The Effect of Peer Tutoring on Interaction Behaviors in Inclusive Physical Education

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This study assessed the effect of peer tutoring on physical, instructional, and social interaction behaviors between elementary school age students with severe and multiple disabilities (SMD) and peers without disabilities. Additional measures addressed the activity time of students with SMD. The study was conducted in inclusive general physical education settings under three instructional support conditions for students with SMD: (a) teacher-directed, (b) peer-mediated, and (c) voluntary peer support. During peer-mediated and voluntary peer support conditions, the instructional and physical interaction behaviors between students with SMD and their peers increased, while social interactions remained low. The activity engagement time data increased for all target students throughout intervention sessions. Interactions between students with SMD and teachers decreased toward the end of intervention.

In the United States, there are about 6.5 million students with disabilities served in general education schools (U.S. Department of Education, 2003). Specifically, students with severe and multiple disabilities (SMD) are included in general education settings with growing frequency (U.S. Department of Education). A major stimulus is to allow students with SMD opportunities for social and academic benefits afforded their peers without disabilities (Block, 2007; Causton-Theoharis & Malmgren, 2005; Cullinan, Sabornie, & Crossland, 1992; Johnson & Johnson, 1991). Because of unique and specific needs of these students, however, inclusion in general education settings can be extremely challenging for both special and general educators. Moreover, the challenge is perhaps heightened in physical education due to the active nature of the education environment and increased opportunities of peer interactions (Ellis, Wright, & Cronis, 1996). Therefore, the more critical problem...
for teachers is how to ensure the meaningful and safe teaching environment while encouraging positive interactions between students with and without disabilities.

The inclusion of students with SMD in general physical education (GPE) may not be successful without utilizing supplementary assistance (Block & Krebs, 1992; Murata & Jansma, 1997). Traditionally, the human resource support for students with SMD includes adapted physical education (APE) specialists or paraprofessionals (Block & Zeman, 1996; Murata & Jansma, 1997; Vogler, Koranda, & Romance, 2000). While the close proximity between a student with SMD and an instructional assistant is desirable and sometimes essential, excessive adult support can be detrimental to a student increasing his or her dependence on adults and in turn create separation from other classmates (Giangreco, Edelman, Luiselli, & MacFarland, 1997). Utilizing peers as a natural support might facilitate interactions between students with and without disabilities while also providing individualized teaching instructions (Block, 1994, 2007; Block, Klavina, & Flint, 2007; Murata & Jansma, 1997). More specifically, using peer rather than adult support is important when one of the goals of inclusion is frequent and positive interactions between students with SMD and their peers (Block & Zeman, 1996; Slininger, Sherrill, & Jankowski, 2000; Vogler et al., 2000).

Research has demonstrated that peer tutoring can be effective in the general education classroom to teach students with SMD academic skills (Cushing & Kennedy, 1997; Shukla, Kennedy, & Cushing, 1998; Werts, Wolery, Snyder, & Caldwell, 1996), social behaviors (Martella, Marchand-Martella, Young, & MacFarlane, 1995; Staub & Hunt, 1993), and activities of daily living (Gilberts, Agran, Hughes, & Wehmeyer, 2001; Greenwood & Todd, 1988). Regarding GPE settings, peer tutoring programs have been successfully applied to students with mild and moderate disabilities (e.g., DePaepe, 1985; Houston-Wilson, Dunn, Van der Mars, & McCubbin, 1997; Lieberman, Dunn, Mars, & McCubbin, 2000; Lieberman, Newcomer, McCubbin, & Dalrymple, 1997; Webster, 1987). Limited research also supports the fact that peers can be trained in providing assistance to students with SMD (Vogler et al., 2000). Along this line, Halle, Gabler-Halle, and Bemben (1989) and Block and colleagues (2001) determined that peer support can be effective in increasing physical skills and motor performance of elementary school age students with severe disabilities. However, in both studies, the peer support programs were implemented in segregated settings (e.g., Special Olympics program at a special school, university fitness laboratory) not related to GPE programs.

The inclusive general education environment is considered to be fertile soil for the development of peer interactions (Causton-Theoharis & Malmgren, 2005). Of empirical studies addressing interactions between students with and without disabilities in GPE setting, most often research has focused on academic outcome of students, while the impact of peer tutoring on interactions between students with and without disabilities (i.e., social benefits) was not discussed (e.g., DePaepe, 1985; Houston-Wilson et al., 1997; Lieberman et al., 1997, 2000; Murata & Jansma, 1997). The literature indicates that peer tutoring can be an integral part of interaction interventions, because peers provide natural contexts for peer behaviors (Block et al., 2007; Greenwood & Todd, 1988). Unfortunately, in APE research investigations addressing behavior change goals of the student with SMD, and furthermore, the enhancement of students’ with and without disabilities relationships in a larger group as the result of peer tutoring has been minimal.
Theoretical Model of Multiple-Component Interaction Behaviors in APE

While many students with SMD are starting to be included in general physical education (GPE), the theory regarding the most effective methods of achieving successful, meaningful, and mutually respectful inclusion is still relatively undeveloped in relation to the impact of contacts between students with SMD and their peers in inclusive GPE settings. From a social psychology perspective, increased shifts toward inclusion have a direct effect on the amount of interactions occurring between students with and without disabilities and on their subsequent social perceptions (Maras & Brown, 2000). Allport’s (1954/1979) contact theory highlighted four major components of favorable interactions: (a) equal status principle between participants involved in interactions, (b) significant others must promote and support equal status interactions, (c) no competition between the group participants, and (d) common goals and interests. Moreover, Allport emphasized that under certain conditions, bringing together individuals from different groups could reduce prejudice among group participants. Although Allport never applied the contact theory to persons with disabilities and never conceptualized its use in this way, this theory has inspired extensive research over the past half century across many disciplines (Pettigrew, 1998; Pettigrew & Tropp, 2000). In addition, it has received support across a variety of societies, conditions, and groups ranging from the racial segregation of schools (Stephan & Rosenfield, 1978) to the educational inclusion of children with disabilities (Harper & Wacker, 1985). Implementing effective inclusive practices involves a set of behaviors, activities, and interactions on the part of teachers and students without disabilities to provide the meaningful and successful learning environment for students with SMD. Effective instructions in inclusive settings require continuous change in the types, frequency, and quality of interactions in the teachers-students and students-students variables (Thousand & Burchard, 1990). Thus, with emphasis on the relationship between these key variables, many students with SMD are likely to receive extra instructional attention from adult support personnel, while unlikely to receive appropriate interactions from or opportunities to interact with their classmates (Cook, 2001). Figure 1 presents a model of multicomponent behaviors in physical education converging instructional, physical, and social behavior components within structured contacts between the teacher, the student with SMD, and their peers in natural GPE environment.

