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The Effects of Trained Peer Tutors on the Physical Education of Children Who Are Visually Impaired

Brian Wiskochil, Lauren J. Lieberman, Cathy Houston-Wilson, and Susan Petersen

Abstract: This study examined the effect of trained peer tutors on the academic learning time–physical education (ALT-PE) scores of children with visual impairments. It found a mean increase of 20.8% for ALT-PE and increases in ALT-PE scores for closed and open skills and that trained peer tutors were more effective than were untrained peer tutors.

Many students who are visually impaired (that is, those who are blind or have low vision) who may have enrolled in special schools for persons with visual impairments in the past now attend public schools (Block, 2007; Dunn & Leitschuh, 2006; Sherrill, 2004). These children face several problems in being integrated into general physical education classes, such as fewer opportunities to participate than their sighted peers, teachers who are apathetic, and teachers who lack sufficient knowledge of how to include students who are visually impaired (Block, 2007; Ellery & Stewart, 2000). Lieberman, Houston-Wilson, and Kozub (2002) examined general physical education teachers' perceptions of the barriers to including students who are visually impaired in physical education. They found that inadequate professional preparation, the lack of appropriate equipment, the lack of knowledge of programming and curricula, and insufficient time in the schedule were the dominant barriers.

Children with visual impairments have a greater need for physical activity and physical education than do their sighted peers (Dunn

& Leitschuh, 2006; Lieberman, 2005), since the lack of vision may restrict their play to such an extent that their physical development is noticeably delayed (Dunn & Leitschuh, 2006; Jan, Sykanda, & Groenveld, 1990). Young children (from birth to age 6) who are visually impaired often demonstrate delays in reaching developmental milestones, particularly in mobility- and locomotion-related behaviors (Sherrill, 2004; Skaggs & Hopper, 1996; Sleeuwenhoek, Boter, & Vermeer, 1995). They also experience delays in object-control and manipulation skills (often of 3 to 6 months), along with delays in play and social skills (Kef, 1997; Kroksmark & Nordell, 2001; Sherrill, 2004).

Children who are visually impaired display lower physical activity levels because of the lack of instruction and practice, their inactive lifestyles, and overprotection (Kozub & Oh, 2004; Lieberman & McHugh, 2001; Sherrill, 2004). However, it has also been demonstrated that they can attain levels of physical fitness that are comparable to those of their sighted peers (Blessing, McCrimmon, Stovall, & Williford, 1993; Buell, 1974, 1982; Lieberman, Stuart, Hand, & Robinson, 2006; Sherrill, 2004).

Engagement of students in subject matter at an appropriate level is a powerful predictor of achievement (Siedentop, Tousignant, & Parker, 1982). Academic learning time–physical education (ALT-PE) is that portion of engaged time when the student is involved with the educational activities that are appropriate to his or her abilities, resulting in high success and low error rates (Parker, 1989). Monitoring the amount of time a student spends engaged in ALT-PE is a method of systematic observation that is used to measure his or her achievement in the physical education classroom. Most of the research on process indicators in relation to students' learning in physical education has focused on ALT-PE scores (Siedentop et al., 1982). "The purpose of the ALT-PE instrument is to measure the portion of time in a physical education lesson that a student is involved in motor activity at an appropriate success rate" (Parker, 1989, p. 195). Success is dependent on two variables. First, the student must be engaged in

motor activity, and second, the engagement must be motor appropriate.

As Knowles, Aufderheide, and McKenzie (1982) noted, classes that used individual instruction had higher percentages of ALT-PE than did classes that did not. This finding lends itself to the notion that the use of peer tutors may increase the ALT-PE scores of students with disabilities, including those with visual impairments. The use of peer tutors is a successful and inexpensive way of giving students with disabilities the extra help they need to succeed in general physical education classes (Houston-Wilson, Lieberman, Horton, & Kasser, 1997). Fernandez-Vivo and Cordero (2005) found that peer tutoring increased the level and stability of the motor-appropriate behavior of students with visual impairments who were integrated into a general physical education classroom.

Research has proved that peer tutors are an effective and cost-efficient means of improving various aspects of physical performance. However, little research has been conducted to show specifically the effect of peer tutors on ALT-PE or any other aspect of physical education for students with visual impairments. The purpose of the study presented here was to determine the effect of same-age peers on the ALT-PE scores of children with visual impairments.

