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Social and dimensional comparison effects on math and reading self-concepts of elementary school children

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ABSTRACT

The big-fish-little-pond model (BFLP) and the internal/external (I/E) frame of reference model highlight the great influence of social and dimensional comparison effects on academic self-concepts (ASCs). In the present study of 291 elementary school children in Grade 2, both models were tested in a unifying framework based on math and reading self-concepts and achievements. The aim was to test the BFLP model, the I/E model, and the revisited I/E model integrating both the predictions of the BFLP model and the I/E model. Results showed significantly positive within-domain achievement-self-concept relations, but no significantly negative cross-domain achievement-self-concept relations. Moreover, there were higher relations between individual achievements than between ASCs, while no support was found for positive compensatory effects of class-average achievements on ASCs. The within and cross-domain effects were generally smaller than the ones reported for older students. This research indicates that social and dimensional comparison effects on ASCs are of less importance in second graders.

1. Introduction

Research on students' academic self-concept (ASC) – defined as self-perceptions of one's academic abilities (Shavelson, Hubner, & Stanton, 1976) – has been a very popular research subject in educational psychology. For instance, numerous studies have examined the moderators (i.e., Cheng, McInerney, & Mok, 2014; Marsh, 2016; Roy, Guay, & Valois, 2015; Weidinger, Spinath, & Steinmayr, 2016; Wouters, Colpin, Van Damme, & Verschueren, 2015) and mediators of students' ASCs (i.e. Nagengast & Marsh, 2012; Tornare, Czajkowski, & Pons, 2015). Most studies have, in particular, focused on the big-fish-little-pond model (BFLP model; Marsh, 1984) and the internal/external frame of reference model (I/E model; Marsh, 1986; Möller & Marsh, 2013) highlighting the crucial role of social and dimensional comparison effects on students' ASCs. However, although extant studies have cross-culturally supported these two models with samples of secondary school students (i.e, Jansen, Scherer, & Schroeders, 2015; Parker, Marsh, Morin, Seaton, & Van Zanden, 2015), little research has yet been conducted on the BFLP model and the I/E model with younger age groups such as elementary school children (i.e., Ehm, Lindberg, & Hasselhorn, 2014; Marsh et al., 2015; Pinxten et al., 2015). This is unfortunate as elementary school age might be the most important period in the formation of children's ASCs (Harter, 2012; Hellmich & Günther, 2011). Also, very few studies have addressed a unified model combining the predictions of the BFLP model and the I/E model: the revisited I/E model (Pinxten et al., 2015). Thus, the present study aims to enhance prior research by (1) focusing on a rather neglected age group, that is elementary school children in Grade 2 from Germany, and (2) testing the BFLP model, the I/E model, and the revisited I/E model simultaneously in one empirical study. A central purpose of this study is, respectively, to reveal whether social and dimensional comparison effects distinguish from those reported for older students (see the meta-analysis of Möller, Pohlmann, Köller, & Marsh, 2009). In addition, (3) another objective is to examine the effects of social and dimensional comparisons on math and reading self-concepts directly to gain more knowledge about the significance of these two comparison effects for younger children's ASCs.

1.1. Theoretical and empirical framework

1.1.1. BFLP model in elementary school children

The BFLP model suggested by Marsh (1986) posits that students' ASCs are mainly influenced by social comparisons, that is, students comparing their academic achievement with that of their classmates. For instance, in a class where students' achievement levels are high, students are more likely to show a lower ASC than in a class where students' achievement levels are poor. However, according to extant literature, the effects of class- or school-average achievement (hereinafter BFLPE) on students' ASCs are often negative when controlling for their individual achievement (i.e., Marsh, Kuyper, Morin, Parker, & Seaton,

