



Study protocol for a school-based single group pragmatic trial to promote resilience in youth: Building Resilience for Healthy Kids

Joey A. Lee^a, Erin Heberlein^b, Emily Pyle^b, Thomas Caughlan^b, Darvi Rahaman^{b, c}, Margaret Sabin^b, Jill L. Kaar^{c, *}

^a University of Colorado Colorado Springs, Department of Health Sciences, Colorado Springs, CO, USA

^b Children's Hospital Colorado, Colorado Springs, Colorado Springs, CO, USA

^c University of Colorado School of Medicine, Department of Pediatrics, Aurora, CO, USA

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ABSTRACT

Background: There is a growing prevalence of mental health disorders among youth. Helping youth develop skills that promote and support mental well-being is an important strategy for addressing this public health concern. Building Resilience for Healthy Kids (Healthy Kids) is a school-based program designed to improve resiliency in youth aged 9–13 years old using an innovative health coaching framework.

Methods: Healthy Kids is a multi-phased intervention that aims to improve youth resilience using a 6-week, 1:1 health coaching program. The program develops youth resilience and was derived from models for developing youth resilience: Positive Relationships, Coping, Skill Development, Healthy Lifestyle, Sense of Culture, and Connectedness. Effectiveness of the intervention will be evaluated using a single-group, pragmatic trial design with pretest-posttest and follow-up assessments up to 12 months. Process measures will evaluate youth's acceptance and satisfaction of the program and attendance rates. Effectiveness will be evaluated by examining changes in resilience and mental health indicators from pre-to-post program and tracking sustainment of changes in mental health indicators over time.

Discussion: Given the pragmatic nature of the study design to work with generally healthy populations of students, we expect small, but sustainable, improvements in youth resilience to be achieved through the intervention. Further, this study will provide insight into the potential effectiveness of using health coaching as a strategy to support and promote youth mental well-being in school settings.

Trial registration: [ClinicalTrials.gov](https://clinicaltrials.gov) Identifier: NCT04202913. Registered December 18, 2019.

1. Introduction

The prevalence of mental health disorders in youth has steadily increased over the past 10 years [1]. Mental health disorders among children and youth are described as “serious changes in the ways children typically learn, behave, or handle their emotions” [2]. Poor mental health status in youth is associated with lower physical activity [3,4], higher sedentary behaviors [5], poor sleep [6], lower academic achievement [7,8], engagement in risky behaviors [9], and suicide [10]. Rates of mental health disorders increase from childhood to adolescence with approximately 17% of children [11,12] and 22% of adolescents [13] reported to have mental health issues in a given year. Further, experiencing mental health disorders in youth is associated with

higher risk for experiencing mental health disorders in adulthood [14–16].

Preventing and caring for mental health disorders in youth has been identified as a primary focus area for addressing mental health nationally [17,18]. Mental health disorders affect youth from all races and socioeconomic groups, although some disorders have higher prevalence in specific groups compared to others [1,12,13]. Resilience, defined as the protective or positive processes that reduce maladaptive outcomes under conditions of risk [19], has been proposed as a mechanism that may mitigate the risk of youth experiencing negative mental health conditions when faced with adversity [19,20]. Interventions aimed at improving youth social-emotional learning and psychological and mental health status, including resilience, have been implemented to promote and support whole child health in line with the Whole School,

* Corresponding author. Department of Pediatrics, Division of Endocrinology, University of Colorado School of Medicine, 13123 East 16th Avenue, B265, Aurora, CO, 80045, USA.

E-mail address: jill.kaar@cuanschutz.edu (J.L. Kaar).

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Whole Community, Whole Child (WSCC) in schools [8,21–24]. Further, schools are logical settings for delivering youth wellness programming as they provide access to students for long periods of time and have existing resources and infrastructure [25] and the WSCC framework that many schools adopt includes values that support the positive development of youth mental health as part of the whole child. Previous school-based interventions that have targeted resiliency as a mechanism to work through to improve mental health outcomes have reported improved depression, anxiety, and internalization of problems [8,21,23]. However, there remains the need to increase understanding around effective school-based strategies for improving youth mental health and resilience and to identify effective implementation approaches and strategies.

Building Resilience for Healthy Kids is a school-based program that aims to improve and support youth resiliency through an innovative health coaching framework. Informed by the American Academy of Pediatrics (AAP) seven “C’s of resilience [26] and the model of resilience developed by the Center on the Developing Child at Harvard University [27], Building Resilient Youth seeks to equip youth with resilience skills and establish a culture of supporting positive adult and peer relationships throughout schools. Building Resilient Youth is a multi-phased trial focused on establishing program effectiveness and examining dissemination potential. Thus, to better understand and inform implementation barriers and facilitators and to accelerate translation of this research into practice, Building Resilience for Healthy Kids is designed and implemented as a pragmatic trial.