Methods

PARTICIPANTS

The participants were four students with visual impairments (two with low vision and two who were blind) with no other disabilities (hereafter called "tutees") and two to four same-aged, same-gender peer tutors from their integrated physical education classes. The four participants who were visually impaired were in the following grades: Sally, 3rd grade; Billy, 6th grade; Roland, 8th grade; and Betty, 11th grade. The sampling design was purposive, meaning that criteria were used to select students who were representative

of all students with visual impairments and sighted classmates who might be trained as tutors in integrated physical education settings throughout the country (Lieberman, Dunn, Van der Mars, & McCubbin, 2000).

The four participants who were visually impaired were selected from a list of campers who attended a sports camp for persons with visual impairments in the Northeast. The list was then narrowed down to children who had visually impaired travel vision or higher who resided in the western New York area. All the tutees volunteered for the study, both they and their parents signed informed consent forms, and the physical education teachers and school districts agreed to participate.

The peer tutors were selected from the tutees' physical education classes. Two to four tutors were trained for each tutee to ensure consistent, skilled, and available tutors throughout the study (Lieberman & Houston-Wilson, 2002). All the tutors volunteered and were chosen by their physical education teacher and classroom teacher, and they and their parents signed informed consent forms. The tutors and the tutees underwent a 1.5- to 2-hour training session developed by Houston-Wilson (1994). Training included information on low vision and blindness, communication, guiding techniques, and various teaching and feedback techniques. It enabled the tutors to become proficient in the instructional techniques of cueing, modeling, physical assistance, tactile modeling, and feedback (O'Connell, Lieberman, & Petersen, 2006). Feedback techniques specifically included positive general feedback, positive specific feedback, and corrective feedback. At the completion of the training program, each tutor was required to pass a test with a score of 90% or better to continue in the study. The test assessed the knowledge gained during the training program. If a score of 90% was not obtained, further instruction and discussion were implemented until the tutor understood all the elements of the training.

INSTRUMENTS

The instruments included a modified version of the ALT-PE coding sheet (Siedentop et al., 1982) that was modified to focus on motor-appropriate behaviors. First-level categories on the coding sheet included motor engaged (ME) and not motor engaged (NE). Under each first-level category were subcategories. The subcategories for ME included motor appropriate, motor inappropriate, and waiting. Subcategories for NE included on-task and off-task. A demographic sheet for each tutee was used to gather information on the tutee, tutors, and physical education teacher.

PROCEDURES

After the tutees were selected, each was videotaped in four to five physical education classes to establish a baseline phase. Once the baseline data demonstrated a steady pattern, the intervention began. Once the intervention began for one student, the primary investigator (the first author) began the baseline phase for the next tutee. The baseline phase was conducted in a staggered fashion to ensure that the target behavior occurred because of the onset of the intervention, rather than because of an extraneous variable. It was possible to videotape only two tutees at one time because the participants were scattered geographically. The primary investigator and teacher selected the tutors according to the criteria that were established prior to the study. Two of the tutees had peers (untrained) working with them in physical education before the study began and during the baseline phase, so it was natural to select these peers as tutors for them. Each tutor then received peer tutor training, along with the tutee. The training took place in one day and lasted approximately 1.5 to 2 hours, depending on the tutors' background knowledge.

After the training was completed, all the participants (the tutors and the tutees) were videotaped for six to eight physical education classes, which served as the intervention phase. The physical education teacher and the primary investigator set up a schedule for the tutors. Since only one tutor was required per physical

education class to assist the tutee, the tutors took turns tutoring. During the intervention phase, each tutor instructed the tutee; physically assisted him or her when necessary; and gave verbal feedback to the tutee on his or her performance. Throughout the intervention phase, the primary investigator monitored and gave feedback to the tutors. The primary investigator met the tutor and tutee prior to each class to give them information on various teaching techniques in regard to the day's activity. The primary investigator also met the tutor and tutee after each physical education class to discuss the day's activity and to answer any questions that the tutor or tutee may have had.

