Behavioral Regulation, Visual Spatial Maturity in Kindergarten, and the Relationship of School Adaptation in the First Grade for a Sample of Turkish Children

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Abstract
Behavioral regulation has recently become an important variable in research looking at kindergarten and first-grade achievement of children in private and public schools. The purpose of this study was to examine a measure of behavioral regulation, the Head Toes Knees Shoulders Task, and to evaluate its relationship with visual spatial maturity at the end of kindergarten. Later, in first grade, teachers were asked to rate the children ($N = 82$) in terms of academic and behavioral adaptation. Behavioral regulation and visual spatial maturity were significantly different between the two school types, but ratings by the teachers in the first grade were affected by children’s visual spatial maturity rather than by behavioral regulation. Socioeducational opportunities provided by the two types of schools may be more important to school adaptation than behavioral regulation.

Keywords
behavioral regulation, Turkish, children

Introduction
School readiness and adaptation has become of primary importance in Turkey within the past years, since a controversial sociopolitical debate has been going on around the government’s decision to lower the age of compulsory education and start children in first grade at 66 months, which was later amended to
require parental consent. It has been shown in research that school readiness and adaptation and achievement in the first grade are related to a variety of variables, starting with socioeconomic variables such as home environment and parenting (Morrison, Bachman, & Connor, 2005), cognitive variables such as phonological skills (Lonigan, 2006), visual spatial skills (Özer, 2009), and socio-emotional competencies (Hughes & Kwok, 2006).

Although an act has been passed to include kindergarten in the compulsory education system, the Turkish educational system is still underserving this age group. It is reported that only 27% of children between the ages of 3 and 5 years are receiving any preschool education (National Education Statistics, 2013). There are also very large differences between public and private schools. Although no direct statistics on private and public schools are available, private preschools are not funded by the state and are mainly utilized by people who can afford them. It has been suggested that in families with higher socioeconomic status, a child’s chance of receiving prekindergarten education is 60 times higher than for a child from families with lower socioeconomic status (Educational Reform Initiative, 2009). While private schools usually do not exceed a student/teacher ratio of 1/20 and provide experiences in language, computers, and innovative technology, public schools usually have student/teacher ratios of around 1/40 and have limited facilities. Pre-kindergarten education is only provided in the private sector. Most private schools provide education starting from kindergarten that extends to the end of high school. For some private schools, there are selection processes before entry into kindergarten. As can be expected, differences in various psychological variables have been demonstrated between private and public school children. For example, significant differences between the visual spatial maturity of children in public and private schools, as measured by the Bender-Gestalt (BG) Test, have been demonstrated (Özer, 2009).

Not only are there vast differences between public and private schools in Turkey in terms of educational opportunities, but also there are differences between the populations they serve. Since private schools are expensive, they are chosen more frequently by parents with more education and higher income. Parental education has been shown to be related to behavioral regulation (Wanless, McClelland, Tominey, & Acock, 2011) and in Turkey parents with more education are reported to use more explanations, more words, and less physical restraint with their children (Baydar, Kuntay, Goksen, Yagmurlu, & Cemalcilar, 2010); that is, parenting styles differ vastly with socioeconomic status. Parents from lower socioeconomic levels with less education provide fewer opportunities for language development, have fewer books, crayons, etc. in the house, and use physical restrictions more frequently (Baydar et al., 2010). Although the relationship between parenting styles and self-regulation has not yet been researched in Turkey, it is expected that parental education may be an important variable affecting behavioral regulation.
In recent years, executive function (EF) abilities have been noted among variables that are related to later academic achievement and early school adaptation. It has been suggested that EF plays a central role in the development of many school readiness and adaptation variables and that EF makes a contribution to prediction of later achievement in school, in addition to classical IQ measurement (Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008; Blair, 2002). EFs are defined as “ability to respond in an adaptive manner to novel situations” (Lezak, Howieson, & Loring, 2004, p. 611), they are a complex set of cognitive regulatory processes that underlie adaptive, goal-directed responding to novel or challenging situations that include working memory, attention, and inhibition of responses (Bierman et al., 2008). Especially for preschool age group, behavioral regulation has emerged as a “comprehensive measure of EF that requires children to attend to commands, remember rules, and inhibit impulses” (Cameron et al., 2012, p. 1231). Behavioral regulation is defined as a subcomponent of executive processes including attention, working memory, and inhibitory control (McClelland et al., 2007).

