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Characteristics of the home context for the nurturing of gifted children in Saudi Arabia

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This study investigates factors in the home environment and their influence on children's analytical, creative, and practical skills. A sample of 294 gifted children (195 male) was recruited from grades 4–7 in Saudi Arabia, where the family context is highly influenced by the principles of Islam. Results did not confirm the effect of birth order, but showed that (1) mother's education was an important factor for gifted children's creativity; (2) the number of boys in the family was negatively associated with gifted boys' creativity ($r = -.21$); and (3) Quran-related learning experiences were positively related to gifted girls' analytical ($r = .46$) and creative ($r = .42$) skills. Implications for understanding non-Western environments for gifted children are discussed.

Keywords: intelligence; giftedness; creativity; practical skills; home environment; the Kingdom of Saudi Arabia

Gifted children develop under multiple systemic influences (family, school, and peers), with different skills (e.g. analytical, creative, and practical skills) serving different purposes in the expression of giftedness at particular developmental stages across the lifespan (Kaufman & Sternberg, 2008). Besides child predisposition (Nisbett et al., 2012) and formal education (Eccles & Roeser, 2012), several family characteristics influence children's cognitive development (e.g. Ramey & Ramey, 2012). For instance, the socioeconomic status (SES) of a child's family (e.g. the highest educational attainment and type of occupation of the parents) has been linked to general intelligence test scores and academic achievement (McLoyd, 1998), along with the accumulation and allocation of educational resources, modeling of high expectations for achievement, and parents' education-related values and beliefs (e.g. the importance of creativity) (Olszewski-Kubilius, 2008). The family structure (e.g. birth order and number and gender of siblings in the household) is also thought to affect intelligence via the amount of cognitive stimulation a child experiences and the degree to which the intellectual and emotional needs of the child are being met (Steelman, Powell, Werum, & Carter, 2002).

Yet, the manifestation and impact of these familial factors on cognitive development are necessarily subject to the influence of the larger cultural milieu (Harkness & Super, 2012). Although empirical evidence on the relationship between the home environment and children's cognitive performance has predominantly emerged from Western countries and some common links have been examined in countries

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worldwide (Chiu, 2010), general consensus in the available literature is that contributions to the development of cognitive functioning vary across different societies (e.g. Buchmann & Hannum, 2001).

One of the most distinctive cultures existing today is that of the Kingdom of Saudi Arabia, which is one of the wealthiest and politically and economically influential, yet one of the most culturally conservative Muslim countries of the world (Baki, 2004; Hamdan, 2005). Its citizens' lives are structured according to the Shari'a, the laws of Islam, along with the larger cultural values of patriarchy and traditional gender-specific customs, including gender segregation outside of the home (Almutairi, 2008). These gender-related values and practices inform many aspects of Saudi Arabian life, from interpersonal relationships, to education, to employment. For example, education is segregated into single-gender schools, with same-gender teachers and different curricula, with boys' schools traditionally having a more rigorous curriculum than girls' (Baki, 2004; Hamdan, 2005).

Gender-related traditions also affect employment issues, which affect the parent population in Saudi Arabia. For example, although women make up more than half of all university graduates, many do not work after university (Prokop, 2003). This is partially due to the primary value of family life in Saudi culture, but also due to restrictions upon what women can study at university and where they can work, as gender segregation and traditionally gender-appropriate activities are limiting factors (Baki, 2004).

Traditionally, the composition of the Saudi Arabian family includes many children who are likely to be close in age, as half of Saudi women have birth intervals of less than two years (Mobaraki & Soderfeldt, 2007). With respect to family hierarchies, it has been noted that many Saudis tend to favor boys, and that Saudi girls are generally seen as subordinate to the males in their family (Almutairi, 2008). Finally, in keeping with customs of male independence and the strict guarding of females outside of the home, free time activities for boys and girls may differ distinctly. For example, there are no school-sponsored sports activities for girls, and social norms discourage girls from practicing physical activities in public (Mobaraki & Soderfeldt, 2007).