EXPERIMENTAL DESIGN

A single-subject delayed multiple-baseline design across the participants was used in the study (Cooper, Heron, & Heward, 1987). The study included four to six physical education classes of the baseline phase and six to eight physical education classes of the intervention phase. After the initial baseline and intervention phases were recorded, subsequent baselines and interventions were added in a delayed fashion (Cooper et al., 1987). This method was chosen because it allowed the researcher to analyze the effects of the intervention without removing it. Also, the treatment could be tested on more than one participant.

ANALYSIS OF THE DATA

Data on all the participants were collected via videotaped recordings during the entire class period. An analysis of the participants' ALT-PE scores were presented as percentages of motor-appropriate behaviors for each class. The researcher used the interval recording technique, six seconds of recording and six seconds of observation, to determine the amount of ALT-PE (Siedentop et al., 1982). Daily percentages were graphed for each participant. Visual analysis was then used to interpret and analyze the data paths for each participant. Visual analysis determined if changes occurred in the data patterns and if the changes corresponded to the implementation of the intervention. Changes

in the level of ALT-PE and in the mean score of ALT-PE across the phases were also analyzed, as were any variability and trends within the phases and overlap between the phases. The difference in the percentages of ALT-PE within the phases was used to determine variability. The percentage of overlap was calculated by counting the number of intervention data points that overlapped with the baseline data and dividing that number by the total number of data points in the intervention (Lieberman et al., 2000). Visual analysis determined the effect of peer tutors on ALT-PE scores of students with visual impairments in general physical education classes.

Results

RELIABILITY

Interobserver and intraobserver reliability were determined by using the formula agreements/agreements + disagreements × 100 (Van der Mars, 1989). Interobserver agreement was determined with a second observer, a graduate student in adapted physical education who was trained in observing and recording the results on data sheets. One class from the baseline phase (16%–25% of the baseline classes) and one class from the intervention phase (12%–16% of the intervention classes) were randomly selected and observed for each participant for the reliability check. Although the recommendation is 20% in each phase, it was not possible to conduct reliability checks that often. An interobserver reliability score of 89.6% was attained. The same randomized method was used for intraobserver reliability. An intraobserver reliability score of 95.8% was attained.

DATA ANALYSIS

The study used a delayed multiple-baseline AB (baseline-intervention) design. Four participants were observed for four to six classes in the baseline phase; then the peer tutors were trained and utilized for six to eight classes. The participants' performance during the baseline phase was compared to their performance

during the intervention phase. If the participants' behaviors changed in the desired direction with the intervention, there is a strong possibility that the independent variable (intervention of peer tutors) was responsible for the change (Lieberman, Newcomer, McCubbin, & Dalrymple, 1997).

Visual analysis was used to inspect and interpret the data paths of ALT-PE scores for each participant and to determine if any changes were present in the data patterns and if these changes corresponded to the intervention of the trained tutors. If percentages of ALT-PE increased only when intervention was implemented, then change could be attributed to the use of the tutors. Data paths within and between phases were also analyzed using visual analysis. Mean scores for each phase were established and compared to determine whether ALT-PE scores increased during the intervention phase. Further analysis consisted of noting variability and trends within each phase and level change and overlap between the phases (see Figure 1). After all the factors were considered, the effect of trained peer tutors on ALT-PE scores were determined using visual analysis.

To determine the effect of the training program, a sighted classmate served as a comparison for the amount of time that sighted students spent engaged in physical education. The researcher and the physical education teacher chose the classmate, who was determined to be the closest in motor skills to the participant. No classmates were peer tutors.

In addition, a separate analysis was conducted to determine if the effects of the peer tutor were similar or different for closed- and open-skill activities. The following is a description of each participant's percentage of ALT-PE. Data were visually analyzed by describing the trends and variability within the phases and level change and overlap between the phases. The participants are arranged according to their level of visual impairment.

Participants who were blind

Billy.
Billy was an 11-year-old sixth grader and, according to his teacher, well behind his peers in motor performance. He enjoyed physical education, but was not included in the class during most activities. Billy had a steady trend during the first two baseline observations (both in wrestling) with a significant downward trend over the last two baseline observations (in wrestling and archery). He had a mean score of 19.2% during the baseline phase. In the intervention phase, there was slightly more variability with no significant trend. Billy had a mean score of 58% during the intervention. His mean score improved 38.8%. The level of change from the baseline to intervention was 56.9% with 0% overlap. The significant level of change, no overlap, and the 38.8% difference in means show an increase in the amount of ALT-PE from the baseline to the intervention phase.

