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Physical Activity Mentoring in Schools: An Undergraduate-Mentored Running Intervention for Elementary Students

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Academic Editor: Elaine Yee-Sing Wong

Special Issue: Lifestyle Modification in Pathophysiology

Recent Progress in Nutrition
2022, volume 2, issue 1
doi:10.21926/rpn.2201009

Received: December 17, 2021
Accepted: March 13, 2022
Published: March 15, 2022

Abstract

Most children do not meet physical activity guidelines, and school-based programs often fail to increase physical activity levels. However, there has been no intervention pairing college mentors with elementary students to date. The purpose of this paper is to report the feasibility and acceptability, both quantitative and qualitative, of an undergraduate-mentored running program designed to increase physical activity in elementary students. A convergent parallel mixed methods design was used to evaluate the feasibility and acceptability of the physical activity intervention for elementary students. Running W.I.S.E. [with Interscholastic Student Engagement] paired college mentors with individual fifth grade elementary school students for bi-weekly running sessions during the school day in early 2020. Quantitative recruitment and retention data were collected and analysed to determine feasibility and acceptability, respectively. Qualitative data comprising letters written by undergraduate mentors to their mentees after the intervention were analysed. Both feasibility and acceptability were achieved. Recruitment and retention rates [100%

each] exceeded the pre-defined feasibility and acceptability criteria. Undergraduate mentors were driven to participate by prosocial, passion-driven, and utility motives. Psychosocial mentor/mentee benefits, as well as observed physiological changes among mentees, were cited as outcomes of participation. Undergraduate-mentored running programs a feasible and acceptable means of increasing physical activity in elementary students. Benefits to both mentors and mentees exist and extend beyond physical health into social and mental health, as well.

Keywords
Children; physical activity; school health

1. Introduction

Physical activity during childhood has been associated with numerous physical health benefits, including improvements in blood cholesterol, blood pressure, the metabolic syndrome, overweight and obesity, bone density, injuries, type II diabetes, and other health indicators [1, 2]. Mental health benefits have also been documented, with a review of 42 systematic reviews and meta-analyses showing links between physical activity and numerous mental health outcomes (e.g., depression, anxiety, self-esteem, and cognitive functioning) in children and adolescents [3]. Outside of physical and mental health, physical activity may also have a positive influence on cognition, brain structure and function, academic achievement, and classroom behaviours [4-6]. These benefits extend into adulthood, as physical activity in childhood tracks into adulthood and may result in improved adult health status [7]. Despite these benefits, most children do not engage in the recommended amount of physical activity.

Current guidelines from the World Health Organization, as well as the US Department of Health and Human Services, recommend that children and adolescents ages 6- through 17-years-old should engage in at least 60 minutes of moderate-to-vigorous physical activity every day [3, 8]. According to the 2018 U.S. Report Card on Physical Activity for Children and Youth, only 24% of US children ages 6-17-years-old participated in 60 minutes of daily physical activity [9]. With the COVID-19 pandemic and social distancing measures, individual physical activity levels have continued to decrease [10]. In response to low rates of physical activity in youth, one of the objectives of the US's Healthy People 2030 is to increase the proportion of children who meet the current aerobic physical activity guidelines to 30.4% [11].

One setting for increasing physical activity in children and adolescents is through schools. Most children attend and spend half of their waking hours at school, and schools have the infrastructure for, and play a role in, health and physical education [12, 13]. Despite the promise of school-based physical activity promotion, results have been mixed. In a meta-analysis, Metcalf et al. found that physical activity interventions, including school-based ones, had only a small effect on children's activity levels [14]. Similar findings were found in other systematic reviews and meta-analyses [15-20]. The impact of school-based physical activity interventions on mental health were more promising; a literature review of 30 interventions found significant beneficial effects on resilience, positive mental health, well-being, and anxiety [21]. Unfortunately, it was unclear if the benefits

remained long-term. Potential barriers to school-based physical activity promotion include lack of resources and time, steep learning curves for teachers, insufficient teacher training, unsupportive school environment, lack of buy-in, and competing priorities [18, 22, 23]. Researchers and professionals must identify ways to minimize or address these barriers when implementing school-based physical activity interventions.

