The Role of Recess in Primary School*

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The Role of Recess in Children's Cognitive Performance and School Adjustment

There can be little doubt that there has been increased emphasis on accountability in both preschool and primary school education over the past 20 years. Opinions regarding the value of this position, however, are certainly diverse. Advocates of the accountability movement, rightfully suggest that scarce tax dollars should be spent only on programs that "work." Politicians as different as former President Bill Clinton and President George W. Bush have supported variants of this view.

One of the specific, though less noticed, impacts of accountability has been that children's opportunities for free time (in the form of recess) and corresponding opportunities to interact with their peers has been eliminated or diminished in many school systems across this country, Canada, and the UK (*The Economist*, 2001; Pellegrini, 2005). The popularity of the movement to minimize recess in schools may be due to the fact that politicians and school superintendents see this as a way in which to "get tough on education", provide more "academic time" for students, and to improve academic performance. Indeed, it may seem commonsensical to many that reducing recess time has a positive effect on achievement. After all, more time spent in academics should directly translate into improved performance (Brophy & Good, 1974). This as viewed was advanced by the former superintendent of schools in Atlanta, Benjamin Canada, even though there was no empirical or theoretical evidence for the claim (*The Economist*, 2001).

On the other hand, many educators and parents, especially, recognize the centrality of teaching skills and maximizing the efficient use of relatively scarce classroom time, but they also see the necessity for the role of breaks between periods of intense work where children can both

relax and interact with peers, with the hope that they will return to their classrooms after their breaks and work with renewed interest.

There can be common ground between the pro- and anti-recess positions. Many, including the authors of this chapter, feel that there is a need for accountability. Our best theory and empirical evidence should be used to guide practice. To do otherwise is to squander the trust and resources of children, families, taxpayers, and educators. Indeed, far too many of the educational policies being recommended for primary school are a form of "folklore" as they have no scientific basis. Yet, what many don't realize is that recess IS educational. In this chapter both theory and empirical data are presented to support the argument that what goes on during the recess period is "educational" in the traditional sense.

Recess is defined here as an unstructured break time between periods of relatively rigorous academic time. Further, recess can take place either indoors or outdoors and should involve children's free choice of activities and playmates, with minimal adult direction; the role of adults should be to supervise children's safety. For example, adult supervision should prevent children from bullying their peers and using unsafe behaviors on play apparatus, such as standing on a see-saw; only very minimally should adults structure children's play and games. From this view, recess is more characteristic of primary schools than preschools as the latter often have "play" as part of the curriculum.

Cognitive Performance in School

An important goal of primary grades schooling, unlike many preschools and nurseries, is teaching children skills and strategies associated with literacy, mathematics, and science - typically measured by some form of standardized achievement test. The term "cognitive performance" is used in this chapter as an umbrella term to cover those skills and strategies

associated with school-based learning. The effects of recess breaks on primary school children's satisfaction with school and standardized test performance, as well as more direct measures of cognitive performance - attention to classroom tasks- are assessed. Direct measures of attention to class work, of course, relate to more general cognitive measures, such as achievement test performance: Students must attend to their work in order to learn it. As we know from years of research, dating back to the 19th century (e.g., Ebinghaus, 1885; James, 1901), distributing work over a long period of time with breaks interjected, compared to massing it into one period, maximizes attention and more general cognitive performance across the life span.

For young children, a specific form of break from cognitively demanding tasks may be especially effective in maximizing cognitive performance, as suggested by David Bjorklund's "cognitive immaturity hypothesis". This position holds that *playful* break times and corresponding peer interaction may be especially important in maximizing performance for primary school children to the extent that such breaks reduce the cognitive interference acquired in earlier instruction (Bjorklund & Harnishfeger, 1987; Bjorklund & Green, 1992; Bjorklund & Pellegrini, 2000). The playful nature of breaks is predicated on the assumption that children's thought processes are different from adults'.

Traditional views of children's cognitive processing (e.g., Piaget, 1983) suggest that young children's cognition is an imperfect version of more mature adult processes. For example, young children's tendencies to make unrealistic estimates of their own capabilities by over estimating their own cognitive (Yussen & Levy, 1975) and social status (Smith & Boulton, 1990) has been framed as a limitation—something to be overcome. The cognitive immaturity hypothesis suggests that these processes are not inferior variants of adult behavior but instead specific adaptations to the niche of childhood that enable young children to effectively learn

skills and behaviors (Bjorklund & Pellegrini, 2000). For example, children's over-estimation of their own cognitive and social skills enables them to persevere at tasks even though, by adult standards, they are not doing it very well. This perseverance may lead to self-perceived success which may, in turn, lead to higher self-perceived competence and help with learning complicated skills and strategies (Bandura, 1997).

With specific reference to the role of recess, this position holds that *playful*, not structured, breaks may be especially important in maximizing performance because unstructured breaks may reduce the cognitive interference associated with immediately preceding instruction (e.g., Bjorklund & Harnishfeger, 1990). The immaturity of children's nervous systems and their lack of experiences render them unable to perform higher-level cognitive tasks with the same efficiency as older children and adults, and directly influence their educability. From this logic, it follows that young children are especially susceptible to the effects of cognitive interference after sustained periods of structured work (see Dempster, 1992). Breaks during periods of sustained cognitive work should reduce cognitive interference and maximize learning and achievement gains (Toppino, Kasserman, & Mracek, 1991). Further, opportunities for peer interaction during playful breaks not only enable children's feeling of potency and competence, but they also help children learn and develop the important social skills necessary for successful peer relations both in and out of school.

