This study compared physical education and recess physical activity levels of elementary school age students with mild mental retardation (MR) and students without disabilities who possessed either high or low cardiorespiratory fitness. For this study, the System for Observing Fitness Instructional Time (SOFIT), a measure of physical activity, was validated for students with mild MR. A significant difference for moderate to vigorous physical activity was obtained between settings. Findings suggest that students with MR and those without disabilities were more active during recess than during physical education. Students with mild MR and those with low cardiorespiratory fitness performed similarly in both the physical education and recess settings.

American children are becoming less physically active (USDHHS, 1996). This decrease in physical activity is a concern because it increases with age (Stephens, Jacobs, & White, 1985). This lack of physical activity is also a concern for children with disabilities (Rimmer, Braddock, & Pitetti, 1996). Children with disabilities, particularly children with mental retardation (MR), have less access to physical activity facilities, are more sedentary, and tend to lack motivation when compared to children without disabilities (Eichstaedt & Lavay, 1992; Kavale & Forness, 2000; Obrusnikova, Valkova, & Block, 2003). A good environmental context within which to study physical activity levels in children without disabilities and children with MR is a school setting (Pangrazi, Corbin, & Welk, 1996; Pate et al., 1995). Today, most children with MR and especially those requiring fewer supports (i.e., mild MR) are included into regular schools (Block, 2000; Cheney & Demchak, 2001; Kavale, 2002; Kavale & Forness, 2000; Obrusnikova et al., 2003). This is also true for inclusion into general physical education classes (Block & Zeman, 1996; LaMaster, Kinchin, Gall, & Siedentop, 1998; Vogler, Koranda, & Romance, 2000).
A first step in addressing physical inactivity of children with MR and children without disabilities is to observe their physical activity levels during the school day. According to Pate et al. (1995) and Watkinson and colleagues (2001), the most likely times children may exhibit appropriate levels of physical activity are during physical education and recess. As more students with MR are included into general physical education and recess contexts (Block & Zeman, 1996; LaMaster et al., 1998; Vogler et al., 2000), research should be conducted to determine similarities or differences in physical activity levels of these students compared to their nondisabled peers. Physical Activity and Health: A Report of the Surgeon General (USDHHS, 1996) supports the need to improve the identification and tracking of physical activity patterns of children with MR. Furthermore, Rimmer, Braddock, and Pitetti (1996) state that enhancing physical activity levels of children with MR warrants further examination. This examination is important because children with MR are one of the largest populations of students with disabilities in school settings (Cheney & Demchak, 2001; Kavale, 2002; Kavale & Forness, 2000; Obrusnikova et al., 2003; Stainback & Stainback, 1990). Moreover, they are likely to be included in physical education and recess settings than other students with severe physical disabilities.

When examining physical activity levels, social cognitive theory may provide insight into the factors that may affect physical activity (Bandura, 1986). Social cognitive theory proposes that behavior is a function of environmental as well as personal factors. Environmental and personal factors affect physical activity engagement. This suggests that environmental settings (e.g., physical education and recess settings) may affect physical activity behavior. When investigating different settings, Sleap and Wartburon (1992) compared physical activity levels of 27 girls and 29 boys (5 to 11 years old) during school recess, free time at home, and physical education classes using an observation method to determine physical activity levels. They found that preadolescent students were engaged in moderate to vigorous physical activity (MVPA) 48% of the time during recess as compared to approximately 36% of the time during physical education (composed primarily of game and gymnastics lessons). Students were most active during school recess and least active during home free time. Further, the environment can play a role in how students with and without disabilities engage in physical activity, especially when the environment is arranged so that individuals have a choice of the activities or equipment they will use. Choice is an important element of the social cognitive theoretical framework (Evans, 1989). For example, students’ physical activity behaviors may be different during physical education and recess because they are allowed to choose the activities in which they will participate. During physical education, students normally participate in activities decided by the teacher. Teachers may choose activities focusing on games, skills, or fitness. Students may not enjoy nor be familiar with some of these activities. Generally, during recess students can choose their activities. In the recess setting, students usually participate in activities that they enjoy and are familiar to them, increasing the likelihood that they will participate. Students may also have higher recess physical activity levels because they can choose their activities. Lorenzi, Horvat, and Pellegrini (1999) concluded that an inclusive, unstructured recess setting (where choice was a factor) facilitated physical activity levels of children with MR.

