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Effects of Recess on Educational Outcomes in Elementary School Children

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Abstract

Introduction: Because physical activity is beneficial for physical and mental health, the declining opportunities to implement adequate recesses in schools are devastating for children. If educational outcomes are positively affected by increased recess time or quality, schools are more likely to receive funding for programs and resources that support this renovation to recesses, providing research in lacking topics. *Purpose*: The purpose of this systematic review is to find related, academic articles for cross examination of data collected on the effects that recess has on educational outcomes so that schools may use this as a resource to receive funding to increase the opportunities for activities in school. *Methods*: Conducting the systematic review was done according to PRISMA guidelines and PROSPERO protocol. The summarized steps for completing this systematic review are in order, as follows: article selections, extraction of information, quality and bias analysis using GRADE, consolidating data from the remaining articles, comparing data, and identifying basic trends. *Results*: Among the 12 articles reviewed, selected, and filtered, the results tended to have increased recess time and/or quality as an association with the improvement of educational outcomes. Across the 12 studies, all were cross-sectional studies or longitudinal, and all except one were conducted on participants in the United States; the outlier was conducted in Spain. The role and number of participants studied varied across articles from six teachers to 11,624 students but all studied elementary school children. The articles investigated different components of educational outcomes such as, improved academics, controlled classroom environment, refined cognitive skills, enhanced performance on school aptitude tests, and improved social behavior, reduced classroom distractions. Results were supported by a variety of both qualitative and

quantitative data, such as recess grading scales, teacher interviews, academic performance, and classroom observations. *Discussion*: Overall, recess tended to show a positive association with educational outcomes. These positive associations may be an asset to justifying the funding for programs and resources that increase recess and overall physical activity in elementary school students.

Introduction

Physical activity and exercise opportunities continue to decrease in United States elementary schools.[1] As daily physical activity and exercise levels decrease, children are increasingly at risk for negative health effects, both physical and mental.[2] According to the United States Department of Health, physical activity improves fitness, cardiovascular function, metabolic function, and bone health.[3] In children, exercise improves bone health, helps keep them at a healthy weight or body composition, improves cardiorespiratory and muscular fitness, and reduces the risk of depression.[4] These negative health effects do not just harm individual students but also harm the schools. Specifically, lower physical activity decreases cognitive performance as well as academic achievement.[5] If there continues to be a decline in activity levels, schools risk their students' emotional health being harmed or worsening.[6] More specifically, when time and quality of physical activity and are decreased, mental health and cognitive performance benefits are diminished or extinguished.[7] In elementary schools, recess is the main source of physical activity; recess is not only decreasing with overall activity, but also with duration and quality. Schools are wanting to maximize class time to increase efficiency by decreasing recess but are most likely doing the opposite.

To encourage schools to increase recess, there must be research on how recess effects educational outcomes. The definition of an educational outcome in this circumstance is the potential to benefit schools through funding. For example, by increasing academic performance–an educational outcome, there is an increase in likelihood of additional school funding.[8] Although there is presently a large pool of research on the effects of recess on students' health, there is a lack of specified research about the effects of recess on educational outcomes—schools' general funding, which may encourage schools to increase recess time and quality.

The purpose of this systematic review is to find related, academic articles for cross examination of collected data collected on the effects that recess has on educational outcomes so that schools may use this as a resource to receive funding and reap the benefits associated with recess to increase the opportunities for physical activities in school.

Methods

In the process of reviewing several articles, PRISMA guidelines and protocols established by PROSPERO were used to outline the procedures of this systematic review. There were four main steps to the research method and one additional step for data analysis; the four main steps were as following: identification of potential articles, selection of the articles, extraction of article information, and screening of the remaining articles.

Identification of potential articles began with a preliminary search based on keywords. After compiling a list of 118 general search results, the study selections were defined by the following information in Microsoft Excel to make the articles easier to identify: reference type, authors, publication year, title, periodical full, and keywords.

This spreadsheet was then used to complete the next step of review, article selection. Selection began filtering the studies through more than just keywords; this is performed in three phases: selection by the title, abstract, and full document. After each selection is performed, a new spreadsheet was made to reduce confusion of when an article was excluded. In addition, for each of these three steps, two reviewers decided "include" or "exclude" and recorded their reason on each spreadsheet. The purpose of the assessors was to provide interrater reliability of this systematic review. Once the two reviewers came to a consensus on any differences in opinions, the next step of the selection process continues; then, a new spreadsheet was made with the remaining articles. All articles must have included recess, elementary schools, and educational outcomes.

