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CULTIVATING HEALTHY SCHOOLS: THE FEASIBILITY OF AN OUTDOOR CLASSROOM IN A PUBLIC ELEMENTARY SCHOOL

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Background: Nature contact and time outdoors is critical for healthy child development and well-being and a disconnect from nature may be problematic. **Purpose:** This study was designed to evaluate the feasibility of a nature contact intervention for children – an outdoor classroom - in a public school. **Methods:** Two kindergarten classes participated in this mix-methods case study (N=2 teachers, n=36 children aged 5-6) and used an outdoor classroom every other day for language arts lesson over a six weeks observation period. The two teachers in this case study completed a survey that assessed perceived practicality and feasibility of using the outdoor classroom every other day for regularly scheduled lessons. Adherence of using outdoor classroom daily was also measured. **Results:** Observational data indicated the teachers had 82% adherence of using the outdoor classroom. Over the six-week study, the teachers used the outdoor classroom 18 of the 22 study days for their regular lessons. Survey data indicated the teachers perceived the outdoor classroom was feasible and practical to use on a daily basis for regular instructor. Barriers to use and suggestions were also reported. **Conclusions:** Outdoor classrooms are a promising way for children to have health-promoting environmental exposures in schools.

Background | There is increasing recognition that children today are more disconnected from nature than ever before and that this disconnect is a problem for health and learning. Children that spend less time outdoors have more health, behavioral, and learning issues than their counterparts.¹ Changes in schools seem to be contributing the nature disconnect; schools are commonly reducing or eliminating outdoor recess because of an increasing rigidity in the emphasis on academic performance and evaluation.²⁻³

But could schools make a change and provide opportunities for nature contact while simultaneously meeting instructional demands? Schools may have a unique opportunity to improve nature contact for children through the use of an outdoor classroom. An outdoor classroom in this study is an outdoor learning space that is used during core academic instruction in the place of indoor classroom. In this study, an outdoor classroom does not denote a special space used for science or hands-on learning, but rather an outdoor alternative to the indoor classroom. The purpose of the outdoor classroom is to increase healthy environmental exposures at school.

The efficacy of spending time learning in an outdoor classroom on health outcomes is a new area of research.⁴ The first known study on the efficacy of an outdoor classroom on health outcomes was conducted in 2014.⁵ The authors found that young children using an outdoor classroom in place of indoor classroom during daily language arts instruction resulted in improvements in children’s learning and well-being.⁵ Specifically, Largo-Wight and colleagues found that teachers’ redirections and students’ on-task behavior were significantly improved in the outdoor classroom compared to the indoor classroom.⁵ Since then, researchers have replicated this study among other student age groups, different geographic locations, and shorter intervention time frames and found similar results.⁶⁻⁷ The outdoor classroom may be an innovative solution to the growing problem of nature and outdoor disconnect that fits within public education realities.⁵

Although recent findings suggested that an outdoor classroom is a promising solution be to meet children’s academic demands while nurturing child well-being, there is no known research on the feasibility and practicality of such an intervention in public school settings. The findings to date are limited

and focus on the feasibility of going outdoors for environmental education lessons and hands-on science education.⁸ There are no known studies that explore the feasibility of using an outdoor space for daily instruction (not specific to hands-on science experiential learning) as an alternative to the indoor classroom. The focus of this study was on the new, nature contact conceptualization of the outdoor classroom, as an alternative to the indoor classroom that offers healthy nature contact exposures that an indoor classroom would not. The goal of this mix-methods case study was to explore the feasibility of a using an outdoor classroom daily for regular instructional lessons in a public school.

Children and Nature Contact. Nature contact exposure is an emerging health behavior.⁹ The primary reason for the emergence of nature contact interest is because of an increasing concern in mental and emotional health; stress and related health ailments are abundant in modern society and efforts to reduce stress and related consequences are a great societal importance.¹⁰ One potential way to cope with modern stress is through exposure to calming environments with nature contact. *Shinrin-yoku* or forest bathing is a Japanese concept that involves passive emersion in the forest and nature for the purpose of restoration from stress and wellness.¹¹ Much of the world's population in developed countries, however, do not have easy access to forests or pristine nature. Therefore, there is an important public health opportunity to cultivate and design exposures of nature or nature contact in built environments for the purpose of wellness and health.¹²

Young children appear to be especially responsive to nature contact exposure. Findings suggest that spending time outdoors may be health-promoting behavior especially for children, including children with special needs. In a survey of 441 children with Attention/Deficit Hyperactivity Disorder (ADHD), for example, children that spent more time in outdoor green play experienced milder symptoms and better concentration than their counterparts.¹³ Past findings also suggest that children with greater access to outdoor play areas and nature views from home had less Attention Deficit Disorder (ADD) symptoms, increased concentration, and increased impulse inhibition.¹⁴ Performance on cognitive tasks may also be slightly improved for children that walk in nature compared to children that walk in urban setting.¹⁵

Time outdoors during childhood may also impact one's value and appreciation of nature¹⁶ and environmental ethic and behavior. Environmental ethic and related environmental health behaviors, such as recycling, are central health behaviors that impact the health of individuals and populations.¹⁷ Wells and Lekies¹⁸ assessed over 2,000 adults and found that

retrospectively reported outdoor and nature experiences during childhood were associated with adult environmental ethic and behaviors.