The primary objectives of Building Resilience for Healthy Kids are: 1) to implement a school-based resilience-focused health coaching intervention to support and promote mental health in middle school-aged youth, and 2) to establish a teacher-supported, peer-based health coaching model in schools to sustain and support resilience programming over time. The purpose of this paper is to describe the design and conceptual framework of the Building Resilience for Healthy Kids intervention and to outline the evaluation design, measures, and analytical plan for the project.

2. Methods

2.1. Study design

The Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) 2013 Checklist was used to report information on the Building Resilience for Healthy Kids Clinical Trial herein (Additional file 1). Building Resilience for Healthy Kids is a single group, pretest-posttest pragmatic trial expecting to involve 1000 5th and 6th grade youth and their schools in the Mountain region of the Western United States. Building Resilience for Healthy Kids is a multi-phased trial that aims to, first, test the effectiveness of the Building Resilience for Healthy Kids in real-world conditions and then to evaluate the potential for dissemination. In the United States school system, youth in the 5–6th grade range are typically between the ages of 9–13 years-old. The 5–6th grade age range eligibility criteria was selected for Building Resilience for Healthy Kids because research has shown that mental health problems can begin to present at this age and rates of mental health issues tend to increase as age increases from this range [13,18]. At the time of drafting this manuscript, results of the pilot study have been examined (Phase 1 conducted January to March 2020) and the recruitment of schools for Phase 2 to examine intervention effectiveness is underway (to be implemented during 2020–2021 academic year).

The intervention employs a 6-week 1:1 health coaching intervention focused on resiliency and delivered within a school setting. Youth will be assigned to a health coach that they will work throughout the duration of the intervention. Meetings between health coaches and youth take place during the school day in private rooms designated by the school. Youth will meet with their health coach on the same day/time

each week to establish a consistent routine for meeting regularly. Using this scheduling approach, some youth-health coach meetings will naturally be missed on days where there are days off (e.g., holidays and parent-teacher conferences), cancellations (e.g., weather-related closures), and late start or early dismissals.

The initial session between health coaches and youth is scheduled to be longer than subsequent weekly sessions (30 min versus 15 min). This allows for youth to complete the Child and Youth Resilience Measure (CYRM-R) questionnaire [28] which is the primary outcome assessment tool (described in the “Study Outcome Assessments” section below), provides time for the health coach to build rapport and get to know the youth and vice-versa, allows for a discussion on the topic of resilience to be sure both parties are operating with a common definition of resilience, and provides time for the health coach to explain their role is to be a supportive guide to the youth in improving their resilience. In the initial session, health coaches will utilize a Resilience Wheel activity to facilitate conversation with youth. The Resilience Wheel is a visual depiction of the six areas of focus for the intervention to help guide the conversation and give the youth a focal point. Health coaches will use the Resilience Wheel to assist youth with sharing about areas they feel they are doing well in or are strong and then transition the conversation to areas the youth would like to grow or improve upon regarding their resilience. The initial sessions conclude with a summary of what was discussed and setting the expectation of what will occur at their next session.

The weekly 1:1 health coaching sessions are 15–20 min in duration. The Resilience Wheel is again used to facilitate conversations on the six key resilience components. Health coaches guide youth to identify their own personal values and interests. Together the youth and the health coach will discuss strategies to improve areas of resilience that the youth identified on the Resilience Wheel as areas for growth or improvement. Health coaches then support youth in developing SMART (Specific, Measurable, Action-Based, Realistic, Time-lined) + PSS goals. PSS is a mnemonic used to support youth in creating goals that are “Positively Framed,” “Salient” to the youth, and help the youth identify others who may “Support” them in achieving goals. Youth set short (weekly) and long-term goals (by end of program) and weekly action step activities are used to help youth work towards goals that they set. Health coaches gauge youth’s ability to complete action steps each week during the weekly meetings and will help the youth to identify and work around barriers and provide support to help youth work towards achieving goals.

In the final session with the health coach (i.e., week 6), youth will re-complete the CYRM-R assessment and the health coach will provide a summary of progress over the 6-week period. Together the health coach and youth will establish an action plan with steps that are intended to help support the youth’s continued success post-intervention. Fig. 1 displays the implementation framework for the intervention within schools.

2.2. Recruitment

For phase 1 of the project, an urban middle school serving approximately 330 6th grade students in the Mountain region of the Western United States was invited to participate in the study. The school was targeted for the phase 1 pilot study because the high school within the school district had experienced a recent spike in poor student mental health status and outcomes (i.e., suicides) and had an interest in providing additional resources to promote and support students’ mental health. For phase 2 of the project, an emphasis will be placed on recruiting schools serving a high prevalence of youth from low income families (i.e., schools serving greater than 50% of students that qualify for free and reduced priced lunch) from the lower income school districts within the region within the region. There are 12 school districts within the study region/area and three of these school districts serve segments