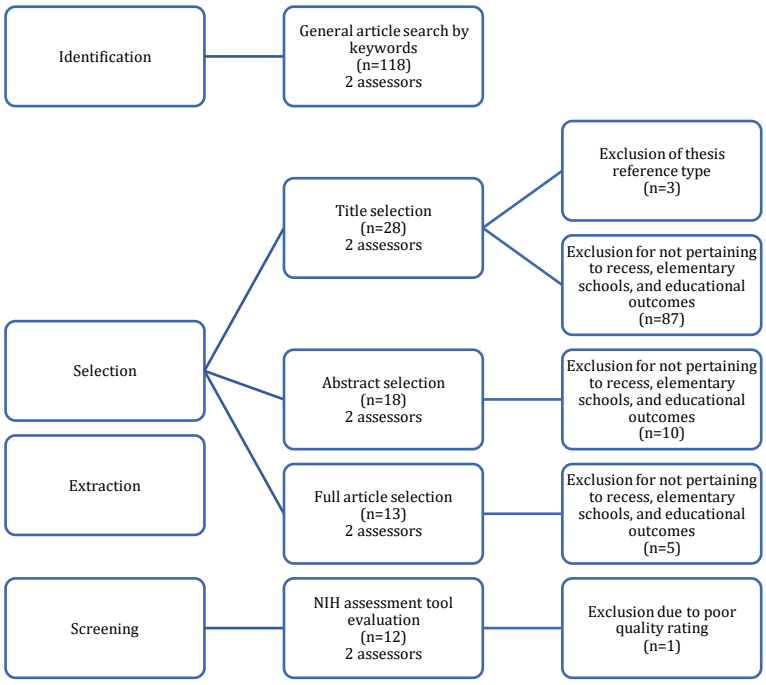

Figure 1

Before reviewing the title, three publications were excluded due to their reference type being theses. When looking for the essential criteria in the titles and abstracts, sometimes it was unclear whether an article had the necessary components; in this case, the articles in question were included until they were reviewed by their full document. During the review based on the title of the articles, 87 articles were excluded for not pertaining to recess, elementary schools, and educational outcomes. The remaining 28 articles continued to selection based on abstracts. This time, 10 studies were excluded for the same reason, leaving 18 articles to be selected based on their full study; five articles were excluded, and 12 articles continued to the next main step: extraction.

Extraction of information pulled out each article data and prepared articles to be graded for bias, conflicts of interest, reliability. On a new spreadsheet, the article data was categorized by their initial defined information plus their abstract, study duration, study design, country, sample size, female sample size, male sample size, school grades, ages, recess session duration, recess frequency, outcome variable or educational outcome, main results, and any addition notes. Not only did the consolidation of data into a single document prepare for article reliability grading, but it also made cross-examination of data much more efficient.

Before comparing data, to minimize articles with skewed results, articles were screened for reliability and risk of bias that would compromise quality. So, after the data extraction, each article was evaluated using GRADE criteria to determine quality of the studies and

analyze any potential bias. Majority of the studies were observational cross-sectional or longitudinal, so questions for screening were specifically using the observational/cross-sectional tool. Through this process, there was only one study that was excluded in this step due to receiving a poor quality rating.

With the 12 articles remaining with their data extracted and consolidated into one document, each study is compared. All results are generally interpretated within the context of the research topic criteria. The extracted data assists in comparing results and qualitative and quantitative statistics, helping to determine whether the general trend has a negative, neutral, or positive association with each educational outcome defined; results are cross examined to consider each articles' variations in purpose, methods, and experimental design.

The results were categorized based on their findings; there are the educational outcomes that recess effects based on the systematic review of related studies: academic performance, classroom behavior, cognitive functions, social/emotional effects, and teaching efficiency. A flow chart of the summarized research methods can be found in Figure 1.

Results

The extraction consists of 12 articles described in Tables 1-A, 1-B, 2-A, and 2-B. Tables 1-A and 1-B display seven cross-sectional case studies, and Tables 2-A and 2-B consists of five longitudinal studies. Out of the combined 12 articles, 11 articles are based on subjects in

the United States, while one study is conducted in Spain. Studies focused on elementary students as their population, but the sample used to measure educational outcomes in each study varied. More specifically, two studies only used teachers' perceptions and opinions, nine studies used elementary school students, and one study used both teachers and students as their testing sample.