In the present study, we describe home environment correlates of analytical, creative, and practical skills for a sample of gifted students from grades 4 to 7 selected from a large-scale study on the etiology of giftedness in Saudi Arabia. We focus on three areas: (1) parents' educational and occupational background; (2) birth order, family size, composition, and density; and (3) recreational and academic activities. Our analyses focus on gender-related differences, as gender role differentiation and segregation are prominent aspects of growing up in Saudi Arabia.

Method

Participants

Of a larger sample of 7778 students (2847 female, $M_{Age} = 12.28$ years, $SD_{Age} = 1.81$ years), grades 3–9, recruited across Saudi Arabia for a large-scale study on the manifestation and etiology of giftedness, 817 students (325 female, $M_{Age} = 11.47$ years, $SD_{Age} = 1.33$ years), grades 4–7, were identified as gifted based on their overall intelligence score (top 85th percentile). Our current sample consists of the 294 of these 817 gifted students for whom data on the home environment were available (99 female, $M_{Age} = 11.43$ years, $SD_{Age} = 1.33$ years). This information was provided

by a total of 239 fathers, 44 mothers, and 7 other relatives (four did not indicate who filled out the questionnaire).

Measures

General intelligence

The Aurora-*g* (for *g*-factor) test battery (Tan et al., 2009) was utilized to assess verbal, figural, and numerical indicators of general intelligence. Aurora-*g* presents three types of paper-and-pencil tasks – analogy, classification, and series problems. All items are multiple choice (four possible responses) and are scored as *correct* (= 1) or *incorrect* (= 0). The three types of tasks were combined to derive three domain-specific indicators of general intelligence: verbal (55 items, Cronbach's $\alpha = .75$); figural (36 items, Cronbach's $\alpha = .78$); and numerical (40 items, Cronbach's $\alpha = .77$). The total score of all three subtests comprised 131 items (Cronbach's $\alpha = .88$).

Analytical, creative, and practical skills

Aurora-*a* (for augmented) is a paper-and-pencil assessment based on Sternberg's Triarchic Theory of Intelligence (Sternberg, 2012). Developed to assess analytical, creative, and practical skills, 17 subtests were designed to look at these skills across and between stimulus domains (six verbal, five numerical, and six figural subtests) using a variety of item formats, including multiple choice (1 = *correct*, 0 = *incorrect*), short answer, and open-ended items. Three teams of trained raters scored the four open-ended subtests independently. There was no overlap in the scoring between the three teams. However, intra-class correlation coefficients (ICC) indicated appropriate agreement between the raters within each team across all subtests ($M_{ICC} = .955$, .959, and .789 for teams 1, 2 and 3, respectively). Scores were calibrated for any rater differences, regressed on grade, and standardized residuals were saved. For each multiple-choice subtest, the mean of all items was computed, regressed on grade, and standardized residuals were saved. A mean composite was computed for analytical, creative, and practical skills for further analyses.

Family context and home environment

Information was collected using a survey that addressed two basic areas of home life: parent demographics and family structure, and children's activities outside of school.

Parent's demographics and structure of the home environment. The first section gathered information about the parents' level of education, their education expectations for their children, country of origin, and their occupations outside the home. The SES of the family based on the parents' occupations was approximated using the International Socioeconomic Index (ISEI-08; Ganzeboom & Treiman, 2012). Next, the child's living situation (with mother only, father only, or with both parents) was ascertained, along with the child's birth order (e.g. first-born or second-born) and the number of boys and girls living in the family. A household crowding index (HCI) was computed by dividing the total number of persons in the household by the total number of bedrooms (cf. Evans, 2006).

Children's academic and recreational activities. Parents indicated whether the child participated in after-school academic programs for the gifted, or weekend academic programs (0 = *no*; 1 = *yes*). Responses were summed with higher scores reflecting a higher level of participation in structured academic programs (hereafter called 'academic activities'; Cronbach's $\alpha = .69$).