One promising school-based physical activity intervention is peer-led mentoring or peer-delivered physical activity interventions, as they bypass the teachers and do not require teacher training, time commitment, and extensive resources [24-28]. Specifically, mentors, such as trained undergraduate students, are low-cost and reduce burden on school teachers [23, 24, 27] Additionally, mentors are able to become more involved with the local community, forming community relationships on an individual level and institutional level between colleges and public-school districts [29].

Although limited, existing peer-led mentoring or peer-delivered physical activity interventions have had positive effects on physical activity behaviour through peer support, enjoyment, perceived competence/self-efficacy, and observational learning/modelling [25-28]. The Girls Peer Activity [G-PACT] project resulted in significant increases in whole day moderate-to-vigorous physical activity among UK adolescent girls [27], Challenge! for urban African American adolescents produced personal benefits for college mentors [24], and the Heart Healthy Kids program in Canada was associated with increased physical activity and cardiovascular fitness [30]. Other promising evidence includes the potential benefits of peer mentoring for improving mental and social health among students and mentors [31]. Peer mentoring in one school-based physical activity intervention resulted in greater confidence, confidence in forming social relationships, and general positivity among students, as well as improved communication, confidence, empathy, relationship-building, and self-awareness among mentors. These benefits are crucial given the impact of isolation and social distancing during the COVID-19 pandemic on mental and social health [32]. A peer mentoring program, while not in the context of a physical activity intervention, has reduced loneliness and mental health problems of children and adolescents during the COVID-19 pandemic [33].

Despite the potential of peer-led mentoring or peer-delivered physical activity interventions for minimizing barriers to implementing school-based physical activity interventions – while still being effective – there has been no such intervention among college mentors and elementary school students. College mentors are valuable resources for promoting health behaviours of children and adolescents, and they have been used in other peer-led physical activity programs with adolescents [24, 34]. They have relevant background and training; can earn college credit, volunteer hours, and/or professional experience; and are inexpensive. Unfortunately, this area of research is scarce and has not been fully explored. Thus, the purpose of this study is to report the feasibility and acceptability, using both quantitative and qualitative data, of an undergraduate-mentored running program designed to increase physical activity during the school day in older elementary school students. It was hypothesized that an undergraduate-mentored running program would be feasible and acceptable based on both quantitative and qualitative data.

2. Materials and Methods

Running W.I.S.E. (**w**ith **I**nterscholastic **S**tudent **E**ngagement) is a peer-delivered physical activity intervention. Based on the premise of peer-led mentoring and potential symbiotic benefits for both mentors and mentees, Running W.I.S.E. pairs elementary school children and mentors together to engage in a running program. Prior to the start of the study, researchers met with school administration from a local charter school in a major metropolitan area to discuss the potential intervention and obtain support. Charter schools are tuition-free, public schools held to the academic rigors of the state but with flexible curricula to meet needs of individual students. The researchers included input from the school administration in the intervention design, including the grade level to target (i.e., fifth graders), days and times for the intervention (i.e., Monday/Wednesday or Tuesday/Thursday in the afternoons), and location of the intervention (i.e., outdoors on sidewalks, cement slabs, and the playground area, or on covered sidewalks if raining).

2.1 Participants

Undergraduate college students, through the primary investigator's academic institution, were recruited to serve as mentors for Running W.I.S.E. Mentors were kinesiology majors, in good academic standing, comfortable running for 30 minutes, and available for at least 90% of sessions. They had the option of receiving one hour of course credit as a research internship for their participation. Mentors completed mandatory ethics and engagement training with school administration, technical training on activity trackers, and a background check through the charter school.

Elementary school students were recruited from a single fifth grade classroom. Students of any gender, race, ethnicity, and socioeconomic status were eligible. Exclusion criteria included having diagnosed health problems or symptoms and/or physical or mental health impairments that would prevent them from completing study requirements. All participants provided parental written informed consent, as well as minor assent.