Academic Performance

Academic performance applies specifically to work and assessments conducted in the elementary classroom setting. Examples of various methods of measuring academic performance are grades and testing information retention, and school aptitude tests in various categories. Articles that measure academic performance and investigate longer recess time concluded that it was associated with better academics; more specifically, better grades and information retention.[9, 10] Some research articles used school aptitude tests as the dependent variable to measure academic performance. It was found that longer recess time has an association with improved school aptitudes in various categories tested: school, numerical,[11] reasoning, nonverbal, and verbal.[12] In addition, the larger the duration of recess, the greater the increase in reading levels.[13] On the other hand, one study found greater recess time had no positive or negative effects on reading levels; but, when recess is within a 16-to-30-minute window, reading levels still tended to be higher, just enough for the data to be considered statistically significant.[14] The slight differences in outcomes between articles may be attributed to difference found through the extracted information: intervention methods and testing duration. Therefore, recess tended to positively effect

academic performance through the consistent correlation of improved academics and school aptitude tests with the increase of time dedicated to recess.

Classroom Behavior

Classroom behavior can be described as externalized problems and behavioral symptoms. Externalized problems include hyperactivity, aggression, and conduct problems. Behavioral problem examples are attention problems, withdrawal, and functional communication--constructive feedback to teachers. After reviewing the included studies, externalized problems and behavioral problems were better with more recess time. Studies also concluded that externalized problems were greater with the longer recess duration[15, 16]; they also concluded that behavioral symptoms were improved with increasing both recess time and quality.[15, 17] In addition, one study examined how increasing just recess time effects overall attention, which also has a significant associate with improvements in the general trend of behavioral symptoms.[10]

Cognitive Functions

Cognitive functions, although related to academic performance and classroom behavior, requires a separate category. Academic performance focuses on grades and assessment, and classroom behavior primarily discusses behaviors that affect the classroom or overall attention as a behavioral problem. Cognitive functions focus on individual mental performance or capability—including focus, adaptability, problem solving, creativity, independence, cognitive flexibility, etc. Studies concluded that students had greater abilities to sustain focus after longer recess lengths.[9, 18, 19] In addition, upon returning from

recess into the classroom, the subjects displayed improved adaptability when reengaging from the recess to classroom transition.[15, 17] When students did settle back into their classrooms, there was an immediate increase in problem-solving after increased recess time. Study results also observed greater independence[18] and creativity by thinking outside of the box.[12, 19] These results correlate with cognitive flexibility improvements, an outcome of an increase in recess duration.[12] After an increase in recess duration, students tended to come back and display cognitive participation in lessons more frequently, and there was noted rise in classroom engagement and learning.[17]

Social/Emotional Effects

Social and emotional effects is an umbrella to describe the effects recess quality and/or duration has on students' emotions—or emotional well-being—and the external projection to others. It is found that students were observed to have friendlier interactions after recess periods[9] and even lower rates of bullying by improving recess quality.[15] Not only did intrapersonal interactions tend to improve after recess, so did personal control. More specifically, when increasing recess time, students tended to have more emotional self-control.[9, 15] Longer recess time and quality resulted in students being more cooperative and less disruptive.[18] After recess, students tended to have positive moods, motivating students to learn when they were in the classroom.[17, 18] In addition, confidence tended to increase with improved mood, correlating with more students tending to assume leadership in the classroom and increasing interpersonal student involvement.[15]

Teaching Efficiency

Although one of the hesitancies for schools to increase recess time is the decreased time for learning—with the understanding school days run within a set window, study results concluded the opposite; decreased class time results in teachers prioritizing curriculum, improving their ability to cover and summarize curriculum while still having improved academic performance.[9]

Study Quality

After screening 13 articles for reliability using GRADE criteria, only one article was excluded for poor quality. The poor quality rating was due to not recording information in multiple sections including more than one essential category. One of the 12 included articles was graded fair because some of the nonessential information was not reported, but all other methodology and data analysis conducted within the article was good quality. The remaining 11 articles were all rated "good."

Table 1-A

Cross-Sectional Studies Analysis Results

Title	Study Duration	Country	n	Grades
A Qualitative Study of Teachers' Perceptions of Increased Recess Time on Teaching, Learning, and Behavior	3 years (data collection in. a much smaller time frame**)	United States	17 teachers	K, 1st, and 2nd
Recess Quality and Social and Behavioral Health in Elementary School Students	1 year (2018-2019)	United States	352 students	3rd/5th
Advocating for Play: The Benefits of Unstructured Play in Public Schools	10 weeks	United States	Interviews: 47 children and 6 teachers Observations: 61 children	K-5th

