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Physical Activity May Strengthen Children's Ability To Pay Attention

ScienceDaily (Apr. 1, 2009) — As school districts across the nation revamped curricula to meet requirements of the federal "No Child Left Behind" Act, opportunities for children to be physically active during the school day diminished significantly.

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Future mandates, however, might be better served by taking into account findings from a University of Illinois study suggesting the academic benefits of physical education classes, recess periods and after-school exercise programs. The research, led by Charles Hillman, a professor of kinesiology and community health and the director of the Neurocognitive Kinesiology Laboratory at Illinois, suggests that physical activity may increase students' cognitive control – or ability to pay attention – and also result in better performance on academic achievement tests.

"The goal of the study was to see if a single acute bout of moderate exercise – walking – was beneficial for cognitive function in a period of time afterward," Hillman said. "This

question has been asked before by our lab and others, in young adults and older adults, but it's never been asked in children. That's why it's an important question."

For each of three testing criteria, researchers noted a positive outcome linking physical activity, attention and academic achievement.

Study participants were 9-year-olds (eight girls, 12 boys) who performed a series of stimulus-discrimination tests known as flanker tasks, to assess their inhibitory control.

On one day, students were tested following a 20-minute resting period; on another day, after a 20-minute session walking on a treadmill. Students were shown congruent and incongruent stimuli on a screen and asked to push a button to respond to incongruencies. During the testing, students were

enlarge



Charles Hillman and Darla Castelli, professors of kinesiology and community health, have found that physical activity may increase students' cognitive control -- or ability to pay attention -- and also result in better performance on academic achievement tests. (Credit: Photo by L. Brian Stauffer)

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outfitted with an electrode cap to measure electroencephalographic (EEG) activity.

"What we found is that following the acute bout of walking, children performed better on the flanker task," Hillman said. "They had a higher rate of accuracy, especially when the task was more difficult. Along with that behavioral effect, we also found that there were changes in their event-related brain potentials (ERPs) – in these neuroelectric signals that are a covert measure of attentional resource allocation."

One aspect of the neuroelectric activity of particular interest to researchers is a measure referred to as the P3 potential. Hillman said the amplitude of the potential relates to the allocation of attentional resources.

"What we found in this particular study is, following acute bouts of walking, children had a larger P3 amplitude, suggesting that they are better able to allocate attentional resources, and this effect is greater in the more difficult conditions of the flanker test, suggesting that when the environment is more noisy – visual noise in this case – kids are better able to gate out that noise and selectively attend to the correct stimulus and act upon it."

In an effort to see how performance on such tests relates to actual classroom learning, researchers next administered an academic achievement test. The test measured performance in three areas: reading, spelling and math.

Again, the researchers noted better test results following exercise.

"And when we assessed it, the effect was largest in reading comprehension," Hillman said. In fact, he said, "If you go by the guidelines set forth by the Wide Range Achievement Test, the increase in reading comprehension following exercise equated to approximately a full grade level.

"Thus, the exercise effect on achievement is not statistically significant, but a meaningful difference."

Hillman said he's not sure why the students' performance on the spelling and math portions of the test didn't show as much of an improvement as did reading comprehension, but suspects it may be related to design of the experiment. Students were tested on reading comprehension first, leading him to speculate that too much time may have elapsed between the physical activity and the testing period for those subjects.

"Future attempts will definitely look at the timing," he said. Subsequent testing also will introduce other forms of physical-activity testing.

"Treadmills are great," Hillman said. "But kids don't walk on treadmills, so it's not an externally valid form of exercise for most children. We currently have an ongoing project that is looking at treadmill walking at the same intensity relative to a Wii Fit game – which is a way in which kids really do exercise."

Still, given the preliminary study's positive outcomes on the flanker task, ERP data and academic testing, study co-author Darla Castelli believes these early findings could be used to

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inform useful curricular changes.

"Modifications are very easy to integrate," Castelli said. For example, she recommends that schools make outside playground facilities accessible before and after school.

"If this is not feasible because of safety issues, then a school-wide assembly containing a brief bout of physical activity is a possible way to begin each day," she said. "Some schools are using the Intranet or internal TV channels to broadcast physical activity sessions that can be completed in each classroom."

Among Castelli's other recommendations for school personnel interested in integrating physical activity into the curriculum:

- scheduling outdoor recess as a part of each school day;
- offering formal physical education 150 minutes per week at the elementary level, 225 minutes at the secondary level;
- encouraging classroom teachers to integrate physical activity into learning.

An example of how physical movement could be introduced into an actual lesson would be "when reading poetry (about nature or the change of seasons), students could act like falling leaves," she said.

The U. of I. study appears in the current issue of the journal *Neuroscience*. Along with Castelli and Hillman, co-authors are U. of I. psychology professor Art Kramer and kinesiology and community health graduate student Mathew Pontifex and undergraduate Lauren Raine.

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**National Association for
Sport and Physical Education**

an association of the American Alliance for Health,
Physical Education, Recreation and Dance

NASPE Sets the Standard

POSITION STATEMENT

Physical Activity Used as Punishment and/or Behavior Management

Position Statement

Administering or withholding physical activity as a form of punishment and/or behavior management is an inappropriate practice.