Regarding recreational activities, respondents estimated the average number of hours a child spent per week with friends outside the school, and provided information on whether the child studied the Quran, memorized the Quran, how many parts of the Quran the child had memorized, as well as the number of years the child had studied the Quran. Children's choices of free-time activities were indicated as what the child spends most of his or her time doing of the following choices: (1) reading for pleasure; (2) reading for pleasure in English; (3) reading non-fiction; (4) playing imaginatively (e.g. dolls, action figures); (5) painting, drawing, and doing arts and crafts; (6) building things (out of Legos or other sets, wood); (7) playing outdoors (e.g. at a park, doing sports); (8) playing on a sports team; (9) listening to music; and (10) listening to English music. All questions except those requiring parents to state a specific number were answered with *no* (= 0) or *yes* (= 1). A principal factor analysis was carried out and four factors were derived based on Eigenvalues greater than one: a reading composite (questions 1 to 3); a composite of creative activities (questions 4 to 6); level of outdoor and sports activities (questions 7 to 8); and the child's exposure to music (questions 9 to 10). The four factors together explained 40.79% of the variance; factor scores were saved and used for further analyses.

Procedure and data analysis

Aurora-*g* and -*a* were translated into Arabic and cross-validated (i.e. evaluated for familiarity, difficulty, and suitability) through back-translation into English by a bi-lingual member of the project team. Both assessments were administered in 2010 to groups of children at school. The information on the home environment was gathered for the gifted students at the beginning of 2012.

Our data analyses focused on two aspects. First, gender differences in cognitive skills and home environment variables were investigated using independent samples *t*-tests with Bonferroni adjustment (i.e. alpha of .05 divided by the number of comparisons) for continuous variables and chi-square (χ^2) tests for dichotomous variables. Second, associations between home environment and cognitive skills were explored using (a) one-way analysis of variance with Bonferroni alpha adjustment for testing mean differences in cognitive skills based on categorical variables; (b) Spearman's rank-order correlation (Spearman's ρ) for testing associations between cognitive skills and ordinal variables (e.g. birth order, ISEI scores); and (c) Pearson product-moment correlation (r) for testing associations between cognitive skills and continuous variables (e.g. number of boys and girls in the family).

Results

Descriptive statistics

Analytical, creative, and practical skills

Table 1 shows descriptive statistics by gender for analytical, creative, and practical skills. Notably, gifted girls scored higher in creative skills ($M_{boys} = .40$, $M_{girls} = .63$), but there were no gender differences in analytical or practical skills.

Table 1. Descriptive statistics for the subscales of Aurora-*a* and Aurora-*g*.

		Total		Boys		Girls					
Variable	*n*	*M*	SD	*M*	SD	*M*	SD	*t*	df	*p*	*d*
Aurora-*a*											
Analytical	258	.49	.69	.51	.69	.45	.69	.63	256	.529	.08
Creative	246	.49	.73	.40	.60	.63	.90	−2.38	135.53	.034	.30
Practical	256	.46	.61	.46	.61	.45	.61	.15	254	.885	.02
Aurora-*g*											
Verbal	294	1.14	.65	1.17	.70	1.07	.53	1.30	249.86	.156	.17
Numerical	294	1.37	1.06	1.44	1.06	1.24	1.05	1.47	292	.143	.18
Figural	294	1.28	.86	1.24	.89	1.38	.78	−1.38	292	.168	.17
Total	294	1.64	.58	1.68	.60	1.58	.53	1.33	292	.185	.17

Notes: $N = 294$. Gender was dummy coded with 0 for boys and 1 for girls. $t = t$-value for independent samples t-test comparing scores of boys and girls. df = degrees of freedom. d = Cohen's d.

Home environment variables

We initially compared the mean scores of gifted boys and girls in the sample (see Table 2). Results showed that gifted girls lived in households with significantly fewer boys ($M_{girls} = 2.20$, $M_{boys} = 3.58$), but with more girls ($M_{girls} = 3.61$, $M_{boys} = 2.51$). Moreover, gifted girls played more creatively ($M_{girls} = .39$, $M_{boys} = -.19$) and spent more time reading compared to gifted boys ($M_{girls} = .29$, $M_{boys} = -.14$). In contrast, gifted boys spent significantly more hours per week with friends outside of school ($M_{girls} = 2.46$, $M_{boys} = 4.52$) and also played more outdoors compared to girls ($M_{girls} = -.55$, $M_{boys} = .27$). Significantly more boys (70.4%) compared to girls (29.6%) studied the Quran (χ^2 (1) = 5.28, $p = .022$, Cramer's $V = .14$). There were

Table 2. Descriptive statistics for continuous variables from the home environment.