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2014b; Marsh et al., 2015; Roy et al., 2015; Szumski & Karwowski, 2015; Wouters et al., 2015). A substantial body of studies has cross-culturally confirmed the robustness of the BFLPE in various academic domains (i.e., Dijkstra, Kuyper, van der Werf, Buunk, & van der Zee, 2008; Trautwein, Gerlach, & Lüdtke, 2008), even in younger age groups such as elementary school children (i.e., Arens & Watermann, 2015; Roy et al., 2015; Szumski & Karwowski, 2015; Wouters et al., 2015). For instance, using a series of three studies, Szumski and Karwowksi (2015) investigated the moderators of the BFLPE among ten-year-old students with and without intellectual disability in Poland. Results provided support for the BFLPE and its moderation by emotional and social integration as the BFLPE was stronger in students who were highly socially integrated with peers, but poorly emotionally integrated into school. In addition, many studies have examined the BFLPE just before transition to secondary school, respectively (i.e., Arens & Watermann, 2015; Arens, Yeung, Craven, Watermann, & Hasselhorn, 2013; Becker & Neumann, 2016; Gniewosz, Eccles, & Noack, 2012; Trautwein & Baeriswyl, 2007). For instance, Arens and Watermann (2015) tested the BFLPE with early-academic-track students and compared its psychosocial consequences with students who stayed at elementary school. Results provided evidence of the BFLPE at the transition into an academic track, while there were no differences in ASCs of students who remained at elementary school. Similarly, drawing on a sample of fourth graders who transitioned from elementary school to secondary school, Becker and Neumann (2016) found that the BFLPE existed in both elementary school and secondary school contexts. However, the BFLPE from elementary school successively decreased and diminished after one year. Thus, given the robustness of the BFLPE in previous research, it can be assumed that the BFLPE will also appear with younger age groups such as elementary school children in Grade 2 who are focused in the present study. However, due to younger children's lower cognitive level and less differentiated ASCs (Harter, 2012), it can also be suggested that the size of the BFLPE will be smaller than in older students. An explanation of this suggestion is that ASCs of younger children are usually highly positive and are still not highly correlated with external factors such as academic achievement (Harter, 2012; Marsh et al., 2015). By contrast, with more life experience, children know their strengths and weaknesses much better leading to more realistic ASCs and higher correlations with academic achievement. For instance, Marsh, Craven, and Debus (1998) found a higher reliability, and a more consistent factor structure of self-concept scales with increasing age (children 5–8 years of age) as well as higher correlations of self-ratings in older students with inferred self-concept ratings of teachers. Similar developmental perspectives have also been stated in earlier studies (Chapman & Tunmer, 1995; Harter, 1999; Marsh, 1989; Marsh & Ayotte, 2003; Marsh et al., 2015; Wigfield & Eccles, 1992).

1.1.2. I/E model in elementary school children

The I/E model developed by Marsh (1986) assumes that the relations between academic achievement and ASCs depend on two comparison processes: (1) The social (external) comparison reference process refers to social comparisons, that is, students comparing their academic achievement with that of their classmates in a specific domain. For instance, when students compare their lower math achievement with the higher math achievement levels of their classmates, they are likely to show a more negative math self-concept. By contrast, (2) the dimensional (internal) comparison reference process relates to students who compare their own academic achievement across domains. Due to these contrasting effects, math achievement, for instance, has a negative influence on verbal self-concept, while verbal achievement negatively affects math self-concept. As a result, math and verbal achievement are highly correlated, while ASCs are not or only weakly interrelated. Numerous studies have provided support for the assumptions of the I/E model (Chiu, 2012; Marsh et al., 2014c; Marsh et al., 2015; Möller, Zimmermann, & Köller, 2014). A considerable work on testing the generalizability of the I/E model is, in particular, the meta-analysis conducted by Möller et al. (2009). Using 69 datasets with 125,308 students, results showed that the relations posited by the I/E model did not differ across measures, gender, ages or countries even if the size of the relations among the I/E variables varied from study to study. A shortcoming of this study is, however, the underrepresentation of younger children (only 3 of 69 samples of children in Grade 4 or younger), and thus the developmental generalizability of the I/E model's predictions. Using stronger statistical models and more appropriate tests, Marsh et al. (2015) tested the I/E model with fourth and eighth graders based on data of the Trends in International Mathematics and Science Study (TIMSS). By systematically comparing the results from nationally representative samples of elementary and secondary school students across countries, they found stronger achievement-self-concept relations for eighth graders than fourth graders (more positive within relations and more negative cross-domain relations). However, these developmental differences varied across countries.

