The developmental approach to physical education aims to instruct individuals in the use of their bodies so that they can execute a wide variety of fundamental movements efficiently and effectively throughout life and apply these basic abilities to a wide range of specialized movement skills for daily living, recreational, or competitive sport needs (Gallahue, 1996). During the early years of development, as children are in the process of refining fundamental movement skills, involvement in a series of coordinated and developmentally sound experiences provides a wealth of information on which to base perceptions of themselves and the world about them (Gallahue & Ozmun, 1998). Fundamental movement skills do not evolve automatically; they are related to age but are not determined by it. Mature motor patterns result from suitable educational intervention (Bouchard, McPherson, & Taylor, 1991; Gallahue, 1996). Therefore, the selection of appropriate learning experiences is one of the most crucial problems of physical education curriculum construction. The physical education teacher must constantly reflect on the extent to which the program contributes to the maximal development of each objective.

There is a general acceptance that the fundamental motor skills are refined and combined to form complex movement skills (Gallahue, 1996; Graham, 1987; O’Connor, Walkley, & Holland, 2000). The Victoria Department of Education (1996) suggests that, “most skills used in various sports and generally in physical activities are advanced forms of fundamental motor skills” (p. 4). From a practical perspective, the acquisition of fundamental motor skills is of great importance for children because it increases self-confidence and leads to more active participation in specialized movement skills in sports during school years, as well as contributing to lifelong sport behavior (Lee, Carter, & Xiang, 1995; Rose, Larkin, & Berger, 1994). In contrast, children who do not develop fundamental motor skills sufficient to meet the requirements of games and sports tend to avoid motor challenges while at the same time exhibiting behavior problems such as low self-confidence, self-esteem, and social immaturity (Larkin & Hoare, 1991; Rose, 1994).

Over the last two decades, the development of fundamental motor skills in young children has become a
priority issue in many countries. For example, in 1986, the Outcomes Committee of the National Association for Sport and Physical Education attempted to establish specific performance standards for children to achieve by completion of each grade in elementary schools [NASPE, 2004]. The resultant content standards emphasized activities to develop locomotor, manipulative, and stability skills such as running, catching, etc.

In Australia, poor performance of fundamental motor skills among first-grade children (Miller & Dickson, 1999; Walkley, Holland, Treloar, & Probyn-Smith, 1993) alarmed the Department of the Parliament of the Commonwealth as well as the Review Committee of Physical Education. This resulted in increased instructional time for fundamental motor skills in elementary schools.

In Greece, physical education has traditionally been taught by physical education teachers only at the high school, Lyceum-lower and upper secondary education levels; whereas general curriculum teachers have been responsible for physical education at the elementary school level. In the early 1990s, physical education specialists began teaching at elementary schools as well. The Greek Ministry of National Education and Religious Affairs and the Greek Pedagogical Institute published the first PE curriculum in 1997 [Ministry of National Education, 1997]. The objective of this curriculum was to improve the physical, emotional, and mental abilities of young children. Content area emphases within the curriculum include perception of time and space, balance, visual and audio coordination, sideways movement, corrective movement, respiratory exercises, rhythmic education, Greek folk dances, and creative movement.

That no content area seems to support the improvement of fundamental motor skills among young children, especially when considering the trends reported above, is discouraging. The level of fundamental motor skills in most young Greek children has been reported as below average [Derri, Zissi, & Pachta, 2001; Evagelinou & Pappa, 1996].

Though the development of all three categories of fundamental motor skills are equally important, manipulation skills are more complex to learn because they incorporate elements of both stability and locomotion. Therefore, they often develop later than skills from the other two categories. Gross motor manipulation involves an individual’s relationship to objects and is characterized by giving force to objects and receiving force from them. Such skills include throwing, catching, trapping, kicking, volleying, rolling, striking, and dribbling. Participation in many individual (e.g., tennis) or group (e.g., soccer, basketball) games requires prior development of the manipulative skills used in them [Rose, 1994].