In addition to cognitive and behavioral benefits, children that spend more time outdoors appear to suffer less eye and vision-related issues. Recent findings have consistently established that young children that spend more time outdoors experience significantly less myopic symptoms than children with less outdoor time.¹⁹⁻²⁰ Wu and colleagues¹⁹ explored the effectiveness of a one-year, school-based intervention among children aged 7-11 that explored the impact of daily outdoor recess on vision. There were no differences in demographic variables and prevalence of myopic symptoms at the start of the study, but after one year, children in the outdoor recess group (n=333) had significantly less myopic symptoms than children in the indoor recess group (n=238).

The impact of time outdoors on obesity prevention and physical activity among children has also been a focus of study. Not surprisingly, findings consistently suggest that the amount of time a child is outdoors is associated with physical activity levels. For example, Burdette and colleagues²¹ found that time outdoors was correlated with more physical activity as measured by accelerometers. Another study with accelerators and GPS measures found children that spent more time outdoors had more minutes of daily moderate to vigorous physical activity (MVPA).²²

Stress and anxiety reduction are another central benefit of nature contact behavior.¹² The question, "How does time outdoors or nature contact behavior impact stress and stress-related health consequences?" has been widely studied. Large-scale, cross-sectional findings among adults consistently show that greater nature contact exposure was correlated to less self-reported stress and health complaints among adults.²³ Experimental findings also show that adults randomized into nature environment conditions to complete a task had less physiological indicators of stress such as lower pulse, less stress hormones (salivary amylase and cortisol responsiveness), and less muscle tension (EMG activity) than adults randomized into standard conditions.²⁴⁻²⁷ A review of findings on "green exercise" comparing indoor and outdoor physical activity among adults summarized several benefits of outdoor physical activity including less tension and increases in positive engagement, revitalization, and energy compared to indoor fitness.²⁸ For example, one study found that adults randomized into jogging in a park resulted in greater stress reduction than those randomized into a jogging in a city.²⁹

Findings among children on the impact of time outdoors on stress and well-being are consistent with the adult literature. Outdoor time among children has been associated with lower stress and anxiety and its correlates such as healthy social and emotional development, prosocial behavior, generalized health, perceived well-being, and better physical health.³⁰⁻³² For example, findings suggest that children with wooded land nearby the home experienced less stress.³³ In a school setting, children's outdoor exposure through outdoor recess has been shown to be associated with stress and stress-related outcomes such as focus, attention, and physical health. Therefore, outdoor recess is recommended by American Association of Pediatrics to foster healthy emotional, social, cognitive, and physical childhood development.^{32, 34-35}

Theoretical Framework. The research question “how is nature contact a health behavior?” has been explored from an interdisciplinary lens. In summation, the theoretical framework used in this study contends that nature contact behavior reduces perceived stress to promote health, well-being, and facilitate attention and learning.^{12,36} Perceived stress in childhood is an established risk factor for poor health outcomes, risk behavior, and poor learning, even impacting individuals into adulthood,³⁷ therefore reducing stress among children creates a healthful environment designed for well-being and academic success.

Why is nature contact behavior and spending time outdoors stress-reducing? Biological researchers point to an evolutionary explanation for this phenomenon. The biophilia hypothesis contends that being outdoors is an effective intervention for people today because of the linkage to survival in the past.³⁸⁻³⁹ (Just as common fears such as heights, snakes, and spiders are rooted in the past related to human survival, Wilson (1984) that the ability to “smell the water, find the plants, follow the animals, and recognize the safe havens must have enjoyed survival advantages”.^{39, p.32}

Psychology and neuroscience researchers have also explored the intricacies of the stress-reducing impact of time outdoors and nature contact in general. Researchers studied the brain, stress response, and cognitive abilities after exposure to outdoor environments or nature contact. This work has led to Attention Restoration Theory (ART) and two complementary mechanisms to explain how time outdoors (or indoor environments with natural elements or biophilic-design) reduces stress in people today. Outdoor exposure appears to restore stress-fatigued cognitive resources such as problem solving or attention. The restoration of resources enhances one's coping abilities and thus reduces stress.⁴⁰ There is also evidence to suggest outdoor exposure and

nature contact may shift one's attention resulting in stimulation of underutilized areas of the brain. This acts to balance the concentrated stimulation and relieve exhausted portions of the brain.⁴¹ Taken together, spending time outdoors may shift one's focus and enliven one's senses to foster restoration and coping and thus foster health and learning.