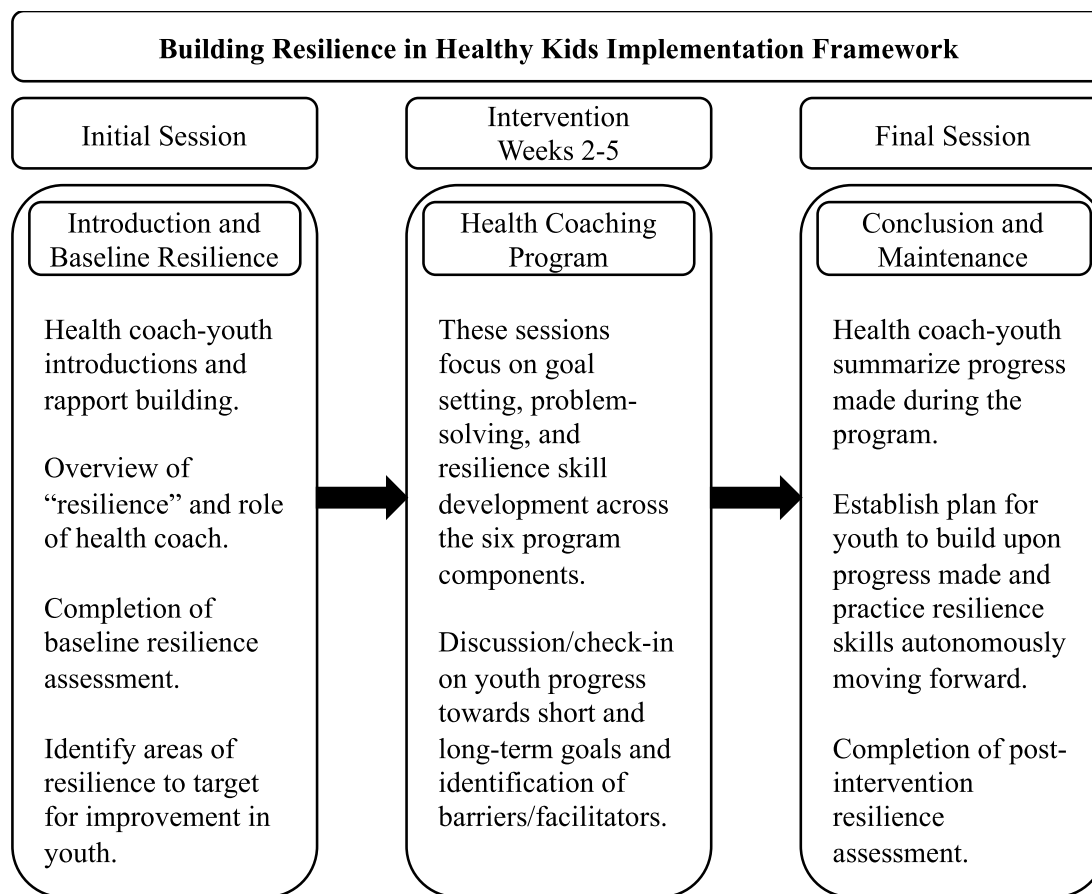


Fig. 1. Implementation framework for building resilience for healthy kids.

of the community with high levels of low socio-economic status families/communities. The recruitment process includes contacting the low-income school district administrators via email and providing them with information and details about the study. Interested school districts will be asked to contact the study personnel and to identify and recommend one school within the district that is interested in participating in the study, able to commit to facilitating implementation of the study (described below), and has greater than 50% of students that qualify for free and reduce priced lunch.

2.3. Participation

Schools that participate in Building Resilience for Healthy Kids will review the interventions conceptual framework and protocol to ensure each fit with their school vision and priorities and to ensure that the program can be feasibly implemented within the school. Once a school enrolls in the study, the school staff/principal will send a letter home to parents/caregivers explaining the program the school will be participating in. Parents/caregivers will be invited to email, text, or call the researchers with any questions or to opt their child out of the study, which they can do at any point in time in the study. Youth will provide their assent to participate in the study during a session at the school where they are able to read about the study (English and Spanish versions provided) and ask on-site school staff any questions they have about the study prior to assenting to and participating in the study. If a family/youth moves out of a participating school, they will be withdrawn from the study. Exclusion criteria include youth with significant developmental delay/cognitive impairment known to the school.

2.4. Building Resilience for Healthy Kids conceptual framework

The Building Resilience for Healthy Kids conceptual framework was developed based on two models for developing resilience in youth: The AAP's seven “C”s of resilience [26] and the model of resilience established by the Center on the Developing Child at Harvard University [27]. The AAP recommends the seven “C”s of resilience as guidelines for helping youth to recognize their own abilities and resources. The seven components of resilience proposed are: 1) competence, 2) confidence, 3) connection, 4) character, 5) contribution, 6) coping, and 7) control. The model of resilience from the Center on the Developing Child at Harvard University focuses on four factors that predispose youth to positive outcomes when faced with significant adversity: 1) facilitating supportive adult-youth relationships, 2) building a sense of self-efficacy and perceived control, 3) providing opportunities to strengthen adaptive skills and self-regulatory capacities, and 4) mobilizing sources of faith, hope, and cultural traditions. Considering these two models for developing resilience in youth, Building Resilience for Healthy Kids consisted of six components to target for development within the intervention (see Table 1):

Positive Relationships. This component focuses on helping to equip youth with skills to develop and foster positive relationships, particularly with trusted adults. These relationships help youth provide youth with personalized attention and direction and an opportunity to develop strong values.