The Role of Peer Interaction at Recess in Predicting First Grade Achievement

Playful break times as a recess break provide an interesting venue not only for children to learn and develop social skills but they are also important for assessing young children's cognitive performance. Specifically, unstructured peer interaction is a cognitively and socially very demanding context while simultaneously very motivating for children. This combination of

high cognitive demands and high motivation should lead to children exhibiting higher levels of competence in recess activities, in comparison to traditional achievement tests, that are not as motivating (Messick, 1983). Consider the social cognitive demands associated with sustained peer interaction. Children must take others' perspectives, communicate effectively, and follow negotiated rules (Pellegrini, 1982). That children enjoy doing these things means that they are motivated to do the necessary social cognitive work to accomplish such high level tasks.

Recess as a demanding and motivating context. Children's interactions with peers during playful interaction, relative to interactions with adults, are cognitively and socially more demanding. A number of studies have demonstrated that, when given free choice in a play environment, children who choose to interact with peers, relative to adults, are more sophisticated on a number of social cognitive dimensions (e.g., Harper & Huie, 1985; Pellegrini, 1984; Wright, 1980). For example, in a university preschool sample, we found that when adults were in children's immediate groups children's play and oral language production was less sophisticated than when the groups were comprised of children alone (Pellegrini, 1984; 1985). Children's use of oral language with their peers, relative to language used with adults, was more explicit (e.g., pronouns are defined) and more narrative-like (e.g., use of temporal and causal conjunctions such as "and then" and "because"). Children's use of this sort of "literate language" reliably predicts performance on tests of early literacy (Pellegrini & Galda, 1993). Further, children's fantasy more frequently involved them taking a greater variety of roles, including those, such as pretending to be the teacher, where they used language to direct their playmates -- a form of language not likely to be observed when teachers are part of the group!

Consistent with Piagetian (1983) theory, the disequilibration characteristic of peer interaction facilitates social and cognitive development. Disequilibration is defined as conceptual

conflict between what children know and what they encounter. When faced with conceptual conflict children try to resolve it and this resolution results in conceptual development. For example, a boy and girl in kindergarten are playing with a doctor's kit. The girl says, " I'll be the doctor and you be sick." That girls can be doctors may conflict with the boy's concept of doctors; this encounter broadens the boy's concept of doctor and what females can do. When individuals disagree, they are confronted with points of view other than their own. In order for the interaction to continue, they must incorporate (or accommodate, to use Piaget's term) the other person's points of view. In short, engaging in sustained social interaction with peers requires a fair amount of social (e.g., cooperation, perspective taking) and cognitive (e.g., ability to communicate clearly) skill.

In comparison, when interacting with an adult, the adult will often take over some of this difficult work, especially if the child is having problems (Vygotsky, 1978). Further, children do not tend to question adults because they are typically socialized not to question or challenge grown-ups. In short, conceptual disagreement, or disequilibration, is more common in peer interaction than in adult-child interaction, which is typically unilateral.

Playful breaks at recess should be a particularly good place to study the ways in which children's social cognitive development is facilitated in playful, peer interaction contexts. As noted above, young children are typically motivated to exhibit high levels of competence there because they enjoy interacting with their peers. Consequently, observations in such a highly motivating context should maximize children's exhibition of social and cognitive competence of the sorts noted earlier (Pellegrini, 1984; Waters & Sroufe, 1983; Wright, 1980). By implication, placing children in such a highly motivating situation is very important from an assessment perspective. It may be that the often-described difference between children's competence as

measured in standardized testing situations and their competence measured in playful situations is due to different levels of motivation to exhibit competence in each situation (Vygotsky, 1978).

Recess behavior in kindergarten predicting 1st grade achievement. Longitudinal analyses also demonstrate relations between kindergarten children's social behavior at recess on the school playground and measures of 1st grade achievement. Kindergarten recess behaviors as a predictor of 1st grade achievement is especially important to consider because this is the transition into full day schooling and also a period in children's development when social interaction and play may be especially important. More specifically, Pellegrini (1992) examined the relation between kindergarten children's behavior at recess and their performance on a standardized achievement test in 1st grade. The intent of this research was to show that standardized achievement and aptitude measures alone have limited explanatory and predictive power, especially for young children.

Zigler and Trickett (1978; see also Zigler & Bishop-Josef, this volume) made this point a generation ago in service of a similar cause, i.e., to argue against over reliance on standardized measures of cognition, such as IQ tests, in favor of measures of social competence, to assess the impact of early intervention programs, like Project Head Start. Again, the basis of this argument is that children's optimum performance is not elicited in standardized tests. Instead, peer interaction on the playground at recess may be a more valid assessment context because it is both highly motivating and very demanding. Like Zigler and Trickett, the analyses presented below should help to guide legislators and departments of education in their views of teaching and assessing young children.

