Climbing Project Objectives

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The physical education climbing project was designed around findings identifying handgrip strength as an important health and longevity indicator (Blue Zones, 2020; BMO Wealth Institute, 2014). Therein, the climbing research team determined a need to implement new forms of physical education assessments in order to test theories encompassing longevity (Blue Zones, Buettner, 2018) and fine motor skill development (Alaniz, Galit, Necesito, & Rosario, 2015; Ohl, Graze, Weber, Kenny, Salvatore, & Wagreich, 2013). Currently, handgrip strength is not identified as a stereotypical standard of measurement in Physical Education teacher education programs. The exploratory study sought to serve as a beginning platform for testing handgrip in the physical education classroom. There are multiple program objectives that benefit physical education and general education teacher preparation programs (Harris & Chen, 2018). Stakeholders should develop interest in the effects of classroom proprioceptive/balance integration and its effects on cognitive functioning (Christensen, Thinggaard, Oksuzyan, Steenstrup, Andersen–Ranbert, Jeune, McGue, & Vaupel, 2013), whilst benefitting from increased upper body and handgrip strength through the use of climbing elements; monkey bars, traverse climbing walls, and traditional and non–stereotypical animal movements in elementary schools.
Interventions and project questions included:
1. Increasing student access to weekly climbing, 8–12 minutes a week.
2. Use of dynamometers as a new fitness test indicator.
3. Can students increase their handgrip strength and fine motor skills over the course of one school year using climbing/hand strengthening interventions?

**Funding Description**

The grant funds were used to purchase and install an 8' indoor monkey bar that was strategically positioned above and used in conjunction with an 8'x20' traverse climbing wall funded through local donors, additional grants, and the school administration. Both were purchased to explore new Physical Education assessments, compare standard fitness assessments, compare new datasets, develop new curriculum and instruction components, and conduct preliminary research studies on K–12 climbing, handgrip strength, and fine motor skill development.

**Population Benefit**

The entire K–5 elementary population, consisting of approximately 320 students, benefitted from having access to the monkey bars. Additionally, the 6th & 7th grade middle school PE classes implemented climbing into their warm-up routines. The Physical Education research team adjusted curriculum methods to infuse climbing throughout the duration of the year. The PE instructors implemented the intervention 2–3 times per week or 8–12 minutes total time each week for the 2017–2018 school year. The Midwestern school involved was the “ideal PE classroom” as their elementary physical education students meet daily for grades K–3 and 4 days a week for grades 4 and 5.
In October 2018, Japanese students from an exchange program visited and explored the monkey bars and other climbing elements in the classroom. With a translator, the research team was able to share prospective theories and research with the visiting Japanese faculty, one of whom was a physical educator at their school in Japan.

Students will continue to benefit from the climbing interventions as the unit was successfully infused into the curriculum without deterring from the instruction time of other teaching elements. The climbing intervention increased safety awareness in the classroom and PE instructors observed greater motor planning while climbing. Additionally, teachers and students reported increased levels of enjoyment for climbing. Therefore, motivation levels increased and a desire to climb became the norm for elementary students.

**Student–Faculty Designed Methods**

The PE research team implemented the climbing methods 2–3 times per week or 8–12 minutes total time each week for K–5 students (N=300) beginning the 2017–2018 school year. Handgrip strength was gathered using a Jamar dynamometer (Sammons Preston, USA). Additionally, students completed the Beery–Buktencia Developmental Test of Visual–
Motor Integration to determine fine motor skill development prior to the implementation and then again at the end of the school year. A neighboring control group consisting of K–6 elementary students (N=300) also completed the Beery–Buktencia at the beginning and end of the school year but did not receive the climbing intervention. Interventions were developed initially using the “CLIMBING THE WALLS” EVERLAST climbing manual (2018) that came with the climbing wall, however the physical education faculty recognized that students were beginning to explore their own avenues of learning while using the monkey bars and wanted to extend their climbs almost immediately. Therefore, the research team began extensions and adaptations allowing students to lead and take responsibility of their climbs based on their differentiated abilities. The research team continued to monitor and sought out more exploratory climbs through extensive literature reviews.