Effects of a 10-week active recess program in school setting on physical fitness, school aptitudes, creativity and cognitive flexibility in elementary school children.	10 weeks	Spain	114 students	3rd, 4th, 5th, or 6th
Teachers' and School Administrators' Views Regarding the Role of Recess for Students	N/A	United States	10 classroom teachers 3 assistant principals 2 principals	N/A
Classroom Benefits of Recess	N/A	United States	99 students	3rd-5th
Effect of Recess on Fifth Grade Students' Time On-Task in an Elementary Classroom	6 weeks	United States	12 students	5th

Table 1-B

Cross-Sectional Studies Analysis Results Continued

Title	Recess Session	Recess Frequency	Outcome Variable	Outcome Method
A Qualitative Study of Teachers' Perceptions of Increased Recess Time on Teaching, Learning, and Behavior	15 minutes	4x/day & 5 days/1 week	Teaching, learning, and children's behavior	Teachers' observations via semi-structured interviews, grade monitoring
Recess Quality and Social and Behavioral Health in Elementary School Students	Mean = 29.54 minutes	5x/week (41 different groups/recess)	Social, emotional, and behavioral competencies for elementary school children	Recess quality (GRF-OT), classroom behavior (BASC-3), Classroom quality (CLASS)
Advocating for Play: The Benefits of Unstructured Play in Public Schools	40 minutes (compared to non-recess 60 min play)	3x/week (for the study observations; doesn't specify the usual frequency)	Cognitive, emotional, and social benefits to play (teachers and students' opinions)	Interviews, surveys, and observations
Effects of a 10-week active recess program in school setting on physical fitness, school aptitudes, creativity	30 minutes	3x/week	Physical fitness, school aptitudes, creativity, and cognitive flexibility	HIT (tool for assessing cognitive skills, such as school aptitudes, creativity, and cognitive flexibility

and cognitive flexibility in elementary school children.				
Teachers' and School Administrators' Views Regarding the Role of Recess for Students	15 minutes	5x/week	Cognitive effects (participation, behavior, affective, continuation of academic learning and negative effects)	Qualitative, semi-structured interviews
Classroom Benefits of Recess	N/A	N/A	Attention and creativity	Attention: letter cancellation/reading comprehension; Creativity: Alternate Use Task
Effect of Recess on Fifth Grade Students' Time On-Task in an Elementary Classroom	25 minutes	1x/day (12 observations total)	On-task behavior; math/reading assessment	Academic achievement (math/reading levels): STAR assessments; On/Off-Task Behaviors: WIR protocol

Table 2-A

Longitudinal Studies Analysis Results

Title	Study Duration	Country	n	Grades
School Recess and Group Classroom Behavior	1 year (1998-1999)	United States	10,301-11,624 children	2nd-4th
The Effect of Doubling the Amount of Recess on Elementary Student Disciplinary Referrals and Achievement Over Time: JRCE JRCE	2 years (2016-2017; 2017-2018 school years)	United States	728 students	K-6th
Association of School-Based Physical Activity Opportunities, Socioeconomic Status, and Third-Grade Reading	1 year	United States	784 students	3rd
The Effect of Multiple Recesses on Listening Effort: A Preliminary Study	1 year	United States	172 students	K-1st
Recess and Reading Achievement of Early Childhood Students in Public Schools	N/A	United States	3,951 students	K

Table 2-B

Longitudinal Studies Analysis Results Continued

Title	Recess Session	Recess Frequency	Outcome Variable	Outcome Method
School Recess and Group Classroom Behavior	<15 minutes; >30 minutes	0-5x/week (depending on which group)	Classroom behavior	Teacher reported classroom behavior rating (TRCB) (1-5)

The Effect of Doubling the Amount of Recess on Elementary Student Disciplinary Referrals and Achievement Over Time: JRCE JRCE	15 minutes	1x/day (first year); 2x/day (second year)	Math/reading scores	Math scores: MI; Reading scores: RI
Association of School-Based Physical Activity Opportunities, Socioeconomic Status, and Third-Grade Reading	N/A	N/A	Reading levels	Comparing scores with the State Board of Education database
The Effect of Multiple Recesses on Listening Effort: A Preliminary Study	15 minutes	1x/day (control); 4x/day	Listening effort, attention	Mann-Whitney U test
Recess and Reading Achievement of Early Childhood Students in Public Schools	1-15 minutes, 16-30 minutes, 31-45 minutes, and ≥45 minutes	0-5x/week (depending on which group)	Reading levels	Item Response Theory (IRT) and standardized (T-test) scores

Discussion

Academic Performance

Over the years, there have been numerous studies about the effects of physical activity on learning. Research shows a positive association in physical activity and academic performance.[20] Since recess provides elementary students an unstructured time and place to incorporate play and expend energy, recess can be considered a good source of physical activity, if implemented. Therefore, academic performance is likely to increase with recess because of the effects physical activity has on learning.