Variable	*M*	SD	M_{boys} (SD)	M_{girls} (SD)	*t*	df	*p*
Hours parents at home daily	14.17	6.55	13.35 (6.10)	15.87 (7.14)	−2.86	151.44	.005
Number of boys in the family	3.12	1.62	3.58 (1.56)	2.20 (1.32)	7.33	213.56	<.001
Number of girls in the family	2.89	1.77	2.51 (1.79)	3.61 (1.48)	−5.18	281	<.001
Parts of the Quran memorized	4.89	6.53	5.37 (7.26)	3.79 (4.27)	1.78	154.74	.078
Number of years studying the Quran	4.35	3.17	4.49 (3.25)	3.96 (2.94)	.93	158	.352
Hours per week with friends outside the school	3.99	4.27	4.52 (4.64)	2.46 (2.46)	4.10	174.05	<.001
Academic activities	.45	.72	.51 (.72)	.38 (.70)	1.40	281	.162
Creative playing	0	.83	−.19 (.81)	.39 (.72)	−5.36	245	<.001
Music	0	.84	−.01 (.84)	.02 (.85)	−.29	245	.769
Play outdoors	0	.79	.27 (.71)	−.55 (.64)	8.77	245	<.001
Reading	0	.80	−.14 (.80)	.29 (.70)	−4.25	245	<.001
HCI	1.50	.63	1.46 (.59)	1.56 (.68)	−1.18	277	.240

Notes: HCI = Household Crowding Index (i.e. number of individuals in the house divided by the number of bedrooms). $t = t$-value for independent samples t-test comparing scores of boys and girls.

no differences between boys and girls in the HCI, birth order, academic activities, the number of years studying the Quran, the number of memorized parts of the Quran, and the exposure to music (t-values < 1.46).

Home environment correlates of cognitive skills

Parents' educational and occupational background

Fathers tended to have a higher educational background: 26.6% had a degree less than high school (33.0% for mothers), 29.8% had a high school degree (28.8% for mothers), 36.3% had a college degree (37.2% for mothers), and 7.3% had a Master's degree or a PhD (1.0% for mothers). The majority of the fathers (85.7%) and mothers (88.2%) were originally from Saudi Arabia. The majority of the identified children lived with both parents (94.4%). Parents had high education expectations for their children; the majority indicated that they expect their child to achieve a college degree (32.8% for boys and 40.6% for girls) or a Master's degree or a PhD (66.7% for boys and 59.4% for girls).

Regarding parents' level of education, children of mothers with higher education scored higher in creativity ($F(3, 236) = 3.04$, $p = .030$), with significant *post hoc* differences only between children whose mother achieved less than a high school degree ($M = .29$, $SD = .78$) and a college degree ($M = .62$, $SD = .72$, $p = .024$). There was no relationship between children's scores and fathers' education.

Regarding employment status, both parents were unemployed for 18.7% of the sample; at least one parent was employed for 59.2% of this sample; and both parents were employed for 22.1% of this sample. Employment status was a significant factor accounting for group differences in analytical skills ($F(2, 255) = 5.05$, $p = .007$) and creative skills ($F(2, 243) = 5.26$, $p = .006$), but not in practical skills ($F(2, 253) = .31$, $p = .737$). *Post-hoc* tests showed that, for analytical skills, children had significantly lower scores ($M = .22$, $SD = .62$) when both parents were unemployed, compared to when at least one parent was employed ($M = .53$, $SD = .69$, $p = .015$) and compared to children for whom both parents were employed ($M = .61$, $SD = .69$, $p = .011$). For creative skills, children showed significantly lower skills when both parents were unemployed ($M = .16$, $SD = .55$), compared to when at least one parent was employed ($M = .55$, $SD = .75$, $p = .005$), and compared to children for whom both parents were employed ($M = .55$, $SD = .64$, $p = .025$).

Overall, parent's ISEI scores were not significantly related to analytical, creative, and practical skills. However, for gifted girls, the ISEI score of the father (available for $n = 25$ girls) was positively related to analytical (Spearman's $\rho = .41$, $p = .041$) and practical skills (Spearman's $\rho = .45$, $p = .025$).