2.2 Procedure

Between January and March 2020, college mentors travelled to the charter school campus, twice a week for 45 minutes over 6 weeks. On intervention days, students completed a warm-up, ran for 30 minutes with their mentor using walk breaks as necessary, and completed a cool-down. Students wore activity trackers to collect run activity data. Full program design and impact on physical activity are available elsewhere [35]. Students and mentors ran outside on school sidewalks on good weather days and under a covered walkway used for carpool on rainy days. Mentors and students both received Running W.I.S.E. t-shirts and stickers to promote the program. Mentors, students, and school personnel did not receive any monetary or other compensation for their participation. Upon completion of the program, undergraduate mentors wrote letters to their mentees describing their experiences in the program.

To gain an in-depth understanding of program outcomes, the study utilized a convergent mixed methods design. A convergent parallel mixed methods design entails the researchers independently collecting and analysing quantitative and qualitative portions of the data, weighing

the methods equally, and interpreting the results of both methods together [36]. Figure 1 illustrates the convergent parallel mixed methods research process.

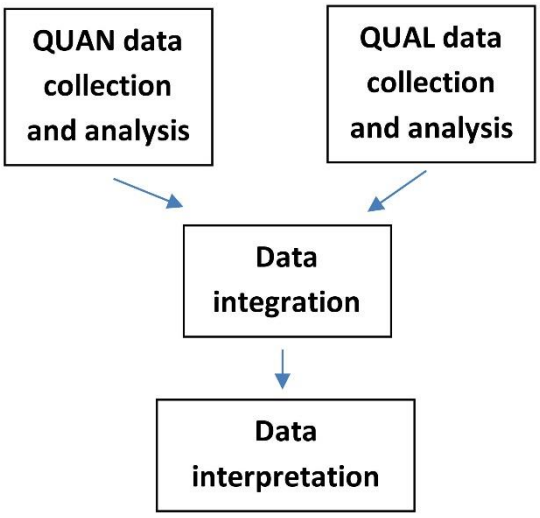

Figure 1 The research process using the convergent parallel mixed methods design.

2.3 Data Analysis

Descriptive statistics were conducted to describe the participant population and both quantitative and qualitative data were analysed to assess feasibility and acceptability. Based on previously published literature on feasibility studies, the researchers quantitatively defined feasibility as ≥50% enrolment of eligible elementary school students [37-39] and acceptability as ≥80% retention rate for mentors and participants. Both outcomes were calculated as simple percentages ± standard deviation.

Feasibility and acceptability were also assessed qualitatively using letters written by undergraduate mentors to their mentees after the intervention. Mentors were prompted to write about motives for participation, rewards, challenges, and any observed changes in themselves and their mentees. Inductive thematic analysis was conducted to analyse letters [40]. Two authors independently familiarized themselves with the data prior to identifying and coding raw data themes (i.e., quotations) that represented basic units of analysis for the study. Codes were then collated into potential themes, and consensus validation of the themes and supporting quotations ensued until researchers reached an agreement on the themes represented by the data [40]. Pseudonyms were assigned to each undergraduate mentor to protect anonymity.

This human subjects study received full Institutional Review Board approval from the primary investigator's institution prior to recruitment, enrolment, or data collection.

3. Results

3.1 Quantitative

In all, 22 fifth grade students were approached to participate in Running W.I.S.E. All 22 students returned informed parental consent and minor assent forms, resulting in 100% enrolment. Table 1

provides descriptive characteristics of the sample. To create a one-to-one mentor-to-participant ratio, 22 undergraduate mentors and one undergraduate alternate mentor participated in Running W.I.S.E. for a total of 23 undergraduate mentors. Over the six-week intervention, all 22 elementary students and 23 mentors retained participation in the program, resulting in a 100% retention rate for both students and mentors. Table 2 provides additional data regarding attendance rates for both mentors and elementary students.

Table 1 Demographic characteristics of participants (n = 22).

Characteristic	M	SD
Age	10.55	.67
Characteristic	n	%
Sex		
Female	11	50
Male	11	50
Race/Ethnicity		
African American	9	41
Hispanic	9	41
White, Non-Hispanic	4	18
Free or Reduced Lunch		
Free	12	55
Reduced	2	9
Neither Free or Reduced	8	36
BMI Classification at Pre-test		
Very Lean	4	18
Healthy	12	55
Needs Improvement	5	23
Needs Improvement Health Risk	1	4

Table 2 Mean and SD for attendance of elementary students and mentors (13 possible sessions).

