spinath, 2012). Various studies have confirmed the relevance of individuals' SPAs for the prediction of school achievement (e.g., Marsh & Yeung, 1998; Spinath et al., 2006; Spinath et al., 2008). A meta-analysis by Hansford and Hattie (1982) reported an average correlation of .21 between self-ratings and performance measures. A more recent meta-analysis by Valentine, DuBois, and Cooper (2004), focusing on longitudinal studies, found an average standardized path/regression coefficient of .08 for self-beliefs as predictors for later academic performance, when prior achievement was controlled. Larger effects were found when the domain of self-beliefs and achievement measures under consideration were equivalent (see also Spinath et al., 2006). Moreover, SPAs incrementally predicted school achievement over and above general intelligence (Spinath et al., 2006; Spinath et al., 2008), although SPAs and g were associated (Spinath et al., 2006). Weber, Lu, Shi, and Spinath (2013) even found a domain-specific motivational factor to be a more powerful predictor than cognitive variables.

FOF is described as a general, affectively based, higher order motivational tendency (Elliot, 1999; Elliot & McGregor, 1999), which also selects and directs achievement activity, but is oriented toward avoidance of failure (Elliot, 1999; Elliot & McGregor, 1999; McClelland, 1953; McClelland, Koestner, & Weinberger, 1989). Failure as a performance-outcome is avoided because it triggers feelings of shame and embarrassment (Atkinson, 1964). Individuals scoring high on FOF tend to overgeneralize the specific failure to the global self (McGregor & Elliot, 2005). Thus, achievement situations not only serve as opportunities to learn, but can have a threatening effect for the individual as well (McGregor & Elliot, 2005). Accordingly, it has been shown that FOF is both negatively correlated with academic success (Herman, 1990) and a valid predictor of general and math-specific school performance of 12th graders over and above intelligence (Steinmayr & Spinath, 2009).

1.2. Sex differences

Perhaps the most frequently used approach to understand the gender gap in educational contexts is the investigation of mean differences in the potential predictor variables of school performance. With respect to g, previous studies did not find mean differences between girls and boys (Deary et al., 2007; Spinath et al., 2008). Nevertheless, differences can be observed in subscales, with girls exceeding boys in verbal abilities (Deary et al., 2007), only few differences in quantitative abilities (rather favoring boys, Halpern, 2012), and — depending on the participants' age — either no differences or an advantage for boys in figural reasoning tasks (Lynn & Irwing, 2004). Reviewing the findings on gender differences concerning SPAs, a differentiation between a global and a domain-specific operationalization is crucial, because gender differences may not emerge when a total score is computed. This is due to counterbalancing gender effects in subcomponents of self-concept (Wylie, 1979). Accordingly, a meta-analysis by Wilgenbusch and Merrell (1999) found gender differences in domain-specific self-concept variables, which were in line with gender-stereotypes (see also Marsh, 1989; Wigfield et al., 1997): Girls showed higher verbal self-concepts (mean $d = -0.23$), whereas boys scored higher on measures of Math-related self-concepts (mean $d = 0.28$). Moreover, a higher Math self-concept of boys was observed, even though they had obtained worse Math grades than girls (Marsh & Yeung, 1998). Concerning FOF, females tend to experience higher levels of FOF than males (McGregor & Elliot, 2005).

However, in order to determine the mechanisms leading to the gender gap in school achievement, detecting mean differences in predictor variables alone is not sufficient. Moreover, it needs to be investigated how the relations between potential predictors and the criterion vary as a function of gender. Only a few studies have addressed this question so far, using different methodological approaches, partly leading to mixed results, and thus leaving this issue unresolved. With respect to g, no gender differences have been observed in its predictive value (Freudenthaler et al., 2008; Steinmayr & Spinath, 2008), suggesting that g is most likely not responsible for gender differences in scholastic achievement. However, since it is an important predictor of school performance, g should be included in any analyses on sex-specific school achievement in order to determine the impact of other predictor variables over and above g. Concerning SPAs, the literature does not show a consistent pattern of results. Two meta-analyses failed to identify gender as a moderator of the relationship between self-ratings and school achievement (Hansford & Hattie, 1982; Valentine et al., 2004). Marsh and Yeung (1998) found similar path coefficients from prior domain-specific self-concept to subsequent Math and English outcome variables for both sexes. In contrast, Watt (2005) found that the path from previous Math-related self-perceptions to subsequent results in a standardized Math-achievement test reached statistical significance only in the male subgroup. Whereas Steinmayr and Spinath (2008) found FOF to be a significant predictor of girls' Math grade only, their results also suggested that the level of FOF was irrelevant for the German grade of both sexes.

1.3. Aim of the present study

The central aim of our study is to further contribute to a more thorough understanding of the processes leading to sex differences in scholastic achievement. We therefore combined different analytic approaches. First, mean differences in the predictor (g, domain-specific SPAs, and FOF) and criterion variables (grades in Math and German) were analyzed. Second, controlling for the influence of g, the incremental contribution of domain-specific SPAs and FOF to school grades were estimated using structural equation modeling (SEM). Third, the role of gender in this complex interplay between predictor and criterion variables was examined by means of multiple-group comparisons. To our knowledge, no study exists