Purpose

This position statement addresses the inappropriate use of or withdrawal from physical activity as a disciplinary consequence, both within and outside of the school environment.

Intended Audience

The audience for this position statement includes school administrators, physical education teachers, classroom teachers, coaches, parents and others working with children and young adults in physical activity settings (e.g., youth sport, interscholastic sport, YMCA, Boys' and Girls' Clubs).

Supporting Information

Children and youths have many opportunities to be physically active in the school environment, including physical education class, recess, and before- and after- school programs. In addition, more than one third of children ages 9-13 participate in organized youth sport (Corbin, Pangrazi & LeMasurier, 2004). It is imperative that these experiences promote the importance of physical activity to one's health. To become active adults, children and youths need to encounter positive physical activity experiences, as supported in the National Association for Sport and Physical Education's (NASPE) *Appropriate Instructional Practice Guidelines* documents for elementary, middle and high school physical education (NASPE, 2009).

A student's motivation for being physically active by engaging in the important subject matter content of physical education and sport should never fall victim to the inappropriate use of physical activity as a disciplinary consequence. NASPE supports that view in its *National Standards for Sport Coaches: Quality Coaches, Quality Sports*, which states that coaches should "never use physical activity or peer pressure as a means of disciplining athlete behavior" (NASPE, 2005, p. 17).

Examples of the inappropriate use of physical activity include:

- Withholding physical education class or recess time for students to complete unfinished school work or as a consequence for misbehavior.
- Forcing students to run laps or perform push-ups because of behavioral infractions (e.g., showing up late, talking, and disruptive behavior).
- Threatening students with physical activity or no physical activity (e.g., no recess, no game time), and then removing the threat because of good behavior.
- Making students run for losing a game or for poor performance (e.g., missing a foul shot, dropping the football).

Core Issue

The core issue is that administering or withdrawing physical activity as punishment is inappropriate and constitutes an unsound education practice.

Inappropriate

Exercise used as punishment is considered a form of corporal punishment in many states (e.g., California, Massachusetts, and Hawaii). Corporal punishment in schools is illegal in 29 states (Dupper & Dingus, 2008) and is defined as “physical pain inflicted on the body of a child as a penalty for disapproved behavior” (National Coalition to Abolish Corporal Punishment in School, 2006). Furthermore, many national professional organizations, including the American Academy of Pediatrics, the National Association for State Boards of Education, the National Education Association and the Centers for Disease Control and Prevention (Dupper & Dingus, 2008) have advocated for bans on corporal punishment. State boards of education in Hawaii and California prohibit withholding physical activity or using it as punishment.

The absence of support for using physical activity as punishment renders its use by a teacher or coach indefensible, from a legal liability standpoint.

Unsound

Time spent on punishment is time that could be spent instructing students, developing fitness levels or other positive learning experiences.

While some people believe that physical activity used as punishment and/or a behavior-management tool is effective, experts perceive this practice as a “quick fix” that actually might discourage the behavior it is intended to elicit. Using negative consequences to alter behavior suppresses the undesirable behavior only while the threat of punishment is present; it doesn't teach self-discipline or address the actual behavior problem. Therefore, student behavior patterns are not changed (Weinberg & Gould, 2007).

At times, it's appropriate to remove a student briefly from a physical education lesson, recreational play, athletic practice or game to stop an undesirable behavior. For example, it's appropriate to remove a student who is behaving in a manner that is unsafe. Teachers should devote that time to allowing the child or youth a moment to cool down, reflect upon his or her actions, and communicate with leaders as to why he or she was removed. Once the student

understands and conveys appropriate behaviors, he or she should return to the activity. However, any prolonged withdrawal of physical activity (e.g., holding a child back from recess or physical education as a consequence of classroom behavior) is both inappropriate and unsound for the same reasons mentioned above.

Alternatives to Physical Activity as Punishment

Successful teachers and coaches create positive learning environments without using physical activity as punishment. Managing and motivating children and youths involve developing an effective preventive-management system; no one, simple solution works for all. Prevention is the key. The following list offers actions that are suitable alternatives to using physical activity as punishment:

- Include students in establishing expectations and outcomes early in the year, and review those expectations and outcomes frequently.
- Include students in meaningful discussions about goals and how to reach them.
- Be consistent with enforcing behavioral expectations within the learning environment.
- Practice and reward compliance with rules and outcomes.
- Offer positive feedback and catch students doing things right.
- Don't reinforce negative behavior by drawing attention to it.
- Hold students accountable for misbehavior.
- Develop efficient routines that keep students involved in learning tasks.
- Wait for students to be attentive before providing directions.

Appropriate Use of Physical Activity

Meaningful engagement in physical activity is an essential aspect of physical education and sport. Building a sense of competence, advocating the joy of physical activity and moving, expanding movement and motor skills, and developing fitness levels are among the numerous practices that support appropriate behavior and the development of positive attitudes toward physical activity.