The measurement of behavioral regulation and its relationship with the end of kindergarten and first grade achievement has been the subject of recent research (McClelland et al., 2007; Ponitz, McClelland, Matthews, & Morrison, 2009). It has been well documented that behavioral regulation at the beginning of kindergarten is related to teacher ratings of behavioral regulation and gains in mathematics at the end of the year (Ponitz et al., 2009). Reading comprehension and vocabulary skills at the end of first grade (Connor et al., 2010) also are related to behavioral regulation in kindergarten.

A direct measure of behavioral regulation in young children (Head Toes Knees Shoulders Task; HTKS) has been developed and its psychometric robustness has been demonstrated with U.S. samples (McClelland et al., 2007) and in other cultures (Wanless et al., 2011). This measure was developed to measure the organized integration of the EFs attention, working memory, and inhibitory control. Studies have shown a relationship between behavioral regulation measured at the beginning of kindergarten and adjustment and achievement in kindergarten (Ponitz et al., 2009). It has been suggested that this measure of behavioral regulation is a measure of individual differences, is developmental in nature, and initially was thought to be affected by sex and parental education only minimally (Ponitz et al., 2009). However, this conclusion regarding minimal contribution of parent education and income level on behavioral regulation was revised in view of later studies showing that children from more impoverished settings do score lower on behavioral regulation (Evans & Rosenbaum, 2008; Sektnan, McClelland, Acock, & Morrison, 2010; Wanless, McClelland, Tominey et al., 2011).

It has been demonstrated that (Wanless, McClelland, Tominey et al., 2011) children from low-income families performed lower on behavioral regulation in the beginning of kindergarten. One of the explanations utilized to account for the connection between family income and children’s behavioral regulation is
the cognitive stimulation model, which suggests that families with low incomes have more difficulty investing in the materials and experiences that would stimulate children’s development of behavioral regulation (Bradley et al., 1989; Chazan-Cohen et al., 2009; Linver, Brooks-Gunn, & Kohen, 2002). Within this framework, it is possible that not participating in enriching extracurricular activities that involve rules, turns, and instructions (such as music and dance lessons) may contribute to these differences. Hence, within the Turkish educational system differences between public and private schools in terms of these opportunities may contribute to differences in behavioral regulation.

In addition, a relationship between self-regulation and preschool experience, between socioeconomic risk and lower self-regulation (Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009), and between levels of poverty and behavioral regulation (Connor et al., 2010) has been demonstrated. Research has shown that behavioral regulation skills require opportunities to practice certain behaviors and impoverished environments may be lacking in many of these opportunities, thus leading to lower behavioral regulation in children from these environments. It is well documented that children from groups with lower maternal education, low family income, suffer more negative developmental and academic outcomes (Burchinal, Peisner-Feinberg, Pianta, & Howes, 2002; Sektnan et al., 2010). The relationship between socioeconomic risks and academic achievement and a variety of cognitive tasks has been frequently demonstrated (Bornstein & Bradley, 2003; Burrage et al., 2008). Blair (2006) has suggested that experiential factors contribute to EF development. As was discussed earlier, the differences between private and public schooling in Turkey are vast not only in terms of the educational opportunities provided but also in the group of children they serve. Due to this, in this study, parental education was included as a proxy variable that is clearly connected to the school system.

Hence, the first hypothesis of the study is that children who are attending public schools, who have had little or no prekindergarten schooling, who have less opportunity to participate in tasks that promote regulation, and who have parents with lower education will perform more poorly on tasks of behavioral regulation than their peers attending private school.

As discussed earlier, EF has been proposed as an important umbrella concept including the ability to integrate and process visual spatial complexity. Visual motor ability involves integration of visual spatial perception and motoric accuracy. Grissmer, Grimm, Aiyer, Murrah, and Steele (2010) in a large-scale analysis have concluded that visual spatial ability at kindergarten is a strong predictor of later achievement. When design copy skills were parsed from draw-a-person and draw-a-profile, it was the strongest predictor of later mathematics and reading. Behavioral regulation measured by HTKS has been shown to be strongly correlated to cognitive flexibility, working memory, and inhibitory control in kindergarten (Becker, Miao, Duncan, & McClelland, 2014; Cameron et al. 2012). It has been suggested that anatomical connections between cerebellar
areas controlling visual motor skills and prefrontal cortices active in EF may be responsible for this effect (Becker et al., 2014).