While conditions for successful contacts are supervised by education personnel, the use of peers as a natural support may be one way to use individualized goals of the students with SM and facilitate natural interaction behaviors between students with SMD and their peers (Block, & Vogler, 1994; Butler & Hodge, 2004; Lieberman & Houston-Wilson, 2002; Place & Hodge, 2001). The desired outcome is the generalization of interactions arising out of contact situations between peer tutors and students with SMD.

This study assessed the effects of peer tutoring on the physical, instructional, and social interactions between students with SMD and peers without disabilities. The study was conducted in an inclusive GPE setting containing three instructional conditions regarding support provided to students with SMD across baseline and intervention phases: (a) teacher-directed, (b) peer-mediated, and (c) voluntary peer support. In addition, the study examined the effects of peer tutoring on interaction behaviors between students with SMD and the adult support personnel (e.g.,
APE teacher). Additional measures addressed the activity engagement time data of students with SMD. Social validation data were obtained from two sources. First, teachers involved in this study completed a brief survey with the purpose to obtain their opinions about peer support procedures that might be used to improve tutoring strategies in future studies. Second, at the end of this study, peer tutors were asked on how they felt about their tasks and outcomes of tutoring procedures.

**Method**

**Participants and Setting**

Two elementary schools from a mid-Atlantic state in the United States served as research sites for this study. Participants included three elementary-age students with SMD and nine peer tutors from their integrated GPE class. To select target students, purposive sampling design (Goetz & Le Compte, 1984) was used including students who were (a) representative of persons with SMD, (b) included in the GPE with support of adult personnel (e.g., APE instructor, teacher assistant), and (c) expected to increase participation in physical activities with age appropriate peers as indicated in their IEP for physical education. In this study, students with SMD were addressed as Eric, Laura, and Mary (pseudonyms). All three target students attended self contained classroom for more than 60% of their school day. Eric was a 9-year-old boy with Ataxia-Telangiectasia, a hereditary degenerative disorder with a severe loss of coordination and balance. In addition, he had limited communication skills. During the GPE class, Eric often needed two persons’ assistance to transfer in the gym and participate in activities. Classmates...
seemed to like him, although it was challenging for them to do activities together or to communicate with Eric. *Laura* was an 8-year-old girl with severe intellectual disabilities. She also had moderate motor difficulties, poor body awareness, and severe speech difficulties. Her behavior sometimes was disruptive and non-compliant, which seemed to be related to attempts to avoid the task. Her current IEP-PE goals included objectives related to ball skills, gross motor skills, and participation in collaborative games with peers without disabilities. *Mary* was a 9-year-old girl with cerebral palsy, severe mental retardation, and very limited vocabulary. She needed physical assistance in all activities during GPE class (e.g., following directions, participating in individual tasks, or games). Mary’s current IEP-PE objectives included goals related to her participation in GPE activities together with peers given moderate verbal and physical assistance. All students were included in the GPE class for full time (i.e., 90–120 min per week).

Nine general education students served as peer tutors (four for Eric, two for Laura, and three for Mary). They were selected from general education classes in which target students were included when attending GPE. The first author presented the general information about the research study for the whole class and called for volunteers. From 18 students who volunteered, 13 returned signed parents or guardian permission forms. In addition, the classroom teachers and GPE teachers were asked to recommend tutors whom they thought to be most appropriate based on their opinion on students’ skills and abilities to follow the requirements of the peer tutoring program. Thus, the final nine participants were selected by the APE and GPE teachers from the pool of students who showed interest in participating and could commit their time during the study. In addition, all students were required to have parental permission to be video recorded.

The GPE classes taught by GPE teachers were 45 min in length and held twice or three times per week for each class. Class sizes were about 25–30 students. The elementary GPE program followed a model in which sport units were organized in 1–2 weeks blocks. For example, the jump-rope unit was followed by the soccer unit, and then the basketball unit. The classes consisted 5–10 min of the warm-up period, 15–25 min of the main part, and 5–10 min of games at the end of class. The APE service in this study was provided by two full-time APE teachers. Special education personnel represented teacher assistants providing supports to students with SMD throughout their school day. Their assistance during GPE classes differed among target students. For example, Eric received support from both the teacher assistant and the APE teacher at the same time, while Laura and Mary received help only from the APE specialist.

**Variables**

The primary dependent variables were instructional and physical interaction behaviors between students with and without disabilities. These measures distinguished interactions between (a) the student with SMD and peer tutors and (b) the student with SMD and other peers without disabilities, not designated as peer tutors. In addition, the interaction behaviors between the student with SMD and adult support personnel were determined.

*Physical interaction behaviors* encompassed one-to-one interactions related to the GPE activities, or IEP-PE objectives for student with SMD (e.g., the student with SMD is engaged in GPE activities with physical assistance from a peer tutor).
Instructional interaction behaviors are any verbal or nonverbal instructions received from/or directed to other(s) to complete the task related to GPE (e.g., prompts, demonstrating the task, providing error correction, providing assistance).

In addition, the social interaction behaviors were analyzed, which included verbal or nonverbal communication on content not related to GPE (e.g., chatting with a friend, complimenting about the dress or shoes). While these behaviors were not related to the GPE, they might affect social acceptance and relationships between students with SMD and their peers without disabilities (Block & Malloy, 1998; Sherrill, Heikinaro-Johansson, & Slininger, 1994; Slininger et al., 2000).