The research team continued to brainstorm ideas for weekly climbing interventions. Handhelds were moved by faculty every 3–6 weeks in order to engage students in decision-making and encouraging self-directed learning.
model, motivating and challenging new climbing obstacles. Pathways, obstacles, and challenges were created and designed by both instructors and students. For example, students performed different directional climbs (forward/backward, up/down, left/right), held items while they climbed, or designed partner climbs. Monkey Bars were used as an additional extension component for students. The students took ownership of their climbing skills by recognizing needs for additional challenges and asked to design and perform unique climbs, supporting a need for K–12 students’ deeper-learning and self-directed learning teaching methods (Knowles, 1984; Sellers, 2019).

**Grant Summary Impact on Indiana Children and Youth**

Exploring new fitness assessments that teach and address longevity factors, specifically handgrip strength at the K–12 level is immensely valuable because the profession should begin to question how physical education courses are assessing children. Instead of separating pedagogy and exercise science principles, professionals need to collaborate, comprehensively merging to find solutions for students as they progress into adulthood. Longevity indicators of VO2max, Leg Strength, Handgrip Strength, & Lean Body Mass (Sugie, Harada, Takahashi, Nara, Ishikawa, Tanaka, Koyama, Fujimoto, Obuchi, Kyo, & Ito, 2018) need to be blended into physical education teacher preparation programs, challenging existing testing methods. As physical educators, it is our responsibility to address the most recent exercise science assessment practices and implement into teacher education programs so that licensed educators may properly prepare students for adulthood health (The Academic Foundations of Exercise Science and Kinesiology, 2013).

Our society is experiencing a multitude of challenges, and one of the most discerning is the amount of time children spend on electronic devices compared to the amount of exploratory play and activity. Observation of this elementary PE classroom reveals students’ motivational
efforts toward climbing. The climbing unit is proving to be a challenging activity where students ask to participate daily. Students ask questions about climbing, handgrip, design new movements to assist with the purpose, and can explain why they are performing these movements in their classroom, demonstrating a highly effective teaching practice (IDOE, Rise Domain 2, 2019). In addition, students come to class sharing new learning they have discovered and ask insightful questions about climbing, handgrip, and brain hemispheric activity. PE faculty were also able to teach scientific research to students at an educationally, appropriate level.

Our research team hopes to challenge existing K–12 physical education testing practices and begin to address most recent literature on climbing, handgrip strength, fine motor skills and its impact on children’s health and cognition. This Physical Education Program is addressing and exploring new assessment components. The research and grant awardee team used the monies for the monkey bars as a handgrip strengthening component and was tested using a Jamar dynamometer, purchased with an additional grant.

The most crucial impact of our research study are the findings that may support more movement during the school day, strengthening handgrip, and improving fine motor skills increasing chances for daily physical education and movement infusion for all students. An important note, the PE classroom has had no climbing injuries and has observed an increase in spacial awareness, particularly amongst the lower grades. By the way of teacher education programs, conferences, presentations, and discussions with various PE colleagues, there has always been support for daily physical education in schools in the state of Indiana. Because this particular Midwestern classroom has daily PE, they are considered the “ideal teaching classroom” to explore the effects of daily physical education. This exploratory intervention study testing the effects of daily climbing in physical education/movement infusion is long overdue. Educators need more concrete evidence of the effects of daily physical education on students physical, social, emotional, and intellectual learning; therein developing an environment for student academic success.

The indoor climbing apparatus was a motivator for students. Climbing generated creativity as students desired to explore different ways to climb
outside of class because of the heightened intrinsic and physiological feeling experienced while performing our climbs. This grant has fueled a more macro conceptualization of how we are approaching classroom management methods and activities that use proprioceptive movements, which may be associated with increased midline, hemispheric brain activity; a helpful intervention for students with developmental delays (Alaniz, et al., 2015).
References