When behavioral regulation as measured by HTKS and fine motor ability were studied, it was found that both variables contribute independently to predicting later school achievement (Cameron et al., 2012). In addition, “design copy” task predicted three different outcomes of later academic achievement. It was indicated that “relative to EF, ability to copy designs is more strongly associated with fall-spring gains in decoding, reading comprehension and overall reading level” (Cameron et al. 2012, p. 1240). Similar results were obtained when visual motor integration was measured along with EF tasks such as working memory, inhibitory control, and visual motor abilities were correlated to EF abilities and predicted 29% of the variance in scholastic adaptation as measured by teacher ratings (Bart, Hajami, & Bar-Haim, 2007). The frequent interpretation for these findings is that the level of “automaticity” reached with better visual motor skills may allow the child to attend to other requirements of school, such as behavioral and emotional regulation (Cameron et al., 2012). In addition, it has been pointed out that a large portion of the child’s time in the first grades is spent on visual motor tasks which may explain the contribution of visual motor skills to later academic achievement (Bart et al., 2007). Finally, it has been suggested that visual motor integration may be a foundational cognitive skill for early childhood and may compensate for deficiency in behavioral inhibition (Cameron et al., 2015).

The BG Test has a long history as a test of visual spatial ability and is associated with both EF (Böhm, Lundequist, & Smedler, 2010) and with school adaptation in the first grade (Özer, 2009). The BG Test has the advantage of being fairly easy to administer and having been shown to be related to general cognitive development and EFs such as planning, impulse control, divided attention, and working memory (Böhm et al., 2010). In Böhm and colleagues’ study of term and preterm children aged 5.5 years, where measures of IQ and EF were administered, it was shown that the Bender Test (scored with the Koppitz system) differentiated the term and preterm children and the Bender scores were significantly related to both PIQ and EF. Availability of norms for cognitive tests or tests of EF at early ages is limited in Turkey. The BGTest (but not the BG–II) is one of the few tests of visual spatial maturity that has been shown to have validity in the Turkish culture (Özer, 2007, 2009). A relationship between Bender error scores at the end of kindergarten and teacher ratings of school adaptation in first grade has been demonstrated (Özer, 2009, 2012). Based on this finding, the lack of available normed instruments and the relationship between Bender scores and EF, it was decided to use the Bender as a measure of general visual spatial maturity to test the hypothesis that the relationship observed between behavioral regulation and adaptation in school may be better accounted for by another more general variable of cognitive/visual spatial maturity. Hence, the second hypothesis of the study is that visual spatial ability
as measured by the BG will be related to behavioral regulation and both variables will predict school adaptation ratings of children. Finally, it was hypothesized that visual spatial maturity will have an added predictive power to behavioral regulation in predicting the variability in school adaptation as measured by teacher ratings.

Hypothesis 1. Children from public schools will perform more poorly on tasks of behavioral regulation than their peers attending private school.

Hypothesis 2. HTKS scores and BG scores will be correlated and these will predict a portion of the variability in school adaptation as measured by teacher ratings.

Hypothesis 3. BG scores will predict school adaptation independently and in addition to HTKS scores.

Method

Participants

The children participating in the study were recruited from a public and a private school. Thirty-two children from the public school and 50 children from the private school participated in the first phase of the study. There were 41 boys and 41 girls. The mean age of the total sample was 71.5 months ($SD = 3.8$). No significant differences in age were present in comparisons of sex ($F = 0.89$, $p > .05$) or school type ($F = 3.03$, $p > .05$). In the public school, 55% of the fathers had an elementary school education or less, while in the private school, 92% of the fathers had university degrees. The children in the public school had no previous preschool experience, while the private school children had a mean of 15.4 months of preschool education. A high tuition was paid for the private school while the public school was free. All of the parents provided informed consent for the participation of their children in the study. The distribution of the children in terms of gender and type of school for both phases of the study is provided in Table 1.

Instruments

Head Toes Knees Shoulders Task (HTKS). This is a measure developed by Ponitz et al. (2009). The scale includes 20 trials divided into two sections. In the first section, a simple task where the child is asked to touch her toes when hearing the command “head” and vice versa is administered. In the second part, the children are asked to respond to four types of behavioral pairing tasks (Head–Toes, Shoulders–Knees). For example, if the administrator said, “Touch your toes,”
the correct response would be for the child to touch his or her head; the correct response to a “Touch your knees” command would be for the child to touch his or her shoulders. Correct responses earned 2 points; incorrect responses earned 0 points; 1 point was given if children made any motion to the incorrect response, but self-corrected and ended with the correct action. Scores ranged from 0 to 40. Validity and inter-rater reliability have been demonstrated in earlier studies (Ponitz et al., 2008).