The results from a two-year longitudinal study conducted in a public school in Athens, Georgia support the role of peer interaction at recess in children's achievement (Pellegrini,

1992). This research was motivated in reaction to a law in the State of Georgia (where Pellegrini was living at the time) requiring kindergarten children to pass a standardized achievement test in order to be promoted to first grade. The school population where the research was carried out was composed of a wide variety of children ranging socio-economically from very poor to very affluent. Children were observed across two years on the school playground during their recess periods. Information on their standardized, academic achievement test performance was available. In this prospective longitudinal study, the Metropolitan Readiness Test (MRT, Nurss & McGauvran, 1976) was used to assess the kindergarten children's general knowledge and achievement in early reading and math concepts. The measure of academic achievement for 1st graders was the Georgia Criterion-Referenced Test (GCRT), also a test of general knowledge and achievement in early literacy and numeracy concepts.

The results demonstrated that children's recess behavior as kindergarteners was a significant predictor of their 1st grade academic achievement, as measured by the GCRT, even after statistically controlling their kindergarten achievement. The measures of recess behavior used were rather gross measures - peer interaction and adult-directed behavior. The peer interactions coded included all forms of cooperative behavior, including play, games, and conversation. Similarly, adult-directed behavior (that is, behavior initiated by a child with an adult) included any overtures to adults by children and positive adult-child interaction. A bar graph, displayed in Figure 1, represents the cumulative variance accounted for in this model. The variables entered, in order, were MRT as a statistical control for kindergarten achievement, Adult Interaction (which was a *negative* predictor of 1st grade achievement), Object Play, Peer Interaction.

/Figure 1 about here/

In step 1 the MRT control variable was entered first in the predicting 1st grade achievement and it accounted for .34 of the variance in 1st grade achievement. Then adult-directed behavior on the playground in kindergarten was entered and it accounted for another, unique .18 of the variance in 1st grade achievement, but the relation was negative, not positive. Object play and then peer interaction on the playground in kindergarten each accounted for another and unique .20 and .11, respectively, of the variance in 1st grade achievement.

Importantly, peer interaction was positively related to achievement, while adult-directed behavior was negatively related to achievement. That is, children who interacted more with peers at recess tended to score higher on the GCRT than children who interacted less with their peers. In fact, children who were involved in high levels of adult-directed behavior at recess tended to score *lower* on these achievement tests than children who interacted less with adults.

These results suggest a number of interesting mechanisms that might have driven the recess advantage. For example, children who chose to interact with adults at recess, rather than with peers, may have lacked the social skills necessary to play with the other children. Evidence from the social competence literature demonstrates that when young children choose to interact with teachers, compared to peers, in play oriented contexts, teachers do most of the work in maintaining interaction (Harper & Huie, 1985; Wright, 1980, 1980). In comparison, when children interact with peers, they must rely on their own social competence to initiate and sustain interaction. Relatedly, children who chose to interact with adults may have been unpopular with their peers. Consequently, they may have been rejected by the peers and by default only had adults with whom to interact. In either case, difficulties in peer relation often forecasts academic difficulties (Coie & Dodge, 1998).

The important point here is that what children do at recess accounts for a statistically significant, and unique, portion of the variation (40%) beyond what standardized tests tell us. These findings support the arguments made by Zigler and Trickett (1978;see also Zigler & Bishop-Josef, this volume) that standardized measures of children's cognition have limited predictive value. Substantially more variance in 1st grade achievement is accounted for when children's behavior in a naturalistic and motivating environment is considered. This speaks against the current practice of using one measure (as in the case of No Child Left Behind) to make inferences about children's cognitive performance, especially a measure that focuses exclusively on the academic side.

The varying role of adults in children's cognition in different contexts is consistent with extant research. For example, in free-play situations, adults generally inhibit older preschool children's exhibition of complex forms of play, whereas peers facilitate it (e.g., Dickinson & Moreton, 1991; Pellegrini, 1984; Pellegrini & Galda, 1993). However, in a small-group *teaching* context, such as planning an errand or a classification task, adults are much more effective tutors than are peers (Tudge & Rogoff, 1989). In short, adult guidance is useful in some contexts, like skill teaching, and peer interaction is important in other contexts, where social competence is at stake.

Peer interaction as the 4th R: The importance of peer interaction for adjustment to school.

The second dimension of the argument made here relates more specially to the importance of peer interaction for children's more general adjustment to primary school. As noted earlier, the observations of recess behavior that were made in the above reported study were rather gross. These measures only told us about the relative value of peer and adult

interaction. In what follows, the role of a specific form of peer interaction, namely, children's games with their peers, in predicting school adjustment will be examined.

At the level of theory, the ability to interact cooperatively with peers, inhibit antisocial behaviors, and form close relationships, such as friendships, are all important developmental tasks for children in the primary grades (Hartup, 1996; Waters & Sroufe, 1981; Zigler & Trickett, 1978). Developmental tasks vary with age (e.g., impulse control during the preschool period and peer group membership during the early primary school years, see Berk, this volume) and the successful mastering of these tasks constitutes "social competence" for that period and provides the foundation for subsequent development. From this view, mastering the skills necessary for membership in one's school peer group and feeling efficacious in this area should provide a basis for subsequent adjustment to school.