Within the social cognitive theory framework for this study, disability may be a personal factor that may affect physical activity behavior as well. Students with
mild MR may have difficulty with verbal instructions during physical education. If instructions are not simple and concrete, these students may not be able to complete the task due to lack of clarity, not due to being unable to physically perform. In a study by Stanish and Mozzochi (2000), disability may have affected physical activity levels. Stanish and Mozzochi examined the physical activity levels of preschool children with developmental delays. Using the System for Observing Fitness Instruction Time (SOFIT), children were observed during an inclusive gross motor activity. MVPA averaged 33% for both students with and without developmental delays. Students without developmental delays spent more time engaged in vigorous physical activity, while students with developmental delays spent more time engaged in moderate physical activity.

In addition, within the theoretical framework for this study, the personal factors of cardiorespiratory fitness level and gender may play a role in student physical activity levels. Students possessing high cardiorespiratory fitness (HCRF) levels are able to sustain physical activity intensities at higher levels and are able to engage in physical activity for longer periods of time than students possessing low cardiorespiratory fitness (LCRF; Winnick & Short, 1999). Children with mild MR typically exhibit reduced levels of physical activity because of LCRF levels (Eichstaedt & Lavay, 1992; Fernhall, Pitetti, Stubbs, & Stadler, 1996; Fernhall et al., 1998; Winnick & Short, 1999). According to Rimmer (1994), individuals with mild MR have cardiorespiratory fitness levels that are similar to sedentary individuals without disabilities. As such, cardiorespiratory fitness levels may play a role in understanding physical activity levels of individuals with and without disabilities. Gender has also been shown to affect physical activity behavior. Sarkin, McKenzie, and Sallis (1997) found that boys and girls were similar during physical education but that boys were more active during recess than girls were.

Another aspect of social cognitive theory is that behaviors are influenced by observation. Observational influence may result in students having models of certain behaviors that are important to increasing physical activity levels. Consequently, models are important because they provide examples of how to successfully engage in physical activity. Moreover, within the physical education settings, teachers may provide modeling of physical activity engagement for their students. Lieberman, Dunn, van der Mars, and McCubbin (2000) examined the effect of peer tutors (a form of modeling) on the physical activity levels of Deaf students using SOFIT. They found that MVPA for Deaf students was initially 22%, while MVPA for the untrained peer tutors was 19%. After training the peer tutors, MVPA increased to 41.5% and 37.9% for Deaf students and the peer tutors, respectively.

Additional data are needed to determine what personal or environmental aspects may increase the likelihood of being physically active. The present study is unique because it compares MVPA of students with mild MR and students without disabilities during two settings, physical education and recess. MVPA was chosen over other physical activity levels (e.g., vigorous physical activity) because overall health benefits can be produced by utilizing MVPA rather than vigorous physical activity alone (Pate, 1995). Unlike previous studies, this study categorizes students without disabilities as possessing either high or low cardiorespiratory fitness levels. To this end, within the social cognitive framework, this study identified and compared MVPA of third, fourth, and fifth grade students with mild MR and students without disabilities (possessing either HCRF or LCRF) across physical education and recess settings. The following were research questions for this
study: Is the SOFIT instrument valid for measuring MVPA for students with mild MR? Does MVPA differ during physical education and recess for the three groups (students without disabilities who possess HCRF, students without disabilities who possess LCRF, and students with mild MR)?

Method

Research Site and Participants

This study was approved by the lead researcher’s university review board. The county board of education officials, the school building principal, and the physical education teacher for the school district agreed to allow the research to be conducted. All parents received a letter explaining the research study. Signed consent was obtained for children who participated in the study.