For the purpose of the present study, the instructions for the test were translated into Turkish by the investigator, and then two psychology professors reviewed and back-translated the instructions. The final version was agreed upon by the three judges. Cronbach’s alpha for the scale was .89.

**BG Test.** The BG Test consists of nine 4 × 6 inch cards, each displaying a unique figure. The individual is asked to draw each figure as he observes it. After testing is completed, the results are scored based on the presence of any of the 30 possible errors defined clearly in the Koppitz (1975) Developmental Scoring System. Since errors are scored, a higher score indicates a poorer performance. Inter-rater reliabilities for the system are reported to range between .79 and .97 (Sattler, 2002). Test–retest reliability ranges between .50 and .84 (Koppitz, 1975). For the present study, the BG protocols were rated by the investigator, and then 20 randomly selected protocols were scored by two master’s level psychologists trained in the same system. The agreements between each scorer and the trainer for total scores were .87 and .84.

**Teacher ratings of school adaptation.** Since there are no standardized test of academic achievement in Turkish and it is difficult to assess children’s achievement at this level, it was decided that a teacher rating that has been previously utilized with Turkish samples would be used (Özer, 2009, 2012). Instead of obtaining
academic scores, teachers are asked to rate the children on six basic dimensions as compared to their peers. This is considered to be an indication of the child’s general performance in school. In the beginning (November) and toward the end (May) of first grade, teachers were asked to rate the children on a scale of 1 to 5 on each of six dimensions: Speed of learning to read, Speed of acquiring mathematical concepts, Homework completion, Class participation, Conduct, and Peer Relations. Teachers were asked to rate the children in comparison to the other children in their class. For example, the Speed of learning to read item was defined as Speed of learning to read, with anchors 5: Far quicker than classmates; 4: Slightly ahead of classmates; 3: The same as classmates; 2: Slightly behind classmates; and 1: Far behind classmates. A total score ranging between 6 and 30 was obtained from teacher ratings of the six dimensions. Three of the questions pertained to the academic arena, while the other three questions were about behavioral adaptation. Two separate scores were computed from the teachers’ ratings: Academic and Behavioral. The teachers had no information regarding the results obtained by the children on the kindergarten screening phase.

Procedure

In the first phase of the study, the children were administered the HTKS and BG Test during May of their kindergarten year. In the second phase, these children were followed up in November and May of first grade, and the teachers were asked to rate them academically and behaviorally. Of the 82 children, 61 continued in the same schools and were included in the second phase. Attrition in the private school sample was minimal since this school was specifically chosen by parents in order to continue their education in this institution, whereas public schools are only accessible to people living in the catchment area. When a family moves, schools are changed. Many of the private schools are considered an important step to higher education, and once a place is secured in these schools, there is very little change, whereas most public schools are considered to be equivalent and parents have no hesitation about changing, especially in the earlier grades. These factors may have produced the differing attrition rates for the public and private schools: 44 of the 50 children (88%) in private school continued first grade in the same school, while only 17 (53%) of the public school children continued first grade in their school.

The administration of the HTKS and BG Test was completed by the investigators and six graduate-level clinical psychology students trained in the administration of both tests. All test administrations took place in the children’s schools. Each child was individually administered HTKS and the BG Test. For 10 of the children, two raters scored the HTKS and the agreement was .97. Approximately, half the children were administered the HTKS first, while
the order was reversed for the other half. In the Bender administration, each child was provided with two pieces of A4 paper, a pencil, and an eraser. They were presented the cards one by one and were asked to draw the figures as they saw them. There were no time limitations.

Results

Phase 1

Analyses of the data were undertaken utilizing SPSS Version 17. The means and standard deviations obtained by the whole sample and the two school groups are presented in Table 2. To assess the normality of the distributions, skewness and kurtosis were calculated for each school type. General guidelines suggest kurtosis absolute values greater than 8.0 and skewness absolute values greater than 3.0 indicate severe deviations from normality (Kline, 2005). As shown in Table 2, skewness and kurtosis values were not extreme; however, differences in distributions were apparent. The private school sample showed a negatively skewed distribution with more children on the upper end. There was no significant relationship as indicated by Pearson correlations between age in months and HTKS scores ($r = .25$, $ns$, 95% CI [.00, .50]) for the whole group. Although this relationship was significant for public school children ($r = .64$, $p < .01$,