Data Collection

In this study, data were collected for a total of 46 GPE sessions. The length of each observation session was 30 min divided in two parts: (a) 20 min of peer-mediated instructional condition and (b) 10 min of voluntary peer support. A single subject delayed multiple baseline research design across participants was used. All observation sessions were collected on videotapes with the use of the SONY Digital Handycam. The student with SMD wore a wireless microphone to enable the first author to monitor interaction behaviors.

During teacher-directed (i.e., baseline) conditions, the APE teacher provided assistance to students with SMD applying the same instructional strategies they used with their students before the study. No additional instructions were given to teachers, thus data were obtained from intact inclusive GPE sessions. The APE teacher sometimes asked random general education students to join the peer with SMD in activities (e.g., passing back the ball, being the partner). General education students were not instructed on how to assist the student with SMD, however.

Peer Tutor Training. The first author conducted three, 30-min training sessions for peer tutors in each research site across three consecutive days. These sessions were organized during free periods of the school day so that it did not negatively affect students’ education program. If students had physical education class the same day as training session, data were not collected that day (it was a case only in the one school). The student with SMD and his or her teacher assistant attended the second and third session. The peer tutor training manual was provided by the first author including instructions, called TIP-TAP steps (i.e., Tips to Teach, Assist, and Practice). At the beginning, the first author and tutors discussed differences in people. The main purpose of this discussion was to teach tutors empathy and compassion so that they would learn to treat their classmates with disabilities the way they would like to be treated. In addition, rules and roles of being a peer tutor were discussed (e.g., being friendly, talk softly, and providing praises). Then, the five TIP-TAP steps were introduced: (a) instructions (e.g., cues, prompts), (b) demonstration, (c) physical assistance, (d) feedback, and (e) error correction. On the second and third session, students, including student with SMD, were assigned to work in pairs to practice the TIP-TAP steps. Selected activities matched the GPE sport unit in particular schools and allowed implementing training practice appropriate to the real GPE class situation. All activities were monitored by the first author to ensure that each tutor had an opportunity to practice with the target student. During the last training session, assessment trials were completed for each peer tutor when he or she was paired with the student with SMD. Peer tutors had to reach the 90%
criterion regarding providing teaching instructions for three consecutive trials. To determine the effectiveness of the training program, peer tutors were asked to complete the peer tutor evaluation forms. Tutors had to score 100% in this evaluation.

During peer-mediated instructional conditions, the APE teacher initiated tutoring procedures assigning the peer tutor(s) to assist the student with SMD. Then, he or she monitored tutoring activities from about a 3–5 m distance and ensured a systematic rotation of peer tutors every 10 min so that none of the tutors would get tired or overwhelmed during the tutoring process. The APE teacher intervened if peer tutors did not provide instructions correctly or if other conditions were detected that might hinder safe and successful participation of any student (e.g., the student with SMD demonstrated disruptive behavior). In addition, peer tutors were reminded to call for teachers’ help if they could not manage noncompliant behavior of their tutees. The APE teacher prompted the peer tutor to interact with the student with SMD if no interactions were occurring for about 20 s during the tutoring period. The teacher praised both the peer tutor and the student with SMD on successful partnership and collaboration to help maintain students’ confidence and enjoyment during tutoring (Cole, 1988; Logan et al., 1998). In addition, ongoing feedback was provided to peer tutors after each GPE class to correct interaction behaviors and improve the ways they provided teaching instructions.

The period of voluntary peer support followed immediately after the peer-mediated instructional condition for the last 10 min of GPE sessions. This part of the class usually was designated for collaborative games, or other activities encouraging spontaneous and voluntary interactions between students, while maintaining high level of participation (e.g., parachute games, activities in pairs). After the period of assigned tutoring, the APE teacher provided tutors a question as to whether they would be willing to assist students with SMD during the last part of the class. For example, the teacher told all peer tutors, “Thank you for a great job! Next, you have a choice whether you want to continue assisting Eric, or you may go back to activities.” While one might assume that peer tutors likely would show willingness to continue tutoring after being trained and having opportunity to practice their skills, this assumption is biased when including students with SMD. Peers without disabilities require more effort and receive less pleasure when playing or interacting with students with SMD (Cole, 1988). Based on social learning theory and empirical research in special education (Shukla et al., 1998; Werts et al., 1996), the cost of benefits has obscure implications for the longevity of natural and voluntary interactions between elementary age students with SMD and their peers if no external factors (e.g., directed by teachers) or internal reinforcements (e.g., good feeling about mutual interactions) available. Thus, if any of tutors agreed to continue tutoring, the teacher let him or her to do so. Otherwise, the teacher assisted the student with SMD. In addition, general education students could join or assists the peer with SMD in activities at any time. As a result, this phase focused on determining if general education students (peer tutors and others) would initiate and engage in voluntary and spontaneous interaction behaviors with the student with SMD.

Data Analyses

The data of the main (20 min) and the last part (10 min) of GPE sessions were analyzed separately. The first author used the Computerized Evaluation Protocol
of Interactions in Physical Education (CEPI-PE; Klavina & Selavo, 2006) to code recorded tapes (Figure 2a). The CEPI-PE operational measurements in three main behavior categories (instructional, physical, and social) are classified as interaction behaviors according to the subcategories in which observable behaviors are manifested, and to whom the behavior is directed (Figure 2b; Table 1; the complete definitions of codes with examples are available by request to the first author).

For example, if the student with SMD was involved in GPE activities while receiving physical assistance from the peer tutor, “Ap” was recorded. If the peer tutor provided general feedback to the student with SMD, then “Fg” was recorded. The interaction behaviors can be observed and coded using interval or continuous recording techniques. In this study a five-second observation and five-second record partial interval system was applied. The obtained data were analyzed based on percentage mean scores and visual inspection of graphs.