The research site was a public elementary school in a small rural town in the southeastern United States. The school was purposively selected because students with mild MR were included in general physical education classes and recess. A physical education teacher with 19 years of experience taught all students. She used the same lesson plan for all classes within respective grades. The participants for this study consisted of 38 third, fourth, and fifth grade children without disabilities and 8 children with mild MR (males = 25; females = 21) ranging in age from 8 to 11 years of age ($M = 9.2$; $SD = 1.2$). A convenience sampling design was implemented from intact classes. IQs of the students with mild MR ranged from 45 to 70 ($M = 58$, $SD = 7.99$). Students with mild MR were determined by state department of education standards as having an IQ of no less than 40 and no greater than 70 and no secondary conditions (e.g., physical disabilities) that would affect their movements. Of the 46 participants, 35 were African-Americans, 7 White Americans, and 4 Hispanic Americans. The high number of African-American children is not surprising because the racial composition of the school was 62% African American.

In order to clarify the importance of fitness to physical activity, students were assessed on the Fitnessgram Progressive Aerobic Cardiovascular Endurance Run (PACER) to determine high and low fitness levels. The PACER test was used to determine high and low cardiorespiratory fitness for students without disabilities (Meredith & Welk, 1999). The PACER test scores for all third, fourth, and fifth graders were reviewed to determine the individuals who had the highest and lowest scores at the end of the previous academic year and at the beginning of the current year. This resulted in 19 students who had HCRF and 19 students with LCRF. Mean age, height, weight, and PACER laps by group are found in Table 1.

Instrumentation

One instrument that has been used successfully to record physical activity levels of school age children is the System for Observing Fitness Instruction Time (SOFIT). While SOFIT has been used in observing physical activity levels of children with and without disabilities (Ernst & Hills, 2000; Lieberman et al., 2000; McKenzie, 1991; McKenzie et al., 1995; McKenzie, Sallis, & Nader, 1991; Stanish & Mozzochi, 2000; van der Mars, Darst, Vogler, & Cusimano, 1998), it has
Table 1  Means and Standard Deviations of Age, Height, Weight, and PACER Laps by Group

<table>
<thead>
<tr>
<th>Variables</th>
<th>MR (n = 8)</th>
<th>SD</th>
<th>LCRF (n = 19)</th>
<th>SD</th>
<th>HCRF (n = 19)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>9.5</td>
<td>1.2</td>
<td>9.7</td>
<td>.9</td>
<td>9.1</td>
<td>.8</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>140.2</td>
<td>9.4</td>
<td>140.6</td>
<td>9.0</td>
<td>136.5</td>
<td>6.8</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>43.9</td>
<td>16.1</td>
<td>54.7</td>
<td>17.3</td>
<td>33.0</td>
<td>6.4</td>
</tr>
<tr>
<td>PACER (# laps)</td>
<td>14.9</td>
<td>7.3</td>
<td>12.1</td>
<td>4.5</td>
<td>40.4</td>
<td>18.4</td>
</tr>
</tbody>
</table>

Note. MR = Mental Retardation; LCRF = Low Cardiorespiratory Fitness; HCRF = High Cardiorespiratory Fitness.

not been used to determine activity intensity levels of students with and without disabilities across both physical education and recess settings. This instrument is a direct observation tool for measuring (a) student physical activity levels, (b) lesson context, and (c) teacher behaviors (McKenzie et al., 1991). A three-phase (dimension) system is incorporated within the SOFIT. At the end of each 20-sec interval, a decision is made concerning the three dimensions. During dimension one, the physical activity level of the student is determined. The level of physical activity is coded as 1, 2, 3, 4, or 5 corresponding to the student’s body position: lying down, sitting, standing, walking, or very active, respectively. Student activity level is coded using momentary time sampling; hence at the end of the 20-sec interval, a level is coded. Next, a curricular lesson context is observed and a decision is made during dimension two. The curricular lesson context decision can be coded as general content, subject matter content, knowledge content, motor content, knowledge content, fitness, skill practice, game play, or free play using a momentary time sampling technique. The third and final dimension of the SOFIT instrument involves coding teacher behaviors. There are six categories of teacher behaviors: promotes fitness, demonstrates fitness, instructs generally, manages, observes, and off-task.

When analyzing and interpreting data from the student activity level dimension, a percentage score was calculated by combining categories four (moderate) and five (vigorous) to determine MVPA (van der Mars et al., 1998). In order to contextualize the environment, both the lesson context and teacher behavior categories were also coded. These codings applied to the physical education setting (in terms of what was being taught) and how the teacher was involved with the student and the lesson content.