Though only a limited number of studies have been published regarding improvement of manipulative skills, it is clear that development of fundamental manipulative skills requires specific content and teaching methods based on developmental needs derived from qualitative assessment (Burton & Miller, 1998; Gallahue, 1996). Thus, the purpose of this study was to investigate the effect of a developmental curriculum in physical education on the development of manipulative skills in first- and second-grade students in Greece.

Methods

Subjects

Participating in this study were 161 students (age in months, $M = 80$, $SD = 6.6$). All subjects were first or second-grade students from two primary schools in the town of Serres, Northern Greece. These schools were randomly selected from twelve schools in the town. Two groups were randomly selected: a Control group (34 boys, 44 girls) and an Experimental group (39 boys, 44 girls).

Instrumentation

The Object-control subtest of the Test of Gross Motor Development [TGMD; Ulrich, 1985] was used to assess manipulative skills. This test is normed for individual assessment of gross motor development in children between 3 and 10 years of age. Five object control skills are assessed (striking, dribbling, catching, kicking, and throwing). Performance descriptions of each object control skill include three to four components. One point is awarded for each skill component that is correctly performed. For example, to achieve a perfect score [4 points] on the over-arm throw, the subject must demonstrate a downward arc of the throwing arm to initiate the windup, rotation of the hip, and shoulder to a point where the nondominant side of the body faces the target, weight transfer, stepping with the foot opposite the throwing hand, and a diagonal follow through of the throwing arm after ball release.

A perfect score on the Object-control subtest is 19 points. Motor assessment of all participating children was performed at the beginning and end of the program for both groups. A verbal description of the test was followed by motor performance modeling; then children performed each skill once. An additional trial was allowed if children needed further practice. All trials were videotaped during the test and assessed by
two physical education teachers. Interscorer reliability between the two evaluators was high \( r = .93 \)

**Procedures**

The treatment lasted eight weeks, with two 45-minute classes per week (16 sessions x 45 minutes per session) and was implemented by two different physical educators. The official Greek PE curriculum was delivered to the Control group (Ministry of National Education and Religious Affairs, 1997). Specifically, the Control Group (CG) participated in (a) space and time perception activities, (b) visual-motor coordination activities, (c) static and dynamic balance, and (d) sideways movement. The Experimental Group (EG) participated in an alternative curriculum directed at improving fundamental manipulative skills. Instruction was conducted via three content areas: self-testing activities (activities that allow the students to perform individually), low organized games (activities not governed by rules and regulations recognized by an official governing body as the standard for performance and play), and rhythmic activities (activities that include fundamental rhythmic elements).

**Results**

Due to normality and homogeneity of the sample, a 2 x 2 repeated measures analysis of variance with Group as the between factor and Testing (pretest vs. posttest) as the repeated-measures factor was conducted to assess differences between the two groups, using data from the object control subtest of the TGMD (Ulrich, 1985). The results of the analysis show that for the Object-control subtest, there were a significant main effects on both the Testing factor \( F(1,159) = 405.37, p < .001 \) and the Group factor \( F(1,159) = 30.52, p < .001 \). In addition, there was a significant interaction between Group and Testing factor \( F(1,159) = 357.39, p < .001 \). The EG was scored higher than the CG during the posttest \( M = 13.19, SD = 1.81 \) and \( M = 9.4, SD = 2.21 \), respectively. Table 1 shows the results for each skill within the Object control subtest of the TGMD.

**Discussion**

In order to develop and refine fundamental motor skills, children must respond with motor control and movement competency to a variety of stimuli. Increased control in the performance of discrete, serial, and continuous movements is evidenced by the ability to accept changes in task requirements (Gallahue & Ozmun, 1998). The current study dealt with the potential influence of a balanced, developmental curriculum on learning fundamental manipulative skills in first- and second-grade. The study compared two physical education programs that differed in the curriculum content areas. The experimental group was exposed to a movement skill curriculum directed on the improvement of fundamental manipulative skills. The control group experienced a PE curriculum that emphasized space and time perception activities, visual-motor coordination activities, and static and dynamic balance activities. The most significant finding was that participants exposed to the movement skill curriculum showed considerable improvement in manipulative skills as measured by the TGMD. In fact, mean scores for the experimental group in all five manipulative skills showed an increase from pre-test to post-test. In contrast, the control group maintained the same pre-test to post-test performance. These results support a hypothesis that a balanced, developmental physical education curriculum emphasizing the improvement of fundamental manipulative skills plays an important role in the development of such skills.