According to earlier studies (i.e., Harter, 2012; Wigfield & Eccles, 1992; Wigfield et al., 1997), younger children usually have an overestimated ASC which is not strongly related to academic achievement. As a consequence, studies on testing the I/E model with elementary school children (i.e., Ehm et al., 2014; Möller, Kuska, & Zaunbauer, 2011b; Pinxten et al., 2015) are inconsistent in terms of the size of the achievement-self-concept relations across different grade levels. For instance, using a sample of 1114 German children from Grade 1 to Grade 3, Ehm et al. (2014) tested the I/E model's predictions in the three domains of math, reading, and writing. In the reading domain, the within achievement-self-concept relations varied from 0.27 (Grade 1), 0.41 (Grade 2) to 0.49 (Grade 3), in the writing domain from 0.17 (Grade 1), 0.29 (Grade 2) to 0.45 (Grade 3), and in the math domain from 0.30 (Grade 1), 0.50 (Grade 2) to 0.58 (Grade 3). Conversely, cross-domain achievement-self-concept relations were mixed: Only math achievement showed a significantly negative effect on reading self-concept in Grade 3 ($\beta = -0.18$, $p < 0.01$), but not in Grade 1 ($\beta = -0.04$) or in Grade 2 ($\beta = -0.09$). Further, math achievement did not significantly negatively affect writing self-concept in all three grade levels ($\beta = -0.08/-0.05/-0.08$). Similarly, reading achievement had a significantly negative effect on math self-concept in Grade 3 ($\beta = -0.17$, $p < 0.05$), but not in Grade 1 ($\beta = -0.05$) or in Grade 2 ($\beta = -0.09$), and there were no significantly positive effects of reading achievement on writing self-concept in all three grade levels ($\beta = 0.03/0.04/0.07$). Moreover, in all three grade levels, writing achievement significantly positively influenced reading self-concept ($\beta = 0.16/0.24/0.27$, $p < 0.01$), while writing achievement showed no effect on math self-concept ($\beta = -0.06/-0.05/-0.01$). In support of the I/E model's predictions, the cross-domain achievement relations were mainly higher than the cross-domain self-concept relations, especially in the math and reading domain (achievements: $\beta = 0.45/0.40/0.40$ vs. self-concepts: $\beta = 0.30/0.18/0.15$) as well as math and writing domain (achievements: $\beta = 0.51/0.44/0.40$ vs. self-concepts: $\beta = 0.36/0.36/0.33$). However, in the reading and writing domain, the cross-domain relations were significantly positive in all three grade levels (achievements: $\beta = 0.55/0.59/0.63$ vs. self-concepts: $\beta = 0.57/0.44/0.33$). Thus, consistent with earlier studies (i.e., Harter, 1999; Wigfield & Eccles, 1992), the results reported by Ehm et al. (2014) suggests that children's ASCs are more highly related to academic achievement with increasing age. As a result, for the present study on second graders, it can be assumed that the achievement-self-concept relations are weaker than the ones reported for older children in Grade 3 or Grade 4 who were examined by Ehm et al. (2014).

No fully empirical support for the I/E model's predictions with elementary school children was also found by Möller et al. (2011b) using a sample of 515 elementary children in Grade 3. While there were significantly positive effects of math and German grades on ASCs of corresponding domains (math domain: $r = 0.44$, verbal domain: $r = 0.42$) and more positive cross-domain relations between achievements ($r = 0.45$, $p < 0.01$) than between ASCs ($r = 0.24$, $p < 0.01$), the cross-