



International note: Are Emirati parents' attitudes toward mathematics linked to their adolescent children's attitudes toward mathematics and mathematics achievement?



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ABSTRACT

Drawing on data from the 2012 Program for International Student Assessment (PISA) and employing multilevel modeling as an analytic strategy, this study examined the relations of adolescent children's perceptions of their parents' attitudes towards mathematics to their own attitudes towards mathematics and mathematics achievement among a sample of 5116 adolescents from 384 schools in the United Arab Emirates. The results of this cross-sectional study revealed that adolescents who perceived that their parents liked mathematics and considered mathematics was important for their children not only to study but also for their career tended to report higher levels of intrinsic and instrumental motivation to learn mathematics, mathematics self-concept and self-efficacy, and mathematics work ethic. Moreover, adolescents who perceived that their parents liked mathematics and considered mathematics was important for their children's career tended to report positive intentions and behaviors toward mathematics. However, adolescents who perceived that their parents considered mathematics was important for their children's career tended to report higher levels of mathematics anxiety. Finally, adolescents who perceived that their parents considered mathematics was important for their children to study performed significantly better on the mathematics assessment than did their peers whose parents disregarded the importance of learning mathematics.

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There is mounting evidence that parents' attitudes and beliefs about education may play a key role in the education of their children (see Hoover-Dempsey, Ice, & Whitaker, 2009; Hoover-Dempsey & Sandler, 1997; Hoover-Dempsey et al., 2005; Jeynes, 2011; Mansour & Martin, 2009; Pomerantz, Moorman, & Litwack, 2007). Specifically, the hitherto research findings from Western cultures, such as North America and Australia, suggest that children whose parents hold positive attitudes and beliefs toward education tend to demonstrate positive attitudes and beliefs about education as well (e.g., Mansour & Martin, 2009), and they tend to perform relatively well on achievement tests (e.g., Jeynes, 2011).

However, there is growing consensus among researchers that attitudes and beliefs toward education may vary among parents hailing from different geographic regions, SES backgrounds, and cultural groups (see Lansford & Bornstein, 2011).

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Such variations may, in turn, be linked to variations in the parent-child attitude and belief dynamics. The present study, therefore, aimed at examining the relations of adolescent children's perceptions of their parents' attitudes towards mathematics with their own attitudes towards mathematics and mathematics achievement in a wealthy West Asian country, the United Arab Emirates. Such an investigation may provide an alternative perspective to the aforementioned North American and Australian research on the links between parents' and their children's attitudes and beliefs toward education.

Method

Data for the study were drawn from the fifth cycle of the Program for International Student Assessment (PISA; <http://pisa2012.acer.edu.au>). The United Arab Emirates has been participating in the PISA assessments since 2009. A total of 5116 Emirati adolescents from 384 schools took part in PISA 2012 (Mean age = 15.33 years; $SD = 0.28$).

The outcome measures in the present study were intrinsic motivation to learn mathematics (4 items; e.g., "I do mathematics because I enjoy it"; Cronbach's $\alpha = .86$), instrumental motivation to learn mathematics (4 items; e.g., "I will learn many things in mathematics that will help me get a job"; Cronbach's $\alpha = .87$), mathematics self-efficacy (8 items; e.g., "Confidence in understanding graphs presented in newspapers"; Cronbach's $\alpha = .83$), mathematics self-concept (5 items; e.g., "I am just not good at mathematics"; Cronbach's $\alpha = .80$), mathematics anxiety (5 items; e.g., "I get very nervous doing mathematics problems"; Cronbach's $\alpha = .77$), mathematics work ethic (9 items; e.g., "I keep my mathematics work well organized"; Cronbach's $\alpha = .90$), mathematics intentions (5 items; e.g., "I am planning on pursuing a career that involves a lot of mathematics"; Cronbach's $\alpha = .62$), mathematics behavior (8 items; e.g., "I take part in mathematics competitions"; Cronbach's $\alpha = .84$), and mathematics achievement (i.e., the overall PISA mathematics literacy scale; Cronbach's $\alpha = .92$). The OECD constructed these measures using item response theory scaling techniques (see OECD, 2014).

The predictor variables included three items from the PISA 2012 student questionnaire ("My parents believe it's important for me to study mathematics"; "My parents believe that mathematics is important for my career"; and "My parents like mathematics"). These three items constituted adolescent children's perceptions of their parents' attitudes toward mathematics. The student-level control variables were gender (0 = male, 1 = female) and the PISA index of economic, social, and cultural status (ESCS; an index of SES derived from parental occupation, parental education, and home possessions; see OECD, 2014). The school-level control variables were school type (0 = Private, 1 = Public), school location (0 = urban, 1 = rural), and school mean ESCS.

Results and discussion

To address the purpose of the study, multilevel regression analyses were conducted (see Table 1). The results of the multilevel regression analyses suggested that adolescents who perceived that their parents liked mathematics and considered mathematics was important for their children not only to study but also for their career tended to report statistically significantly higher levels of intrinsic motivation to learn mathematics ($B = 0.39, p < .001$; $B = 0.23, p < .001$; $B = 0.16, p < .001$, respectively), instrumental motivation to learn mathematics ($B = 0.22, p < .001$; $B = 0.24, p < .001$; $B = 0.46, p < .001$), mathematics self-efficacy ($B = 0.32, p < .001$; $B = 0.18, p < .001$; $B = 0.15, p < .001$), mathematics self-concept ($B = 0.34, p < .001$; $B = 0.20, p < .001$; $B = 0.11, p < .001$), and mathematics work ethic ($B = 0.32, p < .001$; $B = 0.33, p < .001$; $B = 0.17, p < .001$). Previous research, conducted predominantly in Western cultures, have documented similar positive relationships between parents' attitudes and beliefs towards education and their children's dispositions towards education (e.g., Bandura, Barbaranelli, Caprara, & Pastorelli, 2001; Mansour & Martin, 2009).

Furthermore, adolescents who perceived that their parents liked mathematics and considered mathematics was important for their children's career tended to report statistically significantly higher intentions ($B = 0.11, p < .001$; $B = 0.13, p < .001$, respectively) and behaviors ($B = 0.29, p < .001$; $B = 0.22, p < .001$) related to mathematics. Nevertheless, adolescents who perceived that their parents considered mathematics was important for their children's career tended to report statistically significantly higher levels of mathematics anxiety ($B = 0.07, p < .05$). This finding is in congruence with the results of prior Western research, which demonstrated that how parents communicate educational as well as career expectations and aspirations for their children might be associated with their children's academic anxiety (see von der Embse, Barterian, & Segool, 2013).

Finally, consistent with the findings of previous studies in Western countries (e.g., Areepattamannil, 2010; Areepattamannil & Lee, 2014; Jeynes, 2011), adolescents who perceived that their parents considered mathematics was important for their children to study performed statistically significantly better on the mathematics assessment than did their peers whose parents disregarded the importance of learning mathematics ($B = 0.10, p < .001$).

In conclusion, although there is growing evidence that parental attitudes and beliefs toward education may differ by SES, country, and culture, the findings of the present study provide empirical support that the direction of relationship between Emirati parents' attitudes and beliefs about mathematics and their adolescents children's mathematics achievement and dispositions toward mathematics is very similar to the one found in the Western cultures. However, the current study did not include several pertinent family-related confounding factors in the multilevel regression models, other than the family SES. Hence, the results of the study should be interpreted with caution. Nevertheless, future research examining the science and practice of Emirati parenting is warranted to better understand why such a

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