Purpose. Past findings and theory contend that school-based interventions, curriculum, or innovations to promote nature contact among students would foster health and learning. One way to promote nature contact and subsequent learning and well-being among children at schools is to use an outdoor space for learning. To date, there are no known published findings on the feasibility of an outdoor classroom health intervention in public school settings in the U.S. This case study is the first of its kind and designed to explore the feasibility and practicality of a nature contact intervention, an outdoor classroom, in a public school.

Methods | An outdoor classroom was built at a public elementary school in the southeast U.S. The outdoor classroom was located on the school's play yard under a tree and shade tent. The outdoor classroom was basic in design and defined with a circular boundary comprised of half-buried tires, large tree stumps, and 16-gallon potted plants. Children sat on 16 X 16 inch carpet squares and used clipboards for writing. The teacher used a chalkboard for instruction. Research assistants helped prepare the outdoor classroom for use over the six-week study.

Two kindergarten classes participated in this mix-methods study. Each class consisted of a teacher, assistant teacher, and 18 kindergartners. The two teachers taught their respective kindergarten classes their regularly scheduled writing lesson daily in either the indoor or outdoor classroom. The two kindergarten classes rotated where they delivered the writing lessons, with each teacher and her respective class using the outdoor classroom every other day for six weeks.

Quantitative behavioral counts data was collected daily. Adherence data was collected daily for 33 days. Teacher adherence to using the outdoor classroom for daily language arts instruction was teacher choice, and thus represented a measure of feasibility of use. In addition, qualitative data was collected from the teachers at the conclusion of the six-week observation period of daily use of the outdoor classroom. An online survey was emailed to the participating teachers to assess perceived practicality and feasibility of using the outdoor classroom for academic, in this case writing, lessons. Feasibility of using the outdoor

classroom was focused on design and contextual factors. Responses were on a five-point likert scale. This study was approved by IRB Institutional Review Board. The teachers gave informed consent to participate in the study.

Results | The observation data indicate that adherence of using the outdoor classroom daily over the six-week period was high. Over the six-week weeks, the teachers were scheduled to teach their respective class in the outdoor classroom a total of 22 days. The teachers used the outdoor classroom 18 of the 22 scheduled days (approximately 82% of the time). They opted not to use the outdoor classroom on four days. The results of the online post-test survey revealed that weather was the primary reason the outdoor classroom was not used as scheduled on the four days. Rain was the primary reason for not using the outdoor classroom when scheduled. Comfortable temperature, although not the primary driver for adherence in this case study, was also cited as an important.

The survey results showed that the teachers in this case study reported that using the outdoor classroom for the daily writing lesson was “usually easy” and “usually practical” (on a five response Likert scale from always easy/practical to never easy/practical). The contextual variables that the teachers agreed were extremely or very important for the feasibility of using the outdoor classroom included: comfortable temperature, dry, shade, no biting/stinging bugs in space, and comfortable seating. The following contextual variables were less important (somewhat or slightly important) for the feasibility of using the outdoor classroom: comfortable breeze, groomed space with trimmed vegetation, no or few reptiles in space, and no or few birds and animals in space. The teachers reported that the classroom usually met their needs as the teacher.

Barriers to use and suggestions for future public health practitioners were also provided through qualitative response. The teachers provided the following recommendations to increase the feasibility of using an outdoor classroom for future applications: allow students to bring learning materials from indoor classroom to outside, allow students to aide in the daily classroom set up and routine, use with older students, and use in varying subjects.

Discussion | The questions this case study attempted to address were: is using an outdoor classroom in place of their indoor classroom something teachers will do when given the opportunity and is using an outdoor classroom in place of their indoor classroom something teachers will want to do? The adherence data for using the outdoor classroom over the six-week period was high, which suggests that teachers used the

space every day that the weather allowed. Wind and rain were cited as the primary reasons for not using the space when scheduled.

Based on the teachers’ self-report, daily use of the outdoor classroom for a scheduled lesson was reported by the teachers as feasible and practical. These findings are important because an outdoor classroom can only have the opportunity to be effective if it is first practical and feasible for use. Teachers in this study reported that the outdoor classroom was a feasible nature contact intervention that was readily incorporated in to the academic school day over a period of six weeks. These findings suggest using a nature contact space for non-nature contact related curriculum such as literacy was feasible and practical over time in young elementary classrooms.