Coping. This component focuses on equipping youth with skills to help them respond to and manage stressful situations effectively. Youth with effective coping skills are better prepared to overcome challenges and adversities they may encounter.

Skill Development. This component focuses on helping to equip youth with skills that can assist them in present and future life. Skill

Table 1
Six components of the conceptual framework for improving resilience in youth.

Component	Operational Definition
Positive Relationships	Equip youth with skills to develop and foster positive relationships with peers, family, and trusted adults from their community.
Coping	Equip youth with skills to help them to effectively respond to and manage challenges and adversities they face.
Skill Development	Equip youth with skills that promote self-efficacy, competence, and contribute to establishing a meaningful life purpose now and in the future.
Sense of Culture	Provide youth with a sense of connection to the religious/cultural groups that they are associated to develop their self-worth, confidence, and a network of support.
Connectedness	Help youth to establish positive relationship with family, friends, and those that have shared values/beliefs to help them develop strong values and a community of support when making difficult decisions or during challenging times.
Healthy Lifestyles	Help youth to establish positive behaviors that support their overall physical and mental well-being and give them confidence and a sense of control.

development can support and promote youth self-efficacy and competence and help them to establish purpose and understanding of how they can make positive contributions to (and beyond) their communities.

Sense of Culture. This component focuses on providing youth with a sense of connection to the religious/cultural groups that they are associated. Establishing a sense of culture can help youth to form positive relationships and help youth to develop their self-worth and confidence.

Connectedness. This component focuses on establishing positive relationship with family, friends, and those that have shared values/beliefs to provide youth with a community of support that can help them to develop strong values and support youth in making difficult decisions or during challenging times.

Healthy Lifestyles. This component focuses on helping youth to establish positive lifestyle behaviors that support their overall physical and mental well-being. Establishing healthy lifestyle behaviors can help to develop confidence in youth and give them a sense of control and autonomy.

Program health coaches will be required to have one of the following credentials; 1) a certification from either an accredited coaching program with National Commission for Certifying Agencies, or the International Coach Federation accreditation, or 2) a Master's degree in health promotion, with the completion of a health coaching class within the degree curriculum. In addition, all health coaches will undergo a background check, complete an online mandatory reporter training module, and receive training specific to the intervention and research protocol (detailed below) prior to being able to participate in the program.

Most health coach training and certification processes are focused on adult populations and lifestyle behavior changes (e.g., healthy eating, physical activity, and exercise) and little is known about the potential utility for using health coaching with youth and to improve resilience. Thus, for Building Resilience for Healthy Kids it was important to ensure that health coaches received training on the skills necessary to interact with youth in the study and to interact with youth about resilience and to evaluate the effectiveness of the intervention. Further, standardizing the health coach training process for the intervention helps to establish consistency in how health coaches interact with and respond to youth in the health coaching sessions. Therefore, experts in instructing health coaches developed a training protocol for the intervention. The protocol includes six 3.5-h training sessions and covers nine health coaching topics and concepts with a specific focus on interacting with pre-adolescents (see Table 2). Each health coach training session had one or more content focus points and opportunities for

Table 2
Outline of the session focus points for the health coach training protocol.

Session	Topic of Focus
1	Defining and describing resilience Practice of the session greeting, program purpose, timeline, and expectations
2	Developing and establishing caring relationship and therapeutic communication skills
3	Reflections of meaning, feeling, content, and summarizing
4	Creating a focus and building motivation Motivational Interviewing: Handling ambivalence, developing discrepancy, and rolling with resistance SMART + PSS goal setting, building commitment, generative moments, and goal review
5	Cultural competency
6	Concluding the program and the client-coach relationship Overall summary and review of training

health coaches to practices applying skills via interactive case scenarios and role playing and recording and reflecting upon practiced conversations. Although sessions had primary focus points, there was cross over and revisiting of key materials through and across sessions.

2.5. Theoretical foundation

The mechanism selected to facilitate changes in youth resilience in Building Resilience for Healthy Kids was the utilization of 1:1 health coaching. Health coaching has been defined as “a patient-centered relationship, with coaches providing education, feedback, and support to enhance self-awareness, motivation, accountability, and self-efficacy while recognizing that patients are experts in their own life situations and must provide the direction for learning and change” [29]. Therefore, the theoretical basis of the intervention lies in the concept of facilitating changes in understanding, and ultimately, behaviors using health coaching. While health coaching is a common behavior change intervention tool, there is a lack of congruency regarding its theoretical grounding [30]. In addition, consistency and rigor in defining and operationalizing health coaching interventions has been identified as a key need in previous literature [30,31]. A concept analysis by Pearson [32] reported how the tools and techniques utilized in health coaching to facilitate behavior change by increasing motivation and enhancing self-determination are grounded in the constructs of the social determination theory (SDT). The SDT suggests that behavior change is grounded in developing one's autonomy, competence, and relatedness to the causes and processes through which individuals develop motivation for initiating and maintaining behaviors over time. Further, the SDT suggests that in order to maintain behavior changes over time, one must internalize values and learn skills necessary for supporting the behavior change [33]. Therefore, SDT was identified as the guiding theory for facilitating health coach-youth conversations around resilience, developing resilience-related skills, and goal setting. However, with regards to goal setting, aspects of goal theory were applied. Goal theory suggests that to optimize goal potential individual's should have choice in selecting the goal, perceive the goal as being relevant and important, be feasible to attain, and include a feedback mechanism (i.e., check-ins and discussions between youth and health coaches) [34].