Betty.
Betty, aged 16, was in the 11th grade. She liked physical education and was consistently involved in the physical education class. She would attempt skills, but would often perform them incorrectly because of the lack of instruction and opportunity. Various classmates assisted Betty during the class. The girls who assisted Betty had no training as peer tutors. Two of them were eventually trained to be tutors.

Betty had a variable baseline with a significant downward trend during the 3rd and 4th baseline classes (ultimate Frisbee and kickball) and a slight upward trend at the end of the baseline phase. She had a mean score of 37.8% during the baseline phase. There was less variability in the intervention phase, with a significant upward trend during the 9th and 10th intervention classes (both softball). Betty had a mean score of 48.5% during the intervention. Her mean score improved 10.7%. The level of change from the baseline to the intervention was 23.1% with 83.3% overlap.

It is likely that both participants who were blind improved their

ALT-PE scores because of the intervention. Billy improved his mean score by 38.8% between the phases. He also had a 56.9% level of change between the baseline and intervention with no overlap. Betty's mean score improved 10.7% between the phases. Betty demonstrated less variability during the intervention phase. She also had a level of change of 23.1% between the baseline and the intervention.

Participants with impaired travel vision

Roland.
Roland was a 14-year-old eighth grader who was blind in his right eye and had little vision in his left eye. He had weak upper-body and arm strength and little flexibility. He liked physical education and participated fully in most activities but often at a motor-inappropriate level. Two classmates assisted Roland during the baseline period. Neither classmate had trained to be a peer tutor, but both would eventually be trained.

Roland had a variable baseline during the first three baseline classes (volleyball, dance, and dance), with a downward trend during the fourth and fifth baseline classes (both fitness). He had a mean score of 21.4% during the baseline phase. The intervention phase was slightly more variable, with a steadier trend. Intervention began with an upward trend during the first three intervention classes and a downward trend during the last four intervention classes. Roland had a mean score of 51% during the intervention. His mean score improved 29.6%. The level of change from the baseline to the intervention phase was 32.2% with 0% overlap.

Sally.
Sally was a 9-year-old third grader who was blind in her left eye and had some vision in her right eye. According to the physical education teacher, Sally enjoyed physical education and was an excellent athlete. She had high motor abilities, but had trouble tracking moving objects.

Sally had a variable baseline with a slight downward trend toward the end. Her mean score was 55.8% during the baseline phase. The intervention phase was slightly less variable, with an upward trend during the 7th to 9th classes (soccer, scooter basketball, and stations [activities, such as using a jump rope or throwing a ball, set up at various areas of the gymnasium]), followed by a downward trend during 10th to 12th classes (track and field, softball, and softball). Sally finished out her intervention with an upward trend. She had a mean score of 60% during the intervention. Her mean score improved 4.2%. Her level decreased 22.4% from the baseline to the intervention with 85.7% overlap.

Roland's mean score improved 29.6% between the phases, and his level of change was 32.2% with no overlap. He also had a steadier trend during the intervention. The peer tutors were successful in keeping him engaged at an appropriate level and giving him the extra help he needed to achieve an increase in ALT-PE scores. Sally's mean score across the phases increased, and Sally had less variability during the intervention. With a decrease in the level of change and significant overlap, it is difficult to attribute the increase in her mean score and decreased variability to the intervention of peer tutors. Thus, the intervention of peer tutors does not seem to have been responsible for the increase in her ALT-PE score.

TRAINED VERSUS UNTRAINED PEER TUTORS

That untrained classmates aided Roland and Betty during the baseline phase gave the researcher the opportunity to compare the use of untrained peers to trained peer tutors. The data on Roland demonstrate that the trained peer tutors were more effective than the untrained peers in helping Roland to achieve high levels of ALT-PE, as demonstrated by the 29.6% change in the means from the baseline to the intervention phase. It is noteworthy that the downward trend in data point 12 for Roland happened on a day when all the trained peer tutors were absent from school. A different classmate who was untrained helped Roland on that day,

and the trend did not follow that of his classmates, which had been the case until that point. The data on Betty indicate a similar conclusion. The trained peer tutors helped Betty achieve higher levels of ALT-PE than did the untrained peers. The difference between the baseline and the intervention phase was 10.7%. It is noteworthy that the majority of the untrained peers who helped Betty were eventually trained to be peer tutors. The increase in ALT-PE scores for Roland and Betty may be attributed to the training of the peer tutors.