The CEPI-PE categorical variables have been validated in two pilot studies for its use with elementary school students in GPE setting (Klavina, 2007). During development of the CEPI-PE as a new instrument, the face validity was analyzed by asking subject matter experts (Anastasi, 1988) to offer a professional opinion and feedback on this instrument. The face validity for the CEPI-PE was established via panel of six internationally known experts (three professors and three assistant professors) from the United States (U.S.), Israel, and Czech Republic holding well-respected reputations in the APE area and having publications on behavior measures of students with and without disabilities. Panelists were asked to critique the CEPI-PE instrument based on terminology, coding,

Figure 2(a) — Visual display of the CEPI-PE.
and relevance as a measure applicable for students with and without disabilities. Feedback obtained from experts indicated that the CEPI-PE demonstrates face validity of the multiple behavior measures of students with and without disabilities and that such measures contributes knowledge base of the APA domain overall.

Pilot study I was conducted to evaluate the reliability of the CEPI-PE as measured by the intraclass correlation coefficient, kappa coefficient, and percentage agreement. In this study, two purposively selected elementary school age students with SMD receiving APE teachers’ assistance were observed for five 15-min sessions during GPE classes where they participated together with age appropriate peers (n = 25). The interaction behaviors between target students, APE teachers and other classmates were recorded and coded with the CEPI-PE. The results indicated that interobserver and intraobserver reliability coefficients were adequate within acceptable limits. In addition, study results revealed that both students with SMD had considerably more frequent interactions with the APE teacher than with other peers.

Pilot study II was conducted to determine a concurrent validity of the CEPI-PE as compared with the standardized and well established measures of the Basic Academic Learning Time–Adapted Physical Education (B-ALT-APE). In this study, 32 elementary age students were randomly selected and observed during GPE sessions for about 10 min (i.e., 4.7 hr overall). Based on the results of this initial validation study, it was found the CEPI-PE to be a valid tool to analyze and

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**Figure 2(b)** — The relation paths between the main and subcategories of the CEPI-PE.
Table 1  Codes of the CEPI-PE

<table>
<thead>
<tr>
<th>Instructional Interaction Codes</th>
<th>Activity/Physical Interaction Codes</th>
<th>Social Interaction Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C — cue delivery</td>
<td>A — activity engagement independently of all help</td>
<td>Sp+/- positive (+), or Negative (-) social interactions with a peer tutor</td>
</tr>
<tr>
<td>P — prompting</td>
<td>Ap — activity engagement with assistance from a peer tutor</td>
<td>St+/- positive (+), or negative (-) social interactions with a teacher</td>
</tr>
<tr>
<td>Fg — general feedback</td>
<td>Fs — specific feedback</td>
<td>So+/- positive (+), or negative (-) social interactions with an other peer</td>
</tr>
<tr>
<td>Fc — corrective feedback</td>
<td></td>
<td>Ss+/- positive (+), or negative (-) social interactions with the student with SMD</td>
</tr>
<tr>
<td></td>
<td>At — activity engagement with assistance from a teacher</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ao — activity engagement with assistance from an other peer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>As — activity engagement together with the student with SMD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IA, IAp, IAt, IAo, IAs — the same definitions as activity codes, but these concern the students with SMD IEP-PE directed activities.</td>
<td></td>
</tr>
</tbody>
</table>

N - does not present any of behaviors defined above, or person is not visible during particular observation interval.
describe interaction behaviors demonstrated by elementary age students in GPE in relation to a well-established students’ B-ALT- APE measure.

Data Display

For all target students with SMD, the graphic representation of combined physical, instructional, and social interaction behaviors was displayed according to whom interactions were directed (e.g., peer tutors, teacher) during observation sessions. While this study primary focused on examining experimental changes in interaction behaviors between students with SMD, their peers and adults after peer tutoring intervention was introduced, the additional variable of interest also was behaviors presented by peer tutors, particularly instructional behaviors. The mean percentage of combined interaction behaviors demonstrated by tutors was displayed in histograms, and results of tutor instructions were presented in tables.

Interobserver Agreement

Interobserver agreement was assessed with a trained second observer for an average of 30% (28–32%) of all observations. The percentage agreement and the Cohen’s kappa statistic (Cohen, 1960) were used for the interval level agreement since it corrects for agreement by chance. Table 2 presents interobserver agreement scores for the three target students across three experimental conditions.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Kappa and Percentage Agreement (Po) Scores of Interobserver Agreement Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects</td>
<td>Teacher Directed</td>
</tr>
<tr>
<td></td>
<td>Kappa</td>
</tr>
<tr>
<td>Eric</td>
<td>.83</td>
</tr>
<tr>
<td>Peer Tutor(s)</td>
<td>.77</td>
</tr>
<tr>
<td>Teacher</td>
<td>.83</td>
</tr>
<tr>
<td>Laura</td>
<td>.81</td>
</tr>
<tr>
<td>Peer Tutor(s)</td>
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</tr>
<tr>
<td>Teacher</td>
<td>.70</td>
</tr>
<tr>
<td>Mary</td>
<td>.71</td>
</tr>
<tr>
<td>Peer Tutor(s)</td>
<td>.71</td>
</tr>
<tr>
<td>Teacher</td>
<td>.70</td>
</tr>
</tbody>
</table>
Results

Results of the Peer-Mediated Instructional Condition

During GPE periods under *teacher-directed* instructional conditions (i.e., baseline) the scores for interaction behaviors between students with SMD and selected yet not trained peer tutors were variable (Figure 3). The mean score for Mary was 23.3%, which was higher than for Eric and Laura (M = 6.9%, M = 5.3%, respectively). This variability may be attributed to the alternating involvement of selected general education students in interactions with peers with SMD as directed by the APE teacher in each site. The interaction behaviors between target students and other peers were low across all participants (range, .8–2.1%). In contrast, the interaction behaviors with adult support personnel were high for all target students (range, 33.1–48.9%). It should be noted that obtained data did not include intervals when there were no interactions performed by the observed participant (e.g., waiting time).