In addition to the intrapersonal theoretical foundation describe above, aspects of the social-ecological model will also be applied within the intervention to account for additional levels of influence around youth behaviors with regards to youth goal setting. The social-ecological model posits multiple levels of influence, including intrapersonal, interpersonal, organizational, community, and public policy, shape behaviors [35]. Further, the social-ecological model considers how opportunities and access to pursue behaviors are shaped by one's social environment. Therefore, health coaches will work with and help to guide youth in setting goals that are perceived as being feasible given the youths perspective of their social environment across relevant lay-

ers of the social-ecological model. This will help to establish goals throughout the intervention that are feasible for youth to achieve. Thus, a curriculum based on the six components of the intervention's conceptual framework for improving youth resilience (described previously) was developed to train health coaches on how to facilitate conversations with youth on resiliency topics and on how to help youth set and work towards goals to improve resilience skills using weekly activities and goal setting tailored to meet the youth where they are (i.e., SDT and goal theory) and that can feasibly be achieved given the youth's social environment (i.e., goal theory and social-ecological model).

2.6. Evaluation plan

Evaluation of the program will be conducted by having youth complete a series of validated assessment tools at baseline and post-intervention and at 3, 6, 9, and 12-month follow-up. For the baseline and post-intervention assessments, except for the CYRM-R questionnaire, youth will complete the assessment via an online survey platform during a 30-min time block in one of their classes. Students unable to complete the baseline assessment due to absence or being involved in another school-based activity will complete the assessment during their first 1:1 health coaching session. The post-intervention assessment will be conducted at the conclusion of the intervention period with youth re-completing the assessment administered at baseline during a 30-min period during the school day. For youth unable to complete the post-intervention survey at school, a link to the online survey will be sent to youths' school-based email addresses and youth will be asked to complete the assessment as soon as possible with their parents. Representatives from the research team will be onsite at participating schools during the baseline and post-intervention assessments to assist with implementation of the assessments and to address any questions about the survey that youth have.

For the primary outcome measure which assesses youth resilience, the CYRM-R, all youth will complete the CYRM-R assessment during their first (baseline) and last (post-intervention) 1:1 health coaching session. For any youth missing their last health coaching session, a survey link to the CYRM-R questions will be sent to youths' school-based email addresses and youth will be asked to complete the assessment as soon as possible with their parents. At 3, 6, 9, and 12-month follow-up, an email with a link to the complete program assessment tool (including the CYRM-R questions) will be sent to all participating youths' school-based email address.

2.7. Study Outcome Assessments

Intervention effectiveness will be assessed using a pre- and post-test evaluation design. Quantitative and qualitative (semi-structured interviews, open-ended survey questions) methods will be used to inform the utility of the intervention impact. Youth will be asked to self-report sociodemographic characteristics and information about their physical health behaviors and mental and psychological health factors.

Demographic Information. Youth will be asked to self-report their gender, age, and race/ethnicity.

Resilience. The primary outcome measure for the study is youth resilience. The Child and Youth Resilience Measure (CYRM-R) is a measure of social-ecological resilience. This 17-item tool has been validated among children ages 5–9 and youth ages 10–23 years. It is self-administered and uses a 5-point Likert scale ranging from “not at all” to “a lot”. The items within the measures can be directly summed to gain a total score of an individual's resilience. The minimum score is 17 (low resilience) and the maximum score is 85 (high resilience) [28]. The CYRM-R questionnaire assesses youth's personal and relational resilience which allows for exploring these two domains of youth's resilience as well.

Depression and Anxiety. The PROMIS Emotional Distress Anxiety & Depressive Symptoms scales will be used to assess youth depression and anxiety. Each 8-item short form elicits responses on a 5-point scale (from “never” to “almost always”) over the past 7-day period. The measure demonstrated satisfactory goodness of fit and adequate reliability ($\alpha = 0.85$) in children aged 8–17 years [36].

Academic Pressures. The Educational Stress Scale for Adolescents (ESSA) has been validated in middle school students (aged 12–18 years) in a school-based intervention. The 16-item ESSA utilizes a 5-point Likert scale ranging from “strongly disagree” to “strongly agree” with higher scores indicating higher academic stress/pressure [37].