Characteristic	M	SD
Elementary Students		
Days Participated	12.50	.67
Participation Rate	96.09	5.17
Mentors		
Days Participated	12.50	.67
Participation Rate	95.27	7.33

3.2 Qualitative

There were 22 mentor letters available to assess feasibility and acceptability qualitatively. The COVID-19 pandemic disrupted data collection, resulting in qualitative feedback from only two of 22 fifth grade participants. Therefore, mentee letters were not included in this analysis. Two major themes emerged from the thematic analysis: 1) participation motives and 2) participation benefits. Table 3 outlines the common themes, sub-themes, and examples of raw data themes.

Table 3 Examples of raw data themes, and subthemes and major themes.

Raw Data Themes	Subthemes	Major Themes
…I wanted to help kids improve their physical activity levels…	Prosocial Interest	Participation Motives
…I wanted to share my passion for running and hopefully influence someone younger…	Passion-Driven Interests	
…I was interested in exercise research and working with people.	Utility Value	
…I was so excited to make a new friend…	Affiliation	Mentor Benefits
…I don't always have time to destress and just talk with someone.	Break from Routine	
…you said you started to like running…	Enjoyment	Mentee Benefits
…we ran the entire 30 minutes without stopping!	Fitness Improvements	

3.2.1 Motives

Undergraduate mentors' motives for participating in the study were categorized as (a) prosocial interests, (b) passion-driven interests, and (c) utility value. Each motive is further divided into subthemes, which are discussed below.

Prosocial Interests. Prosocial behaviours are behaviours that benefit others, such as donating, sharing, and helping [41]. A desire to help others, particularly to improve the health and fitness of children, was the most cited motive for undergraduate mentors' decisions to participate in the Running W.I.S.E. program. Aja stated, "I decided to be a buddy for Running W.I.S.E because I wanted to help kids improve their physical activity levels in a fun and interactive way." Another mentor, Kai, explained:

"…I decided to be a buddy for Running W.I.S.E. because I wanted to help others improve their physical activity. I love working with kids, and I was so excited to make a new friend and have some fun running more throughout the week."

Passion-Driven Interests. Undergraduate mentors also cited passion-driven interests as influencing their decision to participate in the Running W.I.S.E. program. A quarter of the college students identified that their decision to participate in the mentoring intervention resulted from their love of running and desire to share their passion with others. Emma explained:

"…Sports have had a significant impact on my life. I have always been deeply involved in sports and have been fortunate to continue participating in sports through track and field...I wanted to share my passion for running and hopefully influence someone younger to be active."

Maya reflected upon how her self-efficacy for running matured over time, writing, "I decided to be a buddy for Running W.I.S.E. because I used to struggle at running, but now I love it, and I wanted to share it with someone." Finally, Eva cited both her passion for running and the utility of the program in her decision to participate, writing, "I decided to be a buddy for Running W.I.S.E. because I used to love running and really wanted to get back into it."

Utility Value. The final participation motive that emerged in letters was utility value. Utility value is defined as how useful an individual believes an activity will be in helping them meet their short- or long-term goals [42]. Undergraduate mentors volunteered for the intervention because it allowed them to participate in human research or learn about children's physical activity behaviour. Zara expressed, "I wanted to do something fun this semester as a way to be involved in research that was not as time-intensive as traditional lab-based research." Connor was interested in learning about children's physical activity, writing, "…I wanted to learn more about how exercise can help students your age, and how to make it fun!" Finally, another mentor, Gavin, cited the research value, as well as the opportunity to increase his level of physical activity:

"I decided to be a buddy for Running W.I.S.E. because I was interested in exercise research and working with people. I often find myself struggling to maintain a regular schedule of physical activity and thought that this study would be a good opportunity for myself and for another person."

Several mentors shared Gavin's enthusiasm for achieving their physical activity goals. Khloe "wanted to make sure that I could get exercise in at least twice a week. Otherwise, it would be really hard to get me to run!" Arianna expounded, "…not only did I want to find more ways to exercise for my own personal health, but I also wanted to meet the other students at the charter

school to see more of the Houston community…" As demonstrated by several highlighted raw data themes, prosocial, passion-driven, and utility values emerged as distinct subthemes related to participation motives. However, most mentors had multiple reasons for participation.