Reliability, validity, and feasibility have been reported for the SOFIT instrument for individuals without disabilities. Previous studies established concurrent validity for the SOFIT instrument by comparing the five-level coding system to the energy expenditure values calculated from heart rates collected from the UNIQ Heart Watch (McKenzie et al., 1991; Rowe, Schuldheisz, & van der
Mars, 1997). Interobserver reliability for SOFIT ranged from 88.3% to 91.8% (McKenzie, 1997).

Two trained doctoral students and the lead researcher established interobserver agreement for this study. A 90% interrater agreement was obtained between the coders and the trainer during observer training. Interobserver agreement was obtained by counting the number of agreements per interval, then dividing them by the total number of agreements and disagreements. This number was then multiplied by 100 to obtain a percentage (Cooper, Heron, & Heward, 1987). For this study, 10% of the total observations was randomly checked for interobserver agreement, which was approximately 30 observations. Interobserver agreement percentages ranged from 82% to 100%. The mean interobserver agreement was 94.4%.

Procedures

Physical activity data during physical education were collected during a four-week fitness unit. The physical education teacher was encouraged to teach class as normal without changing unit or lesson plans. The fitness unit was mainly fitness testing of items such as sit-ups, pull-ups, and the PACER test. Other fitness activities completed during this unit included jump rope activities and fitness games. During this period, all third, fourth, and fifth grade students were videotaped during physical education classes. Classes were videotaped for a total of at least 30 min for 5 to 8 sessions. Camera placement in addition to the use of a wide-angle lens allowed the entire gymnasium to be monitored. During the videotaping process, the lead researcher wore a microphone as she verbalized what was happening in the gymnasium and/or what a student was doing if out of the camera’s view. The elapsed time was superimposed directly on the video camera image prior to recording. All physical education classes occurred in the gymnasium.

Physical activity data during recess were collected during the four-week fitness unit also. Recess sessions were also videotaped; these sections usually did not last longer than 15 minutes. In previous studies, recess observations per student have ranged from 5 min (Hovell, Bursick, Sharkey, & McClure, 1978) to 16 min (Lorenzi, Horvat, & Pellegrini, 1999). According to the Council for Physical Education for Children (1998) physical activity guidelines, children should engage in physical activity for 10 to 15 min or longer at a moderate to vigorous intensity. Participants engaged in the following recess activities: jumping rope, walking, running, chasing, touch football, soccer, climbing playground equipment, sliding, and swinging. During morning and afternoon student break/recess periods, the participants were the only ones videotaped. A camera was placed in the far northwest corner of the morning recess area so as not to distract students. This placement, in addition to the use of a wide-angle lens, allowed for most of the recess area to be captured. During videotaping, a microphone was used by the lead researcher as she verbalized what the target students were doing if they were out of the camera’s view. The elapsed time was superimposed directly onto the video camera image. Afternoon recess sessions were the same as morning sessions except the camera was located on the playground recess area in the far northeast corner (opposite the sun) of the playground to capture the entire playground area. All student break/recess periods occurred outside, except one. When indoors, the same procedures were followed for data collection as those for physical education data collection in the gym.
All participants wore Polar Vantage XL Heart Rate Monitors (Polar Electro Inc., 1997) during their physical education and recess sessions. Before each session, the lead researcher placed heart rate monitors on these students. A transmitter was attached to an elastic belt that was worn around the student’s chest, and a receiver that resembled a watch was worn on the wrist. The receiver was programmed to record heart rates at 15-sec intervals. The time was synchronized on both the watches and the camera to add to SOFIT validation data analysis for the participants with mild MR. Data from the monitors were downloaded to the Polar Interface unit at the end of each data collection day. The participants for this study did not appear to be uncomfortable when wearing monitors. While participants looked at the watch, they did not try to adjust the watch or the chest band. Further, the monitor did not interfere with the participants’ physical activity movements. This finding is in agreement with Bar-Or, Bar-Or, Waters, Hirji, and Russell (1996), who found that heart rate monitors were suitable and appropriate for young children.

