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Accuracy and bias in Spanish secondary school students' self-concept of math ability: The influence of gender and parental educational level

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ABSTRACT

The present two-wave longitudinal study investigated the accuracy or bias in students' math self-concept of ability during the transition to high school from the last year of secondary compulsory education (10th grade). The role of students' gender and parents' educational level in predicting the accuracy or bias in math ability self-concepts was also investigated. 424 Spanish students participated. The results analyzed with the person-oriented I-States as Objects Analysis (ISOA) showed four groups of students: high-accurate, low-accurate, optimistic, and pessimistic. Males more likely belonged to the high-accurate or optimistic self-concept math ability group. In addition, students whose parents had a high level of education more likely belonged to the low-accurate or pessimistic self-concept of math ability group.

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1. Introduction

Positive self-concept of ability in different domains is a widely valued educational goal (Marsh, Trautwein, Lüdtke, Köller, & Baumert, 2005) owing to its positive impact on academic learning and achievement. Together with actual performance in different domains, during adolescence domain-specific self-concepts play a major role in educational decisions (Eccles, 2007; Pajares & Schunk, 2005; Simpkins, Davis-Kean, & Eccles, 2006; Wigfield & Eccles, 2000) and in determining students' future aspirations (Eccles, 2007; Simpkins, Davis-Kean, & Eccles, 2006; Wigfield & Eccles, 2002). However, some studies have showed that positive self-concept alone is not necessarily beneficial for one's future achievement and outcomes. Instead, a realistic and accurate self-concept helps students to better understand their own skill levels, making learning more meaningful (Dunning, Heath, & Suls, 2004). Likewise, accurate self-concept promotes self-regulated learning which further affects achievement outcomes, goal accomplishments, and domain-related choices (Fredricks & Eccles, 2002). Inaccurate beliefs about one's abilities, in turn, easily lead students to wrong-headed academic decisions and to subsequent low performance (Eccles, 2007; López-Sáez, Puertas, & Sáinz, 2011). This may further imply a decrease in students' academic motivation and career aspirations (Bong & Skaalvik, 2003; Pajares & Miller, 1994). However, regardless the importance of realistic self-concept on one's outcomes and academic/vocational choices, little is known about the accuracy of or bias in students' self-concepts of ability during the time when students are required to make

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future academic/vocational choices while facing the transition to secondary education. Moreover, research on the stability and changes in students' self-concept of ability during educational transitions is scarce. Consequently, the present two-wave longitudinal study investigated the accuracy of and bias in students' self-concept of math ability before and after the transition to high school. In addition, the role of student- (e.g., gender) and parent-related (e.g., level of education) antecedents in predicting the accuracy of, and bias in, students' math ability self-concepts was examined.

1.1. Self-concept of ability

Several terms (such as confidence, ability perceptions, and competence beliefs) have been used in the literature to make reference to ability self-concepts (Wigfield & Eccles, 2000). According to the expectancy value theory of achievement motivation (Wigfield & Eccles, 2002), self-concepts of ability refer to individuals' evaluations of their competencies in different domains and the feelings of self-worth that accompany competence beliefs (Pajares & Schunk, 2005). Students usually base their competence evaluations on their past performance or knowledge (Cole et al., 2001; Dweck & Molden, 2007; Jacobs, Osgood, Eccles, & Wigfield, 2002), on comparisons between their own and other students' capacities (Bong & Skaalvik, 2003; Bouffard, Markovits, Vezeau, Boisvert, & Dumas, 1998), and on evaluative feedback from parents (Rytkönen, Aunola, & Nurmi, 2007) and teachers (Upadyaya & Eccles, 2014). Variation exists in students' ability self-concepts in different domains, which together form broader academic self-concept of abilities (Elliot & Dweck, 2007).

Several studies have shown that changes occur in students' ability self-concepts over the school years. At the beginning of primary school children's self-concept of ability in different domains is typically overly positive, however, when students move into the higher grades their self-concept of ability in different domains begins to decrease and becomes sometimes even negative (Bouffard, Vezeau, Roy, & Lengelé, 2011; Jacobs et al., 2002). These changes are partly normative and partly reflect the fact that students' ability self-concepts become more realistic as they grow up (Bouffard et al., 1998). Changes also occur in students' ability self-concepts during various educational transitions (Cole et al., 2001) which are typically reflected as declines in students' self-concepts of ability (Jacobs et al., 2002). According to the stage-environment fit (Eccles et al., 1993) negative changes in students' ability self-concepts reflect the poor fit between the individual (e.g., student) and context (e.g., school). Lesser personalized instruction, increased ability groupings, stronger teacher authority, and lower levels of student autonomy (Eccles et al., 1993), together with perceptions of increased academic pressures (Pajares & Schunk, 2005) often follow the transition to secondary education and contribute to these declines in students' ability self-concepts.

Previous research has also shown that self-concept of ability in different domains is typically associated with performance in the same domain. Students often feel more competent in academic areas in which they achieve well (Wigfield & Eccles, 2002). Academic achievement is normally measured by grades and test scores which act as indicators of competence and provide both an internal (e.g., the same student thinks that he/she is better at reading than at math) and an external frame of reference (e.g., social comparison) for students (Marsh & Hau, 2004). Similarly, research on reciprocal effects has shown that prior self-concept predicts subsequent academic achievement (Marsh & Hau, 2005).

1.2. Accuracy or bias in students' self-concept of math ability: correlates and consequences

Although a large number of research exists on students' self-concept of ability in different domains, few studies have examined the accuracy or bias in students' ability self-concepts (Bouffard et al., 1998; Rytkönen et al., 2007). More concretely, there is a lack of research examining the accuracy and bias in students' ability self-concepts across the transition from compulsory secondary education to non-compulsory secondary school (high school).[1] The accuracy in student's self-concepts refers to the extent to which the students' ability self-concept is realistic. That is, the extent to which students' ability self-concept corresponds to their actual level of performance (Bouffard et al., 1998; Rytkönen et al., 2007; Sheldrake, Mujtaba, & Reiss; 2014). Bias in students' self-concept of ability can be positive (e.g., self-concept is higher than actual performance, overestimation) or negative (e.g., self-concept is lower than actual performance, underestimation). Accurate self-concept of ability can serve as a self-regulatory component, which directly affects achievement outcomes, goal accomplishments, and domain-related choices (Fredricks & Eccles, 2002), whereas inaccurate self-concept of ability may lead students to wrong-headed academic decisions and to subsequent low performance (Eccles, 2007; López-Sáez, Puertas, & Sáinz, 2011). Previous studies have revealed that self-concept of math ability does not always reflect the students' actual grades or performance in math (Fredricks & Eccles, 2002; Frome & Eccles, 1998). For example, students with learning difficulties or low performance tend to have an overly optimistic view of their abilities in math and other domains (Dunning, Heath, & Suls, 2004; Kruger & Dunning, 1999).

Other empirical research suggests that the more realistic ability self-concepts students hold in different domains, the more realistic and adaptive study-related choices they will make in the future (Baumeister, Campbell, Krueger, & Vohs,

[1] In the current Spanish educational system, secondary school consists of two academic stages: compulsory and post compulsory. The compulsory one comprises grades from 7 to 10. The post compulsory stage is divided into high school and higher vocational training. High school (*Bachillerato*) targets university bound students and includes grades 11 and 12, where students have already chosen 1 out of the 3 academic tracks: science and technology; humanities and social sciences; and arts. The higher vocational training track also covers 2 years and, once completed, students can either enter the labor market or continue university studies.

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