Numerous longitudinal studies and field experiments documented the importance of children's peer relations in their initial adjustment to elementary school (e.g., Ladd, Kochenderfer, & Coleman, 1996; Pellegrini, 1992; Pellegrini, Kato, Blatchford, & Baines, 2002). For example, Ladd and colleagues (Ladd, et al., 1996; Ladd, Price, & Hart, 1988) demonstrated that successful transition from preschool to primary school is fostered when children make the transition with a friend. Friends provide social emotional support for each other in the new, and sometimes stressful, school environment.

One particular type of peer interaction, playing games with rules, such as tag, soccer, and jump rope games is especially important for children making the transition to full day schooling because these games represent a motivating and important developmental task for that age group (Sutton-Smith, 1971). As Piaget (1965) argued, games are a modal form of interaction for primary school-age children. Correspondingly, the design features of games are representative of

a developmental task for that period. For example, following an externally defined a priori rule is important not only in games but also important in the larger arena of social exchange. Sutton-Smith (1971) and others (Pellegrini et al., 2002) have documented empirically the importance of certain forms of games (games of challenge and leadership) for children, and especially boys, making the transition to primary school. Pellegrini and colleagues (2002) defined general facility with games in terms of percent of time spent in games on the playground at recess as well as peer nominations and teacher ratings of children as "leaders" in games. It was found that playground games only predicted boys', but not girls', school adjustment.

This finding is consistent with the theoretical assumption that the social rules and roles that children learn in one niche (with their peers at recess) predict competence in a related niche - adjustment to school more generally. Both the school playground at recess and classroom settings are similar to the extent that they encourage rule governed behavior and cooperative interaction with peers.

The lack of relations between girls' outdoor games and school adjustment may be related to the fact that girls, generally, are less keen on playing outdoors, relative to boys (Harper & Sanders, 1975). This relative lack of enthusiasm for the outdoors as a play venue may be due to the fact that girls find boys' loud and boisterous behavior outdoors unpleasant and thus segregate themselves from boys into more sedentary groups (Maccoby, 1986; Pellegrini, 2004). It would be interesting to see the degree to which girls' games predict school adjustment in an all girls' school- where boys' crashing bodies do not inhibit their games. Further, girls' facility with indoor games is also worth examining.

The research cited above also showed how facility with outdoor games during the first part of the school year predicted end-of-year social competence and school adjustment even after

controlling for social competence and school adjustment, at the beginning of the year (Pellegrini et al., 2002). Social competence in this study was defined following Sroufe and colleagues (Sroufe, Egelund, & Carlson, 1999) at both the group (being liked by peers) and relationship levels (reciprocal friends). That game facility predicted children's school adjustment is a very important finding for educational policy makers. Games probably provide opportunities to learn and practice the skills necessary for effective social interaction with peers in an important socialization context - early schooling. Further, being facile in one dimension of school, albeit playing games at recess, is probably very important for children's more general feelings of efficacy in school. Feelings of efficacy about school may relate to subsequent achievement motivation, for example, attendance and positive classroom participation.

While these results reinforce earlier research where children's peer relations in school predicted school success (e.g., Ladd & Price, 1993), they extend this earlier work in that the majority of the students in the current study were low-income children. It is well known that children, and again boys especially, from economically disadvantaged groups, have difficulty adjusting to and succeeding in school (e.g., Ackerman, Brown, & Izard, 2004; Heath, 1983). We demonstrated that their success in one part of the first grade school day (games at recess) can predict more general school adjustment.

The Role of Recess in Cognitive Performance: Proximal Measures

In the preceding section the positive role of recess in children's achievement tests scores was demonstrated. Recess also has a relatively *immediate* impact on children's cognitive performance. Specifically, in this section we illustrate how children's attention to classroom tasks is facilitated by recess breaks. It is probably this increased attention that is responsible, in part at least, for the positive role of recess in achievement.

Attention is a measure that is consistent with theories suggesting that breaks from concentrated schoolwork should maximize performance. Following the notion of massed vs. distributed practice (Ebinghaus, 1885; James, 1901), children are less attentive to classroom tasks during longer, compared to shorter, seatwork periods (e.g., Stevenson & Lee, 1990). Correspondingly, children are more physically active and socially interactive on the playground after longer, compared to shorter, confinement periods (e.g., Smith & Hagan, 1980). These breaks and the behaviors observed during breaks, in turn, have implications for children's classroom behavior after recess (e.g., Hart, 1993), as well as more distal academic and social cognitive development, as was demonstrated in the previous section. In the studies reported below, attention was measured in terms of children's looking at either their seat work or, in cases when the teacher was reading to them, at the teacher. Additionally, in some studies children's fidgeting and listlessness was also coded as a measure of *in*attention while children did their seatwork.

In what follow the effects of recess timing on children's attention to classroom work was examined. By recess timing we mean the amount of time *before* recess that children are forced to be sedentary (or are deprived of social and physical play) and attend to class work. This type of regimen typifies most primary school classrooms (Minuchin & Shapiro, 1983). The school in which this research was conducted allowed the researchers to manipulate the times that children went out for recess as well as what they did in their classrooms before and after recess. Consequently, these experiments enabled researchers to make *causal* inferences about the effects of recess timing on children's attention to classroom tasks.