Figure 3 illustrates that the introduction of *peer-mediated* instructional conditions resulted in an immediate increase in interaction behaviors with peer tutors for all target students. For Eric, the mean score was 60.2% (range, 35–87.5%), for Laura 63.4% (range, 35–87.5%), and for Mary it was 73% (range, 60–80%). Mean scores for interaction behaviors between students with SMD and other peers were slightly higher during peer-mediated than in teacher-directed conditions (range, 5.4–10.8%). In contrast, interaction behaviors with adult support personnel decreased for all target students (range, 11.1–13.4%).

Furthermore, the mean and range of subcategories of interaction behaviors for students with SMD and persons to whom the particular student directed behaviors across the teacher-directed and peer-mediated conditions are illustrated in the Table 3. These data shows that target students did not provide any instructions, while they were mostly engaged in GPE related activities with the teacher during teacher-directed conditions and with peer tutors during peer-mediated conditions. The social interaction behaviors remained low throughout the study, indicating that students did not engage in conversations or in nonverbal interactions not related to GPE content.

The additional variables of interest, interaction behaviors demonstrated by peer tutors, are presented in Figure 4 and Table 4. During intervention, the peer tutors of Mary and Laura more frequently demonstrated instructional behaviors (M = 35.2% and M = 55.7%, respectively), while Eric’s peer tutors more often were engaged in physical interaction behaviors (36.5%; Figure 4). Of instructional interactions, tutors considerably increased prompt scores (Table 4). Peer tutors did not demonstrate any negative social behaviors toward students with SMD. Thus, all social interactions illustrated in Figure 4 were positive.

Results of the Voluntary Peer Support Condition

As indicated before, the voluntary peer support condition followed immediately after the peer-mediated condition for the last 10 min of the GPE class. The teacher-directed or baseline data of this condition replicated baseline data from the main
Figure 3 — Percentage of intervals when student with SMD interacted with teacher, peer tutors, and other peers across teacher-directed and peer-mediated instructional conditions.
Table 3  Means and Ranges of Interaction Behavior Subcategories for Students With SMD Across Teacher-Directed and Peer-Mediated Conditions

<table>
<thead>
<tr>
<th>Student</th>
<th>Phase</th>
<th>At</th>
<th>Ap</th>
<th>Ao</th>
<th>St+</th>
<th>Sp+</th>
<th>So+</th>
<th>St-</th>
<th>Sp-</th>
<th>So-</th>
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<tbody>
<tr>
<td></td>
<td>Teacher-Directed</td>
<td>18.3</td>
<td>2.1</td>
<td>.5</td>
<td>6.3</td>
<td>.3</td>
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<td>.0</td>
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<tr>
<td></td>
<td></td>
<td>(16-22)</td>
<td>(1-3)</td>
<td>(0-2)</td>
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<td>(0-1)</td>
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<tr>
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<td>Peer-Mediated</td>
<td>3.4</td>
<td>20.5</td>
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<td>1.8</td>
<td>4.8</td>
<td>1.2</td>
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<td>(0-7)</td>
<td>(0-2)</td>
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<tr>
<td>Laura</td>
<td>Teacher-Directed</td>
<td>10.2</td>
<td>1.1</td>
<td>.4</td>
<td>1.5</td>
<td>.5</td>
<td>.4</td>
<td>1.2</td>
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<tr>
<td></td>
<td>Peer-Mediated</td>
<td>2.7</td>
<td>22.7</td>
<td>1.0</td>
<td>1.6</td>
<td>2.2</td>
<td>.7</td>
<td>1.8</td>
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<td>Mary</td>
<td>Teacher-Directed</td>
<td>16.2</td>
<td>8.1</td>
<td>.2</td>
<td>.7</td>
<td>.7</td>
<td>.1</td>
<td>.4</td>
<td>.0</td>
<td>.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(9-21)</td>
<td>(5-17)</td>
<td>(0-1)</td>
<td>(0-3)</td>
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<td>(0-2)</td>
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</tr>
<tr>
<td></td>
<td>Peer-Mediated</td>
<td>3.8</td>
<td>24.8</td>
<td>3.5</td>
<td>.5</td>
<td>3.8</td>
<td>.5</td>
<td>0</td>
<td>.6</td>
<td>.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0-12)</td>
<td>(18-30)</td>
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<td>(0-2)</td>
<td>(1-8)</td>
<td>(0-2)</td>
<td>(0-3)</td>
<td>(0-1)</td>
<td></td>
</tr>
</tbody>
</table>

Note. At = Activity with assistance from teacher, Ap = Activity with assistance from peer tutor, Ao = Activity with assistance from other peer, St +/- = social positive (+) or negative (-) interaction with the teacher, SP +/- = social positive (+) or negative (-) interaction with the peer tutor, SO +/- = social positive (+) or negative (-) interaction with the other student.

part indicating limited interactions between target students and students without disabilities (Figure 5). The interaction behaviors with other peers were low for all target students (range, .8–3.7%), while all target students had highest scores for interactions with the teacher (range, 36.9–52.5%). As during peer-mediated intervention, target students demonstrated limited social interactions across teacher-directed and voluntary peer support conditions (Table 5).

The data from voluntary peer support conditions indicates high variability in data for all target students that may be attributed to the alternating support of tutors and other classmates to peers with SMD across the last periods of GPE classes. The mean scores of interaction behaviors with peer tutors increased for all students with SMD (range, 31.9–46%). As during peer-mediated conditions, tutors of Mary and Laura more frequently used instructions (21.6% and 19.8%, respectively), while tutors of Eric more frequently were engaged in physical interaction behaviors (28.0%; Figure 6). All tutors particularly increased prompting comparing to other instructions (Table 6).