In this study, researchers aided teachers in setting up the space for the lesson. Future studies should further explore the feasibility and practicality of this promising school-based intervention independently without research assistance. In fact, this was a recommendation that both teachers stressed would improve the ease and feasibility of using the outdoor classroom. The teachers reported that students bringing their normal materials from inside would reduce distraction of new materials. This was a surprising finding as we thought that having outdoor materials and setting up the classroom for the teachers and students would be easier.

Future research should assess the feasibility and practicality of using the outdoor classroom among varying populations and for different subjects. The teachers reported that writing was a more challenging subject to teach outdoors because of the kindergartners’ initial struggle using the clipboards. Stable table or desk surfaces in the indoor classroom may be more conducive to writing lessons. Literacy and science were suggested as practical lessons for the outdoor classroom. Also, one teacher reported that the outdoor classroom may be more feasible with children slightly older than those in this study (5-6 years). Future research should also expand to assess the efficacy and feasibility of an outdoor classroom among diverse representations of children to determine the well-being (efficacy) and practicality (feasibility) impact of using an outdoor space to learn by varying demographic and cultural variables.

The data presented in this case study was based on behavioral counts over 33 days and qualitative self-reported data from two participating teachers. The findings provide preliminary evidence on feasibility and practicality for regular use of an outdoor classroom in a public elementary school. Future research should expand upon these findings to assess

the feasibility of using an outdoor space among a greater number of teachers of varying grade-levels.

This case study was conducted in southeast U.S. where the weather was conducive to spending time outdoors. Rain and extreme temperature, important contextual factors in this case study, were not a major concern over the observation period. The generalizability of this case study's preliminary findings to geographic regions that have more severe weather conditions present a possible limitation. Would the feasibility of using an outdoor classroom in the North-West U.S. or Germany, for example, be lower? This question warrants future research. However, we consider that the feasibility of using an outdoor classroom would mirror the feasibility of using the school playground or play yard. In some regions, the use would likely be seasonal, whereas in other areas it may be year-round similar to the use of the school's playground or play yard.⁴²

Implications | Healthy environmental exposures at school are especially important for children because it is the space that children spend the majority of their waking hours. Environmental interventions or healthy exposures, such as the outdoor classroom, are a valuable asset to any school in that healthy design elements have the potential to positively impact children without any commitment or effort from the children. Past findings show that having normal language arts lesson in an outdoor space had positive impact on the children's well-being and learning-related outcomes compared to doing those same learning activities in an indoor space.⁵ These findings highlight that the outdoor classroom space alone, have the potential to passively promote health.

Another unforeseen implication of this study is related to COVID-19 and transmission of viruses in general.⁴³ Understanding the feasibility of using an outdoor classroom, as defined in this study as an alternative to indoor classroom, could provide helpful evidence to schools as they look for ways to increase social distance and reduce transmission. Schools today are facing new challenges and tasked with creating not only healthy school spaces, but also safe environments that do not accelerate disease transmission. Outdoor classrooms may help both improve health and well-being (through nature contact exposure) and improve safety (by reducing transmission). This is an important and new consideration.

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These findings are especially pertinent for public health practitioners and educators in climates that are readied for increased outdoor time. In this study, temperature was cited as the secondary determinant following rain of using the outdoor learning space. In the State of Florida, for example, students would have ample opportunity to learn in outdoor classrooms and enjoy the healthy environmental exposures throughout the majority of the school year. That said, just as outdoor recess and school playgrounds may have more use throughout the school year in climates such as Florida with weather conducive to outdoor nature contact, it does not diminish the need for similar opportunities for children in more extreme climates. Nature contact and opportunities to be outdoors are important for all children.

Public health practitioners may use outdoor classrooms to increase nature contact exposures and strengthen the health of our schools and classrooms. In addition, to adhering to the teacher reported barriers to use and suggestion detailed previously, public health practitioners should also strive to build partnerships and work with school staff, teachers, and administrators throughout the planning and implementation of an outdoor learning space. Parent groups and community partners should also be included in the planning stages of the outdoor classroom.⁴² There are several grass-root organizations to provide practical "how-to" information and funding sources for outdoor classrooms. Children and Nature (<http://www.childrenandnature.org/>) and Children's Environmental Health Network (<http://www.cehn.org/>) may provide helpful resources for educators and child advocates working toward outdoor classrooms. In addition, the CDC's Healthy Community Design Initiative and Listserv (www.cdc.gov/healthyplaces/listserv.htm) provides related research, trainings, and funding opportunities that would apply to health promoters working on improving the school environment through outdoor classrooms.

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