The children enrolled in this public elementary school were from varied social economic and ethnic backgrounds. In all of the cases, the children in each of the grades were systematically

exposed to different schedules for recess timing. On some days they went out to recess at 10 AM and on other days at 10.30 AM. Before and after each recess period children were read an experimentally manipulated male-preferred (with male characters) or a female-preferred (with female characters) book. During this time we coded their attention to the task. We also observed and coded their recess behavior.

Our orientation in studying the role of recess timing in children's attention suggests that during that period immediately preceding recess, children's inattention to instructional tasks should increase as a function of duration of the deprivation period. Anecdotal evidence from Japan and Taiwan suggests that children's attention to class work is maximized when instructional periods are relatively short, not long, intense, and there are frequent breaks between these work periods (Stevenson & Lee, 1990). In these countries, as in the Peoples' Republic of China (Kessen, 1975), children are given a break every 50-minutes or so. When children return from breaks they seemed more attentive and ready to work than before the breaks (see also Lewis, 1995).

In the studies reported below, the effects of both indoor and outdoor recess periods on attention are examined. Examining the effects of indoor recess on children's attention would provide insight into the role of a relatively sedentary break period on subsequent attention. Thus, these results should provide further evaluation of the "blowing off steam" hypothesis (Evans & Pellegrini, 1997). If children's attention is greater after than before the indoor break, the role of physical activity per se should be minimal. Further, and from a policy perspective, educators sometimes use indoor recess as an alternative to outdoor breaks. This may be due to the fact that teachers or playground supervisors are reluctant to go outdoors during inclement weather or they

may be sensitive to the possibility of law suits related to injuries on playground equipment. Results from this experiment should provide insight into the efficacy of indoor breaks.

The first study, to our knowledge, to address directly this issue of outdoor recess activity and post-recess attention found that 3rd grade children's attention before recess was lower than it was after recess, especially for boys, thus suggesting that recess facilitates attention (Pellegrini & Davis, 1993). However, before accepting these findings at face value and assuming that recess *causes* children to be more or less focused in their studies, at least one alternative explanation for the results is possible. These results may have been due to the fact that attention was related to the gender role stereotypicality of the tasks on which the children worked. Specifically, in the Pellegrini and Davis (1993) study children's class work often involved listening to a story. Because the researchers did not systematically monitor the stories read, it may have been the case that some of the stories read were more preferred by girls. Thus, their attention may have been related to the task, not the effect of recess. In the next series of experiments this confound was removed by systematically varying gender-preference of tasks before and after recess.

In Experiment 1 of a new series of experiments, the effects of outdoor recess timing on the classroom behavior of boys and girls in grades K, 2, and 4 was examined (Pellegrini et al., 1995). As in all experiments in this series, recess timing varied by 30-minutes. Children's attention (assessed by looking at the book being read to them or at the teacher doing the reading) was assessed before and after recess on male-preferred and female-preferred books.

In Experiment 1, the pre-recess results supported the suppositions of Stevenson and Lee (1990), who proposed that children are less attentive during long, compared to short, work periods. That is, children were generally more attentive during the short deprivation period, relative to the long period, and older children were more attentive than younger children were.

For example, 4th grade children's mean attention scores were greater during the short deprivation time, relative to the long deprivation time. It should neither be surprising that children are less attentive as the time they spend on a task increases; nor should it be surprising that their attention to school task increases with age. Further, children were more attentive after recess than before. Figure 2 displays the pre-recess and post-recess *inattention* for grades K, 2, and 4. Note that at each grade level the children were more *inattentive* before than after recess. These data are displayed in Figure 2.

/Figure 2 about here/

The pre-recess results also support earlier work suggesting that attention to school tasks increases with age (Wittrock, 1986). Further, it was found that boys' and girls' attention to the book read to them was influenced by the gender-role stereotypicality of the story. For example, 4th grade boys in the long timing condition were more attentive to male-preferred stories and less attentive to female-preferred stories while the pattern was reversed for the girls. This finding is consistent with the extant literature on gender preference for stories (Monson & Sebesta, 1991).

Results from this experiment should be interpreted cautiously primarily because of the small sample size (20 children/grade and 10 children/sex within each grade) and because there was only one classroom at each grade level. Replication is clearly needed to assure that the results are not aberrational (Lykken, 1968), especially when the results have implications for school policy. Replication is also needed to clarify the effect of condition on physical activity at recess; the results from this experiment were not consistent with the one other experiment involving primary school children. With these needs in mind two more experiments were conducted (Pellegrini et al, 1995).

In Experiment 2, the same outdoor recess timing and attention procedures were used as in Experiment 1. In Experiment 2, 2nd and 4th graders (one classroom for each grade) were studied in the same school as in Experiment 1. The results from Experiment 2, similar to those from Experiment 1, revealed that children's task attention is affected by recess timing and that timing interacted with dimensions of the task as well as children's age and gender. Children generally, but especially 2nd graders, were more attentive after recess, relative to before recess. In addition, a significant difference between pre-recess and post-recess attention was observed for 2nd grade only, not for 4th grade. That is, only second graders, not 4th graders were more attentive after recess that before. In Figure 3, the pre- and post-recess inattention scores are displayed. The values 1 and 2 indicate 2nd grade pre-recess and post-recess inattention, respectively. Similarly, 3 and 4 represent 4th grade pre-recess and post-recess inattention, respectively. In both cases note that inattention is greater after recess than before.