| Table 2. Descriptive statistics for the distributions of scores on the HTKS by school type. |
|---------------------------------|-----------------|-----------------|-----------------|
|                                | Total group     | Public school   | Private school  |
| N                               | 82              | 32              | 50              |
| Mean                            | 26.67           | 18.13           | 32.24           |
| Standard deviation              | 11.41           | 11.17           | 7.49            |
| Variance                        | 130.23          | 124.76          | 56.06           |
| Coefficient of variance         | 0.42            | 0.61            | 0.23            |
| Skewness                        | -1.11           | -0.45           | 0.33            |
| Standard Error                  | 0.27            | 0.41            | 0.34            |
| Kurtosis                        | 0.38            | -0.86           | 7.27            |
| Standard Error                  | 0.53            | 0.81            | 0.67            |
| Min. possible                   | 0               | 0               | 0               |
| Max. possible                   | 40              | 35              | 40              |
| % at 0                          | 7.3             | 15.6            | 2               |
| % at 40                         | 1.2             | 0               | 2               |
95% CI = [.33, .88]), no significant relationship was observed for private school children ($r = .02, \text{ ns}, 95\% \text{ CI} = [-.30, .48]$.

The differences observed on the mean HTKS scores of public ($M = 18.13, SD = 11.17$) and private school ($M = 32.24, SD = 7.49$) children were analyzed using univariate analyses of variance (ANOVA), and the difference was significant ($F = 46.49, p < .01, \eta^2 = 0.37$). In a similar fashion, private school children performed better, i.e., with fewer errors ($M = 6.84, SD = 3.15$) on the BG Test, as compared with public school children ($M = 10.22, SD = 3.80$). The difference was again significant ($F = 19.12, p < .01, \eta^2 = 0.19$). It can be noted that while the effect of school type on HTKS may be considered to be in the moderate range, the effect size on the BG Test is considered to be small (Field, 2009).

Multivariate ANOVA was performed using gender and school type as independent variables and HTKS scores and BG scores as dependent variables. There were no gender effects on the HTKS ($F = 1.04, p > .05$), but on the BG Test, girls performed with fewer errors than boys ($F = 6.20, p < .05, \eta^2 = 0.08$), although this would be considered a small effect. There was no sex by school-type interaction effect for either measure.

**Phase 2**

Teachers’ ratings of the children’s adaptation and academics at the beginning and end of first grade are presented in Table 3. Repeated measures ANOVA utilizing time at ratings as the within-subjects variable and mean teacher ratings as the dependent variable indicated that there were no differences between the ratings of the teachers at the beginning or end of the year ($F = 0.48, p > .05$) and no school type by time interaction effect ($F = 2.08, p > .05$), so the beginning of year and end of year ratings were averaged to obtain one score. The mean teacher rating from the public school did not differ from the mean rating in the private school ($F = 2.10, p > .05$).

Since the rate of loss of participants was larger for the public school and there were significant differences in children’s performances on the BG Test and

<table>
<thead>
<tr>
<th>School type</th>
<th>Overall rating M</th>
<th>SD</th>
<th>Academic adaptation M</th>
<th>SD</th>
<th>Behavioral adaptation M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public school</td>
<td>19.56</td>
<td>4.02</td>
<td>9.59</td>
<td>2.11</td>
<td>9.88</td>
<td>2.36</td>
</tr>
<tr>
<td>Private school</td>
<td>21.76</td>
<td>4.72</td>
<td>10.33</td>
<td>2.10</td>
<td>11.20</td>
<td>3.14</td>
</tr>
<tr>
<td>Total</td>
<td>20.61</td>
<td>5.02</td>
<td>9.77</td>
<td>2.46</td>
<td>10.84</td>
<td>2.99</td>
</tr>
</tbody>
</table>

M: mean; SD: standard deviation.
HTKS at Phase 1, the analyses in Phase 2 were undertaken separately for the two school types. The correlations between the scores obtained on BG and HTKS for the two school types are presented in Table 4.

Based on the significant differences in Phase 1, categorization of children as high and low in behavioral regulation and visual spatial maturity was undertaken utilizing each group’s own means. For public school children based on their means and standard deviations, high behavioral regulators were defined as children scoring above 21 on the HTKS and those children obtaining an error score of 10 or above on the BG were classified as having lower visual spatial maturity. For the private school children, on the HTKS the cutoff was 32 and on the BG Test those private school children obtaining a score of 7 and above were classified as having lower visual spatial maturity. Based on these classifications, separate ANOVAs were conducted to look at effects of spatial maturity and behavioral regulation on first-grade teacher ratings. The mean teacher ratings of first-grade adaptation for children classified as high or low behavioral regulators, high and low visual spatial maturity for the two school types are presented in Table 5. For public school children, high behavioral regulators were rated higher by the teachers in first grade ($F = 6.87$, $p < .05$, partial $\eta^2 = 0.33$) but the level of spatial maturity did not have an effect ($F = 0.64$, $p > .05$). For the private school children, the effects were reversed; behavioral regulation status did not have an effect ($F = 0.29$, $p > .05$), whereas visual spatial maturity level had an effect on first-grade teacher ratings ($F = 5.62$, $p < .05$, partial $\eta^2 = 0.12$). Although the main effects were different for the two school types, as can be observed in Table 5, the group that was rated most positively by the teachers in both school types was the children who were high both in behavioral regulation and visual spatial maturity.