Self-Efficacy: The 24-Item Self-Efficacy Questionnaire for Children (SEQ-C) validated among children and adolescents 12–19 years old [38]. The 24-items represent three domains of self-efficacy: (1) social self-efficacy, which has to do with perceived capability for peer relationships and assertiveness; (2) academic self-efficacy which is concerned with the perceived capability to manage one's own learning behavior, to master academic subjects, and to fulfill academic expectations; and (3) emotional self-efficacy which pertains to the perceived capability of coping with negative emotions. Each item is scored on a 5-point Likert scale ranging from “not at all” to “very well”. An overall self-efficacy score can be obtained by summing across all items, with a higher score indicating higher levels of self-efficacy.

Grit: A 12-Item Grit Scale validated by Duckworth et al. [39] among children 7–15 years old will be used. The tool measures the non-cognitive trait of grit, defined as perseverance and passion for long-term goals. The tool uses a 5-point Likert scale ranging from “very much like me” to “not like me at all”. The maximum overall score is “extremely gritty” and the lowest score is “not at all gritty”.

Bullying: Five bullying-specific questions from the 2019 Middle School Healthy Kids Colorado Survey will be used [40]. This tool is supported and endorsed by the Colorado Department of Public Health and Environment, the Colorado Department of Education and the Colorado Department of Human Services. Regularly administered in schools statewide, the survey is validated among Colorado students in grades 6–12.

Health Behaviors. Questions assessing physical activity and screen time ($n = 12$), sleep ($n = 13$), and nutrition habits ($n = 10$) were obtained from the Healthy Kids Colorado Survey and the Youth Risk Behavior Surveillance Survey [40–43]. The physical activity questions queries physical activity at school and in organized activities over the past 12 months, how youth get to school (e.g., walk, bike), the average number of days per week of physical activity, and hours per day youth spend on screen time. Dietary patterns (i.e., breakfast consumption), food choices (i.e., fruit, vegetables, and sugar sweetened beverages), and hunger ques will be assessed. Sleep behaviors including bed/wake time, having tv in bedroom, time it takes to fall asleep, and daytime sleepiness will also be assessed.

A schematic diagram of the intervention and assessment implementation timeline is provided in Table 3.

2.8. Study process and satisfaction measures

During the intervention, youth health coach session attendance rates will be tracked. This will allow for examination of acceptance of the program by youth and characteristics that may contribute to variations in session attendance. In addition, tracking and evaluation of the health coach session attendance rates will allow for the examination of a potential dose response within the intervention and exploration of the number of sessions that may be optimal or minimal for having an impact on youth resilience and the secondary mental health outcome measures.

Following completion of the intervention, participating youth and classroom teachers, school counselors, and school administrators (e.g., principals, vice principals) will be asked to complete a follow-up ques-

Table 3
Schematic diagram of the Building Resilience for Healthy Kids intervention and assessment timeline.

Timepoint ^a	Study Period								
	Enrollment	Baseline (week before program begins)	Week 1	Weeks 2–5	Week 6	Post-intervention (week after program ends)	3-month follow-up	6-month follow-up	12-month follow-up
Informed Consent	X								
Intervention period			X	X	X				
Outcome Assessments:									
Resilience			X		X		X	X	X
Secondary physical and mental health outcome measures		X				X	X	X	X
Process and Satisfaction Assessments:									
Session attendance rates			X	X	X				
Satisfaction and Acceptability Questionnaire						X			

^a Relevant intervention timepoints listed in this row.

tionnaire to collect information about their perceptions about the program that will be used for summative and formative evaluation purposes. Youth will be asked to complete a 21-item Satisfaction and Acceptability questionnaire to understand their experiences with the intervention and to identify strategies for improving delivery of the intervention. The questionnaire will ask youth about their experience with their health coach and the health coaching sessions, their interest and value of participating in the intervention, their perception about their coping/resilience skill development, the impact the intervention has had on them, and an open-ended question where youth will be able to provide feedback related to the intervention or recommendations on how to improve it in the future. School faculty and administrators will be asked to participate in semi-structured interview sessions or complete a follow-up questionnaire to collect information about their perceptions regarding how the program impacted their students and about the implementation feasibility for their school. Results from both the student and faculty level data collection will be used to evaluate student and school experiences with the intervention, to improve the intervention protocol for future iterations of the program, and to enhance the potential for sustaining the intervention within participating schools.

2.9. Statistical analysis

Evaluation of the effectiveness of the intervention will be evaluated using a regression model accounting for clustering at the grade-level and controlling for baseline resilience, intervention engagement (i.e., session attendance rates), and demographic factors (gender, race, ethnicity) to examine changes in youth resilience and potential factors that may contribute to the intervention effectiveness. Separate regression models will be used to examine changes in the secondary psychological and mental health outcome measures using the baseline and post-intervention data. Further, Hedges' *g* effect sizes and 95% confidence intervals will be used to examine the interventions impact on the primary and secondary outcome variables. The utilization of Hedges' *g* for calculating effect sizes corrects for overestimations of the true population effect present in Cohen's *d* [44]. Longitudinal analysis using the baseline, post-intervention and 3, 6, and 12-month follow-up data will examine changes in youth physical and mental health behaviors over time using a Bayesian One-way Repeated Measures Analysis of Variance. Further, baseline data will be used to group youth into low, moderate, and high scoring groups for each outcome measure and repeated measures models accounting for within-subjects variability will be used to evaluate if there are any differences in how the impact of the intervention is sustained over time across the groups. In addition, a risk score will be constructed based on the sociodemographic variables and psychological and mental health questionnaires used in the study. Construction of the risk score will allow for identifying youth with a higher need for mental health services/support. This will facilitate dissemina-

tion and sustainment of the intervention in a more feasible manner by focusing the intervention resources (i.e., health coaches) on youth with the highest need.