Family composition

Gifted children's birth order ranged from first-born (23.4%) to the 13th child (.4%) in the family (median = 3, mode = 1), and was similar for boys and girls, with the exception that more boys (25.6%) were first-born children compared to girls (19.6%). Birth order was not or only weakly related to analytical (Spearman's $\rho = .05$), creative (Spearman's $\rho = -.12$), and practical skills (Spearman's $\rho = -.08$). Overall, the number of boys in the family was negatively related to creative skills ($r = -.15$, $p = .021$), whereas the number of girls was negatively related to analytical

skills ($r = -.13$, $p = .035$). However, both correlations were significant only for boys, with more boys in the family associated with lower creative skills ($r = -.21$, $p = .01$) and more girls in the family related to lower analytical skills ($r = -.17$, $p = .028$). Overall, the number of siblings (i.e. number of boys plus number of girls in the household) was negatively related to analytical skills ($r = -.13$, $p = .049$), but only for boys ($r = -.20$, $p = .013$).

The HCI ranged between .36 and 3.50 ($M = 1.50$, $SD = .63$) and was below 1 for 20.4% of the sample, between 1 and 2 for 63.8% of the sample, and higher than 2 for 15.8% of the sample. Controlling for the parents' levels of education and occupational status, the HCI was positively related to practical skills ($r = .15$, $p = .031$), indicating that gifted children demonstrate higher practical skills in more "crowded" households.

Recreational and academic activities

Regarding recreational activities, the level of reading showed small but consistent positive associations with analytical ($r = .15$, $p = .024$), creative ($r = .25$, $p < .001$) and practical skills ($r = .14$, $p = .043$) (see Table 3). Creative playing was positively related to creative ($r = .17$, $p = .012$) and practical skills ($r = .14$, $p = .042$). Listening to music or playing outdoors was not related to any of the three skills. Furthermore, academic activities were positively related to analytical ($r = .21$, $p < .001$), creative ($r = .23$, $p < .001$), and practical skills ($r = .17$, $p = .006$).

For gifted boys and girls combined, none of the Quran-related activities were related to analytical, creative, and practical skills. However, for girls analytical skills were positively related to the number of years a girl studied the Quran ($r = .46$, $p = .004$), whereas creative skills were positively related to the number of memorized parts of the Quran ($r = .42$, $p = .003$).

Discussion

To our knowledge, this study is the first investigation to explore home environment correlates of analytical, creative, and practical skills of a sample of gifted students in Saudi Arabia. The set of analyses confirmed some expected findings; most notably that gifted girls achieved higher scores on the creativity composite than boys, but not in analytical and practical skills. Other results were rather mixed, as we discuss in the following sections.

Parent's educational and occupational background

Concerning the parents' educational background, our analyses showed that only the educational background of the mothers of gifted children was an important factor, and only for creative skills. Specifically, there was a significant difference in creative skills between children whose mother achieved less than a high school degree compared to a college degree. This might be due to the fact that women in Saudi culture often pursuit a degree in teaching, education, or arts at the university level given the specific gender roles existing in this society (Hamdan, 2005); these mothers might value creative productions more and thus pass their "creative education" on to their children as well. It may also be due to more educated mothers' possible exposure to information and environments conducive to new or non-traditional (i.e. in this context, "more creative") ideas.

Table 3. Correlations between analytical, creative and practical skills, three indicators of intelligence and academic and recreational activities.

		1	2	3	4	5	6	7	8	9	10	11	12
	Aurora-*a*												
1.	Analytical		.46**	.59**	.19*	.42**	.20**	.53**	.21**	.11	−.12	−.12	.15*
2.	Creative			.37**	.19*	.23**	.05	.29**	.23**	.17*	.05	−.08	.25**
3.	Practical				.10	.30**	.16*	.37**	.17*	.14*	−.01	−.13	.14*
	Aurora-*g*												
4.	Verbal					−.05	−.23**	.39**	.08	−.12	.06	−.08	.02
5.	Numerical						−.02	.68**	.18*	.01	−.12	.10	.00
6.	Figural							.46**	.14*	.10	−.15*	−.02	.06
7.	Total								.26**	−.00	−.16*	.01	.04
8.	Academic activities									.18*	−.10	.16*	.12
9.	Creative playing										.14*	−.06	.53**
10.	Music											.08	.18*
11.	Playing outdoors												−.13*
12.	Reading												

*$p < .05$.
**$p < .001$.