Interestingly, during the last periods of the GPE class, all target students had the highest scores in interaction behaviors with other peers (Figure 5), the mean scores ranging from 16.4 to 32.5%. However, these data patterns did not present stability and predictability throughout the intervention sessions. Finally, the mean scores in interaction behaviors with the teacher decreased during voluntary peer support across all target students (range, 10.8–20.7%).
Figure 4 — Mean percentage of intervals in physical, instructional, and social interactions for peer tutors with students with SMD across teacher-directed and peer-mediated instructional conditions.
Table 4  Mean Percentage of Intervals in Instructional Interaction Behaviors Demonstrated by Peer Tutors Across Teacher-Directed and Peer-Mediated Conditions

<table>
<thead>
<tr>
<th>Peer Tutors</th>
<th>Phase</th>
<th>P</th>
<th>C</th>
<th>Fg</th>
<th>Fs</th>
<th>Fc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eric’s Peer Tutors</td>
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<td></td>
<td>Peer-Mediated</td>
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<tr>
<td>Laura’s Peer Tutors</td>
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<td>.0</td>
</tr>
<tr>
<td></td>
<td>Peer-Mediated</td>
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<td>8.4</td>
<td>3.4</td>
<td>6.8</td>
</tr>
<tr>
<td>Mary’s Peer Tutors</td>
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<tr>
<td></td>
<td>Peer-Mediated</td>
<td>12.9</td>
<td>8.7</td>
<td>6.5</td>
<td>2.5</td>
<td>4.6</td>
</tr>
</tbody>
</table>

*Note.* P = Prompt, C = Cue, Fg = Feedback General, Fs = Feedback Specific, Fc = Feedback Corrective

**Activity Engagement Time Data for Students With SMD**

With data for each phase combined and displayed, a clear pattern of a greater activity engagement emerges during intervention phases utilizing peer-mediated and voluntary peer support conditions (Figure 7). For Eric the increase was from an average score of 50.3% during baseline to an average score of 61.7% during intervention, for Laura the mean score increased from 46.2 to 68.9%, and for Mary from 61.3 to 85%.

In summary, along with the teacher-directed data being lower than peer-mediated and voluntary peer support data, the current study findings showed the functional relationship between an independent variable (i.e., implementation of peer tutoring) and dependent variable (i.e., interaction behaviors between students with SMD and students without disabilities).

**Social Validity**

Seven teachers and nine peer tutors involved in this study completed their surveys. All teachers indicated that interactions between students with and without SMD increased during intervention phases. Four teachers reported that they noticed that students with SMD enjoyed being assisted by their classmates from the beginning of intervention sessions, while three stated that tutees needed some time to adjust to tutors’ continuous presence and instructions. Regarding peer tutors’ performance, teachers reported observable social growth in these students and positive acceptance toward classmates with SMD. Some teachers commented that “it was a positive experience for both students.” When asked about the applicability of peer tutoring for students with SMD in GPE setting, all teachers’ responses were in agreement
Figure 5 — Percentage of intervals when students with SMD interacted with teacher, peer tutors, and other peers across teacher-directed instructional condition and voluntary peer support.
Table 5  Means and Ranges of Interaction Behavior Subcategories for Students With SMD across Teacher -Directed and Voluntary Peer Support Conditions

<table>
<thead>
<tr>
<th>Student</th>
<th>Phase</th>
<th>At</th>
<th>Ap</th>
<th>Ao</th>
<th>St+</th>
<th>Sp+</th>
<th>So+</th>
<th>St-</th>
<th>Sp-</th>
<th>So-</th>
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</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Eric</td>
<td>Teacher-Directed</td>
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<td>.1</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Voluntary Peer Support</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Laura</td>
<td>Teacher-Directed</td>
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<td>1.1</td>
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<td>1.1</td>
<td>.2</td>
<td>.4</td>
<td>0</td>
<td>0</td>
<td>.1</td>
</tr>
<tr>
<td></td>
<td>Voluntary Peer Support</td>
<td>2.5</td>
<td>5.6</td>
<td>1.8</td>
<td>.8</td>
<td>.5</td>
<td>.7</td>
<td>.4</td>
<td>.3</td>
<td>.2</td>
</tr>
<tr>
<td>Mary</td>
<td>Teacher-Directed</td>
<td>6.5</td>
<td>4.2</td>
<td>.5</td>
<td>.6</td>
<td>.1</td>
<td>.0</td>
<td>.5</td>
<td>.1</td>
<td>.0</td>
</tr>
<tr>
<td></td>
<td>Voluntary Peer Support</td>
<td>1.8</td>
<td>7.6</td>
<td>5.6</td>
<td>3</td>
<td>1.3</td>
<td>.5</td>
<td>.0</td>
<td>.1</td>
<td>.3</td>
</tr>
</tbody>
</table>

Note. At = Activity with assistance from teacher, Ap = Activity with assistance from peer tutor, Ao = Activity with assistance from other peer, St+/− = social positive (+) or negative (-) interaction with the teacher, Sp+/− = social positive (+) or negative (-) interaction with the peer tutor, So+/− = social positive (+) or negative (-) interaction with the other student.

that it was feasible to implement the intervention in GPE environment. Finally, teachers recommended that peer tutoring intervention should involve more peer tutors so that each general education student would have a chance helping the peer with SMD. Teachers also suggested the need for more thorough training for peer tutors, especially regarding safety issues.