/Figure 3 about here/

In Experiment 3, students in two 4th grade classrooms were studied and the same recess timing paradigm employed in the previous experiments was used. The recess period was indoors, however. The same experiment was conducted with two separate intact classrooms. Such a design was chosen because of the relatively small samples involved in each classroom. This procedure minimizes the probability of obtaining aberrant results if similar results are obtained in both samples - thus replicating each other. The results from this experiment are similar to those from other experiments: Attention was greater after the recess period than it was before the break in classroom 2. The result from the indoor recess study was similar to the outdoors results- Children are generally more attentive to classroom work after recess than before. Whether recess is indoors or outdoors does not seem to matter. In Figure 3, these results are displayed with pre-

recess (Numbers 1 and 3) and post-recess scores (Number 2 and 4) of inattention for the two classrooms. Again, note that in both cases, inattention is lower after recess than before, as displayed in Figure 4.

/Figure 4 about here/

The resulting message from all of this research is clear. Breaks between periods of intense work maximize children's attention to their class work. More speculatively, it is probably this increased attention that is partially responsible for the positive relations between recess and performance on achievement tests.

What we really still need to know, however, is the degree to which different types of recess regimens relate to attention and achievement. A first step in this direction was already presented, as we found that indoor recess periods, like outdoor periods, seemed to be effective facilitators of children's attention to class work. This result is consistent with mass vs. distributed practice as the mechanism responsible for the effects of recess on attention. From this view, the nature of the break is less important than having a break per se. To more thoroughly examine this explanation, researchers should examine different types of breaks after periods of intense cognitive work. For example, does watching a short video or listening to music for a short period facilitate attention? Further, do these effects vary with the age and gender of the child?

Bjorklund's cognitive immaturity hypothesis provides some guidance here (Bjorklund & Pellegrini, 2000). The theory suggests that breaks for preschool and young primary school children should be "playful" and unstructured. Providing time for children to interact with peers or materials on their own terms, that is, with minimal adult direction, should maximize attention to subsequent tasks. The venue, indoors or outdoors, is not important. With older children,

merely providing breaks between periods of intense work might suffice to maximize attention. The research on massed vs. distributed practice with adults supports this view.

Another crucial aspect of the recess period that needs further research is the duration of the recess period. Should it be 10 minutes, 20 minutes, 30 minutes, etc? We simply do not know. Answers to this question have obvious implications for school policy and scheduling. We explored the issue of recess duration with a sample a preschool children (age 4- 5 years) (Holmes, Pellegrini & Schmidt, unpublished data). Procedurally, children had "circle time" and were read a story before recess. Then they went outdoors for recess periods of 10, 20, or 30 minutes. When they returned to their classrooms they again sat in a circle and listened to a story read to them by their teachers. Attention was recorded and coded (using scan sampling and instantaneous recording procedures) for whether the child was gazing in the direction of the book or the teacher reading the book.

Consistent with earlier work with older, primary school children (Pellegrini & Davis, 1993, Pellegrini et al., 1995), attention was greater following, relative to before, the recess period and girls were more attentive than boys to classroom tasks in all conditions. Thus it seems reasonable to conclude that outdoor recess breaks help children attend to classroom tasks.

Regarding the differing durations of recess periods, we found that attention to classroom tasks was greatest following the 20- and 10-minute outdoor play periods whereas the 30-minute period resulted in higher rates of inattention. These findings are consistent with anecdotal evidence from the UK that stated that children become bored with recess after too long a period, and thus longer periods may become counter-productive (Blatchford, 1998).. This work needs to be replicated as it represents only one short term study with a relatively small sample. The duration of the recess periods is clearly important as it is one of the persistent questions posed to

us by parents and teachers. How long should the recess be? Should its duration vary with children's age? Clearly at this point we only have hints, and are not sure.

While children's attention to classrooms instruction is obviously very important we should not lose sight of the importance of peer interactions for children's successful development as both students and members of society. The importance of developing peer relations is especially important during the preschool and early primary school years (3- 6 years of age) (Waters & Sroufe, 1983). Thus, providing recess periods that encourage opportunities for relatively unfettered peer interaction as well as exploration of different materials would maximize both the social and cognitive benefits of recess.

Policy Implications

Data presented in this chapter provide empirical support for the positive role of recess in the school curriculum. Providing breaks over the course of the instructional day facilitates primary school children's attention to classroom tasks. That these results were obtained using well-controlled field experiments and replicated a number of times by different groups of researchers should provide confidence in the findings. In terms of specific class performance, the results presented here support the anecdotal evidence from Taiwanese and Japanese schools suggesting that in order to maintain high levels of attention, children need frequent breaks in the course of the day (Stevenson & Lee, 1990). Recall, Stevenson and Lee's study compared the achievement of Asian and American school-age children and found Americans lagging far behind. They found that Asian schools had longer school days and school years but they also provided children with breaks every 50 minutes across the entire school day.