These results are consistent with Ignico (1991). A competency-based assessment and instructional program over a 10-week period, with eight hours of instructional time on twelve skills, had a positive effect on gross motor development as measured by the TGMD. One explanation for the findings by both Ignico and this study is that the subjects were in an early stage of learning, a period characterized by large gains in performance.

Other studies also stress the necessity of content and performance standards related to fundamental motor skills. Children with normal development (Karabouriotis, Evaggelinou, Tzetzis, & Kourtessis, 2002) as well

**TABLE 1—Descriptive Results for Pre- and Post-Testing**

<table>
<thead>
<tr>
<th>Skill</th>
<th>Group*</th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Strike</td>
<td>C</td>
<td>1.53</td>
<td>.96</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>1.55</td>
<td>.83</td>
</tr>
<tr>
<td>Dribbling</td>
<td>C</td>
<td>1.28</td>
<td>.95</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>1.21</td>
<td>.98</td>
</tr>
<tr>
<td>Catching</td>
<td>C</td>
<td>3.36</td>
<td>.58</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>2.99</td>
<td>.82</td>
</tr>
<tr>
<td>Kicking</td>
<td>C</td>
<td>1.67</td>
<td>.53</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>1.67</td>
<td>.61</td>
</tr>
<tr>
<td>Throwing</td>
<td>C</td>
<td>1.42</td>
<td>.78</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>1.63</td>
<td>.97</td>
</tr>
<tr>
<td>Total Score</td>
<td>C</td>
<td>9.27</td>
<td>2.24</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>9.12</td>
<td>2.47</td>
</tr>
</tbody>
</table>

* C = Control Group, old curriculum
* E = Experimental Group, Developmental curriculum

Note: Items derived from the object control subtest of the Test of Gross Motor Development (Ulrich, 1985).
as children with special needs (Marshall & Bouffard, 1997; Rintala et al., 1998) should be given opportunities to develop and refine fundamental motor skills. As such, a balanced physical education curriculum at the elementary school level accommodates the developmental level of children in the program and provides numerous ways to learn, including the psychomotor, cognitive, and affective domains. Learning fundamental motor skills during this critical period (early elementary) influences children’s present as well as their future physical activity.

A fundamental motor skill intervention program, however, may not automatically result in improved performance. Miller and Dickson (1999) conducted a five-week intensive instruction program for nine- and ten-year-old boys and girls that did not significantly change performance of the overhead throw. Due to the complexity of this issue, physical educators and sport scientists should constantly reflect on questions such as these: What characteristics within a PE curriculum are most appropriate for producing motor skill improvements? What skills should PE teachers teach first and at what age? What content areas are the most influential in helping children derive maximum benefit, such as improved motor skills? (Bredekamp, 1992; Graham, 1987; Grineski, 1992).

Physical educators should also be able to identify specific performance criteria in each fundamental motor skill. For skills not yet mastered, they must be able to design learning tasks that produce significant gains in performance [Ignico, 1991]. Examples of specific performance criteria are located in the TGMD.

Fundamental motor skills form the foundation for participation in sports (Aicinena, 1992). Children who lack fundamental motor skills are likely to experience frustration and difficulty in learning advanced skills, reducing their enjoyment of sports and other activities. In addition, those who lack fundamental motor skills are more likely to experience the consequences of "public failure" [Rose, Larkin, & Berger, 1994], leading them to avoid participation in organized sport and reducing the development of a physical active lifestyle [DHHS, 1997]. Thus, the selection of appropriate learning experiences in physical education is one of the most crucial problems in physical education curriculum construction. Preservice training must include practical experiences in both assessment of children's fundamental motor skills and designing appropriate instructional activities.

References