When peer tutors were asked about physical performance of their tutees, four tutors rated it as “very good,” four as “good,” and one as “moderate.” Seven tutors reported that they did not know about peer tutoring before this study. Eight tutors indicated that their attitude toward the peer with SMD improved, while for one it did not change. Some tutors anecdotally noted that the tutee would be “unable to participate in activities” before the study, but they realized that their friend was capable “of doing many things together with other classmates.” Tutors mentioned that getting to know their tutee and helping him or her participate in GPE activities was the best experience in this study. When asked to indicate the most challenging experience, three students mentioned their worries with some safety aspects for the tutee or themselves. These responses included comments of “being afraid of being responsible for tutee’s name injuries,” “it hurt when tutee’s name accidentally hit us.” Eight tutors indicated that they would like to participate in peer tutoring activities in future, while one peer tutor reported negatively.
Figure 6 — Mean percentage of intervals in physical, instructional, and social interactions for peer tutors with students with SMD across teacher-directed and voluntary peer support instructional conditions.
### Table 6  Mean Percentage of Instructional Interaction Behaviors Demonstrated by Peer Tutors Across Teacher-Directed and Voluntary Peer Support Conditions

<table>
<thead>
<tr>
<th>Peer Tutors</th>
<th>Phase</th>
<th>P</th>
<th>C</th>
<th>Fg</th>
<th>Fs</th>
<th>Fc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eric’s Peer Tutors</td>
<td>Teacher-Directed</td>
<td>.5</td>
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<td>.0</td>
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<tr>
<td></td>
<td>Voluntary Peer Support</td>
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<td>2.5</td>
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<td>.0</td>
</tr>
<tr>
<td>Laura’s Peer Tutors</td>
<td>Teacher-Directed</td>
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<td>.6</td>
<td>.3</td>
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<td>.0</td>
</tr>
<tr>
<td></td>
<td>Voluntary Peer Support</td>
<td>4.2</td>
<td>2.8</td>
<td>2.1</td>
<td>1.4</td>
<td>.0</td>
</tr>
<tr>
<td>Mary’s Peer Tutors</td>
<td>Teacher-Directed</td>
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<td>.0</td>
<td>2.5</td>
<td>.0</td>
<td>.0</td>
</tr>
<tr>
<td></td>
<td>Voluntary Peer Support</td>
<td>9.1</td>
<td>4.1</td>
<td>5</td>
<td>2.5</td>
<td>.8</td>
</tr>
</tbody>
</table>

*Note.*  
P = Prompt, C = Cue, Fg = Feedback General, Fs = Feedback Specific, Fc = Feedback Corrective

**Discussion**

This study demonstrated the effect of peer tutoring on the interaction behaviors between students with SMD and students without disabilities in inclusive GPE setting. The data of behaviors collected under teacher-directed conditions indicated high level of interactions between students with SMD and adults. Regarding interactions with prospective peer tutors, all target students occasionally interacted with selected students as a result of teachers’ instructions and positive attitude of individual general education students. For example, the anecdotal notes collected throughout the study indicated that general education students in Mary’s class demonstrated positive attitude toward her throughout the study. In contrast, classmates of Laura and Eric did not show any initiative to approach or interact with their peers with SMD. Anecdotal notes indicated that both Eric and Laura often were taken to a side of the gym or left sitting alone during activities that negatively affected their activity engagement time as well as interactions with other classmates. The social isolation and segregation of both target students may be attributed to continuous assistance by an adult(s) presented before the study. For example, while Eric received instructional support from the APE teacher in activities, the teacher assistant physically assisted him in standing, walking, or sitting resulting two adults providing support. Overall, the continuous close proximity of the assistant personnel increased target students’ dependence on adults and limited their interactions with classmates. In support of this, several authors have noted that the prolonged close proximity of adult support personnel adversely affected interactions between students with and without disabilities while at the same time increasing social isolation and loss of independence for students with disabilities (Causton-Theoharis & Malmgren, 2005; Giangreco et al., 1997; Giangreco, Broer, & Edelman, 1999; Giangreco, Edelman, & Broer, 2001).

When peer-mediated conditions containing trained peer tutor intervention were initiated, interaction behaviors between target students and peer tutors raised immediately across the three research sites (see Figure 3). Peer tutors tended to use the TIP-TAP accurately and successfully to instruct and assist their tutees. In turn, students with SMD accepted these instructions and engaged in high rates
Figure 7 — Percentage of intervals in activity engagement for students with SMD across study phase.
of interaction behaviors. Thus, it is not surprising that for all target students, the level of interaction behaviors with peer tutors significantly increased and was maintained under peer-mediated conditions. These results replicate findings of previous studies demonstrating that peer tutoring can contribute the meaningful academic engagement and successful collaboration between students with and without disabilities in inclusive GPE (Houston-Wilson et al., 1997; Lieberman et al., 1997, 2000; Murata & Jansma, 1997). The visual analyses of graphed data illustrating interactions between target students and peer tutors revealed that none of intervention data points overlapped with those of baseline. In addition, the peer tutor rotation procedures could have been a reason for maintenance of the high level of interaction behaviors between students with SMD and tutors. Again, this is supported by research in which the use of multiple peer tutors for students with SMD resulted in a higher level of fitness (Halle et al., 1989) and improved academic participation in the classroom (Martella et al., 1995). Social interaction behaviors remained low for all target students throughout this study, however. Along this line, the implementation of peer-mediated instructional conditions contributed in slight increase of negative social behaviors demonstrated by Laura and Mary toward their peer tutors. The possible explanation could have been the change of learning environment requiring them to follow instructions provided by peers rather than by adults. In addition, during peer-mediated conditions, tutors considerably increased the number of prompts (Table 4). These findings are important because they indicate that tutors had to provide multiple prompts to tutees before receiving the desirable activity response. For example, Laura’s noncompliant behavior and limited cognitive skills resulted in a large number of prompts provided by her peer tutors.