Data Analysis

Data are presented by mean percentages, standard deviations, and ranges. Pearson product moment correlations were used to determine concurrent validity. Heart rates from the Polar Vantage XL Heart Rate Monitors of the participants with mild MR were correlated with SOFIT data. SOFIT data were used to determine MVPA. The percentage of engagement in physical activity was computed for each activity category for each student and then categories four and five were aggregated to calculate the percent of MVPA. A 3 group $\times$ 2 physical activity setting ANOVA was used for data analysis. Groups consisted of 8 children with mild MR, 19 children without disabilities who possessed HCRF, and 19 children without disabilities who possessed LCRF. The two physical activity settings were physical education and recess. SAS Statistical Software was used to analyze data (SAS, 1999). An alpha level of .05 was used. Scheffe post hoc test was used when appropriate. The Scheffe test was chosen because of its conservative nature. Effect sizes were calculated (omega squared) for significant results (Sutlive & Ulrich, 1998; Tolson, 1980). Utilizing effect size was important in this study because of the small sample size. Omega squared was used because it is more accurate in determining effect size than other effect size procedures (Vincent, 1995).

Results

Preliminary Grade and Gender Analyses

Preliminary data analyses were conducted to determine the possibility of grade level and/or gender effects. ANOVA test results indicated no significant differences for grade level, $F(2, 43) = .95, p = .39$ or gender, $F(1, 43) = .78, p = .38$. As a result, grade level and gender were not used in subsequent analyses.

Research Question 1

Concurrent validity of SOFIT for measuring physical activity of children with mild MR was established during the physical education setting. There was an average of seven (range 5 to 8) physical education observations (30-min duration) that occurred
Observations resulted in 90 time interval measures within each 30-min observation period. Concurrent validity was established by correlating heart rates with physical activity levels for all participants with mild MR \((n = 8)\). The results of the physical education data revealed Pearson product moment correlation coefficients ranging from \(r = .72\) to \(r = .86\). The mean Pearson product moment correlation coefficient for all participants with mild MR in physical education was \(r = .81\). All children in physical education had Pearson product moment correlation coefficients that were significant \((p = .01)\).

There were two 15-min recess observations that occurred on the playground for participants with mild MR during the validation of SOFIT. Observations resulted in 45 time interval measures within each 15-min observation period. Concurrent validity was established by correlating heart rates with activity levels for all participants with mild MR \((n = 8)\). SOFIT physical activity levels were coded every 20 sec during the observation period from the videotape analysis. These data were then correlated. The results of the recess data revealed Pearson product moment correlation coefficients ranging from \(r = .06\) to \(r = .90\). The mean Pearson product moment correlation coefficient for all participants with mild MR was \(r = .69\). Seven of the eight children’s Pearson product moment correlation coefficients were significant at the .01 level. The child with a Pearson product moment correlation coefficient of \(r = .06\) had an irregular heartbeat; therefore, the resulting correlation was considered an outlier. The heart rate of the participant with the irregular heart rate was only evident during the recess sessions and not the physical education sessions.

**Research Question 2**

There was a significant difference between settings for MVPA, \(F(1, 70) = 296.52, \ p = .0001\). MVPA for the recess setting was higher (66%) than for the physical education setting (24%). The omega-squared value was .74 for MVPA, revealing a large effect size. There was no main effect for group.

**Discussion**

The purpose of this study was to compare MVPA of elementary students possessing HCRF, LCRF, and mild MR during physical education and recess. The SOFIT instrument was used to determine physical activity levels and it was validated for use with students possessing mild MR. The theoretical framework for this study was based on social cognitive theory (Bandura, 1986). The underlying premise of this theory is that behavior is affected by both environment and personal factors. Within this study, the two environments examined were physical education and recess.

Regarding Research Question 1 for students with mild MR, we found that the SOFIT instrument is a valid instrument for measuring physical activity levels of children with mild MR. These findings are consistent with Rowe et al.’s (1997) findings of elementary children without disabilities. Similarly, McKenzie et al. (1991) had reported that the SOFIT instrument was valid for elementary age children without disabilities. The finding that the SOFIT instrument is valid for children with disabilities is not surprising. Children with disabilities, particularly those with mild MR, are typically similar in physical and motor skills to their same age
peers without disabilities (Eichstaedt & Lavay, 1992; Fernhall, Pitetti, Stubbs, & Stadler, 1996; Fernhall et al., 1998; Winnick & Short, 1999), especially at a young age when skills and activities are less complex.