### Table 4. Pearson correlations between HTKS, bender-gestalt scores, and teachers ratings.

<table>
<thead>
<tr>
<th></th>
<th>HTKS</th>
<th>BG</th>
<th>Total teacher ratings</th>
<th>Academic ratings</th>
<th>Behavioral ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTKS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total teacher</td>
<td>0.11</td>
<td>-0.52c</td>
<td></td>
<td>0.93c</td>
<td>0.85a,c</td>
</tr>
<tr>
<td>Academic ratings</td>
<td>-0.02</td>
<td>-0.51c</td>
<td></td>
<td>0.89c</td>
<td>0.65a,c</td>
</tr>
<tr>
<td>Behavioral ratings</td>
<td>0.18</td>
<td>-0.43c</td>
<td></td>
<td>0.94c</td>
<td>0.71c</td>
</tr>
</tbody>
</table>

HTKS: Head Toes Knees Shoulders Task; BG: Bender-Gestalt.

a Correlations indicated in the right quadrant, are for public school children, correlations at the left quadrant are for private school children.

b $p < .05$.

c $p < .01$. 

Although the main effects were different for the two school types, as can be observed in Table 5, the group that was rated most positively by the teachers in both school types was the children who were high both in behavioral regulation and visual spatial maturity.
Finally, hierarchical linear regression analysis with teacher ratings in first grade as the dependent variable was conducted for the whole group. The whole sample was utilized in this analysis without breaking down into school types since the sample size was too small for the public school children; instead, school type was entered into the regression analysis as an independent variable. Initially, gender was entered in the first step. In the second step, school type, age, HTKS scores, and BG scores were entered. The results of this analysis are presented in Table 6. This analysis revealed that gender contributed significantly to teacher ratings. Gender accounted for 14% of the variance in teacher ratings, $F(1,59) = 9.29, p < .05$. When age, school type, HTKS, and BG scores were entered, the variability accounted for increased to 29%, $F(3,56) = 4.14, p < .05$. To evaluate the third hypothesis regarding the additive predicting value of BG to HTKS, a second hierarchical regression was undertaken, where gender was entered in the first step; age, school type, and HTKS scores in the second step; and BG scores in the final step. The addition of school type, age, and HTKS scores increased the explained variance from 14% to 19% which was not significant, $F(1,57) = 2.09, p > .05$, while the entry of BG scores at the third level accounted for a significant improvement in prediction from 19% to 29%, $F(1,56) = 7.39, p < .01$.

**Discussion**

This initial examination of the HTKS as a measure of behavioral regulation revealed significant variability in the Turkish sample. No ceiling or floor effect was observed in either type of school. In terms of construct validity, the relationship between age and HTKS scores is important and has been demonstrated in other studies (Ponitz et al., 2008, 2009). In the present sample, although this developmental trend was observed for the total group, it was significant for public school children and not for private school children. It is possible that, as will be discussed in relation to the second phase of the study, the educational

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**Table 5.** Mean teacher ratings of school adaptation for public and private school children grouped based on their level of behavioral regulation and visual spatial cognitive maturity.

<table>
<thead>
<tr>
<th>Level of visual spatial maturity</th>
<th>Level of behavioral regulation</th>
<th>Public school</th>
<th>Private school</th>
<th>Public school</th>
<th>Private school</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td></td>
<td>21.58</td>
<td>25.04</td>
<td>15.50</td>
<td>21.63</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td>21.13</td>
<td>19.86</td>
<td>17.00</td>
<td>20.95</td>
</tr>
</tbody>
</table>
opportunities and experience in the private school children may have washed out
the effects of developmental change with age range restricted to 2 years.