2.10. Sample size calculation

Considering this is a pragmatic trial evaluating the effectiveness of the intervention to impact resilience and other physical and mental health measures in a general population of youth, it is hypothesized that small effects on resilience and other psychological and mental health indicators would be observed in the study. In addition, it is important to account for a potential clustering effect as responses from individuals within a cluster, in this case school and grade-level, are likely to be more similar than those from different clusters (i.e., other schools/grade levels). Govender et al. [45] reported test-retest intraclass correlation coefficient (ICC) values for the 28-item CYRM subscales to be greater than 0.60; however the authors were unable to identify cases of ICC values for clusters comparable to a school grade level. As a result, we utilized a value of 0.30 to express the degree of within grade-level similarity in responses to inform our sample size calculation. Therefore, to obtain a small effect size of 0.20 it was calculated that a sample size of at least 379 youth with baseline and post-intervention data would be needed to detect an improvement in the primary outcome measure, resilience, with 80% statistical power and alpha set at 0.05 while accounting for grade-level clustering.

Ethics approval

The intervention protocol was approved by the senior author's university (JLK) Institutional Review Board in fall 2019. School district Institutional Review Board approval will be attained prior to any school's participation, as applicable. Youth (aged 9–13 years) provide assent prior to participating in the study and prior to any data collection. Parents provide passive consent and can opt their child out of the study at any time.

2.11. Expected impact

The effectiveness phase of Building Resilience for Healthy Kids was launched in January of 2020. At the time of drafting this publication, evaluation of the program outcomes from the first phase of the intervention is on-going. Evaluation of the student and school faculty and administrator satisfaction and feedback will inform potential changes to the protocol for future iterations of the intervention. Specific emphasis will be placed on enhancing intervention feasibility and sustainability along with increasing the potential for establishing a protocol that can be disseminated more broadly.

Building Resilience for Healthy Kids aims to improve and support youth resilience by equipping them with skills and confidence to face and manage challenges that arise in their lives. The program accomplishes this by using a 1:1 health coaching framework that focuses on skill development, goal setting, and building positive relationships, which helps to establish a positive infrastructure within and around youth to enable them to optimally respond to adversity they may face. Building Resilience for Healthy Kids anticipates having a positive impact on resilience, depression, anxiety, academic pressure, grit, and self-efficacy in approximately 1000 youth in intervention schools during the first two years of the program. It is hypothesized that by focusing on the development of youth resilience skills that sustainment of increases in resilience will be observed at medium (~3-month) and long-term (6- and 12-month) follow-up time points. In addition, it is hypothesized that positive changes in youth behavioral health outcomes will be observed in concert with improvements in youth mental health status. Finally, although not evaluated in the present study, participating schools may see decreases in youth behavioral issues and absences and increases in academic performance by youth through the intervention. Efforts to integrate this data in future phases of the intervention (and retrospectively for the first phase) are planned.

3. Discussion

School-based interventions have been identified as a key national and global strategy for supporting and promoting mental health in youth [17,18]. Building Resilience for Healthy Kids is an innovative school-based protocol utilizing health coaching to address resilience and mental health status in youth aged 9 to 13 years-old. The program was developed to be synergistic with the mission and values of the Whole School, Whole Community, Whole Child model (aka WSCC) [46], to support the overall health and well-being of youth.

A major strength of the Building Resilience for Healthy Kids intervention is that it integrates and applies two models for developing and supporting resilience in youth [26,27] using an intervention protocol strategy that is guided by social determination theory and goal theory. Utilizing the health coaching protocol, the intervention aims to educate youth about resilience, development resilience skills, assist them to identify, set, and work towards personal goals around resilience using themes derived from the two resilience models. A previous review by Dray et al. [21] identified that school-based resilience focused interventions were effective for improving youth anxiety and depression in the short-term, especially those that employed strategies consistent with cognitive behavior therapy. The Building Resilience for Healthy Kids protocol is consistent with cognitive behavior therapy as it aims to educate youth about resilience and develop their resilience skills through goal setting using strategies that are consistent with youths' stage of change and personal capacity and abilities. The individualized focus of the protocol (i.e., 1:1 sessions) enables health coaches and youth to consider youths perspectives about their surrounding social environment (i.e., social-ecological model) when developing goals which can optimize the potential for intervention success. To our knowledge, this is the first intervention positioning trained health coaches within school settings to support and promote youth resilience during the school day.