Table 2 shows that the MVPA mean percentages were higher during recess than during physical education for all three groups. Descriptive statistics showed that average MVPA percentages during physical education for all participants was less than 30%. These percentages suggest that these participants did not meet the Healthy People 2000 objective for being physically active at least 50% of the time during physical education. Stanish and Mozzochi (2000) reported similar physical activity levels for children with and without developmental delays during structured gross motor play. Lieberman et al. (2000) also reported similar results for Deaf students during inclusive physical education (USDHHS, 1990).

McKenzie and colleagues (1991) reported that students without disabilities in grades three through five spent 58% of their time engaged in MVPA during fitness lessons and 44% of their time engaged in MVPA during non-fitness lessons (e.g., game play, skill drills). van der Mars et al. (1998) reported that students spent 52% of their time engaged in MVPA during physical education fitness lessons (e.g., aerobics, fitness circuit, etc.). Percentages from these studies (58%, 44%, and 52%) are all higher than for the participants without disabilities in this study. According to van der Mars et al. (1998) and McKenzie et al. (1991), physical education fitness oriented lessons result in higher MVPA than other lessons that focus on skill or knowledge content. Fitness lessons result in higher MVPA levels because students are more active and on-task due to the nature of the activity (i.e., jogging, jumping rope, walking), whereas during non-fitness lessons, students are more likely to be off task, standing, or waiting for a turn (i.e., relays, volleyball drills, game play). It is speculated that the participants in this study did not have higher physical activity levels during fitness lessons because these lessons related to fitness testing, not fitness activities. During physical fitness testing, the participants would perform fitness test items, record partner scores, or watch classmates perform fitness test items. Therefore, the amount of time the participants were active was reduced.

Table 2  Means and Standard Deviations of Percentages for MVPA by Group and Setting

<table>
<thead>
<tr>
<th></th>
<th>MR (n = 8)</th>
<th>LCRF (n = 19)</th>
<th>HCRF (n = 19)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>PE</td>
<td>23</td>
<td>16.4</td>
<td>21</td>
</tr>
<tr>
<td>Recess</td>
<td>65</td>
<td>25.5</td>
<td>65</td>
</tr>
</tbody>
</table>

Note. MR = Mental Retardation; LCRF = Low Cardiorespiratory Fitness; HCRF = High Cardiorespiratory Fitness; MVPA = Moderate to Vigorous Physical Activity; PE = Physical Education
Recess physical activity levels of approximately 50% and higher, have been reported within the literature. Ernst and Hills (2000) reported MVPA ranging from 31% (for students during regular unstructured recess) to 52% (for students during structured recess). Sleap and Wartburon (1992) reported that students were engaged in MVPA 48% of the time during recess. Also during recess, Hovell, Bursick, Sharkey, and McClure (1978) reported moderate physical activity intensity to be 60% for elementary students. All the children for these studies were individuals without disabilities. Moreover, none of these studies identified the cardiorespiratory level of their participants.

Regarding Research Question 2, there was a significant difference between settings for MVPA. The difference found in physical activity intensity between settings supports the theoretical underpinnings of social cognitive theory related to environment factors. Evans (1989) stated that choice is an integral aspect of the social cognitive theoretical framework. Within the physical education setting, participants were not allowed to choose the type of activities in which to engage, while in the recess setting, participants were allowed to choose their activities. A majority of the participants during recess chose high intensity activities like jumping rope and running and chasing other students. It is unclear as to why the participants chose these activities. However, it is speculated that these participants enjoyed these activities because they were laughing and smiling while engaged. Participants with HCRF chose activities like soccer or touch football (team related activities); whereas, participants with LCRF and those with mild MR chose individual games like sliding, swinging, and jumping rope. The finding of this study is consistent with Horvat, Richards, and Franklin (2000), who reported significant higher differences in physical activity levels of students with MR during recess than during a structured setting.