3.2.2 Participation Benefits

The benefits of participating in the mentoring program were categorized as (a) mentor benefits and (b) mentee benefits. Given the nature of the qualitative data, mentee benefits described are those perceived by the undergraduate mentors.

Mentor Benefits. Undergraduate mentors cited several psychosocial benefits resulting from their participation in Running W.I.S.E. Affiliation, or the need to have meaningful connections with others, was cited by each mentor. Affiliation emerged as both a motive and an outcome of participation. Brandon explained, "The most rewarding part of being physically active with you was the time we could bond about things we liked while getting a good workout in." Similarly, Gavin explained:

"Over the seven weeks, we bonded over a shared enthusiasm for these subjects, and I was happy to have found someone to discuss them with. These were the kinds of things that I don't usually have many opportunities to talk about with my own friends and peers and it was a genuine pleasure to be able to talk about them with you. Your energy was infectious, and our time together was always a bright spot in my day…I haven't had so much fun talking about Star Wars with someone in years."

Kai also expressed how shared interests fostered connection between mentor and mentee:

"…I was so excited to make a new friend and have some fun running more throughout the week…I learned that you like video games just as much as I do. I absolutely loved our conversations about Call of Duty and how we both have spent so much time trying to level up our characters. I also enjoyed how we both got better at running over the course of the semester. Over the 7 weeks, we became much better friends."

In addition to affiliation, more than half of the mentors cited having a break from their typical routine as a benefit of the program. In her letter to her mentee, Zara stated, "I hope you had as much fun as I did, running around outside and not having to worry about class or school for that special half-hour every Monday and Wednesday." Sloane wrote her mentee, "Running with you and the rest of the students at UHCS was always the best part of my week." Similarly, Ximena wrote, "…I enjoyed sharing about my day with you and hearing you share about yours with me. As a college student, I don't always have time to de-stress and just talk with someone," indicating that mentoring through physical activity may have provided opportunities for stress management.

Mentee Benefits. Undergraduate mentors observed several physiological and psychosocial improvements among the elementary school students. Changes in psychosocial factors, namely enjoyment, were cited by the majority of mentors. In her letter to her mentee, Zara wrote, "The most rewarding part of being physically active with you was watching you slowly become more enthusiastic about exercising after every week." Similarly, Norah wrote, "I know that you said you started to like running, and I hope that passion continues." Stacey also discussed psychosocial changes observed during the 7-week program:

"The most rewarding part of being physically active with you was your enthusiasm! Seeing your smile and hearing your laugh made me happy. Your excitement made me feel like I was being a good mentor and that you were having fun."

In addition to psychosocial benefits, behavioural changes were also observed among the elementary school students. Sloane wrote, "You gradually stopped wearing dresses and boots to run in, and started to wear running gear that made you so fast, it was hard to keep up at times."

Finally, evidence of physiological improvements (i.e., increased fitness) was cited by every mentor. Maya wrote to her mentee, "The most rewarding part of being physically active with you was watching you run faster and longer." Shaila provided a mensurable improvement, writing, "The most rewarding part of being physically active with you was when we ran the entire 30 minutes without stopping! I was very proud of you for accomplishing that goal."

Emma also observed a tangible increase in her mentee's fitness, writing:

"…The most rewarding part of being physically active with you was seeing your improvement as a runner! When we began the program, we split the thirty minutes between running and walking. However, in just a few weeks, we spent only a few of our thirty minutes catching our breath and walking."

Similarly, Isabel wrote, "I think Running W.I.S.E. was good for you because by the end, you had improved a lot and could jog for a long time." In addition to mentors' observations of mentees' fitness improvements, objective measures of physiological improvement have been previously reported [35].

4. Discussion

Both quantitative and qualitative data point to the success of the Running W.I.S.E. program. The 100% recruitment and 100% retention rates for both mentors and elementary students exceeded the pre-defined feasibility and acceptability rates of 50% and 80% respectively. Notably, these rates also exceed recruitment and retention rates reported for other physical activity interventions, including undergraduate-led, parent-led, and home/school collaborations [43-45]. Elementary students were successfully enrolled and retained in Running W.I.S.E. Likewise, mentors were also eager to participate and continue with the program for multiple reasons elucidated in qualitative findings.