OPEN- VERSUS CLOSED-SKILL ACTIVITIES

The researcher also had the opportunity to assess the difference in ALT-PE scores for open-skilled activities, such as hockey and wrestling, and closed-skilled activities, such as archery and stations, across the participants and phases. The data demonstrate that, as a whole, peer tutors were effective in helping to increase the participants' ALT-PE scores during both types of activities. The increase in ALT-PE scores during open-skill activities was 16.6%, and the increase in ALT-PE scores during closed-skill activities was 29.4%. This finding demonstrates that trained peer tutors can be effective in helping to increase the ALT-PE scores of students with visual impairments during both open- and closed-skilled activities.

MEAN COMPARISONS BETWEEN THE PARTICIPANTS AND THEIR CLASSMATES

Throughout the baseline phase, there were large differences in the mean scores of the tutees and their sighted classmates. Differences between the means of the two groups during the baseline phase ranged from 6.3% to 58.3%, with the sighted classmates consistently having higher ALT-PE scores. The intervention of the peer tutors helped to decrease the difference in ALT-PE scores between all but one of the participants and his or her classmates. Overall, differences during the intervention phase ranged from 17.8% to 3.9%. The percentage of improvement ranged from 49% to 4.2%. These data demonstrate that the use of trained peer tutors

can help increase the ALT-PE scores of students who are visually impaired to levels that are more comparable with those of their sighted peers. Therefore, ALT-PE scores improved across all the students after the intervention by the trained, same-age peer tutors.

LIMITATIONS

It should be noted that there were only four participants in the study and that these participants varied in visual status, gender, and age. Therefore, it is difficult to generalize the results to the population of children with visual impairments. In addition, although the trained peer tutors appeared to be more effective than the untrained peers, there were only two participants in this portion of the study. Thus, further studies should be conducted to support the various effects of peer tutoring for children with visual impairments.

Discussion

Four participants with visual impairments who ranged in grade from Grade 3 to Grade 11 were studied to analyze the effects that trained, same-age peer tutors had on their ALT-PE scores. Each tutee had at least two trained peer tutors assigned to work with him or her on an individual basis during the general physical education class. The peer tutors gave instruction, demonstrated skills, provided feedback, physically guided the tutees, and monitored the tutees' behavior. The results indicated that the peer tutors effectively used the teaching and feedback techniques that the researcher taught them during training. They used the hierarchy of verbal cue, demonstration, physical guidance, and tactile modeling as was intended. A delayed multiple AB (baseline-intervention) design was used across the participants.

In all cases, the peer tutoring increased the mean percentage level of ALT-PE. In all but one case, peer tutoring increased the level of ALT-PE between the baseline and intervention phases. It is speculated that because Sally had more usable vision and was already involved in sports, the use of peer tutors had less of an

effect on her than on the other tutees. In addition, Sally started out at a high level of ALT-PE that was similar to that of her sighted peers, so there was little room for improvement.

In two cases, peer tutoring decreased the variability of the tutees' motor performance, and in three cases, the gap between the tutees' and sighted classmates' ALT-PE scores decreased by an average of 27.5%. Thus, it appears that peer tutoring can have a positive effect on the ALT-PE scores of students with visual impairments in general physical education classes.

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***Brian Wiskochil, M.S.**, certified adapted physical educator; mailing address: 2650 Ralphwood Drive, Toledo, OH 43613; e-mail: <bwiskoc@yahoo.com>. **Lauren J. Lieberman, Ph.D.**, professor, Department of Physical Education and Sport, State University of New York at Brockport, 350 New Campus Drive, Brockport, NY 11420; e-mail: <llieberm@brockport.edu>. **Cathy Houston-Wilson, Ph.D.**, professor and associate chairperson, Department of Physical Education and Sport, State University of New York at Brockport; e-mail: <chouston@brockport.edu>. **Susan Petersen, Ph.D.**, chairperson, Department of Physical Education and Sport, State University of New York at Brockport;*

e-mail: <speterse@brockport.edu>.

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