Another strength of the study is the robust evaluation plan using validated tools to study intervention effectiveness. The development of a two-phased intervention trial will allow the Building Resilience for Healthy Kids researchers to study the effectiveness of the intervention over a two-year period. This design will also allow the researchers to utilize a continuous improvement plan to enhance the intervention protocol as feedback and lessons are learned from each phase to improve the protocol for the next phase. This will provide a more extensive evaluation of the effectiveness of the intervention and allow for a long-term evaluation plan design. The need for interventions with more extensive evaluation plans and longer implementation periods has been previ-

ously reported [21,22]. Further the process evaluation and Acceptability and Satisfaction surveys (versions completed by youth and school faculty and administrators) will allow for examination of the intervention dosage (i.e., number of health coaching sessions) necessary to have a positive impact on youth mental health indicators and resilience in concordance with the feasibility and acceptability of the intervention reported. This evaluation design can help to maximize the intervention design for effectiveness and feasible dissemination in the future.

The pragmatic study design will have strengths and limitations [47]. First, the design does not allow for a control group and sacrifices internal validity; however, it allows for more youth to participate and potentially benefit from the intervention. A strong evaluation plan has been proposed to optimize understanding from data that will be collected and to examine changes in youth from baseline to post-intervention and at 3, 6, and 12-month follow up time periods. The long-term follow-up evaluation plan will allow for the examination of any sustained mental health outcomes obtained through the intervention and identify any potential wearing off or regression of any intervention effects. The intervention will use primarily self-reported data which has the potential for reporting bias. Further, youth may not feel comfortable reporting information about their perceptions of their psychological and mental health. Although a limitation, self-report survey data is used extensively in research and only previously validated tools were included within the study. Survey data also allows for feasible, cost-effective, and timely data collection when working in settings, such as schools, where those factors are important. Another limitation of the study could be that the intervention design requires schools to have staff and space available for integrating the health coaching framework within schools (i.e., staff to help schedule health coaching schedule within the school day and space for students and health coaches to meet privately). While this approach may be viable for some schools, it may not be feasible for others. Finally, the intervention is relatively short in duration and intensity (one 15- to 20-min session per week over the course of 6-weeks). Intervention with a longer duration and with longer session lengths, which may be ideal for a typical health coaching session, may yield better results; however, integrating the sessions within a school day limits the potential for session frequency and duration. Nonetheless, integrating the intervention within the context of a school setting allows for the intervention to reach more students that may otherwise not be reached by the intervention, and the duration of the intervention is consistent with other school-based resilience-focused interventions.

In conclusion, Building Resilience for Healthy Kids builds upon previous literature by deploying a long-term, school-based, health coaching intervention to improve youth resilience using a theory-based approach that is grounded in two models for developing and supporting youth resilience. The results of the trial can provide schools with a model for supporting youth resilience and mental health status at a key time in their life before research suggests rates of mental health disorders increase. Building Resilience for Healthy Kids could prove to be a scalable strategy for addressing mental health needs in youth.

Declaration of competing interest

The authors declare that they have no competing interests.

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Abbreviations

AAP American Academy of Pediatrics
CYRM-R: Child and Youth Resilience Measure

Ethics approval and consent to participate

The study protocol was approved by the senior author's (JLK) institutional review board. School/School district institutional review and approval will be obtained from all participating schools, as applicable. All schools will review the study protocol and confirm participation and feasibility for school to engage in the intervention prior to participating. Assent will be obtained from all participating youth prior to participation in the study. Parents will provide passive consent and will be able to withdrawal their youth from the study at any time. Ethics Committee: Colorado Multiple Institution Review Board. Protocol # 19–2602. Effective Data November 13, 2019.

Consent for publication

Not applicable.

Availability of data and materials

Data sharing is not applicable to this article as no datasets were generated or analyzed within this manuscript.

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Authors contributions

JAL drafted the manuscript and participated in the conception and design of the project. JLK critically reviewed the manuscript and participated in the conception and design of the work. EH, EP, TC, DR, and MS participated in the conception and design of the study. All authors, JAL, EH, EP, TC, DR, MS, and JLK, read and approved the final version of the manuscript and have agreed both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.

Declaration of competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Authors information

Joey A. Lee, Ph.D., University of Colorado - Colorado Springs, Department of Health Sciences, Colorado Springs, CO.
Erin Heberlein, M.S., Children's Hospital Colorado - Colorado Springs, Colorado Springs, CO.
Emily Pyle, M.H.A, Children's Hospital Colorado - Colorado Springs, Colorado Springs, CO.
Thomas Caughlan, M.S.W. L.C.S.W, Children's Hospital Colorado - Colorado Springs, Colorado Springs, CO.
Darvi Rahaman M.D., Children's Hospital Colorado - Colorado Springs, Colorado Springs, CO and University of Colorado School of Medicine, Department of Pediatrics, Aurora, CO.
Margaret Sabin, Children's Hospital Colorado - Colorado Springs, Colorado Springs, CO.
Jill L. Kaar, Ph.D., University of Colorado School of Medicine, Department of Pediatrics, Aurora, CO.

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