The HTKS scale has mainly been used at the beginning of kindergarten in
many studies (Ponitz et al., 2008, 2009); in the present study, it was used to
measure behavioral regulation at the end of kindergarten since most of the
children in Turkish population do not have access to prekindergarten education.
In many studies of HTKS (e.g., Ponitz et al., 2009; Wanless et al., 2011, and
Suchodoletz et al., 2013), children who were between 60 and 65 months of age
obtained mean HTKS scores above the 50% cutoff of 20 points. In the Turkish
public school sample (although the mean age of the children was 70.44 months),
the children obtained a mean score of 18.13, which compared with other studies
was only higher than the means obtained by children (54 months) in the
Taiwanese (Wanless et al., 2011) and Icelandic (55 mo) samples (Suchodoletz
et al., 2013) with children much younger than the Turkish sample, whereas the
means obtained by the private school children (32.24) were comparable to their

Table 6 Hierarchical regression analysis of teacher ratings of school adapta-
tion as predicted by -gestalt, HTKS scores, school type, and sex.

<table>
<thead>
<tr>
<th>Analysis</th>
<th>$R^2$</th>
<th>B</th>
<th>SE</th>
<th>$\beta$</th>
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<tbody>
<tr>
<td>Analysis 1</td>
<td>.54</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>17.89</td>
<td>11.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-2.84</td>
<td>1.21</td>
<td></td>
<td>-0.26a</td>
</tr>
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<td></td>
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<tr>
<td>Bender-Gestalt</td>
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<td></td>
<td>-0.36b</td>
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HTKS: Head Toes Knees Shoulders Task; BG: Bender-Gestalt.
a $p < .05$.
b $p < .01$. 

The HTKS scale has mainly been used at the beginning of kindergarten in
many studies (Ponitz et al., 2008, 2009); in the present study, it was used to
measure behavioral regulation at the end of kindergarten since most of the
children in Turkish population do not have access to prekindergarten education.
In many studies of HTKS (e.g., Ponitz et al., 2009; Wanless et al., 2011, and
Suchodoletz et al., 2013), children who were between 60 and 65 months of age
obtained mean HTKS scores above the 50% cutoff of 20 points. In the Turkish
public school sample (although the mean age of the children was 70.44 months),
the children obtained a mean score of 18.13, which compared with other studies
was only higher than the means obtained by children (54 months) in the
Taiwanese (Wanless et al., 2011) and Icelandic (55 mo) samples (Suchodoletz
et al., 2013) with children much younger than the Turkish sample, whereas the
means obtained by the private school children (32.24) were comparable to their
age mates in studies from other cultures (Pointz et al., 2009). Since one of the differences between these samples appear to be the Turkish public school children’s lack of access to prekindergarten education, it would appear that although behavioral regulation is an individual difference variable related to age, it also benefits from socioeducational experiences as suggested by Blair (2006). In line with other studies, it was shown that lower socioeconomic status, as indicated by the lower educational level of the parents in the sample and fewer educational opportunities for the children in public schools, appeared to be related to lower behavioral regulation. It has been suggested that behavioral regulation requires opportunities for practice, and prekindergarten education contributes to higher behavioral regulation (Burrage et al., 2008; Rimm-Kaufman et al., 2009) and family risk factors associated with poverty are related to lower behavioral regulation (Connor et al., 2010). The present findings are consistent with these earlier findings, the children coming from poorer households, who had not had access to preschool education, performed less well on behavioral regulation at the end of kindergarten as compared with their privately schooled age mates.

The findings regarding behavioral regulation and gender are not always consistent in the literature. It has been suggested that at first grade, girls show better behavioral regulation than boys (Rimm-Kaufman et al., 2009); however, this study utilized measures of behavioral regulation other than the HTKS. Studies using HTKS have shown differences favoring girls in the United States, but no such difference was observed in Asian societies (Wanless et al., 2011). Possibly, behavioral regulation of children is promoted more strongly in Asian countries regardless of sex. It would appear that a similar process was at work here in this study. That is, differences in behavior regulation might be related more strongly with educational opportunities and experiences rather than gender. The observed differences stemmed from school type rather than gender. The children who had more prekindergarten education, who came from more affluent homes, and who had received kindergarten education in a private school showed higher behavioral regulation regardless of gender.

Differences between the visual spatial maturity of public and private school children were also observed. Private school children performed with fewer errors than their public school counterparts on the BG. This was consistent with earlier studies (Özer, 2009). The observed gender differences on the BG Test are also consistent with earlier research (Özer, 2009; Rajabi, 2009). It has been suggested that girls pay more attention to detail (Lange-Küttner & Ebersbach, 2013) and are in general more mature at entrance to first grade (Gredler, 1992). The sex differences observed on the BG Test in this study were also indicative of girls having higher visuospatial cognitive maturity than boys. Unlike behavioral regulation, this sex difference appears to be at work regardless of school type or educational opportunities.