While not an initial goal of the program, participation was another important finding noted during the intervention. The participation rates calculated for both mentors and elementary students indicated that not only did mentors and elementary students enrol and remain enrolled, but regular engagement between the mentored pairs was also very high. The 95.27% and 96.06% participation rates by mentors and elementary students, respectively, also exceed those seen in other mentored physical activity studies [44]. This consistent and regular interaction between pairs is key to developing and strengthening the mentor/mentee relationship and thus in turn, enhancing the benefits of the Running W.I.S.E. program [28].

Qualitatively, mentors demonstrated both positive motivators and significant benefits from the program. Mentors perceived and observed positive changes in their mentees over the course of the intervention, as well. The mentor motivations of prosocial interest, passion-driven interests, and utility value were similar to those seen in other peer-led mentoring programs, including the desire to build their own healthy lifestyle [28]. The mentors in this study were driven by healthy

motivators and altruistic motives, including the most commonly reported reason of improving the health and fitness of children. These altruistic motivators are not unique to our study and are common purposes driving any mentor [24, 28]. Thus, these qualitative findings also increase the feasibility of an undergraduate-mentored running program by highlighting the availability and desire of college undergraduates to improve the lives of others through physical activity.

Moreover, mentors perceived specific personal benefits from participation in the study including affiliation and break from routine. While affiliation and relationship building have been found among mentors in other physical activity programs, break from routine seems to be less commonly reported [31]. This particular benefit was perhaps most apparent in Ximena who reported: "As a college student, I don't always have time to de-stress and just talk with someone." The use of exclusively college undergraduates as mentors may have influenced this finding and created an unanticipated additional benefit to mentors through stress management. Regardless, benefits of the program extended beyond the primary goal of increasing physical activity in elementary students and into social and mental health benefits to mentors, as well.

Finally, mentors were able to perceive direct benefits to their mentees. The increase in fitness seen over the course of the Running W.I.S.E. intervention is common in mentored physical activity programs [27, 30, 45]. While this was not an unexpected observation, it is reassuring that while both mentors and elementary students enjoyed the interaction, benefits to physical activity, with the potential to impact health, were also seen. The original purpose of the intervention was to improve the health of elementary school youth through increased physical activity. The enjoyment of physical activity noted in elementary students strengthened the mentor participation satisfaction. This further supports the study's acceptability, as was noted quantitatively through retention and participation rates.

Limitations of the study include a small sample size and use of a charter school population. Use of a charter school population may impact generalizability into standard public schools due to greater curricular flexibility. However, charter schools are public schools and subject to all state and local education standards. Moreover, a majority of the children who participated in this study were classified as healthy or very lean by body composition which may have impacted engagement in a positive manner. Disruption to the intervention after 6 weeks because of the COVID-19 pandemic further limited the study by precluding full 10-week implementation of the intervention, as well as final data collection from elementary students. However, significant data supporting the feasibility and acceptability, as well as numerous perceived benefits to both mentors and mentees, were collected in our study and are worthy of report. Strengths of the study include a low-cost design with a simple intervention intended to maximize participation, while minimizing staffing and economic burden on the school. Recruiting local undergraduate students as mentors increases the repeatability of our study. Another strength is the diversity of the elementary student population. Future studies are needed to support and strengthen our initial findings and should include the use of larger mentor and mentee populations in more traditional public and private elementary school settings.

5. Conclusions

Undergraduate-mentored running programs are feasible and acceptable means of increasing physical activity in elementary school youth. Benefits to both mentors and mentees exist and

extend beyond physical health into social and mental health, as well. The use of undergraduate-mentored physical activity programs in local elementary schools should be promoted to improve the lives of mentors and mentees alike.

Author Contributions

LSK and AMP were involved in experimental concept and design, data acquisition and analysis, and manuscript drafting and revision. CSD was involved in experimental concept and design and manuscript drafting and revision. UK and AXR were involved in data acquisition and analysis and manuscript drafting and revision.

Competing Interests

The authors have declared that no competing interests exist.

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