Gender-specific effects of family composition

In Western countries, the number of siblings and family size has typically been found to be negatively associated with educational outcomes (Steelman et al., 2002), as a smaller number of children in the family is thought to be associated with a larger amount of attention they are likely to receive from their parents. In contrast, in developing countries, larger family structures could have a potential buffering effect along with the impact of order and gender composition of siblings (Buchmann & Hannum, 2001). The findings presented here lend support to the claim that, more than birth order, the effect of family size is gender-specific and is contingent on gender composition (Steelman et al., 2002). With more "competition" from other boys in the family, gifted girls may not excel further because their brothers may take more attention and educational resources. Moreover, parenting behavior, values, and socialization practices in families with more boys could be linked to parents' expectations regarding an appropriate employment for their gifted boy, with less value attributed to the demonstration of creative skills. In contrast, more girls in a gifted boys' family is indicative of lower analytical performance, reflecting the opposite pattern: creative performances might be supported more in families with more girls, which might be associated with less emphasis on analytical skills.

A higher number of people in the household might also be beneficial. Family members can provide extra resources and additional learning opportunities for a child, or compete for them (Steelman et al., 2002). In the present study, a higher ratio of number of people in the household per number of bedrooms was positively related to gifted children's practical skills, thus indicating a beneficial effect of family density for the implementation and application of ideas and knowledge.

Recreational and academic activities

Surprisingly, gifted girls' analytical skills were higher the longer they had studied the Quran; creative skills were higher for girls who had memorized more parts of the Quran. To date, very little is known about the effects of Quran education on cognitive skills. Although sometimes considered a mere form of rote learning through memorization, children acquire important skills during the course of Quran education, such as letter naming accuracy, decoding skills, and reading fluency; these skills are particularly important for the appropriate recitation of longer texts (Moore, 2012). These skills might be of importance for solving those tasks in this study that require a high level of verbal processing. Moreover, Quranic schooling has been found to have a positive effect on serial memory processing (Wagner & Spratt, 1987). This skill could be beneficial for generating novel and task-appropriate response as it allows an individual to serially recall clues and evaluate their applicability to the solution of a task (Stein, 1989), and fosters a fluent and efficient retrieval of information from a newly acquired knowledge base (Feldhusen, 2006).

Limitations

Two aspects that limit the generalizability of the findings in this study must be acknowledged. First, the relationships ascertained between home environment and cognitive skills are rather moderate in magnitude. Clearly, not all the variance in analytical, creative, and practical skills can be attributed to the family environment.

Some of that variance is due to the effect of the school context in which children are formally educated and to individual background characteristics of the students. Answering the question of whether the family context influences gifted children's cognitive skills after accounting for other sources could inform future research on the relative importance of schools and family life for the cognitive development of children in Saudi Arabia. Second, home environment information was available only for a subsample of high performing students (294 of 817 gifted students). Due to this selective sampling procedure, this sample might not be representative of other same-age peers in Saudi Arabia. Future studies should additionally collect information on the home environment from children who were not identified as gifted, in order to compare the configuration of family contextual factors.

Conclusion

To date, very little is known about the effect of specific home environmental factors on different aspects of giftedness, especially in the Middle East in general and Saudi Arabia in particular. In this study, we found that the specific customs and traditions of Saudi Arabia, and possible deviations from these, appear to be associated with characteristics of the development of boys' and girls' cognitive skills, differentiating them particularly in their analytic and creative skills. For example, having a highly educated mother may be – in the Saudi context – more of a deviation from the societal norm, which seems to be associated with higher creativity in gifted children. Additionally, the gender of siblings seemed to play a more important role than family density and SES. The findings presented here contribute to the field's growing understanding of the environmental correlates with intellectual superiority around the world, and extend the view that family environment is an important context for the development and manifestation of cognitive skills, though specifics of this environment may vary across countries (Hein, Reich, & Grigorenko, in press).

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