Phase 2 of this study involved following up with the children in first grade and obtaining teacher ratings of classroom adaptation. The purpose of this was to
examine the effects of behavioral regulation and visuospatial cognitive maturity on school adaptation. The teachers were asked to rate the children at the beginning and end of first grade. It was believed that some of the independent variables may contribute to understanding the changes from beginning to end of the year. Interestingly, the teachers’ ratings did not change significantly over the year. This may have been due to the fact that the teachers were doing a second rating and wished to stay consistent or a general opinion about the child was formed early and did not change. It was also interesting to observe that mean teacher ratings did not differ among public school and private school teachers, although it was shown that the children were significantly different in terms of behavioral regulation and visuospatial cognitive maturity. However, the teachers were asked to rate the children in comparison to other children in their classrooms, so perhaps, the teacher ratings would not reflect real differences in the maturity of the children in the two types of school. In a study on teacher evaluations (Mashburn, Hamre, Downer, & Pianta, 2007), it was suggested that cultural values and expectations may have an effect on teacher ratings. Although the children in the sample were from the same culture, they came from and were evaluated under such different conditions that the comparison of the teacher ratings may not have been that meaningful since they did not have a common reference group.

The findings observed when comparing high and low behavioral regulators in the two school types indicated that while behavioral regulation is important in public schools, it is visuospatial cognitive maturity that is valued in terms of teacher ratings in private schools. It is possible that in the large, crowded classrooms of public schools, it was important for teachers to maintain behavioral control, so attention and inhibitory skills of the children were valued more highly than academic skills. In the private schools, where most children entered with acceptable behavioral regulation following their kindergarten experience, the priority of the teachers would be academic achievement, and thus the importance of visuospatial cognitive maturity.

As predicted and consistent with earlier literature, a relationship between visuospatial skills and behavioral regulation was observed. Furthermore supporting the second hypothesis, both visual spatial skills and behavioral regulation contributed to predicting higher levels of teacher ratings. A regression analysis was undertaken to further delineate which of the factors under investigation explained the teachers’ ratings of adaptation in the first grade. It was shown in earlier studies (Özer, 2009) that visuospatial cognitive maturity as measured by the BG Test was a predictor of teacher ratings. The present study also examined the contribution of behavioral regulation. Although behavioral regulation contributed significantly in adding to the explanatory power when BG, age, and school type were all entered in a hierarchical regression in predicting teacher ratings, in a second analysis, it was observed that it was the BG that contributed mainly in explaining the change in predictive power.
As suggested in earlier studies (Wanless et al., 2011), other variables may underlie the relationship between HTKS scores and school achievement. In line with Rimm-Kaufman et al. (2009) and Connor et al. (2010), variables such as previous educational opportunities, parental educational level, and visuospatial maturity (Özer, 2009) are of such importance that when these are taken into consideration, the contribution of behavioral regulation to school adaptation is too small to detect. Cultural variables may also play a role. It has been shown that in Taiwan and China, HTKS scores were not related to teachers’ ratings of behavioral regulation (Wanless et al., 2011). Teaching practices and expectations from children differ significantly from culture to culture. In the current study, even in the same culture different patterns of development and expectations may affect school adaptation in differing educational contexts.

A major limitation of the present study was small sample size and the loss of participants from Phase 1 to 2. Although this type of attrition in sample is expected in longitudinal studies, the fact that due to sample characteristics more of the loss was from public schools may have had an effect on the results. The second limitation of the study was that in terms of school adaptation, only teachers’ ratings were utilized, and no measures of achievement were included. This was due to the fact that there are no standardized achievement measures available for children at this age in Turkish, and the two types of schools utilize different measurements of achievement. On the other hand, the use of teacher ratings was also a strong point of this study. Many of the other studies (e.g., McClelland et al., 2007; Wanless et al., 2011) have either included only measures of achievement or if they included teachers’ ratings, these were only focused on behavioral regulation. In the present study, the teachers were asked to provide ratings on academic and social adaptation.

It can be concluded from the present study that even though behavioral regulation at the kindergarten level has recently emerged as an important predictor of academic achievement in the first grades, these findings may be limited to more homogenous samples where many of the other important contributing variables to school success are controlled. In culturally and educationally different contexts such as the one in the present study, the direct developmental contribution of behavioral regulation to later achievement may be overshadowed by other more primary variables.

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