This evidence should inform policy and be used to guide those policy makers and politicians seeking to diminish or eliminate recess from the school curriculum. First, and like

Asian schools, American children's school days and school years should be lengthened. Such a policy would bring the total number of hours American children attend school in a year closer to other countries in the world. This increase should have the corresponding benefit of increasing achievement. Longer school days and years- with frequent breaks- should accomplish this. Additionally, a longer school day and year would ensure that children have a safe place while their parents are at work. Children would be in school, learning and interacting with their peers, rather at home, unsupervised, or in expensive after-school care.

While recess periods alone seem to be important, it is also important to let children interact on their own terms with peers. Providing children with a physical education class as a substitute for recess, does not serve the same purpose (Bjorklund & Pellegrini, 2000; Council on Physical Education for Children, 2001). They need to PLAY! This conclusion is supported on a number of fronts. First, and at the level of theory, both the cognitive immaturity hypothesis and massed vs. distributed practice theory suggest that after periods of intense children need breaks from instruction. A physical education class is another form of instruction and thus would not provide the sort of break need to maximize instruction. Further, physical education classes typically do not provide the variety of rich opportunities for peer interaction that recess does. The research presented above pointed to the importance of peer interaction for both social and cognitive outcomes.

Second, the importance of physical education for classroom attention is typically predicated on the idea that children "need to blow off steam" after periods of work and the vigorous activity associated with physical education should serve this purpose. As noted earlier, the idea of "blowing off steam" is rooted in Surplus Energy Theory- an invalid 19th century theory (Evans & Pellegrini, 1997).

Third, and related to this last point, earlier research on the role of recess in children's attention found no empirical relation between the levels of children's vigorous activity on the playground at recess and subsequent attention to classroom tasks (Pellegrini & Huberty, 1993). Consequently, these results showed be used against any effort to use physical education as a substitute for recess.

Another implication of this work is that gender-preference of classroom tasks is important in children's attention to those tasks. Specifically, research on children's attention consistently shows that boys are less attentive to classroom tasks than girls (Pellegrini et al., 1995). Further, recess breaks are especially effective in maximizing boys' attention, relative to girls. These findings have implications for school-age boys being diagnosed with attention deficit hyperactivity disorder (ADHD) (Pellegrini & Horvat, 1995). We know, for example, that providing opportunities more breaks minimizing fidgeting and maximizes attention- two dimensions of ADHD. Teachers and parents should be aware of the fact the classroom organization may be responsible for their sons' attention and fidgeting and that breaks may be a better remedy than Ritalin.

Lastly, the finding that children's competence develops in the context of interacting with peers is especially important as children are rapidly losing these opportunities. There are signs in both the US and the UK that children of primary school age have less time available to out of school for interacting freely with peers and thus developing social skills and competence (Blatchford, 1998). For example, after school many American children enter empty homes, waiting for their parent(s) to return from work (Steinberg, 1986). There is also a trend in both the US (Pellegrini, 2005) and in the UK (Blatchford, 1998; Blatchford & Sumpner, 1998) for recess time to be limited or eliminated from the primary school day. Recess may be one of the few

times during the day when children have the opportunity to interact with peers and develop social skills free from adult intervention.

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Figure 1

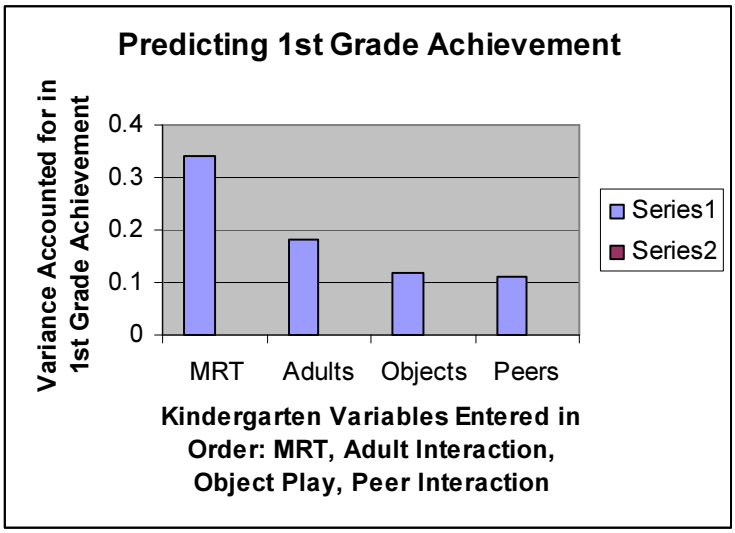

Predicting 1st Grade Achievement
Variance Accounted for in 1st Grade Achievement
0.4
0.3
0.2
0.1
0
MRT
Adults
Objects
Peers
Series1
Series2
Kindergarten Variables Entered in Order: MRT, Adult Interaction, Object Play, Peer Interaction