Classroom Behavior

Children, especially in elementary school, are known for their high energy. When students are expected to listen, learn, and follow directions, their high energy can be disruptive to the objectives of the day. Allowing elementary school children to have a designated recess time of sufficient duration is the perfect opportunity for them to get their energy out in an

enjoyable way. Therefore, upon returning to the classroom, students are better able to settle and focus on the lessons or activities. Classroom behavior may also be associated indirectly with other educational outcomes. For example, the better the environment for learning, the more information is retained; the more information children are retaining, the better their academic performance.

Cognitive Functions

Some of the cognitive functions were found to have a generally positive association with recess. Since recess is considered a source of physical activity and creative outlet, the potential cause of these positive associations most likely relate back to physical activity and creative freedom. Research supports that physical activity is related to improved attention.[21] In addition, physical activity results in energy expenditure. When students are returning to the classroom, the use of energy and potential improvement in attention may attribute to the results of the articles in this systematic review that tended to support improved reengagement upon returning to the classroom. The unstructured play time for kids allows them to explore different mediums of play and learning how to entertain themselves. This fosters creativity, problem solving, independence, and encourages creativity.

Social/Emotional Effects

Recess is an opportunity for elementary students to engage socially with one another and process emotions as much as it is an opportunity to be physically active, in the form of play. Physical activity has a positive effect on emotional health[22]; children may even use recess

to as an emotional outlet to release stress, anxiousness, jitteriness, boredom, etc. When people's emotions are positive, people are more likely to interact kindly. Understandably, this would most likely result in lower bullying rates.[23] The associations of recess and positive emotional effects may also be attributed to the social effects. Social conversations in elementary school students are important for their development.[24] When children learn and practice how to get along with one another and make friends, social norms and behaviors are learned and applied to their lives, possibly even improving the classroom environment.

Teaching Efficiency

Teaching efficiency positive association with recess may be attributed to three reasons: less class time, more information is retained by students with physical activity, and there are decreased classroom distractions. A reduction in class time means teachers are inclined to focus more on the necessary curriculum. Memory falls under the cognitive effects educational outcome but also may contribute to teaching efficiency. Results of this systematic review found positive associations with memory retention and recess. The more information is retained by students, the less repetition of material is needed, potentially reducing the time on each subject material. In addition, classroom behavior, another educational outcome, may also contribute to teaching efficiency. This systematic review also found there to be an association with decreased disruptive classroom behavior and recess. When there are fewer disruptions and distractions, teachers deviate from the subject less often.

Limitations

One limitation to this review is a study that contradicted the main findings but is still graded as a good quality article. The study found that longer unstructured play divided into multiple recesses resulted in a decrease in listening effort.[25] The independent variable was different than most articles; instead of testing for an increase in a recess time per session, researchers designed a block schedule that lowered sessions times but had them occur multiple times throughout the day. The increase opportunity for attention disruptions may correlate with the conclusion the article reached, but the results should still be considered. Variations in research methodologies, like the article previously described, are a limitation in most systematic reviews. Most of the article reviewed in this systematic review were excluded due to them being off topic—or not pertaining to elementary school children, recess, and education outcomes. Out of the articles that were satisfying the requirements to be considered on-topic, quality became a factor of exclusion. Additionally, this systematic review is not direct research about the effects of recess on educational outcomes in elementary school children; it is a systematic review of related, academic articles.

Implications

If the associations found in this systematic review are applied to the schools, teachers are likely to experience less disruptive classrooms, improved student participation, slightly less classroom time, etc. Although classroom time would be shortened, the positive associations recess has on overall classroom quality may out weight the shortened in-class time. School administrators are likely to benefit, as well; articles found through this systematic review should be used as resources for increasing the funding to schools.

Conclusions

This systematic review cross examines articles that focus on the effect elementary school recess has on one or more educational outcomes. Although each article used was deemed good quality and relevant to the topic, further research should be conducted in supplementation to this review for two reasons: to narrow the purpose of research on specifically educational outcomes and increase the amount of research on this topic to test the reliability of any claims made. To review, recess is associated with improvements in academic, behavioral, cognitive, social/emotional, and other aspects of educational outcomes; articles found, analyzed, and compared should be used as resources for increasing the funding to schools.

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