When it comes to promoting healthy lifestyles, it's just as important to use physical activity as a positive as it is to avoid using physical activity as a negative. Students need more experiences that use physical activity — rather than junk food — to celebrate significant events. Organizing a dance, developmentally appropriate games, cooperative activities, scavenger hunts, etc., provides students with the opportunity to move, socialize with peers and engage in physical activity for the fun of it.

Conclusion

NASPE opposes administering or withholding physical activity as a form of punishment and/or behavior management. School administrators, physical education teachers, classroom teachers, coaches, parents and others working with children and young adults play a critical role in providing meaningful physical activity experiences. Therefore, teachers should see providing meaningful physical activity as a way to ensure that children and youths develop positive

attitudes about physical activity and stop viewing physical activity as a means of punishment and/or behavior modification.

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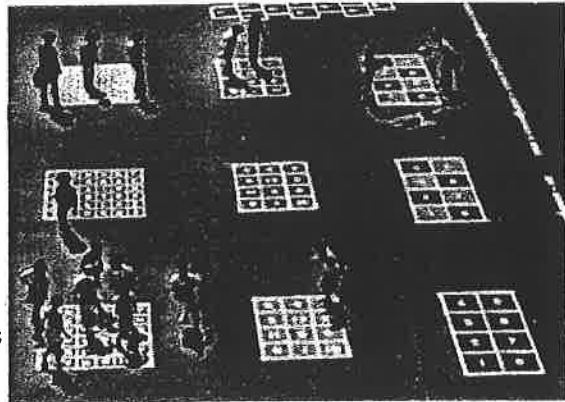
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60 Alternatives to Withholding Recess January 2007

Given the value of recess in a student's physical and social development, and the need for periodic breaks from classroom instruction, using recess as punishment is inappropriate.

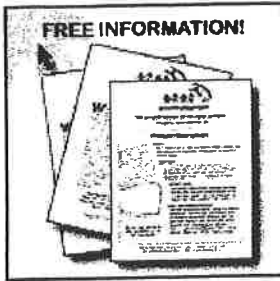


Listed below are some alternatives to withholding recess.

Zero Cost Alternatives

1. Sit by friends
2. Watch a video
3. Read outdoors
4. Teach the class
5. Have extra art time
6. Extra music and reading time
7. Homework coupon
8. Coupon for prizes and privileges
9. Enjoy class outdoors
10. Play a computer game
11. Read to a younger class
12. Get a no homework pass
13. Make deliveries to the office
14. Listen to music while working
15. Play a favorite game or puzzle
16. Earn play money for privileges
17. Walk with a teacher during lunch
18. Be a helper in another classroom
19. Eat lunch with a teacher or principal
20. Dance to favorite music in the classroom
21. Get "free choice" time at the end of the day
22. Listen with a headset to a book on audiotape
23. Have a teacher perform special skills (i.e. sing)
24. Have a teacher read a special book to the class
25. Recognition with morning announcements
26. Chat break at the end of class
27. Taking care of the class pet





28. Extra recess
29. Small playground equipment to check out
30. Leading the class to lunch, recess, library or other adventure
31. Music concert at school
32. Walk break from class
33. Have lunch or breakfast in the classroom
34. Private lunch in classroom with a friend
35. Show-and-tell
36. Play favorite game
37. Teacher performs special skill: cartwheel, guitar playing
38. First to line up.
39. Teacher's helper.

Low Cost Alternatives

40. Select a paperback book
41. Enter a drawing for donated prizes
42. Take a trip to the treasure box
43. Get stickers, pencils, and other school supplies
44. Receive a video store or movie theatre coupon
45. Get a set of flash cards printed from a computer
46. Receive a "mystery pack" (notepad, folder, sports cards, etc.)
47. Certificate/trophy/ribbon/plaque
48. Gift certificate to local food merchants
49. Free pass to sporting event or play
50. Pencil toppers
51. Stickers
52. Pencils
53. Stars or smiley faces
54. GAME DAY: Students earn letters to spell game day...after the letters have been earned, we play reading or phonics-type board games. Kids love Game Day!"
55. FRIDAY FREE TIME: Students have thirty minutes at the beginning of the week and they can earn or lose free time according to their behavior. Use a timer and turn it on (they can hear it) if they are too loud working, lining up, etc. Add time when their behavior is good. Adding time is the most effective. You will save time by not waiting for them to settle down so their free time is really reclaiming time that would have been lost.

Discipline Alternatives

56. Write a letter of apology to the person who has been wronged and Discuss with teaching the importance of apologies
57. Write a letter to parents/guardians explaining why behavior is inappropriate or disruptive and stating what student will try to do to change behavior
58. Take away privilege of choice for class or individual activity when choice is built into activity
59. Do make up work during free choice time
60. Have students sit away from the group to do class work and have them "earn" their way back into the group activities
61. Have student work with teacher to develop a plan for behavior change tied to incremental privileges
62. Create a behavior charts with students that identifies a target behavior and agreed upon reinforcements and rewards for chronic behavior issue