Within the physical education setting, participants had limited space, whereas in the recess setting, participants had ample space within which to move. The more open space that an individual has, the more likely one is able to engage in activities utilizing large areas (e.g., touch football, soccer, tag, etc.). These activities usually yield high MVPA. Physical education consisted of a physical fitness unit where participants listened to instructions, performed warm-up exercises while standing or sitting, and recorded partner PACER test scores. However, during the recess setting, participants were more likely to be active because a teacher did not use time to provide lengthy instructions, hence resulting in more opportunities for high MVPA.

All physical education sessions occurred indoors while all recess sessions except for one session occurred outdoors. McKenzie et al. (1995) found that students engaged in outdoor physical activities were more active than those engaged in indoor lessons (42% as compared to 32%, respectively). Additionally, Pellegrini, Horvat, and Huberty (1998) found that outdoor (unstructured) play activity resulted in more energy output than indoor (unstructured) play activity. The findings in this study showed higher MVPA for outdoor physical activity (i.e., recess setting) than indoor physical activity (i.e., physical education setting). Results are consistent with Smith and Connolly (1980) who found that restricted space resulted in low MVPA, while spacious environments resulted in high MVPA.

The recess setting may have resulted in higher physical activity time percentages because of the shorter amounts of time for recess. Shorter bouts of physical activity engagement may have allowed participants to engage in higher...
intensity physical activity levels, since they knew they would be on the playground for only a short period of time.

All three groups had similar MVPA levels within the two settings. While these differences were not statistically significant, they do warrant discussion. These differences may be explained by social cognitive theory related to the personal factors of cardiorespiratory fitness level and disability. Cardiorespiratory fitness and physical activity levels are positively related (Leon, Connett, Jacobs, & Raurama, 1987; Sallis, Haskell, Fortmann, Wood, & Vranizan, 1986). Participants with HCRF had higher MVPA (72%) during recess than participants with LCRF (65%) and those with mild MR (65%). Participants with HCRF also had higher MVPA (28%) during physical education than participants with LCRF (21%) and those with mild MR (23%). These higher physical activity levels could be attributed to their ability to sustain high levels of physical activity due to their fitness status.

Results of this study suggest that participants with LCRF and participants with mild MR are similar. Participants with LCRF and participants with mild MR scored low on their PACER test, indicating that they had similar cardiorespiratory fitness levels. Participants with LCRF and those with mild MR had average PACER test laps of 12.1 and 14.9, respectively. In addition, participants with LCRF and mild MR had similar MVPA levels for physical education, 21% and 23%, respectively and the same MVPA levels for recess. These findings support the claim by Rimmer, Braddock, and Pitetti (1996) that individuals with MR are most similar to those who are sedentary and have LCRF levels (Eichstaedt & Lavay, 1992; Rimmer et al., 1996; Winnick & Short, 1999). Within the context of this study, it seems that children with mild MR were appropriately placed within the regular physical education class because their activity levels were similar to nondisabled children with LCRF.

**Summary and Recommendations**

In summary, based on the findings of this study, (a) the SOFIT instrument can be used to measure physical activity levels of students with mild MR; (b) children regardless of group affiliation were more active in the recess setting than the physical education setting; (c) when measuring MVPA, students with mild MR were similar to their same age peers with LCRF in both physical education and recess settings; and (d) the nature of the physical education fitness unit (e.g., mainly fitness testing) and the high amount of teacher instruction/explanation may have attributed to the low MVPA levels. In conclusion, social cognitive theory provides an appropriate framework to examine physical activity of students. Physical education and recess should be viewed as separate settings for increasing physical activity levels. It is recommended that schools should have recess periods during the morning and afternoon that are 10-20 minutes long that will allow students to accumulate short bouts of physical activity throughout the day (Blair & Connelly, 1996; Pate, 1995). In addition, physical education sessions should focus on activities maximizing activity time such as games using a variety of locomotor skills. When testing for fitness, innovative methods should be used to increase MVPA.

Based on these findings, it is recommended that future research include the following: (a) more in-depth examination of environmental context as it relates to physical activity; (b) more in-depth examination of personal factors as they relate to physical activity, particularly participant fitness levels; (c) longitudinal
follow-up studies from elementary through high school; (d) additional examination of physical activity, not only inside the school context but also outside the school context; and (e) validation of the SOFIT instrument for use with children with other disabilities.

References