Furthermore, the interaction behaviors between students with SMD and other peers also slightly increased during peer-mediated conditions. Anecdotal notes indicated that students not designated as peer tutors occasionally joined the target students’ dyad and showed desire to assist in activities. For example, they asked the APE teacher on how to provide assistance or helped by passing back the ball or holding the rope while the peer tutor prompted the student with SMD to complete activity. The common feature across all research sites was that general education students who were not peer tutors first approached an adult (i.e., the APE teacher, teacher assistant, or first author) to ask permission for joining and helping the target student while they never directly came up to the student with SMD. These situations indicated a superior role of the adult leading other students to perceive the peer with disabilities with an adult person as a “package deal” (Giangreco et al., 1997). The possible explanation also could have been the teachers’ involvement in monitoring of the peer tutoring process and their occasional help to peer tutors regarding instructions and physical assistance to the student with SMD. Since APE teachers were located in about 3–5 m distance from the target dyad, it was difficult to capture and collect data on APE teachers’ instructional engagement in peer tutoring. Moreover, the camera was focused on the student with SMD who also had a microphone, therefore limiting the recording of verbal sounds coming from the distance. Because of these technical restrictions, the teachers’ interactions with peer tutors were not examined in this study. Anecdotal notes indicated that teachers prompted and corrected tutors several times (3–5) during the first intervention sessions while their involvement decreased as study progressed and tutors mastered their skills.
The data of voluntary peer support sessions were the core of this study showing whether students with and without disabilities would engage in voluntary and spontaneous interactions during GPE periods following immediately after peer tutoring procedures. The visual analyses of graphed data revealed a large variability in scores (see Figure 5). Despite the alternating declines in the data paths, the interactions of students with SMD with peer tutors and with other peers were well above the data of teacher-directed conditions. Anecdotal notes reported that peer tutors showed willingness to help the student with SMD also during the last period of GPE class. They did not maintain continuous assistance for the whole period, however. If another classmate approached the target student, the tutor let him or her to take over while providing the classmate with brief instructions regarding assistance. On the other hand, peer tutors tended to maintain more interactions with students with SMD than other classmates throughout all sessions. It may be argued that a hierarchical relationship could have been established between tutors and students with SMD as the result of assigned peer tutoring. The outcomes of this study might be different if the voluntary peer support phase would occur before the tutoring intervention, or if the maintenance phase would be added for gathering voluntary peer support data. The findings from similar studies (Helmstetter, Peck, & Giangreco, 1994; Hughes et al., 2000), however, are inconclusive regarding the effect of the role of peer tutors on the development of interactions among students with and without disabilities. In this regard, several researchers (e.g., Block, Hornbaker, & Klavina, 2006; Greenwood & Todd, 1988; Slininger et al., 2000) emphasized the importance of peer involvement as a necessary part of interventions because peers provide natural contexts for targeted interaction behaviors. For all target students, participation together with classmates allowed them not only to be exposed to the GPE activities but also provided them with the sense of being included in the class. For example, Eric became affiliated with a group of students, including tutors and nontutors, who assisted him in activities and also included Eric in social conversations. Along this line, Goodwin and Watkinson (2000) found that factors contributing to positive experiences for students with physical disabilities in GPE were a sense of belonging and companionship.

The activity engagement data showed a steady data path for all students with SMD during teacher-directed conditions. However, these data demonstrated an accelerating trend across peer-mediated and voluntary peer support conditions (see Figure 7). The alternating support provided by trained peer tutors and other classmates had a positive effect on activity engagement measures for students with SMD overall. The mean scores of activity engagement data across the three target students increased for 11–23.7% (see Figure 7). While these findings were similar to those of Lieberman and colleagues (1997), they run contrary to the outcomes of other peer tutoring studies (e.g., Murata & Jansma, 1997; Webster, 1987) where students with disabilities had considerably lower motor activity engagement across peer intervention phases. Moreover, previous studies involving students with moderate and mild disabilities and utilizing ALT-PE measures (i.e., DePaepe, 1985; Lieberman et al., 1997; Webster, 1987), distinguished “transition” variables from “appropriate activity engagement” variables. In the current study, activity time data for students with SMD were classified as the engagement in GPE activity and also transition time from one activity place to another. Students with SMD who have very limited functional capabilities and learning potential movements such as walking, running, and basic object control skills (e.g., passing a ball), require a
lot of effort and strength. In support of this, Block, Hornbaker and Klavina (2006) suggested that physical education teachers consider basic motor skills such as pushing a wheelchair, walking with a gait trainer, or using assistive device for the functional assessment of students with SMD.

In summary, examining the relationships between students-teachers and students-students interaction behaviors through the use of the data collecting instrument, which included the contextual variables of both students and teachers, provided a realistic approach to determine and understand the advantages and/or problems of peer support instructional strategies in GPE settings. The current findings would be more strongly supported, however, if future research would include measures of multiple interaction behaviors to supplement the data presented in this study.

**Limitations**

There were several limitations in this study that should be noted. First, a purposive sample selection was used to select the targeted students with SMD. The small accessible population restricted the sample selection from the “larger” pool of students with SMD included in GPE class. Second, students without disabilities in this study were volunteers and hence also were not necessarily representatives of the larger population of elementary school students. In addition, at least two tutors were assigned to each target student who rotated during peer-mediated phase. The individual characteristics of peer tutors (e.g., previous experience in interactions with peers with disabilities) and tutees (e.g., health conditions, functional capabilities, and communication skills) could influence interaction measures between students with and without disabilities. Third, the presence of the first author during each GPE class may have resulted in reactivity by the participants (Kazdin, 1982). Peer tutors under less obvious observations may not be as interactive and persistent with tutoring procedures. Fourth, the activities within a particular GPE sport unit could affect students’ performance. The outcomes of the study utilizing peer tutoring across different GPE sport units in prolonged time periods might have been different. Fifth, this study was limited in the data of determining the maintenance and generalization effects of peer tutoring instructional accommodations. Finally, data collection in the natural GPE setting was challenging because of the active and noisy environment. This affected the visual field that could be observed and recorded on video camera, as well as sound that could be captured by one microphone used by the student with SMD. The addition of static recording equipment, such as multiple video cameras, may have resulted in more reliable data.

**Implications for Future Research**

The limitations noted in this study show the need for future research. Future research should investigate the effects of the peer-mediated intervention across a wider variety of participants, settings, and age groups. Results indicated that during intervention sessions, students with SMD increased interaction behaviors with general education students not designated as peer tutors. Future research should use class wide peer tutoring so that all students in the class have the opportunity to interact with students with SMD or combine the peer tutoring intervention with other peer support activities involving more students without disabilities. For example,
implement peer tutor training for selected students and use the disability awareness program for all students in the class. Finally, future studies should investigate the relationship between the academic achievements and interaction behaviors for students with and without SMD as the result of peer tutoring interventions.

References