Figure 2

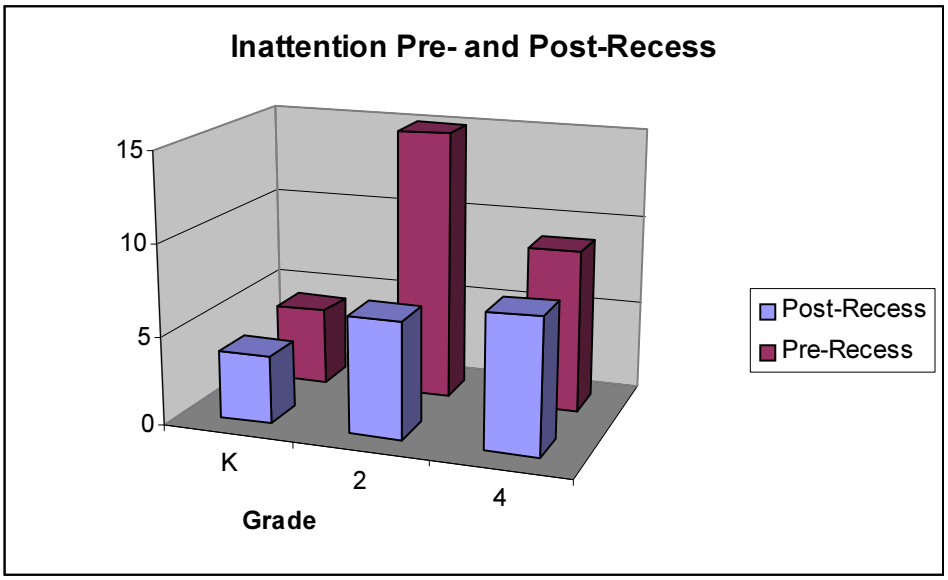

Inattention Pre- and Post-Recess
15
10
5
0
K
2
4
Grade
Post-Recess
Pre-Recess

Figure 3

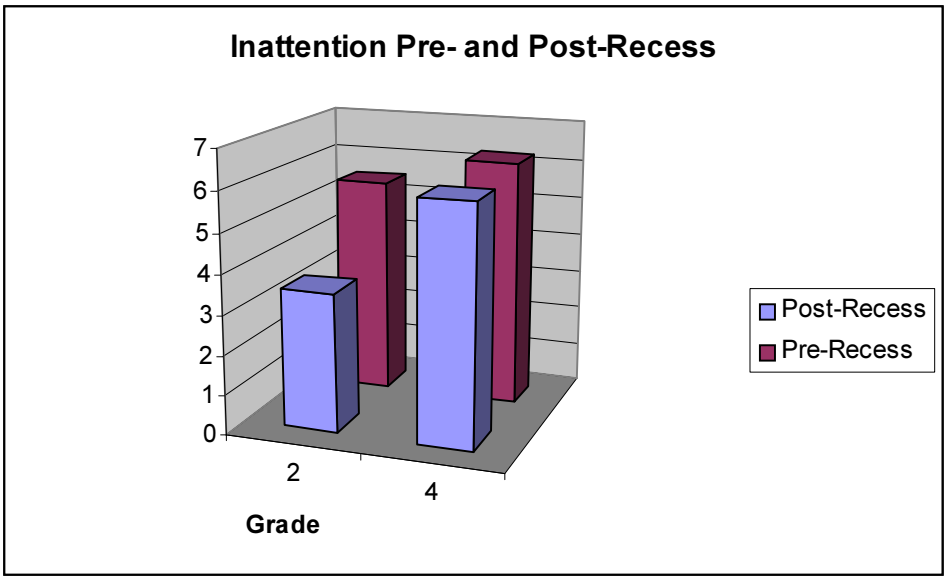
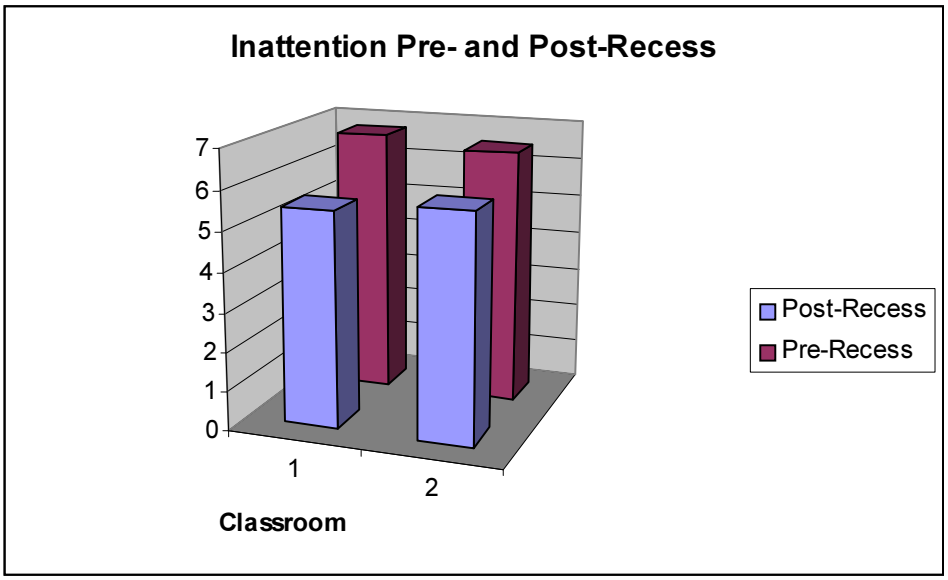

Inattention Pre- and Post-Recess
7
6
5
4
3
2
1
0
2
4
Grade
Post-Recess
Pre-Recess

Figure 4


Inattention Pre- and Post-Recess
7
6
5
4
3
2
1
0
1
2
Classroom
Post-Recess
Pre-Recess

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